LAKE OROVILLE PUBLIC UTILITY DISTRICT

SEWER SYSTEM MASTER PLAN

MARCH 9, 2010

SAUERS ENGINEERING, INC.
Civil and Environmental Engineers

LAKE OROVILLE AREA PUBLIC UTILITY DISTRICT

SEWER SYSTEM MASTER PLAN

March 9, 2010

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LAKE OROVILLE AREA PUBLIC UTILITY DISTRICT
SEWER SYSTEM MASTER PLAN

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EXECUTIVE SUMMARY

This report is an updated master plan for the wastewater collection system requirements for the Lake Oroville Area Public Utility District. It is based on the District's billing records and mapping and on the County of Butte General Plan. This study is to be used as a planning tool to assist in providing adequate wastewater collection and to the community being served by the District.

Existing and Projected Wastewater Flows. Average dry-weather and average wet-weather sewer flows (mgd) are predicted based on current conditions, general plan 10-year, 20-year and buildout conditions.

2010		2020		2030		Buildout	
ADWF	AWWF	ADWF	AWWF	ADWF	AWWF	ADWF	AWWF
1.276	1.520	1.397	1.664	1.492	1.777	2.396	2.854

Collection System. The trunk lines of the sewer pipeline system were modeled using a computer. The flow conditions listed above plus an allowance for infiltration/inflow (I/I) were applied to the model. Pipes that were too small to convey present and future wastewater loads were upsized and categorized according to the year of needed improvement. Cost estimates were prepared for anticipated future pipeline construction. Pipeline replacement requirements and costs are listed in Table 5-2 in Chapter 5.

Capital Improvement Program. A summary of anticipated construction costs for sewer system improvements (including pipeline replacements and expansions) are tabulated below.

Year of Expenditure	Cost (2010 dollars)
2010	$ 2,927,278
2010-Buildout	$ 17,903,837

A more detailed listing of these figures is included in the Capital Improvement Program in Chapter 5, Tables 5-2, 5-3, 5-4 and 5-5.

Chapter 1

INTRODUCTION

BACKGROUND

The Lake Oroville Area Public Utility District (LOAPUD) provides sanitary sewer collection services for the unincorporated area east and south of the City of Oroville in Butte County, California. The District's boundary encompasses approximately 8,457 acres (13.2 square miles) ranging in elevation between approximately 200 feet and 1,000 feet above sea level. A vicinity map for LOAPUD is shown in Figure 1.

The District provides service connections to approximately 4,412 customers. Customers include single and multiple family residences, a variety of commercial uses, and public facilities including schools and recreational facilities associated with nearby Lake Oroville. For purposes of record keeping and billing, the District converts non-residential customers to equivalent dwelling units (edu). This adjusts larger wastewater customers to the equivalent number of residential customers which generate the same quantity of wastewater. The District currently serves 6,045 edu according to District records.
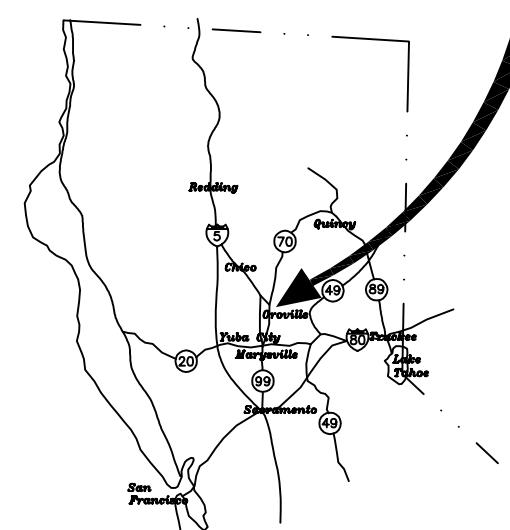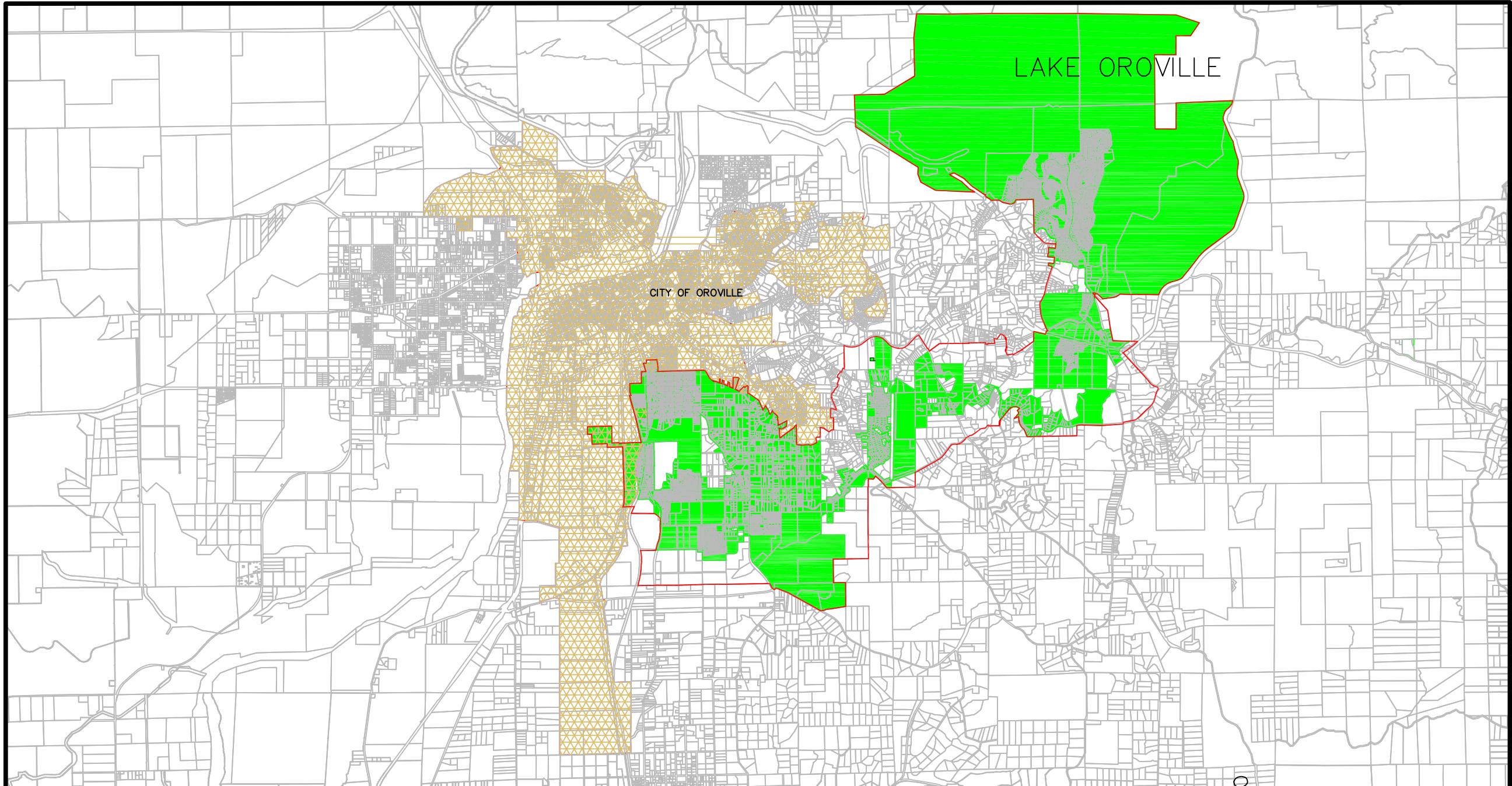
The District, formerly known as the North Burbank Public Utility District, was formed in 1938. Until 1977, the District owned and operated a wastewater treatment plant providing treatment and disposal services in addition to collection. Treatment and disposal are now provided at a regional plant operated by the Sewerage Commission - Oroville Region (SCOR).

Because the District is located in unincorporated Butte County, land uses are governed by the Butte County General Plan. The current general plan was adopted in the 1970's with certain elements being updated at various times since then. The first comprehensive update to the General Plan is in the process as of the writing of this Masterplan and is expected to be completed some time in 2010. The General Plan contains policies related to community growth and development which encourage new, orderly development while offering a full range of municipal services. It also includes policies on the annexation of contiguous areas outside the existing boundaries of municipal service providers. The Local Agency Formation Commission (LAFCo) and State law require the District to adopt a sphere of influence giving the District responsibility in these adjacent unincorporated areas.

Maps created as part of the General Plan provide a basis for the ultimate development of the District's service area. Ultimate development is based on the land use and zoning designations, densities, and areas of each of zoning district. It is estimated that the District is currently at approximately 53% of projected buildout within its current service area.

TREATMENT AND DISPOSAL

Since 1977, treatment and disposal of the wastewater conveyed through the District's collection system have been provided by the Sewerage Commission - Oroville Region (SCOR) regional treatment plant located west of the District's service area. The SCOR plant is operated through a Joint Powers Agreement (JPA) which also involves the City of Oroville and the Thermalito Water and Sewer District. The plant is rated for an average dry-weather flow of 6.5 million gallons per day with current average dry-weather flows of 3.2 million gallons per day. The unused capacity of the plant is available to the JPA members under a first come, first served policy.

LAKE OROVILLE

CITY OF OROVILLE

Legend

▇ Existing Service Area
▬ Existing Sphere of Influence
— Parcel Boundary

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Butte   California

Sewer System
Masterplan 2010

Vicinity Map

Sheet 1 of 14

Designed: KEM
Drawn: KEM
Date: March 2010
Scale: N.T.S.

Redding
Quincy
5
70
Chico
49
89
Oroville
Yuba City
Marysville
20
99
Sacramento
49
San Francisco
Lake Tahoe

SEWER SYSTEM MASTER PLAN

The Sewer System Master Plan is an evaluation of the District's wastewater collection system. The system is evaluated in terms of its ability to adequately convey current flows and, by estimating the future growth of the District's service area, in terms of its ability to accommodate additional future flows. The study also identifies new collection system facilities which will be needed to allow the system to expand into new service territory.

Chapter 2 contains information on the existing and projected future wastewater flows for the District. Included are current flow projections, wastewater generation factors, and projections of future additional flows.

A description of the existing collection system is included in Chapter 3. This chapter presents an inventory of existing pipelines and lift stations, a discussion of infiltration/inflow and its affects on the system, and a discussion of non-District facilities.

The actual sewer system master plan, including results of a computer analysis of the system, are presented in Chapter 4. Chapter 4 includes discussions on current and future wastewater flow quantities, pipeline capacities and sizing, and, based on the results of the computer analysis, a list of the pipelines in need of replacement along with their estimated costs. This chapter also includes new collection system facilities needed to meet the anticipated expansion of the system along with cost estimates.

Chapter 5 is a recommended plan and capital improvement program for the replacement of existing facilities and construction of new facilities. It provides cost estimates and the estimated time when the improvements will be needed.

Appendix A contains a discussion on the computer model analysis and Appendices B through D contain the computer printouts showing the results of the computer modeling.

AUTHORS AND CREDITS

Sauers Engineering, Inc. of Nevada City provided overall project coordination and was directly responsible for the preparation of the master plan. Key personnel included Keith Knibb, RCE 51290, Dean Marsh, RCE 58100, and Karen Nelson, RCE 46413, and Kirk Moberg, EIT.

Thanks go out to the members of the Lake Oroville Area Public Utility District staff who participated in the master planning process. The valuable information and assistance provided by District staff made this study possible. Staff members who contributed valuable assistance and information during the preparation of the master plan include Alan Brown, General Manager; Jan Rustenhoven, Cindy Quigley, Darin Kahalekulu, and Dan Sanders.

Chapter 2

EXISTING AND PROJECTED WASTEWATER FLOWS

This chapter of the master plan report describes the methods used to evaluate current and future wastewater generation rates, population development trends, and average wastewater flow rates.

BACKGROUND

The original District sphere of influence was created in 1984 and approved by the District, known at that time as North Burbank Public Utility District. Since then, the sphere of influence has been amended at various times to its current boundary as shown on Figure 2.
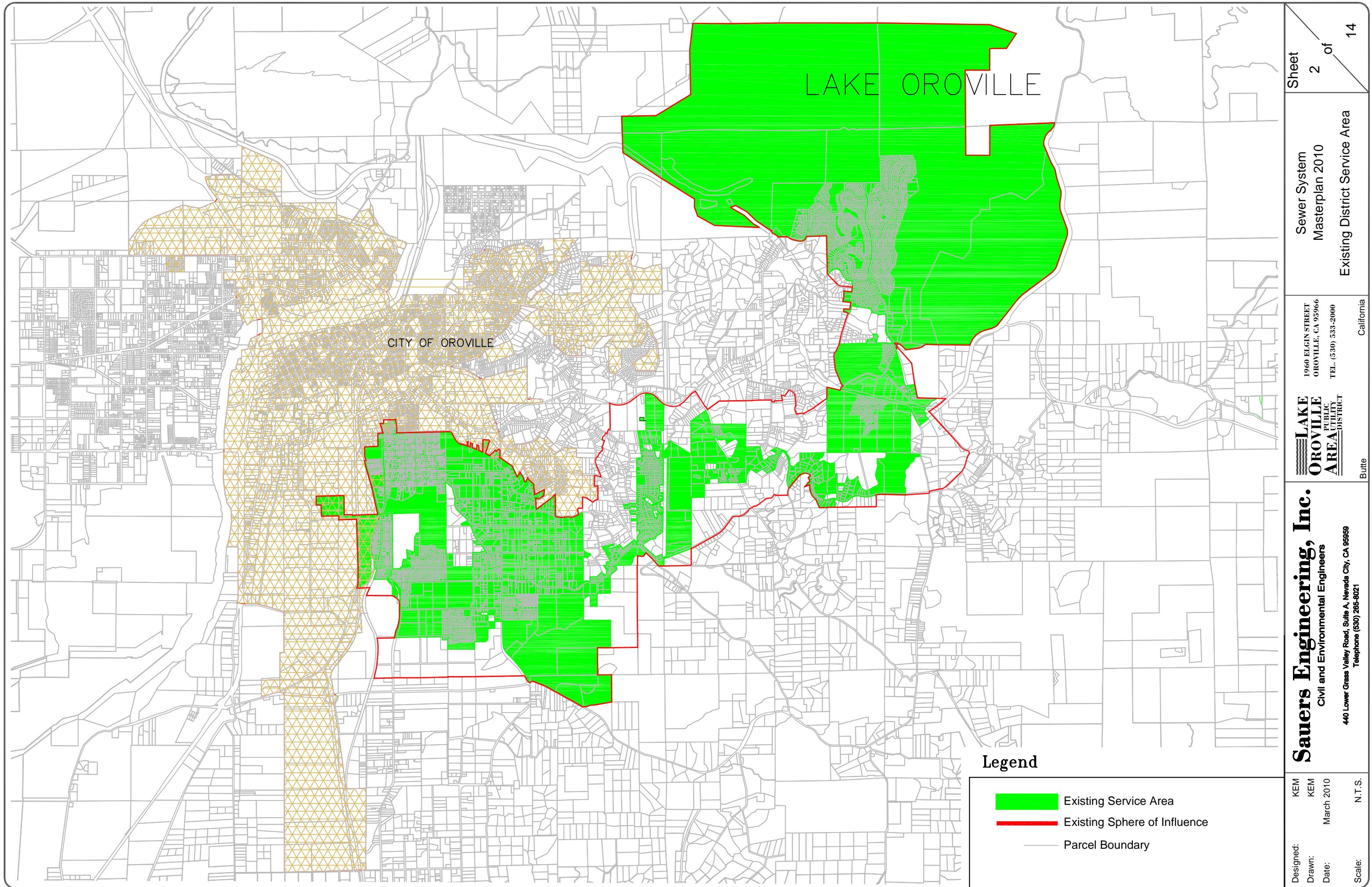
This study includes all of the existing service boundary, existing sphere boundary and the proposed future sphere boundary titled on the map in Figure 3 as Masterplan Study Area which all appear to have a reasonable likelihood of developing and would logically be served by the District's system.
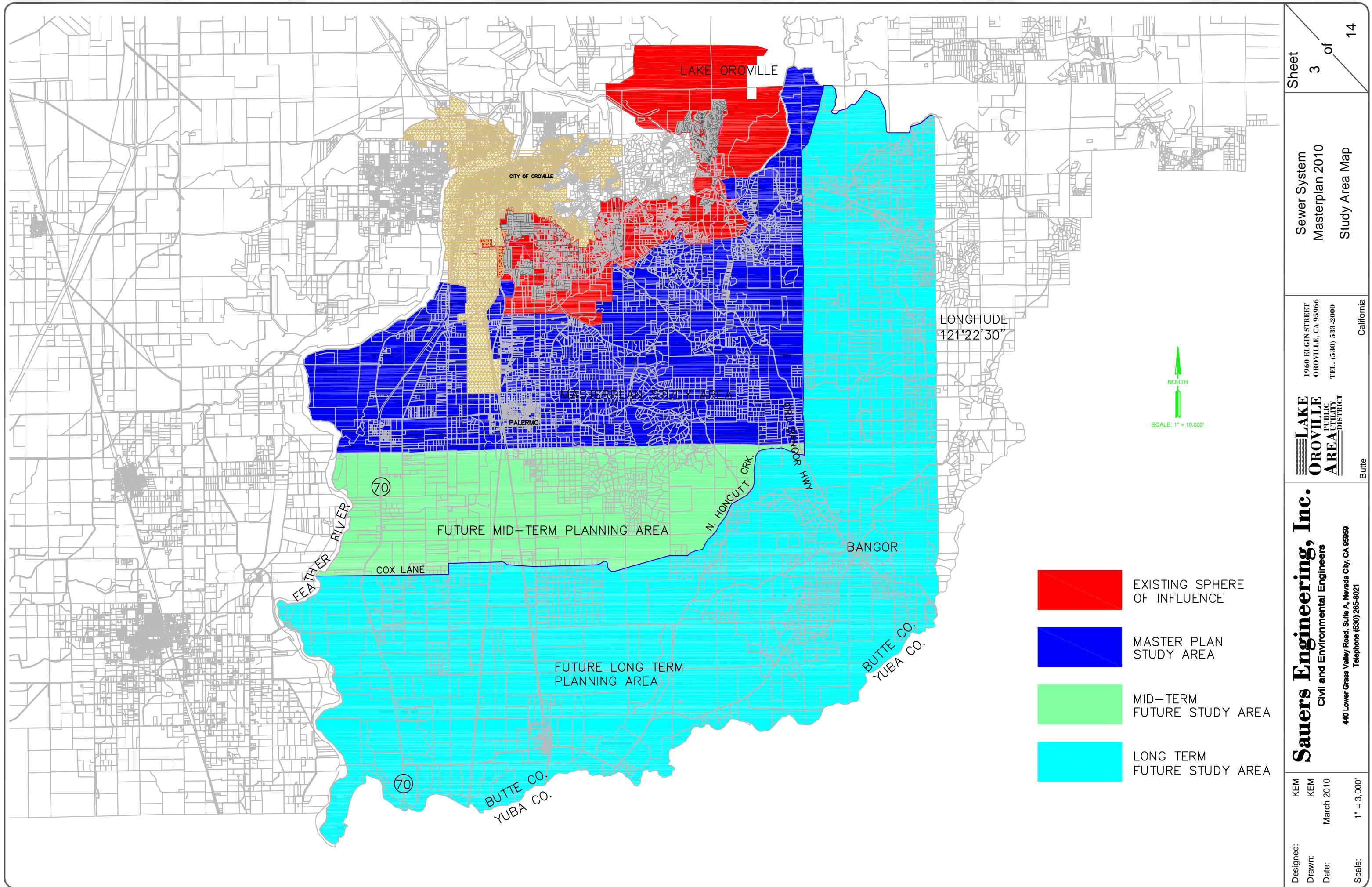
Existing land uses for areas currently being served by the District are based on District maps and billing records which indicate the type of service (residential, commercial, public, etc.) for each customer. Projections for future development within the study area are based on the Butte County Department of Development Services Draft General Plan Land Use Map (Draft adopted April 2009). The general plan includes zoning and land use designation maps and descriptions used to determine the character and density of future development in the study area. Local conditions such as topography, water courses, and other environmental constraints were also taken into account in determining areas of land not likely to be developed. In some cases, where more specific information was available on proposed projects, that information was used in lieu of general plan designations.

WASTEWATER FLOW BASE INFORMATION

To accurately model the distribution of development and corresponding flows, the District's sewer service area was divided into drainage subareas, or collection zones. The collection zones were based on the District's sewer system maps and on topographic maps for areas not currently served. The collection zones represent areas which contribute flows through smaller collection system branches to a common point on one of the systems primary interceptor lines or sewer lift stations. Collection zone identification numbers refer to the District manhole number on the interceptor line which receives sewage from the collection zone. The map of the current collection zones is shown on Figure 4. Land use projections for each of the collection zones including existing EDU's, future projected EDU's, and future commercial areas within the current service boundary are also shown on Figure 4.

Sewer services were distributed within the collection zones based on the District's billing records and maps showing the parcels being served. Existing commercial services were converted to equivalent dwelling units (EDU's) for use in flow projections. The total edu count for the District is 6,045. The existing flow projections were calculated using the SCOR metering records for District flow to the treatment plant. In addition, some collection zone flow projections were calculated using District flow meter records and pump station records.

LAKE OROVILLE

CITY OF OROVILLE

Sheet 2 of 14

Sewer System
Masterplan 2010

Existing District Service Area

Designed:	KEM
Drawn:	KEM
Date:	March 2010
Scale:	N.T.S.

Legend

▮ (green)	Existing Service Area
▬ (red)	Existing Sphere of Influence
—	Parcel Boundary

LAKE OROVILLE

CITY OF OROVILLE

LONGITUDE 121°22'30"

MASTERPLAN STUDY AREA

PALERMO

FUTURE MID-TERM PLANNING AREA

N. HONCUTT CRK.

OLD BANGOR HWY

BANGOR

COX LANE

FEATHER RIVER

70

FUTURE LONG TERM PLANNING AREA

BUTTE CO.
YUBA CO.

BUTTE CO.
YUBA CO.

70

NORTH

SCALE: 1" = 10,000'

EXISTING SPHERE OF INFLUENCE

MASTER PLAN STUDY AREA

MID-TERM FUTURE STUDY AREA

LONG TERM FUTURE STUDY AREA

Sheet 3 of 14

Sewer System Masterplan 2010
Study Area Map

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Butte   California

Designed: KEM
Drawn: KEM
Date: March 2010
Scale: 1" = 3,000'

Flow generation factors were based on the number of equivalent dwelling units being served by the District and the total flow as recorded at the SCOR meter. Flows were averaged over the last six years for average dry-weather flow (ADWF) from the month of May to the end of October. Wet weather flows were also estimated based on peak flows recorded at the SCOR meter and flow measurements taken at various locations using District flow meters. Increased flow due to wet weather conditions was distributed as infiltration/inflow (I/I) to the various collection zones based on the age, condition, and known deficiencies of each collection zone system.

To determine the ADWF from LOAPUD, flows to the SCOR Plant since 2003 during the dry weather periods between May and October were averaged and are listed in Table 2-1.

Table 2-1
Average Dry Weather Flows
From LOAPUD to SCOR Plant

	Average Daily Flow, million gallons per day (mgd)							
Month	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Ave*
May	1.083	0.784	0.884	0.874	0.884	0.854	0.878	0.892
June	0.881	0.771	0.809	0.850	0.858	0.854	0.821	0.835
July	0.880	0.791	0.808	0.842	0.861	0.844	0.818	0.835
August	0.906	0.813	0.806	0.847	0.893	0.832	0.833	0.847
September	0.896	0.807	0.812	0.872	0.903	0.834	0.837	0.852
October	0.882	0.853	0.811	0.881	0.881	0.858	0.841	0.858
Dry Weather Average Flow (mgd)								0.853

Using the total edu count within the District of 6,045, the average daily flow per edu is 141 gpd/edu (853,000 gpd/6,045 edu). In the previous Masterplan, the waste generation factor was calculated to be 204 gpd/edu. Over the last ten years, the District has conducted an extensive I/I program that has reduced I/I flows in to their system. Even during the dry weather periods, the district was seeing dry weather I/I. So, although the total edu count for the district has increased by approximately 1,024 in the last ten years, the wastewater flows have remained steady. This can be attributed to the Districts I/I program and also to conservation measures of the District's customers. Although the wastewater generation factor has decreased significantly since the 2000 Masterplan, the District feels that a factor of safety should be implemented in calculating the wastewater generation factor. A factor of safety of 1.5 shall be applied to the 141 gpd/edu to arrive at a District Standard rounded to 210 gpd/edu. The wastewater generation factors (average dry-weather flow) used to develop flows for the current year 2010 condition and for future flow projections are as follows:

Residential:	210 gallons per day/equivalent dwelling unit
Commercial/Industrial:	600 gallons per day/gross acre
Public Lands:	Case by case projection

The estimated distribution of current wastewater flows for each collection zone is shown on Figure 4. The year 2010 flow projections using the above generation factors for the ADWF are shown in Table 2-2. The AWWF shown in Table 2-2 is the actual wet weather flows metered at the SCOR Plant as discussed and shown later in Table 4-1. The PWWF shown in Table 2-2 is based on a peaking factor of 6.5.

Table 2-2

YEAR 2010 FLOW PROJECTIONS
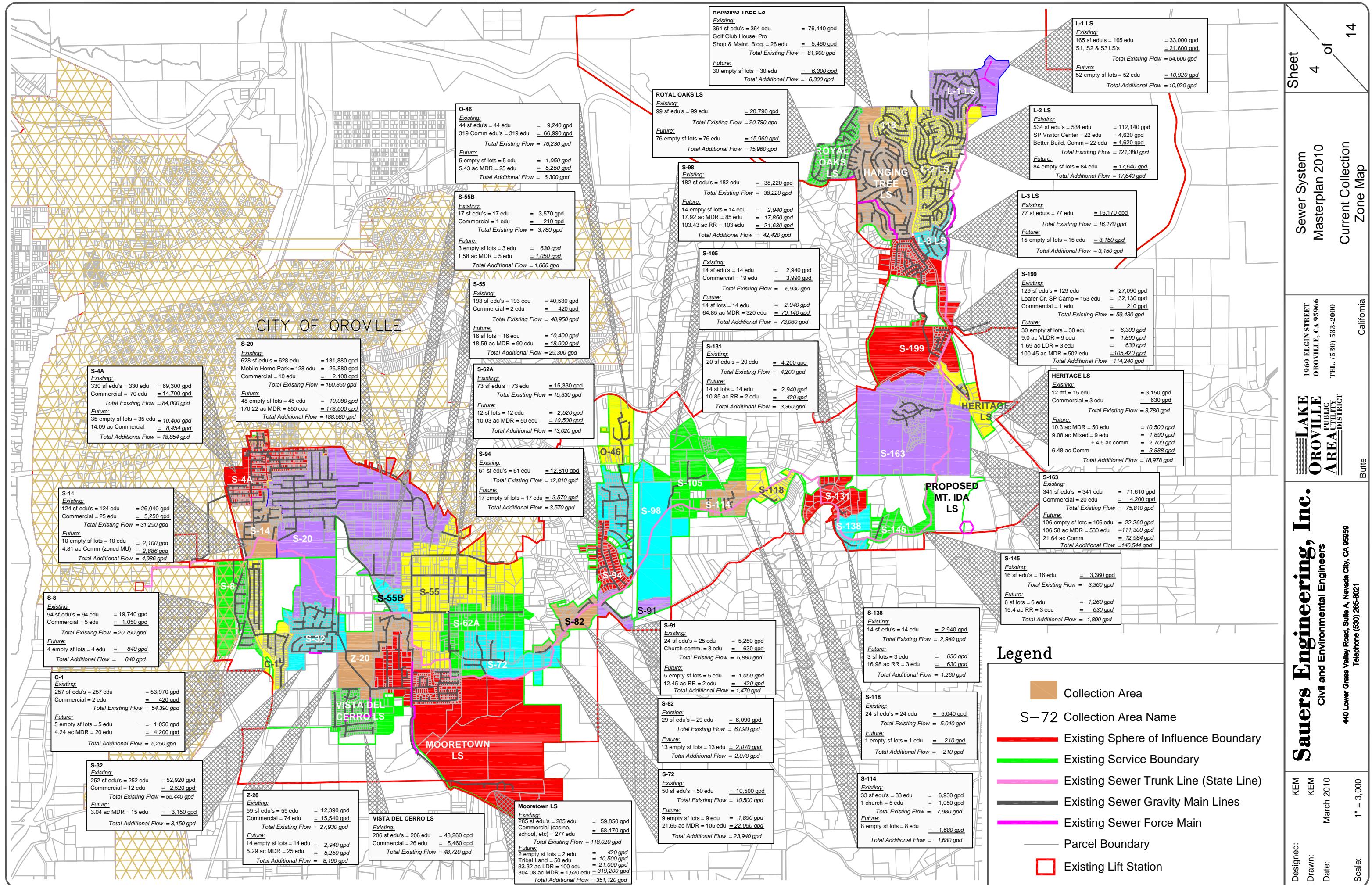
ADWF (mgd)	AWWF (mgd)	Peak WWF (mgd)
1.276	1.52	8.29

FUTURE WASTEWATER FLOW PROJECTIONS

The Butte County general plan gives information on the potential ultimate development of the study area based on the land use and zoning designations. This ultimate, or buildout, condition can be derived from the general plan densities and the area of land in each zoning district. This does not, however, give any indication as to when the buildout condition will be realized. The rate of development in the District in recent years has been relatively steady at approximately 1% growth per year. The Center for Economic Development at CSU Chico publication, Butte County Economic and Demographic Profile 2008, shows an approximate growth rate in the Oroville area of approximately 1% since 1990. This Masterplan will continue to use a 1% growth rate for projections out to buildout. Figure 5 presents a map of areas between the District's current service boundary and SOI that could be serviced in the future. It shows the projected buildout flows from these areas and what manhole these flows would enter the main interceptor line. There are areas both residential and commercial, however, that may have greater growth potential within the study area. Areas of interest that have the potential for being a part of the future LOAPUD Service Boundary are:
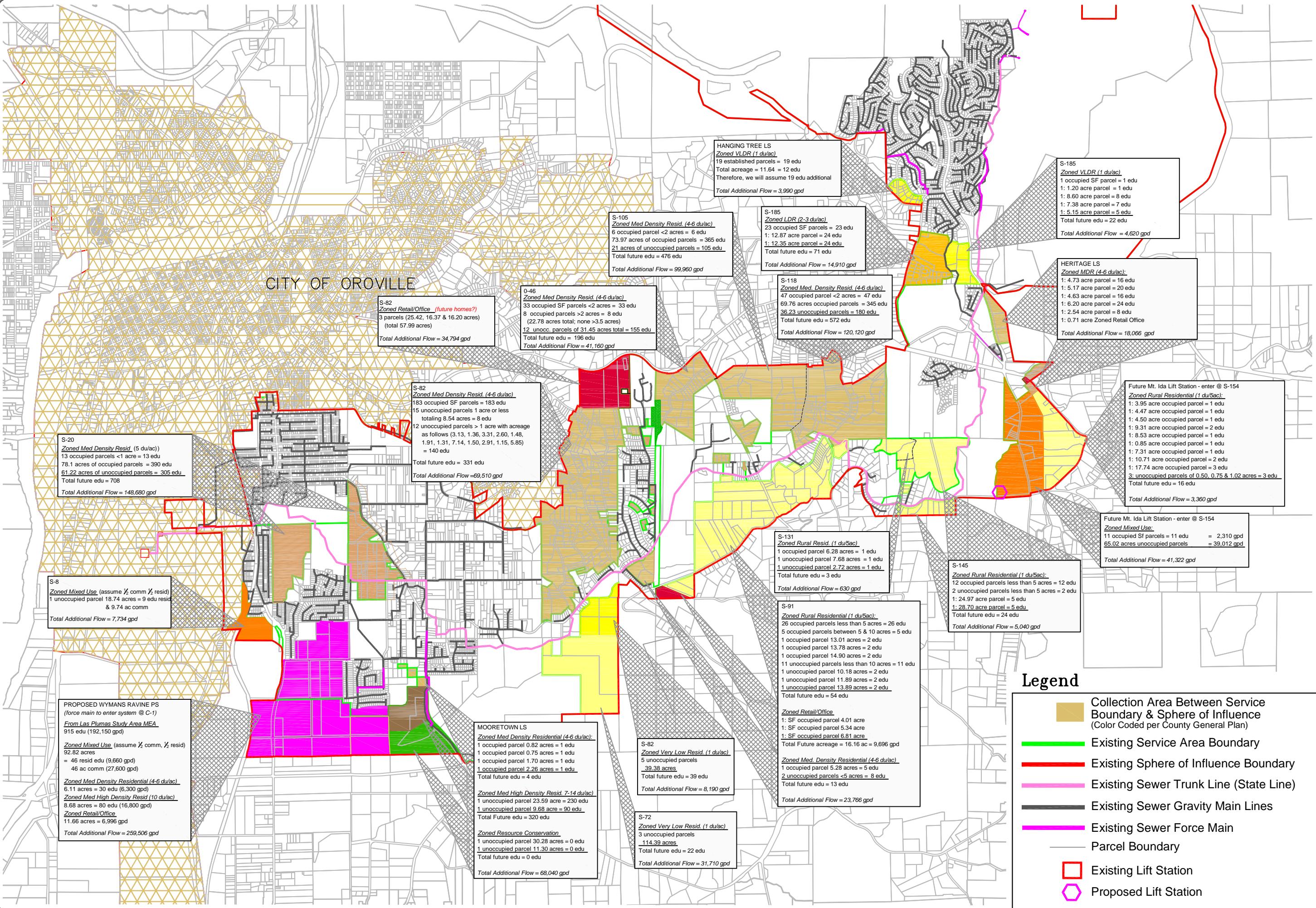
  ▸ Las Plumas
  ▸ Rio D'Oro
  ▸ Mt. Ida

The Las Plumas development area is located south of the City of Oroville and north of the town of Palermo. Baggett Marysville Road borders the west side, Lower Wyandotte Road borders the east, and Ithaca Street borders the north. The total Las Plumas Study Area consists of approximately 2,247 acres with approximately 385 acres projected for development. The projected development would consist of 1,899 dwelling units and 330,000 square feet of commercial space. The Las Plumas Study Area encompasses land that is inside the existing LOAPUD Service Boundary, between the service boundary and the LOAPUD SOI and also land that is outside of the SOI. It is

CITY OF OROVILLE

Sheet 4 of 14

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LAKE OROVILLE AREA PUBLIC UTILITY DISTRICT

Butte / California

Sewer System
Masterplan 2010
Current Collection
Zone Map

Designed:	KEM
Drawn:	KEM
Date:	March 2010
Scale:	1" = 3,000'

HANGING TREE LS
Existing:
364 sf edu's = 364 edu = 76,440 gpd
Golf Club House, Pro
Shop & Maint. Bldg. = 26 edu = 5,460 gpd
Total Existing Flow = 81,900 gpd
Future:
30 empty sf lots = 30 edu = 6,300 gpd
Total Additional Flow = 6,300 gpd

L-1 LS
Existing:
165 sf edu's = 165 edu = 33,000 gpd
S1, S2 & S3 LS's = 21,600 gpd
Total Existing Flow = 54,600 gpd
Future:
52 empty sf lots = 52 edu = 10,920 gpd
Total Additional Flow = 10,920 gpd

ROYAL OAKS LS
Existing:
99 sf edu's = 99 edu = 20,790 gpd
Total Existing Flow = 20,790 gpd
Future:
76 empty sf lots = 76 edu = 15,960 gpd
Total Additional Flow = 15,960 gpd

L-2 LS
Existing:
534 sf edu's = 534 edu = 112,140 gpd
SP Visitor Center = 22 edu = 4,620 gpd
Better Build. Comm = 22 edu = 4,620 gpd
Total Existing Flow = 121,380 gpd
Future:
84 empty sf lots = 84 edu = 17,640 gpd
Total Additional Flow = 17,640 gpd

O-46
Existing:
44 sf edu's = 44 edu = 9,240 gpd
319 Comm edu's = 319 edu = 66,990 gpd
Total Existing Flow = 76,230 gpd
Future:
5 empty sf lots = 5 edu = 1,050 gpd
5.43 ac MDR = 25 edu = 5,250 gpd
Total Additional Flow = 6,300 gpd

S-98
Existing:
182 sf edu's = 182 edu = 38,220 gpd
Total Existing Flow = 38,220 gpd
Future:
14 empty sf lots = 14 edu = 2,940 gpd
17.92 ac MDR = 85 edu = 17,850 gpd
103.43 ac RR = 103 edu = 21,630 gpd
Total Additional Flow = 42,420 gpd

L-3 LS
Existing:
77 sf edu's = 77 edu = 16,170 gpd
Total Existing Flow = 16,170 gpd
Future:
15 empty sf lots = 15 edu = 3,150 gpd
Total Additional Flow = 3,150 gpd

S-55B
Existing:
17 sf edu's = 17 edu = 3,570 gpd
Commercial = 1 edu = 210 gpd
Total Existing Flow = 3,780 gpd
Future:
3 empty sf lots = 3 edu = 630 gpd
1.58 ac MDR = 5 edu = 1,050 gpd
Total Additional Flow = 1,680 gpd

S-105
Existing:
14 sf edu's = 14 edu = 2,940 gpd
Commercial = 19 edu = 3,990 gpd
Total Existing Flow = 6,930 gpd
Future:
14 sf lots = 14 edu = 2,940 gpd
64.85 ac MDR = 320 edu = 70,140 gpd
Total Additional Flow = 73,080 gpd

S-199
Existing:
129 sf edu's = 129 edu = 27,090 gpd
Loafer Cr. SP Camp = 153 edu = 32,130 gpd
Commercial = 1 edu = 210 gpd
Total Existing Flow = 59,430 gpd
Future:
30 empty sf lots = 30 edu = 6,300 gpd
9.0 ac VLDR = 9 edu = 1,890 gpd
1.69 ac LDR = 3 edu = 630 gpd
100.45 ac MDR = 502 edu = 105,420 gpd
Total Additional Flow = 114,240 gpd

S-55
Existing:
193 sf edu's = 193 edu = 40,530 gpd
Commercial = 2 edu = 420 gpd
Total Existing Flow = 40,950 gpd
Future:
16 sf lots = 16 edu = 10,400 gpd
18.59 ac MDR = 90 edu = 18,900 gpd
Total Additional Flow = 29,300 gpd

S-20
Existing:
628 sf edu's = 628 edu = 131,880 gpd
Mobile Home Park = 128 edu = 26,880 gpd
Commercial = 10 edu = 2,100 gpd
Total Existing Flow = 160,860 gpd
Future:
48 empty sf lots = 48 edu = 10,080 gpd
170.22 ac MDR = 850 edu = 178,500 gpd
Total Additional Flow = 188,580 gpd

S-4A
Existing:
330 sf edu's = 330 edu = 69,300 gpd
Commercial = 70 edu = 14,700 gpd
Total Existing Flow = 84,000 gpd
Future:
35 empty sf lots = 35 edu = 10,400 gpd
14.09 ac Commercial = 8,454 gpd
Total Additional Flow = 18,854 gpd

S-62A
Existing:
73 sf edu's = 73 edu = 15,330 gpd
Total Existing Flow = 15,330 gpd
Future:
12 sf lots = 12 edu = 2,520 gpd
10.03 ac MDR = 50 edu = 10,500 gpd
Total Additional Flow = 13,020 gpd

S-131
Existing:
20 sf edu's = 20 edu = 4,200 gpd
Total Existing Flow = 4,200 gpd
Future:
14 sf lots = 14 edu = 2,940 gpd
10.85 ac RR = 2 edu = 420 gpd
Total Additional Flow = 3,360 gpd

HERITAGE LS
Existing:
12 mf = 15 edu = 3,150 gpd
Commercial = 3 edu = 630 gpd
Total Existing Flow = 3,780 gpd
Future:
10.3 ac MDR = 50 edu = 10,500 gpd
9.08 ac Mixed = 9 edu = 1,890 gpd
+ 4.5 ac comm = 2,700 gpd
6.48 ac Comm = 3,888 gpd
Total Additional Flow = 18,978 gpd

S-14
Existing:
124 sf edu's = 124 edu = 26,040 gpd
Commercial = 25 edu = 5,250 gpd
Total Existing Flow = 31,290 gpd
Future:
10 empty sf lots = 10 edu = 2,100 gpd
4.81 ac Comm (zoned MU) = 2,886 gpd
Total Additional Flow = 4,986 gpd

S-94
Existing:
61 sf edu's = 61 edu = 12,810 gpd
Total Existing Flow = 12,810 gpd
Future:
17 empty sf lots = 17 edu = 3,570 gpd
Total Additional Flow = 3,570 gpd

S-163
Existing:
341 sf edu's = 341 edu = 71,610 gpd
Commercial = 20 edu = 4,200 gpd
Total Existing Flow = 75,810 gpd
Future:
106 empty sf lots = 106 edu = 22,260 gpd
106.58 ac MDR = 530 edu = 111,300 gpd
21.64 ac Comm = 12,984 gpd
Total Additional Flow = 146,544 gpd

S-8
Existing:
94 sf edu's = 94 edu = 19,740 gpd
Commercial = 5 edu = 1,050 gpd
Total Existing Flow = 20,790 gpd
Future:
4 empty sf lots = 4 edu = 840 gpd
Total Additional Flow = 840 gpd

S-145
Existing:
16 sf edu's = 16 edu = 3,360 gpd
Total Existing Flow = 3,360 gpd
Future:
6 sf lots = 6 edu = 1,260 gpd
15.4 ac RR = 3 edu = 630 gpd
Total Additional Flow = 1,890 gpd

S-138
Existing:
14 sf edu's = 14 edu = 2,940 gpd
Total Existing Flow = 2,940 gpd
Future:
3 sf lots = 3 edu = 630 gpd
16.98 ac RR = 3 edu = 630 gpd
Total Additional Flow = 1,260 gpd

C-1
Existing:
257 sf edu's = 257 edu = 53,970 gpd
Commercial = 2 edu = 420 gpd
Total Existing Flow = 54,390 gpd
Future:
5 empty sf lots = 5 edu = 1,050 gpd
4.24 ac MDR = 20 edu = 4,200 gpd
Total Additional Flow = 5,250 gpd

S-91
Existing:
24 sf edu's = 25 edu = 5,250 gpd
Church comm. = 3 edu = 630 gpd
Total Existing Flow = 5,880 gpd
Future:
5 empty sf lots = 5 edu = 1,050 gpd
12.45 ac RR = 2 edu = 420 gpd
Total Additional Flow = 1,470 gpd

S-118
Existing:
24 sf edu's = 24 edu = 5,040 gpd
Total Existing Flow = 5,040 gpd
Future:
1 empty sf lots = 1 edu = 210 gpd
Total Additional Flow = 210 gpd

S-82
Existing:
29 sf edu's = 29 edu = 6,090 gpd
Total Existing Flow = 6,090 gpd
Future:
13 empty sf lots = 13 edu = 2,070 gpd
Total Additional Flow = 2,070 gpd

S-32
Existing:
252 sf edu's = 252 edu = 52,920 gpd
Commercial = 12 edu = 2,520 gpd
Total Existing Flow = 55,440 gpd
Future:
3.04 ac MDR = 15 edu = 3,150 gpd
Total Additional Flow = 3,150 gpd

S-72
Existing:
50 sf edu's = 50 edu = 10,500 gpd
Total Existing Flow = 10,500 gpd
Future:
9 empty sf lots = 9 edu = 1,890 gpd
21.65 ac MDR = 105 edu = 22,050 gpd
Total Additional Flow = 23,940 gpd

S-114
Existing:
33 sf edu's = 33 edu = 6,930 gpd
1 church = 5 edu = 1,050 gpd
Total Existing Flow = 7,980 gpd
Future:
8 empty sf lots = 8 edu = 1,680 gpd
Total Additional Flow = 1,680 gpd

Z-20
Existing:
59 sf edu's = 59 edu = 12,390 gpd
Commercial = 74 edu = 15,540 gpd
Total Existing Flow = 27,930 gpd
Future:
14 empty sf lots = 14 edu = 2,940 gpd
5.29 ac MDR = 25 edu = 5,250 gpd
Total Additional Flow = 8,190 gpd

VISTA DEL CERRO LS
Existing:
206 sf edu's = 206 edu = 43,260 gpd
Commercial = 26 edu = 5,460 gpd
Total Existing Flow = 48,720 gpd
Future:
14 empty sf lots = 14 edu = 2,940 gpd
Total Additional Flow = 8,190 gpd

Mooretown LS
Existing:
285 sf edu's = 285 edu = 59,850 gpd
Commercial (casino,
school, etc) = 277 edu = 58,170 gpd
Total Existing Flow = 118,020 gpd
Future:
2 empty sf lots = 2 edu = 420 gpd
Tribal Land = 50 edu = 10,500 gpd
33.32 ac LDR = 100 edu = 21,000 gpd
304.08 ac MDR = 1,520 edu = 319,200 gpd
Total Additional Flow = 351,120 gpd

PROPOSED MT. IDA LS

Legend

Collection Area

S-72 Collection Area Name

— Existing Sphere of Influence Boundary

— Existing Service Boundary

— Existing Sewer Trunk Line (State Line)

— Existing Sewer Gravity Main Lines

— Existing Sewer Force Main

— Parcel Boundary

▢ Existing Lift Station

ROYAL OAKS LS
HANGING TREE LS
L-1 LS
L-2 LS
L-3 LS
S-4A
S-14
S-20
S-55B
S-55
S-62A
S-94
S-98
S-105
S-118
S-131
S-138
S-145
S-91
S-82
S-72
Z-20
VISTA DEL CERRO LS
MOORETOWN LS
HERITAGE LS
S-163
S-199

CITY OF OROVILLE

HANGING TREE LS
Zoned VLDR (1 du/ac)
19 established parcels = 19 edu
Total acreage = 11.64 = 12 edu
Therefore, we will assume 19 edu additional

Total Additional Flow = 3,990 gpd

S-185
Zoned VLDR (1 du/ac)
1 occupied SF parcel = 1 edu
1: 1.20 acre parcel = 1 edu
1: 8.60 acre parcel = 8 edu
1: 7.38 acre parcel = 7 edu
1: 5.15 acre parcel = 5 edu
Total future edu = 22 edu

Total Additional Flow = 4,620 gpd

S-105
Zoned Med Density Resid. (4-6 du/ac)
6 occupied parcel <2 acres = 6 edu
73.97 acres of occupied parcels = 365 edu
21 acres of unoccupied parcels = 105 edu
Total future edu = 476 edu

Total Additional Flow = 99,960 gpd

S-185
Zoned LDR (2-3 du/ac)
23 occupied SF parcels = 23 edu
1: 12.87 acre parcel = 24 edu
1: 12.35 acre parcel = 24 edu
Total future edu = 71 edu

Total Additional Flow = 14,910 gpd

HERITAGE LS
Zoned MDR (4-6 du/ac):
1: 4.73 acre parcel = 16 edu
1: 5.17 acre parcel = 20 edu
1: 4.63 acre parcel = 16 edu
1: 6.20 acre parcel = 24 edu
1: 2.54 acre parcel = 8 edu
1: 0.71 acre Zoned Retail Office
Total future edu = 84 edu

Total Additional Flow = 18,066 gpd

O-46
Zoned Med Density Resid. (4-6 du/ac)
33 occupied SF parcels <2 acres = 33 edu
8 occupied parcels >2 acres = 8 edu
(22.78 acres total; none >3.5 acres)
12 unocc. parcels of 31.45 acres total = 155 edu
Total future edu = 196 edu

Total Additional Flow = 41,160 gpd

S-82
Zoned Retail/Office (future homes?)
3 parcels (25.42, 16.37 & 16.20 acres)
(total 57.99 acres)

Total Additional Flow = 34,794 gpd

S-118
Zoned Med. Density Resid. (4-6 du/ac)
47 occupied parcel <2 acres = 47 edu
69.76 acres occupied parcels = 345 edu
36.23 unoccupied parcels = 180 edu
Total future edu = 572 edu

Total Additional Flow = 120,120 gpd

S-82
Zoned Med Density Resid. (4-6 du/ac)
183 occupied SF parcels = 183 edu
15 unoccupied parcels 1 acre or less
  totaling 8.54 acres = 8 edu
12 unoccupied parcels > 1 acre with acreage
as follows (3.13, 1.36, 3.31, 2.60, 1.48,
1.91, 1.31, 7.14, 1.50, 2.91, 1.15, 5.85)
= 140 edu
Total future edu = 331 edu

Total Additional Flow =69,510 gpd

S-20
Zoned Med Density Resid. (5 du/ac))
13 occupied parcels <1 acre = 13 edu
78.1 acres of occupied parcels = 390 edu
61.22 acres of unoccupied parcels = 305 edu
Total future edu = 708

Total Additional Flow = 148,680 gpd

Future Mt. Ida Lift Station - enter @ S-154
Zoned Rural Residential (1 du/5ac):
1: 3.95 acre occupied parcel = 1 edu
1: 4.47 acre occupied parcel = 1 edu
1: 4.50 acre occupied parcel = 1 edu
1: 9.31 acre occupied parcel = 2 edu
1: 8.53 acre occupied parcel = 1 edu
1: 0.85 acre occupied parcel = 1 edu
1: 7.31 acre occupied parcel = 1 edu
1: 10.71 acre occupied parcel = 2 edu
1: 17.74 acre occupied parcel = 3 edu
3: unoccupied parcels of 0.50, 0.75 & 1.02 acres = 3 edu
Total future edu = 16 edu

Total Additional Flow = 3,360 gpd

Future Mt. Ida Lift Station - enter @ S-154
Zoned Mixed Use:
11 occupied SF parcels = 11 edu   = 2,310 gpd.
65.02 acres unoccupied parcels   = 39,012 gpd.

Total Additional Flow = 41,322 gpd

S-8
Zoned Mixed Use (assume ½ comm ½ resid)
1 unoccupied parcel 18.74 acres = 9 edu resid
& 9.74 ac comm

Total Additional Flow = 7,734 gpd

S-131
Zoned Rural Resid. (1 du/5ac)
1 occupied parcel 6.28 acres = 1 edu
1 unoccupied parcel 7.68 acres = 1 edu
1 unoccupied parcel 2.72 acres = 1 edu
Total future edu = 3 edu

Total Additional Flow = 630 gpd

S-145
Zoned Rural Residential (1 du/5ac):
12 occupied parcels less than 5 acres = 12 edu
2 unoccupied parcels less than 5 acres = 2 edu
1: 24.97 acre parcel = 5 edu
1: 28.70 acre parcel = 5 edu
Total future edu = 24 edu

Total Additional Flow = 5,040 gpd

S-91
Zoned Rural Residential (1 du/5ac):
26 occupied parcels less than 5 acres = 26 edu
5 occupied parcels between 5 & 10 acres = 5 edu
1 occupied parcel 13.01 acres = 2 edu
1 occupied parcel 13.78 acres = 2 edu
1 occupied parcel 14.90 acres = 2 edu
11 unoccupied parcels less than 10 acres = 11 edu
1 unoccupied parcel 10.18 acres = 2 edu
1 unoccupied parcel 11.89 acres = 2 edu
1 unoccupied parcel 13.89 acres = 2 edu
Total future edu = 54 edu

Zoned Retail/Office
1: SF occupied parcel 4.01 acre
1: SF occupied parcel 5.34 acre
1: SF occupied parcel 6.81 acre
Total Future acreage = 16.16 ac = 9,696 gpd

Zoned Med. Density Residential (4-6 du/ac)
1 occupied parcel 5.28 acres = 5 edu
2 unoccupied parcels <5 acres = 8 edu
Total future edu = 13 edu

Total Additional Flow = 23,766 gpd

PROPOSED WYMANS RAVINE PS
(force main to enter system @ C-1)
From Las Plumas Study Area MEA
915 edu (192,150 gpd)

Zoned Mixed Use (assume ½ comm, ½ resid)
92.82 acres
  = 46 resid edu (9,660 gpd)
  46 ac comm (27,600 gpd)

Zoned Med Density Residential (4-6 du/ac)
6.11 acres = 30 edu (6,300 gpd)
Zoned Med High Density Resid (10 du/ac)
8.68 acres = 80 edu (16,800 gpd)
Zoned Retail/Office
11.66 acres = 6,996 gpd

Total Additional Flow = 259,506 gpd

MOORETOWN LS
Zoned Med Density Residential (4-6 du/ac):
1 occupied parcel 0.82 acres = 1 edu
1 occupied parcel 0.75 acres = 1 edu
1 occupied parcel 1.70 acres = 1 edu
1 occupied parcel 2.26 acres = 1 edu
Total future edu = 4 edu

Zoned Med High Density Residential 7-14 du/ac):
1 unoccupied parcel 23.59 acre = 230 edu
1 unoccupied parcel 9.68 acre = 90 edu
Total Future edu = 320 edu

Zoned Resource Conservation
1 unoccupied parcel 30.28 acres = 0 edu
1 unoccupied parcel 11.30 acres = 0 edu
Total future edu = 0 edu

Total Additional Flow = 68,040 gpd

S-82
Zoned Very Low Resid. (1 du/ac)
5 unoccupied parcels
  39.38 acres
Total future edu = 39 edu

Total Additional Flow = 8,190 gpd

S-72
Zoned Very Low Resid. (1 du/ac)
3 unoccupied parcels
  114.39 acres
Total future edu = 22 edu

Total Additional Flow = 31,710 gpd

Legend

(tan)	Collection Area Between Service Boundary & Sphere of Influence (Color Coded per County General Plan)
(green)	Existing Service Area Boundary
(red)	Existing Sphere of Influence Boundary
(pink)	Existing Sewer Trunk Line (State Line)
(black)	Existing Sewer Gravity Main Lines
(magenta)	Existing Sewer Force Main
(thin line)	Parcel Boundary
(red box)	Existing Lift Station
(magenta hex)	Proposed Lift Station

proposed that all flows generated in the Las Plumas Study Area would flow to a future "Wymans Ravine" lift station proposed in the vicinity of Wyman's Ravine and Railroad Avenue north of the town of Palermo as shown on Figure 6.

The Rio D'oro development is located along Highway 70 south of Oroville and its plan is to encompass 685 acres with proposed land uses of residential, commercial, public facility, park and open space, and environmental conservation. Approximately 2,730 residential units and 30 acres of commercial use are planned. The wastewater flow from Rio D'Oro would be piped to the new proposed Wyman's Ravine Lift Station as shown on Figure 6.

Even as the District's service area approaches buildout, it is unlikely that the entire population within the ultimate sphere of influence would be served by a public wastewater collection and treatment system due to limitations in plant capacity, the cost of extending the collection system, topographical constraints on the collection system itself, and low population densities in some of the outlying areas. Some of the areas in the sphere of influence will continue to be served by septic systems and not pursue annexation unless there are strong incentives for annexation such as a significant number of septic system failures which present health and safety concerns.

For the purpose of this master plan, flow projections within the current service boundary were developed for buildout and at ten and twenty year growth periods with a growth rate at 1%. These projections, presented in Table 2-3, were generated by estimating the distribution of new households anticipated in the general plan along with new commercial and industrial development within the individual master plan collection zones. The flow projections attempt to recognize projects in progress and any other known information.

Table 2-3

FUTURE TOTAL FLOW PROJECTIONS
within current service boundary

10-Year (2020)			20-year (2030)			Buildout		
Additional ADWF (mgd)	Total ADWF (mgd)	Total AWWF (mgd)	Additional ADWF (mgd)	Total ADWF (mgd)	Total AWWF (mgd)	Additional ADWF (mgd)	Total ADWF (mgd)	Total AWWF (mgd)
0.121	1.397	1.664	0.216	1.492	1.777	1.120	2.396	2.854

Tables 2-4, 2-5 and 2-6 break down the ADWF flow projections for each collection zone within the current service boundary, the sphere of influence and the master study area, respectively. These tables show the projected flows for the year of analysis and also projects when buildout will occur to reach the projected buildout flow. This is based on a 1% growth rate with the exception that for flows outside of the SOI and in the areas of known future development such as the Las Plumas Study Area and the Mt. Ida Lift Station collection area, we will assume a 1% growth of the buildout flows per year for the first ten years (10% of the final buildout flows will occur in ten years).

Table 2-4
ADWF Flow Projections for 2020, 2030 & Buildout @ 1% Growth Rate *within Current Service Boundary Only*

Collection Zone	Current 2010 Flow (gpd)	2020 Flow (gpd)	2030 Flow (gpd)	Additional Buildout Flow (gpd)	Total Flow @ Buildout (gpd)	Years To Reach Buildout Flow @ 1% Growth	Projected Year for Buildout to Occur
Royal Oaks LS	20790	22965.09	25367.75	15960	36750	57.25	2067
Hanging Tree LS	81900	88200.00	88200.00	6300	88200	7.45	2017
L-1 LS	54600	60312.37	65520.00	10920	65520	18.32	2028
L-2 LS	121380	134079.03	139020.00	17640	139020	13.64	2024
L-3 LS	16170	17861.74	19320.00	3150	19320	17.89	2028
S-199	59430	65647.69	72515.89	114240	173670	107.77	2118
Heritage LS	3780	4175.47	4612.32	18978	22758	180.42	2190
S-163	75810	83741.40	92502.61	146544	222354	108.14	2118
S-145	3360	3711.53	4099.84	1890	5250	44.85	2055
S-138	2940	3247.59	3587.36	1260	4200	35.85	2046
S-131	4200	4639.41	5124.80	3360	7560	59.07	2069
S-118	5040	5250.00	5250.00	210	5250	4.10	2014
S-114	7980	8814.88	9660.00	1680	9660	19.20	2029
S-105	6930	7655.03	8455.92	73080	80010	245.85	2256
S-98	38220	42218.66	46635.66	42420	80640	75.04	2085
O-46	76230	82530.00	82530.00	6300	82530	7.98	2018
S-94	12810	14150.21	15630.63	3570	16380	24.71	2035
S-91	5880	6495.18	7174.72	1470	7350	22.43	2032
S-82	6090	6727.15	7430.96	2070	8160	29.41	2039
S-72	10500	11598.53	12812.00	23940	34440	119.38	2129
S-62A	15330	16933.86	18705.51	13020	28350	61.79	2072
S-55	40950	45234.28	49966.78	29300	70250	54.24	2064
S-55B	3780	4175.47	4612.32	1680	5460	36.96	2047
Mooretown LS	118020	130367.50	144006.83	351120	469140	138.69	2149
Vista Del Cerro LS	48720	48720.00	48720.00	0	48720	0.00	2010
Z-20	27930	30852.10	34079.91	8190	36120	25.84	2036
S-32	55440	58590.00	58590.00	3150	58590	5.55	2016
S-20	160860	177689.52	196279.77	188580	349440	77.97	2088
S-14	31290	34563.63	36276.00	4986	36276	14.86	2025
C-1	54390	59640.00	59640.00	5250	59640	9.26	2019
S-8	20790	21630.00	21630.00	840	21630	3.98	2014
S-4A	84000	92788.26	102495.96	18854	102854	20.35	2030
Total Flow	*1,275,540*	*1,395,205.58*	*1,490,453.53*	*1,119,952*	*2,395,492*		

Table 2-5
ADWF: Flow Projections for 2020, 2030 & Buildout @ 1% Growth Rate *within Current Sphere of Influence*

| Collection Zone	Current 2010 Flow (gpd)	2020 Flow (gpd)	2030 Flow (gpd)	Additional SB Buildout Flow (gpd)	Additional SOI Buildout Flow (gpd)	Total Flow @ Buildout (gpd)	Years To Reach Buildout Flow @ 1% Growth	Projected Year for Buildout to Occur
Royal Oaks LS	20790	22965.09	25367.75	15960	0	36750	57.25	2067
Hanging Tree LS	81900	90867.55	92190.00	6300	3990	92190	11.89	2022
L-1 LS	54600	60312.37	65520.00	10920	0	65520	18.32	2028
L-2 LS	121380	134079.03	139020.00	17640	0	139020	13.64	2024
L-3 LS	16170	17861.74	19320.00	3150	0	19320	17.89	2028
S-199	59430	66109.69	73439.89	114240	4620	178290	110.41	2120
Heritage LS	3780	5982.07	8225.52	18978	18066	40824	239.14	2249
S-163	75810	83741.40	92502.61	146544	0	222354	108.14	2118
Mt. Ida LS *	0	4468.20	8936.40	0	44682	44682	100.00	2110
S-145	3360	4215.53	5107.84	1890	5040	10290	112.48	2122
S-138	2940	3247.59	3587.36	1260	0	4200	35.85	2046
S-131	4200	4702.41	5250.80	3360	630	8190	67.12	2077
S-118	5040	17579.30	30173.76	210	120120	125370	322.99	2333
S-114	7980	8814.88	9660.00	1680	0	9660	19.20	2029
S-105	6930	17651.03	28447.92	73080	99960	179970	327.32	2337
S-98	38220	42218.66	46635.66	42420	0	80640	75.04	2085
O-46	76230	88321.34	101247.09	6300	41160	123690	48.64	2059
S-94	12810	14150.21	15630.63	3570	0	16380	24.71	2035
S-91	5880	8871.78	11927.92	1470	23766	31116	167.45	2177
S-82	6090	17940.55	29857.76	2070	112134	120294	299.82	2310
S-72	10500	14769.53	19154.00	23940	31710	66150	184.97	2195
S-62A	15330	16933.86	18705.51	13020	0	28350	61.79	2072
S-55	40950	45234.28	49966.78	29300	0	70250	54.24	2064
S-55B	3780	4175.47	4612.32	1680	0	5460	36.96	2047
Mooretown LS	118020	137171.50	157614.83	351120	68040	537180	152.30	2162
Vista Del Cerro LS	48720	48720.00	48720.00	0	0	48720	0.00	2010
Z-20	27930	30852.10	34079.91	8190	0	36120	25.84	2036
S-32	55440	58590.00	58590.00	3150	0	58590	5.55	2016
S-20	160860	192557.52	226015.77	188580	148680	498120	113.59	2124
S-14	31290	34563.63	36276.00	4986	0	36276	14.86	2025
C-1	54390	86031.00	118267.34	5250	259506	319146	177.83	2188
S-8	20790	23738.49	26914.55	840	7734	29364	34.70	2045
S-4A	84000	92788.26	102495.96	18854	0	102854	20.35	2030
Total Flow	1,275,540	1500226.07	1,713,461.87	1,119,952	989,838	3,385,330		

Table 2-6
ADWF: Flow Projections for 2020, 2030 & Buildout for entire Master Plan Study Area

Collection Zone	Current 2010 Flow (gpd)	2020 Flow (gpd)	2030 Flow (gpd)	Additional SB Buildout Flow (gpd)	Additional SOI Buildout Flow (gpd)	Additional MSA Buildout Flow (Fig. 6) (gpd)	Total Flow @ Buildout (gpd)	Years To Reach Total Buildout Flow	Proj. Year for Buildout to Occur
Royal Oaks LS	20790	22965.09	25367.75	15960	0	0	36750	57.25	2067
Hanging Tree LS	81900	90867.55	92190.00	6300	3990	0	92190	11.89	2022
L-1 LS	54600	60312.37	65520.00	10920	0	0	65520	18.32	2028
L-2 LS	121380	134079.03	139020.00	17640	0	0	139020	13.64	2024
L-3 LS	16170	17861.74	19320.00	3150	0	0	19320	17.89	2028
S-199	59430	66109.69	73439.89	114240	4620	0	178290	110.41	2120
Heritage LS	3780	5982.07	8225.52	18978	18066	0	40824	239.14	2249
S-163	75810	83741.40	92502.61	146544	0	0	222354	108.14	2118
Mt. Ida LS *	0	27175.20	54350.40	0	44682	227,070	271752	100.00	2110
S-145	3360	4215.53	5107.84	1890	5040	0	10290	112.48	2122
S-138	2940	3247.59	3587.36	1260	0	0	4200	35.85	2046
S-131	4200	4702.41	5250.80	3360	630	0	8190	67.12	2077
S-118	5040	17579.30	30173.76	210	120120	0	125370	322.99	2333
S-114	7980	8814.88	9660.00	1680	0	0	9660	19.20	2029
S-105	6930	34685.03	62515.92	73080	99960	170,340	350310	394.25	2404
S-98	38220	42218.66	46635.66	42420	0	0	80640	75.04	2085
O-46	76230	118483.34	161571.09	6300	41160	301,620	425310	172.76	2183
S-94	12810	14150.21	15630.63	3570	0	0	16380	24.71	2035
S-91	5880	8871.78	11927.92	1470	23766	0	31116	167.45	2177
S-82	6090	17940.55	29857.76	2070	112134	0	120294	299.82	2310
S-72	10500	14769.53	19154.00	23940	31710	0	66150	184.97	2195
S-62A	15330	16933.86	18705.51	13020	0	0	28350	61.79	2072
S-55	40950	45234.28	49966.78	29300	0	0	70250	54.24	2064
S-55B	3780	4175.47	4612.32	1680	0	0	5460	36.96	2047
Mooretown LS	118020	137171.50	157614.83	351120	68040	0	537180	152.30	2162
Vista Del Cerro LS	48720	48720.00	48720.00	0	0	0	48720	0.00	2010
Z-20	27930	30852.10	34079.91	8190	0	0	36120	25.84	2036
S-32	55440	58590.00	58590.00	3150	0	0	58590	5.55	2016
S-20	160860	192557.52	226015.77	188580	148680	0	498120	113.59	2124
S-14	31290	34563.63	36276.00	4986	0	0	36276	14.86	2025
C-1	54390	257303.40	460812.14	5250	259506	1,712,724	2031870	363.86	2374
S-8	20790	23738.49	26914.55	840	7734	0	29364	34.70	2045
S-4A	84000	92788.26	102495.96	18854	0	0	102854	20.35	2030
Total Flow	1,275,540	1741401.47	2195812.67	1,119,952	989,838	2,411,754	5,797,084		
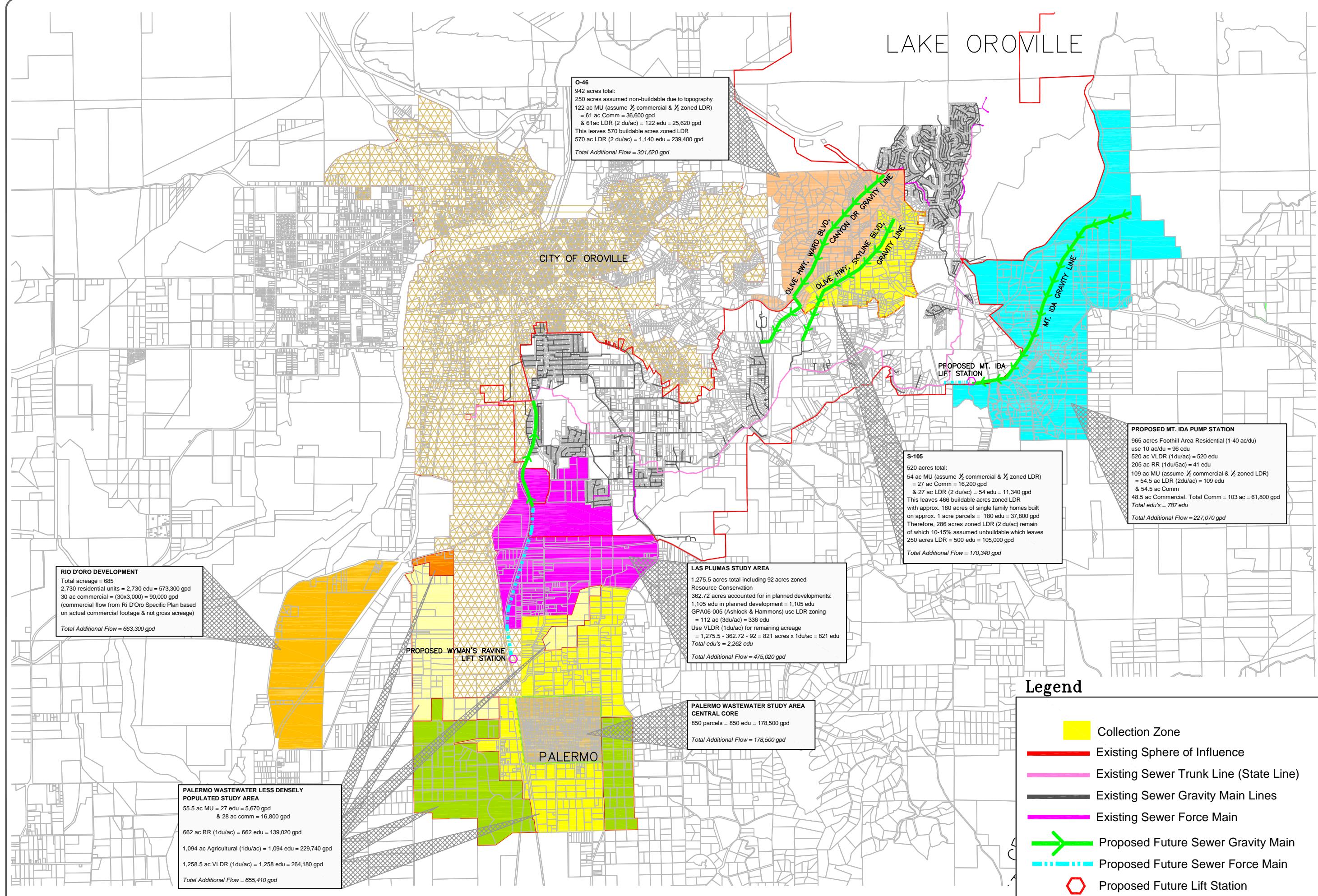
FACTORS INFLUENCING WASTEWATER FLOW PROJECTIONS

The flow projections made in this study are "best estimates" based on available information. The projections attempt to recognize that growth will sometimes be constrained by shortcomings in public infrastructure such as the collection system or traffic capacities, as well as local environmental conditions.

The actual increase in wastewater flows could be influenced by many factors including land use decisions by the county Planning Commission and Board of Supervisors, availability of new jobs in the area, and the general economy at the local, state, and national level. Commercial and industrial projects have the ability to increase the prosperity of the study area if they are well planned and timed. Generally, these types of projects generate lower wastewater flows per developed acre than residential projects.

O-46
942 acres total:
250 acres assumed non-buildable due to topography
122 ac MU (assume ½ commercial & ½ zoned LDR)
= 61 ac Comm = 36,600 gpd
& 61ac LDR (2 du/ac) = 122 edu = 25,620 gpd
This leaves 570 buildable acres zoned LDR
570 ac LDR (2 du/ac) = 1,140 edu = 239,400 gpd

Total Additional Flow = 301,620 gpd

CITY OF OROVILLE

OLIVE HWY, WARD BLVD, CANYON DR GRAVITY LINE
OLIVE HWY, SKYLINE BLVD, GRAVITY LINE

MT. IDA GRAVITY LINE

PROPOSED MT. IDA LIFT STATION

PROPOSED MT. IDA PUMP STATION
965 acres Foothill Area Residential (1-40 ac/du)
use 10 ac/du = 96 edu
520 ac VLDR (1du/ac) = 520 edu
205 ac RR (1du/5ac) = 41 edu
109 ac MU (assume ½ commercial & ½ zoned LDR)
= 54.5 ac LDR (2du/ac) = 109 edu
& 54.5 ac Comm
54.5 ac Commercial. Total Comm = 103 ac = 61,800 gpd
Total edu's = 787 edu

Total Additional Flow = 227,070 gpd

S-105
520 acres total:
54 ac MU (assume ½ commercial & ½ zoned LDR)
= 27 ac Comm = 16,200 gpd
& 27 ac LDR (2 du/ac) = 54 edu = 11,340 gpd
This leaves 466 buildable acres zoned LDR
with approx. 180 acres of single family homes built
on approx. 1 acre parcels = 180 edu = 37,800 gpd
Therefore, 286 acres zoned LDR (2 du/ac) remain
of which 10-15% assumed unbuildable which leaves
250 acres LDR = 500 edu = 105,000 gpd

Total Additional Flow = 170,340 gpd

LAS PLUMAS STUDY AREA
1,275.5 acres total including 92 acres zoned
Resource Conservation
362.72 acres accounted for in planned developments:
1,105 edu in planned development = 1,105 edu
GPA06-005 (Ashlock & Hammons) use LDR zoning
= 112 ac (3du/ac) = 336 edu
Use VLDR (1du/ac) for remaining acreage
= 1,275.5 - 362.72 - 92 acres x 1du/ac = 821 edu
Total edu's = 2,262 edu

Total Additional Flow = 475,020 gpd

RIO D'ORO DEVELOPMENT
Total acreage = 685
2,730 residential units = 2,730 edu = 573,300 gpd
30 ac commercial = (30x3,000) = 90,000 gpd
(commercial flow from Ri D'Oro Specific Plan based
on actual commercial footage & not gross acreage)

Total Additional Flow = 663,300 gpd

PROPOSED WYMAN'S RAVINE LIFT STATION

PALERMO WASTEWATER STUDY AREA CENTRAL CORE
850 parcels = 850 edu = 178,500 gpd

Total Additional Flow = 178,500 gpd

PALERMO

PALERMO WASTEWATER LESS DENSELY POPULATED STUDY AREA
55.5 ac MU = 27 edu = 5,670 gpd
& 28 ac comm = 16,800 gpd

662 ac RR (1du/ac) = 662 edu = 139,020 gpd
1,094 ac Agricultural (1du/ac) = 1,094 edu = 229,740 gpd
1,258.5 ac VLDR (1du/ac) = 1,258 edu = 264,180 gpd

Total Additional Flow = 655,410 gpd

Legend

▨ (yellow)	Collection Zone
▬ (red)	Existing Sphere of Influence
▬ (pink)	Existing Sewer Trunk Line (State Line)
▬ (black)	Existing Sewer Gravity Main Lines
▬ (magenta)	Existing Sewer Force Main
▬► (green)	Proposed Future Sewer Gravity Main
▬ (cyan)	Proposed Future Sewer Force Main
⬡ (red)	Proposed Future Lift Station

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Civil and Environmental Engineers
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LAKE OROVILLE AREA PUBLIC UTILITY DISTRICT
1960 ELGIN STREET
OROVILLE, CA 95966
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California
Butte

Sewer System Masterplan 2010
Future Collection Areas
Outside Existing SOI

Designed: KEM
Drawn: KEM
Date: March 2010
Scale: 5:

Chapter 3

EXISTING WASTEWATER COLLECTION SYSTEM

This chapter describes the existing wastewater collection system within the District's service area. The system includes gravity pipelines, manholes, pressure pipelines, and sewer pump stations as shown on Figure 7.

WASTEWATER COLLECTION SYSTEM
According to an inventory of the District's collection system maps, the system consists of approximately 74 miles of gravity sewer pipeline ranging from 3-inch to 30-inch diameter and approximately 4.5 miles of force main. The force main inventory includes approximately 2.5 miles of force main from the District's lift stations and approximately 2 miles of small diameter pressure pipe within the Villa Verona STEP system. The collection system also includes approximately 1,550 manholes. Table 3-1 shows the pipeline system inventory. There are also nine sewer lift stations in the system.

Table 3-1

COLLECTION SYSTEM INVENTORY

Collection System Pipeline (3"-10", typ)	Collection System Manholes	Interceptor Pipeline (12"-24", typ)	Interceptor Manholes	Force Main (3"-8", typ)	Individual STEP Systems
335,860 ft. (63.6 mi.)	1,550	54,850 ft. (10.4 mi.)	203	23,760 ft. (4.5 mi.)	350

Pipeline materials vary throughout the collection system and include examples of many of the most popular pipeline materials used for sewer construction over the years. Materials include concrete, clay, steel, ductile iron, asbestos-cement, and polyvinyl chloride. Pipe joint materials have also changed over the years with older pipelines likely consisting of concrete mortar or leaded joints and newer pipelines consisting of synthetic rubber joints. The newer joint materials are believed to greatly improve pipe performance, with a marked reduction in infiltration rates.
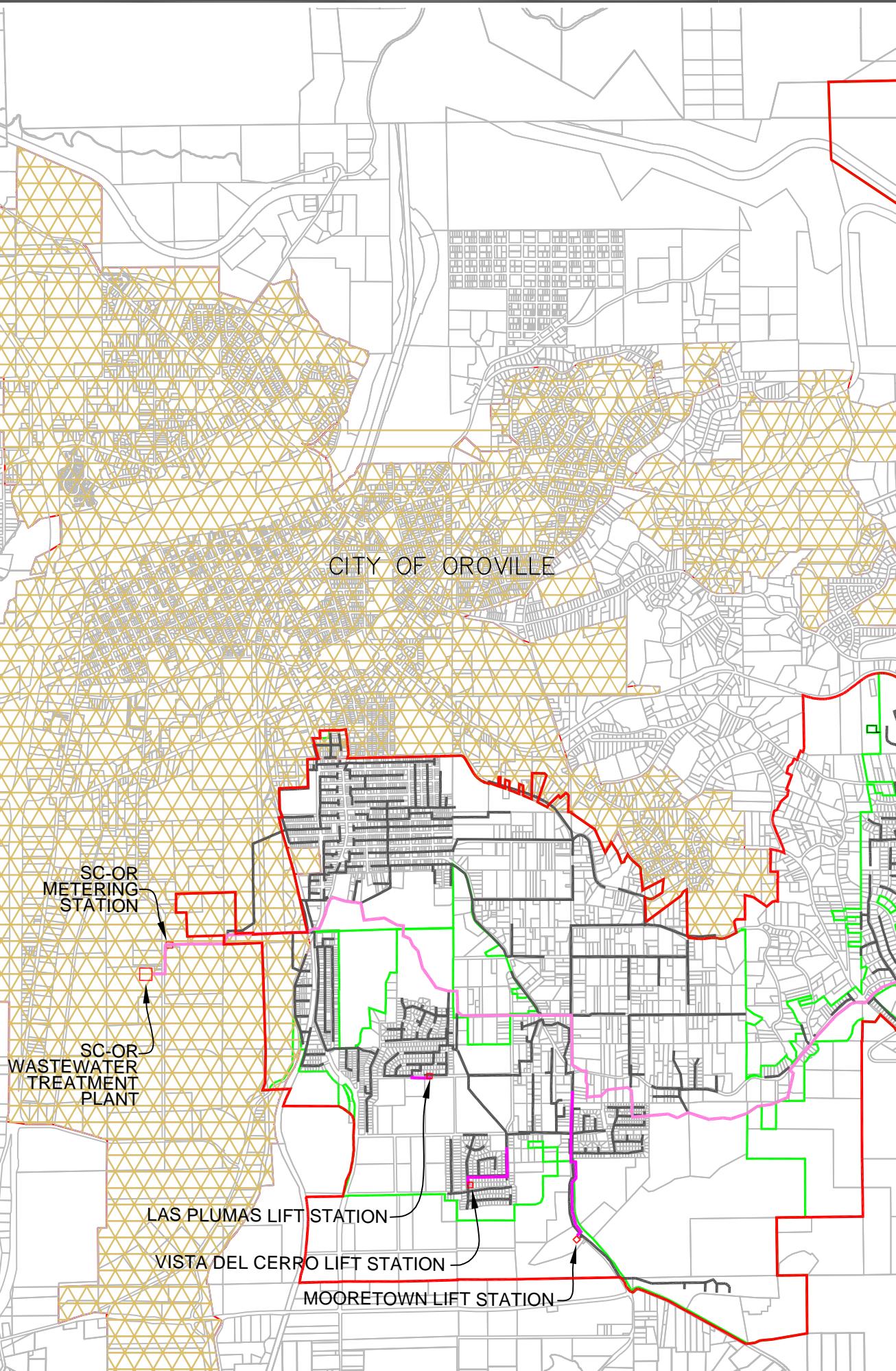
Manholes are typically concrete, either cast-in-place or precast. Normal manhole depths range from 3 to 10 feet deep. There are some manholes which are very shallow, less than 2 feet, and some that are very deep, greater than 18 feet.

The District operates an existing STEP (septic tank effluent pump) system in the Villa Verona Assessment District area. This system utilizes individual pumps and septic tanks located on the customer's property to pump wastewater from the customer to a District pipeline. These systems are used where local topography does not lend itself to either a conventional gravity collection system or a regional sewer lift station. These systems are considered high maintenance due to the need for servicing each of the pumps and periodic pumping of the septic tanks. Due to the high maintenance and the increased spill potential from the STEP system, the District is currently (Summer 2009) in Phase 1 of an approximate 3-year program to replace the Villa Verona STEP

LAKE OROVILLE

L-1 LIFT STATION

L-2 LIFT STATION

ROYAL OAKS LIFT STATION

HANGING TREE LIFT STATION

L-3 LIFT STATION

CITY OF OROVILLE

HERITAGE LIFT STATION

SC-OR METERING STATION

SC-OR WASTEWATER TREATMENT PLANT

LAS PLUMAS LIFT STATION

VISTA DEL CERRO LIFT STATION

MOORETOWN LIFT STATION

Legend

Existing Sphere of Influence Boundary	
Existing Service Boundary	
Existing Sewer Gravity Main Lines	
Existing Sewer Gravity Main Lines	
Existing Sewer Force Main	
Parcel Boundary	
Existing Lift Station	

Sewer System Masterplan 2010
Existing Facilities Map

Designed: KEM
Drawn: KEM
Date: March 2010
Scale: 1" = 3,000'

system with a conventional gravity system that will convey each parcels wastewater to the District's State Line Interceptor.

The collection system includes nine regional sewer lift stations currently maintained by LOAPUD for pumping sewage from local low-lying areas into the gravity collection system. Sewer lift station information is included in Table 3-2 on the following page. Two of the lift stations are part of multiple stage pump systems whereby discharge from the stations flows to subsequent stations to be pumped again. Sewage from portions of the Kelly Ridge collection system must be pumped twice prior to reaching the gravity system.

TABLE 3-2 - LOAPUD LIFT STATIONS

Royal Oaks Lift Station

Location:	Royal Oaks Dr.
Capacity:	250 gpm
Surface Elevation:	920'
Pumps:	2 - Moyno 1GOHS1, 15 hp
Wet Well Size:	1,500 gallon
Lift:	60'
Nearest Surface Water:	50'

Hanging Tree Lift Station

Location:	Hanging Tree Ct.
Capacity:	375 gpm
Surface Elevation:	985'
Pumps:	2, 2-Stage Gorman Rupp T6A-B 88 hp
Wet Well Size:	1,500 gallons
Lift:	101'
Nearest Surface Water:	5'

Heritage Lift Station

Location:	Rachell Road
Capacity:	130 gpm
Surface Elevation:	840'
Pumps:	2 - Peabody Barnes 4SEH-1002, 15 hp
Wet Well Size:	1,000 gallons
Lift:	22'
Nearest Surface Water:	30'

Las Plumas Lift Station

Location:	Las Plumas Ave.
Capacity:	110 gpm
Surface Elevation:	273'
Pumps:	2-Wemco Torque 3S2 submersible
Wet Well Size:	1,500 gallons
Lift:	11'
Nearest Surface Water:	300'

L-1 Lift Station

Location:	Bidwell Canyon Rd.
Capacity:	335 gpm
Surface Elevation:	938'
Pumps:	2 - Gorman Rupp T3A3S-B/WW, 15 hp
Wet Well Size:	4500 gal
Overflow Storage:	11,000 gal
Lift:	42'
Nearest Surface Water:	100'

L-2 Lift Station

Location:	Bidwell Canyon Rd.
Capacity:	850 gpm
Surface Elevation:	936'
Pumps:	2 - Gorman Rupp T6A3S-B/WW, 50 hp
Wet Well Size:	7000 gal
Overflow Storage:	27,000 gal
Lift:	92'
Nearest Surface Water:	150'

L-3 Lift Station

Location:	Bidwell Canyon Rd.
Capacity:	100 - 200 gpm
Surface Elevation:	949'
Pumps:	2-FLYGT submers. NP3102, 6 hp
Wet Well Size:	7050 gal
Overflow Storage:	7,535 gal
Lift:	81'
Nearest Surface Water:	150'

Mooretown Lift Station

Location:	Lower Wyandotte Rd.
Capacity:	447 gpm
Surface Elevation:	245'
Pumps:	2 - FLYGT NP3171 submersible 25 hp
Wet Well Size:	1,500 gal
Overflow Storage:	16,000 gal
Lift:	122'
Nearest Surface Water:	10'

Vista Del Cerro Lift Station

Location:	Vista Del Cerro Rd.
Capacity:	300 gpm
Surface Elevation:	253
Pumps:	HYDR-O-MATIC #s RV4B & LV4B, 15 hp
Wet Well Size:	1,500 gallons
Lift:	36'
Nearest Surface Water:	300'

INFILTRATION/INFLOW

The District's wastewater collection system is known to experience high rates of infiltration/inflow (I/I). This is not unusual considering the age and materials of much of the system. I/I is what accounts for the difference between dry weather flows and wet weather flows. Flows measured at the SCOR meter indicate peak wet-weather flows are typically three to four times higher than dry-weather flows and can be as high as seven to eight times. These increases are directly attributable to I/I entering the system during wet weather conditions.

Infiltration is mainly groundwater which enters the collection system indirectly through defective pipes, pipe joints, damaged lateral connections, or manhole walls. Infiltration is related to high groundwater which is in turn influenced by rainfall and soil type. Infiltration does continue to impact the sewer system after a storm event has ended until the groundwater level is lower than the collection system. Infiltration also impacts the District's system even during the dry summer month periods due to nearby creeks and other water bodies.

Inflow is extraneous storm water which directly enters the sewer system through roof leaders, yard drains, sump pumps, clean outs, cellar drains, and storm drains which have been connected to the sewer collection system. Storm water may also enter the system through damaged or misplaced manhole lids and frame seals. Inflow tends to impact the sewer system in direct relation to storm events, starting as soon as runoff develops and ending shortly after the storm event ends.

High I/I rates can severely impact a sewer system in a number of ways. These include:

> ‣ The District pays to treat non-sewage flows.
> ‣ Peak I/I flows are the primary cause of surcharges and spills at manholes.
> ‣ Since design of replacement pipelines must take into account peak flows, the design tends to be driven by the need to accommodate I/I.
> ‣ The design of sewer lift stations must take into account I/I leading to larger facilities required to accommodate non-sewage flows.
> ‣ The District pays increased costs for larger facilities than would otherwise be needed for sewage flows.
> ‣ The District must pay SCOR for excess peak flows.

Since the 2000 Masterplan, the District has reduced I/I flows through its I/I reduction program as evidenced by the history of flow patterns to the SCOR plant over the last 10 years. The flows from the LOAPUD service area to the SCOR plant have basically remained the same while the edu count for the District has risen by approximately 1,000 edu.

Although the District has seen significant improvement in terms of decreased average flows, I/I is still a problem in many locations and the District has undertaken an aggressive I/I reduction program aimed at reducing peak wet weather flow at the collection system outfall and surcharging conditions in the collection system. Using television inspections, smoke testing, and personnel experience, the District has identified a number of I/I problem sections in the collection system including pipelines and manholes. District crews have repaired and rehabilitated some of the worst problem areas. The District also has and utilizes portable flow meters which help in locating and isolating areas of high I/I. This will make the I/I reduction program more effective by concentrating efforts on areas which have been identified as having

high I/I rates.

In 2009, the District also adopted a lateral pipeline testing and replacement program. This program states that whenever a re-model building permit is issued or there is a change of ownership for a parcel that is being serviced by the District, the owner must test the sewer lateral and repair or replace the lateral if it does not meet the District standards. With this lateral replacement program, it is anticipated that more lateral service lines will be replaced in the future which will have significant impact on I/I reduction.

Since the 2000 Masterplan, the District has repaired and/or replaced sections of pipe throughout the service area to mitigate the I/I problem. The areas where pipeline has been replaced or repaired in response to I/I concerns are shown in Table 3-3.

Table 3-3
Sewer Pipeline Replacement History
In Response To I/I Concerns

Location	Year	Size	Manhole # from	Manhole # to	Total Feet	Replace/ Repair
State Line Interceptor	2006-2009	Various	--	--	±8,270	Replace
Oakvale Court	2007	15"	S-113	S-125	2,992	Replace
Lincoln Crossing	2006	30"	M/H6	S-10	1,986	Replace
Lincoln Crossing	2006	36"	M/H1	M/H2	177	Replace
Lower Wyandotte	2006	27"	S-67	#11	1,985	Replace
L-2 Lift Station	2006	8"	L-2	L-3	1,000	Replace
Richtor Tract	2007	12"	A-10	A-40	955	Replace
Foothill Crossing	2008	30"	S-97	S-98	146	Replace
Foothill Crossing	2008	30"	S-98	S-99	70	Replace
Wahoo	2007	12"	S-126	S-127	140	Replace
Silverleaf	2007	8"	Z-31E	Z-31EA	87	Replace
Lower Wyandotte	2006	6"	G-67	G-70	72	Replace
Marysville Bagget	2005	N.A.	B-13	B-14	10	Replace
The district has also made numerous repairs to leaking pipe joints throughout their collection system in the last ten years.						

Chapter 4

COLLECTION SYSTEM MASTER PLAN

The objective of the collection system master plan is to (1) determine the capacity and limitations of the existing collection system, and (2) determine the physical modifications, renovations, and additions to the existing collection system necessary to meet current and future needs. To meet these objectives, the area served by the system, both currently and in the future, was identified, subdivided, and evaluated so that the wastewater generated in the service area could be calculated. The existing collection system was then analyzed to determine its ability to transport the generated flows to the treatment facilities.

SERVICE AREA

The present service area and current sphere of influence as previously discussed is shown on Figure 2. As development occurs and the need for service expands, the service area will expand. Potential new service areas considered in this master plan are also shown on Figures 5 and 6. Predicting the timing and rate of expansion is very difficult because it is influenced by so many extraneous factors. For the purposes of modeling the collection system, the service area was analyzed in three stages; current year 2010, 10-year growth, 20-year growth and buildout.

COLLECTION SYSTEM MODEL

The geometry of the existing system was modeled on a computer with the aid of the following information:

▸   Lake Oroville Area Public Utility District System Map, February 2000

▸   North Burbank Public Utility District Modifications to Royal Oaks Pump Sta., Sep 1978

▸   North Burbank Public Utility District Sphere of Influence, June 1984

▸   Kelly Ridge Estates Improvement Plans, September 1970

▸   L-System Lift Station Modifications, January, 2007

▸   Topographic Survey State Line Rehabilitation, March 2002

▸   Topographic Survey Sanitary Sewer Facilities, May 2006

▸   State Line Sewer Replacement 2006 - Phase 1, April 2006

▸   LOAPUD Sewer System Masterplan, July 2000

In the model, existing interceptor lines were listed with their manholes, pipeline diameters, inlet and outlet elevations, and lengths. The topographic maps were used to lay out proposed interceptor lines to serve areas beyond the present limits of the system. Elevations were also obtained from topographic maps and Google Earth™. A more detailed discussion of the

modeling techniques and applicable input and output parameters is included in Appendix A of this report.

WASTEWATER FLOW QUANTITIES

In Chapter 2, land use and population trends were analyzed and projected into the future. Factors of wastewater production were applied to develop flow rates for land use areas at points of time in the future. These flow rates provide the basis for formulation of this master plan.

The collection system was modeled for the year 2010, 10-year (2020), 20-year (2030) and at buildout growth conditions. Sewage flows for the 2010 model were based on the current distribution of development and land uses. Collection zones were established using the District's sewer system maps. Collection zones consisted of areas of branched systems of smaller collection pipelines which eventually tie together to discharge at a single point into one of the sewer interceptor lines. Only the sewer interceptor lines, major collector lines, and some of the force mains were included in the collection system model. Flows accumulated in the collection zone pipelines were input as point sources into the appropriate interceptor line manholes.

Collection system models for the 10-year, 20-year and buildout conditions were based on the County's general plan maps for the study area. The additional residential and commercial development was distributed within the study area with emphasis on currently active new developments. Additional growth included infill of areas currently within the sewer service area and new development outside the sewer service area which could reasonably be expected to connect to the sewer system. For purposes of this master plan, some areas within the study area which are currently being served by individual septic/leachfield systems are expected to continue to use those systems and not contribute flow to the sewer system. It was also anticipated that some new development on larger parcels which are isolated from the sewer system would qualify to be developed on individual sewage disposal systems and not contribute flow to the sewer system.

Essential elements in the development of the system requirements are the unit and per capita flows for the various types of anticipated land uses, as well as the characteristics of these general flows. The requirements must reflect the variations in the seasonal, daily, and hourly rates of flow so that the various elements of the system are properly related to each other and are economically sized.

The wastewater flow into the system is comprised of domestic flow, infiltration, and inflow. Domestic flow is generated in households, commercial and industrial establishments, and public facilities. The flow of wastewater, excluding I/I, will vary throughout the day, with maximum flows occurring during the day and minimum flow at night. Domestic flow does not have a significant seasonal variation.

When designing for the proper size and slope for a new sewer line, the maximum domestic flow must be determined. The relationship between maximum domestic flow and average flow is usually expressed through a design term called "peaking factor". This peaking factor is multiplied by the average flow to determine the peak flow. Design peaking factors vary with the size of the collection system. Large systems have lower peaking factors (often about 2.0), while small systems have higher peaking factors (in the range of 3.0 to 4.0).

From a sewer modeling point of view, it is important to look at the sewer pipelines in terms of their capacity for storm events and the peak wet weather flows (PWWF). Analyzing a pipelines ability to carry PWWF's is crucial to lessen the potential for pipeline surcharging and potential overflowing of manholes.
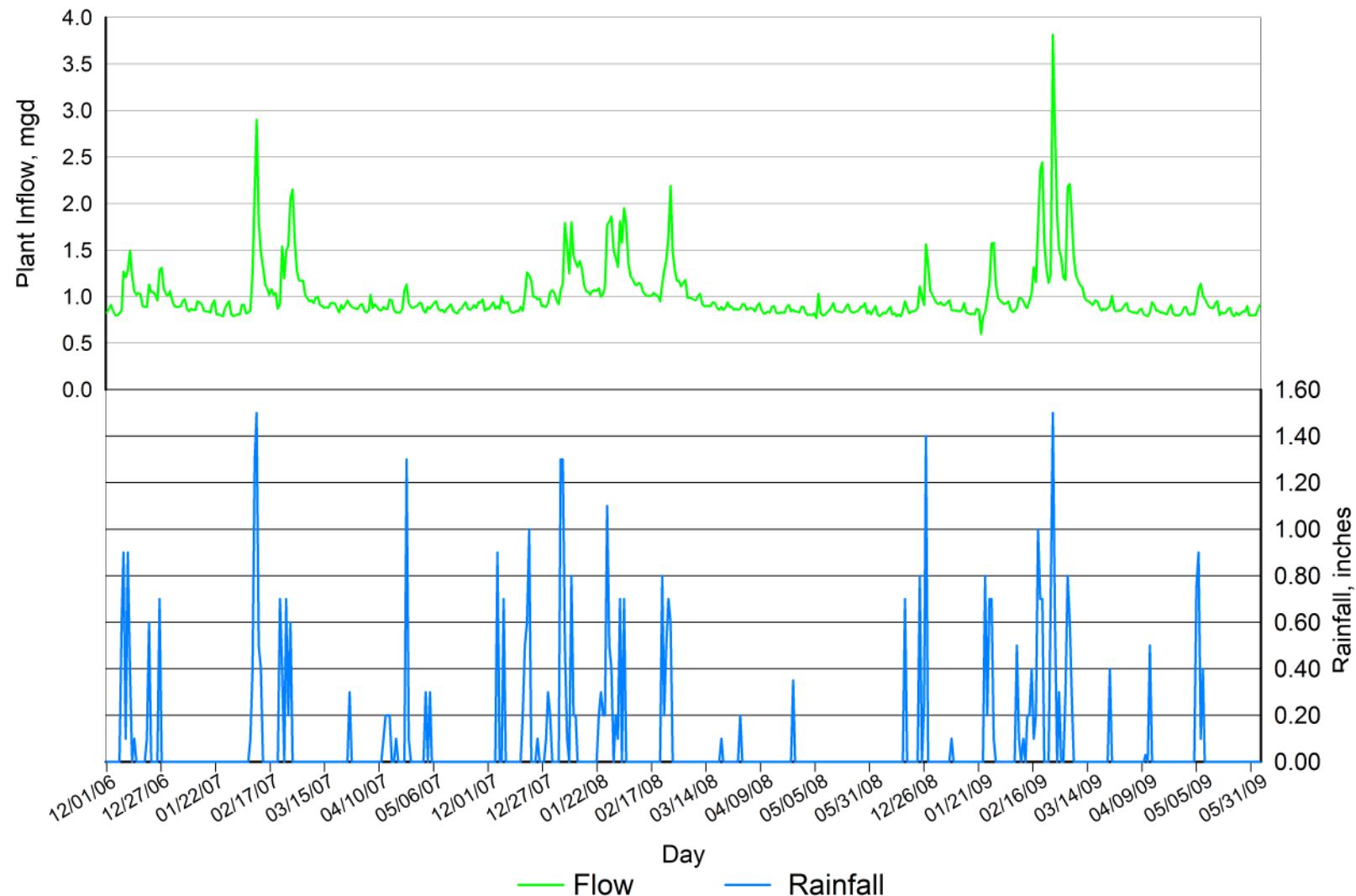
Taking this into account, the computer modeling program peaked domestic flows based on a wet weather peaking factor developed by comparing SCOR metering records of dry weather ADWF and wet weather PWWF. The wet period (December through May) total daily flows from December 2006 to May 2009 are shown in Table 4-1 and a graph showing the daily rainfall verses daily SCOR plant inflow from LOAPUD is shown in Figure 8. Figure 8 graphically shows the existence of an I/I problem within the LOAPUD system and the impact that rainfall events have on the flow entering the SCOR plant.

The peak daily flow during this study period is shown to be 3.81 mgd with an average daily flow during this study period of 1.52 mgd. Table 4-1 shows that daily wet weather flows are typically 1.5 to 2.0 mgd. This is approximately 2.0 to 2.5 times the average daily dry weather flow. However, the SCOR plant receives peak flows from LOAPUD of short duration that can be in the range of 6 to 10 mgd. Although these are short duration flows, they do have the potential to cause temporary spillage or overflows and the lifting of manhole lids. The SCOR plant charges the District for exceeding its peak flow. This charge is one time annually, for the highest recorded daily peak flow of that year. SCOR determines that peak flow based on multiplying their waste generation factor of 260 gpd/edu times the number of LOAPUD edu's times a peaking factor of 4. This equates to an allowable peak day flow of approximately 6.2 mgd. Comparing these instantaneous peak flows to the ADWF as seen at the SCOR Plant, a peaking factor of 6.5 was determined and was used in the model to determine PWWF. The PWWF in the model was used to determine the adequate pipe size for existing and future pipes in the District and determine when that pipe size would be needed to carry the projected PWWF.

Table 4-1

								Daily Plant Inflow (wet weather months), *million gallons per day*									
Day	Dec 2006	Jan 2007	Feb 2007	Mar 2007	Apr 2007	May 2007	Dec 2007	Jan 2008	Feb 2008	Mar 2008	Apr 2008	May 2008	Dec 2008	Jan 2009	Feb 2009	Mar 2009	Apr 2009	May 2009
1	0.83	0.96	0.81	1.28	0.92	0.83	0.90	0.96	1.58	1.15	0.87	0.80	0.81	0.91	0.95	2.18	0.83	0.92
2	0.87	0.90	0.81	1.18	0.85	0.89	0.94	0.92	1.95	1.18	0.88	0.82	0.79	0.91	0.86	2.21	0.83	1.08
3	0.91	0.89	0.91	1.17	0.83	0.87	0.87	1.07	1.78	0.99	0.87	0.77	0.81	0.94	0.84	1.88	0.82	1.14
4	0.85	0.89	0.91	1.17	0.85	0.90	0.90	1.14	1.36	0.99	0.84	1.03	0.83	0.96	0.85	1.42	0.86	1.01
5	0.80	0.90	0.82	1.02	1.02	0.93	0.87	1.79	1.22	0.98	0.90	0.82	0.82	0.86	0.88	1.23	0.87	0.98
6	0.80	0.95	0.83	0.98	0.88	0.95	1.01	1.54	1.19	0.97	0.93	0.80	0.86	0.85	0.98	1.17	0.81	0.93
7	0.82	0.97	0.85	0.95	0.92	0.87	0.94	1.25	1.14	0.96	0.86	0.80	0.89	0.85	0.98	1.12	0.80	0.89
8	0.85	0.87	1.26	0.96	0.89	0.85	0.93	1.80	1.12	1.01	0.82	0.83	0.81	0.85	0.96	1.10	0.79	0.88
9	1.27	0.84	2.12	0.93	0.86	0.86	0.94	1.44	1.15	1.03	0.82	0.85	0.82	0.84	0.89	0.99	0.83	0.88
10	1.21	0.87	2.90	0.99	0.85	0.83	0.85	1.37	1.13	0.92	0.84	0.88	0.79	0.86	0.88	0.96	0.94	0.93
11	1.28	0.86	1.81	1.00	0.89	0.87	0.83	1.32	1.05	0.90	0.83	0.93	0.81	0.93	0.96	0.95	0.91	0.95
12	1.49	0.86	1.48	0.91	0.87	0.89	0.83	1.38	1.02	0.90	0.89	0.85	0.79	0.83	1.03	0.93	0.85	0.80
13	1.22	0.95	1.32	0.90	0.87	0.92	0.85	1.30	1.01	0.90	0.90	0.84	0.85	0.82	1.31	0.91	0.85	0.83
14	1.06	0.94	1.13	0.88	0.97	0.85	0.84	1.13	1.01	0.90	0.83	0.84	0.95	0.81	1.16	0.96	0.83	0.82
15	1.02	0.92	1.08	0.89	0.96	0.83	0.89	1.06	1.01	0.94	0.82	0.83	0.88	0.82	1.75	0.95	0.83	0.83
16	1.04	0.85	1.02	0.88	0.86	0.82	0.85	1.05	1.04	0.93	0.83	0.84	0.82	0.81	2.36	0.89	0.82	0.87
17	1.03	0.84	1.08	0.93	0.83	0.86	1.02	1.02	1.02	0.88	0.83	0.89	0.84	0.87	2.44	0.85	0.81	0.88
18	0.90	0.84	1.02	0.93	0.83	0.87	1.26	1.06	1.01	0.86	0.83	0.92	0.84	0.86	1.61	0.87	0.87	0.81
19	0.89	0.83	1.04	0.93	0.83	0.91	1.23	1.07	0.95	0.89	0.89	0.85	0.85	0.86	1.31	0.86	0.91	0.79
20	0.89	0.92	0.87	0.88	0.87	0.94	1.17	1.06	1.13	0.86	0.91	0.83	0.88	0.78	1.15	0.88	0.82	0.83
21	1.13	0.96	0.92	0.83	1.07	0.87	1.00	1.09	1.28	0.88	0.84	0.83	1.11	0.83	1.24	0.90	0.80	0.80
22	1.05	0.81	1.54	0.91	1.13	0.86	1.00	1.00	1.39	0.94	0.86	0.84	1.00	0.98	3.81	1.01	0.80	0.82
23	1.05	0.81	1.20	0.87	0.93	0.88	0.97	1.03	1.65	0.89	0.84	0.85	0.91	1.14	2.77	0.87	0.80	0.84
24	1.02	0.80	1.49	0.91	0.89	0.91	0.98	1.11	2.19	0.89	0.84	0.89	1.56	1.57	1.88	0.84	0.82	0.84
25	0.96	0.79	1.55	0.96	0.88	0.88	0.90	1.77	1.48	0.86	0.83	0.89	1.35	1.58	1.51	0.85	0.88	0.90
26	1.29	0.87	2.06	0.92	0.89	0.94	0.90	1.81	1.28	0.87	0.89	0.93	1.06	1.13	1.43	0.85	0.89	0.80
27	1.31	0.92	2.15	0.89	0.90	0.94	0.89	1.86	1.17	0.86	0.89	0.82	1.02	0.99	1.21	0.87	0.82	0.80
28	1.08	0.95	1.59	0.88	0.93	0.97	0.93	1.50	1.17	0.87	0.82	0.85	0.97	0.96	1.18	0.91	0.80	0.80
29	1.03	0.81		0.87	0.93	0.85	1.05	1.42	1.11	0.92	0.80	0.81	0.93	0.94		0.93	0.82	0.80
30	1.01	0.79		0.87	0.85	0.87	1.07	1.32		0.92	0.81	0.86	0.92	0.92		0.85	0.81	0.86
31	1.06	0.80		0.91		0.87	1.04	1.81		0.86		0.90	0.94	0.93		0.84		0.91
Peak	*1.49*	*0.97*	*2.90*	*1.28*	*1.13*	*0.97*	*1.26*	*1.86*	*2.19*	*1.18*	*0.93*	*1.03*	*1.56*	*1.58*	*3.81*	*2.21*	*0.94*	*1.14*

Figure 8

LOAPUD Daily Plant Inflow to SCOR vs. Rainfall, December thru May

Both infiltration and inflow are significant sources of flow in the existing District system. This is primarily due to the age and deteriorated condition of some of the older pipes, joints, laterals and manholes. It is expected that new lines to be constructed will be much less susceptible to I/I.

Infiltration and inflow are, for the purposes of the computer model, treated as a single quantity that is accounted for in peaking the ADWF. The ADWF and PWWF quantities of I/I are calculated as components of design flows. The total design flows are comprised of infiltration, inflow, and domestic flows as follows:

> ADWF = Average daily domestic flow + Average dry-weather I/I
> PWWF = Peak daily domestic flow + Peak wet-weather I/I.

The PWWF figures are used as design flows in evaluating the collection system so that the system will be able to transmit the maximum projected flow to the treatment facilities without sanitary sewer overflow (SSO) incidents.

PIPELINE SIZING

The District's system was modeled on a computer using the previously discussed geometry and design flows. Figures 9, 10 & 11 show the manholes and the sections of pipeline between these manholes that were analyzed in the sewer model. These figures show the manhole numbers as entered in the computer model. The collection zones shown earlier in Figure 4 correspond to this manhole numbering whereas the collection zone number corresponds to the manhole on the interceptor line where the collection zone areas flow is introduced. The computer program analyzed the carrying capacity of each sewer line reach by reach. The capacity of each line was calculated using Manning's equation and a Manning's friction coefficient of 0.013. A pipe was considered undersized when its depth to diameter ratio (D/d) at peak flow exceeded the design value of 0.75.
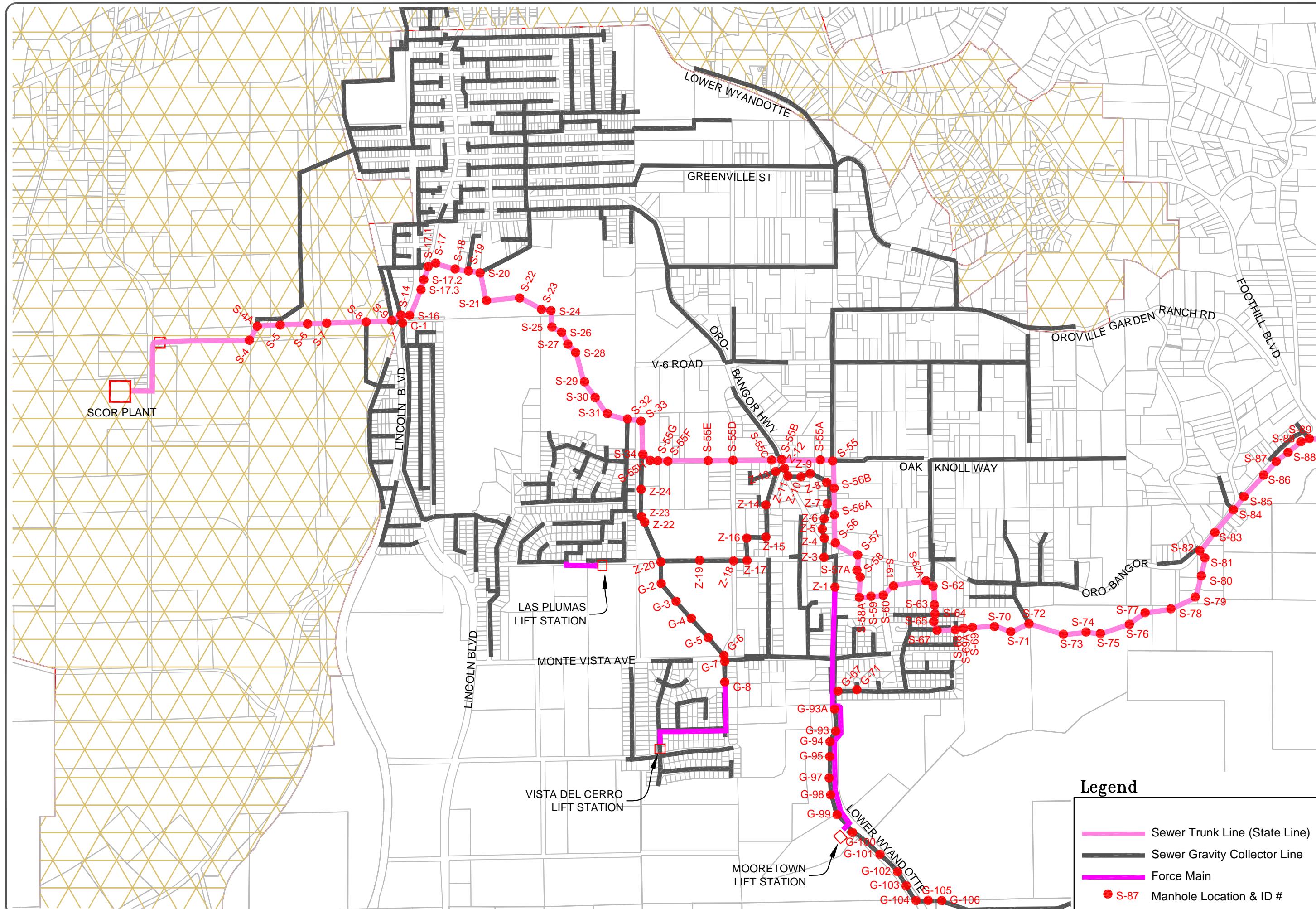
In the event that a pipeline reach was undersized, a correct replacement pipeline size for the projected flow was calculated. Results of these analyses for within the existing service boundary are included in the computer printouts in Appendix B of this report. Results for the model analysis of projected peak wet weather flows out to the sphere of influence is included in Appendix C. Results for the model analysis of projected peak wet weather flows out to the master study area is included in Appendix D. The cost estimates shown in these tabulated results are based on pipeline replacement costs only.
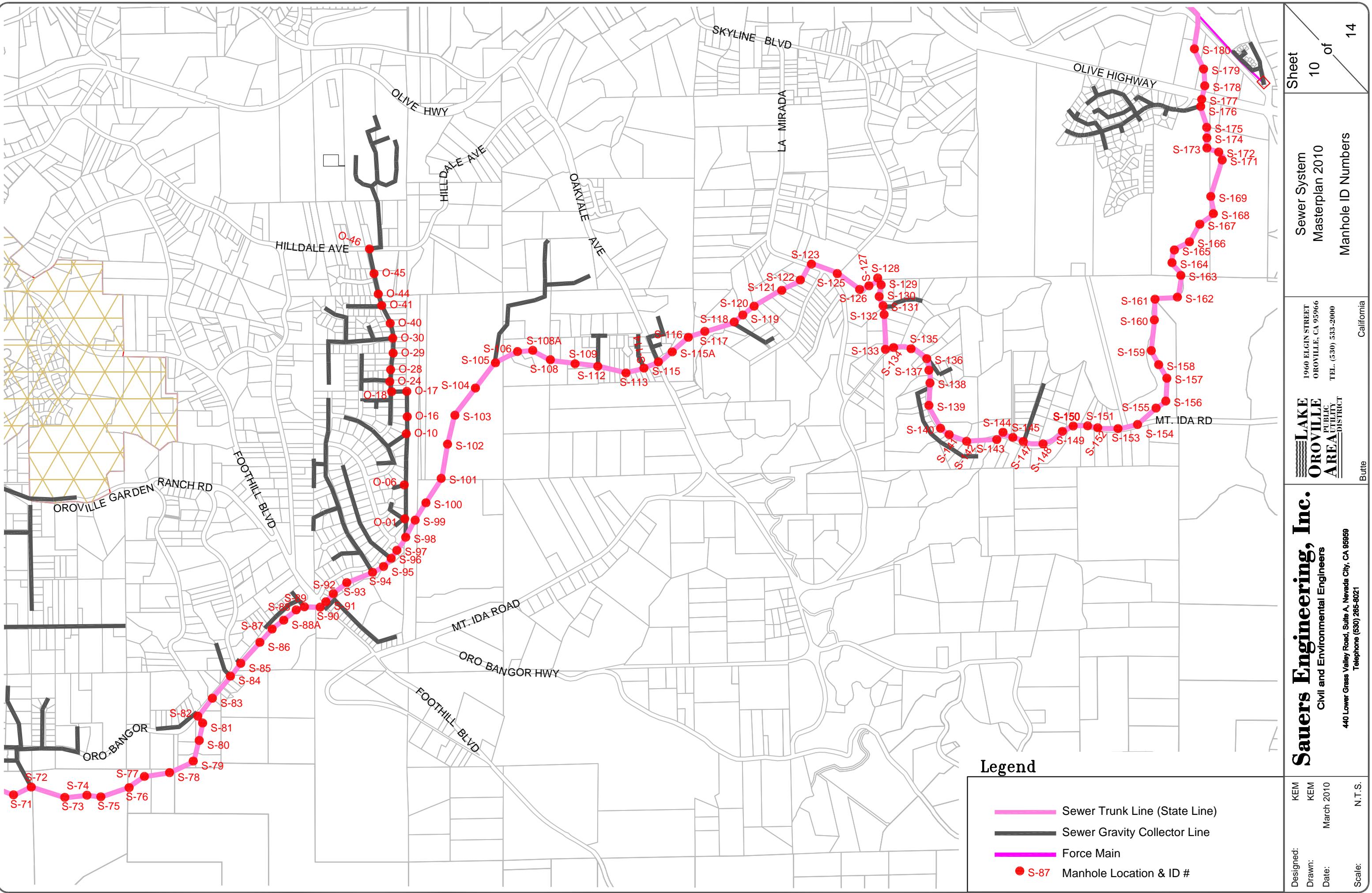
MODEL RESULTS
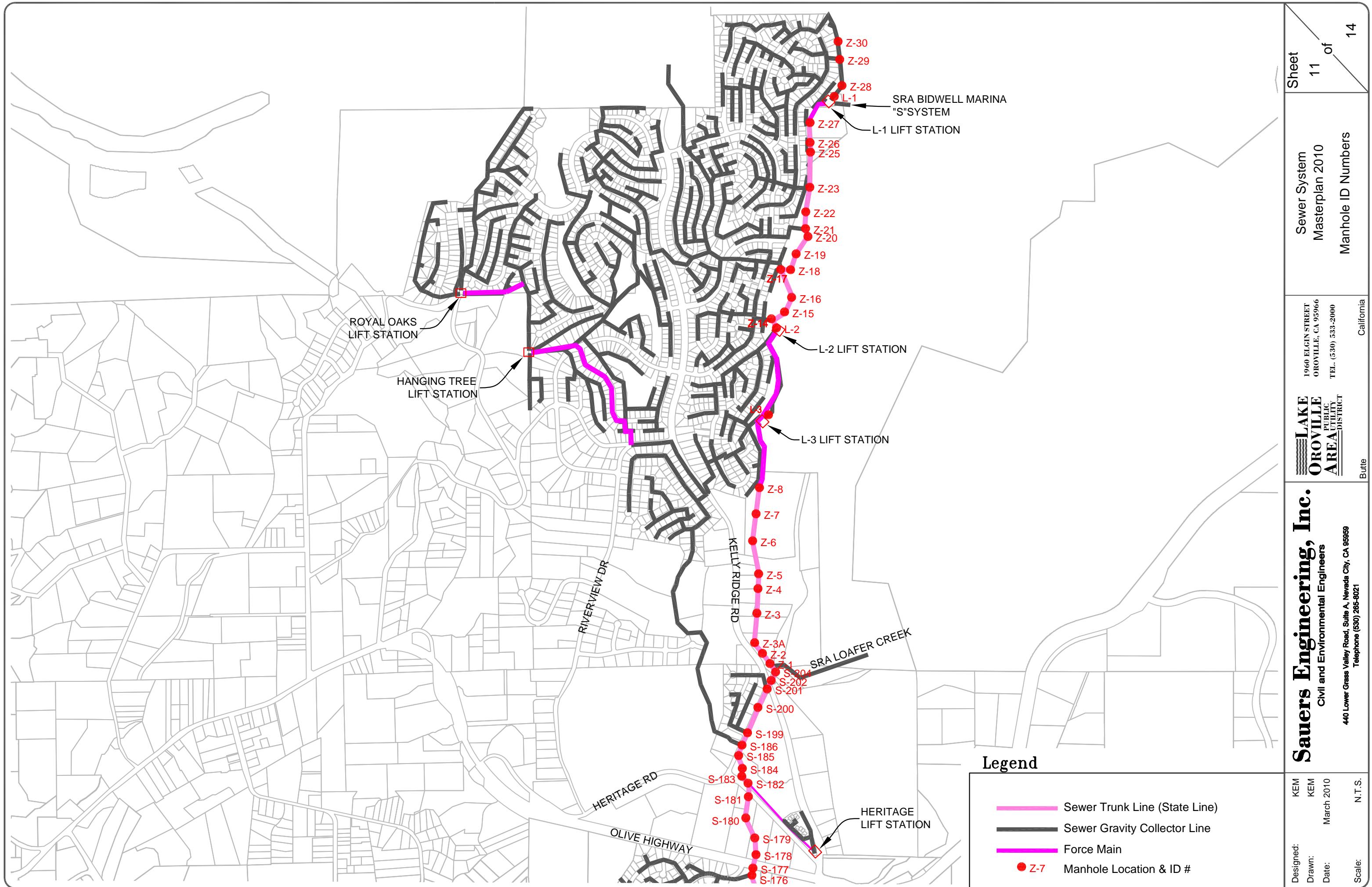
The results of the model for projected average dry weather flows within the existing service boundary for current conditions are shown in Appendix B-1. The results of the computer modeling indicate that some portions of the existing interceptor line are in need of replacement to a larger diameter under the current ADWF conditions. When a peaking factor is applied to look at peak wet weather flows, many sections of pipeline for the current 2009/2010 year are shown to be undersized as shown in the tabulated results in Appendix B-2. In the model printouts under the heading "Flow Type", sections of pipe that are determined inadequate are labeled "pressurized". This situation can be caused by either that section of pipes diameter being too small or the slope of that section of pipe is too shallow to carry the flow. A pipe section will also be called out to be replaced if the d/D ratio is greater than 0.75. A section of pipe can also be labeled pressurized even if its d/D ratio is less than 0.75 and its slope and pipe diameter is adequate. This can be due

Sewer System
Masterplan 2010
Manhole ID Numbers

Legend

Sewer Trunk Line (State Line)	
Sewer Gravity Collector Line	
Force Main	
● S-87 Manhole Location & ID #	

LOWER WYANDOTTE
GREENVILLE ST
OROVILLE GARDEN RANCH RD
FOOTHILL BLVD
LINCOLN BLVD
ORO. BANGOR HWY
V-6 ROAD
OAK KNOLL WAY
ORO.-BANGOR
MONTE VISTA AVE
LINCOLN BLVD
LOWER WYANDOTTE

SCOR PLANT
LAS PLUMAS LIFT STATION
VISTA DEL CERRO LIFT STATION
MOORETOWN LIFT STATION

SKYLINE BLVD

OLIVE HWY

OLIVE HIGHWAY

HILLDALE AVE

OAKVALE AVE

LA MIRADA

HILLDALE AVE

O-46
O-45
O-44
O-41
O-40
O-30
O-29
O-28
O-24
O-18
O-17
O-16
O-10

S-180
S-179
S-178
S-177
S-176
S-175
S-174
S-173
S-172
S-171
S-169
S-168
S-167
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S-152
S-149
S-148
S-141

S-123
S-122
S-121
S-120
S-118
S-119
S-117
S-116
S-115A
S-115
S-113
S-112
S-109
S-108A
S-108
S-106
S-105
S-104
S-103
S-102
S-101

S-127
S-128
S-125
S-129
S-126
S-130
S-132
S-131
S-133
S-134
S-135
S-136
S-137
S-138
S-139
S-140
S-144
S-145
S-150
S-143

MT. IDA RD

FOOTHILL BLVD

OROVILLE GARDEN RANCH RD

O-06
O-01

S-100
S-99
S-98
S-97
S-96
S-95
S-94
S-93
S-92
S-91
S-90
S-89
S-88A
S-88
S-87
S-86
S-85
S-84
S-83
S-82
S-81
S-80
S-79
S-78
S-77
S-76
S-75
S-74
S-73
S-72
S-71

MT. IDA ROAD

ORO BANGOR HWY

FOOTHILL BLVD

ORO BANGOR

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LAKE OROVILLE
AREA PUBLIC UTILITY DISTRICT

Sewer System
Masterplan 2010
Manhole ID Numbers

Butte   California

Sheet
10 of 14

Designed: KEM
Drawn: KEM
Date: March 2010
Scale: N.T.S.

Legend

Sewer Trunk Line (State Line)

Sewer Gravity Collector Line

Force Main

S-87   Manhole Location & ID #

Z-30
Z-29
Z-28
L-1
SRA BIDWELL MARINA "S" SYSTEM
L-1 LIFT STATION
Z-27
Z-26
Z-25
Z-23
Z-22
Z-21
Z-20
Z-19
Z-18
Z-17
Z-16
Z-15
Z-14
L-2
L-2 LIFT STATION
L-3
L-3 LIFT STATION
Z-8
Z-7
Z-6
Z-5
Z-4
Z-3
Z-3A
Z-2
Z-1
S-204
S-202
S-201
S-200
S-199
S-186
S-185
S-184
S-183
S-182
S-181
S-180
S-179
S-178
S-177
S-176

SRA LOAFER CREEK

ROYAL OAKS LIFT STATION

HANGING TREE LIFT STATION

RIVERVIEW DR

KELLY RIDGE RD

HERITAGE RD

OLIVE HIGHWAY

HERITAGE LIFT STATION

Legend

Sewer Trunk Line (State Line)	
Sewer Gravity Collector Line	
Force Main	
Z-7 Manhole Location & ID #	

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Sewer System
Masterplan 2010
Manhole ID Numbers

Designed: KEM
Drawn: KEM
Date: March 2010
Scale: N.T.S.

to the downstream section of pipe being pressurized with a d/D of 1.0 and the wastewater is backed up in to the upstream section of pipe. An example of this is shown for the 2009 PWWF condition for the sections of pipe S-144 through S-142 where the pipe from S-144 to S-143 has a d/D of 0.49 but is pressurized due to the backup of wastewater in the downstream section S-143 to S-142 that has a d/D ratio of 1.0.

Based on PWWF within the current Service Boundary only, Table 4-2 on the following page summarizes the sections of pipe deemed inadequate in size, their corrected size, and the approximate time in which it is anticipated that the larger pipe will be necessary. This is presented to show what would be required if the District did not expand beyond its current Service Boundary.

Table 4-2
LOAPUD Sewer Master Plan 2010
Pipeline Replacement Per Year of Analysis
Based on Flows Within Current Service Boundary

Pipe Section ID	Pipeline Section		Pipe Length (ft)	Existing Pipe Size (inch)	Pipe Replacement Size per Year of Analysis			
	From MH	To MH			Year 2010	Year 2020	Year 2030	Buildout
193	G-100 - Moore		20.00	10				12
237	S-186 - S-185		160.00	12	21	21	21	21
241 thru 281	S-184 - S-163		3270.00	18				21
283	S-163 - S-162		327.00	18			21	24
285	S-162 - S-161		351.00	18		21	21	24
287	S-161 - S-160		329.00	18			21	24
289	S-160 - S-159		416.00	18			21	24
291	S-159 - S-158		225.50	18			21	24
293	S-158 - S-157		199.50	18				21
295	S-157 - S-156		391.00	18			21	24
297 thru 301	S-156 - S-153		381.00	18				21
309 thru 311	S-150 - S-148		465.00	12				15
323	S-143 - S-142		395.00	12	18	18	18	21
327 thru 331	S-141 - S-138		910.07	12				15
335 thru 349	S-137 - S-129		768.96	18				21
353	S-128 - S-127		123.94	18			21	24
355 thru 359	S-127 - S-123		871.03	18				21
363 thru 365	S-123 - S-121		598.62	12				15
375	S-117 - S-116		216.00	15				18
383	S-113 - S-112		408.65	15			18	18
391 thru 393	S-109 - S-108A		680.11	15				18
397	S-105 - S-104		403.92	12	15	15	15	18
407 thru 409	S-100 - S-98		515.63	18				21
413	S-97 - S-96		94.00	18	21	21	21	27
415 thru 423	S-96 - S-91		1162.29	18	21	21	21	24
429 thru 431	S-89 - S-88A		342.92	18	21	24	24	27

Pipe Section ID	Pipeline Section From MH	Pipeline Section To MH	Pipe Length (ft)	Existing Pipe Size (inch)	Year 2010	Year 2020	Year 2030	Buildout
432	S-88A	S-87	282.74	18	24	24	24	30
433 thru 447	S-87	S-79	2316.44	18	21	24	24	27
449	S-79	S-78	358.51	18	24	24	24	30
451 thru 457	S-78	S-74	1186.86	18	21	24	24	27
459	S-74	S-73	308.99	18	24	24	24	27
461	S-73	S-72	473.94	18	21	24	24	27
463 thru 465	S-72	S-70	512.91	18	21	21	24	27
467	S-70	S-69	340.00	18	21	21	21	27
469	S-69	S-69A	116.00	18	21	21	24	27
471 thru 485	S-68	S-60	1213.17	27				30
501 thru 507	S-34	S-30	1254.45	24				30
509	S-30	S-29	396.46	15				21
511	S-29	S-28	455.06	15			18	21
513	S-28	S-27	136.69	15		18	18	21
515 thru 521	S-27	S-23	725.45	24				30
523	S-23	S-22	419.03	15				18
525	S-22	S-21	288.70	15			18	21
527	S-21	S-20	179.30	18				21
543 thru 545	S-8	S-6	740.00	24				30
547 thru 551	S-6	S-4	1012.00	30				36
633 thru 637	Z1	Z4	961.33	18				21
639	Z4	Z5	95.62	18			21	30
641 thru 651	Z5	Z11	1372.48	18				21
653	Z11	Z12	117.71	18				27
659	Z14	Z15	450.79	18				24
665	Z17	Z18	188.77	18				21
774 thru 778	S-17.3	S-17.2	762.00	30				36
792	S-55C	S-55D	548.00	27				30
806	S-62A	S-61	423.00	27				30
Total Feet Of Pipe			*31662.54*					

ADDITIONAL COLLECTION SYSTEM IMPROVEMENTS

As part of this study, additional improvements were analyzed which would improve the operation of the collection system.

There may be an additional opportunity to decrease reliance on pumping wastewater from the Kelly Ridge area. The master plan anticipates two future collection pipelines serving areas west and south of Kelly Ridge on both the north and south sides of Olive Highway. If carefully planned, these pipelines could extend into Kelly Ridge conveying flows currently being pumped by the Royal Oaks and Hanging Tree pump stations. The line on the north side of Olive Highway is essentially located as was originally proposed as part of the Kelly Ridge Estates development, which has been referred to as the "A" Line.

As part of this study, we have modeled transmission lines and lift stations to extend the collection system to new service areas. The model was analyzed for projected flow conditions with additional collection zones outside of the existing service boundary but within the existing sphere of influence as shown earlier in Figure 5. The system was modeled with the additional flow projections from these additional collection zones and the results are tabulated in Appendix C. The model was also analyzed for projected flow conditions based on additional flow from collection zones outside of the existing sphere of influence out to the master study area (MSA) as shown earlier in Figure 6. The results of this model analysis are tabulated in Appendix D.

The pipelines and lift stations shown for the analysis outside of the service boundary and sphere of influence are hypothetical sewer lines and stations based on the projected service area and the most effective use of existing topography. It is expected that the developers and/or property owners of the new service areas will bear the cost of installing these new facilities. This computer model may be used as a planning tool by the District. As these new facilities are installed, the District may require that they be sized to accommodate additional future connections.

The modeling anticipated the extension of a number of new pipelines, both gravity and force mains, to provide service to new outlying areas within the study area. In some cases, the location, alignment, and preliminary sizing were included in the collection system model. In other cases, it was considered too speculative given the uncertainties predicting actual locations and densities of future development.

In addition to pipelines, the modeling also anticipates the construction of two new sewer lift stations. One of these proposed stations is identified as the Mt. Ida Lift Station and would provide service to the Stringtown Area which encompasses the area southeast and east of Highway 162 near the intersection area of Mt. Ida Road, Miners Ranch Road and Old Olive Highway and eastward past Forbestown Road as shown previously on Figures 5 and 6. The proposed Mt. Ida Lift Station would eventually allow for the decommissioning of the Heritage Lift Station. The second new station which is identified as the Wyman's Ravine Lift Station would be located in the vicinity of Wyman's Ravine and Railroad Avenue north of the town of Palermo as shown previously on Figure 6. This lift station would provide service for the Rio D'Oro development and the Las Plumas Study Area. The Wyman's Ravine Lift Station would eventually allow fo the decommissioning of the Las Plumas Lift Station and the Vista Del Cerro Lift Station. As the flows to these two stations could flow to the new Wyman's Ravine station for pumping.

The community of Palermo, located south of LOAPUD's current service boundary, is currently (as of 2010) exploring ways to extend wastewater service to the area. The community is actively investigating alternatives for collection and conveyance, and/or treatment and disposal of their wastewater. Two alternatives are being evaluated. The first would be to construct new wastewater collection infrastructure (sewer mains, manholes, service laterals) within the Palermo service area with a new regional lift station that would pump the wastewater to the existing LOAPUD gravity system, or the SC-OR treatment plant. The second would be to construct the wastewater collection infrastructure and also construct a new stand-alone wastewater treatment plant in the vicinity of Palermo to treat and dispose of the wastewater from the Palermo area. It is anticipated that with either of these scenarios, the Palermo service area would annex to LOAPUD to provide ongoing operation and maintenance.

Based on projected peak wet weather flows within the Master Study Area, there are sections of the existing system that need to be upsized to meet design conditions. Some will require replacement immediately and some in the future. The sections of greatest concern are portions of the District's State Line Interceptor.

The State Line is the District's primary interceptor line conveying flows from throughout the service area to the SCOR treatment plant. This pipeline periodically surcharges during peak wet-weather events which was confirmed by the model. Portions of the State Line have been replaced with adequately sized pipe, however the model indicates that approximately 45,525 feet of the line would be in need of replacement either now, in 2020, in 2030 or by buildout. The model shows that approximately 11,164 feet of pipe are deemed necessary for replacement now to accommodate peak wet weather flows. Table 4-3 lists all sections of pipeline that would need replacement currently, in 2020, in 2030 or at buildout. This table shows the current diameter of sections of pipe needing replacement and the diameter required based on the year of analysis and the collection boundary. Thus it shows the required pipe section size based on the District staying within its current service boundary (SB), to expand service out to the sphere of influence (SOI) or to expand service out to the master study area (MSA). This data is also shown graphically on Figures 12 through 14.

Of particular concern with regard to the replacement of portions of the State Line is a large section of pipeline from Carriage Manor Mobile Home Park east to Oro-Bangor Highway and along Oro-Bangor Highway to Foothill Boulevard and past Foothill Boulevard paralleling Fairhill Drive. As Table 4-3 and Figures 12 and 13 show, this is the portion between manholes S-69A to S-96. The lack of adequate capacity of the existing pipeline in this area is mostly due to minimal slope of the pipe, with slopes as low as 0.002 to 0.003. This section of pipeline is also old clay pipe which can be a leading contributor to I/I. It is recommended that this stretch of pipeline be replaced with the adequate size of pipe. As shown earlier in Table 2-4, collection zones S-82, S-91, S-94 which are along this stretch of mainline will reach buildout between 22 and 29 years from now and collection zone O-46 which feeds in to this section of interceptor is projected to reach buildout in approximately 8 years. Therefore, it is recommended that this whole stretch of pipeline from S-69A to S-96 be replaced with the required pipe size at buildout conditions. Also, it is recommended that the portion of pipeline approximately between S-93 to S-98 be replaced following an alternate alignment by moving the pipe to within Oro-Bangor Highway. An analysis of the topography and resulting slope of the pipeline shows that this alignment will provide improved flow characteristics for this section.

Figures 12, 13 and 14 graphically show the sections of pipeline needing replacement, the replacement pipe size and the corresponding year that that pipe size would be required. This graphical representation shows the required pipe diameter size based on projected PWWF for the entire Master Study Area. The sections of pipeline highlighted in red are required to be replaced now to accommodate peak wet weather flows. The sections of pipeline highlighted in cyan (light blue) are required to be replaced by 2020. The sections of pipeline highlighted in dark blue are required to be replaced by 2030 and the sections highlighted in green are required to be replaced by buildout. The time to reach buildout for each of these sections was shown previously in Tables 2-4, 2-5 and 2-6.

Table 4-3
LOAPUD Sewer Master Plan 2010
Pipeline Replacement Per Year of Analysis
SB: service boundary; SOI: sphere of influence; MSA: master study area

Pipe Section ID	Pipeline Section From MH	Pipeline Section To MH	Pipe Length (ft)	Existing Pipe Size (inch)	Year 2010	Year 2020 SB	Year 2020 SOI	Year 2020 MSA	Year 2030 SB	Year 2030 SOI	Year 2030 MSA	Buildout SB	Buildout SOI	Buildout MSA
131 thru 135	O-46	O-41	817.00	12										18
137 thru 139	O-41	O-30	503.40	12										15
141 thru 143	O-30	O-28	388.98	12										18
145 thru 149	O-28	O-17	543.00	12										15
151 thru 153	O-17	O-10	614.00	12										18
156	O-10	O-6	692.00	12										15
163	O-1	S-98	268.00	12										18
193	G-100	Moore	20.00	10								12	12	12
237	S-186	S-185	160.00	12	21	21	21	21	21	21	21	24	24	24
241 thru 243	S-184	S-182	386.86	18								21	21	21
245 thru 247	S-182	S-180	398.90	18						21	21	21	21	21
249 thru 251	S-180	S-178	625.52	18		21	21	21	21	21	21	21	21	21
253 thru 255	S-178	S-176	222.60	18					21	21	21	21	21	21
257	S-176	S-175	311.66	18		21	21	21	21	21	21	21	21	21
259 thru 261	S-175	S-173	261.32	18					21	21	21	21	21	21
263	S-173	S-172	273.50	18		21	21	21	21	21	21	21	21	21
265	S-172	S-171	160.10	18					21	21	21	21	21	21

Table 4-3, *continued*
LOAPUD Sewer Master Plan 2010
Pipeline Replacement Per Year of Analysis
SB: service boundary; SOI: sphere of influence; MSA: master study area

Pipe Section ID	Pipeline Section		Pipe Length (ft)	Existing Pipe Size (inch)	Year 2010	Year 2020			Year 2030			Buildout		
	From MH	To MH				SB	SOI	MSA	SB	SOI	MSA	SB	SOI	MSA
269 thru 273	S-171	- S-167	880.60	18								21	21	21
277	S-166	- S-165	254.47	18					21	21	21	21	21	21
279	S-165	- S-164	124.36	18		21	21	21	21	21	21	21	21	21
281	S-164	- S-163	250.67	18						21	21	21	21	21
283 thru 291	S-163	- S-158	1648.50	18	21	21	21	21	21	21	21	24	24	24
293	S-158	- S-157	199.50	18		21	21	21	21	21	21	24	24	24
295	S-157	- S-156	391.00	18	21	21	21	21	21	21	21	24	24	24
297	S-156	- S-155	155.00	18								21	21	21
301	S-154	- S-153	226.00	18		21	21	21	21	21	21	24	24	24
305	S-152	- S-151	185.00	12								15	15	15
307	S-151	- S-150	200.00	12										15
309	S-150	- S-149	200.00	12								15	15	15
311	S-149	- S-148	265.00	12				15	15	15	15	15	15	15
313	S-148	- S-147	309.01	12								15	15	15
315	S-147	- S-145	181.82	12										15
321	S-144	- S-143	32.76	12								15	15	15
323	S-143	- S-142	395.00	12	18	18	18	18	18	18	18	21	21	21

Table 4-3, *continued*
LOAPUD Sewer Master Plan 2010
Pipeline Replacement Per Year of Analysis
SB: service boundary; SOI: sphere of influence; MSA: master study area

Pipe Section ID	Pipeline Section From MH	To MH	Pipe Length (ft)	Existing Pipe Size (inch)	Year 2010	Year 2020 SB	SOI	MSA	Year 2030 SB	SOI	MSA	Buildout SB	SOI	MSA
325	S-142	- S-141	239.00	12										15
327 thru 329	S-141	- S-139	505.00	12								15	15	15
331	S-139	- S-138	405.07	12							15	15	15	15
335 thru 337	S-137	- S-135	390.42	18								21	21	24
347 thru 349	S-131	- S-129	378.54	18								21	21	24
351	S-129	- S-128	67.23	18										21
353	S-128	- S-127	123.94	18	21	21	21	21	21	21	21	24	24	24
355	S-127	- S-126	1162.29	18								21	21	24
357	S-126	- S-125	349.97	18							21	21	21	24
359	S-125	- S-123	389.66	18						21	21	21	21	24
363	S-123	- S-122	289.06	12						15	15	15	15	15
365	S-122	- S-121	309.56	12							15	15	15	15
367 thru 371	S-121	- S-118	832.85	12										15
373	S-118	- S-117	454.47	12									15	15
375	S-117	- S-116	216.00	15								18	18	18
379	S-115	- S-114	268.45	15										18
383	S-113	- S-112	408.65	15	18	18	18	18	18	18	18	21	21	21

Pipe Section ID	Pipeline Section		Pipe Length (ft)	Existing Pipe Size (inch)	Pipe Replacement Size per Year of Analysis & per Collection Boundary									
	From MH	To MH			Year 2010	Year 2020			Year 2030			Buildout		
						SB	SOI	MSA	SB	SOI	MSA	SB	SOI	MSA
391 thru 393	S-109	S-108A	680.11	15								18	18	18
395	S-106	S-105	345.00	15										18
397	S-105	S-104	403.92	12	15	15	15	15	15	15	18	18	18	21
399 thru 401	S-104	S-102	999.63	18									21	21
405	S-101	S-100	462.02	18										21
407 thru 409	S-100	S-98	515.63	18								21	21	24
411	S-98	S-97	215.67	18									21	24
413	S-97	S-96	94.00	18	21	24	24	24	24	24	24	27	30	36
415 thru 417	S-96	S-94	336.95	18	21	21	21	21	21	21	24	24	27	30
419	S-94	S-93	386.14	18	21	21	21	21	21	24	24	24	27	30
421	S-93	S-92	213.63	18	21	21	21	21	21	21	24	24	27	30
423	S-92	S-91	226.18	18	21	21	24	24	24	24	24	27	27	36
425	S-91	S-90	65.74	27									30	36
427	S-90	S-89	151.18	30										36
429 thru 431	S-89	S-88A	342.92	18	24	24	24	24	24	24	27	27	30	36
432	S-88A	S-87	282.74	18	24	24	27	27	27	27	27	30	36	36
433 thru 447	S-87	S-79	2316.44	18	24	24	24	24	24	24	27	27	30	36

Pipe Section ID	Pipeline Section From MH	To MH	Pipe Length (ft)	Existing Pipe Size (inch)	Year 2010	Year 2020 SB	SOI	MSA	Year 2030 SB	SOI	MSA	Buildout SB	SOI	MSA
449	S-79	S-78	358.51	18	24	24	27	27	24	27	27	30	36	36
451 thru 457	S-78	S-74	1186.86	18	24	24	24	24	24	24	27	27	30	36
459	S-74	S-73	308.88	18	24	24	27	27	24	27	27	30	36	36
461 thru 465	S-73	S-70	986.85	18	24	24	24	24	24	24	27	27	30	36
467	S-70	S-69	340.00	18	21	21	24	24	24	24	24	27	30	36
469	S-69	S-69A	116.00	18	24	24	24	24	24	24	27	27	30	36
471 thru 475	S-68	S-65	388.92	27						30	30	30	36	48
477	S-65	S-64	103.14	27						30	30	36	36	48
479 thru 481	S-64	S-62	424.00	27						30	30	30	36	48
483 thru 485	S-62	S-60	297.11	27						30	30	36	36	48
489	S-59	S-58A	191.00	27								30	36	36
491 thru 495	S-58	S-56A	851.00	27									36	36
497	S-55	S-55A	340.00	27								30	36	36
501	S-34	S-33	486.14	24				27	27	27	27	30	36	36
503	S-33	S-32	179.87	24							27	30	30	36
505 thru 507	S-32	S-30	588.44	24				27		27	27	30	36	36
509	S-30	S-29	396.46	15			18	18	18	18	18	18	21	24
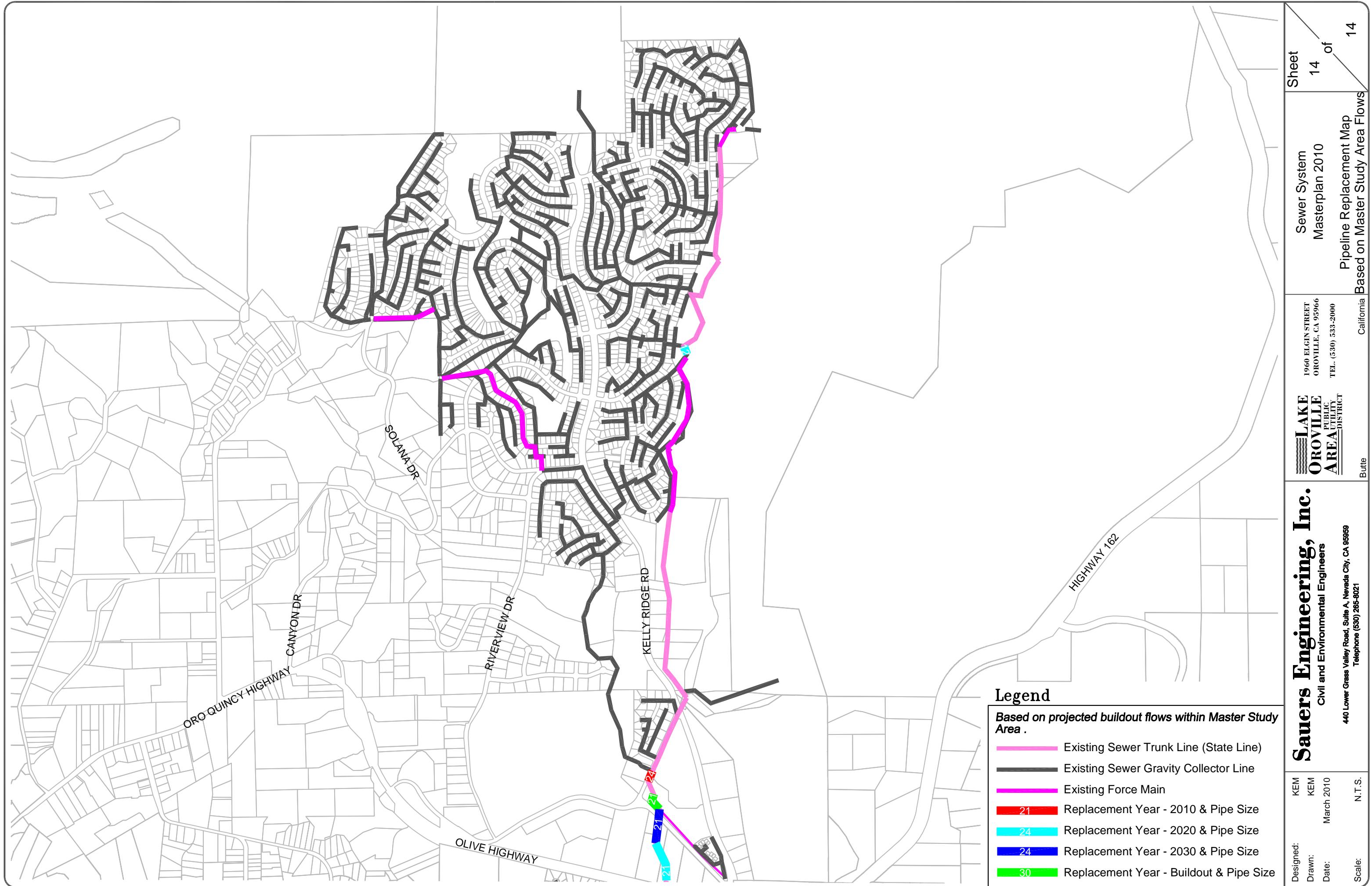
Table 4-3, *continued*
LOAPUD Sewer Master Plan 2010
Pipeline Replacement Per Year of Analysis
SB: service boundary; SOI: sphere of influence; MSA: master study area

Pipe Section ID	Pipeline Section From MH	To MH	Pipe Length (ft)	Existing Pipe Size (inch)	Year 2010	Year 2020 SB	SOI	MSA	Year 2030 SB	SOI	MSA	Buildout SB	SOI	MSA
511	S-29	- S-28	455.06	15		18	18	18	18	18	18	18	21	24
513	S-28	- S-27	136.69	15	18	18	18	18	18	18	18	21	21	24
515	S-27	- S-26	160.65	24						27	27	30	36	36
517 thru 519	S-26	- S-24	419.55	24							27	27	30	36
521	S-24	- S-23	145.25	24						27	27	30	36	36
523	S-23	- S-22	419.03	15				18		18	18	18	21	21
525	S-22	- S-21	288.70	15		18	18	18	18	18	18	21	21	24
527	S-21	- S-20	179.30	18								21	24	24
533	S-18	- S-17	339.00	30										36
541	S-9	- S-8	390.00	30										36
543	S-8	- S-7	477.00	24				27		27	27	30	36	48
545	S-7	- S-6	263.00	24							27	27	36	36
547 thru 549	S-6	- S-4A	712.00	30									36	48
551	S-4A	- S-4	300.00	30								36	36	48
639	Z4	- Z5	95.62	18								24	27	27
653	Z11	- Z12	117.71	18								21	24	24
659	Z14	- Z15	450.79	18								21	21	21

Table 4-3, *continued*
LOAPUD Sewer Master Plan 2010
Pipeline Replacement Per Year of Analysis
SB: service boundary; SOI: sphere of influence; MSA: master study area

Pipe Section ID	Pipeline Section		Pipe Length (ft)	Existing Pipe Size (inch)	Year 2010	Year 2020			Year 2030			Buildout		
	From MH	To MH				SB	SOI	MSA	SB	SOI	MSA	SB	SOI	MSA
772	C-1	- S-9	70.00	8										15
774	S-17.3	- S-16	388.00	30								36	48	48
776	S-17.2	- S-17.3	130.00	30								36	36	48
778	S-17.1	- S-17.2	244.00	30								36	48	48
780	S-58A	- S-58	394.00	27								30	36	36
782 thru 786	S-57A	- S-55	976.00	27									36	36
788 thru 794	S-55A	- S-55E	1338.00	27								30	36	36
796	S-55E	- S-55F	479.00	27									36	36
798	S-55F	- S-55G	250.00	27										30
804	S-55H	- S-34	135.00	27										48
806	S-62A	- S-61	423.00	27						30	30	36	36	48
808	S-69A	- S-68	70.00	27									30	36
814	S-115A	- S-115	251.00	15										18
97	Z-14	- L-2	110.88	10		12	12	12	12	12	12	12	12	12
Total Feet Of Pipe			*45525.00*											

OLIVE HIGHWAY

SKYLINE BLVD

OAKVALE AVE

MT. IDA ROAD

Legend

Based on projected buildout flows within Master Study Area.

— Existing Sewer Trunk Line (State Line)
— Existing Sewer Gravity Collector Line
— Existing Force Main
— **21** Replacement Year - 2010 & Pipe Size
— **24** Replacement Year - 2020 & Pipe Size
— **24** Replacement Year - 2030 & Pipe Size
— **30** Replacement Year - Buildout & Pipe Size

Designed: KEM
Drawn: KEM
Date: March 2010
Scale: N.T.S.

LAKE
OROVILLE
AREA PUBLIC UTILITY DISTRICT

Butte   California

Sewer System
Masterplan 2010

Pipeline Replacement Map
Based on Master Study Area Flows

Designed:	KEM
Drawn:	KEM
Date:	March 2010
Scale:	N.T.S.

SOLANA DR

RIVERVIEW DR

KELLY RIDGE RD

ORO QUINCY HIGHWAY

CANYON DR

OLIVE HIGHWAY

HIGHWAY 162

Legend

Based on projected buildout flows within Master Study Area .

— Existing Sewer Trunk Line (State Line)

— Existing Sewer Gravity Collector Line

— Existing Force Main

21 Replacement Year - 2010 & Pipe Size

24 Replacement Year - 2020 & Pipe Size

24 Replacement Year - 2030 & Pipe Size

30 Replacement Year - Buildout & Pipe Size

The sewer model also identified existing lift stations which will require expansion due to projected peak flows. Table 4-4 shows the projected lift station capacity requirements from present conditions out to buildout. These capacity requirements are based on peak wet weather flows for the entire Master Study Area. This table shows the current (2010) capacity of each lift station and the required capacity for each lift station at the study interval for each service area. Thus, the table identifies what capacity would be required for each lift station if the District were to only continue serving within the existing service boundary, if the District were to expand service to the sphere of influence or if the District were to expand service out to the masterplan study area.

Table 4-4
Projected Lift Station Capacity Requirements

| Lift Station | Service Area & Corresponding Flow Per Time of Analysis (flow in gpm) | | | | | | | | | |
| | Existing Service Boundary | | | | Sphere Of Influence | | | Masterplan Study Area | | |
	2010	2020	2030	Buildout	2020	2030	Buildout	2020	2030	Buildout
L1	335	335	335	335	335	335	335	335	335	335
L2	850	940	963	963	940	963	963	940	963	963
L3	205	205	205	205	205	205	205	205	205	205
Royal Oaks	250	250	250	250	250	250	250	250	250	250
Hanging Tree	550	550	550	550	550	550	550	550	550	550
Heritage	130	130	130	130	130	130	130	130	130	130
Mooretown	447	447	500	1300	447	500	1490	447	500	1490
Vista Del Cerro	300	300	300	300	300	300	300	300	300	300
Las Plumas	110	110	110	110	110	110	110	110	110	110
Mt. Ida	-	-	-	-	20	30	130	85	170	850
Wyman's Ravine	-	-	-	-	75	165	720	550	1115	5480

Table 4-4 shows that all but two of the existing lift stations are adequately sized for current and future buildout conditions. No enlargements would be required for stations L1, L3, Royal Oaks, Hanging Tree, Heritage, Vista Del Cerro, or Las Plumas. The remaining two lift stations (L2 and Mooretown) would need to be improved in the future to meet buildout conditions (larger pumps, increased overflow storage, etc.).

Chapter 5

RECOMMENDED PLAN AND CAPITAL IMPROVEMENT PROGRAM

Collection system improvements will be necessary to meet current and future needs of the study area. Phased implementation of these improvements is recommended. This chapter summarizes the recommended improvement plan and provides cost estimates for anticipated improvements.

COLLECTION SYSTEM PIPELINE REPLACEMENT

Table 5-1 is a list of unit prices used to develop the cost estimates for future sewer construction.

Table 5-1
Sewer Pipeline Construction Unit Costs

Pipe Diameter	Cost/Foot
8"	$125.00
10"	$140.00
12"	$175.00
15"	$210.00
18"	$245.00
21"	$260.00
24"	$270.00
27"	$280.00
30"	$300.00
36"	$320.00
48"	$365.00

Using these unit costs, Table 5-2 gives estimated construction costs (2010 pricing basis) for each discrete reach of pipeline needing replacement (as shown in Table 4-3) for current and for future capacity needs. In Table 5-2, there are two columns that list construction costs: one column for costs associated for pipeline replacements to meet current capacity needs (existing customers), and one column for costs associated with future capacity needs. The construction cost is based on the ultimate pipeline diameter that would be needed at buildout as shown in Table 4-3. The cost of replacing existing sewers which are incapable of carrying current and anticipated future flows includes the cost of materials and construction. Materials include pipeline, manholes, and fittings. Construction costs include soil and rock excavation, pipeline placement, backfill, surface restoration, contractor's overhead and profit, and other factors. Cost estimates do not include right-of-way, engineering, or similar expenses.

Table 5-2
Estimated Pipeline Replacement Schedule

Computer Model Pipe Section ID (Appendix B-D)	Pipeline Section			Pipe Section ⌀ (inch)	Section Length (ft)	Costs Related to Current Capacity Needs ($)	Costs Related to Future Capacity Needs ($)	Total Cost ($)
	From MH		To MH					
131 to 135	O-46	-	O-41	18	817.00	$0	$200,165	$200,165
137 to 139	O-41	-	O-30	15	503.40	$0	$105,714	$105,714
141 to 143	O-30	-	O-28	18	388.98	$0	$95,300	$95,300
145 to 149	0-28	-	O-17	15	543.00	$0	$114,030	$114,030
151 to 153	O-17	-	0-10	18	614.00	$0	$150,430	$150,430
156	O-10	-	O-6	15	692.00	$0	$145,320	$145,320
163	O-1	-	S-98	18	268.00	$0	$65,660	$65,660
193	G-100	-	Moore	12	20.00	$0	$3,500	$3,500
237	S-186	-	S-185	24	160.00	$41,600	$1,600	$43,200
241 to 281	S-184	-	S-163	21	4150.56	$0	$1,079,068	$1,079,068
283 to 291	S-163	-	S-158	24	1648.50	$428,610	$16,485	$445,095
293	S-158	-	S-157	24	199.50	$0	$53,865	$53,865
295	S-157	-	S-156	24	391.00	$101,660	$3,910	$105,570
297	S-156	-	S-155	21	155.00	$0	$40,300	$40,300
301	S-154	-	S-153	24	226.00	$0	$61,020	$61,020
305 to 321	S-152	-	S-143	15	1373.59	$0	$288,454	$288,454
323	S-143	-	S-142	21	395.00	$96,775	$3,950	$102,700
325 to 331	S-142	-	S-138	15	1149.07	$0	$241,305	$241,305
335 to 337	S-137	-	S-135	24	390.42	$0	$105,413	$105,413
347 to 349	S-131	-	S-129	24	378.54	$0	$102,206	$102,206
351	S-129	-	S-128	21	67.23	$0	$17,480	$17,480
353	S-128	-	S-127	24	123.94	$32,224	$1,240	$33,464
355 to 359	S-127	-	S-123	24	1901.92	$0	$513,518	$513,518
363 to 373	S-123	-	S-117	15	1885.94	$0	$396,047	$396,047
375	S-117	-	S-116	18	216.00	$0	$52,920	$52,920
379	S-115	-	S-114	18	268.45	$0	$65,770	$65,770
383	S-113	-	S-112	21	408.65	$100,119	$6,130	$106,249

391 to 393	S-109	-	S-108A	18	680.11	$0	$166,627	$166,627
395	S-106	-	S-105	18	345.00	$0	$84,525	$84,525
397	S-105	-	S-104	21	403.92	$84,823	$20,196	$105,019
399 to 401	S-104	-	S-102	21	999.63	$0	$259,904	$259,904
405	S-101	-	S-100	21	462.02	$0	$120,125	$120,125
407 to 411	S-100	-	S-97	24	731.30	$0	$197,451	$197,451
413	S-97	-	S-96	36	94.00	$24,440	$5,640	$30,080
415 to 421	S-96	-	S-92	30	936.72	$243,547	$37,469	$281,016
423	S-92	-	S-91	36	226.18	$58,807	$13,571	$72,378
425 to 427	S-91	-	S-89	36	216.92	$0	$69,414	$69,414
429 to 465	S-89	-	S-70	36	5783.20	$1,561,464	$289,160	$1,850,624
467	S-70	-	S-69	36	340.00	$88,400	$20,400	$108,800
469	S-69	-	S-69A	36	116.00	$31,320	$3,480	$37,120
471 to 485	S-68	-	S-60	48	1213.17	$0	$442,807	$442,807
489 to 780	S-59	-	S-58	36	585.00	$0	$187,200	$187,200
491 to 495	S-58	-	S-56A	36	851.00	$0	$272,320	$272,320
497 to 796	S-57A	-	S-55F	36	3133.00	$0	$1,002,560	$1,002,560
798	S-55F	-	S-55G	30	250.00	$0	$75,000	$75,000
804	S-55H	-	S-34	48	135.00	$0	$49,275	$49,275
501 to 507	S-34	-	S-30	36	1254.45	$0	$401,424	$401,424
509 to 511	S-30	-	S-28	24	851.52	$0	$229,910	$229,910
513	S-28	-	S-27	24	136.69	$33,489	$3,417	$36,906
515 to 521	S-27	-	S-23	36	725.45	$0	$232,144	$232,144
523	S-23	-	S-22	21	419.03	$0	$108,948	$108,948
525 to 527	S-22	-	S-20	24	468.00	$0	$126,360	$126,360
533	S-18	-	S-17	36	339.00	$0	$108,480	$108,480
541	S-9	-	S-8	36	390.00	$0	$124,800	$124,800
543	S-8	-	S-7	48	477.00	$0	$174,105	$174,105
545	S-7	-	S-6	36	263.00	$0	$84,160	$84,160
547 to 551	S-6	-	S-4	48	1012.00	$0	$369,380	$369,380
639	Z-4	-	Z-5	27	95.62	$0	$26,774	$26,774
653	Z-11	-	Z-12	24	117.71	$0	$31,782	$31,782
659	Z-14	-	Z-15	21	450.79	$0	$117,205	$117,205

772	C-1	-	S-9	15	70.00	$0	$14,700	$14,700
774 to 778	S-17.1	-	S-16	48	762.00	$0	$278,130	$278,130
806	S-62A	-	S-61	48	423.00	$0	$154,395	$154,395
808	S-69A	-	S-68	36	70.00	$0	$22,400	$22,400
814	S-115A	-	S-115	18	251.00	$0	$61,495	$61,495
97	Z-14	-	L-2	12	110.88	$0	$19,404	$19,404
				Total:	45525	$2,927,278	$9,937,337	$12,868,910

A summary of the cost estimates listed in Table 5-2 is provided in Table 5-3. These estimates include a 25% allowance for engineering, administrative, legal, and contingency costs.

Table 5-3

PIPELINE REPLACEMENT SCHEDULE

Location	Construction Cost (2010 dollars)		
	2010	Future	Total
LOAPUD Sewer System	$ 2,927,278	$ 9,937,337	$ 12,868,910
Engineering, Contingencies @ 25%	731,820	2,484,334	3,217,228
Total	**$3,659,098**	**$12,421,671**	**$16,086,138**

The District should monitor the ability of critical pipelines to convey peak wet-weather flows. Table 4-3 and the data tables contained in Appendices B through D will be helpful in directing the staff's attention to the pipelines expected to be unable to convey the expected flows. Typical events of overloaded pipelines are surcharging in manholes and, in extreme cases, overflow of raw wastewater at manhole covers.

Following field confirmation of problem areas listed in Tables 4-3 and 5-2, it will be necessary to prepare plans and specifications, secure additional rights-of-way, if applicable, and proceed with bidding for construction. It would be normal to identify critical lines during winter. Engineering could be scheduled for spring, with construction scheduled for the following summer. Some work may be scheduled each year or the District could fund a large project each five to ten years.

Chapter 4 discussed potential future improvement projects to accommodate future expansion of the system to meet future development needs. It is difficult to predict the order or timing of expansion since there are so many variables predicting growth trends. Table 5-4 lists these proposed projects and the estimated associated construction costs. Because of the uncertainties in locating and sizing these facilities, these should be considered very preliminary estimates. These facilities only include the transmission mains, force mains, and lift stations and do not include any of the on-site collection systems. Cost estimates are calculated the same as for the pipeline replacements.

Table 5-4

PROPOSED SEWER COLLECTION SYSTEM FACILITIES

Location	Facility	Length (ft)	Estimated Construction Cost ($)
Oro Quincy Hwy, Mt. Ida Rd, Forbestown Rd	"Hawk Ravine" gravity transmission pipeline	14,900	2,309,500
	Mt Ida Lift Station		650,000
	Force main	1,600	112,000
Olive Hwy, Ward Bl, Canyon Dr	"A Line" Gravity transmission pipeline	13,100	2,030,500
Olive Hwy, Skyline Bl	Gravity transmission pipeline	9,300	1,441,500
Wyman's Ravine & Railroad Ave: Las Plumas Study Area	Wyman's Ravine Lift Station		800,000
	Force main	8,900	623,000

Total Construction Costs	**$7,966,500**
Engineering, contingencies @ 25%	**$1,991,625**
Total	***$9,958,125***

Table 5-5 lists the total cost estimates and year of expenditure for sewer pipeline replacements and system expansion projects.

Table 5-5

CAPITAL IMPROVEMENTS PROGRAM ESTIMATED CONSTRUCTION COSTS

Project Type	2010 Projects	Future Projects
Pipeline Replacement	$2,927,278	$9,937,337
Proposed Facilities	$0	$7,966,500
Total	**$2,927,278**	**$17,903,837**

LAKE OROVILLE AREA PUBLIC UTILITY DISTRICT
SEWER SYSTEM MASTER PLAN

APPENDICES

APPENDIX A

COMPUTER MODEL ANALYSIS

APPENDIX A

COMPUTER ANALYSIS

The Lake Oroville Area Public Utility District sewer collection system was modeled using the H$_2$OMAP Sewer/Pro software package developed by MHW Soft, Inc. First, a map of the collection system was digitized including pipes, or links, and manholes, or nodes, to produce a geometrically accurate layout of the system. Next, data and design conditions were attached to each of the model entities. This information included pipeline lengths and diameters, pipe and manhole invert and ground elevations, maximum depth ratio (depth of flow divided by the diameter of the pipe or d/D) and minimum velocity requirements, pump station capacities and flow rates, wastewater flow inputs, and rainfall information and collection system I/I. Analysis results are given for each pipeline in the system.

Appendices B through D shows the tabulated results of the computer analysis for projected flows within the current service boundary (Appendix B), within the sphere of influence (Appendix C) and within the master study area (Appendix D) for peak wet weather flows for current, 2020, 2030 and buildout conditions.

Geographic information is given for each pipeline including pipe diameter (inches), length (feet) and slope. Flows are given showing total sanitary flow, peakable flow, full pipe flow, and design flow at d/D of 0.75. Flow rates are given in million gallons per day (mgd). The tables show depth ratio (d/D) and velocity (fps) within the pipe for the projected flows.

A pipeline was considered overloaded when the modeled d/D was greater than the maximum allowable d/D assigned to the pipe. Where this occurred, the program selected a replacement pipeline diameter which would relieve the overloading conditions.

The computer analysis also identified pipelines which experience surcharge under modeling conditions. Surcharge is not necessarily an indication that a pipe is undersized. Adequately sized pipelines may experience surcharge when a backwater condition is created in a downstream pipeline. This should be considered when setting priorities for pipeline replacements. Identifying and replacing the pipelines responsible for creating the backwater condition may provide surcharge relief for a larger portion of the system.

The depth ratio (depth of flow divided by the diameter of the pipe or d/D) is a good indicator of the severity of an overload condition. For this analysis, a pipeline was considered overloaded if the d/D was greater than 0.75. Some pipelines identified as overloaded may have a depth ratio only slightly higher than 0.75 while others may be flowing full. This should be considered when setting priorities for pipeline replacement. In some cases, a d/D of 0.75 may be too high. Review of the d/D values in the following tables would show which additional pipelines would be considered overload with lower depth ratios.

In the computer model, I/I and wastewater inflow were considered as a single quantity and where I/I was accounted for in peaking the ADWF. Based on influent flow records at the treatment plant, wet weather I/I is known to be a significant source of flow in the collection system. In many pipelines, including many shown to be overloaded, I/I accounts for the majority of the flow and is the reason for the overloading condition. Because assumptions were made as to the location and extent of I/I due to of the lack of detailed information, the computer model may or may not accurately recreate what is being experienced in the field.

Complementing the computer modeling program with a comprehensive I/I study would be very beneficial in defining and prioritizing a pipeline replacement program. Once a model is calibrated to accurately recreate I/I impacts in the system, the affects of eliminating I/I sources can also accurately be modeled.

This computer analysis is intended to identify potential collection system problem areas and provide guidance on possible pipeline replacements based on the conditions set in the model. Prior to any actual pipeline replacement project, a thorough investigation of the actual design parameters including field verification of existing conditions should be conducted.

These printouts can be a powerful tool in effectively understanding the collection system. First, the printouts can be quickly scanned to identify reaches in need of improvement. Second, in conjunction with the accompanying maps, they describe the collection system status for any given location and its ability to handle larger loads where development or annexation is being considered. Third, this appendix serves as a guide for overall system improvements. It is a comprehensive but brief analysis of the trunk line system status that gives an overview of expected future conditions.

APPENDIX B

FLOWS WITHIN CURRENT SERVICE BOUNDARY

APPENDIX B1

**FLOWS WITHIN CURRENT SERVICE BOUNDARY
2010 ADWF**

LOAPUD 2009 ADWF

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTREI	6	5.00	0.046	0.082	0.082	Free Surface	3.989	0.219	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTREI	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.021	0.021	Free Surface	7.181	0.057	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.004	0.000	Free Surface	1.309	0.039	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.016	0.016	Free Surface	2.365	0.069	1.682	1.534				
108	39	LS-VISTADELCER	8	5.00	0.300	0.049	0.049	Free Surface	6.343	0.075	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.076	0.000	Free Surface	1.408	0.164	1.312	1.197	6.000	1.505	0.42	29,165.50
133	O45	O44	12	237.30	0.004	0.076	0.000	Free Surface	1.473	0.159	1.398	1.275	6.000	1.577	0.406	15,424.50
135	O44	O41	12	131.00	0.004	0.076	0.000	Free Surface	1.450	0.160	1.368	1.248	6.000	1.553	0.411	8,515.00
137	O41	O40	12	216.00	0.013	0.076	0.000	Free Surface	2.291	0.117	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.076	0.000	Free Surface	2.323	0.116	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.076	0.000	Free Surface	1.432	0.162	1.343	1.224	6.000	1.531	0.415	9,033.70
143	O29	O28	12	250.00	0.004	0.076	0.000	Free Surface	1.452	0.160	1.370	1.249	6.000	1.553	0.411	16,250.00
145	O28	O24	12	196.00	0.006	0.076	0.000	Free Surface	1.745	0.141	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.076	0.000	Free Surface	1.950	0.131	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.076	0.000	Free Surface	1.708	0.143	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.076	0.000	Free Surface	1.561	0.152	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.076	0.000	Free Surface	1.579	0.151	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.076	0.000	Free Surface	1.785	0.139	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	4.514	0.000	Free Surface	18.004	0.133	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.076	0.000	Free Surface	3.499	0.088	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.076	0.000	Free Surface	1.301	0.173	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	0.118	0.000	Free Surface	4.382	0.130	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.649	0.000	Free Surface	5.478	0.573	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.649	0.000	Free Surface	4.931	0.626	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.649	0.000	Free Surface	8.843	0.395	5.011	4.569				

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219	Z-5	Z-4	12	341.58	0.076	1.649	0.000	Free Surface	10.529	0.347	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.649	0.000	Free Surface	10.008	0.360	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.649	0.000	Free Surface	9.098	0.387	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.649	0.000	Free Surface	9.899	0.363	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.649	0.000	Free Surface	8.126	0.421	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.649	0.000	Free Surface	4.569	0.669	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.649	0.000	Free Surface	7.655	0.440	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.649	0.000	Free Surface	8.077	0.423	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	1.708	0.000	Free Surface	8.317	0.425	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	2.500	0.000	Pressurized	4.925	1.000	0.796	0.726	21.000	2.469	0.62	24,000.00
239	S-185	S-184	18	354.41	0.007	2.500	0.000	Free Surface	4.929	0.456	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	2.500	0.000	Free Surface	3.434	0.609	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	2.500	0.000	Free Surface	3.305	0.629	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	2.687	0.000	Free Surface	3.348	0.662	3.462	3.157				
247	S-181	S-180	18	248.09	0.003	2.687	0.000	Free Surface	3.388	0.655	3.511	3.202				
249	S-180	S-179	18	404.10	0.002	2.687	0.000	Free Surface	3.251	0.680	3.335	3.041				
251	S-179	S-178	18	221.42	0.002	2.687	0.000	Free Surface	3.165	0.696	3.235	2.950				
253	S-178	S-177	18	80.58	0.002	2.687	0.000	Free Surface	3.293	0.672	3.391	3.093				
255	S-177	S-176	18	142.02	0.002	2.687	0.000	Free Surface	3.283	0.674	3.379	3.082				
257	S-176	S-175	18	311.66	0.002	2.687	0.000	Free Surface	3.251	0.680	3.339	3.045				
259	S-175	S-174	18	100.00	0.003	2.687	0.000	Free Surface	3.354	0.661	3.471	3.165				
261	S-174	S-173	18	161.32	0.003	2.687	0.000	Free Surface	3.388	0.655	3.514	3.205				
263	S-173	S-172	18	273.50	0.002	2.687	0.000	Free Surface	3.215	0.687	3.293	3.003				
265	S-172	S-171	18	160.10	0.002	2.687	0.000	Free Surface	3.304	0.670	3.403	3.103				
269	S-171	S-169	18	414.77	0.004	2.687	0.000	Free Surface	3.834	0.590	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	2.687	0.000	Free Surface	3.818	0.592	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	2.687	0.000	Free Surface	3.818	0.592	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	2.687	0.000	Free Surface	5.660	0.434	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	2.687	0.000	Free Surface	3.310	0.669	3.414	3.113				
279	S-165	S-164	18	124.36	0.002	2.687	0.000	Free Surface	3.256	0.679	3.343	3.049				
281	S-164	S-163	18	250.67	0.003	2.687	0.000	Free Surface	3.394	0.654	3.519	3.209				
283	S-163	S-162	18	327.00	0.003	2.763	0.000	Free Surface	3.321	0.684	3.409	3.108				
285	S-162	S-161	18	351.00	0.002	2.763	0.000	Free Surface	3.306	0.687	3.389	3.090				
287	S-161	S-160	18	329.00	0.002	2.763	0.000	Free Surface	3.316	0.685	3.398	3.099				
289	S-160	S-159	18	416.00	0.003	2.763	0.000	Free Surface	3.420	0.666	3.532	3.221				
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	2.763	0.000	Free Surface	3.403	0.669	3.511	3.202				
293	S-158	S-157	18	199.50	0.003	2.763	0.000	Free Surface	3.554	0.644	3.702	3.376				
295	S-157	S-156	18	391.00	0.003	2.763	0.000	Free Surface	3.375	0.674	3.477	3.170				
297	S-156	S-155	18	155.00	0.004	2.763	0.000	Free Surface	3.973	0.586	4.270	3.894				
299	S-155	S-154	18	415.00	0.010	2.763	0.000	Free Surface	5.669	0.442	6.832	6.230				

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301	S-154	S-153	18	226.00	0.003	2.763	0.000	Free Surface	3.601	0.637	3.761	3.430				
303	S-153	S-152	18	230.00	0.013	2.763	0.000	Free Surface	6.264	0.410	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	2.763	0.000	Free Surface	10.860	0.501	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	2.763	0.000	Free Surface	12.072	0.461	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	2.763	0.000	Free Surface	10.597	0.511	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	2.763	0.000	Free Surface	8.579	0.606	4.049	3.692				
313	S-148	S-147	12	309.01	0.061	2.763	0.000	Free Surface	11.179	0.490	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	2.763	0.000	Free Surface	12.343	0.454	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	2.767	0.000	Free Surface	13.869	0.416	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	2.767	0.000	Pressurized	11.411	0.482	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	2.767	0.000	Pressurized	5.450	1.000	1.635	1.491	18.000	4.367	0.543	55,300.00
325	S-142	S-141	12	239.00	0.085	2.767	0.000	Free Surface	12.587	0.447	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	2.767	0.000	Free Surface	9.949	0.538	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	2.767	0.000	Free Surface	9.718	0.548	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	2.767	0.000	Free Surface	9.250	0.570	4.456	4.064				
333	S-138	S-137	18	265.59	0.034	2.770	0.000	Free Surface	8.797	0.320	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	2.770	0.000	Free Surface	4.185	0.563	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	2.770	0.000	Free Surface	4.226	0.558	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	2.770	0.000	Free Surface	11.173	0.269	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	2.770	0.000	Free Surface	8.553	0.326	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	2.770	0.000	Free Surface	7.612	0.355	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	2.770	0.000	Free Surface	10.747	0.277	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	2.774	0.000	Free Surface	4.246	0.557	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	2.774	0.000	Free Surface	4.321	0.549	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	2.774	0.000	Free Surface	5.491	0.455	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	2.774	0.000	Free Surface	3.533	0.649	3.669	3.345				
355	S-127	S-126	18	131.40	0.005	2.774	0.000	Free Surface	4.269	0.554	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	2.774	0.000	Free Surface	4.079	0.575	4.412	4.023				
359	S-125	S-123	18	389.66	0.004	2.774	0.000	Free Surface	4.017	0.583	4.321	3.940				
363	S-123	S-122	12	289.06	0.033	2.774	0.000	Free Surface	8.859	0.592	4.212	3.841				
365	S-122	S-121	12	309.56	0.037	2.774	0.000	Free Surface	9.273	0.570	4.467	4.074				
367	S-121	S-120	12	430.79	0.082	2.774	0.000	Free Surface	12.477	0.451	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	2.774	0.000	Free Surface	12.602	0.448	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	2.774	0.000	Free Surface	13.203	0.432	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	2.779	0.000	Free Surface	12.938	0.439	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	2.779	0.000	Free Surface	6.691	0.519	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	2.779	0.000	Free Surface	11.080	0.354	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	2.779	0.000	Free Surface	9.187	0.406	8.011	7.305				
381	S-114	S-113	15	234.61	0.039	2.787	0.000	Free Surface	9.440	0.399	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	2.787	0.000	Free Surface	5.183	0.642	3.750	3.420				

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389	S-112	S-109	15	310.00	0.070	2.787	0.000	Free Surface	11.635	0.342	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	2.787	0.000	Free Surface	6.694	0.520	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	2.787	0.000	Free Surface	6.670	0.521	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	2.787	0.000	Free Surface	8.579	0.429	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	2.794	0.000	Free Surface	6.479	0.792	2.887	2.632	15.000	6.711	0.52	48,470.40
399	S-104	S-103	18	501.82	0.012	2.794	0.000	Free Surface	6.082	0.423	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	2.794	0.000	Free Surface	6.073	0.423	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	2.794	0.000	Free Surface	8.411	0.333	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	2.794	0.000	Free Surface	7.341	0.367	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	2.794	0.000	Free Surface	5.141	0.481	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	2.794	0.000	Free Surface	5.062	0.487	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	2.908	0.000	Free Surface	7.181	0.385	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	2.908	0.000	Free Surface	3.191	0.744	3.217	2.934				
415	S-96	S-95	18	116.00	0.003	2.908	0.000	Free Surface	3.776	0.639	3.947	3.599				
417	S-95	S-94	18	220.95	0.003	2.908	0.000	Free Surface	3.796	0.636	3.966	3.617				
419	S-94	S-93	18	386.14	0.003	2.921	0.000	Free Surface	3.796	0.638	3.965	3.616				
421	S-93	S-92	18	213.63	0.003	2.921	0.000	Free Surface	3.806	0.637	3.979	3.629				
423	S-92	S-91	18	226.18	0.003	2.921	0.000	Free Surface	3.483	0.688	3.564	3.250				
425	S-91	S-90	27	65.74	0.002	2.927	0.000	Free Surface	2.926	0.413	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	2.927	0.000	Free Surface	2.937	0.352	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	2.927	0.000	Pressurized	2.563	1.000	2.856	2.604	21.000	2.979	0.604	16,191.00
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	2.927	0.000	Free Surface	2.938	0.814	2.946	2.686	21.000	3.052	0.592	35,247.00
432	S88A	S-87	18	282.74	0.001	2.927	0.000	Pressurized	2.563	1.000	2.496	2.276	21.000	2.675	0.663	42,411.00
433	S-87	S-86	18	239.17	0.002	2.927	0.000	Free Surface	2.945	0.813	2.953	2.693	21.000	3.055	0.592	35,875.50
435	S-86	S-85	18	303.02	0.002	2.927	0.000	Free Surface	2.945	0.813	2.952	2.692	21.000	3.055	0.592	45,453.00
437	S-85	S-84	18	296.01	0.002	2.927	0.000	Free Surface	2.929	0.817	2.934	2.676	21.000	3.043	0.594	44,401.50
439	S-84	S-83	18	300.28	0.002	2.927	0.000	Free Surface	2.932	0.816	2.940	2.681	21.000	3.049	0.593	45,042.00
441	S-83	S-82	18	361.66	0.002	2.927	0.000	Free Surface	2.945	0.813	2.952	2.692	21.000	3.055	0.592	54,249.00
443	S-82	S-81	18	118.63	0.002	2.933	0.000	Pressurized	2.568	1.000	2.931	2.673	21.000	3.044	0.595	17,794.50
445	S-81	S-80	18	315.60	0.002	2.933	0.000	Free Surface	2.938	0.816	2.943	2.684	21.000	3.05	0.594	47,340.00
447	S-80	S-79	18	382.07	0.002	2.933	0.000	Free Surface	2.931	0.818	2.934	2.676	21.000	3.044	0.595	57,310.50
449	S-79	S-78	18	358.51	0.001	2.933	0.000	Pressurized	2.568	1.000	2.593	2.364	21.000	2.759	0.646	53,776.50
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	2.933	0.000	Free Surface	2.931	0.818	2.939	2.680	21.000	3.05	0.594	46,671.00
453	S-77	S-76	18	207.87	0.002	2.933	0.000	Free Surface	2.978	0.805	2.986	2.723	21.000	3.086	0.588	31,180.50
455	S-76	S-75	18	413.60	0.002	2.933	0.000	Free Surface	2.988	0.802	2.994	2.730	21.000	3.092	0.587	62,040.00
457	S-75	S-74	18	254.25	0.002	2.933	0.000	Free Surface	2.985	0.803	2.988	2.725	21.000	3.086	0.588	38,137.50
459	S-74	S-73	18	308.99	0.001	2.933	0.000	Pressurized	2.568	1.000	2.598	2.369	21.000	2.764	0.646	46,348.50
461	S-73	S-72	18	473.94	0.002	2.933	0.000	Free Surface	2.978	0.805	2.983	2.720	21.000	3.083	0.588	71,091.00
463	S-72	S-71	18	298.55	0.002	2.943	0.000	Free Surface	3.243	0.741	3.273	2.984				

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465	S-71	S-70	18	214.36	0.002	2.943	0.000	Free Surface	3.229	0.744	3.255	2.968				
467	S-70	S-69	18	340.00	0.003	2.943	0.000	Free Surface	3.483	0.693	3.560	3.246				
469	S-69	S-69A	18	116.00	0.002	2.943	0.000	Free Surface	3.252	0.739	3.284	2.995				
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	2.943	0.000	Free Surface	2.430	0.478	6.373	5.812				
475	S-67	S-65	27	150.92	0.001	2.943	0.000	Free Surface	2.417	0.479	6.327	5.770				
477	S-65	S-64	27	103.14	0.001	2.943	0.000	Free Surface	2.395	0.483	6.249	5.699				
479	S-64	S-63	27	132.00	0.001	2.943	0.000	Free Surface	2.411	0.480	6.298	5.744				
481	S-63	S-62	27	292.00	0.001	2.943	0.000	Free Surface	2.417	0.479	6.325	5.768				
483	S-62	S-62A	27	53.00	0.001	2.943	0.000	Free Surface	2.370	0.487	6.165	5.621				
485	S-61	S-60	27	244.11	0.001	2.959	0.000	Free Surface	2.411	0.482	6.293	5.739				
487	S-60	S-59	27	179.00	0.014	2.959	0.000	Free Surface	6.339	0.237	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	2.959	0.000	Free Surface	2.969	0.411	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	2.959	0.000	Free Surface	3.044	0.404	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	2.959	0.000	Free Surface	3.068	0.401	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	2.959	0.000	Free Surface	3.039	0.404	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	3.000	0.000	Free Surface	3.091	0.403	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	4.107	0.000	Free Surface	3.809	0.524	7.581	6.913				
503	S-33	S-32	24	179.87	0.003	4.107	0.000	Free Surface	4.138	0.491	8.467	7.721				
505	S-32	S-31	24	272.57	0.003	4.163	0.000	Free Surface	4.136	0.497	8.424	7.682				
507	S-31	S-30	24	315.87	0.003	4.163	0.000	Free Surface	4.070	0.503	8.249	7.522				
509	S-30	S-29	15	396.46	0.035	4.163	0.000	Free Surface	10.070	0.517	7.881	7.186				
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	4.163	0.000	Free Surface	9.813	0.527	7.610	6.940				
513	S-28	S-27	15	136.69	0.029	4.163	0.000	Free Surface	9.378	0.547	7.179	6.546				
515	S-27	S-26	24	160.65	0.003	4.163	0.000	Free Surface	4.221	0.489	8.656	7.893				
517	S-26	S-25	24	132.87	0.004	4.163	0.000	Free Surface	4.378	0.475	9.083	8.282				
519	S-25	S-24	24	286.68	0.004	4.163	0.000	Free Surface	4.343	0.478	8.998	8.205				
521	S-24	S-23	24	145.25	0.003	4.163	0.000	Free Surface	4.173	0.493	8.515	7.765				
523	S-23	S-22	15	419.03	0.040	4.163	0.000	Free Surface	10.575	0.497	8.409	7.668				
525	S-22	S-21	15	288.70	0.032	4.163	0.000	Free Surface	9.656	0.534	7.453	6.796				
527	S-21	S-20	18	179.30	0.022	4.163	0.000	Free Surface	8.358	0.450	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	4.323	0.000	Free Surface	6.409	0.265	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	4.323	0.000	Free Surface	6.467	0.264	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	4.323	0.000	Free Surface	5.292	0.304	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	4.323	0.000	Free Surface	7.727	0.232	36.508	33.291				
537	S-16	S-14	36	177.00	0.005	4.323	0.000	Free Surface	4.814	0.251	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	4.355	0.000	Free Surface	13.390	0.159	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	4.409	0.000	Free Surface	5.779	0.290	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	4.430	0.000	Free Surface	5.024	0.448	10.719	9.775				

LOAPUD 2009 ADWF

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545	S-7	S-6	24	263.00	0.006	4.430	0.000	Free Surface	5.376	0.426	11.748	10.713				
547	S-6	S-5	30	343.00	0.004	4.430	0.000	Free Surface	4.295	0.361	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	4.430	0.000	Free Surface	4.302	0.360	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	4.514	0.000	Free Surface	4.205	0.372	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				

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63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.644	0.000	Free Surface	1.903	0.337	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.644	0.000	Free Surface	1.799	0.351	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.644	0.000	Free Surface	1.789	0.353	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.644	0.000	Free Surface	0.918	0.590	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.644	0.000	Free Surface	2.040	0.320	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.644	0.000	Free Surface	2.084	0.315	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.644	0.000	Free Surface	1.913	0.336	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.644	0.000	Free Surface	1.917	0.335	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.644	0.000	Free Surface	1.202	0.476	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.644	0.000	Free Surface	2.473	0.279	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.644	0.000	Free Surface	2.753	0.258	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.644	0.000	Free Surface	1.452	0.412	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.644	0.000	Free Surface	2.561	0.272	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.644	0.000	Free Surface	2.664	0.264	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.644	0.000	Free Surface	1.946	0.332	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.644	0.000	Free Surface	2.927	0.247	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.644	0.000	Free Surface	5.124	0.167	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.104	0.000	Free Surface	3.110	0.231	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.104	0.000	Free Surface	2.851	0.246	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.104	0.000	Free Surface	1.713	0.354	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	0.054	0.000	Free Surface	4.488	0.102	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	4.323	0.000	Free Surface	3.388	0.423	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	4.323	0.000	Free Surface	3.591	0.405	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	4.323	0.000	Free Surface	3.378	0.424	11.541	10.524				

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780	S-58A	S-58	27	394.00	0.002	2.959	0.000	Free Surface	2.967	0.412	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	2.959	0.000	Free Surface	3.058	0.402	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	2.959	0.000	Free Surface	3.073	0.401	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	2.959	0.000	Free Surface	3.044	0.404	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	3.000	0.000	Free Surface	3.066	0.406	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	3.004	0.000	Free Surface	3.092	0.404	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	3.004	0.000	Free Surface	3.053	0.407	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	3.004	0.000	Free Surface	3.070	0.406	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	3.004	0.000	Free Surface	3.192	0.394	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	3.004	0.000	Free Surface	4.832	0.291	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	3.004	0.000	Free Surface	8.462	0.196	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	3.004	0.000	Free Surface	11.819	0.155	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	2.959	0.000	Free Surface	2.420	0.481	6.324	5.767				
808	S-69A	S-68	27	70.00	0.002	2.943	0.000	Free Surface	3.286	0.380	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	2.787	0.000	Free Surface	10.240	0.375	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	2.779	0.000	Free Surface	9.187	0.406	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.649	0.000	Free Surface	6.561	0.496	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.055	0.000	Free Surface	1.034	0.207	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	0.604	0.000	Free Surface	3.967	0.446	1.471	1.341				
98	Z20	Z22	24	505.68	0.003	1.104	0.000	Free Surface	2.908	0.242	8.575	7.819				
MTID,	MTIDAIN	MTIDALS	8	5	0.2	0	0	Free Surface	0	0	3.502	3.193				
WYM,	WYMAN	WYMANSRAVINE	8	5	0.3	0	0	Free Surface	0	0	4.289	3.911				

APPENDIX B2

FLOWS WITHIN CURRENT SERVICE BOUNDARY
2010 PWWF

LOAPUD 2009 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.532	0.082	Free Surface	6.612	0.606	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.135	0.021	Free Surface	12.642	0.139	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.025	0.004	Free Surface	2.309	0.094	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.105	0.016	Free Surface	4.153	0.169	1.682	1.534				
108	39	LS-VISTADELCER	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.496	0.076	Free Surface	2.405	0.426	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.496	0.076	Free Surface	2.519	0.411	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.496	0.076	Free Surface	2.480	0.416	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.496	0.076	Free Surface	3.971	0.294	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.496	0.076	Free Surface	4.026	0.292	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.496	0.076	Free Surface	2.446	0.420	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.496	0.076	Free Surface	2.480	0.416	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.496	0.076	Free Surface	3.002	0.361	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.496	0.076	Free Surface	3.367	0.332	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.496	0.076	Free Surface	2.937	0.367	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.496	0.076	Free Surface	2.677	0.393	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.496	0.076	Free Surface	2.711	0.389	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.496	0.076	Free Surface	3.076	0.354	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	8.840	0.810	Free Surface	21.979	0.184	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.496	0.076	Free Surface	6.115	0.217	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.496	0.076	Pressurized	2.210	0.454	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	0.767	0.118	Free Surface	7.575	0.330	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.519	0.000	Free Surface	5.372	0.545	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.519	0.000	Free Surface	4.847	0.593	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.519	0.000	Free Surface	8.654	0.378	5.011	4.569				

LOAPUD 2009 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.519	0.000	Free Surface	10.291	0.333	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.519	0.000	Free Surface	9.777	0.345	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.519	0.000	Free Surface	8.902	0.370	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.519	0.000	Free Surface	9.674	0.348	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.519	0.000	Free Surface	7.950	0.402	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.519	0.000	Free Surface	4.494	0.632	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.519	0.000	Free Surface	7.487	0.421	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.519	0.000	Free Surface	7.899	0.404	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	1.905	0.059	Free Surface	8.560	0.452	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	2.697	0.059	Pressurized	5.314	1.000	0.796	0.726	21	2.507	0.653	$24,000
239	S-185	S-184	18	354.41	0.007	2.697	0.059	Free Surface	5.030	0.476	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	2.697	0.059	Free Surface	3.490	0.641	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	2.697	0.059	Free Surface	3.355	0.663	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	2.885	0.059	Free Surface	3.393	0.697	3.462	3.157				
247	S-181	S-180	18	248.09	0.003	2.885	0.059	Free Surface	3.429	0.690	3.511	3.202				
249	S-180	S-179	18	404.10	0.002	2.885	0.059	Free Surface	3.288	0.718	3.335	3.041				
251	S-179	S-178	18	221.42	0.002	2.885	0.059	Free Surface	3.200	0.736	3.235	2.950				
253	S-178	S-177	18	80.58	0.002	2.885	0.059	Free Surface	3.331	0.709	3.391	3.093				
255	S-177	S-176	18	142.02	0.002	2.885	0.059	Free Surface	3.322	0.711	3.379	3.082				
257	S-176	S-175	18	311.66	0.002	2.885	0.059	Free Surface	3.292	0.717	3.339	3.045				
259	S-175	S-174	18	100.00	0.003	2.885	0.059	Free Surface	3.398	0.696	3.471	3.165				
261	S-174	S-173	18	161.32	0.003	2.885	0.059	Free Surface	3.435	0.689	3.514	3.205				
263	S-173	S-172	18	273.50	0.002	2.885	0.059	Free Surface	3.250	0.726	3.293	3.003				
265	S-172	S-171	18	160.10	0.002	2.885	0.059	Free Surface	3.341	0.707	3.403	3.103				
269	S-171	S-169	18	414.77	0.004	2.885	0.059	Free Surface	3.891	0.618	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	2.885	0.059	Free Surface	3.881	0.620	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	2.885	0.059	Free Surface	3.877	0.620	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	2.885	0.059	Free Surface	5.767	0.451	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	2.885	0.059	Free Surface	3.352	0.705	3.414	3.113				
279	S-165	S-164	18	124.36	0.002	2.885	0.059	Free Surface	3.292	0.717	3.343	3.049				
281	S-164	S-163	18	250.67	0.003	2.885	0.059	Free Surface	3.440	0.688	3.519	3.209				
283	S-163	S-162	18	327.00	0.003	3.378	0.135	Free Surface	3.406	0.811	3.409	3.108	21	3.529	0.591	$49,050
285	S-162	S-161	18	351.00	0.002	3.378	0.135	Free Surface	3.383	0.816	3.389	3.090	21	3.512	0.594	$52,650
287	S-161	S-160	18	329.00	0.002	3.378	0.135	Free Surface	3.391	0.814	3.398	3.099	21	3.519	0.593	$49,350
289	S-160	S-159	18	416.00	0.003	3.378	0.135	Free Surface	3.519	0.783	3.532	3.221	21	3.627	0.578	$62,400
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	3.378	0.135	Free Surface	3.502	0.787	3.511	3.202	21	3.612	0.580	$33,825
293	S-158	S-157	18	199.50	0.003	3.378	0.135	Free Surface	3.676	0.750	3.702	3.376				
295	S-157	S-156	18	391.00	0.003	3.378	0.135	Free Surface	3.469	0.795	3.477	3.170	21	3.583	0.584	$58,650
297	S-156	S-155	18	155.00	0.004	3.378	0.135	Free Surface	4.146	0.671	4.270	3.894				

LOAPUD 2009 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	3.378	0.135	Free Surface	5.966	0.497	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	3.378	0.135	Free Surface	3.726	0.740	3.761	3.430				
303	S-153	S-152	18	230.00	0.013	3.378	0.135	Free Surface	6.603	0.459	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	3.378	0.135	Free Surface	11.411	0.565	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	3.378	0.135	Free Surface	12.707	0.519	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	3.378	0.135	Free Surface	11.107	0.578	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	3.378	0.135	Free Surface	8.923	0.698	4.049	3.692				
313	S-148	S-147	12	309.01	0.061	3.378	0.135	Free Surface	11.734	0.553	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	3.378	0.135	Free Surface	12.984	0.510	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	3.399	0.139	Free Surface	14.649	0.466	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	3.399	0.139	Pressurized	12.020	0.545	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	3.399	0.139	Pressurized	6.697	1.000	1.635	1.491	18	4.573	0.620	$55,300
325	S-142	S-141	12	239.00	0.085	3.399	0.139	Free Surface	13.278	0.503	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	3.399	0.139	Free Surface	10.434	0.612	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	3.399	0.139	Free Surface	10.185	0.625	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	3.399	0.139	Free Surface	9.659	0.654	4.456	4.064				
333	S-138	S-137	18	265.59	0.034	3.418	0.142	Free Surface	9.334	0.357	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	3.418	0.142	Free Surface	4.385	0.646	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	3.418	0.142	Free Surface	4.423	0.641	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	3.418	0.142	Free Surface	11.859	0.300	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	3.418	0.142	Free Surface	9.072	0.365	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	3.418	0.142	Free Surface	8.055	0.398	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	3.418	0.142	Free Surface	11.407	0.309	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	3.446	0.146	Free Surface	4.451	0.642	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	3.446	0.146	Free Surface	4.531	0.632	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	3.446	0.146	Free Surface	5.803	0.516	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	3.446	0.146	Free Surface	3.654	0.770	3.669	3.345	21	3.754	0.571	$18,591
355	S-127	S-126	18	131.40	0.005	3.446	0.146	Free Surface	4.474	0.639	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	3.446	0.146	Free Surface	4.272	0.665	4.412	4.023				
359	S-125	S-123	18	389.66	0.004	3.446	0.146	Free Surface	4.202	0.675	4.321	3.940				
363	S-123	S-122	12	289.06	0.033	3.446	0.146	Free Surface	9.260	0.688	4.212	3.841				
365	S-122	S-121	12	309.56	0.037	3.446	0.146	Free Surface	9.708	0.659	4.467	4.074				
367	S-121	S-120	12	430.79	0.082	3.446	0.146	Free Surface	13.183	0.512	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	3.446	0.146	Free Surface	13.311	0.508	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	3.446	0.146	Free Surface	13.976	0.489	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	3.479	0.151	Free Surface	13.722	0.500	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	3.479	0.151	Free Surface	7.054	0.596	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	3.479	0.151	Free Surface	11.783	0.399	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	3.479	0.151	Free Surface	9.739	0.461	8.011	7.305				

LOAPUD 2009 PWWF w/ Peaking Factor 6.5

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381	S-114	S-113	15	234.61	0.039	3.530	0.159	Free Surface	10.050	0.455	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	3.530	0.159	Free Surface	5.377	0.771	3.750	3.420	18	5.536	0.546	$57,211
389	S-112	S-109	15	310.00	0.070	3.530	0.159	Free Surface	12.404	0.388	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	3.530	0.159	Free Surface	7.076	0.602	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	3.530	0.159	Free Surface	7.056	0.604	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	3.530	0.159	Free Surface	9.117	0.491	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	3.575	0.166	Pressurized	7.043	1.000	2.887	2.632	15	7.104	0.606	$48,470
399	S-104	S-103	18	501.82	0.012	3.575	0.166	Free Surface	6.487	0.486	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	3.575	0.166	Free Surface	6.470	0.487	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	3.575	0.166	Free Surface	8.997	0.379	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	3.575	0.166	Free Surface	7.844	0.420	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	3.575	0.166	Free Surface	5.461	0.558	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	3.575	0.166	Free Surface	5.380	0.564	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	4.319	0.280	Pressurized	7.970	0.480	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	4.319	0.280	Pressurized	3.782	1.000	3.217	2.934	21	3.530	0.734	$14,100
415	S-96	S-95	18	116.00	0.003	4.319	0.280	Pressurized	3.782	1.000	3.947	3.599	21	4.172	0.632	$17,400
417	S-95	S-94	18	220.95	0.003	4.319	0.280	Pressurized	3.782	1.000	3.966	3.617	21	4.188	0.630	$33,143
419	S-94	S-93	18	386.14	0.003	4.403	0.293	Pressurized	3.855	1.000	3.965	3.616	21	4.208	0.638	$57,921
421	S-93	S-92	18	213.63	0.003	4.403	0.293	Pressurized	3.855	1.000	3.979	3.629	21	4.219	0.636	$32,045
423	S-92	S-91	18	226.18	0.003	4.403	0.293	Pressurized	3.855	1.000	3.564	3.250	21	3.857	0.688	$33,927
425	S-91	S-90	27	65.74	0.002	4.441	0.299	Pressurized	3.258	0.524	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	4.441	0.299	Pressurized	3.289	0.441	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	4.441	0.299	Pressurized	3.888	1.000	2.856	2.604	24	3.296	0.630	$16,731
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	4.441	0.299	Pressurized	3.888	1.000	2.946	2.686	24	3.382	0.616	$36,422
432	S88A	S-87	18	282.74	0.001	4.441	0.299	Pressurized	3.888	1.000	2.496	2.276	24	2.956	0.693	$43,825
433	S-87	S-86	18	239.17	0.002	4.441	0.299	Pressurized	3.888	1.000	2.953	2.693	24	3.389	0.615	$37,071
435	S-86	S-85	18	303.02	0.002	4.441	0.299	Pressurized	3.888	1.000	2.952	2.692	24	3.389	0.615	$46,968
437	S-85	S-84	18	296.01	0.002	4.441	0.299	Pressurized	3.888	1.000	2.934	2.676	24	3.370	0.618	$45,882
439	S-84	S-83	18	300.28	0.002	4.441	0.299	Pressurized	3.888	1.000	2.940	2.681	24	3.376	0.617	$46,543
441	S-83	S-82	18	361.66	0.002	4.441	0.299	Pressurized	3.888	1.000	2.952	2.692	24	3.385	0.616	$56,057
443	S-82	S-81	18	118.63	0.002	4.480	0.305	Pressurized	3.923	1.000	2.931	2.673	24	3.375	0.622	$18,388
445	S-81	S-80	18	315.60	0.002	4.480	0.305	Pressurized	3.923	1.000	2.943	2.684	24	3.387	0.620	$48,918
447	S-80	S-79	18	382.07	0.002	4.480	0.305	Pressurized	3.923	1.000	2.934	2.676	24	3.375	0.622	$59,221
449	S-79	S-78	18	358.51	0.001	4.480	0.305	Pressurized	3.923	1.000	2.593	2.364	24	3.059	0.678	$55,569
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	4.480	0.305	Pressurized	3.923	1.000	2.939	2.680	24	3.381	0.621	$48,227
453	S-77	S-76	18	207.87	0.002	4.480	0.305	Pressurized	3.923	1.000	2.986	2.723	24	3.425	0.614	$32,220
455	S-76	S-75	18	413.60	0.002	4.480	0.305	Pressurized	3.923	1.000	2.994	2.730	24	3.432	0.613	$64,108
457	S-75	S-74	18	254.25	0.002	4.480	0.305	Pressurized	3.923	1.000	2.988	2.725	24	3.425	0.614	$39,409

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ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	4.480	0.305	Pressurized	3.923	1.000	2.598	2.369	24	3.064	0.677	$47,893
461	S-73	S-72	18	473.94	0.002	4.480	0.305	Pressurized	3.923	1.000	2.983	2.720	24	3.419	0.615	$73,461
463	S-72	S-71	18	298.55	0.002	4.549	0.315	Pressurized	3.983	1.000	3.273	2.984	24	3.687	0.585	$46,275
465	S-71	S-70	18	214.36	0.002	4.549	0.315	Pressurized	3.983	1.000	3.255	2.968	24	3.672	0.587	$33,226
467	S-70	S-69	18	340.00	0.003	4.549	0.315	Pressurized	3.983	1.000	3.560	3.246	21	3.877	0.706	$51,000
469	S-69	S-69A	18	116.00	0.002	4.549	0.315	Pressurized	3.983	1.000	3.284	2.995	24	3.702	0.583	$17,980
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	4.549	0.315	Free Surface	2.695	0.625	6.373	5.812				
475	S-67	S-65	27	150.92	0.001	4.549	0.315	Free Surface	2.677	0.628	6.327	5.770				
477	S-65	S-64	27	103.14	0.001	4.549	0.315	Free Surface	2.653	0.633	6.249	5.699				
479	S-64	S-63	27	132.00	0.001	4.549	0.315	Free Surface	2.668	0.630	6.298	5.744				
481	S-63	S-62	27	292.00	0.001	4.549	0.315	Free Surface	2.677	0.628	6.325	5.768				
483	S-62	S-62A	27	53.00	0.001	4.549	0.315	Free Surface	2.625	0.639	6.165	5.621				
485	S-61	S-60	27	244.11	0.001	4.648	0.331	Free Surface	2.678	0.640	6.293	5.739				
487	S-60	S-59	27	179.00	0.014	4.648	0.331	Free Surface	7.216	0.299	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	4.648	0.331	Free Surface	3.336	0.533	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	4.648	0.331	Free Surface	3.422	0.522	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	4.648	0.331	Free Surface	3.446	0.520	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	4.648	0.331	Free Surface	3.414	0.523	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	4.915	0.372	Free Surface	3.511	0.535	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	6.196	0.403	Free Surface	4.163	0.688	7.581	6.913				
503	S-33	S-32	24	179.87	0.003	6.196	0.403	Free Surface	4.554	0.635	8.467	7.721				
505	S-32	S-31	24	272.57	0.003	6.557	0.459	Free Surface	4.588	0.663	8.424	7.682				
507	S-31	S-30	24	315.87	0.003	6.557	0.459	Free Surface	4.505	0.674	8.249	7.522				
509	S-30	S-29	15	396.46	0.035	6.557	0.459	Free Surface	11.121	0.696	7.881	7.186				
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	6.557	0.459	Free Surface	10.792	0.716	7.610	6.940				
513	S-28	S-27	15	136.69	0.029	6.557	0.459	Free Surface	10.262	0.751	7.179	6.546	18	10.515	0.536	$19,137
515	S-27	S-26	24	160.65	0.003	6.557	0.459	Free Surface	4.690	0.650	8.656	7.893				
517	S-26	S-25	24	132.87	0.004	6.557	0.459	Free Surface	4.871	0.629	9.083	8.282				
519	S-25	S-24	24	286.68	0.004	6.557	0.459	Free Surface	4.832	0.634	8.998	8.205				
521	S-24	S-23	24	145.25	0.003	6.557	0.459	Free Surface	4.626	0.658	8.515	7.765				
523	S-23	S-22	15	419.03	0.040	6.557	0.459	Free Surface	11.724	0.664	8.409	7.668				
525	S-22	S-21	15	288.70	0.032	6.557	0.459	Free Surface	10.607	0.728	7.453	6.796				
527	S-21	S-20	18	179.30	0.022	6.557	0.459	Free Surface	9.353	0.590	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	7.602	0.620	Free Surface	7.522	0.355	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	7.602	0.620	Free Surface	7.585	0.353	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	7.602	0.620	Free Surface	6.185	0.411	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	7.602	0.620	Free Surface	9.093	0.310	36.508	33.291				

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537	S-16	S-14	36	177.00	0.005	7.602	0.620	Free Surface	5.654	0.335	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	7.806	0.651	Free Surface	15.909	0.212	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	8.159	0.705	Free Surface	6.854	0.401	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	8.294	0.726	Free Surface	5.833	0.660	10.719	9.775				
545	S-7	S-6	24	263.00	0.006	8.294	0.726	Free Surface	6.271	0.620	11.748	10.713				
547	S-6	S-5	30	343.00	0.004	8.294	0.726	Free Surface	5.071	0.512	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	8.294	0.726	Free Surface	5.077	0.512	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	8.840	0.810	Free Surface	5.007	0.544	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

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621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.644	0.000	Free Surface	1.903	0.337	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.644	0.000	Free Surface	1.799	0.351	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.644	0.000	Free Surface	1.789	0.353	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.644	0.000	Free Surface	0.918	0.590	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.644	0.000	Free Surface	2.040	0.320	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.644	0.000	Free Surface	2.084	0.315	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.644	0.000	Free Surface	1.913	0.336	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.644	0.000	Free Surface	1.917	0.335	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.644	0.000	Free Surface	1.202	0.476	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.644	0.000	Free Surface	2.473	0.279	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.644	0.000	Free Surface	2.753	0.258	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.644	0.000	Free Surface	1.452	0.412	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.644	0.000	Free Surface	2.561	0.272	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.644	0.000	Free Surface	2.664	0.264	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.644	0.000	Free Surface	1.946	0.332	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.644	0.000	Free Surface	2.927	0.247	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.644	0.000	Free Surface	5.124	0.167	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.257	0.028	Free Surface	3.229	0.247	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.257	0.028	Free Surface	2.958	0.262	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.257	0.028	Free Surface	1.777	0.380	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

LOAPUD 2009 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	0.354	0.054	Free Surface	7.810	0.255	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	7.602	0.620	Free Surface	3.904	0.590	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	7.602	0.620	Free Surface	4.145	0.562	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	7.602	0.620	Free Surface	3.885	0.592	11.541	10.524				
780	S-58A	S-58	27	394.00	0.002	4.648	0.331	Free Surface	3.332	0.534	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	4.648	0.331	Free Surface	3.438	0.521	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	4.648	0.331	Free Surface	3.454	0.519	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	4.648	0.331	Free Surface	3.422	0.522	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	4.915	0.372	Free Surface	3.479	0.539	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	4.939	0.375	Free Surface	3.512	0.537	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	4.939	0.375	Free Surface	3.465	0.543	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	4.939	0.375	Free Surface	3.489	0.540	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	4.939	0.375	Free Surface	3.636	0.522	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	4.939	0.375	Free Surface	5.553	0.378	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	4.939	0.375	Free Surface	9.790	0.251	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	4.939	0.375	Free Surface	13.695	0.198	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	4.648	0.331	Free Surface	2.690	0.637	6.324	5.767				
808	S-69A	S-68	27	70.00	0.002	4.549	0.315	Free Surface	3.687	0.484	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	3.530	0.159	Free Surface	10.901	0.428	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	3.479	0.151	Free Surface	9.739	0.461	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.519	0.000	Free Surface	6.425	0.473	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.519	0.000	Free Surface	6.425	0.473	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.519	0.000	Free Surface	6.416	0.474	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.355	0.055	Free Surface	1.727	0.565	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.271	0.121	Free Surface	4.695	0.718	1.471	1.341				
98	Z20	Z22	24	505.68	0.003	1.257	0.028	Free Surface	3.017	0.259	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0	0	Free Surface	0	0	3.502	3.193				
WYM	WYMANS	WYMANSRAVINE	8	5	0.3	0	0	Free Surface	0	0	4.289	3.911				

APPENDIX B3

FLOWS WITHIN CURRENT SERVICE BOUNDARY
2020 PWWF

LOAPUD 2020 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTREI	6	5.00	0.046	0.573	0.088	Free Surface	6.712	0.638	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTREI	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.149	0.023	Free Surface	13.023	0.146	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.027	0.004	Free Surface	2.381	0.098	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.116	0.018	Free Surface	4.276	0.178	1.682	1.534				
108	39	LS-VISTADELCER	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.536	0.083	Free Surface	2.455	0.445	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.536	0.083	Free Surface	2.573	0.430	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.536	0.083	Free Surface	2.531	0.435	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.536	0.083	Free Surface	4.063	0.307	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.536	0.083	Free Surface	4.117	0.304	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.536	0.083	Free Surface	2.498	0.439	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.536	0.083	Free Surface	2.535	0.435	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.536	0.083	Free Surface	3.069	0.376	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.536	0.083	Free Surface	3.442	0.346	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.536	0.083	Free Surface	3.003	0.383	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.536	0.083	Free Surface	2.736	0.410	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.536	0.083	Free Surface	2.767	0.407	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.536	0.083	Free Surface	3.140	0.370	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	9.479	0.889	Free Surface	22.430	0.191	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.536	0.083	Free Surface	6.261	0.225	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.536	0.083	Pressurized	2.257	0.475	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	0.847	0.130	Free Surface	7.785	0.347	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.649	0.000	Free Surface	5.478	0.573	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.649	0.000	Free Surface	4.931	0.626	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.649	0.000	Free Surface	8.843	0.395	5.011	4.569				

LOAPUD 2020 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.649	0.000	Free Surface	10.529	0.347	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.649	0.000	Free Surface	10.008	0.360	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.649	0.000	Free Surface	9.098	0.387	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.649	0.000	Free Surface	9.899	0.363	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.649	0.000	Free Surface	8.126	0.421	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.649	0.000	Free Surface	4.569	0.669	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.649	0.000	Free Surface	7.655	0.440	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.649	0.000	Free Surface	8.077	0.423	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	1.649	0.000	Free Surface	8.240	0.417	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	2.441	0.000	Pressurized	4.808	1.000	0.796	0.726	21	2.456	0.610	$24,000
239	S-185	S-184	18	354.41	0.007	2.868	0.066	Free Surface	5.104	0.494	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	2.868	0.066	Free Surface	3.531	0.669	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	2.868	0.066	Free Surface	3.393	0.693	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	3.055	0.066	Free Surface	3.422	0.729	3.462	3.157				
247	S-181	S-180	18	248.09	0.003	3.055	0.066	Free Surface	3.461	0.722	3.511	3.202				
249	S-180	S-179	18	404.10	0.002	3.055	0.066	Free Surface	3.311	0.753	3.335	3.041	21	3.392	0.563	$60,615
251	S-179	S-178	18	221.42	0.002	3.055	0.066	Free Surface	3.223	0.773	3.235	2.950	21	3.314	0.573	$33,213
253	S-178	S-177	18	80.58	0.002	3.055	0.066	Free Surface	3.361	0.742	3.391	3.093				
255	S-177	S-176	18	142.02	0.002	3.055	0.066	Free Surface	3.352	0.744	3.379	3.082				
257	S-176	S-175	18	311.66	0.002	3.055	0.066	Free Surface	3.316	0.752	3.339	3.045	21	3.395	0.562	$46,749
259	S-175	S-174	18	100.00	0.003	3.055	0.066	Free Surface	3.427	0.729	3.471	3.165				
261	S-174	S-173	18	161.32	0.003	3.055	0.066	Free Surface	3.466	0.721	3.514	3.205				
263	S-173	S-172	18	273.50	0.002	3.055	0.066	Free Surface	3.272	0.762	3.293	3.003	21	3.359	0.567	$41,025
265	S-172	S-171	18	160.10	0.002	3.055	0.066	Free Surface	3.370	0.740	3.403	3.103				
269	S-171	S-169	18	414.77	0.004	3.055	0.066	Free Surface	3.939	0.643	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.055	0.066	Free Surface	3.925	0.645	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	3.055	0.066	Free Surface	3.925	0.645	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	3.055	0.066	Free Surface	5.851	0.466	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.055	0.066	Free Surface	3.379	0.738	3.414	3.113				
279	S-165	S-164	18	124.36	0.002	3.055	0.066	Pressurized	3.320	0.751	3.343	3.049	21	3.399	0.562	$18,654
281	S-164	S-163	18	250.67	0.003	3.055	0.066	Pressurized	3.471	0.720	3.519	3.209				
283	S-163	S-162	18	327.00	0.003	3.599	0.149	Pressurized	3.151	1.000	3.409	3.108	21	3.580	0.616	$49,050
285	S-162	S-161	18	351.00	0.002	3.599	0.149	Pressurized	3.151	1.000	3.389	3.090	21	3.560	0.619	$52,650
287	S-161	S-160	18	329.00	0.002	3.599	0.149	Pressurized	3.151	1.000	3.398	3.099	21	3.570	0.618	$49,350
289	S-160	S-159	18	416.00	0.003	3.599	0.149	Pressurized	3.151	1.000	3.532	3.221	21	3.680	0.602	$62,400
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	3.599	0.149	Pressurized	3.151	1.000	3.511	3.202	21	3.663	0.604	$33,825
293	S-158	S-157	18	199.50	0.003	3.599	0.149	Free Surface	3.697	0.795	3.702	3.376	21	3.818	0.584	$29,925
295	S-157	S-156	18	391.00	0.003	3.599	0.149	Pressurized	3.151	1.000	3.477	3.170	21	3.635	0.608	$58,650
297	S-156	S-155	18	155.00	0.004	3.599	0.149	Free Surface	4.194	0.703	4.270	3.894				

LOAPUD 2020 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	3.599	0.149	Free Surface	6.061	0.516	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	3.599	0.149	Free Surface	3.750	0.783	3.761	3.430	21	3.865	0.578	$33,900
303	S-153	S-152	18	230.00	0.013	3.599	0.149	Free Surface	6.720	0.476	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	3.599	0.149	Free Surface	11.574	0.589	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	3.599	0.149	Free Surface	12.898	0.539	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	3.599	0.149	Free Surface	11.271	0.602	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	3.599	0.149	Free Surface	9.008	0.734	4.049	3.692				
313	S-148	S-147	12	309.01	0.061	3.599	0.149	Free Surface	11.908	0.575	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	3.599	0.149	Free Surface	13.196	0.529	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	3.623	0.153	Free Surface	14.886	0.484	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	3.623	0.153	Pressurized	12.190	0.567	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	3.623	0.153	Pressurized	7.138	1.000	1.635	1.491	18	4.631	0.647	$55,300
325	S-142	S-141	12	239.00	0.085	3.623	0.153	Free Surface	13.487	0.523	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	3.623	0.153	Free Surface	10.567	0.640	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	3.623	0.153	Free Surface	10.313	0.653	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	3.623	0.153	Free Surface	9.783	0.685	4.456	4.064				
333	S-138	S-137	18	265.59	0.034	3.644	0.156	Free Surface	9.499	0.370	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	3.644	0.156	Free Surface	4.437	0.676	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	3.644	0.156	Free Surface	4.481	0.670	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	3.644	0.156	Free Surface	12.081	0.310	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	3.644	0.156	Free Surface	9.226	0.378	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	3.644	0.156	Free Surface	8.196	0.413	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	3.644	0.156	Free Surface	11.612	0.319	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	3.674	0.161	Free Surface	4.503	0.672	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	3.674	0.161	Free Surface	4.593	0.660	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	3.674	0.161	Free Surface	5.893	0.536	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	3.674	0.161	Pressurized	3.217	1.000	3.669	3.345	21	3.806	0.596	$18,591
355	S-127	S-126	18	131.40	0.005	3.674	0.161	Free Surface	4.533	0.668	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	3.674	0.161	Free Surface	4.321	0.697	4.412	4.023				
359	S-125	S-123	18	389.66	0.004	3.674	0.161	Free Surface	4.244	0.709	4.321	3.940				
363	S-123	S-122	12	289.06	0.033	3.674	0.161	Free Surface	9.354	0.723	4.212	3.841				
365	S-122	S-121	12	309.56	0.037	3.674	0.161	Free Surface	9.829	0.690	4.467	4.074				
367	S-121	S-120	12	430.79	0.082	3.674	0.161	Free Surface	13.395	0.532	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	3.674	0.161	Free Surface	13.535	0.527	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	3.674	0.161	Free Surface	14.195	0.508	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	3.709	0.166	Free Surface	13.936	0.519	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	3.709	0.166	Free Surface	7.151	0.622	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	3.709	0.166	Free Surface	11.973	0.414	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	3.709	0.166	Free Surface	9.906	0.478	8.011	7.305				

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381	S-114	S-113	15	234.61	0.039	3.766	0.175	Free Surface	10.220	0.472	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	3.766	0.175	Pressurized	4.748	1.000	3.750	3.420	18	5.619	0.568	$57,211
389	S-112	S-109	15	310.00	0.070	3.766	0.175	Free Surface	12.633	0.402	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	3.766	0.175	Free Surface	7.169	0.629	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	3.766	0.175	Free Surface	7.143	0.631	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	3.766	0.175	Free Surface	9.266	0.510	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	3.816	0.183	Pressurized	7.517	1.000	2.887	2.632	15	7.199	0.634	$48,470
399	S-104	S-103	18	501.82	0.012	3.816	0.183	Free Surface	6.591	0.505	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	3.816	0.183	Free Surface	6.575	0.506	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	3.816	0.183	Free Surface	9.156	0.393	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	3.816	0.183	Free Surface	7.977	0.436	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	3.816	0.183	Free Surface	5.543	0.581	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	3.816	0.183	Pressurized	5.459	0.588	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	4.627	0.307	Pressurized	8.112	0.500	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	4.627	0.307	Pressurized	4.051	1.000	3.217	2.934	24	3.654	0.598	$14,570
415	S-96	S-95	18	116.00	0.003	4.627	0.307	Pressurized	4.051	1.000	3.947	3.599	21	4.235	0.662	$17,400
417	S-95	S-94	18	220.95	0.003	4.627	0.307	Pressurized	4.051	1.000	3.966	3.617	21	4.249	0.660	$33,143
419	S-94	S-93	18	386.14	0.003	4.719	0.322	Pressurized	4.131	1.000	3.965	3.616	21	4.262	0.670	$57,921
421	S-93	S-92	18	213.63	0.003	4.719	0.322	Pressurized	4.131	1.000	3.979	3.629	21	4.276	0.668	$32,045
423	S-92	S-91	18	226.18	0.003	4.719	0.322	Pressurized	4.131	1.000	3.564	3.250	21	3.900	0.727	$33,927
425	S-91	S-90	27	65.74	0.002	4.761	0.328	Pressurized	3.311	0.547	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	4.761	0.328	Pressurized	3.346	0.459	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	4.761	0.328	Pressurized	4.168	1.000	2.856	2.604	24	3.345	0.661	$16,731
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	4.761	0.328	Pressurized	4.168	1.000	2.946	2.686	24	3.429	0.646	$36,422
432	S88A	S-87	18	282.74	0.001	4.761	0.328	Pressurized	4.168	1.000	2.496	2.276	24	2.987	0.732	$43,825
433	S-87	S-86	18	239.17	0.002	4.761	0.328	Pressurized	4.168	1.000	2.953	2.693	24	3.435	0.646	$37,071
435	S-86	S-85	18	303.02	0.002	4.761	0.328	Pressurized	4.168	1.000	2.952	2.692	24	3.435	0.646	$46,968
437	S-85	S-84	18	296.01	0.002	4.761	0.328	Pressurized	4.168	1.000	2.934	2.676	24	3.417	0.648	$45,882
439	S-84	S-83	18	300.28	0.002	4.761	0.328	Pressurized	4.168	1.000	2.940	2.681	24	3.423	0.647	$46,543
441	S-83	S-82	18	361.66	0.002	4.761	0.328	Pressurized	4.168	1.000	2.952	2.692	24	3.435	0.646	$56,057
443	S-82	S-81	18	118.63	0.002	4.805	0.335	Pressurized	4.207	1.000	2.931	2.673	24	3.425	0.652	$18,388
445	S-81	S-80	18	315.60	0.002	4.805	0.335	Pressurized	4.207	1.000	2.943	2.684	24	3.431	0.651	$48,918
447	S-80	S-79	18	382.07	0.002	4.805	0.335	Pressurized	4.207	1.000	2.934	2.676	24	3.425	0.652	$59,221
449	S-79	S-78	18	358.51	0.001	4.805	0.335	Pressurized	4.207	1.000	2.593	2.364	24	3.094	0.715	$55,569
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	4.805	0.335	Pressurized	4.207	1.000	2.939	2.680	24	3.431	0.651	$48,227
453	S-77	S-76	18	207.87	0.002	4.805	0.335	Pressurized	4.207	1.000	2.986	2.723	24	3.472	0.645	$32,220
455	S-76	S-75	18	413.60	0.002	4.805	0.335	Pressurized	4.207	1.000	2.994	2.730	24	3.478	0.644	$64,108
457	S-75	S-74	18	254.25	0.002	4.805	0.335	Pressurized	4.207	1.000	2.988	2.725	24	3.475	0.644	$39,409

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459	S-74	S-73	18	308.99	0.001	4.805	0.335	Pressurized	4.207	1.000	2.598	2.369	24	3.098	0.714	$47,893
461	S-73	S-72	18	473.94	0.002	4.805	0.335	Pressurized	4.207	1.000	2.983	2.720	24	3.472	0.645	$73,461
463	S-72	S-71	18	298.55	0.002	4.880	0.346	Pressurized	4.273	1.000	3.273	2.984	24	3.745	0.612	$46,275
465	S-71	S-70	18	214.36	0.002	4.880	0.346	Pressurized	4.273	1.000	3.255	2.968	24	3.731	0.614	$33,226
467	S-70	S-69	18	340.00	0.003	4.880	0.346	Pressurized	4.273	1.000	3.560	3.246	21	3.912	0.748	$51,000
469	S-69	S-69A	18	116.00	0.002	4.880	0.346	Pressurized	4.273	1.000	3.284	2.995	24	3.759	0.610	$17,980
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	4.880	0.346	Free Surface	2.734	0.655	6.373	5.812				
475	S-67	S-65	27	150.92	0.001	4.880	0.346	Free Surface	2.716	0.659	6.327	5.770				
477	S-65	S-64	27	103.14	0.001	4.880	0.346	Free Surface	2.689	0.665	6.249	5.699				
479	S-64	S-63	27	132.00	0.001	4.880	0.346	Free Surface	2.707	0.661	6.298	5.744				
481	S-63	S-62	27	292.00	0.001	4.880	0.346	Free Surface	2.716	0.659	6.325	5.768				
483	S-62	S-62A	27	53.00	0.001	4.880	0.346	Free Surface	2.658	0.672	6.165	5.621				
485	S-61	S-60	27	244.11	0.001	4.990	0.363	Free Surface	2.718	0.672	6.293	5.739				
487	S-60	S-59	27	179.00	0.014	4.990	0.363	Free Surface	7.360	0.310	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	4.990	0.363	Free Surface	3.391	0.557	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	4.990	0.363	Free Surface	3.481	0.545	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	4.990	0.363	Free Surface	3.509	0.542	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	4.990	0.363	Free Surface	3.470	0.547	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	5.284	0.409	Free Surface	3.572	0.560	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	6.587	0.444	Free Surface	4.205	0.721	7.581	6.913				
503	S-33	S-32	24	179.87	0.003	6.587	0.444	Free Surface	4.609	0.663	8.467	7.721				
505	S-32	S-31	24	272.57	0.003	6.968	0.502	Free Surface	4.638	0.693	8.424	7.682				
507	S-31	S-30	24	315.87	0.003	6.968	0.502	Free Surface	4.554	0.705	8.249	7.522				
509	S-30	S-29	15	396.46	0.035	6.968	0.502	Free Surface	11.225	0.730	7.881	7.186				
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	6.968	0.502	Free Surface	10.877	0.753	7.610	6.940	18	11.149	0.537	$63,708
513	S-28	S-27	15	136.69	0.029	6.968	0.502	Free Surface	10.306	0.795	7.179	6.546	18	10.667	0.557	$19,137
515	S-27	S-26	24	160.65	0.003	6.968	0.502	Free Surface	4.742	0.680	8.656	7.893				
517	S-26	S-25	24	132.87	0.004	6.968	0.502	Free Surface	4.933	0.656	9.083	8.282				
519	S-25	S-24	24	286.68	0.004	6.968	0.502	Free Surface	4.892	0.661	8.998	8.205				
521	S-24	S-23	24	145.25	0.003	6.968	0.502	Free Surface	4.674	0.688	8.515	7.765				
523	S-23	S-22	15	419.03	0.040	6.968	0.502	Free Surface	11.855	0.694	8.409	7.668				
525	S-22	S-21	15	288.70	0.032	6.968	0.502	Free Surface	10.680	0.767	7.453	6.796	18	10.975	0.544	$40,418
527	S-21	S-20	18	179.30	0.022	6.968	0.502	Free Surface	9.471	0.614	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	8.123	0.680	Free Surface	7.657	0.368	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	8.123	0.680	Free Surface	7.726	0.366	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	8.123	0.680	Free Surface	6.299	0.426	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	8.123	0.680	Free Surface	9.259	0.321	36.508	33.291				

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537	S-16	S-14	36	177.00	0.005	8.123	0.680	Free Surface	5.758	0.347	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	8.348	0.714	Free Surface	16.223	0.219	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	8.736	0.774	Free Surface	6.985	0.417	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	8.876	0.796	Free Surface	5.899	0.694	10.719	9.775				
545	S-7	S-6	24	263.00	0.006	8.876	0.796	Free Surface	6.360	0.649	11.748	10.713				
547	S-6	S-5	30	343.00	0.004	8.876	0.796	Free Surface	5.154	0.534	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	8.876	0.796	Free Surface	5.165	0.533	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	9.479	0.889	Free Surface	5.092	0.568	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

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621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.644	0.000	Free Surface	1.903	0.337	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.644	0.000	Free Surface	1.799	0.351	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.644	0.000	Free Surface	1.789	0.353	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.644	0.000	Free Surface	0.918	0.590	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.644	0.000	Free Surface	2.040	0.320	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.644	0.000	Free Surface	2.084	0.315	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.644	0.000	Free Surface	1.913	0.336	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.644	0.000	Free Surface	1.917	0.335	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.644	0.000	Free Surface	1.202	0.476	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.644	0.000	Free Surface	2.473	0.279	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.644	0.000	Free Surface	2.753	0.258	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.644	0.000	Free Surface	1.452	0.412	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.644	0.000	Free Surface	2.561	0.272	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.644	0.000	Free Surface	2.664	0.264	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.644	0.000	Free Surface	1.946	0.332	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.644	0.000	Free Surface	2.927	0.247	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.644	0.000	Free Surface	5.124	0.167	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.276	0.031	Free Surface	3.246	0.248	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.276	0.031	Free Surface	2.971	0.264	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.276	0.031	Free Surface	1.782	0.383	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

LOAPUD 2020 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	0.388	0.060	Free Surface	8.030	0.267	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	8.123	0.680	Free Surface	3.960	0.616	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	8.123	0.680	Free Surface	4.209	0.585	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	8.123	0.680	Free Surface	3.938	0.619	11.541	10.524				
780	S-58A	S-58	27	394.00	0.002	4.990	0.363	Free Surface	3.388	0.558	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	4.990	0.363	Free Surface	3.497	0.543	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	4.990	0.363	Free Surface	3.513	0.542	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	4.990	0.363	Free Surface	3.478	0.546	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	5.284	0.409	Free Surface	3.538	0.564	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	5.311	0.413	Free Surface	3.575	0.562	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	5.311	0.413	Free Surface	3.526	0.568	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	5.311	0.413	Free Surface	3.545	0.565	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	5.311	0.413	Free Surface	3.701	0.546	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	5.311	0.413	Free Surface	5.659	0.393	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	5.311	0.413	Free Surface	9.990	0.260	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	5.311	0.413	Free Surface	13.980	0.205	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	4.990	0.363	Free Surface	2.727	0.670	6.324	5.767				
808	S-69A	S-68	27	70.00	0.002	4.880	0.346	Free Surface	3.751	0.505	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	3.766	0.175	Free Surface	11.092	0.443	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	3.709	0.166	Free Surface	9.906	0.478	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.649	0.000	Free Surface	6.561	0.496	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.392	0.060	Free Surface	1.766	0.603	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.354	0.134	Free Surface	4.736	0.756	1.471	1.341	12	4.858	0.539	$11,088
98	Z20	Z22	24	505.68	0.003	1.276	0.031	Free Surface	3.030	0.261	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0	0	Free Surface	0	0	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	0	0	Free Surface	0	0	4.289	3.911				

APPENDIX B4

**FLOWS WITHIN CURRENT SERVICE BOUNDARY
2030 PWWF**

LOAPUD 2030 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.573	0.088	Free Surface	6.712	0.638	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.165	0.025	Free Surface	13.416	0.153	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.030	0.005	Free Surface	2.454	0.103	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.126	0.019	Free Surface	4.379	0.185	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.536	0.083	Free Surface	2.455	0.445	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.536	0.083	Free Surface	2.573	0.430	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.536	0.083	Free Surface	2.531	0.435	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.536	0.083	Free Surface	4.063	0.307	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.536	0.083	Free Surface	4.117	0.304	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.536	0.083	Free Surface	2.498	0.439	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.536	0.083	Free Surface	2.535	0.435	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.536	0.083	Free Surface	3.069	0.376	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.536	0.083	Free Surface	3.442	0.346	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.536	0.083	Free Surface	3.003	0.383	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.536	0.083	Free Surface	2.736	0.410	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.536	0.083	Free Surface	2.767	0.407	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.536	0.083	Free Surface	3.140	0.370	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	10.025	0.956	Free Surface	22.797	0.196	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.536	0.083	Free Surface	6.261	0.225	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.536	0.083	Pressurized	2.257	0.475	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	0.936	0.144	Free Surface	8.005	0.366	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.682	0.000	Free Surface	5.508	0.580	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.682	0.000	Free Surface	4.954	0.634	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.682	0.000	Free Surface	8.895	0.399	5.011	4.569				

LOAPUD 2030 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.682	0.000	Free Surface	10.588	0.351	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.682	0.000	Free Surface	10.061	0.364	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.682	0.000	Free Surface	9.156	0.391	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.682	0.000	Free Surface	9.953	0.367	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.682	0.000	Free Surface	8.176	0.425	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.682	0.000	Free Surface	4.585	0.679	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.682	0.000	Free Surface	7.696	0.445	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.682	0.000	Free Surface	8.127	0.427	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	1.682	0.000	Free Surface	8.277	0.421	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	2.474	0.000	Pressurized	4.874	1.000	0.796	0.726	21	2.461	0.616	$24,000
239	S-185	S-184	18	354.41	0.007	2.945	0.073	Free Surface	5.138	0.501	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	2.945	0.073	Free Surface	3.546	0.683	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	2.945	0.073	Free Surface	3.412	0.707	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	3.133	0.073	Free Surface	3.432	0.745	3.462	3.157				
247	S-181	S-180	18	248.09	0.003	3.133	0.073	Free Surface	3.475	0.736	3.511	3.202				
249	S-180	S-179	18	404.10	0.002	3.133	0.073	Free Surface	3.321	0.770	3.335	3.041	21	3.413	0.571	$60,615
251	S-179	S-178	18	221.42	0.002	3.133	0.073	Free Surface	3.225	0.793	3.235	2.950	21	3.333	0.583	$33,213
253	S-178	S-177	18	80.58	0.002	3.133	0.073	Free Surface	3.373	0.758	3.391	3.093	21	3.456	0.565	$12,087
255	S-177	S-176	18	142.02	0.002	3.133	0.073	Free Surface	3.360	0.761	3.379	3.082	21	3.449	0.566	$21,303
257	S-176	S-175	18	311.66	0.002	3.133	0.073	Free Surface	3.321	0.770	3.339	3.045	21	3.413	0.571	$46,749
259	S-175	S-174	18	100.00	0.003	3.133	0.073	Free Surface	3.442	0.743	3.471	3.165				
261	S-174	S-173	18	161.32	0.003	3.133	0.073	Free Surface	3.480	0.735	3.514	3.205				
263	S-173	S-172	18	273.50	0.002	3.133	0.073	Free Surface	3.280	0.779	3.293	3.003	21	3.377	0.576	$41,025
265	S-172	S-171	18	160.10	0.002	3.133	0.073	Free Surface	3.382	0.756	3.403	3.103	21	3.463	0.564	$24,015
269	S-171	S-169	18	414.77	0.004	3.133	0.073	Free Surface	3.963	0.653	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.133	0.073	Free Surface	3.946	0.656	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	3.133	0.073	Free Surface	3.943	0.656	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	3.133	0.073	Free Surface	5.888	0.473	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.133	0.073	Pressurized	3.391	0.754	3.414	3.113	21	3.474	0.563	$38,171
279	S-165	S-164	18	124.36	0.002	3.133	0.073	Pressurized	3.330	0.768	3.343	3.049	21	3.420	0.570	$18,654
281	S-164	S-163	18	250.67	0.003	3.133	0.073	Pressurized	3.485	0.734	3.519	3.209				
283	S-163	S-162	18	327.00	0.003	3.734	0.165	Pressurized	3.269	1.000	3.409	3.108	21	3.607	0.632	$49,050
285	S-162	S-161	18	351.00	0.002	3.734	0.165	Pressurized	3.269	1.000	3.389	3.090	21	3.587	0.635	$52,650
287	S-161	S-160	18	329.00	0.002	3.734	0.165	Pressurized	3.269	1.000	3.398	3.099	21	3.600	0.633	$49,350
289	S-160	S-159	18	416.00	0.003	3.734	0.165	Pressurized	3.269	1.000	3.532	3.221	21	3.707	0.617	$62,400
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	3.734	0.165	Pressurized	3.269	1.000	3.511	3.202	21	3.694	0.619	$33,825
293	S-158	S-157	18	199.50	0.003	3.734	0.165	Pressurized	3.269	1.000	3.702	3.376	21	3.848	0.598	$29,925
295	S-157	S-156	18	391.00	0.003	3.734	0.165	Pressurized	3.269	1.000	3.477	3.170	21	3.663	0.624	$58,650
297	S-156	S-155	18	155.00	0.004	3.734	0.165	Free Surface	4.212	0.725	4.270	3.894				

LOAPUD 2030 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	3.734	0.165	Free Surface	6.113	0.527	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	3.734	0.165	Free Surface	3.757	0.813	3.761	3.430	21	3.898	0.592	$33,900
303	S-153	S-152	18	230.00	0.013	3.734	0.165	Free Surface	6.783	0.486	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	3.734	0.165	Free Surface	11.660	0.604	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	3.734	0.165	Free Surface	13.015	0.551	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	3.734	0.165	Free Surface	11.354	0.617	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	3.734	0.165	Free Surface	9.047	0.758	4.049	3.692	15	9.299	0.505	$31,800
313	S-148	S-147	12	309.01	0.061	3.734	0.165	Free Surface	12.008	0.589	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	3.734	0.165	Free Surface	13.306	0.542	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	3.760	0.169	Free Surface	15.021	0.495	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	3.760	0.169	Pressurized	12.290	0.581	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	3.760	0.169	Pressurized	7.408	1.000	1.635	1.491	18	4.670	0.664	$55,300
325	S-142	S-141	12	239.00	0.085	3.760	0.169	Free Surface	13.615	0.535	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	3.760	0.169	Free Surface	10.649	0.656	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	3.760	0.169	Free Surface	10.386	0.671	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	3.760	0.169	Free Surface	9.845	0.704	4.456	4.064				
333	S-138	S-137	18	265.59	0.034	3.784	0.173	Free Surface	9.596	0.377	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	3.784	0.173	Free Surface	4.464	0.695	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	3.784	0.173	Free Surface	4.512	0.688	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	3.784	0.173	Free Surface	12.210	0.316	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	3.784	0.173	Free Surface	9.327	0.385	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	3.784	0.173	Free Surface	8.275	0.421	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	3.784	0.173	Free Surface	11.733	0.325	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	3.817	0.178	Free Surface	4.538	0.690	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	3.817	0.178	Free Surface	4.625	0.679	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	3.817	0.178	Free Surface	5.946	0.549	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	3.817	0.178	Pressurized	3.342	1.000	3.669	3.345	21	3.840	0.610	$18,591
355	S-127	S-126	18	131.40	0.005	3.817	0.178	Free Surface	4.566	0.687	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	3.817	0.178	Free Surface	4.350	0.718	4.412	4.023				
359	S-125	S-123	18	389.66	0.004	3.817	0.178	Free Surface	4.270	0.730	4.321	3.940				
363	S-123	S-122	12	289.06	0.033	3.817	0.178	Free Surface	9.397	0.746	4.212	3.841				
365	S-122	S-121	12	309.56	0.037	3.817	0.178	Free Surface	9.889	0.711	4.467	4.074				
367	S-121	S-120	12	430.79	0.082	3.817	0.178	Free Surface	13.512	0.544	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	3.817	0.178	Free Surface	13.649	0.540	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	3.817	0.178	Free Surface	14.327	0.520	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	3.851	0.183	Free Surface	14.056	0.531	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	3.851	0.183	Free Surface	7.214	0.638	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	3.851	0.183	Free Surface	12.111	0.422	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	3.851	0.183	Free Surface	9.997	0.489	8.011	7.305				

LOAPUD 2030 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	3.914	0.193	Free Surface	10.332	0.482	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	3.914	0.193	Pressurized	4.935	1.000	3.750	3.420	18	5.668	0.583	$57,211
389	S-112	S-109	15	310.00	0.070	3.914	0.193	Free Surface	12.757	0.411	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	3.914	0.193	Free Surface	7.229	0.646	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	3.914	0.193	Free Surface	7.204	0.647	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	3.914	0.193	Free Surface	9.358	0.521	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	3.969	0.201	Pressurized	7.819	1.000	2.887	2.632	15	7.255	0.651	$48,470
399	S-104	S-103	18	501.82	0.012	3.969	0.201	Free Surface	6.652	0.518	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	3.969	0.201	Free Surface	6.644	0.518	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	3.969	0.201	Free Surface	9.261	0.401	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	3.969	0.201	Free Surface	8.060	0.446	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	3.969	0.201	Free Surface	5.595	0.596	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	3.969	0.201	Pressurized	5.508	0.604	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	4.809	0.330	Pressurized	8.186	0.511	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	4.809	0.330	Pressurized	4.210	1.000	3.217	2.934	24	3.683	0.613	$14,570
415	S-96	S-95	18	116.00	0.003	4.809	0.330	Pressurized	4.210	1.000	3.947	3.599	21	4.260	0.682	$17,400
417	S-95	S-94	18	220.95	0.003	4.809	0.330	Pressurized	4.210	1.000	3.966	3.617	21	4.281	0.679	$33,143
419	S-94	S-93	18	386.14	0.003	4.910	0.346	Pressurized	4.299	1.000	3.965	3.616	21	4.295	0.689	$57,921
421	S-93	S-92	18	213.63	0.003	4.910	0.346	Pressurized	4.299	1.000	3.979	3.629	21	4.309	0.688	$32,045
423	S-92	S-91	18	226.18	0.003	4.910	0.346	Pressurized	4.299	1.000	3.564	3.250	24	4.012	0.581	$35,058
425	S-91	S-90	27	65.74	0.002	4.957	0.353	Pressurized	3.343	0.561	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	4.957	0.353	Pressurized	3.381	0.470	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	4.957	0.353	Pressurized	4.340	1.000	2.856	2.604	24	3.368	0.681	$16,731
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	4.957	0.353	Pressurized	4.340	1.000	2.946	2.686	24	3.457	0.665	$36,422
432	S88A	S-87	18	282.74	0.001	4.957	0.353	Pressurized	4.340	1.000	2.496	2.276	27	3.072	0.601	$45,238
433	S-87	S-86	18	239.17	0.002	4.957	0.353	Pressurized	4.340	1.000	2.953	2.693	24	3.462	0.664	$37,071
435	S-86	S-85	18	303.02	0.002	4.957	0.353	Pressurized	4.340	1.000	2.952	2.692	24	3.462	0.664	$46,968
437	S-85	S-84	18	296.01	0.002	4.957	0.353	Pressurized	4.340	1.000	2.934	2.676	24	3.445	0.667	$45,882
439	S-84	S-83	18	300.28	0.002	4.957	0.353	Pressurized	4.340	1.000	2.940	2.681	24	3.451	0.666	$46,543
441	S-83	S-82	18	361.66	0.002	4.957	0.353	Pressurized	4.340	1.000	2.952	2.692	24	3.462	0.664	$56,057
443	S-82	S-81	18	118.63	0.002	5.005	0.361	Pressurized	4.382	1.000	2.931	2.673	24	3.450	0.672	$18,388
445	S-81	S-80	18	315.60	0.002	5.005	0.361	Pressurized	4.382	1.000	2.943	2.684	24	3.461	0.670	$48,918
447	S-80	S-79	18	382.07	0.002	5.005	0.361	Pressurized	4.382	1.000	2.934	2.676	24	3.450	0.672	$59,221
449	S-79	S-78	18	358.51	0.001	5.005	0.361	Pressurized	4.382	1.000	2.593	2.364	24	3.110	0.739	$55,569
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	5.005	0.361	Pressurized	4.382	1.000	2.939	2.680	24	3.456	0.671	$48,227
453	S-77	S-76	18	207.87	0.002	5.005	0.361	Pressurized	4.382	1.000	2.986	2.723	24	3.502	0.663	$32,220
455	S-76	S-75	18	413.60	0.002	5.005	0.361	Pressurized	4.382	1.000	2.994	2.730	24	3.508	0.662	$64,108
457	S-75	S-74	18	254.25	0.002	5.005	0.361	Pressurized	4.382	1.000	2.988	2.725	24	3.502	0.663	$39,409

LOAPUD 2030 PWWF w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	5.005	0.361	Pressurized	4.382	1.000	2.598	2.369	24	3.114	0.738	$47,893
461	S-73	S-72	18	473.94	0.002	5.005	0.361	Pressurized	4.382	1.000	2.983	2.720	24	3.496	0.664	$73,461
463	S-72	S-71	18	298.55	0.002	5.088	0.373	Pressurized	4.455	1.000	3.273	2.984	24	3.780	0.629	$46,275
465	S-71	S-70	18	214.36	0.002	5.088	0.373	Pressurized	4.455	1.000	3.255	2.968	24	3.763	0.632	$33,226
467	S-70	S-69	18	340.00	0.003	5.088	0.373	Pressurized	4.455	1.000	3.560	3.246	24	4.039	0.595	$52,700
469	S-69	S-69A	18	116.00	0.002	5.088	0.373	Pressurized	4.455	1.000	3.284	2.995	24	3.791	0.628	$17,980
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	5.088	0.373	Free Surface	2.753	0.676	6.373	5.812				
475	S-67	S-65	27	150.92	0.001	5.088	0.373	Free Surface	2.740	0.679	6.327	5.770				
477	S-65	S-64	27	103.14	0.001	5.088	0.373	Free Surface	2.710	0.686	6.249	5.699				
479	S-64	S-63	27	132.00	0.001	5.088	0.373	Free Surface	2.727	0.682	6.298	5.744				
481	S-63	S-62	27	292.00	0.001	5.088	0.373	Free Surface	2.736	0.680	6.325	5.768				
483	S-62	S-62A	27	53.00	0.001	5.088	0.373	Free Surface	2.680	0.692	6.165	5.621				
485	S-61	S-60	27	244.11	0.001	5.210	0.392	Free Surface	2.736	0.694	6.293	5.739				
487	S-60	S-59	27	179.00	0.014	5.210	0.392	Free Surface	7.448	0.317	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	5.210	0.392	Free Surface	3.426	0.572	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	5.210	0.392	Free Surface	3.518	0.560	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	5.210	0.392	Free Surface	3.545	0.557	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	5.210	0.392	Free Surface	3.507	0.562	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	5.535	0.442	Free Surface	3.610	0.576	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	6.938	0.481	Free Surface	4.236	0.752	7.581	6.913	27	4.326	0.598	$77,782
503	S-33	S-32	24	179.87	0.003	6.938	0.481	Free Surface	4.654	0.688	8.467	7.721				
505	S-32	S-31	24	272.57	0.003	7.319	0.539	Free Surface	4.672	0.721	8.424	7.682				
507	S-31	S-30	24	315.87	0.003	7.319	0.539	Free Surface	4.592	0.732	8.249	7.522				
509	S-30	S-29	15	396.46	0.035	7.319	0.539	Free Surface	11.290	0.762	7.881	7.186	18	11.593	0.542	$55,504
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	7.319	0.539	Free Surface	10.929	0.787	7.610	6.940	18	11.289	0.553	$63,708
513	S-28	S-27	15	136.69	0.029	7.319	0.539	Pressurized	9.228	1.000	7.179	6.546	18	10.785	0.574	$19,137
515	S-27	S-26	24	160.65	0.003	7.319	0.539	Free Surface	4.783	0.705	8.656	7.893				
517	S-26	S-25	24	132.87	0.004	7.319	0.539	Free Surface	4.972	0.681	9.083	8.282				
519	S-25	S-24	24	286.68	0.004	7.319	0.539	Free Surface	4.941	0.685	8.998	8.205				
521	S-24	S-23	24	145.25	0.003	7.319	0.539	Free Surface	4.713	0.715	8.515	7.765				
523	S-23	S-22	15	419.03	0.040	7.319	0.539	Free Surface	11.942	0.722	8.409	7.668				
525	S-22	S-21	15	288.70	0.032	7.319	0.539	Free Surface	10.701	0.805	7.453	6.796	18	11.108	0.561	$40,418
527	S-21	S-20	18	179.30	0.022	7.319	0.539	Free Surface	9.572	0.635	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	8.595	0.736	Free Surface	7.773	0.380	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	8.595	0.736	Free Surface	7.847	0.377	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	8.595	0.736	Free Surface	6.394	0.440	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	8.595	0.736	Free Surface	9.410	0.330	36.508	33.291				

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537	S-16	S-14	36	177.00	0.005	8.595	0.736	Free Surface	5.851	0.358	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	8.831	0.772	Free Surface	16.491	0.225	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	9.218	0.832	Free Surface	7.084	0.429	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	9.359	0.853	Free Surface	5.948	0.724	10.719	9.775				
545	S-7	S-6	24	263.00	0.006	9.359	0.853	Free Surface	6.420	0.675	11.748	10.713				
547	S-6	S-5	30	343.00	0.004	9.359	0.853	Free Surface	5.220	0.551	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	9.359	0.853	Free Surface	5.231	0.550	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	10.025	0.956	Free Surface	5.159	0.589	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.720	0.000	Free Surface	1.964	0.357	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.720	0.000	Free Surface	1.857	0.373	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.720	0.000	Free Surface	1.845	0.374	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.720	0.000	Free Surface	0.942	0.635	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.720	0.000	Free Surface	2.104	0.340	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.720	0.000	Free Surface	2.150	0.334	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.720	0.000	Free Surface	1.960	0.358	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.720	0.000	Free Surface	1.973	0.356	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.720	0.000	Free Surface	1.977	0.356	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.720	0.000	Free Surface	1.960	0.358	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.720	0.000	Free Surface	1.236	0.508	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.720	0.000	Free Surface	2.552	0.295	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.720	0.000	Free Surface	2.843	0.273	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.720	0.000	Free Surface	1.496	0.438	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.720	0.000	Free Surface	2.643	0.288	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.720	0.000	Free Surface	2.750	0.280	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.720	0.000	Free Surface	2.009	0.352	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.720	0.000	Free Surface	3.023	0.262	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.720	0.000	Free Surface	5.297	0.177	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.374	0.034	Free Surface	3.313	0.258	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.374	0.034	Free Surface	3.036	0.274	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.374	0.034	Free Surface	1.818	0.399	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	0.388	0.060	Free Surface	8.030	0.267	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	8.595	0.736	Free Surface	4.004	0.641	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	8.595	0.736	Free Surface	4.262	0.607	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	8.595	0.736	Free Surface	3.990	0.643	11.541	10.524				
780	S-58A	S-58	27	394.00	0.002	5.210	0.392	Free Surface	3.423	0.573	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	5.210	0.392	Free Surface	3.533	0.558	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	5.210	0.392	Free Surface	3.548	0.556	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	5.210	0.392	Free Surface	3.514	0.561	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	5.535	0.442	Free Surface	3.577	0.581	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	5.565	0.447	Free Surface	3.615	0.578	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	5.565	0.447	Free Surface	3.564	0.585	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	5.565	0.447	Free Surface	3.585	0.582	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	5.565	0.447	Free Surface	3.737	0.563	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	5.565	0.447	Free Surface	5.733	0.403	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	5.565	0.447	Free Surface	10.131	0.266	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	5.565	0.447	Free Surface	14.188	0.210	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	5.210	0.392	Free Surface	2.749	0.691	6.324	5.767				
808	S-69A	S-68	27	70.00	0.002	5.088	0.373	Free Surface	3.790	0.518	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	3.914	0.193	Free Surface	11.205	0.453	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	3.851	0.183	Free Surface	9.997	0.489	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.682	0.000	Free Surface	6.594	0.502	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.426	0.066	Free Surface	1.798	0.637	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.386	0.139	Free Surface	4.750	0.771	1.471	1.341	12	4.885	0.546	$11,088
98	Z20	Z22	24	505.68	0.003	1.374	0.034	Free Surface	3.097	0.271	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0	0	Free Surface	0	0	3.502	3.193				
WYM	WYMANS	WYMANSRAVINE	8	5	0.3	0	0	Free Surface	0	0	4.289	3.911				

APPENDIX B5

**FLOWS WITHIN CURRENT SERVICE BOUNDARY
BUILDOUT PWWF**

LOAPUD Buildout PWWF Within Service Boundary w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.573	0.088	Free Surface	6.712	0.638	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.239	0.037	Free Surface	14.975	0.183	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.148	0.023	Free Surface	3.944	0.223	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.126	0.019	Free Surface	4.379	0.185	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.536	0.083	Free Surface	2.455	0.445	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.536	0.083	Free Surface	2.573	0.430	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.536	0.083	Free Surface	2.531	0.435	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.536	0.083	Free Surface	4.063	0.307	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.536	0.083	Free Surface	4.117	0.304	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.536	0.083	Free Surface	2.498	0.439	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.536	0.083	Free Surface	2.535	0.435	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.536	0.083	Free Surface	3.069	0.376	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.536	0.083	Free Surface	3.442	0.346	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.536	0.083	Free Surface	3.003	0.383	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.536	0.083	Free Surface	2.736	0.410	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.536	0.083	Free Surface	2.767	0.407	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.536	0.083	Free Surface	3.140	0.370	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	14.896	1.506	Free Surface	25.589	0.239	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.536	0.083	Free Surface	6.261	0.225	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.536	0.083	Pressurized	2.257	0.475	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	3.049	0.469	Free Surface	10.530	0.766	3.269	2.981	12	10.831	0.543	$2,000
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.682	0.000	Free Surface	5.508	0.580	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.682	0.000	Free Surface	4.954	0.634	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.682	0.000	Free Surface	8.895	0.399	5.011	4.569				

LOAPUD Buildout PWWF Within Service Boundary w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.682	0.000	Free Surface	10.588	0.351	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.682	0.000	Free Surface	10.061	0.364	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.682	0.000	Free Surface	9.156	0.391	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.682	0.000	Free Surface	9.953	0.367	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.682	0.000	Free Surface	8.176	0.425	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.682	0.000	Free Surface	4.585	0.679	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.682	0.000	Free Surface	7.696	0.445	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.682	0.000	Free Surface	8.127	0.427	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	2.811	0.174	Pressurized	9.417	0.569	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	3.744	0.174	Pressurized	7.375	1.000	0.796	0.726	24	2.725	0.641	$24,800
239	S-185	S-184	18	354.41	0.007	3.744	0.174	Pressurized	5.444	0.581	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	3.744	0.174	Pressurized	3.278	1.000	3.640	3.319	21	3.799	0.606	$25,710
243	S-183	S-182	18	215.46	0.003	3.744	0.174	Pressurized	3.278	1.000	3.470	3.165	21	3.660	0.625	$32,319
245	S-182	S-181	18	150.81	0.003	3.931	0.174	Pressurized	3.442	1.000	3.462	3.157	21	3.692	0.647	$22,622
247	S-181	S-180	18	248.09	0.003	3.931	0.174	Pressurized	3.442	1.000	3.511	3.202	21	3.730	0.642	$37,214
249	S-180	S-179	18	404.10	0.002	3.931	0.174	Pressurized	3.442	1.000	3.335	3.041	21	3.580	0.665	$60,615
251	S-179	S-178	18	221.42	0.002	3.931	0.174	Pressurized	3.442	1.000	3.235	2.950	21	3.494	0.680	$33,213
253	S-178	S-177	18	80.58	0.002	3.931	0.174	Pressurized	3.442	1.000	3.391	3.093	21	3.629	0.657	$12,087
255	S-177	S-176	18	142.02	0.002	3.931	0.174	Pressurized	3.442	1.000	3.379	3.082	21	3.617	0.659	$21,303
257	S-176	S-175	18	311.66	0.002	3.931	0.174	Pressurized	3.442	1.000	3.339	3.045	21	3.583	0.665	$46,749
259	S-175	S-174	18	100.00	0.003	3.931	0.174	Pressurized	3.442	1.000	3.471	3.165	21	3.698	0.646	$15,000
261	S-174	S-173	18	161.32	0.003	3.931	0.174	Pressurized	3.442	1.000	3.514	3.205	21	3.734	0.641	$24,198
263	S-173	S-172	18	273.50	0.002	3.931	0.174	Pressurized	3.442	1.000	3.293	3.003	21	3.545	0.671	$41,025
265	S-172	S-171	18	160.10	0.002	3.931	0.174	Pressurized	3.442	1.000	3.403	3.103	21	3.641	0.655	$24,015
269	S-171	S-169	18	414.77	0.004	3.931	0.174	Pressurized	4.096	0.783	4.107	3.745	21	4.221	0.578	$62,216
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.931	0.174	Pressurized	4.076	0.787	4.090	3.729	21	4.204	0.580	$30,752
273	S-168	S-167	18	260.82	0.004	3.931	0.174	Pressurized	4.076	0.787	4.087	3.727	21	4.204	0.580	$39,123
275	S-167	S-166	18	125.00	0.010	3.931	0.174	Pressurized	6.233	0.541	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.931	0.174	Pressurized	3.442	1.000	3.414	3.113	21	3.647	0.654	$38,171
279	S-165	S-164	18	124.36	0.002	3.931	0.174	Pressurized	3.442	1.000	3.343	3.049	21	3.586	0.664	$18,654
281	S-164	S-163	18	250.67	0.003	3.931	0.174	Pressurized	3.442	1.000	3.519	3.209	21	3.737	0.641	$37,601
283	S-163	S-162	18	327.00	0.003	5.376	0.396	Pressurized	4.707	1.000	3.409	3.108	24	3.948	0.636	$50,685
285	S-162	S-161	18	351.00	0.002	5.376	0.396	Pressurized	4.707	1.000	3.389	3.090	24	3.930	0.638	$54,405
287	S-161	S-160	18	329.00	0.002	5.376	0.396	Pressurized	4.707	1.000	3.398	3.099	24	3.941	0.637	$50,995
289	S-160	S-159	18	416.00	0.003	5.376	0.396	Pressurized	4.707	1.000	3.532	3.221	24	4.064	0.620	$64,480
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	5.376	0.396	Pressurized	4.707	1.000	3.511	3.202	24	4.042	0.623	$34,953
293	S-158	S-157	18	199.50	0.003	5.376	0.396	Pressurized	4.707	1.000	3.702	3.376	24	4.213	0.602	$30,923
295	S-157	S-156	18	391.00	0.003	5.376	0.396	Pressurized	4.707	1.000	3.477	3.170	24	4.013	0.627	$60,605
297	S-156	S-155	18	155.00	0.004	5.376	0.396	Pressurized	4.707	1.000	4.270	3.894	21	4.638	0.698	$23,250

LOAPUD Buildout PWWF Within Service Boundary w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	5.376	0.396	Free Surface	6.621	0.669	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	5.376	0.396	Pressurized	4.707	1.000	3.761	3.430	24	4.267	0.595	$35,030
303	S-153	S-152	18	230.00	0.013	5.376	0.396	Free Surface	7.391	0.608	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	5.376	0.396	Free Surface	12.367	0.799	5.511	5.025	15	12.824	0.522	$22,200
307	S-151	S-150	12	200.00	0.076	5.376	0.396	Free Surface	14.033	0.706	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	5.376	0.396	Pressurized	10.591	1.000	5.328	4.858	15	12.501	0.533	$24,000
311	S-149	S-148	12	265.00	0.031	5.376	0.396	Pressurized	10.591	1.000	4.049	3.692	15	10.107	0.636	$31,800
313	S-148	S-147	12	309.01	0.061	5.376	0.396	Free Surface	12.826	0.770	5.725	5.221	15	13.196	0.511	$37,081
315	S-147	S-145	12	181.82	0.080	5.376	0.396	Free Surface	14.381	0.690	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	5.411	0.401	Free Surface	16.361	0.620	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	5.411	0.401	Pressurized	13.161	0.755	5.887	5.368	15	13.509	0.504	$3,931
323	S-143	S-142	12	395.00	0.005	5.411	0.401	Pressurized	10.659	1.000	1.635	1.491	21	5.125	0.643	$59,250
325	S-142	S-141	12	239.00	0.085	5.411	0.401	Free Surface	14.727	0.680	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	5.411	0.401	Pressurized	10.659	1.000	4.903	4.471	15	11.749	0.563	$30,600
329	S-140	S-139	12	250.00	0.042	5.411	0.401	Pressurized	10.659	1.000	4.756	4.337	15	11.481	0.574	$30,000
331	S-139	S-138	12	405.07	0.037	5.411	0.401	Pressurized	10.659	1.000	4.456	4.064	15	10.918	0.599	$48,608
333	S-138	S-137	18	265.59	0.034	5.438	0.405	Free Surface	10.573	0.461	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	5.438	0.405	Pressurized	4.761	1.000	4.561	4.159	21	4.904	0.671	$21,389
337	S-136	S-135	18	247.83	0.005	5.438	0.405	Pressurized	4.761	1.000	4.617	4.210	21	4.953	0.665	$37,175
339	S-135	S-134	18	194.99	0.066	5.438	0.405	Free Surface	13.496	0.383	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	5.438	0.405	Free Surface	10.262	0.472	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	5.438	0.405	Free Surface	9.093	0.519	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	5.438	0.405	Free Surface	12.961	0.395	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	5.487	0.413	Pressurized	4.804	1.000	4.640	4.231	21	4.981	0.667	$35,508
349	S-130	S-129	18	141.82	0.005	5.487	0.413	Pressurized	4.804	1.000	4.748	4.330	21	5.074	0.656	$21,273
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	5.487	0.413	Pressurized	6.414	0.701	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	5.487	0.413	Pressurized	4.804	1.000	3.669	3.345	24	4.203	0.613	$19,211
355	S-127	S-126	18	131.40	0.005	5.487	0.413	Pressurized	4.804	1.000	4.676	4.264	21	5.014	0.663	$19,710
357	S-126	S-125	18	349.97	0.004	5.487	0.413	Pressurized	4.804	1.000	4.412	4.023	21	4.785	0.691	$52,496
359	S-125	S-123	18	389.66	0.004	5.487	0.413	Pressurized	4.804	1.000	4.321	3.940	21	4.698	0.703	$58,449
363	S-123	S-122	12	289.06	0.033	5.487	0.413	Pressurized	10.809	1.000	4.212	3.841	15	10.474	0.627	$34,687
365	S-122	S-121	12	309.56	0.037	5.487	0.413	Pressurized	10.809	1.000	4.467	4.074	15	10.966	0.604	$37,147
367	S-121	S-120	12	430.79	0.082	5.487	0.413	Free Surface	14.586	0.694	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	5.487	0.413	Free Surface	14.746	0.688	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	5.487	0.413	Free Surface	15.538	0.656	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	5.521	0.418	Free Surface	15.224	0.672	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	5.521	0.418	Pressurized	6.961	1.000	5.229	4.768	18	7.923	0.587	$30,240
377	S-116	S-115A	15	260.00	0.061	5.521	0.418	Free Surface	13.278	0.519	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	5.521	0.418	Free Surface	10.887	0.610	8.011	7.305				

LOAPUD Buildout PWWF Within Service Boundary w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	5.584	0.428	Free Surface	11.247	0.600	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	5.584	0.428	Pressurized	7.040	1.000	3.750	3.420	21	6.200	0.563	$61,298
389	S-112	S-109	15	310.00	0.070	5.584	0.428	Free Surface	13.993	0.502	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	5.584	0.428	Pressurized	7.040	1.000	5.228	4.767	18	7.942	0.591	$49,820
393	S-108	S-108A	15	324.25	0.015	5.584	0.428	Pressurized	7.040	1.000	5.203	4.745	18	7.918	0.593	$45,395
395	S-106	S-105	15	345.00	0.030	5.584	0.428	Free Surface	10.137	0.655	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	6.104	0.508	Pressurized	12.025	1.000	2.887	2.632	18	8.099	0.627	$56,549
399	S-104	S-103	18	501.82	0.012	6.104	0.508	Free Surface	7.314	0.686	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	6.104	0.508	Free Surface	7.291	0.688	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	6.104	0.508	Free Surface	10.354	0.513	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	6.104	0.508	Free Surface	8.976	0.575	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	6.104	0.508	Pressurized	5.344	1.000	5.974	5.448	21	6.224	0.604	$42,845
409	S-99	S-98	18	230.00	0.007	6.104	0.508	Pressurized	5.344	1.000	5.852	5.337	21	6.130	0.611	$34,500
411	S-98	S-97	18	215.67	0.019	7.165	0.671	Pressurized	8.957	0.660	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	7.165	0.671	Pressurized	6.273	1.000	3.217	2.934	27	4.056	0.649	$15,040
415	S-96	S-95	18	116.00	0.003	7.165	0.671	Pressurized	6.273	1.000	3.947	3.599	24	4.696	0.703	$17,980
417	S-95	S-94	18	220.95	0.003	7.165	0.671	Pressurized	6.273	1.000	3.966	3.617	24	4.711	0.701	$34,247
419	S-94	S-93	18	386.14	0.003	7.271	0.688	Pressurized	6.366	1.000	3.965	3.616	24	4.723	0.709	$59,852
421	S-93	S-92	18	213.63	0.003	7.271	0.688	Pressurized	6.366	1.000	3.979	3.629	24	4.738	0.707	$33,113
423	S-92	S-91	18	226.18	0.003	7.271	0.688	Pressurized	6.366	1.000	3.564	3.250	27	4.413	0.612	$36,189
425	S-91	S-90	27	65.74	0.002	7.319	0.695	Pressurized	3.608	0.736	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	7.319	0.695	Pressurized	3.714	0.596	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	7.319	0.695	Pressurized	6.408	1.000	2.856	2.604	27	3.691	0.721	$17,270
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	7.319	0.695	Pressurized	6.408	1.000	2.946	2.686	27	3.791	0.703	$37,597
432	S88A	S-87	18	282.74	0.001	7.319	0.695	Pressurized	6.408	1.000	2.496	2.276	30	3.374	0.646	$48,066
433	S-87	S-86	18	239.17	0.002	7.319	0.695	Pressurized	6.408	1.000	2.953	2.693	27	3.796	0.702	$38,267
435	S-86	S-85	18	303.02	0.002	7.319	0.695	Pressurized	6.408	1.000	2.952	2.692	27	3.796	0.702	$48,483
437	S-85	S-84	18	296.01	0.002	7.319	0.695	Pressurized	6.408	1.000	2.934	2.676	27	3.779	0.705	$47,362
439	S-84	S-83	18	300.28	0.002	7.319	0.695	Pressurized	6.408	1.000	2.940	2.681	27	3.779	0.705	$48,045
441	S-83	S-82	18	361.66	0.002	7.319	0.695	Pressurized	6.408	1.000	2.952	2.692	27	3.796	0.702	$57,866
443	S-82	S-81	18	118.63	0.002	7.372	0.703	Pressurized	6.454	1.000	2.931	2.673	27	3.778	0.710	$18,981
445	S-81	S-80	18	315.60	0.002	7.372	0.703	Pressurized	6.454	1.000	2.943	2.684	27	3.790	0.708	$50,496
447	S-80	S-79	18	382.07	0.002	7.372	0.703	Pressurized	6.454	1.000	2.934	2.676	27	3.778	0.710	$61,131
449	S-79	S-78	18	358.51	0.001	7.372	0.703	Pressurized	6.454	1.000	2.593	2.364	30	3.483	0.633	$60,947
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	7.372	0.703	Pressurized	6.454	1.000	2.939	2.680	27	3.784	0.709	$49,782
453	S-77	S-76	18	207.87	0.002	7.372	0.703	Pressurized	6.454	1.000	2.986	2.723	27	3.836	0.700	$33,259
455	S-76	S-75	18	413.60	0.002	7.372	0.703	Pressurized	6.454	1.000	2.994	2.730	27	3.847	0.698	$66,176
457	S-75	S-74	18	254.25	0.002	7.372	0.703	Pressurized	6.454	1.000	2.988	2.725	27	3.841	0.699	$40,680

LOAPUD Buildout PWWF Within Service Boundary w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	7.372	0.703	Pressurized	6.454	1.000	2.598	2.369	30	3.489	0.632	$52,528
461	S-73	S-72	18	473.94	0.002	7.372	0.703	Pressurized	6.454	1.000	2.983	2.720	27	3.830	0.701	$75,830
463	S-72	S-71	18	298.55	0.002	7.596	0.737	Pressurized	6.651	1.000	3.273	2.984	27	4.158	0.669	$47,768
465	S-71	S-70	18	214.36	0.002	7.596	0.737	Pressurized	6.651	1.000	3.255	2.968	27	4.141	0.671	$34,298
467	S-70	S-69	18	340.00	0.003	7.596	0.737	Pressurized	6.651	1.000	3.560	3.246	27	4.451	0.630	$54,400
469	S-69	S-69A	18	116.00	0.002	7.596	0.737	Pressurized	6.651	1.000	3.284	2.995	27	4.171	0.667	$18,560
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	7.596	0.737	Pressurized	2.956	1.000	6.373	5.812	30	3.008	0.742	$40,460
475	S-67	S-65	27	150.92	0.001	7.596	0.737	Pressurized	2.956	1.000	6.327	5.770	30	2.992	0.746	$25,656
477	S-65	S-64	27	103.14	0.001	7.596	0.737	Pressurized	2.956	1.000	6.249	5.699	36	3.035	0.538	$19,081
479	S-64	S-63	27	132.00	0.001	7.596	0.737	Pressurized	2.956	1.000	6.298	5.744	30	2.980	0.749	$22,440
481	S-63	S-62	27	292.00	0.001	7.596	0.737	Pressurized	2.956	1.000	6.325	5.768	30	2.992	0.746	$49,640
483	S-62	S-62A	27	53.00	0.001	7.596	0.737	Pressurized	2.956	1.000	6.165	5.621	36	3.004	0.542	$9,805
485	S-61	S-60	27	244.11	0.001	7.780	0.766	Pressurized	3.027	1.000	6.293	5.739	36	3.070	0.543	$45,160
487	S-60	S-59	27	179.00	0.014	7.780	0.766	Free Surface	8.325	0.392	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	7.780	0.766	Free Surface	3.685	0.766	8.342	7.607	30	3.771	0.619	$32,470
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	7.780	0.766	Free Surface	3.804	0.742	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	7.780	0.766	Free Surface	3.836	0.736	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	7.780	0.766	Free Surface	3.794	0.744	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	8.237	0.836	Free Surface	3.882	0.770	8.775	8.002	30	3.974	0.622	$57,800
501	S-34	S-33	24	486.14	0.003	10.811	0.878	Pressurized	5.324	1.000	7.581	6.913	30	4.801	0.668	$82,644
503	S-33	S-32	24	179.87	0.003	10.811	0.878	Pressurized	5.324	1.000	8.467	7.721	30	5.240	0.619	$30,578
505	S-32	S-31	24	272.57	0.003	11.192	0.936	Pressurized	5.512	1.000	8.424	7.682	30	5.260	0.636	$46,337
507	S-31	S-30	24	315.87	0.003	11.192	0.936	Pressurized	5.512	1.000	8.249	7.522	30	5.168	0.646	$53,698
509	S-30	S-29	15	396.46	0.035	11.192	0.936	Pressurized	14.110	1.000	7.881	7.186	18	12.645	0.724	$55,504
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	11.192	0.936	Pressurized	14.110	1.000	7.610	6.940	18	12.279	0.744	$63,708
513	S-28	S-27	15	136.69	0.029	11.192	0.936	Pressurized	14.110	1.000	7.179	6.546	21	11.993	0.579	$20,504
515	S-27	S-26	24	160.65	0.003	11.192	0.936	Pressurized	5.512	1.000	8.656	7.893	30	5.375	0.624	$27,311
517	S-26	S-25	24	132.87	0.004	11.192	0.936	Pressurized	5.512	1.000	9.083	8.282	27	5.472	0.742	$21,259
519	S-25	S-24	24	286.68	0.004	11.192	0.936	Pressurized	5.512	1.000	8.998	8.205	27	5.428	0.748	$45,869
521	S-24	S-23	24	145.25	0.003	11.192	0.936	Pressurized	5.512	1.000	8.515	7.765	30	5.307	0.631	$24,693
523	S-23	S-22	15	419.03	0.040	11.192	0.936	Pressurized	14.110	1.000	8.409	7.668	18	13.347	0.688	$58,664
525	S-22	S-21	15	288.70	0.032	11.192	0.936	Pressurized	14.110	1.000	7.453	6.796	21	12.347	0.565	$43,305
527	S-21	S-20	18	179.30	0.022	11.192	0.936	Pressurized	9.799	1.000	10.014	9.131	21	10.639	0.641	$26,895
529	S-20	S-19	30	184.00	0.011	13.463	1.286	Free Surface	8.748	0.488	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	13.463	1.286	Free Surface	8.839	0.484	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	13.463	1.286	Free Surface	7.142	0.574	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	13.463	1.286	Free Surface	10.633	0.420	36.508	33.291				

LOAPUD Buildout PWWF Within Service Boundary w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
537	S-16	S-14	36	177.00	0.005	13.463	1.286	Free Surface	6.599	0.458	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	13.699	1.322	Free Surface	18.721	0.281	79.299	72.312	48	17.739	0.151	$16,800
541	S-9	S-8	30	390.00	0.008	14.087	1.382	Pressurized	7.882	0.550	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	14.227	1.403	Pressurized	7.007	1.000	10.719	9.775	30	6.686	0.636	$81,090
545	S-7	S-6	24	263.00	0.006	14.227	1.403	Pressurized	7.007	1.000	11.748	10.713	27	7.063	0.731	$42,080
547	S-6	S-5	30	343.00	0.004	14.227	1.403	Free Surface	5.674	0.737	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	14.227	1.403	Free Surface	5.682	0.736	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	14.896	1.506	Free Surface	5.508	0.795	15.347	13.994	36	5.701	0.557	$55,500
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.933	0.000	Free Surface	5.402	0.492	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.933	0.000	Free Surface	4.478	0.572	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.933	0.000	Free Surface	5.669	0.360	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.933	0.000	Free Surface	7.099	0.306	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.933	0.000	Free Surface	6.239	0.336	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.933	0.000	Free Surface	7.932	0.282	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.933	0.000	Free Surface	5.320	0.377	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.933	0.000	Free Surface	9.085	0.465	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.933	0.000	Free Surface	5.477	0.369	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.933	0.000	Free Surface	7.049	0.568	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.933	0.000	Free Surface	5.410	0.373	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.933	0.000	Free Surface	11.953	0.273	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.933	0.000	Pressurized	5.405	0.373	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.933	0.000	Free Surface	11.367	0.283	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.933	0.000	Pressurized	5.792	0.354	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.933	0.000	Free Surface	5.552	0.366	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.933	0.000	Free Surface	6.841	0.314	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.933	0.000	Free Surface	6.855	0.313	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.933	0.000	Free Surface	6.405	0.329	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.933	0.000	Free Surface	6.718	0.318	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.933	0.000	Free Surface	8.568	0.267	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.933	0.000	Free Surface	8.028	0.280	5.458	4.977				

LOAPUD Buildout PWWF Within Service Boundary w/ Peaking Factor 6.5

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.933	0.000	Free Surface	5.405	0.373	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.933	0.000	Free Surface	5.434	0.372	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.933	0.000	Free Surface	5.434	0.372	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.933	0.000	Free Surface	6.490	0.326	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.933	0.000	Free Surface	5.405	0.373	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.933	0.000	Free Surface	5.643	0.361	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	1.872	0.000	Free Surface	2.502	0.623	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	1.872	0.000	Free Surface	2.352	0.657	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	1.872	0.000	Free Surface	2.336	0.661	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	1.872	0.000	Pressurized	1.639	1.000	0.984	0.898	24	1.178	0.730	$14,821
641	Z5	Z6	18	93.95	0.002	1.872	0.000	Free Surface	2.697	0.585	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	1.872	0.000	Free Surface	2.759	0.574	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	1.872	0.000	Free Surface	2.495	0.625	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	1.872	0.000	Free Surface	2.516	0.620	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	1.872	0.000	Free Surface	2.521	0.619	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	1.872	0.000	Free Surface	2.495	0.625	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	1.872	0.000	Pressurized	1.639	1.000	1.403	1.279	21	1.536	0.731	$17,657
655	Z12	Z13	18	113.00	0.003	1.872	0.000	Free Surface	3.307	0.497	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	1.872	0.000	Free Surface	3.701	0.455	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	1.872	0.000	Pressurized	1.639	1.000	1.814	1.654	21	1.894	0.607	$67,619
661	Z15	Z16	18	254.79	0.003	1.872	0.000	Free Surface	3.432	0.482	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	1.872	0.000	Free Surface	3.576	0.467	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	1.872	0.000	Free Surface	2.564	0.610	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	1.872	0.000	Free Surface	3.943	0.434	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	1.872	0.000	Free Surface	6.996	0.284	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Pressurized	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	2.539	0.036	Pressurized	3.943	0.354	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	2.539	0.036	Pressurized	3.606	0.378	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	2.539	0.036	Pressurized	2.126	0.569	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

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75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	0.388	0.060	Free Surface	8.030	0.267	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	13.463	1.286	Pressurized	4.244	1.000	11.608	10.586	36	4.490	0.624	$71,780
776	S-17.2	S-17.3	30	130.00	0.002	13.463	1.286	Pressurized	4.244	1.000	12.555	11.448	36	4.773	0.593	$24,050
778	S-17.1	S-17.2	30	244.00	0.002	13.463	1.286	Pressurized	4.244	1.000	11.541	10.524	36	4.466	0.627	$45,140
780	S-58A	S-58	27	394.00	0.002	7.780	0.766	Free Surface	3.685	0.766	8.338	7.603	30	3.771	0.619	$66,980
782	S-57A	S-57	27	283.00	0.002	7.780	0.766	Free Surface	3.825	0.738	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	7.780	0.766	Free Surface	3.841	0.735	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	7.780	0.766	Free Surface	3.804	0.742	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	8.237	0.836	Free Surface	3.838	0.778	8.667	7.903	30	3.934	0.627	$62,900
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	8.272	0.842	Free Surface	3.879	0.773	8.769	7.997	30	3.973	0.624	$18,700
792	S-55C	S-55D	27	548.00	0.002	8.272	0.842	Free Surface	3.822	0.785	8.616	7.857	30	3.923	0.631	$93,160
794	S-55D	S-55E	27	310.00	0.002	8.272	0.842	Free Surface	3.845	0.780	8.681	7.916	30	3.944	0.628	$52,700
796	S-55E	S-55F	27	479.00	0.002	8.272	0.842	Free Surface	4.039	0.743	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	8.272	0.842	Free Surface	6.351	0.505	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	8.272	0.842	Free Surface	11.331	0.327	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	8.272	0.842	Free Surface	15.915	0.256	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	7.780	0.766	Pressurized	3.027	1.000	6.324	5.767	36	3.081	0.542	$78,255
808	S-69A	S-68	27	70.00	0.002	7.596	0.737	Free Surface	4.137	0.672	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	5.584	0.428	Free Surface	12.243	0.559	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	5.521	0.418	Free Surface	10.887	0.610	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.682	0.000	Free Surface	6.594	0.502	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.426	0.066	Free Surface	1.798	0.637	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.386	0.139	Free Surface	4.750	0.771	1.471	1.341	12	4.885	0.546	$11,088
98	Z20	Z22	24	505.68	0.003	2.539	0.036	Pressurized	3.676	0.373	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0	0	Free Surface	0	0	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	0	0	Free Surface	0	0	4.289	3.911				

APPENDIX C

FLOWS WITHIN SPHERE OF INFLUENCE

APPENDIX C1

FLOWS WITHIN SPHERE OF INFLUENCE
2020 PWWF

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.591	0.091	Free Surface	6.759	0.650	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.149	0.023	Free Surface	13.023	0.146	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.039	0.006	Free Surface	2.650	0.116	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.116	0.018	Free Surface	4.276	0.178	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.574	0.088	Free Surface	2.498	0.463	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.574	0.088	Free Surface	2.619	0.446	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.574	0.088	Free Surface	2.579	0.452	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.574	0.088	Free Surface	4.137	0.318	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.574	0.088	Free Surface	4.199	0.314	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.574	0.088	Free Surface	2.543	0.457	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.574	0.088	Free Surface	2.579	0.452	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.574	0.088	Free Surface	3.125	0.391	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.574	0.088	Free Surface	3.507	0.359	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.574	0.088	Free Surface	3.058	0.397	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.574	0.088	Free Surface	2.786	0.426	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.574	0.088	Free Surface	2.821	0.422	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.574	0.088	Free Surface	3.200	0.384	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	10.025	0.951	Free Surface	22.796	0.196	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.574	0.088	Free Surface	6.384	0.233	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.574	0.088	Pressurized	2.296	0.494	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	0.892	0.137	Free Surface	7.895	0.357	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.649	0.000	Free Surface	5.478	0.573	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.649	0.000	Free Surface	4.931	0.626	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.649	0.000	Free Surface	8.843	0.395	5.011	4.569				

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.649	0.000	Free Surface	10.529	0.347	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.649	0.000	Free Surface	10.008	0.360	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.649	0.000	Free Surface	9.098	0.387	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.649	0.000	Free Surface	9.899	0.363	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.649	0.000	Free Surface	8.126	0.421	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.649	0.000	Free Surface	4.569	0.669	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.649	0.000	Free Surface	7.655	0.440	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.649	0.000	Free Surface	8.077	0.423	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	2.079	0.066	Free Surface	8.755	0.475	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	2.871	0.066	Pressurized	5.655	1.000	0.796	0.726	21	2.535	0.684	$24,000
239	S-185	S-184	18	354.41	0.007	2.871	0.066	Free Surface	5.109	0.494	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	2.871	0.066	Free Surface	3.529	0.670	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	2.871	0.066	Free Surface	3.397	0.693	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	3.058	0.066	Free Surface	3.420	0.730	3.462	3.157				
247	S-181	S-180	18	248.09	0.003	3.058	0.066	Free Surface	3.465	0.722	3.511	3.202				
249	S-180	S-179	18	404.10	0.002	3.058	0.066	Free Surface	3.310	0.754	3.335	3.041	21	3.395	0.563	$60,615
251	S-179	S-178	18	221.42	0.002	3.058	0.066	Free Surface	3.222	0.774	3.235	2.950	21	3.314	0.574	$33,213
253	S-178	S-177	18	80.58	0.002	3.058	0.066	Free Surface	3.364	0.742	3.391	3.093				
255	S-177	S-176	18	142.02	0.002	3.058	0.066	Free Surface	3.350	0.745	3.379	3.082				
257	S-176	S-175	18	311.66	0.002	3.058	0.066	Free Surface	3.314	0.753	3.339	3.045	21	3.395	0.563	$46,749
259	S-175	S-174	18	100.00	0.003	3.058	0.066	Free Surface	3.430	0.729	3.471	3.165				
261	S-174	S-173	18	161.32	0.003	3.058	0.066	Free Surface	3.465	0.722	3.514	3.205				
263	S-173	S-172	18	273.50	0.002	3.058	0.066	Free Surface	3.276	0.762	3.293	3.003	21	3.359	0.567	$41,025
265	S-172	S-171	18	160.10	0.002	3.058	0.066	Free Surface	3.373	0.740	3.403	3.103				
269	S-171	S-169	18	414.77	0.004	3.058	0.066	Free Surface	3.943	0.643	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.058	0.066	Free Surface	3.929	0.645	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	3.058	0.066	Free Surface	3.922	0.646	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	3.058	0.066	Free Surface	5.848	0.467	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.058	0.066	Free Surface	3.383	0.738	3.414	3.113				
279	S-165	S-164	18	124.36	0.002	3.058	0.066	Pressurized	3.319	0.752	3.343	3.049	21	3.399	0.562	$18,654
281	S-164	S-163	18	250.67	0.003	3.058	0.066	Pressurized	3.470	0.721	3.519	3.209				
283	S-163	S-162	18	327.00	0.003	3.602	0.150	Pressurized	3.154	1.000	3.409	3.108	21	3.577	0.617	$49,050
285	S-162	S-161	18	351.00	0.002	3.602	0.150	Pressurized	3.154	1.000	3.389	3.090	21	3.563	0.619	$52,650
287	S-161	S-160	18	329.00	0.002	3.602	0.150	Pressurized	3.154	1.000	3.398	3.099	21	3.570	0.618	$49,350
289	S-160	S-159	18	416.00	0.003	3.602	0.150	Pressurized	3.154	1.000	3.532	3.221	21	3.680	0.603	$62,400
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	3.602	0.150	Pressurized	3.154	1.000	3.511	3.202	21	3.666	0.604	$33,825
293	S-158	S-157	18	199.50	0.003	3.602	0.150	Free Surface	3.691	0.797	3.702	3.376	21	3.817	0.584	$29,925
295	S-157	S-156	18	391.00	0.003	3.602	0.150	Pressurized	3.154	1.000	3.477	3.170	21	3.638	0.608	$58,650
297	S-156	S-155	18	155.00	0.004	3.602	0.150	Free Surface	4.191	0.704	4.270	3.894				

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	3.602	0.150	Free Surface	6.059	0.516	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	3.631	0.150	Free Surface	3.751	0.790	3.761	3.430	21	3.871	0.582	$33,900
303	S-153	S-152	18	230.00	0.013	3.631	0.150	Free Surface	6.735	0.478	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	3.631	0.150	Free Surface	11.584	0.593	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	3.631	0.150	Free Surface	12.925	0.542	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	3.631	0.150	Free Surface	11.294	0.605	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	3.631	0.150	Free Surface	9.025	0.739	4.049	3.692				
313	S-148	S-147	12	309.01	0.061	3.631	0.150	Free Surface	11.940	0.578	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	3.631	0.150	Free Surface	13.221	0.532	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	3.658	0.154	Free Surface	14.933	0.486	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	3.658	0.154	Pressurized	12.218	0.571	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	3.658	0.154	Pressurized	7.207	1.000	1.635	1.491	18	4.644	0.651	$55,300
325	S-142	S-141	12	239.00	0.085	3.658	0.154	Free Surface	13.522	0.526	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	3.658	0.154	Free Surface	10.594	0.644	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	3.658	0.154	Free Surface	10.342	0.657	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	3.658	0.154	Free Surface	9.801	0.689	4.456	4.064				
333	S-138	S-137	18	265.59	0.034	3.679	0.157	Free Surface	9.522	0.372	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	3.679	0.157	Free Surface	4.444	0.681	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	3.679	0.157	Free Surface	4.487	0.675	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	3.679	0.157	Free Surface	12.118	0.312	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	3.679	0.157	Free Surface	9.251	0.380	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	3.679	0.157	Free Surface	8.224	0.415	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	3.679	0.157	Free Surface	11.637	0.321	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	3.710	0.162	Free Surface	4.510	0.677	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	3.710	0.162	Free Surface	4.599	0.665	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	3.710	0.162	Free Surface	5.903	0.540	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	3.710	0.162	Pressurized	3.248	1.000	3.669	3.345	21	3.816	0.599	$18,591
355	S-127	S-126	18	131.40	0.005	3.710	0.162	Free Surface	4.539	0.673	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	3.710	0.162	Free Surface	4.330	0.702	4.412	4.023				
359	S-125	S-123	18	389.66	0.004	3.710	0.162	Free Surface	4.253	0.714	4.321	3.940				
363	S-123	S-122	12	289.06	0.033	3.710	0.162	Free Surface	9.364	0.729	4.212	3.841				
365	S-122	S-121	12	309.56	0.037	3.710	0.162	Free Surface	9.847	0.695	4.467	4.074				
367	S-121	S-120	12	430.79	0.082	3.710	0.162	Free Surface	13.417	0.535	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	3.710	0.162	Free Surface	13.556	0.531	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	3.710	0.162	Free Surface	14.228	0.511	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	3.824	0.180	Free Surface	14.038	0.529	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	3.824	0.180	Free Surface	7.202	0.635	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	3.824	0.180	Free Surface	12.081	0.420	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	3.824	0.180	Free Surface	9.978	0.487	8.011	7.305				

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	3.882	0.188	Free Surface	10.300	0.480	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	3.882	0.188	Pressurized	4.894	1.000	3.750	3.420	18	5.661	0.579	$57,211
389	S-112	S-109	15	310.00	0.070	3.882	0.188	Free Surface	12.731	0.409	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	3.882	0.188	Free Surface	7.220	0.642	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	3.882	0.188	Free Surface	7.194	0.644	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	3.882	0.188	Free Surface	9.335	0.519	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	3.996	0.206	Pressurized	7.873	1.000	2.887	2.632	15	7.267	0.654	$48,470
399	S-104	S-103	18	501.82	0.012	3.996	0.206	Free Surface	6.666	0.520	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	3.996	0.206	Free Surface	6.651	0.521	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	3.996	0.206	Free Surface	9.279	0.403	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	3.996	0.206	Free Surface	8.081	0.447	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	3.996	0.206	Free Surface	5.600	0.599	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	3.996	0.206	Pressurized	5.515	0.606	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	4.845	0.337	Pressurized	8.198	0.514	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	4.845	0.337	Pressurized	4.242	1.000	3.217	2.934	24	3.690	0.616	$14,570
415	S-96	S-95	18	116.00	0.003	4.845	0.337	Pressurized	4.242	1.000	3.947	3.599	21	4.265	0.686	$17,400
417	S-95	S-94	18	220.95	0.003	4.845	0.337	Pressurized	4.242	1.000	3.966	3.617	21	4.285	0.683	$33,143
419	S-94	S-93	18	386.14	0.003	4.937	0.351	Pressurized	4.322	1.000	3.965	3.616	21	4.299	0.692	$57,921
421	S-93	S-92	18	213.63	0.003	4.937	0.351	Pressurized	4.322	1.000	3.979	3.629	21	4.312	0.690	$32,045
423	S-92	S-91	18	226.18	0.003	4.937	0.351	Pressurized	4.322	1.000	3.564	3.250	24	4.017	0.583	$35,058
425	S-91	S-90	27	65.74	0.002	4.994	0.360	Pressurized	3.351	0.563	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	4.994	0.360	Pressurized	3.388	0.472	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	4.994	0.360	Pressurized	4.373	1.000	2.856	2.604	24	3.377	0.684	$16,731
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	4.994	0.360	Pressurized	4.373	1.000	2.946	2.686	24	3.460	0.669	$36,422
432	S88A	S-87	18	282.74	0.001	4.994	0.360	Pressurized	4.373	1.000	2.496	2.276	27	3.078	0.604	$45,238
433	S-87	S-86	18	239.17	0.002	4.994	0.360	Pressurized	4.373	1.000	2.953	2.693	24	3.466	0.668	$37,071
435	S-86	S-85	18	303.02	0.002	4.994	0.360	Pressurized	4.373	1.000	2.952	2.692	24	3.466	0.668	$46,968
437	S-85	S-84	18	296.01	0.002	4.994	0.360	Pressurized	4.373	1.000	2.934	2.676	24	3.449	0.671	$45,882
439	S-84	S-83	18	300.28	0.002	4.994	0.360	Pressurized	4.373	1.000	2.940	2.681	24	3.454	0.670	$46,543
441	S-83	S-82	18	361.66	0.002	4.994	0.360	Pressurized	4.373	1.000	2.952	2.692	24	3.466	0.668	$56,057
443	S-82	S-81	18	118.63	0.002	5.111	0.378	Pressurized	4.475	1.000	2.931	2.673	24	3.461	0.683	$18,388
445	S-81	S-80	18	315.60	0.002	5.111	0.378	Pressurized	4.475	1.000	2.943	2.684	24	3.472	0.681	$48,918
447	S-80	S-79	18	382.07	0.002	5.111	0.378	Pressurized	4.475	1.000	2.934	2.676	24	3.467	0.682	$59,221
449	S-79	S-78	18	358.51	0.001	5.111	0.378	Pressurized	4.475	1.000	2.593	2.364	27	3.187	0.598	$57,362
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	5.111	0.378	Pressurized	4.475	1.000	2.939	2.680	24	3.467	0.682	$48,227
453	S-77	S-76	18	207.87	0.002	5.111	0.378	Pressurized	4.475	1.000	2.986	2.723	24	3.512	0.674	$32,220
455	S-76	S-75	18	413.60	0.002	5.111	0.378	Pressurized	4.475	1.000	2.994	2.730	24	3.523	0.672	$64,108
457	S-75	S-74	18	254.25	0.002	5.111	0.378	Pressurized	4.475	1.000	2.988	2.725	24	3.518	0.673	$39,409

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	5.111	0.378	Pressurized	4.475	1.000	2.598	2.369	27	3.190	0.598	$49,438
461	S-73	S-72	18	473.94	0.002	5.111	0.378	Pressurized	4.475	1.000	2.983	2.720	24	3.512	0.674	$73,461
463	S-72	S-71	18	298.55	0.002	5.207	0.392	Pressurized	4.559	1.000	3.273	2.984	24	3.797	0.640	$46,275
465	S-71	S-70	18	214.36	0.002	5.207	0.392	Pressurized	4.559	1.000	3.255	2.968	24	3.783	0.642	$33,226
467	S-70	S-69	18	340.00	0.003	5.207	0.392	Pressurized	4.559	1.000	3.560	3.246	24	4.057	0.604	$52,700
469	S-69	S-69A	18	116.00	0.002	5.207	0.392	Pressurized	4.559	1.000	3.284	2.995	24	3.810	0.638	$17,980
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	5.207	0.392	Free Surface	2.764	0.688	6.373	5.812				
475	S-67	S-65	27	150.92	0.001	5.207	0.392	Free Surface	2.747	0.691	6.327	5.770				
477	S-65	S-64	27	103.14	0.001	5.207	0.392	Free Surface	2.722	0.697	6.249	5.699				
479	S-64	S-63	27	132.00	0.001	5.207	0.392	Free Surface	2.739	0.693	6.298	5.744				
481	S-63	S-62	27	292.00	0.001	5.207	0.392	Free Surface	2.747	0.691	6.325	5.768				
483	S-62	S-62A	27	53.00	0.001	5.207	0.392	Free Surface	2.689	0.705	6.165	5.621				
485	S-61	S-60	27	244.11	0.001	5.317	0.409	Free Surface	2.746	0.705	6.293	5.739				
487	S-60	S-59	27	179.00	0.014	5.317	0.409	Free Surface	7.490	0.320	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	5.317	0.409	Free Surface	3.440	0.580	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	5.317	0.409	Free Surface	3.534	0.567	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	5.317	0.409	Free Surface	3.560	0.564	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	5.317	0.409	Free Surface	3.526	0.568	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	5.611	0.455	Free Surface	3.623	0.581	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	6.915	0.490	Free Surface	4.233	0.750	7.581	6.913				
503	S-33	S-32	24	179.87	0.003	6.915	0.490	Free Surface	4.653	0.687	8.467	7.721				
505	S-32	S-31	24	272.57	0.003	7.295	0.548	Free Surface	4.670	0.719	8.424	7.682				
507	S-31	S-30	24	315.87	0.003	7.295	0.548	Free Surface	4.591	0.730	8.249	7.522				
509	S-30	S-29	15	396.46	0.035	7.295	0.548	Free Surface	11.283	0.760	7.881	7.186	18	11.581	0.541	$55,504
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	7.295	0.548	Free Surface	10.920	0.785	7.610	6.940	18	11.277	0.552	$63,708
513	S-28	S-27	15	136.69	0.029	7.295	0.548	Pressurized	9.198	1.000	7.179	6.546	18	10.784	0.573	$19,137
515	S-27	S-26	24	160.65	0.003	7.295	0.548	Free Surface	4.782	0.703	8.656	7.893				
517	S-26	S-25	24	132.87	0.004	7.295	0.548	Free Surface	4.972	0.679	9.083	8.282				
519	S-25	S-24	24	286.68	0.004	7.295	0.548	Free Surface	4.933	0.684	8.998	8.205				
521	S-24	S-23	24	145.25	0.003	7.295	0.548	Free Surface	4.711	0.713	8.515	7.765				
523	S-23	S-22	15	419.03	0.040	7.295	0.548	Free Surface	11.938	0.720	8.409	7.668				
525	S-22	S-21	15	288.70	0.032	7.295	0.548	Free Surface	10.715	0.801	7.453	6.796	18	11.096	0.560	$40,418
527	S-21	S-20	18	179.30	0.022	7.295	0.548	Free Surface	9.567	0.633	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	8.547	0.741	Free Surface	7.763	0.379	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	8.547	0.741	Free Surface	7.838	0.376	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	8.547	0.741	Free Surface	6.377	0.439	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	8.547	0.741	Free Surface	9.396	0.329	36.508	33.291				

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
537	S-16	S-14	36	177.00	0.005	8.547	0.741	Free Surface	5.840	0.357	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	8.772	0.775	Free Surface	16.457	0.225	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	9.267	0.835	Free Surface	7.090	0.431	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	9.422	0.859	Free Surface	5.954	0.728	10.719	9.775				
545	S-7	S-6	24	263.00	0.006	9.422	0.859	Free Surface	6.432	0.678	11.748	10.713				
547	S-6	S-5	30	343.00	0.004	9.422	0.859	Free Surface	5.226	0.554	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	9.422	0.859	Free Surface	5.237	0.553	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	10.025	0.951	Free Surface	5.158	0.589	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.644	0.000	Free Surface	1.903	0.337	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.644	0.000	Free Surface	1.799	0.351	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.644	0.000	Free Surface	1.789	0.353	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.644	0.000	Free Surface	0.918	0.590	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.644	0.000	Free Surface	2.040	0.320	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.644	0.000	Free Surface	2.084	0.315	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.644	0.000	Free Surface	1.913	0.336	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.644	0.000	Free Surface	1.917	0.335	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.644	0.000	Free Surface	1.202	0.476	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.644	0.000	Free Surface	2.473	0.279	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.644	0.000	Free Surface	2.753	0.258	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.644	0.000	Free Surface	1.452	0.412	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.644	0.000	Free Surface	2.561	0.272	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.644	0.000	Free Surface	2.664	0.264	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.644	0.000	Free Surface	1.946	0.332	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.644	0.000	Free Surface	2.927	0.247	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.644	0.000	Free Surface	5.124	0.167	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.276	0.031	Free Surface	3.246	0.248	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.276	0.031	Free Surface	2.971	0.264	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.276	0.031	Free Surface	1.782	0.383	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

LOAPUD SOI 2020 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	0.496	0.060	Free Surface	8.609	0.302	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	8.547	0.741	Free Surface	4.003	0.638	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	8.547	0.741	Free Surface	4.254	0.605	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	8.547	0.741	Free Surface	3.981	0.641	11.541	10.524				
780	S-58A	S-58	27	394.00	0.002	5.317	0.409	Free Surface	3.440	0.580	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	5.317	0.409	Free Surface	3.549	0.565	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	5.317	0.409	Free Surface	3.564	0.563	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	5.317	0.409	Free Surface	3.534	0.567	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	5.611	0.455	Free Surface	3.586	0.586	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	5.638	0.459	Free Surface	3.625	0.583	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	5.638	0.459	Free Surface	3.575	0.590	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	5.638	0.459	Free Surface	3.596	0.587	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	5.638	0.459	Free Surface	3.751	0.567	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	5.638	0.459	Free Surface	5.754	0.406	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	5.638	0.459	Free Surface	10.161	0.268	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	5.638	0.459	Free Surface	14.234	0.211	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	5.317	0.409	Free Surface	2.758	0.702	6.324	5.767				
808	S-69A	S-68	27	70.00	0.002	5.207	0.392	Free Surface	3.811	0.525	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	3.882	0.188	Free Surface	11.175	0.451	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	3.824	0.180	Free Surface	9.978	0.487	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.649	0.000	Free Surface	6.561	0.496	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.392	0.060	Free Surface	1.766	0.603	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.354	0.134	Free Surface	4.736	0.756	1.471	1.341	12	4.858	0.539	$11,088
98	Z20	Z22	24	505.68	0.003	1.276	0.031	Free Surface	3.030	0.261	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0.029	0.004	Free Surface	4.709	0.065	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	0.171	0.026	Free Surface	9.269	0.136	4.289	3.911				

APPENDIX C2

FLOWS WITHIN SPHERE OF INFLUENCE
2030 PWWF

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.599	0.092	Free Surface	6.776	0.657	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.165	0.025	Free Surface	13.416	0.153	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.148	0.023	Free Surface	3.944	0.223	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.126	0.019	Free Surface	4.379	0.185	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.658	0.101	Free Surface	2.586	0.501	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.658	0.101	Free Surface	2.714	0.482	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.658	0.101	Free Surface	2.669	0.489	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.658	0.101	Free Surface	4.301	0.341	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.658	0.101	Free Surface	4.361	0.338	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.658	0.101	Free Surface	2.632	0.494	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.658	0.101	Free Surface	2.673	0.488	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.658	0.101	Free Surface	3.243	0.421	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.658	0.101	Free Surface	3.641	0.386	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.658	0.101	Free Surface	3.175	0.428	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.658	0.101	Free Surface	2.887	0.460	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.658	0.101	Free Surface	2.923	0.456	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.658	0.101	Free Surface	3.320	0.414	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	11.263	1.103	Free Surface	23.612	0.208	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.658	0.101	Free Surface	6.640	0.250	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.658	0.101	Pressurized	2.375	0.536	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	1.024	0.158	Free Surface	8.203	0.385	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.682	0.000	Free Surface	5.508	0.580	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.682	0.000	Free Surface	4.954	0.634	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.682	0.000	Free Surface	8.895	0.399	5.011	4.569				

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.682	0.000	Free Surface	10.588	0.351	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.682	0.000	Free Surface	10.061	0.364	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.682	0.000	Free Surface	9.156	0.391	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.682	0.000	Free Surface	9.953	0.367	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.682	0.000	Free Surface	8.176	0.425	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.682	0.000	Free Surface	4.585	0.679	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.682	0.000	Free Surface	7.696	0.445	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.682	0.000	Free Surface	8.127	0.427	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	2.244	0.086	Free Surface	8.928	0.496	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	3.036	0.086	Pressurized	5.980	1.000	0.796	0.726	21	2.560	0.713	$24,000
239	S-185	S-184	18	354.41	0.007	3.036	0.086	Free Surface	5.180	0.510	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	3.036	0.086	Free Surface	3.564	0.698	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	3.036	0.086	Free Surface	3.425	0.725	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	3.223	0.086	Free Surface	3.443	0.764	3.462	3.157	21	3.533	0.568	$22,622
247	S-181	S-180	18	248.09	0.003	3.223	0.086	Free Surface	3.489	0.754	3.511	3.202	21	3.570	0.563	$37,214
249	S-180	S-179	18	404.10	0.002	3.223	0.086	Free Surface	3.326	0.791	3.335	3.041	21	3.432	0.582	$60,615
251	S-179	S-178	18	221.42	0.002	3.223	0.086	Free Surface	3.228	0.816	3.235	2.950	21	3.351	0.594	$33,213
253	S-178	S-177	18	80.58	0.002	3.223	0.086	Free Surface	3.379	0.778	3.391	3.093	21	3.478	0.576	$12,087
255	S-177	S-176	18	142.02	0.002	3.223	0.086	Free Surface	3.366	0.781	3.379	3.082	21	3.468	0.577	$21,303
257	S-176	S-175	18	311.66	0.002	3.223	0.086	Free Surface	3.330	0.790	3.339	3.045	21	3.439	0.581	$46,749
259	S-175	S-174	18	100.00	0.003	3.223	0.086	Free Surface	3.452	0.762	3.471	3.165	21	3.540	0.567	$15,000
261	S-174	S-173	18	161.32	0.003	3.223	0.086	Free Surface	3.489	0.754	3.514	3.205	21	3.574	0.563	$24,198
263	S-173	S-172	18	273.50	0.002	3.223	0.086	Free Surface	3.287	0.801	3.293	3.003	21	3.398	0.587	$41,025
265	S-172	S-171	18	160.10	0.002	3.223	0.086	Free Surface	3.391	0.775	3.403	3.103	21	3.489	0.574	$24,015
269	S-171	S-169	18	414.77	0.004	3.223	0.086	Free Surface	3.982	0.667	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.223	0.086	Free Surface	3.969	0.669	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	3.223	0.086	Free Surface	3.962	0.670	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	3.223	0.086	Pressurized	5.931	0.481	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.223	0.086	Pressurized	3.400	0.773	3.414	3.113	21	3.496	0.573	$38,171
279	S-165	S-164	18	124.36	0.002	3.223	0.086	Pressurized	3.334	0.789	3.343	3.049	21	3.439	0.581	$18,654
281	S-164	S-163	18	250.67	0.003	3.223	0.086	Pressurized	3.493	0.753	3.519	3.209	21	3.578	0.563	$37,601
283	S-163	S-162	18	327.00	0.003	3.824	0.179	Pressurized	3.348	1.000	3.409	3.108	21	3.622	0.643	$49,050
285	S-162	S-161	18	351.00	0.002	3.824	0.179	Pressurized	3.348	1.000	3.389	3.090	21	3.610	0.645	$52,650
287	S-161	S-160	18	329.00	0.002	3.824	0.179	Pressurized	3.348	1.000	3.398	3.099	21	3.616	0.644	$49,350
289	S-160	S-159	18	416.00	0.003	3.824	0.179	Pressurized	3.348	1.000	3.532	3.221	21	3.728	0.627	$62,400
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	3.824	0.179	Pressurized	3.348	1.000	3.511	3.202	21	3.711	0.629	$33,825
293	S-158	S-157	18	199.50	0.003	3.824	0.179	Pressurized	3.348	1.000	3.702	3.376	21	3.869	0.607	$29,925
295	S-157	S-156	18	391.00	0.003	3.824	0.179	Pressurized	3.348	1.000	3.477	3.170	21	3.681	0.634	$58,650
297	S-156	S-155	18	155.00	0.004	3.824	0.179	Free Surface	4.230	0.738	4.270	3.894				

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	3.824	0.179	Free Surface	6.146	0.535	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	3.867	0.179	Pressurized	3.386	1.000	3.761	3.430	21	3.928	0.605	$33,900
303	S-153	S-152	18	230.00	0.013	3.867	0.179	Free Surface	6.840	0.496	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	3.867	0.179	Free Surface	11.760	0.617	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	3.867	0.179	Free Surface	13.121	0.563	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	3.867	0.179	Free Surface	11.441	0.632	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	3.867	0.179	Free Surface	9.078	0.782	4.049	3.692	15	9.378	0.516	$31,800
313	S-148	S-147	12	309.01	0.061	3.867	0.179	Free Surface	12.111	0.602	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	3.867	0.179	Free Surface	13.421	0.553	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	3.900	0.184	Free Surface	15.160	0.505	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	3.900	0.184	Pressurized	12.395	0.595	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	3.900	0.184	Pressurized	7.684	1.000	1.635	1.491	18	4.696	0.683	$55,300
325	S-142	S-141	12	239.00	0.085	3.900	0.184	Free Surface	13.731	0.547	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	3.900	0.184	Free Surface	10.720	0.674	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	3.900	0.184	Free Surface	10.450	0.689	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	3.900	0.184	Free Surface	9.901	0.725	4.456	4.064				
333	S-138	S-137	18	265.59	0.034	3.924	0.188	Free Surface	9.688	0.385	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	3.924	0.188	Free Surface	4.491	0.715	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	3.924	0.188	Free Surface	4.538	0.708	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	3.924	0.188	Free Surface	12.333	0.322	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	3.924	0.188	Free Surface	9.415	0.393	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	3.924	0.188	Free Surface	8.363	0.430	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	3.924	0.188	Free Surface	11.861	0.332	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	3.958	0.193	Free Surface	4.564	0.710	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	3.958	0.193	Free Surface	4.655	0.697	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	3.958	0.193	Free Surface	5.994	0.562	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	3.958	0.193	Pressurized	3.465	1.000	3.669	3.345	21	3.869	0.625	$18,591
355	S-127	S-126	18	131.40	0.005	3.958	0.193	Free Surface	4.591	0.706	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	3.958	0.193	Free Surface	4.366	0.740	4.412	4.023				
359	S-125	S-123	18	389.66	0.004	3.958	0.193	Free Surface	4.290	0.753	4.321	3.940	21	4.394	0.563	$58,449
363	S-123	S-122	12	289.06	0.033	3.958	0.193	Free Surface	9.442	0.770	4.212	3.841	15	9.714	0.511	$34,687
365	S-122	S-121	12	309.56	0.037	3.958	0.193	Free Surface	9.934	0.732	4.467	4.074				
367	S-121	S-120	12	430.79	0.082	3.958	0.193	Free Surface	13.632	0.557	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	3.958	0.193	Free Surface	13.766	0.552	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	3.958	0.193	Free Surface	14.462	0.531	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	4.154	0.223	Free Surface	14.323	0.556	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	4.154	0.223	Free Surface	7.319	0.673	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	4.154	0.223	Free Surface	12.342	0.440	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	4.154	0.223	Free Surface	10.196	0.511	8.011	7.305				

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	4.217	0.233	Free Surface	10.528	0.504	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	4.217	0.233	Pressurized	5.317	1.000	3.750	3.420	18	5.764	0.611	$57,211
389	S-112	S-109	15	310.00	0.070	4.217	0.233	Free Surface	13.021	0.428	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	4.217	0.233	Free Surface	7.334	0.681	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	4.217	0.233	Free Surface	7.311	0.683	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	4.217	0.233	Free Surface	9.522	0.546	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	4.402	0.261	Pressurized	8.671	1.000	2.887	2.632	15	7.398	0.702	$48,470
399	S-104	S-103	18	501.82	0.012	4.402	0.261	Free Surface	6.827	0.551	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	4.402	0.261	Free Surface	6.812	0.552	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	4.402	0.261	Free Surface	9.510	0.425	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	4.402	0.261	Free Surface	8.284	0.473	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	4.402	0.261	Pressurized	5.716	0.639	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	4.402	0.261	Pressurized	5.626	0.647	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	5.363	0.409	Pressurized	8.410	0.546	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	5.363	0.409	Pressurized	4.696	1.000	3.217	2.934	24	3.771	0.660	$14,570
415	S-96	S-95	18	116.00	0.003	5.363	0.409	Pressurized	4.696	1.000	3.947	3.599	21	4.335	0.742	$17,400
417	S-95	S-94	18	220.95	0.003	5.363	0.409	Pressurized	4.696	1.000	3.966	3.617	21	4.353	0.739	$33,143
419	S-94	S-93	18	386.14	0.003	5.465	0.425	Pressurized	4.785	1.000	3.965	3.616	24	4.460	0.582	$59,852
421	S-93	S-92	18	213.63	0.003	5.465	0.425	Pressurized	4.785	1.000	3.979	3.629	21	4.375	0.749	$32,045
423	S-92	S-91	18	226.18	0.003	5.465	0.425	Pressurized	4.785	1.000	3.564	3.250	24	4.105	0.624	$35,058
425	S-91	S-90	27	65.74	0.002	5.542	0.437	Pressurized	3.432	0.602	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	5.542	0.437	Pressurized	3.481	0.501	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	5.542	0.437	Pressurized	4.852	1.000	2.856	2.604	24	3.430	0.742	$16,731
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	5.542	0.437	Pressurized	4.852	1.000	2.946	2.686	24	3.522	0.724	$36,422
432	S88A	S-87	18	282.74	0.001	5.542	0.437	Pressurized	4.852	1.000	2.496	2.276	27	3.143	0.648	$45,238
433	S-87	S-86	18	239.17	0.002	5.542	0.437	Pressurized	4.852	1.000	2.953	2.693	24	3.527	0.723	$37,071
435	S-86	S-85	18	303.02	0.002	5.542	0.437	Pressurized	4.852	1.000	2.952	2.692	24	3.527	0.723	$46,968
437	S-85	S-84	18	296.01	0.002	5.542	0.437	Pressurized	4.852	1.000	2.934	2.676	24	3.507	0.727	$45,882
439	S-84	S-83	18	300.28	0.002	5.542	0.437	Pressurized	4.852	1.000	2.940	2.681	24	3.517	0.725	$46,543
441	S-83	S-82	18	361.66	0.002	5.542	0.437	Pressurized	4.852	1.000	2.952	2.692	24	3.527	0.723	$56,057
443	S-82	S-81	18	118.63	0.002	5.736	0.466	Pressurized	5.022	1.000	2.931	2.673	24	3.521	0.748	$18,388
445	S-81	S-80	18	315.60	0.002	5.736	0.466	Pressurized	5.022	1.000	2.943	2.684	24	3.535	0.745	$48,918
447	S-80	S-79	18	382.07	0.002	5.736	0.466	Pressurized	5.022	1.000	2.934	2.676	24	3.526	0.747	$59,221
449	S-79	S-78	18	358.51	0.001	5.736	0.466	Pressurized	5.022	1.000	2.593	2.364	27	3.264	0.646	$57,362
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	5.736	0.466	Pressurized	5.022	1.000	2.939	2.680	24	3.530	0.746	$48,227
453	S-77	S-76	18	207.87	0.002	5.736	0.466	Pressurized	5.022	1.000	2.986	2.723	24	3.579	0.736	$32,220
455	S-76	S-75	18	413.60	0.002	5.736	0.466	Pressurized	5.022	1.000	2.994	2.730	24	3.589	0.734	$64,108
457	S-75	S-74	18	254.25	0.002	5.736	0.466	Pressurized	5.022	1.000	2.988	2.725	24	3.584	0.735	$39,409

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	5.736	0.466	Pressurized	5.022	1.000	2.598	2.369	27	3.270	0.646	$49,438
461	S-73	S-72	18	473.94	0.002	5.736	0.466	Pressurized	5.022	1.000	2.983	2.720	24	3.579	0.736	$73,461
463	S-72	S-71	18	298.55	0.002	5.861	0.486	Pressurized	5.131	1.000	3.273	2.984	24	3.883	0.696	$46,275
465	S-71	S-70	18	214.36	0.002	5.861	0.486	Pressurized	5.131	1.000	3.255	2.968	24	3.865	0.699	$33,226
467	S-70	S-69	18	340.00	0.003	5.861	0.486	Pressurized	5.131	1.000	3.560	3.246	24	4.160	0.655	$52,700
469	S-69	S-69A	18	116.00	0.002	5.861	0.486	Pressurized	5.131	1.000	3.284	2.995	24	3.895	0.694	$17,980
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	5.861	0.486	Free Surface	2.812	0.756	6.373	5.812	30	2.873	0.613	$40,460
475	S-67	S-65	27	150.92	0.001	5.861	0.486	Free Surface	2.798	0.760	6.327	5.770	30	2.857	0.616	$25,656
477	S-65	S-64	27	103.14	0.001	5.861	0.486	Free Surface	2.765	0.769	6.249	5.699	30	2.830	0.621	$17,534
479	S-64	S-63	27	132.00	0.001	5.861	0.486	Free Surface	2.783	0.764	6.298	5.744	30	2.846	0.618	$22,440
481	S-63	S-62	27	292.00	0.001	5.861	0.486	Free Surface	2.794	0.761	6.325	5.768	30	2.857	0.616	$49,640
483	S-62	S-62A	27	53.00	0.001	5.861	0.486	Free Surface	2.727	0.779	6.165	5.621	30	2.799	0.627	$9,010
485	S-61	S-60	27	244.11	0.001	5.982	0.504	Free Surface	2.788	0.778	6.293	5.739	30	2.857	0.627	$41,499
487	S-60	S-59	27	179.00	0.014	5.982	0.504	Free Surface	7.746	0.341	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	5.982	0.504	Free Surface	3.528	0.627	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	5.982	0.504	Free Surface	3.627	0.612	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	5.982	0.504	Free Surface	3.655	0.608	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	5.982	0.504	Free Surface	3.617	0.614	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	6.307	0.554	Free Surface	3.712	0.628	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	7.711	0.593	Pressurized	3.797	1.000	7.581	6.913	27	4.426	0.642	$77,782
503	S-33	S-32	24	179.87	0.003	7.711	0.593	Free Surface	4.727	0.749	8.467	7.721				
505	S-32	S-31	24	272.57	0.003	8.091	0.652	Free Surface	4.725	0.786	8.424	7.682	27	4.860	0.617	$43,611
507	S-31	S-30	24	315.87	0.003	8.091	0.652	Free Surface	4.632	0.803	8.249	7.522	27	4.780	0.626	$50,539
509	S-30	S-29	15	396.46	0.035	8.091	0.652	Pressurized	10.202	1.000	7.881	7.186	18	11.874	0.576	$55,504
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	8.091	0.652	Pressurized	10.202	1.000	7.610	6.940	18	11.542	0.590	$63,708
513	S-28	S-27	15	136.69	0.029	8.091	0.652	Pressurized	10.202	1.000	7.179	6.546	18	11.039	0.612	$19,137
515	S-27	S-26	24	160.65	0.003	8.091	0.652	Free Surface	4.844	0.767	8.656	7.893	27	4.962	0.606	$25,704
517	S-26	S-25	24	132.87	0.004	8.091	0.652	Free Surface	5.056	0.735	9.083	8.282				
519	S-25	S-24	24	286.68	0.004	8.091	0.652	Free Surface	5.014	0.741	8.998	8.205				
521	S-24	S-23	24	145.25	0.003	8.091	0.652	Free Surface	4.772	0.778	8.515	7.765	27	4.897	0.613	$23,240
523	S-23	S-22	15	419.03	0.040	8.091	0.652	Free Surface	12.082	0.787	8.409	7.668	18	12.467	0.554	$58,664
525	S-22	S-21	15	288.70	0.032	8.091	0.652	Pressurized	10.202	1.000	7.453	6.796	18	11.361	0.598	$40,418
527	S-21	S-20	18	179.30	0.022	8.091	0.652	Free Surface	9.757	0.682	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	9.561	0.878	Free Surface	8.005	0.402	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	9.561	0.878	Free Surface	8.077	0.400	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	9.561	0.878	Free Surface	6.565	0.468	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	9.561	0.878	Free Surface	9.694	0.349	36.508	33.291				

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
537	S-16	S-14	36	177.00	0.005	9.561	0.878	Free Surface	6.025	0.379	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	9.796	0.914	Free Surface	17.001	0.237	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	10.422	0.973	Free Surface	7.315	0.460	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	10.597	1.000	Free Surface	6.024	0.809	10.719	9.775	27	6.215	0.630	$76,320
545	S-7	S-6	24	263.00	0.006	10.597	1.000	Free Surface	6.549	0.743	11.748	10.713				
547	S-6	S-5	30	343.00	0.004	10.597	1.000	Free Surface	5.367	0.597	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	10.597	1.000	Free Surface	5.377	0.596	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	11.263	1.103	Free Surface	5.284	0.637	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.720	0.000	Free Surface	1.964	0.357	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.720	0.000	Free Surface	1.857	0.373	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.720	0.000	Free Surface	1.845	0.374	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.720	0.000	Free Surface	0.942	0.635	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.720	0.000	Free Surface	2.104	0.340	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.720	0.000	Free Surface	2.150	0.334	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.720	0.000	Free Surface	1.960	0.358	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.720	0.000	Free Surface	1.973	0.356	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.720	0.000	Free Surface	1.977	0.356	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.720	0.000	Free Surface	1.960	0.358	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.720	0.000	Free Surface	1.236	0.508	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.720	0.000	Free Surface	2.552	0.295	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.720	0.000	Free Surface	2.843	0.273	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.720	0.000	Free Surface	1.496	0.438	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.720	0.000	Free Surface	2.643	0.288	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.720	0.000	Free Surface	2.750	0.280	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.720	0.000	Free Surface	2.009	0.352	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.720	0.000	Free Surface	3.023	0.262	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.720	0.000	Free Surface	5.297	0.177	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.374	0.034	Free Surface	3.313	0.258	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.374	0.034	Free Surface	3.036	0.274	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.374	0.034	Free Surface	1.818	0.399	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

LOAPUD SOI 2030 PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	0.625	0.060	Free Surface	9.187	0.342	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	9.561	0.878	Free Surface	4.085	0.691	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	9.561	0.878	Free Surface	4.354	0.653	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	9.561	0.878	Free Surface	4.066	0.694	11.541	10.524				
780	S-58A	S-58	27	394.00	0.002	5.982	0.504	Free Surface	3.528	0.627	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	5.982	0.504	Free Surface	3.644	0.610	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	5.982	0.504	Free Surface	3.662	0.607	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	5.982	0.504	Free Surface	3.627	0.612	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	6.307	0.554	Free Surface	3.679	0.633	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	6.337	0.559	Free Surface	3.717	0.630	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	6.337	0.559	Free Surface	3.664	0.638	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	6.337	0.559	Free Surface	3.690	0.634	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	6.337	0.559	Free Surface	3.850	0.611	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	6.337	0.559	Free Surface	5.932	0.434	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	6.337	0.559	Free Surface	10.513	0.285	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	6.337	0.559	Free Surface	14.723	0.224	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	5.982	0.504	Free Surface	2.798	0.775	6.324	5.767	30	2.868	0.625	$71,910
808	S-69A	S-68	27	70.00	0.002	5.861	0.486	Free Surface	3.920	0.564	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	4.217	0.233	Free Surface	11.428	0.473	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	4.154	0.223	Free Surface	10.196	0.511	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.682	0.000	Free Surface	6.594	0.502	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.426	0.066	Free Surface	1.798	0.637	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.386	0.139	Free Surface	4.750	0.771	1.471	1.341	12	4.885	0.546	$11,088
98	Z20	Z22	24	505.68	0.003	1.374	0.034	Free Surface	3.097	0.271	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0.058	0.009	Free Surface	5.812	0.09	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	0.381	0.059	Free Surface	11.743	0.201	4.289	3.911				

APPENDIX C3

**FLOWS WITHIN SPHERE OF INFLUENCE
BUILDOUT PWWF**

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.599	0.092	Free Surface	6.776	0.657	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.239	0.037	Free Surface	14.975	0.183	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.265	0.041	Free Surface	4.666	0.300	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.126	0.019	Free Surface	4.379	0.185	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.804	0.124	Free Surface	2.717	0.565	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.804	0.124	Free Surface	2.849	0.544	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.804	0.124	Free Surface	2.803	0.551	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.804	0.124	Free Surface	4.544	0.380	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.804	0.124	Free Surface	4.608	0.376	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.804	0.124	Free Surface	2.763	0.558	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.804	0.124	Free Surface	2.806	0.551	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.804	0.124	Free Surface	3.418	0.471	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.804	0.124	Free Surface	3.842	0.431	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.804	0.124	Free Surface	3.342	0.479	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.804	0.124	Free Surface	3.036	0.517	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.804	0.124	Free Surface	3.076	0.512	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.804	0.124	Free Surface	3.503	0.462	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	20.124	2.102	Free Surface	27.906	0.278	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.804	0.124	Free Surface	7.038	0.276	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.804	0.124	Pressurized	2.487	0.608	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Pressurized	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	3.492	0.537	Pressurized	9.905	1.000	3.269	2.981	12	11.173	0.591	$2,000
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Pressurized	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.682	0.000	Free Surface	5.508	0.580	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.682	0.000	Free Surface	4.954	0.634	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.682	0.000	Free Surface	8.895	0.399	5.011	4.569				

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.682	0.000	Free Surface	10.588	0.351	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.682	0.000	Free Surface	10.061	0.364	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.682	0.000	Free Surface	9.156	0.391	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.682	0.000	Free Surface	9.953	0.367	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.682	0.000	Free Surface	8.176	0.425	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.682	0.000	Free Surface	4.585	0.679	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.682	0.000	Free Surface	7.696	0.445	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.682	0.000	Free Surface	8.127	0.427	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	2.841	0.178	Pressurized	9.438	0.573	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	3.633	0.178	Pressurized	7.157	1.000	0.796	0.726	24	2.706	0.628	$24,800
239	S-185	S-184	18	354.41	0.007	3.633	0.178	Pressurized	5.409	0.569	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	3.633	0.178	Pressurized	3.631	0.818	3.640	3.319	21	3.777	0.594	$25,710
243	S-183	S-182	18	215.46	0.003	3.633	0.178	Pressurized	3.181	1.000	3.470	3.165	21	3.634	0.613	$32,319
245	S-182	S-181	18	150.81	0.003	3.820	0.178	Pressurized	3.345	1.000	3.462	3.157	21	3.670	0.635	$22,622
247	S-181	S-180	18	248.09	0.003	3.820	0.178	Pressurized	3.345	1.000	3.511	3.202	21	3.710	0.629	$37,214
249	S-180	S-179	18	404.10	0.002	3.820	0.178	Pressurized	3.345	1.000	3.335	3.041	21	3.563	0.651	$60,615
251	S-179	S-178	18	221.42	0.002	3.820	0.178	Pressurized	3.345	1.000	3.235	2.950	21	3.473	0.666	$33,213
253	S-178	S-177	18	80.58	0.002	3.820	0.178	Pressurized	3.345	1.000	3.391	3.093	21	3.606	0.645	$12,087
255	S-177	S-176	18	142.02	0.002	3.820	0.178	Pressurized	3.345	1.000	3.379	3.082	21	3.600	0.646	$21,303
257	S-176	S-175	18	311.66	0.002	3.820	0.178	Pressurized	3.345	1.000	3.339	3.045	21	3.563	0.651	$46,749
259	S-175	S-174	18	100.00	0.003	3.820	0.178	Pressurized	3.345	1.000	3.471	3.165	21	3.677	0.634	$15,000
261	S-174	S-173	18	161.32	0.003	3.820	0.178	Pressurized	3.345	1.000	3.514	3.205	21	3.710	0.629	$24,198
263	S-173	S-172	18	273.50	0.002	3.820	0.178	Pressurized	3.345	1.000	3.293	3.003	21	3.526	0.657	$41,025
265	S-172	S-171	18	160.10	0.002	3.820	0.178	Pressurized	3.345	1.000	3.403	3.103	21	3.619	0.643	$24,015
269	S-171	S-169	18	414.77	0.004	3.820	0.178	Pressurized	4.082	0.764	4.107	3.745	21	4.192	0.568	$62,216
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.820	0.178	Pressurized	4.071	0.766	4.090	3.729	21	4.179	0.569	$30,752
273	S-168	S-167	18	260.82	0.004	3.820	0.178	Pressurized	4.066	0.767	4.087	3.727	21	4.179	0.569	$39,123
275	S-167	S-166	18	125.00	0.010	3.820	0.178	Pressurized	6.182	0.532	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.820	0.178	Pressurized	3.345	1.000	3.414	3.113	21	3.625	0.642	$38,171
279	S-165	S-164	18	124.36	0.002	3.820	0.178	Pressurized	3.345	1.000	3.343	3.049	21	3.569	0.650	$18,654
281	S-164	S-163	18	250.67	0.003	3.820	0.178	Pressurized	3.345	1.000	3.519	3.209	21	3.717	0.628	$37,601
283	S-163	S-162	18	327.00	0.003	5.265	0.401	Pressurized	4.610	1.000	3.409	3.108	24	3.930	0.627	$50,685
285	S-162	S-161	18	351.00	0.002	5.265	0.401	Pressurized	4.610	1.000	3.389	3.090	24	3.915	0.629	$54,405
287	S-161	S-160	18	329.00	0.002	5.265	0.401	Pressurized	4.610	1.000	3.398	3.099	24	3.922	0.628	$50,995
289	S-160	S-159	18	416.00	0.003	5.265	0.401	Pressurized	4.610	1.000	3.532	3.221	24	4.044	0.612	$64,480
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	5.265	0.401	Pressurized	4.610	1.000	3.511	3.202	24	4.025	0.614	$34,953
293	S-158	S-157	18	199.50	0.003	5.265	0.401	Pressurized	4.610	1.000	3.702	3.376	24	4.196	0.593	$30,923
295	S-157	S-156	18	391.00	0.003	5.265	0.401	Pressurized	4.610	1.000	3.477	3.170	24	3.995	0.618	$60,605
297	S-156	S-155	18	155.00	0.004	5.265	0.401	Pressurized	4.610	1.000	4.270	3.894	21	4.621	0.688	$23,250

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	5.265	0.401	Free Surface	6.604	0.658	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	5.452	0.401	Pressurized	4.774	1.000	3.761	3.430	24	4.281	0.601	$35,030
303	S-153	S-152	18	230.00	0.013	5.452	0.401	Free Surface	7.411	0.614	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	5.452	0.401	Free Surface	12.371	0.811	5.511	5.025	15	12.869	0.527	$22,200
307	S-151	S-150	12	200.00	0.076	5.452	0.401	Free Surface	14.064	0.714	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	5.452	0.401	Pressurized	10.741	1.000	5.328	4.858	15	12.548	0.538	$24,000
311	S-149	S-148	12	265.00	0.031	5.452	0.401	Pressurized	10.741	1.000	4.049	3.692	15	10.141	0.642	$31,800
313	S-148	S-147	12	309.01	0.061	5.452	0.401	Free Surface	12.846	0.779	5.725	5.221	15	13.254	0.515	$37,081
315	S-147	S-145	12	181.82	0.080	5.452	0.401	Free Surface	14.406	0.698	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	5.519	0.411	Free Surface	16.432	0.628	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	5.519	0.411	Pressurized	13.184	0.769	5.887	5.368	15	13.580	0.510	$3,931
323	S-143	S-142	12	395.00	0.005	5.519	0.411	Pressurized	10.873	1.000	1.635	1.491	21	5.147	0.651	$59,250
325	S-142	S-141	12	239.00	0.085	5.519	0.411	Free Surface	14.787	0.689	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	5.519	0.411	Pressurized	10.873	1.000	4.903	4.471	15	11.810	0.570	$30,600
329	S-140	S-139	12	250.00	0.042	5.519	0.411	Pressurized	10.873	1.000	4.756	4.337	15	11.533	0.582	$30,000
331	S-139	S-138	12	405.07	0.037	5.519	0.411	Pressurized	10.873	1.000	4.456	4.064	15	10.967	0.606	$48,608
333	S-138	S-137	18	265.59	0.034	5.547	0.415	Free Surface	10.624	0.466	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	5.547	0.415	Pressurized	4.856	1.000	4.561	4.159	21	4.922	0.681	$21,389
337	S-136	S-135	18	247.83	0.005	5.547	0.415	Pressurized	4.856	1.000	4.617	4.210	21	4.970	0.675	$37,175
339	S-135	S-134	18	194.99	0.066	5.547	0.415	Free Surface	13.568	0.387	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	5.547	0.415	Free Surface	10.315	0.477	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	5.547	0.415	Free Surface	9.134	0.525	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	5.547	0.415	Free Surface	13.048	0.399	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	5.600	0.423	Pressurized	4.903	1.000	4.640	4.231	21	5.001	0.677	$35,508
349	S-130	S-129	18	141.82	0.005	5.600	0.423	Pressurized	4.903	1.000	4.748	4.330	21	5.100	0.665	$21,273
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	5.600	0.423	Pressurized	6.429	0.713	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	5.600	0.423	Pressurized	4.903	1.000	3.669	3.345	24	4.222	0.622	$19,211
355	S-127	S-126	18	131.40	0.005	5.600	0.423	Pressurized	4.903	1.000	4.676	4.264	21	5.034	0.673	$19,710
357	S-126	S-125	18	349.97	0.004	5.600	0.423	Pressurized	4.903	1.000	4.412	4.023	21	4.795	0.703	$52,496
359	S-125	S-123	18	389.66	0.004	5.600	0.423	Pressurized	4.903	1.000	4.321	3.940	21	4.716	0.714	$58,449
363	S-123	S-122	12	289.06	0.033	5.600	0.423	Pressurized	11.032	1.000	4.212	3.841	15	10.527	0.636	$34,687
365	S-122	S-121	12	309.56	0.037	5.600	0.423	Pressurized	11.032	1.000	4.467	4.074	15	11.022	0.611	$37,147
367	S-121	S-120	12	430.79	0.082	5.600	0.423	Free Surface	14.639	0.705	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	5.600	0.423	Free Surface	14.795	0.698	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	5.600	0.423	Free Surface	15.620	0.665	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	6.415	0.549	Free Surface	15.563	0.757	6.964	6.351	15	15.977	0.505	$54,536
375	S-117	S-116	15	216.00	0.016	6.415	0.549	Pressurized	8.088	1.000	5.229	4.768	18	8.185	0.648	$30,240
377	S-116	S-115A	15	260.00	0.061	6.415	0.549	Free Surface	13.755	0.569	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	6.415	0.549	Free Surface	11.229	0.677	8.011	7.305				

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	6.478	0.558	Free Surface	11.583	0.664	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	6.478	0.558	Pressurized	8.167	1.000	3.750	3.420	21	6.408	0.619	$61,298
389	S-112	S-109	15	310.00	0.070	6.478	0.558	Free Surface	14.514	0.549	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	6.478	0.558	Pressurized	8.167	1.000	5.228	4.767	18	8.195	0.653	$49,820
393	S-108	S-108A	15	324.25	0.015	6.478	0.558	Pressurized	8.167	1.000	5.203	4.745	18	8.167	0.655	$45,395
395	S-106	S-105	15	345.00	0.030	6.478	0.558	Free Surface	10.391	0.733	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	7.648	0.738	Pressurized	15.065	1.000	2.887	2.632	18	8.437	0.740	$56,549
399	S-104	S-103	18	501.82	0.012	7.648	0.738	Pressurized	6.696	1.000	7.493	6.833	21	7.813	0.603	$75,273
401	S-103	S-102	18	497.81	0.012	7.648	0.738	Pressurized	6.696	1.000	7.473	6.815	21	7.798	0.604	$74,672
403	S-102	S-101	18	478.13	0.030	7.648	0.738	Free Surface	10.920	0.589	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	7.648	0.738	Free Surface	9.403	0.670	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	7.648	0.738	Pressurized	6.696	1.000	5.974	5.448	21	6.508	0.707	$42,845
409	S-99	S-98	18	230.00	0.007	7.648	0.738	Pressurized	6.696	1.000	5.852	5.337	21	6.394	0.719	$34,500
411	S-98	S-97	18	215.67	0.019	8.976	0.943	Pressurized	9.241	0.793	9.265	8.448	21	9.540	0.583	$32,351
413	S-97	S-96	18	94.00	0.002	8.976	0.943	Pressurized	7.859	1.000	3.217	2.934	30	4.303	0.625	$15,980
415	S-96	S-95	18	116.00	0.003	8.976	0.943	Pressurized	7.859	1.000	3.947	3.599	27	4.995	0.659	$18,560
417	S-95	S-94	18	220.95	0.003	8.976	0.943	Pressurized	7.859	1.000	3.966	3.617	27	5.016	0.657	$35,352
419	S-94	S-93	18	386.14	0.003	9.082	0.959	Pressurized	7.952	1.000	3.965	3.616	27	5.029	0.662	$61,782
421	S-93	S-92	18	213.63	0.003	9.082	0.959	Pressurized	7.952	1.000	3.979	3.629	27	5.038	0.661	$34,181
423	S-92	S-91	18	226.18	0.003	9.082	0.959	Pressurized	7.952	1.000	3.564	3.250	27	4.600	0.718	$36,189
425	S-91	S-90	27	65.74	0.002	9.284	0.990	Pressurized	3.613	1.000	8.210	7.486	30	3.849	0.711	$11,176
427	S-90	S-89	30	151.18	0.002	9.284	0.990	Pressurized	3.895	0.703	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	9.284	0.990	Pressurized	8.129	1.000	2.856	2.604	30	3.931	0.697	$18,350
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	9.284	0.990	Pressurized	8.129	1.000	2.946	2.686	30	4.037	0.681	$39,947
432	S88A	S-87	18	282.74	0.001	9.284	0.990	Pressurized	8.129	1.000	2.496	2.276	36	3.608	0.550	$52,307
433	S-87	S-86	18	239.17	0.002	9.284	0.990	Pressurized	8.129	1.000	2.953	2.693	30	4.043	0.680	$40,659
435	S-86	S-85	18	303.02	0.002	9.284	0.990	Pressurized	8.129	1.000	2.952	2.692	30	4.043	0.680	$51,513
437	S-85	S-84	18	296.01	0.002	9.284	0.990	Pressurized	8.129	1.000	2.934	2.676	30	4.024	0.683	$50,322
439	S-84	S-83	18	300.28	0.002	9.284	0.990	Pressurized	8.129	1.000	2.940	2.681	30	4.030	0.682	$51,048
441	S-83	S-82	18	361.66	0.002	9.284	0.990	Pressurized	8.129	1.000	2.952	2.692	30	4.043	0.680	$61,482
443	S-82	S-81	18	118.63	0.002	10.066	1.110	Pressurized	8.814	1.000	2.931	2.673	30	4.071	0.728	$20,167
445	S-81	S-80	18	315.60	0.002	10.066	1.110	Pressurized	8.814	1.000	2.943	2.684	30	4.083	0.726	$53,652
447	S-80	S-79	18	382.07	0.002	10.066	1.110	Pressurized	8.814	1.000	2.934	2.676	30	4.077	0.727	$64,952
449	S-79	S-78	18	358.51	0.001	10.066	1.110	Pressurized	8.814	1.000	2.593	2.364	36	3.783	0.565	$66,324
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	10.066	1.110	Pressurized	8.814	1.000	2.939	2.680	30	4.077	0.727	$52,894
453	S-77	S-76	18	207.87	0.002	10.066	1.110	Pressurized	8.814	1.000	2.986	2.723	30	4.136	0.717	$35,338
455	S-76	S-75	18	413.60	0.002	10.066	1.110	Pressurized	8.814	1.000	2.994	2.730	30	4.142	0.716	$70,312
457	S-75	S-74	18	254.25	0.002	10.066	1.110	Pressurized	8.814	1.000	2.988	2.725	30	4.136	0.717	$43,223

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	10.066	1.110	Pressurized	8.814	1.000	2.598	2.369	36	3.787	0.564	$57,163
461	S-73	S-72	18	473.94	0.002	10.066	1.110	Pressurized	8.814	1.000	2.983	2.720	30	4.130	0.718	$80,570
463	S-72	S-71	18	298.55	0.002	10.496	1.177	Pressurized	9.190	1.000	3.273	2.984	30	4.499	0.689	$50,754
465	S-71	S-70	18	214.36	0.002	10.496	1.177	Pressurized	9.190	1.000	3.255	2.968	30	4.478	0.692	$36,441
467	S-70	S-69	18	340.00	0.003	10.496	1.177	Pressurized	9.190	1.000	3.560	3.246	30	4.813	0.649	$57,800
469	S-69	S-69A	18	116.00	0.002	10.496	1.177	Pressurized	9.190	1.000	3.284	2.995	30	4.506	0.688	$19,720
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	10.496	1.177	Pressurized	4.085	1.000	6.373	5.812	36	3.308	0.655	$44,030
475	S-67	S-65	27	150.92	0.001	10.496	1.177	Pressurized	4.085	1.000	6.327	5.770	36	3.291	0.658	$27,920
477	S-65	S-64	27	103.14	0.001	10.496	1.177	Pressurized	4.085	1.000	6.249	5.699	36	3.259	0.664	$19,081
479	S-64	S-63	27	132.00	0.001	10.496	1.177	Pressurized	4.085	1.000	6.298	5.744	36	3.280	0.660	$24,420
481	S-63	S-62	27	292.00	0.001	10.496	1.177	Pressurized	4.085	1.000	6.325	5.768	36	3.291	0.658	$54,020
483	S-62	S-62A	27	53.00	0.001	10.496	1.177	Pressurized	4.085	1.000	6.165	5.621	36	3.221	0.671	$9,805
485	S-61	S-60	27	244.11	0.001	10.681	1.205	Pressurized	4.156	1.000	6.293	5.739	36	3.288	0.669	$45,160
487	S-60	S-59	27	179.00	0.014	10.681	1.205	Pressurized	9.055	0.468	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.342	7.607	36	4.101	0.555	$35,335
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.637	7.876	36	4.210	0.543	$4,995
493	S-57	S-56	27	318.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.718	7.950	36	4.244	0.540	$58,830
495	S-56	S56A	27	506.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.604	7.846	36	4.201	0.544	$93,610
497	S-55	S-55A	27	340.00	0.002	11.137	1.275	Pressurized	4.334	1.000	8.775	8.002	36	4.309	0.552	$62,900
501	S-34	S-33	24	486.14	0.003	13.985	1.317	Pressurized	6.888	1.000	7.581	6.913	36	5.163	0.573	$89,936
503	S-33	S-32	24	179.87	0.003	13.985	1.317	Pressurized	6.888	1.000	8.467	7.721	30	5.487	0.749	$30,578
505	S-32	S-31	24	272.57	0.003	14.366	1.375	Pressurized	7.075	1.000	8.424	7.682	36	5.632	0.546	$50,425
507	S-31	S-30	24	315.87	0.003	14.366	1.375	Pressurized	7.075	1.000	8.249	7.522	36	5.546	0.553	$58,436
509	S-30	S-29	15	396.46	0.035	14.366	1.375	Pressurized	18.113	1.000	7.881	7.186	21	13.621	0.642	$59,469
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	14.366	1.375	Pressurized	18.113	1.000	7.610	6.940	21	13.239	0.658	$68,259
513	S-28	S-27	15	136.69	0.029	14.366	1.375	Pressurized	18.113	1.000	7.179	6.546	21	12.627	0.687	$20,504
515	S-27	S-26	24	160.65	0.003	14.366	1.375	Pressurized	7.075	1.000	8.656	7.893	36	5.753	0.537	$29,720
517	S-26	S-25	24	132.87	0.004	14.366	1.375	Pressurized	7.075	1.000	9.083	8.282	30	5.852	0.723	$22,588
519	S-25	S-24	24	286.68	0.004	14.366	1.375	Pressurized	7.075	1.000	8.998	8.205	30	5.802	0.729	$48,736
521	S-24	S-23	24	145.25	0.003	14.366	1.375	Pressurized	7.075	1.000	8.515	7.765	36	5.682	0.542	$26,871
523	S-23	S-22	15	419.03	0.040	14.366	1.375	Pressurized	18.113	1.000	8.409	7.668	21	14.345	0.614	$62,855
525	S-22	S-21	15	288.70	0.032	14.366	1.375	Pressurized	18.113	1.000	7.453	6.796	21	13.020	0.668	$43,305
527	S-21	S-20	18	179.30	0.022	14.366	1.375	Pressurized	12.578	1.000	10.014	9.131	24	11.369	0.597	$27,792
529	S-20	S-19	30	184.00	0.011	17.604	1.874	Free Surface	9.339	0.574	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	17.604	1.874	Free Surface	9.436	0.569	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	17.604	1.874	Free Surface	7.546	0.689	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	17.604	1.874	Pressurized	11.409	0.489	36.508	33.291				

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
537	S-16	S-14	36	177.00	0.005	17.604	1.874	Free Surface	7.058	0.536	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	17.840	1.910	Pressurized	20.186	0.322	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	19.264	1.969	Pressurized	8.430	0.677	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	19.455	1.999	Pressurized	9.581	1.000	10.719	9.775	36	7.273	0.567	$88,245
545	S-7	S-6	24	263.00	0.006	19.455	1.999	Pressurized	9.581	1.000	11.748	10.713	36	7.800	0.536	$48,655
547	S-6	S-5	30	343.00	0.004	19.455	1.999	Pressurized	6.132	1.000	15.918	14.515	36	6.217	0.647	$63,455
549	S-5	S-4A	30	369.00	0.004	19.455	1.999	Pressurized	6.132	1.000	15.958	14.552	36	6.233	0.646	$68,265
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	20.124	2.102	Pressurized	6.343	1.000	15.347	13.994	36	6.076	0.681	$55,500
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Pressurized	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Pressurized	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	2.146	0.000	Free Surface	2.571	0.686	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	2.146	0.000	Free Surface	2.407	0.729	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	2.146	0.000	Pressurized	2.387	0.734	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	2.146	0.000	Pressurized	1.879	1.000	0.984	0.898	27	1.236	0.640	$15,299
641	Z5	Z6	18	93.95	0.002	2.146	0.000	Free Surface	2.776	0.641	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	2.146	0.000	Free Surface	2.842	0.628	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	2.146	0.000	Free Surface	2.563	0.688	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	2.146	0.000	Free Surface	2.583	0.683	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	2.146	0.000	Free Surface	2.587	0.682	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	2.146	0.000	Free Surface	2.563	0.688	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	2.146	0.000	Pressurized	1.879	1.000	1.403	1.279	24	1.616	0.622	$18,245
655	Z12	Z13	18	113.00	0.003	2.146	0.000	Pressurized	3.418	0.539	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	2.146	0.000	Free Surface	3.829	0.493	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	2.146	0.000	Pressurized	1.879	1.000	1.814	1.654	21	1.948	0.667	$67,619
661	Z15	Z16	18	254.79	0.003	2.146	0.000	Free Surface	3.550	0.523	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	2.146	0.000	Free Surface	3.702	0.506	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	2.146	0.000	Free Surface	2.634	0.671	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	2.146	0.000	Free Surface	4.082	0.469	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	2.146	0.000	Free Surface	7.271	0.305	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Pressurized	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Pressurized	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Pressurized	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	2.812	0.036	Pressurized	4.054	0.374	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	2.812	0.036	Pressurized	3.709	0.400	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	2.812	0.036	Pressurized	2.175	0.608	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

LOAPUD SOI Buildout PWWF (based on additional flows shown on Figure 5)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	1.424	0.060	Pressurized	11.409	0.542	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	17.604	1.874	Pressurized	5.549	1.000	11.608	10.586	48	4.826	0.460	$81,480
776	S-17.2	S-17.3	30	130.00	0.002	17.604	1.874	Pressurized	5.549	1.000	12.555	11.448	36	5.023	0.717	$24,050
778	S-17.1	S-17.2	30	244.00	0.002	17.604	1.874	Pressurized	5.549	1.000	11.541	10.524	48	4.807	0.461	$51,240
780	S-58A	S-58	27	394.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.338	7.603	36	4.101	0.555	$72,890
782	S-57A	S-57	27	283.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.686	7.920	36	4.229	0.542	$52,355
784	S56A	S-56B	27	401.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.737	7.968	36	4.248	0.540	$74,185
786	S-56B	S-55	27	292.00	0.002	10.681	1.205	Pressurized	4.156	1.000	8.631	7.870	36	4.210	0.543	$54,020
788	S-55A	S-55B	27	370.00	0.002	11.137	1.275	Pressurized	4.334	1.000	8.667	7.903	36	4.262	0.557	$68,450
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	11.173	1.281	Pressurized	4.348	1.000	8.769	7.997	36	4.304	0.554	$20,350
792	S-55C	S-55D	27	548.00	0.002	11.173	1.281	Pressurized	4.348	1.000	8.616	7.857	36	4.248	0.560	$101,380
794	S-55D	S-55E	27	310.00	0.002	11.173	1.281	Pressurized	4.348	1.000	8.681	7.916	36	4.276	0.557	$57,350
796	S-55E	S-55F	27	479.00	0.002	11.173	1.281	Pressurized	4.348	1.000	9.170	8.362	36	4.459	0.538	$88,615
798	S-55F	S-55G	27	250.00	0.007	11.173	1.281	Free Surface	6.813	0.609	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	11.173	1.281	Free Surface	12.324	0.383	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	11.173	1.281	Free Surface	17.344	0.299	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	10.681	1.205	Pressurized	4.156	1.000	6.324	5.767	36	3.299	0.667	$78,255
808	S-69A	S-68	27	70.00	0.002	10.496	1.177	Pressurized	4.085	1.000	9.595	8.750	30	4.478	0.692	$11,900
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	6.478	0.558	Free Surface	12.654	0.615	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	6.415	0.549	Free Surface	11.229	0.677	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.682	0.000	Free Surface	6.594	0.502	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.426	0.066	Free Surface	1.798	0.637	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.386	0.139	Free Surface	4.750	0.771	1.471	1.341	12	4.885	0.546	$11,088
98	Z20	Z22	24	505.68	0.003	2.812	0.036	Pressurized	3.783	0.394	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0.29	0.045	Free Surface	9.396	0.195	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	1.687	0.26	Free Surface	17.879	0.436	4.289	3.911				

APPENDIX D

FLOWS WITHIN MASTERPLAN STUDY AREA

APPENDIX D1

FLOWS WITHIN MASTERPLAN STUDY AREA
2020 PWWF

LOAPUD MSA 2020 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.591	0.091	Free Surface	6.759	0.650	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.149	0.023	Free Surface	13.023	0.146	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.039	0.006	Free Surface	2.650	0.116	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.116	0.018	Free Surface	4.276	0.178	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	0.770	0.118	Free Surface	2.687	0.551	1.312	1.197				
133	O45	O44	12	237.30	0.004	0.770	0.118	Free Surface	2.821	0.530	1.398	1.275				
135	O44	O41	12	131.00	0.004	0.770	0.118	Free Surface	2.776	0.537	1.368	1.248				
137	O41	O40	12	216.00	0.013	0.770	0.118	Free Surface	4.492	0.371	2.624	2.393				
139	O40	O30	12	287.40	0.013	0.770	0.118	Free Surface	4.557	0.367	2.676	2.440				
141	O30	O29	12	138.98	0.003	0.770	0.118	Free Surface	2.735	0.543	1.343	1.224				
143	O29	O28	12	250.00	0.004	0.770	0.118	Free Surface	2.779	0.536	1.370	1.249				
145	O28	O24	12	196.00	0.006	0.770	0.118	Free Surface	3.378	0.460	1.780	1.623				
147	O24	O18	12	122.00	0.008	0.770	0.118	Free Surface	3.796	0.421	2.085	1.901				
149	O18	O17	12	225.00	0.006	0.770	0.118	Free Surface	3.305	0.468	1.728	1.576				
151	O17	O16	12	346.00	0.004	0.770	0.118	Free Surface	3.004	0.504	1.520	1.386				
153	O16	O10	12	268.00	0.004	0.770	0.118	Free Surface	3.042	0.499	1.545	1.409				
156	O10	O6	12	692.00	0.006	0.770	0.118	Free Surface	3.464	0.451	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	11.109	0.999	Free Surface	23.507	0.206	118.993	108.509				
161	O6	O1	12	500.13	0.043	0.770	0.118	Free Surface	6.946	0.271	4.814	4.390				
163	O1	S-98	12	268.00	0.003	0.770	0.118	Pressurized	2.462	0.592	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	0.892	0.137	Free Surface	7.895	0.357	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.649	0.000	Free Surface	5.478	0.573	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.649	0.000	Free Surface	4.931	0.626	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.649	0.000	Free Surface	8.843	0.395	5.011	4.569				

LOAPUD MSA 2020 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.649	0.000	Free Surface	10.529	0.347	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.649	0.000	Free Surface	10.008	0.360	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.649	0.000	Free Surface	9.098	0.387	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.649	0.000	Free Surface	9.899	0.363	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.649	0.000	Free Surface	8.126	0.421	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.649	0.000	Free Surface	4.569	0.669	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.649	0.000	Free Surface	7.655	0.440	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.649	0.000	Free Surface	8.077	0.423	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	2.079	0.066	Free Surface	8.755	0.475	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	2.871	0.066	Pressurized	5.655	1.000	0.796	0.726	21	2.535	0.684	$24,000
239	S-185	S-184	18	354.41	0.007	2.871	0.066	Free Surface	5.109	0.494	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	2.871	0.066	Free Surface	3.529	0.670	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	2.871	0.066	Free Surface	3.397	0.693	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	3.058	0.066	Free Surface	3.420	0.730	3.462	3.157				
247	S-181	S-180	18	248.09	0.003	3.058	0.066	Free Surface	3.465	0.722	3.511	3.202				
249	S-180	S-179	18	404.10	0.002	3.058	0.066	Free Surface	3.310	0.754	3.335	3.041	21	3.395	0.563	$60,615
251	S-179	S-178	18	221.42	0.002	3.058	0.066	Free Surface	3.222	0.774	3.235	2.950	21	3.314	0.574	$33,213
253	S-178	S-177	18	80.58	0.002	3.058	0.066	Free Surface	3.364	0.742	3.391	3.093				
255	S-177	S-176	18	142.02	0.002	3.058	0.066	Free Surface	3.350	0.745	3.379	3.082				
257	S-176	S-175	18	311.66	0.002	3.058	0.066	Free Surface	3.314	0.753	3.339	3.045	21	3.395	0.563	$46,749
259	S-175	S-174	18	100.00	0.003	3.058	0.066	Free Surface	3.430	0.729	3.471	3.165				
261	S-174	S-173	18	161.32	0.003	3.058	0.066	Free Surface	3.465	0.722	3.514	3.205				
263	S-173	S-172	18	273.50	0.002	3.058	0.066	Free Surface	3.276	0.762	3.293	3.003	21	3.359	0.567	$41,025
265	S-172	S-171	18	160.10	0.002	3.058	0.066	Free Surface	3.373	0.740	3.403	3.103				
269	S-171	S-169	18	414.77	0.004	3.058	0.066	Free Surface	3.943	0.643	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.058	0.066	Free Surface	3.929	0.645	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	3.058	0.066	Free Surface	3.922	0.646	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	3.058	0.066	Free Surface	5.848	0.467	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.058	0.066	Free Surface	3.383	0.738	3.414	3.113				
279	S-165	S-164	18	124.36	0.002	3.058	0.066	Pressurized	3.319	0.752	3.343	3.049	21	3.399	0.562	$18,654
281	S-164	S-163	18	250.67	0.003	3.058	0.066	Pressurized	3.470	0.721	3.519	3.209				
283	S-163	S-162	18	327.00	0.003	3.602	0.150	Pressurized	3.154	1.000	3.409	3.108	21	3.577	0.617	$49,050
285	S-162	S-161	18	351.00	0.002	3.602	0.150	Pressurized	3.154	1.000	3.389	3.090	21	3.563	0.619	$52,650
287	S-161	S-160	18	329.00	0.002	3.602	0.150	Pressurized	3.154	1.000	3.398	3.099	21	3.570	0.618	$49,350
289	S-160	S-159	18	416.00	0.003	3.602	0.150	Pressurized	3.154	1.000	3.532	3.221	21	3.680	0.603	$62,400
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	3.602	0.150	Pressurized	3.154	1.000	3.511	3.202	21	3.666	0.604	$33,825
293	S-158	S-157	18	199.50	0.003	3.602	0.150	Free Surface	3.691	0.797	3.702	3.376	21	3.817	0.584	$29,925
295	S-157	S-156	18	391.00	0.003	3.602	0.150	Pressurized	3.154	1.000	3.477	3.170	21	3.638	0.608	$58,650
297	S-156	S-155	18	155.00	0.004	3.602	0.150	Free Surface	4.191	0.704	4.270	3.894				

LOAPUD MSA 2020 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	3.602	0.150	Free Surface	6.059	0.516	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	3.724	0.150	Free Surface	3.756	0.811	3.761	3.430	21	3.896	0.591	$33,900
303	S-153	S-152	18	230.00	0.013	3.724	0.150	Free Surface	6.774	0.485	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	3.724	0.150	Free Surface	11.653	0.603	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	3.724	0.150	Free Surface	13.011	0.550	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	3.724	0.150	Free Surface	11.347	0.616	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	3.724	0.150	Free Surface	9.048	0.756	4.049	3.692	15	9.287	0.504	$31,800
313	S-148	S-147	12	309.01	0.061	3.724	0.150	Free Surface	12.002	0.588	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	3.724	0.150	Free Surface	13.303	0.541	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	3.752	0.154	Free Surface	15.025	0.494	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	3.752	0.154	Pressurized	12.287	0.580	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	3.752	0.154	Pressurized	7.391	1.000	1.635	1.491	18	4.667	0.663	$55,300
325	S-142	S-141	12	239.00	0.085	3.752	0.154	Free Surface	13.599	0.534	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	3.752	0.154	Free Surface	10.643	0.655	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	3.752	0.154	Free Surface	10.379	0.670	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	3.752	0.154	Free Surface	9.837	0.703	4.456	4.064				
333	S-138	S-137	18	265.59	0.034	3.773	0.157	Free Surface	9.594	0.376	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	3.773	0.157	Free Surface	4.465	0.693	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	3.773	0.157	Free Surface	4.507	0.688	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	3.773	0.157	Free Surface	12.188	0.316	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	3.773	0.157	Free Surface	9.316	0.385	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	3.773	0.157	Free Surface	8.277	0.420	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	3.773	0.157	Free Surface	11.724	0.325	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	3.804	0.162	Free Surface	4.536	0.688	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	3.804	0.162	Free Surface	4.616	0.678	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	3.804	0.162	Free Surface	5.938	0.548	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	3.804	0.162	Pressurized	3.330	1.000	3.669	3.345	21	3.834	0.609	$18,591
355	S-127	S-126	18	131.40	0.005	3.804	0.162	Free Surface	4.565	0.685	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	3.804	0.162	Free Surface	4.348	0.716	4.412	4.023				
359	S-125	S-123	18	389.66	0.004	3.804	0.162	Free Surface	4.267	0.729	4.321	3.940				
363	S-123	S-122	12	289.06	0.033	3.804	0.162	Free Surface	9.390	0.744	4.212	3.841				
365	S-122	S-121	12	309.56	0.037	3.804	0.162	Free Surface	9.884	0.709	4.467	4.074				
367	S-121	S-120	12	430.79	0.082	3.804	0.162	Free Surface	13.510	0.543	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	3.804	0.162	Free Surface	13.631	0.539	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	3.804	0.162	Free Surface	14.327	0.518	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	3.918	0.180	Free Surface	14.121	0.537	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	3.918	0.180	Free Surface	7.236	0.646	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	3.918	0.180	Free Surface	12.153	0.426	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	3.918	0.180	Free Surface	10.041	0.494	8.011	7.305				

LOAPUD MSA 2020 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	3.975	0.188	Free Surface	10.372	0.487	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	3.975	0.188	Pressurized	5.012	1.000	3.750	3.420	18	5.688	0.588	$57,211
389	S-112	S-109	15	310.00	0.070	3.975	0.188	Free Surface	12.814	0.414	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	3.975	0.188	Free Surface	7.254	0.652	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	3.975	0.188	Free Surface	7.229	0.654	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	3.975	0.188	Free Surface	9.393	0.526	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	4.201	0.223	Pressurized	8.275	1.000	2.887	2.632	15	7.341	0.678	$48,470
399	S-104	S-103	18	501.82	0.012	4.201	0.223	Free Surface	6.752	0.535	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	4.201	0.223	Free Surface	6.736	0.536	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	4.201	0.223	Free Surface	9.403	0.414	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	4.201	0.223	Free Surface	8.190	0.460	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	4.201	0.223	Pressurized	5.667	0.618	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	4.201	0.223	Pressurized	5.573	0.627	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	5.245	0.384	Pressurized	8.364	0.539	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	5.245	0.384	Pressurized	4.592	1.000	3.217	2.934	24	3.752	0.650	$14,570
415	S-96	S-95	18	116.00	0.003	5.245	0.384	Pressurized	4.592	1.000	3.947	3.599	21	4.323	0.729	$17,400
417	S-95	S-94	18	220.95	0.003	5.245	0.384	Pressurized	4.592	1.000	3.966	3.617	21	4.341	0.726	$33,143
419	S-94	S-93	18	386.14	0.003	5.337	0.398	Pressurized	4.673	1.000	3.965	3.616	21	4.350	0.736	$57,921
421	S-93	S-92	18	213.63	0.003	5.337	0.398	Pressurized	4.673	1.000	3.979	3.629	21	4.362	0.734	$32,045
423	S-92	S-91	18	226.18	0.003	5.337	0.398	Pressurized	4.673	1.000	3.564	3.250	24	4.084	0.614	$35,058
425	S-91	S-90	27	65.74	0.002	5.395	0.407	Pressurized	3.407	0.592	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	5.395	0.407	Pressurized	3.457	0.494	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	5.395	0.407	Pressurized	4.723	1.000	2.856	2.604	24	3.414	0.727	$16,731
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	5.395	0.407	Pressurized	4.723	1.000	2.946	2.686	24	3.505	0.709	$36,422
432	S88A	S-87	18	282.74	0.001	5.395	0.407	Pressurized	4.723	1.000	2.496	2.276	27	3.130	0.636	$45,238
433	S-87	S-86	18	239.17	0.002	5.395	0.407	Pressurized	4.723	1.000	2.953	2.693	24	3.515	0.707	$37,071
435	S-86	S-85	18	303.02	0.002	5.395	0.407	Pressurized	4.723	1.000	2.952	2.692	24	3.515	0.707	$46,968
437	S-85	S-84	18	296.01	0.002	5.395	0.407	Pressurized	4.723	1.000	2.934	2.676	24	3.494	0.711	$45,882
439	S-84	S-83	18	300.28	0.002	5.395	0.407	Pressurized	4.723	1.000	2.940	2.681	24	3.499	0.710	$46,543
441	S-83	S-82	18	361.66	0.002	5.395	0.407	Pressurized	4.723	1.000	2.952	2.692	24	3.515	0.707	$56,057
443	S-82	S-81	18	118.63	0.002	5.512	0.425	Pressurized	4.826	1.000	2.931	2.673	24	3.503	0.724	$18,388
445	S-81	S-80	18	315.60	0.002	5.512	0.425	Pressurized	4.826	1.000	2.943	2.684	24	3.518	0.721	$48,918
447	S-80	S-79	18	382.07	0.002	5.512	0.425	Pressurized	4.826	1.000	2.934	2.676	24	3.508	0.723	$59,221
449	S-79	S-78	18	358.51	0.001	5.512	0.425	Pressurized	4.826	1.000	2.593	2.364	27	3.238	0.629	$57,362
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	5.512	0.425	Pressurized	4.826	1.000	2.939	2.680	24	3.513	0.722	$48,227
453	S-77	S-76	18	207.87	0.002	5.512	0.425	Pressurized	4.826	1.000	2.986	2.723	24	3.559	0.713	$32,220
455	S-76	S-75	18	413.60	0.002	5.512	0.425	Pressurized	4.826	1.000	2.994	2.730	24	3.570	0.711	$64,108
457	S-75	S-74	18	254.25	0.002	5.512	0.425	Pressurized	4.826	1.000	2.988	2.725	24	3.559	0.713	$39,409

LOAPUD MSA 2020 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	5.512	0.425	Pressurized	4.826	1.000	2.598	2.369	27	3.244	0.628	$49,438
461	S-73	S-72	18	473.94	0.002	5.512	0.425	Pressurized	4.826	1.000	2.983	2.720	24	3.559	0.713	$73,461
463	S-72	S-71	18	298.55	0.002	5.608	0.440	Pressurized	4.910	1.000	3.273	2.984	24	3.853	0.674	$46,275
465	S-71	S-70	18	214.36	0.002	5.608	0.440	Pressurized	4.910	1.000	3.255	2.968	24	3.834	0.677	$33,226
467	S-70	S-69	18	340.00	0.003	5.608	0.440	Pressurized	4.910	1.000	3.560	3.246	24	4.125	0.635	$52,700
469	S-69	S-69A	18	116.00	0.002	5.608	0.440	Pressurized	4.910	1.000	3.284	2.995	24	3.865	0.672	$17,980
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	5.608	0.440	Free Surface	2.800	0.728	6.373	5.812				
475	S-67	S-65	27	150.92	0.001	5.608	0.440	Free Surface	2.780	0.732	6.327	5.770				
477	S-65	S-64	27	103.14	0.001	5.608	0.440	Free Surface	2.749	0.740	6.249	5.699				
479	S-64	S-63	27	132.00	0.001	5.608	0.440	Free Surface	2.768	0.735	6.298	5.744				
481	S-63	S-62	27	292.00	0.001	5.608	0.440	Free Surface	2.780	0.732	6.325	5.768				
483	S-62	S-62A	27	53.00	0.001	5.608	0.440	Free Surface	2.720	0.748	6.165	5.621				
485	S-61	S-60	27	244.11	0.001	5.718	0.456	Free Surface	2.773	0.748	6.293	5.739				
487	S-60	S-59	27	179.00	0.014	5.718	0.456	Free Surface	7.651	0.333	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	5.718	0.456	Free Surface	3.497	0.608	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	5.718	0.456	Free Surface	3.593	0.594	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	5.718	0.456	Free Surface	3.618	0.591	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	5.718	0.456	Free Surface	3.582	0.596	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	6.012	0.502	Free Surface	3.680	0.607	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	7.315	0.537	Free Surface	4.257	0.789	7.581	6.913	27	4.378	0.619	$77,782
503	S-33	S-32	24	179.87	0.003	7.315	0.537	Free Surface	4.696	0.717	8.467	7.721				
505	S-32	S-31	24	272.57	0.003	7.696	0.595	Free Surface	4.705	0.751	8.424	7.682	27	4.803	0.598	$43,611
507	S-31	S-30	24	315.87	0.003	7.696	0.595	Free Surface	4.614	0.766	8.249	7.522	27	4.729	0.605	$50,539
509	S-30	S-29	15	396.46	0.035	7.696	0.595	Free Surface	11.330	0.799	7.881	7.186	18	11.730	0.559	$55,504
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	7.696	0.595	Pressurized	9.703	1.000	7.610	6.940	18	11.412	0.571	$63,708
513	S-28	S-27	15	136.69	0.029	7.696	0.595	Pressurized	9.703	1.000	7.179	6.546	18	10.913	0.593	$19,137
515	S-27	S-26	24	160.65	0.003	7.696	0.595	Free Surface	4.815	0.734	8.656	7.893				
517	S-26	S-25	24	132.87	0.004	7.696	0.595	Free Surface	5.022	0.706	9.083	8.282				
519	S-25	S-24	24	286.68	0.004	7.696	0.595	Free Surface	4.977	0.712	8.998	8.205				
521	S-24	S-23	24	145.25	0.003	7.696	0.595	Free Surface	4.750	0.744	8.515	7.765				
523	S-23	S-22	15	419.03	0.040	7.696	0.595	Free Surface	12.029	0.752	8.409	7.668	18	12.328	0.537	$58,664
525	S-22	S-21	15	288.70	0.032	7.696	0.595	Pressurized	9.703	1.000	7.453	6.796	18	11.236	0.579	$40,418
527	S-21	S-20	18	179.30	0.022	7.696	0.595	Free Surface	9.670	0.657	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	8.948	0.788	Free Surface	7.860	0.388	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	8.948	0.788	Free Surface	7.933	0.385	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	8.948	0.788	Free Surface	6.458	0.450	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	8.948	0.788	Free Surface	9.506	0.337	36.508	33.291				

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
537	S-16	S-14	36	177.00	0.005	8.948	0.788	Free Surface	5.915	0.366	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	9.172	0.822	Free Surface	16.666	0.230	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	10.352	0.882	Free Surface	7.306	0.458	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	10.506	0.906	Free Surface	6.014	0.803	10.719	9.775	27	6.207	0.626	$76,320
545	S-7	S-6	24	263.00	0.006	10.506	0.906	Free Surface	6.537	0.738	11.748	10.713				
547	S-6	S-5	30	343.00	0.004	10.506	0.906	Free Surface	5.363	0.593	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	10.506	0.906	Free Surface	5.374	0.592	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	11.109	0.999	Free Surface	5.268	0.631	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

LOAPUD MSA 2020 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.644	0.000	Free Surface	1.903	0.337	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.644	0.000	Free Surface	1.799	0.351	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.644	0.000	Free Surface	1.789	0.353	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.644	0.000	Free Surface	0.918	0.590	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.644	0.000	Free Surface	2.040	0.320	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.644	0.000	Free Surface	2.084	0.315	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.644	0.000	Free Surface	1.913	0.336	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.644	0.000	Free Surface	1.917	0.335	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.644	0.000	Free Surface	1.900	0.337	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.644	0.000	Free Surface	1.202	0.476	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.644	0.000	Free Surface	2.473	0.279	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.644	0.000	Free Surface	2.753	0.258	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.644	0.000	Free Surface	1.452	0.412	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.644	0.000	Free Surface	2.561	0.272	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.644	0.000	Free Surface	2.664	0.264	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.644	0.000	Free Surface	1.946	0.332	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.644	0.000	Free Surface	2.927	0.247	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.644	0.000	Free Surface	5.124	0.167	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.276	0.031	Free Surface	3.246	0.248	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.276	0.031	Free Surface	2.971	0.264	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.276	0.031	Free Surface	1.782	0.383	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

LOAPUD MSA 2020 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	1.180	0.060	Free Surface	10.891	0.484	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	8.948	0.788	Free Surface	4.037	0.659	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	8.948	0.788	Free Surface	4.297	0.624	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	8.948	0.788	Free Surface	4.020	0.661	11.541	10.524				
780	S-58A	S-58	27	394.00	0.002	5.718	0.456	Free Surface	3.493	0.608	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	5.718	0.456	Free Surface	3.611	0.592	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	5.718	0.456	Free Surface	3.625	0.590	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	5.718	0.456	Free Surface	3.589	0.595	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	6.012	0.502	Free Surface	3.642	0.613	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	6.039	0.506	Free Surface	3.679	0.610	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	6.039	0.506	Free Surface	3.627	0.617	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	6.039	0.506	Free Surface	3.648	0.614	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	6.039	0.506	Free Surface	3.810	0.592	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	6.039	0.506	Free Surface	5.861	0.422	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	6.039	0.506	Free Surface	10.364	0.278	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	6.039	0.506	Free Surface	14.523	0.219	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	5.718	0.456	Free Surface	2.788	0.744	6.324	5.767				
808	S-69A	S-68	27	70.00	0.002	5.608	0.440	Free Surface	3.878	0.549	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	3.975	0.188	Free Surface	11.253	0.457	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	3.918	0.180	Free Surface	10.041	0.494	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.649	0.000	Free Surface	6.561	0.496	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.649	0.000	Free Surface	6.553	0.497	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.392	0.060	Free Surface	1.766	0.603	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.354	0.134	Free Surface	4.736	0.756	1.471	1.341	12	4.858	0.539	$11,088
98	Z20	Z22	24	505.68	0.003	1.276	0.031	Free Surface	3.030	0.261	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0.177	0.027	Free Surface	8.11	0.153	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	1.285	0.198	Free Surface	16.612	0.375	4.289	3.911				

APPENDIX D2

FLOWS WITHIN MASTERPLAN STUDY AREA
2030 PWWF

LOAPUD MSA 2030 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.599	0.092	Free Surface	6.776	0.657	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.165	0.025	Free Surface	13.416	0.153	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.053	0.008	Free Surface	2.919	0.135	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.126	0.019	Free Surface	4.379	0.185	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	1.050	0.162	Free Surface	2.872	0.677	1.312	1.197				
133	O45	O44	12	237.30	0.004	1.050	0.162	Free Surface	3.026	0.646	1.398	1.275				
135	O44	O41	12	131.00	0.004	1.050	0.162	Free Surface	2.971	0.657	1.368	1.248				
137	O41	O40	12	216.00	0.013	1.050	0.162	Free Surface	4.883	0.440	2.624	2.393				
139	O40	O30	12	287.40	0.013	1.050	0.162	Free Surface	4.955	0.435	2.676	2.440				
141	O30	O29	12	138.98	0.003	1.050	0.162	Free Surface	2.924	0.666	1.343	1.224				
143	O29	O28	12	250.00	0.004	1.050	0.162	Free Surface	2.974	0.656	1.370	1.249				
145	O28	O24	12	196.00	0.006	1.050	0.162	Free Surface	3.649	0.553	1.780	1.623				
147	O24	O18	12	122.00	0.008	1.050	0.162	Free Surface	4.117	0.502	2.085	1.901				
149	O18	O17	12	225.00	0.006	1.050	0.162	Free Surface	3.571	0.563	1.728	1.576				
151	O17	O16	12	346.00	0.004	1.050	0.162	Free Surface	3.230	0.611	1.520	1.386				
153	O16	O10	12	268.00	0.004	1.050	0.162	Free Surface	3.273	0.604	1.545	1.409				
156	O10	O6	12	692.00	0.006	1.050	0.162	Free Surface	3.743	0.542	1.839	1.677				
158	S-4	SCORPLANT	30	100.00	0.200	13.446	1.197	Free Surface	24.842	0.227	118.993	108.509				
161	O6	O1	12	500.13	0.043	1.050	0.162	Free Surface	7.585	0.317	4.814	4.390				
163	O1	S-98	12	268.00	0.003	1.050	0.162	Pressurized	2.610	0.739	1.172	1.068				
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Free Surface	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	1.024	0.158	Free Surface	8.203	0.385	3.269	2.981				
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Free Surface	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.682	0.000	Free Surface	5.508	0.580	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.682	0.000	Free Surface	4.954	0.634	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.682	0.000	Free Surface	8.895	0.399	5.011	4.569				

LOAPUD MSA 2030 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.682	0.000	Free Surface	10.588	0.351	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.682	0.000	Free Surface	10.061	0.364	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.682	0.000	Free Surface	9.156	0.391	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.682	0.000	Free Surface	9.953	0.367	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.682	0.000	Free Surface	8.176	0.425	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.682	0.000	Free Surface	4.585	0.679	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.682	0.000	Free Surface	7.696	0.445	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.682	0.000	Free Surface	8.127	0.427	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	2.244	0.086	Free Surface	8.928	0.496	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	3.036	0.086	Pressurized	5.980	1.000	0.796	0.726	21	2.560	0.713	$24,000
239	S-185	S-184	18	354.41	0.007	3.036	0.086	Free Surface	5.180	0.510	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	3.036	0.086	Free Surface	3.564	0.698	3.640	3.319				
243	S-183	S-182	18	215.46	0.003	3.036	0.086	Free Surface	3.425	0.725	3.470	3.165				
245	S-182	S-181	18	150.81	0.003	3.223	0.086	Free Surface	3.443	0.764	3.462	3.157	21	3.533	0.568	$22,622
247	S-181	S-180	18	248.09	0.003	3.223	0.086	Free Surface	3.489	0.754	3.511	3.202	21	3.570	0.563	$37,214
249	S-180	S-179	18	404.10	0.002	3.223	0.086	Free Surface	3.326	0.791	3.335	3.041	21	3.432	0.582	$60,615
251	S-179	S-178	18	221.42	0.002	3.223	0.086	Free Surface	3.228	0.816	3.235	2.950	21	3.351	0.594	$33,213
253	S-178	S-177	18	80.58	0.002	3.223	0.086	Free Surface	3.379	0.778	3.391	3.093	21	3.478	0.576	$12,087
255	S-177	S-176	18	142.02	0.002	3.223	0.086	Free Surface	3.366	0.781	3.379	3.082	21	3.468	0.577	$21,303
257	S-176	S-175	18	311.66	0.002	3.223	0.086	Free Surface	3.330	0.790	3.339	3.045	21	3.439	0.581	$46,749
259	S-175	S-174	18	100.00	0.003	3.223	0.086	Free Surface	3.452	0.762	3.471	3.165	21	3.540	0.567	$15,000
261	S-174	S-173	18	161.32	0.003	3.223	0.086	Free Surface	3.489	0.754	3.514	3.205	21	3.574	0.563	$24,198
263	S-173	S-172	18	273.50	0.002	3.223	0.086	Free Surface	3.287	0.801	3.293	3.003	21	3.398	0.587	$41,025
265	S-172	S-171	18	160.10	0.002	3.223	0.086	Free Surface	3.391	0.775	3.403	3.103	21	3.489	0.574	$24,015
269	S-171	S-169	18	414.77	0.004	3.223	0.086	Free Surface	3.982	0.667	4.107	3.745				
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.223	0.086	Free Surface	3.969	0.669	4.090	3.729				
273	S-168	S-167	18	260.82	0.004	3.223	0.086	Free Surface	3.962	0.670	4.087	3.727				
275	S-167	S-166	18	125.00	0.010	3.223	0.086	Pressurized	5.931	0.481	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.223	0.086	Pressurized	3.400	0.773	3.414	3.113	21	3.496	0.573	$38,171
279	S-165	S-164	18	124.36	0.002	3.223	0.086	Pressurized	3.334	0.789	3.343	3.049	21	3.439	0.581	$18,654
281	S-164	S-163	18	250.67	0.003	3.223	0.086	Pressurized	3.493	0.753	3.519	3.209	21	3.578	0.563	$37,601
283	S-163	S-162	18	327.00	0.003	3.824	0.179	Pressurized	3.348	1.000	3.409	3.108	21	3.622	0.643	$49,050
285	S-162	S-161	18	351.00	0.002	3.824	0.179	Pressurized	3.348	1.000	3.389	3.090	21	3.610	0.645	$52,650
287	S-161	S-160	18	329.00	0.002	3.824	0.179	Pressurized	3.348	1.000	3.398	3.099	21	3.616	0.644	$49,350
289	S-160	S-159	18	416.00	0.003	3.824	0.179	Pressurized	3.348	1.000	3.532	3.221	21	3.728	0.627	$62,400
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	3.824	0.179	Pressurized	3.348	1.000	3.511	3.202	21	3.711	0.629	$33,825
293	S-158	S-157	18	199.50	0.003	3.824	0.179	Pressurized	3.348	1.000	3.702	3.376	21	3.869	0.607	$29,925
295	S-157	S-156	18	391.00	0.003	3.824	0.179	Pressurized	3.348	1.000	3.477	3.170	21	3.681	0.634	$58,650
297	S-156	S-155	18	155.00	0.004	3.824	0.179	Free Surface	4.230	0.738	4.270	3.894				

LOAPUD MSA 2030 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	3.824	0.179	Free Surface	6.146	0.535	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	4.069	0.179	Pressurized	3.562	1.000	3.761	3.430	21	3.966	0.627	$33,900
303	S-153	S-152	18	230.00	0.013	4.069	0.179	Free Surface	6.927	0.511	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	4.069	0.179	Free Surface	11.877	0.639	5.511	5.025				
307	S-151	S-150	12	200.00	0.076	4.069	0.179	Free Surface	13.271	0.582	6.352	5.793				
309	S-150	S-149	12	200.00	0.053	4.069	0.179	Free Surface	11.561	0.654	5.328	4.858				
311	S-149	S-148	12	265.00	0.031	4.069	0.179	Pressurized	8.016	1.000	4.049	3.692	15	9.493	0.532	$31,800
313	S-148	S-147	12	309.01	0.061	4.069	0.179	Free Surface	12.236	0.623	5.725	5.221				
315	S-147	S-145	12	181.82	0.080	4.069	0.179	Free Surface	13.575	0.571	6.538	5.962				
319	S-145	S-144	12	106.90	0.110	4.102	0.184	Free Surface	15.360	0.521	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	4.102	0.184	Pressurized	12.544	0.614	5.887	5.368				
323	S-143	S-142	12	395.00	0.005	4.102	0.184	Pressurized	8.081	1.000	1.635	1.491	18	4.737	0.709	$55,300
325	S-142	S-141	12	239.00	0.085	4.102	0.184	Free Surface	13.889	0.564	6.720	6.128				
327	S-141	S-140	12	255.00	0.045	4.102	0.184	Free Surface	10.821	0.699	4.903	4.471				
329	S-140	S-139	12	250.00	0.042	4.102	0.184	Free Surface	10.534	0.717	4.756	4.337				
331	S-139	S-138	12	405.07	0.037	4.102	0.184	Free Surface	9.965	0.756	4.456	4.064	15	10.229	0.504	$48,608
333	S-138	S-137	18	265.59	0.034	4.125	0.188	Free Surface	9.817	0.396	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	4.125	0.188	Free Surface	4.520	0.745	4.561	4.159				
337	S-136	S-135	18	247.83	0.005	4.125	0.188	Free Surface	4.570	0.737	4.617	4.210				
339	S-135	S-134	18	194.99	0.066	4.125	0.188	Free Surface	12.508	0.331	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	4.125	0.188	Free Surface	9.548	0.404	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	4.125	0.188	Free Surface	8.475	0.442	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	4.125	0.188	Free Surface	12.031	0.340	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	4.160	0.193	Free Surface	4.595	0.739	4.640	4.231				
349	S-130	S-129	18	141.82	0.005	4.160	0.193	Free Surface	4.686	0.726	4.748	4.330				
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	4.160	0.193	Free Surface	6.067	0.579	6.537	5.961				
353	S-128	S-127	18	123.94	0.003	4.160	0.193	Pressurized	3.642	1.000	3.669	3.345	21	3.906	0.647	$18,591
355	S-127	S-126	18	131.40	0.005	4.160	0.193	Free Surface	4.627	0.734	4.676	4.264				
357	S-126	S-125	18	349.97	0.004	4.160	0.193	Free Surface	4.394	0.772	4.412	4.023	21	4.517	0.573	$52,496
359	S-125	S-123	18	389.66	0.004	4.160	0.193	Free Surface	4.308	0.788	4.321	3.940	21	4.448	0.580	$58,449
363	S-123	S-122	12	289.06	0.033	4.160	0.193	Free Surface	9.459	0.809	4.212	3.841	15	9.829	0.526	$34,687
365	S-122	S-121	12	309.56	0.037	4.160	0.193	Free Surface	10.000	0.764	4.467	4.074	15	10.284	0.508	$37,147
367	S-121	S-120	12	430.79	0.082	4.160	0.193	Free Surface	13.791	0.574	6.628	6.044				
369	S-120	S-119	12	218.67	0.085	4.160	0.193	Free Surface	13.936	0.569	6.715	6.124				
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	4.160	0.193	Free Surface	14.643	0.547	7.163	6.532				
373	S-118	S-117	12	454.47	0.091	4.356	0.223	Free Surface	14.471	0.573	6.964	6.351				
375	S-117	S-116	15	216.00	0.016	4.356	0.223	Free Surface	7.376	0.697	5.229	4.768				
377	S-116	S-115A	15	260.00	0.061	4.356	0.223	Free Surface	12.504	0.452	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	4.356	0.223	Free Surface	10.316	0.525	8.011	7.305				

LOAPUD MSA 2030 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	4.418	0.233	Free Surface	10.639	0.519	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	4.418	0.233	Pressurized	5.571	1.000	3.750	3.420	18	5.820	0.631	$57,211
389	S-112	S-109	15	310.00	0.070	4.418	0.233	Free Surface	13.186	0.439	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	4.418	0.233	Free Surface	7.392	0.705	5.228	4.767				
393	S-108	S-108A	15	324.25	0.015	4.418	0.233	Free Surface	7.359	0.708	5.203	4.745				
395	S-106	S-105	15	345.00	0.030	4.418	0.233	Free Surface	9.636	0.562	7.293	6.650				
397	S-105	S-104	12	403.92	0.016	4.825	0.295	Pressurized	9.505	1.000	2.887	2.632	18	7.685	0.539	$56,549
399	S-104	S-103	18	501.82	0.012	4.825	0.295	Free Surface	6.966	0.584	7.493	6.833				
401	S-103	S-102	18	497.81	0.012	4.825	0.295	Free Surface	6.952	0.585	7.473	6.815				
403	S-102	S-101	18	478.13	0.030	4.825	0.295	Free Surface	9.756	0.447	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	4.825	0.295	Free Surface	8.480	0.499	9.697	8.842				
407	S-100	S-99	18	285.63	0.008	4.825	0.295	Pressurized	5.818	0.682	5.974	5.448				
409	S-99	S-98	18	230.00	0.007	4.825	0.295	Pressurized	5.727	0.691	5.852	5.337				
411	S-98	S-97	18	215.67	0.019	6.178	0.503	Pressurized	8.683	0.597	9.265	8.448				
413	S-97	S-96	18	94.00	0.002	6.178	0.503	Pressurized	5.409	1.000	3.217	2.934	24	3.855	0.736	$14,570
415	S-96	S-95	18	116.00	0.003	6.178	0.503	Pressurized	5.409	1.000	3.947	3.599	24	4.565	0.632	$17,980
417	S-95	S-94	18	220.95	0.003	6.178	0.503	Pressurized	5.409	1.000	3.966	3.617	24	4.586	0.630	$34,247
419	S-94	S-93	18	386.14	0.003	6.280	0.519	Pressurized	5.498	1.000	3.965	3.616	24	4.595	0.638	$59,852
421	S-93	S-92	18	213.63	0.003	6.280	0.519	Pressurized	5.498	1.000	3.979	3.629	24	4.611	0.636	$33,113
423	S-92	S-91	18	226.18	0.003	6.280	0.519	Pressurized	5.498	1.000	3.564	3.250	24	4.219	0.688	$35,058
425	S-91	S-90	27	65.74	0.002	6.357	0.531	Pressurized	3.526	0.661	8.210	7.486				
427	S-90	S-89	30	151.18	0.002	6.357	0.531	Pressurized	3.597	0.545	11.023	10.052				
429	S-89	S-88	18	107.94	0.002	6.357	0.531	Pressurized	5.566	1.000	2.856	2.604	27	3.599	0.649	$17,270
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	6.357	0.531	Pressurized	5.566	1.000	2.946	2.686	27	3.688	0.636	$37,597
432	S88A	S-87	18	282.74	0.001	6.357	0.531	Pressurized	5.566	1.000	2.496	2.276	27	3.225	0.717	$45,238
433	S-87	S-86	18	239.17	0.002	6.357	0.531	Pressurized	5.566	1.000	2.953	2.693	27	3.695	0.635	$38,267
435	S-86	S-85	18	303.02	0.002	6.357	0.531	Pressurized	5.566	1.000	2.952	2.692	27	3.695	0.635	$48,483
437	S-85	S-84	18	296.01	0.002	6.357	0.531	Pressurized	5.566	1.000	2.934	2.676	27	3.682	0.637	$47,362
439	S-84	S-83	18	300.28	0.002	6.357	0.531	Pressurized	5.566	1.000	2.940	2.681	27	3.685	0.636	$48,045
441	S-83	S-82	18	361.66	0.002	6.357	0.531	Pressurized	5.566	1.000	2.952	2.692	27	3.695	0.635	$57,866
443	S-82	S-81	18	118.63	0.002	6.551	0.561	Pressurized	5.736	1.000	2.931	2.673	27	3.696	0.651	$18,981
445	S-81	S-80	18	315.60	0.002	6.551	0.561	Pressurized	5.736	1.000	2.943	2.684	27	3.709	0.649	$50,496
447	S-80	S-79	18	382.07	0.002	6.551	0.561	Pressurized	5.736	1.000	2.934	2.676	27	3.702	0.650	$61,131
449	S-79	S-78	18	358.51	0.001	6.551	0.561	Pressurized	5.736	1.000	2.593	2.364	27	3.343	0.713	$57,362
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	6.551	0.561	Pressurized	5.736	1.000	2.939	2.680	27	3.709	0.649	$49,782
453	S-77	S-76	18	207.87	0.002	6.551	0.561	Pressurized	5.736	1.000	2.986	2.723	27	3.754	0.643	$33,259
455	S-76	S-75	18	413.60	0.002	6.551	0.561	Pressurized	5.736	1.000	2.994	2.730	27	3.761	0.642	$66,176
457	S-75	S-74	18	254.25	0.002	6.551	0.561	Pressurized	5.736	1.000	2.988	2.725	27	3.754	0.643	$40,680

LOAPUD MSA 2030 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	6.551	0.561	Pressurized	5.736	1.000	2.598	2.369	27	3.348	0.712	$49,438
461	S-73	S-72	18	473.94	0.002	6.551	0.561	Pressurized	5.736	1.000	2.983	2.720	27	3.751	0.643	$75,830
463	S-72	S-71	18	298.55	0.002	6.676	0.580	Pressurized	5.845	1.000	3.273	2.984	27	4.055	0.611	$47,768
465	S-71	S-70	18	214.36	0.002	6.676	0.580	Pressurized	5.845	1.000	3.255	2.968	27	4.032	0.614	$34,298
467	S-70	S-69	18	340.00	0.003	6.676	0.580	Pressurized	5.845	1.000	3.560	3.246	24	4.255	0.722	$52,700
469	S-69	S-69A	18	116.00	0.002	6.676	0.580	Pressurized	5.845	1.000	3.284	2.995	27	4.063	0.610	$18,560
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	6.676	0.580	Pressurized	2.598	1.000	6.373	5.812	30	2.950	0.671	$40,460
475	S-67	S-65	27	150.92	0.001	6.676	0.580	Pressurized	2.598	1.000	6.327	5.770	30	2.931	0.675	$25,656
477	S-65	S-64	27	103.14	0.001	6.676	0.580	Pressurized	2.598	1.000	6.249	5.699	30	2.903	0.681	$17,534
479	S-64	S-63	27	132.00	0.001	6.676	0.580	Pressurized	2.598	1.000	6.298	5.744	30	2.921	0.677	$22,440
481	S-63	S-62	27	292.00	0.001	6.676	0.580	Pressurized	2.598	1.000	6.325	5.768	30	2.931	0.675	$49,640
483	S-62	S-62A	27	53.00	0.001	6.676	0.580	Pressurized	2.598	1.000	6.165	5.621	30	2.871	0.688	$9,010
485	S-61	S-60	27	244.11	0.001	6.797	0.599	Pressurized	2.645	1.000	6.293	5.739	30	2.927	0.687	$41,499
487	S-60	S-59	27	179.00	0.014	6.797	0.599	Free Surface	8.025	0.365	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	6.797	0.599	Free Surface	3.620	0.686	8.342	7.607				
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	6.797	0.599	Free Surface	3.720	0.669	8.637	7.876				
493	S-57	S-56	27	318.00	0.002	6.797	0.599	Free Surface	3.751	0.664	8.718	7.950				
495	S-56	S56A	27	506.00	0.002	6.797	0.599	Free Surface	3.714	0.670	8.604	7.846				
497	S-55	S-55A	27	340.00	0.002	7.122	0.649	Free Surface	3.805	0.684	8.775	8.002				
501	S-34	S-33	24	486.14	0.003	8.526	0.687	Pressurized	4.199	1.000	7.581	6.913	27	4.505	0.690	$77,782
503	S-33	S-32	24	179.87	0.003	8.526	0.687	Pressurized	4.199	1.000	8.467	7.721	27	4.929	0.638	$28,779
505	S-32	S-31	24	272.57	0.003	8.906	0.746	Pressurized	4.386	1.000	8.424	7.682	27	4.957	0.659	$43,611
507	S-31	S-30	24	315.87	0.003	8.906	0.746	Pressurized	4.386	1.000	8.249	7.522	27	4.867	0.670	$50,539
509	S-30	S-29	15	396.46	0.035	8.906	0.746	Pressurized	11.229	1.000	7.881	7.186	18	12.128	0.613	$55,504
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	8.906	0.746	Pressurized	11.229	1.000	7.610	6.940	18	11.796	0.628	$63,708
513	S-28	S-27	15	136.69	0.029	8.906	0.746	Pressurized	11.229	1.000	7.179	6.546	18	11.248	0.654	$19,137
515	S-27	S-26	24	160.65	0.003	8.906	0.746	Pressurized	4.386	1.000	8.656	7.893	27	5.060	0.647	$25,704
517	S-26	S-25	24	132.87	0.004	8.906	0.746	Pressurized	5.098	0.803	9.083	8.282	27	5.262	0.626	$21,259
519	S-25	S-24	24	286.68	0.004	8.906	0.746	Pressurized	5.052	0.811	8.998	8.205	27	5.224	0.630	$45,869
521	S-24	S-23	24	145.25	0.003	8.906	0.746	Pressurized	4.386	1.000	8.515	7.765	27	4.999	0.654	$23,240
523	S-23	S-22	15	419.03	0.040	8.906	0.746	Pressurized	11.229	1.000	8.409	7.668	18	12.756	0.588	$58,664
525	S-22	S-21	15	288.70	0.032	8.906	0.746	Pressurized	11.229	1.000	7.453	6.796	18	11.606	0.637	$40,418
527	S-21	S-20	18	179.30	0.022	8.906	0.746	Free Surface	9.907	0.734	10.014	9.131				
529	S-20	S-19	30	184.00	0.011	10.376	0.972	Free Surface	8.182	0.421	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	10.376	0.972	Free Surface	8.258	0.418	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	10.376	0.972	Free Surface	6.707	0.490	21.462	19.571				
535	S-17	S-17.1	30	44.00	0.019	10.376	0.972	Free Surface	9.913	0.365	36.508	33.291				

LOAPUD MSA 2030 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
537	S-16	S-14	36	177.00	0.005	10.376	0.972	Free Surface	6.162	0.396	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	10.611	1.008	Free Surface	17.395	0.247	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	12.605	1.068	Free Surface	7.679	0.514	24.078	21.956				
543	S-8	S-7	24	477.00	0.005	12.780	1.095	Pressurized	6.294	1.000	10.719	9.775	27	6.436	0.722	$76,320
545	S-7	S-6	24	263.00	0.006	12.780	1.095	Pressurized	6.294	1.000	11.748	10.713	27	6.949	0.673	$42,080
547	S-6	S-5	30	343.00	0.004	12.780	1.095	Free Surface	5.574	0.679	15.918	14.515				
549	S-5	S-4A	30	369.00	0.004	12.780	1.095	Free Surface	5.592	0.677	15.958	14.552				
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	13.446	1.197	Free Surface	5.453	0.726	15.347	13.994				
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Free Surface	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

LOAPUD MSA 2030 PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	0.720	0.000	Free Surface	1.964	0.357	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	0.720	0.000	Free Surface	1.857	0.373	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	0.720	0.000	Free Surface	1.845	0.374	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	0.720	0.000	Free Surface	0.942	0.635	0.984	0.898				
641	Z5	Z6	18	93.95	0.002	0.720	0.000	Free Surface	2.104	0.340	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	0.720	0.000	Free Surface	2.150	0.334	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	0.720	0.000	Free Surface	1.960	0.358	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	0.720	0.000	Free Surface	1.973	0.356	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	0.720	0.000	Free Surface	1.977	0.356	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	0.720	0.000	Free Surface	1.960	0.358	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	0.720	0.000	Free Surface	1.236	0.508	1.403	1.279				
655	Z12	Z13	18	113.00	0.003	0.720	0.000	Free Surface	2.552	0.295	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	0.720	0.000	Free Surface	2.843	0.273	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	0.720	0.000	Free Surface	1.496	0.438	1.814	1.654				
661	Z15	Z16	18	254.79	0.003	0.720	0.000	Free Surface	2.643	0.288	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	0.720	0.000	Free Surface	2.750	0.280	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	0.720	0.000	Free Surface	2.009	0.352	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	0.720	0.000	Free Surface	3.023	0.262	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	0.720	0.000	Free Surface	5.297	0.177	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Free Surface	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Free Surface	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Free Surface	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	1.374	0.034	Free Surface	3.313	0.258	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	1.374	0.034	Free Surface	3.036	0.274	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	1.374	0.034	Pressurized	1.818	0.399	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	1.993	0.060	Free Surface	12.266	0.677	2.490	2.271				
774	S-17.3	S-16	30	388.00	0.002	10.376	0.972	Free Surface	4.138	0.737	11.608	10.586				
776	S-17.2	S-17.3	30	130.00	0.002	10.376	0.972	Free Surface	4.420	0.693	12.555	11.448				
778	S-17.1	S-17.2	30	244.00	0.002	10.376	0.972	Free Surface	4.115	0.741	11.541	10.524				
780	S-58A	S-58	27	394.00	0.002	6.797	0.599	Free Surface	3.614	0.687	8.338	7.603				
782	S-57A	S-57	27	283.00	0.002	6.797	0.599	Free Surface	3.739	0.666	8.686	7.920				
784	S56A	S-56B	27	401.00	0.002	6.797	0.599	Free Surface	3.758	0.663	8.737	7.968				
786	S-56B	S-55	27	292.00	0.002	6.797	0.599	Free Surface	3.720	0.669	8.631	7.870				
788	S-55A	S-55B	27	370.00	0.002	7.122	0.649	Free Surface	3.763	0.690	8.667	7.903				
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	7.152	0.653	Free Surface	3.803	0.687	8.769	7.997				
792	S-55C	S-55D	27	548.00	0.002	7.152	0.653	Free Surface	3.750	0.695	8.616	7.857				
794	S-55D	S-55E	27	310.00	0.002	7.152	0.653	Free Surface	3.773	0.691	8.681	7.916				
796	S-55E	S-55F	27	479.00	0.002	7.152	0.653	Free Surface	3.947	0.664	9.170	8.362				
798	S-55F	S-55G	27	250.00	0.007	7.152	0.653	Free Surface	6.121	0.464	16.256	14.823				
802	S-55G	S-55H	27	102.00	0.032	7.152	0.653	Free Surface	10.880	0.303	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	7.152	0.653	Free Surface	15.256	0.238	57.550	52.479				
806	S-62A	S-61	27	423.00	0.001	6.797	0.599	Pressurized	2.645	1.000	6.324	5.767	30	2.941	0.684	$71,910
808	S-69A	S-68	27	70.00	0.002	6.676	0.580	Free Surface	4.032	0.614	9.595	8.750				
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	4.418	0.233	Free Surface	11.558	0.486	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	4.356	0.223	Free Surface	10.316	0.525	8.010	7.304				
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.682	0.000	Free Surface	6.594	0.502	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.426	0.066	Free Surface	1.798	0.637	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.386	0.139	Free Surface	4.750	0.771	1.471	1.341	12	4.885	0.546	$11,088
98	Z20	Z22	24	505.68	0.003	1.374	0.034	Free Surface	3.097	0.271	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	0.353	0.054	Free Surface	9.944	0.215	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	2.608	0.401	Free Surface	19.928	0.563	4.289	3.911	27	17.835	0.106	800

APPENDIX D3

FLOWS WITHIN MASTERPLAN STUDY AREA
BUILDOUT PWWF

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
100	Z37E2	LS-HANGINGTRE	6	5.00	0.046	0.599	0.092	Free Surface	6.776	0.657	0.780	0.711				
101	Z1C	L-2	8	77.00	0.116	0.000	0.000	Free Surface	0.000	0.000	2.664	2.429				
102	Z201E	LS-HANGINGTRE	6	980.00	0.050	0.360	0.000	Free Surface	6.231	0.465	0.816	0.744				
104	35	LS-ROYALOAKS	6	5.00	0.800	0.239	0.037	Free Surface	14.975	0.183	3.252	2.966				
106	37	HERITAGE-LS	8	10.00	0.030	0.265	0.041	Free Surface	4.666	0.300	1.356	1.237				
107	Z-9	L-3	8	26.00	0.046	0.126	0.019	Free Surface	4.379	0.185	1.682	1.534				
108	39	LS-VISTADELCEF	8	5.00	0.300	0.317	0.049	Free Surface	11.124	0.184	4.289	3.911				
131	O46	O45	12	448.70	0.003	2.764	0.425	Pressurized	5.446	1.000	1.312	1.197	18	3.681	0.625	$62,818
133	O45	O44	12	237.30	0.004	2.764	0.425	Pressurized	5.446	1.000	1.398	1.275	18	3.867	0.600	$33,222
135	O44	O41	12	131.00	0.004	2.764	0.425	Pressurized	5.446	1.000	1.368	1.248	18	3.804	0.608	$18,340
137	O41	O40	12	216.00	0.013	2.764	0.425	Pressurized	5.446	1.000	2.624	2.393	15	6.222	0.547	$25,920
139	O40	O30	12	287.40	0.013	2.764	0.425	Pressurized	5.446	1.000	2.676	2.440	15	6.312	0.541	$34,488
141	O30	O29	12	138.98	0.003	2.764	0.425	Pressurized	5.446	1.000	1.343	1.224	18	3.750	0.615	$19,457
143	O29	O28	12	250.00	0.004	2.764	0.425	Pressurized	5.446	1.000	1.370	1.249	18	3.807	0.607	$35,000
145	O28	O24	12	196.00	0.006	2.764	0.425	Pressurized	5.446	1.000	1.780	1.623	15	4.570	0.713	$23,520
147	O24	O18	12	122.00	0.008	2.764	0.425	Pressurized	5.446	1.000	2.085	1.901	15	5.206	0.635	$14,640
149	O18	O17	12	225.00	0.006	2.764	0.425	Pressurized	5.446	1.000	1.728	1.576	15	4.459	0.729	$27,000
151	O17	O16	12	346.00	0.004	2.764	0.425	Pressurized	5.446	1.000	1.520	1.386	18	4.125	0.568	$48,440
153	O16	O10	12	268.00	0.004	2.764	0.425	Pressurized	5.446	1.000	1.545	1.409	18	4.178	0.563	$37,520
156	O10	O6	12	692.00	0.006	2.764	0.425	Pressurized	5.446	1.000	1.839	1.677	15	4.696	0.695	$83,040
158	S-4	SCORPLANT	30	100.00	0.200	31.082	2.574	Free Surface	31.577	0.349	118.993	108.509				
161	O6	O1	12	500.13	0.043	2.764	0.425	Free Surface	9.808	0.543	4.814	4.390				
163	O1	S-98	12	268.00	0.003	2.764	0.425	Pressurized	5.446	1.000	1.172	1.068	18	3.360	0.677	$37,520
183	G106	G105	8	197.00	0.033	0.000	0.000	Free Surface	0.000	0.000	1.426	1.300				
185	G104	G103	10	121.00	0.028	0.000	0.000	Free Surface	0.000	0.000	2.377	2.167				
187	G103	G102	10	282.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.722	0.659				
189	G102	G101	10	425.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.719	0.656				
191	G101	G100	10	281.00	0.007	0.000	0.000	Pressurized	0.000	0.000	1.155	1.053				
193	G100	LS-MOORETOWN	10	20.00	0.053	3.492	0.537	Pressurized	9.905	1.000	3.269	2.981	12	11.173	0.591	$2,000
195	G71	G67	8	270.00	0.020	0.000	0.000	Free Surface	0.000	0.000	1.098	1.001				
197	G67	G93A	8	112.00	0.016	0.000	0.000	Free Surface	0.000	0.000	0.976	0.890				
199	G93	G94	10	125.50	0.003	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
201	G94	G95	10	361.65	0.003	0.000	0.000	Free Surface	0.000	0.000	0.735	0.671				
203	G95	G97	10	322.73	0.003	0.000	0.000	Pressurized	0.000	0.000	0.716	0.653				
207	G97	G98	10	252.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.710	0.647				
209	G98	G99	10	244.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.716	0.653				
21	Z-30	Z-29	6	273.76	0.039	0.000	0.000	Free Surface	0.000	0.000	0.717	0.654				
211	G99	G100	10	305.00	0.003	0.000	0.000	Pressurized	0.000	0.000	0.718	0.655				
213	Z-8	Z-7	12	349.95	0.013	1.682	0.000	Free Surface	5.508	0.580	2.636	2.403				
215	Z-7	Z-6	12	293.35	0.010	1.682	0.000	Free Surface	4.954	0.634	2.303	2.101				
217	Z-6	Z-5	12	391.96	0.047	1.682	0.000	Free Surface	8.895	0.399	5.011	4.569				

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
219	Z-5	Z-4	12	341.58	0.076	1.682	0.000	Free Surface	10.588	0.351	6.369	5.807				
221	Z-4	Z-3	12	353.51	0.066	1.682	0.000	Free Surface	10.061	0.364	5.935	5.412				
223	Z-3	Z-3A	12	348.92	0.051	1.682	0.000	Free Surface	9.156	0.391	5.210	4.751				
225	Z-3A	Z-2	12	273.30	0.064	1.682	0.000	Free Surface	9.953	0.367	5.842	5.328				
227	Z-2	Z-1	12	227.65	0.037	1.682	0.000	Free Surface	8.176	0.425	4.461	4.068				
229	Z-1	S-204	12	43.80	0.008	1.682	0.000	Free Surface	4.585	0.679	2.093	1.909				
231	S-201	S-200	12	268.27	0.032	1.682	0.000	Free Surface	7.696	0.445	4.113	3.751				
233	S-200	S-199	12	193.73	0.037	1.682	0.000	Free Surface	8.127	0.427	4.425	4.035				
235	S-199	S-186	12	145.00	0.039	2.841	0.178	Pressurized	9.438	0.573	4.543	4.143				
237	S-186	S-185	12	160.00	0.001	3.633	0.178	Pressurized	7.157	1.000	0.796	0.726	24	2.706	0.628	$24,800
239	S-185	S-184	18	354.41	0.007	3.633	0.178	Pressurized	5.409	0.569	5.864	5.347				
241	S-184	S-183	18	171.40	0.003	3.633	0.178	Pressurized	3.631	0.818	3.640	3.319	21	3.777	0.594	$25,710
243	S-183	S-182	18	215.46	0.003	3.633	0.178	Pressurized	3.181	1.000	3.470	3.165	21	3.634	0.613	$32,319
245	S-182	S-181	18	150.81	0.003	3.820	0.178	Pressurized	3.345	1.000	3.462	3.157	21	3.670	0.635	$22,622
247	S-181	S-180	18	248.09	0.003	3.820	0.178	Pressurized	3.345	1.000	3.511	3.202	21	3.710	0.629	$37,214
249	S-180	S-179	18	404.10	0.002	3.820	0.178	Pressurized	3.345	1.000	3.335	3.041	21	3.563	0.651	$60,615
251	S-179	S-178	18	221.42	0.002	3.820	0.178	Pressurized	3.345	1.000	3.235	2.950	21	3.473	0.666	$33,213
253	S-178	S-177	18	80.58	0.002	3.820	0.178	Pressurized	3.345	1.000	3.391	3.093	21	3.606	0.645	$12,087
255	S-177	S-176	18	142.02	0.002	3.820	0.178	Pressurized	3.345	1.000	3.379	3.082	21	3.600	0.646	$21,303
257	S-176	S-175	18	311.66	0.002	3.820	0.178	Pressurized	3.345	1.000	3.339	3.045	21	3.563	0.651	$46,749
259	S-175	S-174	18	100.00	0.003	3.820	0.178	Pressurized	3.345	1.000	3.471	3.165	21	3.677	0.634	$15,000
261	S-174	S-173	18	161.32	0.003	3.820	0.178	Pressurized	3.345	1.000	3.514	3.205	21	3.710	0.629	$24,198
263	S-173	S-172	18	273.50	0.002	3.820	0.178	Pressurized	3.345	1.000	3.293	3.003	21	3.526	0.657	$41,025
265	S-172	S-171	18	160.10	0.002	3.820	0.178	Pressurized	3.345	1.000	3.403	3.103	21	3.619	0.643	$24,015
269	S-171	S-169	18	414.77	0.004	3.820	0.178	Pressurized	4.082	0.764	4.107	3.745	21	4.192	0.568	$62,216
27	Z-29	Z-28	6	374.66	0.005	0.000	0.000	Free Surface	0.000	0.000	0.266	0.243				
271	S-169	S-168	18	205.01	0.004	3.820	0.178	Pressurized	4.071	0.766	4.090	3.729	21	4.179	0.569	$30,752
273	S-168	S-167	18	260.82	0.004	3.820	0.178	Pressurized	4.066	0.767	4.087	3.727	21	4.179	0.569	$39,123
275	S-167	S-166	18	125.00	0.010	3.820	0.178	Pressurized	6.182	0.532	6.888	6.281				
277	S-166	S-165	18	254.47	0.003	3.820	0.178	Pressurized	3.345	1.000	3.414	3.113	21	3.625	0.642	$38,171
279	S-165	S-164	18	124.36	0.002	3.820	0.178	Pressurized	3.345	1.000	3.343	3.049	21	3.569	0.650	$18,654
281	S-164	S-163	18	250.67	0.003	3.820	0.178	Pressurized	3.345	1.000	3.519	3.209	21	3.717	0.628	$37,601
283	S-163	S-162	18	327.00	0.003	5.265	0.401	Pressurized	4.610	1.000	3.409	3.108	24	3.930	0.627	$50,685
285	S-162	S-161	18	351.00	0.002	5.265	0.401	Pressurized	4.610	1.000	3.389	3.090	24	3.915	0.629	$54,405
287	S-161	S-160	18	329.00	0.002	5.265	0.401	Pressurized	4.610	1.000	3.398	3.099	24	3.922	0.628	$50,995
289	S-160	S-159	18	416.00	0.003	5.265	0.401	Pressurized	4.610	1.000	3.532	3.221	24	4.044	0.612	$64,480
29	Z-28	J-1	8	289.21	0.007	0.000	0.000	Free Surface	0.000	0.000	0.656	0.598				
291	S-159	S-158	18	225.50	0.003	5.265	0.401	Pressurized	4.610	1.000	3.511	3.202	24	4.025	0.614	$34,953
293	S-158	S-157	18	199.50	0.003	5.265	0.401	Pressurized	4.610	1.000	3.702	3.376	24	4.196	0.593	$30,923
295	S-157	S-156	18	391.00	0.003	5.265	0.401	Pressurized	4.610	1.000	3.477	3.170	24	3.995	0.618	$60,605
297	S-156	S-155	18	155.00	0.004	5.265	0.401	Pressurized	4.610	1.000	4.270	3.894	21	4.621	0.688	$23,250

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
299	S-155	S-154	18	415.00	0.010	5.265	0.401	Free Surface	6.604	0.658	6.832	6.230				
301	S-154	S-153	18	226.00	0.003	6.489	0.401	Pressurized	5.682	1.000	3.761	3.430	24	4.430	0.678	$35,030
303	S-153	S-152	18	230.00	0.013	6.489	0.401	Pressurized	7.667	0.694	7.839	7.148				
305	S-152	S-151	12	185.00	0.057	6.489	0.401	Pressurized	12.784	1.000	5.511	5.025	15	13.410	0.587	$22,200
307	S-151	S-150	12	200.00	0.076	6.489	0.401	Pressurized	12.784	1.000	6.352	5.793	15	14.952	0.537	$24,000
309	S-150	S-149	12	200.00	0.053	6.489	0.401	Pressurized	12.784	1.000	5.328	4.858	15	13.070	0.600	$24,000
311	S-149	S-148	12	265.00	0.031	6.489	0.401	Pressurized	12.784	1.000	4.049	3.692	15	10.453	0.730	$31,800
313	S-148	S-147	12	309.01	0.061	6.489	0.401	Pressurized	12.784	1.000	5.725	5.221	15	13.813	0.573	$37,081
315	S-147	S-145	12	181.82	0.080	6.489	0.401	Free Surface	14.691	0.813	6.538	5.962	15	15.281	0.528	$21,818
319	S-145	S-144	12	106.90	0.110	6.556	0.411	Free Surface	16.961	0.712	7.664	6.989				
321	S-144	S-143	12	32.76	0.065	6.556	0.411	Pressurized	12.916	1.000	5.887	5.368	15	14.147	0.566	$3,931
323	S-143	S-142	12	395.00	0.005	6.556	0.411	Pressurized	12.916	1.000	1.635	1.491	21	5.292	0.743	$59,250
325	S-142	S-141	12	239.00	0.085	6.556	0.411	Free Surface	15.081	0.799	6.720	6.128	15	15.638	0.522	$28,680
327	S-141	S-140	12	255.00	0.045	6.556	0.411	Pressurized	12.916	1.000	4.903	4.471	15	12.259	0.639	$30,600
329	S-140	S-139	12	250.00	0.042	6.556	0.411	Pressurized	12.916	1.000	4.756	4.337	15	11.964	0.652	$30,000
331	S-139	S-138	12	405.07	0.037	6.556	0.411	Pressurized	12.916	1.000	4.456	4.064	15	11.348	0.684	$48,608
333	S-138	S-137	18	265.59	0.034	6.584	0.415	Free Surface	11.087	0.516	12.510	11.408				
335	S-137	S-136	18	142.59	0.004	6.584	0.415	Pressurized	5.764	1.000	4.561	4.159	24	5.185	0.599	$22,101
337	S-136	S-135	18	247.83	0.005	6.584	0.415	Pressurized	5.764	1.000	4.617	4.210	24	5.236	0.594	$38,414
339	S-135	S-134	18	194.99	0.066	6.584	0.415	Free Surface	14.203	0.426	17.454	15.917				
341	S-134	S-133	18	183.37	0.031	6.584	0.415	Free Surface	10.766	0.528	12.023	10.963				
343	S-133	S-132	18	372.84	0.023	6.584	0.415	Free Surface	9.505	0.584	10.224	9.323				
345	S-132	S-131	18	198.32	0.059	6.584	0.415	Free Surface	13.644	0.439	16.527	15.071				
347	S-131	S-130	18	236.72	0.005	6.637	0.423	Pressurized	5.811	1.000	4.640	4.231	24	5.263	0.596	$36,692
349	S-130	S-129	18	141.82	0.005	6.637	0.423	Pressurized	5.811	1.000	4.748	4.330	24	5.357	0.587	$21,982
35	Z-27	Z-26	10	387.33	0.005	0.482	0.000	Free Surface	2.876	0.481	1.030	0.940				
351	S-129	S-128	18	67.23	0.009	6.637	0.423	Pressurized	5.811	1.000	6.537	5.961	21	6.807	0.601	$10,085
353	S-128	S-127	18	123.94	0.003	6.637	0.423	Pressurized	5.811	1.000	3.669	3.345	24	4.357	0.702	$19,211
355	S-127	S-126	18	131.40	0.005	6.637	0.423	Pressurized	5.811	1.000	4.676	4.264	24	5.294	0.593	$20,367
357	S-126	S-125	18	349.97	0.004	6.637	0.423	Pressurized	5.811	1.000	4.412	4.023	24	5.064	0.615	$54,245
359	S-125	S-123	18	389.66	0.004	6.637	0.423	Pressurized	5.811	1.000	4.321	3.940	24	4.980	0.624	$60,397
363	S-123	S-122	12	289.06	0.033	6.637	0.423	Pressurized	13.074	1.000	4.212	3.841	15	10.845	0.721	$34,687
365	S-122	S-121	12	309.56	0.037	6.637	0.423	Pressurized	13.074	1.000	4.467	4.074	15	11.397	0.688	$37,147
367	S-121	S-120	12	430.79	0.082	6.637	0.423	Pressurized	13.074	1.000	6.628	6.044	15	15.538	0.530	$51,695
369	S-120	S-119	12	218.67	0.085	6.637	0.423	Free Surface	15.092	0.809	6.715	6.124	15	15.683	0.526	$26,240
37	Z-26	Z-25	10	232.49	0.056	0.482	0.000	Free Surface	6.757	0.256	3.352	3.057				
371	S-119	S-118	12	183.39	0.096	6.637	0.423	Free Surface	16.017	0.761	7.163	6.532	15	16.469	0.506	$22,007
373	S-118	S-117	12	454.47	0.091	7.452	0.549	Pressurized	14.680	1.000	6.964	6.351	15	16.569	0.553	$54,536
375	S-117	S-116	15	216.00	0.016	7.452	0.549	Pressurized	9.395	1.000	5.229	4.768	18	8.395	0.726	$30,240
377	S-116	S-115A	15	260.00	0.061	7.452	0.549	Free Surface	14.211	0.628	10.365	9.452				
379	S-115	S-114	15	268.45	0.037	7.452	0.549	Free Surface	11.465	0.764	8.011	7.305	18	11.789	0.542	$37,583

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
381	S-114	S-113	15	234.61	0.039	7.514	0.558	Free Surface	11.872	0.744	8.317	7.584				
383	S-113	S-112	15	408.65	0.008	7.514	0.558	Pressurized	9.474	1.000	3.750	3.420	21	6.594	0.688	$61,298
389	S-112	S-109	15	310.00	0.070	7.514	0.558	Free Surface	15.018	0.604	11.078	10.102				
39	Z-25	Z-23	10	290.86	0.005	0.482	0.000	Free Surface	2.888	0.479	1.036	0.945				
391	S-109	S-108	15	355.86	0.016	7.514	0.558	Pressurized	9.474	1.000	5.228	4.767	18	8.406	0.730	$49,820
393	S-108	S-108A	15	324.25	0.015	7.514	0.558	Pressurized	9.474	1.000	5.203	4.745	18	8.371	0.733	$45,395
395	S-106	S-105	15	345.00	0.030	7.514	0.558	Pressurized	9.474	1.000	7.293	6.650	18	10.983	0.578	$48,300
397	S-105	S-104	12	403.92	0.016	9.792	0.909	Pressurized	19.289	1.000	2.887	2.632	21	9.100	0.653	$60,588
399	S-104	S-103	18	501.82	0.012	9.792	0.909	Pressurized	8.573	1.000	7.493	6.833	21	8.187	0.719	$75,273
401	S-103	S-102	18	497.81	0.012	9.792	0.909	Pressurized	8.573	1.000	7.473	6.815	21	8.163	0.721	$74,672
403	S-102	S-101	18	478.13	0.030	9.792	0.909	Free Surface	11.462	0.700	11.698	10.667				
405	S-101	S-100	18	462.02	0.020	9.792	0.909	Pressurized	8.573	1.000	9.697	8.842	21	10.081	0.599	$69,303
407	S-100	S-99	18	285.63	0.008	9.792	0.909	Pressurized	8.573	1.000	5.974	5.448	24	6.979	0.652	$44,273
409	S-99	S-98	18	230.00	0.007	9.792	0.909	Pressurized	8.573	1.000	5.852	5.337	24	6.862	0.662	$35,650
411	S-98	S-97	18	215.67	0.019	13.080	1.415	Pressurized	11.452	1.000	9.265	8.448	24	10.475	0.591	$33,429
413	S-97	S-96	18	94.00	0.002	13.080	1.415	Pressurized	11.452	1.000	3.217	2.934	36	4.745	0.582	$17,390
415	S-96	S-95	18	116.00	0.003	13.080	1.415	Pressurized	11.452	1.000	3.947	3.599	30	5.454	0.707	$19,720
417	S-95	S-94	18	220.95	0.003	13.080	1.415	Pressurized	11.452	1.000	3.966	3.617	30	5.471	0.705	$37,562
419	S-94	S-93	18	386.14	0.003	13.187	1.431	Pressurized	11.546	1.000	3.965	3.616	30	5.482	0.709	$65,644
421	S-93	S-92	18	213.63	0.003	13.187	1.431	Pressurized	11.546	1.000	3.979	3.629	30	5.499	0.707	$36,317
423	S-92	S-91	18	226.18	0.003	13.187	1.431	Pressurized	11.546	1.000	3.564	3.250	36	5.141	0.548	$41,843
425	S-91	S-90	27	65.74	0.002	13.389	1.462	Pressurized	5.210	1.000	8.210	7.486	36	4.256	0.650	$12,162
427	S-90	S-89	30	151.18	0.002	13.389	1.462	Pressurized	4.220	1.000	11.023	10.052	36	4.301	0.645	$27,968
429	S-89	S-88	18	107.94	0.002	13.389	1.462	Pressurized	11.723	1.000	2.856	2.604	36	4.343	0.639	$19,969
43	Z1G	Z-23	6	25.00	0.040	0.000	0.000	Free Surface	0.000	0.000	0.724	0.660				
431	S-88	S88A	18	234.98	0.002	13.389	1.462	Pressurized	11.723	1.000	2.946	2.686	36	4.449	0.626	$43,471
432	S88A	S-87	18	282.74	0.001	13.389	1.462	Pressurized	11.723	1.000	2.496	2.276	36	3.889	0.705	$52,307
433	S-87	S-86	18	239.17	0.002	13.389	1.462	Pressurized	11.723	1.000	2.953	2.693	36	4.457	0.625	$44,246
435	S-86	S-85	18	303.02	0.002	13.389	1.462	Pressurized	11.723	1.000	2.952	2.692	36	4.457	0.625	$56,059
437	S-85	S-84	18	296.01	0.002	13.389	1.462	Pressurized	11.723	1.000	2.934	2.676	36	4.437	0.627	$54,762
439	S-84	S-83	18	300.28	0.002	13.389	1.462	Pressurized	11.723	1.000	2.940	2.681	36	4.441	0.627	$55,552
441	S-83	S-82	18	361.66	0.002	13.389	1.462	Pressurized	11.723	1.000	2.952	2.692	36	4.457	0.625	$66,907
443	S-82	S-81	18	118.63	0.002	14.171	1.582	Pressurized	12.407	1.000	2.931	2.673	36	4.482	0.653	$21,947
445	S-81	S-80	18	315.60	0.002	14.171	1.582	Pressurized	12.407	1.000	2.943	2.684	36	4.497	0.651	$58,386
447	S-80	S-79	18	382.07	0.002	14.171	1.582	Pressurized	12.407	1.000	2.934	2.676	36	4.489	0.652	$70,683
449	S-79	S-78	18	358.51	0.001	14.171	1.582	Pressurized	12.407	1.000	2.593	2.364	36	4.055	0.715	$66,324
45	Z-23	Z-22	10	352.33	0.004	0.482	0.000	Free Surface	2.635	0.515	0.917	0.836				
451	S-78	S-77	18	311.14	0.002	14.171	1.582	Pressurized	12.407	1.000	2.939	2.680	36	4.497	0.651	$57,561
453	S-77	S-76	18	207.87	0.002	14.171	1.582	Pressurized	12.407	1.000	2.986	2.723	36	4.552	0.645	$38,456
455	S-76	S-75	18	413.60	0.002	14.171	1.582	Pressurized	12.407	1.000	2.994	2.730	36	4.560	0.644	$76,516
457	S-75	S-74	18	254.25	0.002	14.171	1.582	Pressurized	12.407	1.000	2.988	2.725	36	4.552	0.645	$47,036

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
459	S-74	S-73	18	308.99	0.001	14.171	1.582	Pressurized	12.407	1.000	2.598	2.369	36	4.061	0.714	$57,163
461	S-73	S-72	18	473.94	0.002	14.171	1.582	Pressurized	12.407	1.000	2.983	2.720	36	4.548	0.645	$87,679
463	S-72	S-71	18	298.55	0.002	14.601	1.649	Pressurized	12.784	1.000	3.273	2.984	36	4.924	0.618	$55,232
465	S-71	S-70	18	214.36	0.002	14.601	1.649	Pressurized	12.784	1.000	3.255	2.968	36	4.906	0.620	$39,657
467	S-70	S-69	18	340.00	0.003	14.601	1.649	Pressurized	12.784	1.000	3.560	3.246	36	5.259	0.585	$62,900
469	S-69	S-69A	18	116.00	0.002	14.601	1.649	Pressurized	12.784	1.000	3.284	2.995	36	4.942	0.616	$21,460
47	Z-22	Z-21	10	232.19	0.005	0.482	0.000	Free Surface	2.771	0.495	0.982	0.895				
471	S-68	S-67	27	238.00	0.001	14.601	1.649	Pressurized	5.682	1.000	6.373	5.812	48	3.627	0.497	$49,980
475	S-67	S-65	27	150.92	0.001	14.601	1.649	Pressurized	5.682	1.000	6.327	5.770	48	3.609	0.499	$31,693
477	S-65	S-64	27	103.14	0.001	14.601	1.649	Pressurized	5.682	1.000	6.249	5.699	48	3.578	0.502	$21,659
479	S-64	S-63	27	132.00	0.001	14.601	1.649	Pressurized	5.682	1.000	6.298	5.744	48	3.598	0.500	$27,720
481	S-63	S-62	27	292.00	0.001	14.601	1.649	Pressurized	5.682	1.000	6.325	5.768	48	3.609	0.499	$61,320
483	S-62	S-62A	27	53.00	0.001	14.601	1.649	Pressurized	5.682	1.000	6.165	5.621	48	3.538	0.506	$11,130
485	S-61	S-60	27	244.11	0.001	14.785	1.677	Pressurized	5.753	1.000	6.293	5.739	48	3.605	0.504	$51,263
487	S-60	S-59	27	179.00	0.014	14.785	1.677	Pressurized	9.805	0.568	23.955	21.844				
489	S-59	S-58A	27	191.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.342	7.607	36	4.387	0.691	$35,335
49	Z-21	Z-20	10	122.31	0.004	0.482	0.000	Free Surface	2.632	0.516	0.917	0.836				
491	S-58	S-57A	27	27.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.637	7.876	36	4.515	0.674	$4,995
493	S-57	S-56	27	318.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.718	7.950	36	4.552	0.669	$58,830
495	S-56	S56A	27	506.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.604	7.846	36	4.508	0.675	$93,610
497	S-55	S-55A	27	340.00	0.002	15.242	1.747	Pressurized	5.931	1.000	8.775	8.002	36	4.602	0.681	$62,900
501	S-34	S-33	24	486.14	0.003	18.090	1.789	Pressurized	8.909	1.000	7.581	6.913	36	5.445	0.683	$89,936
503	S-33	S-32	24	179.87	0.003	18.090	1.789	Pressurized	8.909	1.000	8.467	7.721	36	5.957	0.631	$33,276
505	S-32	S-31	24	272.57	0.003	18.470	1.847	Pressurized	9.097	1.000	8.424	7.682	36	5.954	0.643	$50,425
507	S-31	S-30	24	315.87	0.003	18.470	1.847	Pressurized	9.097	1.000	8.249	7.522	36	5.856	0.652	$58,436
509	S-30	S-29	15	396.46	0.035	18.470	1.847	Pressurized	23.287	1.000	7.881	7.186	24	14.560	0.599	$61,451
51	Z-20	Z-19	10	369.98	0.005	0.482	0.000	Free Surface	2.903	0.478	1.044	0.952				
511	S-29	S-28	15	455.06	0.033	18.470	1.847	Pressurized	23.287	1.000	7.610	6.940	24	14.174	0.612	$70,534
513	S-28	S-27	15	136.69	0.029	18.470	1.847	Pressurized	23.287	1.000	7.179	6.546	24	13.539	0.637	$21,187
515	S-27	S-26	24	160.65	0.003	18.470	1.847	Pressurized	9.097	1.000	8.656	7.893	36	6.082	0.631	$29,720
517	S-26	S-25	24	132.87	0.004	18.470	1.847	Pressurized	9.097	1.000	9.083	8.282	36	6.323	0.610	$24,581
519	S-25	S-24	24	286.68	0.004	18.470	1.847	Pressurized	9.097	1.000	8.998	8.205	36	6.276	0.614	$53,036
521	S-24	S-23	24	145.25	0.003	18.470	1.847	Pressurized	9.097	1.000	8.515	7.765	36	6.007	0.638	$26,871
523	S-23	S-22	15	419.03	0.040	18.470	1.847	Pressurized	23.287	1.000	8.409	7.668	21	15.011	0.738	$62,855
525	S-22	S-21	15	288.70	0.032	18.470	1.847	Pressurized	23.287	1.000	7.453	6.796	24	13.938	0.621	$44,749
527	S-21	S-20	18	179.30	0.022	18.470	1.847	Pressurized	16.172	1.000	10.014	9.131	24	11.928	0.713	$27,792
529	S-20	S-19	30	184.00	0.011	21.708	2.345	Pressurized	9.770	0.660	28.057	25.585				
53	Z-19	Z-18	10	201.37	0.006	0.482	0.000	Free Surface	3.056	0.459	1.119	1.020				
531	S-19	S-18	30	161.00	0.011	21.708	2.345	Pressurized	9.869	0.654	28.416	25.913				
533	S-18	S-17	30	339.00	0.007	21.708	2.345	Pressurized	6.842	1.000	21.462	19.571	36	8.047	0.571	$62,715
535	S-17	S-17.1	30	44.00	0.019	21.708	2.345	Pressurized	12.002	0.555	36.508	33.291				

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
537	S-16	S-14	36	177.00	0.005	21.708	2.345	Pressurized	7.404	0.612	31.331	28.571				
539	S-14	S-9	30	80.00	0.089	21.944	2.382	Pressurized	21.371	0.360	79.299	72.312				
541	S-9	S-8	30	390.00	0.008	30.223	2.441	Pressurized	9.526	1.000	24.078	21.956	36	9.461	0.659	$72,150
543	S-8	S-7	24	477.00	0.005	30.414	2.471	Pressurized	14.979	1.000	10.719	9.775	48	8.147	0.468	$100,170
545	S-7	S-6	24	263.00	0.006	30.414	2.471	Pressurized	14.979	1.000	11.748	10.713	36	8.554	0.727	$48,655
547	S-6	S-5	30	343.00	0.004	30.414	2.471	Pressurized	9.586	1.000	15.918	14.515	48	7.010	0.527	$72,030
549	S-5	S-4A	30	369.00	0.004	30.414	2.471	Pressurized	9.586	1.000	15.958	14.552	48	7.026	0.526	$77,490
55	Z-18	Z-17	10	152.09	0.004	0.482	0.000	Free Surface	2.478	0.541	0.846	0.771				
551	S-4A	S-4	30	300.00	0.003	31.082	2.574	Pressurized	9.797	1.000	15.347	13.994	48	6.854	0.546	$63,000
559	Z108E	Z107E	6	274.00	0.011	0.000	0.000	Free Surface	0.000	0.000	0.374	0.341				
561	Z107E	Z106E	6	104.00	0.033	0.000	0.000	Free Surface	0.000	0.000	0.285	0.260				
563	Z106E	Z81E	6	248.00	0.020	0.000	0.000	Free Surface	0.000	0.000	0.511	0.466				
565	Z81E	Z73E	6	307.00	0.140	0.000	0.000	Free Surface	0.000	0.000	1.359	1.239				
567	Z73E	Z51E	6	480.00	0.054	0.000	0.000	Free Surface	0.000	0.000	0.845	0.770				
569	Z51E	Z37E	6	177.00	0.073	0.000	0.000	Free Surface	0.000	0.000	0.982	0.895				
57	Z314E	Z313E	6	287.56	0.140	0.000	0.000	Free Surface	0.000	0.000	1.363	1.242				
571	Z37E	Z37E2	6	437.00	0.046	0.000	0.000	Free Surface	0.000	0.000	0.781	0.712				
583	HT1	HT2	10	396.00	0.018	0.792	0.000	Free Surface	5.182	0.448	1.918	1.749				
585	HT2	HT3	10	179.00	0.011	0.792	0.000	Free Surface	4.306	0.517	1.497	1.365				
587	HT3	HT4	12	227.00	0.021	0.792	0.000	Free Surface	5.419	0.330	3.364	3.068				
589	HT4	HT5	12	300.00	0.040	0.792	0.000	Free Surface	6.781	0.281	4.600	4.195				
59	Z313E	Z312E	6	284.85	0.014	0.000	0.000	Free Surface	0.000	0.000	0.436	0.398				
591	HT5	HT6	12	353.00	0.028	0.792	0.000	Free Surface	5.959	0.308	3.841	3.503				
593	HT6	HT7	12	149.00	0.054	0.792	0.000	Free Surface	7.561	0.260	5.363	4.891				
595	HT7	HT8	12	278.00	0.018	0.792	0.000	Free Surface	5.087	0.346	3.084	2.812				
598	HT8	HT10	8	322.00	0.073	0.792	0.000	Free Surface	8.702	0.424	2.117	1.930				
600	HT21A	HT22	12	287.00	0.019	0.792	0.000	Free Surface	5.238	0.338	3.208	2.925				
601	HT10	HT11	8	307.00	0.037	0.792	0.000	Free Surface	6.785	0.514	1.512	1.379				
602	HT25	HT26	12	155.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.153	2.875				
603	HT11	HT12	10	143.00	0.162	0.792	0.000	Free Surface	11.413	0.251	5.721	5.217				
604	HT27	HT28	12	64.00	0.019	0.792	0.000	Pressurized	5.167	0.342	3.148	2.871				
605	HT12	HT13	10	108.00	0.141	0.792	0.000	Free Surface	10.845	0.260	5.334	4.864				
606	HT28	S-186	12	175.00	0.023	0.792	0.000	Pressurized	5.532	0.325	3.464	3.159				
607	HT13	HT14	12	154.00	0.020	0.792	0.000	Free Surface	5.301	0.335	3.265	2.977				
609	HT14	HT15	12	91.00	0.036	0.792	0.000	Free Surface	6.527	0.289	4.363	3.979				
61	Z312E	Z302E	6	184.64	0.109	0.000	0.000	Free Surface	0.000	0.000	1.202	1.096				
611	HT15	HT16	12	168.00	0.036	0.792	0.000	Free Surface	6.542	0.288	4.374	3.989				
613	HT16	HT17	12	223.00	0.030	0.792	0.000	Free Surface	6.113	0.302	3.981	3.630				
615	HT17	HT18	12	208.00	0.034	0.792	0.000	Free Surface	6.413	0.292	4.257	3.882				
617	HT18	HT19	12	186.00	0.067	0.792	0.000	Free Surface	8.171	0.246	5.976	5.449				
619	HT19	HT20	12	177.00	0.056	0.792	0.000	Free Surface	7.662	0.257	5.458	4.977				

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
621	HT20	HT21	12	147.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.152	2.874				
623	HT21	HT21A	12	106.00	0.019	0.792	0.000	Free Surface	5.192	0.341	3.171	2.892				
625	HT22	HT23	12	235.00	0.019	0.792	0.000	Free Surface	5.197	0.340	3.174	2.894				
627	HT23	HT24	12	252.00	0.031	0.792	0.000	Free Surface	6.203	0.299	4.059	3.702				
629	HT24	HT25	12	297.00	0.019	0.792	0.000	Free Surface	5.167	0.342	3.150	2.873				
63	Z302E	Z298E	6	120.76	0.058	0.000	0.000	Free Surface	0.000	0.000	0.879	0.802				
631	HT26	HT27	12	172.00	0.021	0.792	0.000	Free Surface	5.387	0.332	3.340	3.046				
633	Z1	Z2	18	487.70	0.001	2.146	0.000	Free Surface	2.571	0.686	2.634	2.402				
635	Z2	Z3	18	187.56	0.001	2.146	0.000	Free Surface	2.407	0.729	2.435	2.220				
637	Z3	Z4	18	286.07	0.001	2.146	0.000	Pressurized	2.387	0.734	2.415	2.202				
639	Z4	Z5	18	95.62	0.000	2.146	0.000	Pressurized	1.879	1.000	0.984	0.898	27	1.236	0.640	$15,299
641	Z5	Z6	18	93.95	0.002	2.146	0.000	Free Surface	2.776	0.641	2.896	2.641				
643	Z6	Z7	18	317.85	0.002	2.146	0.000	Free Surface	2.842	0.628	2.982	2.719				
645	Z7	Z8	18	276.06	0.001	2.146	0.000	Free Surface	2.563	0.688	2.623	2.392				
647	Z8	Z9	18	303.71	0.002	2.146	0.000	Free Surface	2.583	0.683	2.649	2.416				
649	Z9	Z10	18	118.24	0.002	2.146	0.000	Free Surface	2.587	0.682	2.656	2.422				
65	Z298E	Z286E	6	355.30	0.088	0.000	0.000	Free Surface	0.000	0.000	1.079	0.984				
651	Z10	Z11	18	262.67	0.001	2.146	0.000	Free Surface	2.563	0.688	2.623	2.392				
653	Z11	Z12	18	117.71	0.000	2.146	0.000	Pressurized	1.879	1.000	1.403	1.279	24	1.616	0.622	$18,245
655	Z12	Z13	18	113.00	0.003	2.146	0.000	Pressurized	3.418	0.539	3.788	3.455				
657	Z13	Z14	18	399.38	0.004	2.146	0.000	Free Surface	3.829	0.493	4.402	4.014				
659	Z14	Z15	18	450.79	0.001	2.146	0.000	Pressurized	1.879	1.000	1.814	1.654	21	1.948	0.667	$67,619
661	Z15	Z16	18	254.79	0.003	2.146	0.000	Free Surface	3.550	0.523	3.978	3.627				
663	Z16	Z17	18	319.76	0.004	2.146	0.000	Free Surface	3.702	0.506	4.205	3.834				
665	Z17	Z18	18	188.77	0.002	2.146	0.000	Free Surface	2.634	0.671	2.714	2.475				
667	Z18	Z19	18	483.00	0.005	2.146	0.000	Free Surface	4.082	0.469	4.798	4.376				
67	Z286E	Z285E	6	282.35	0.062	0.000	0.000	Free Surface	0.000	0.000	0.902	0.823				
671	Z19	Z20	18	494.51	0.024	2.146	0.000	Free Surface	7.271	0.305	10.604	9.670				
673	G8	G7	10	314.30	0.003	0.432	0.000	Free Surface	2.332	0.520	0.809	0.738				
675	G7	G6	10	18.70	0.003	0.432	0.000	Free Surface	2.166	0.552	0.734	0.669				
677	G6	G5	10	319.00	0.003	0.432	0.000	Free Surface	2.291	0.527	0.791	0.721				
679	G5	G4	10	319.80	0.003	0.432	0.000	Free Surface	2.291	0.527	0.790	0.720				
681	G4	G3	10	324.70	0.003	0.432	0.000	Pressurized	2.286	0.528	0.788	0.719				
683	G3	G2	10	324.70	0.003	0.432	0.000	Pressurized	2.313	0.523	0.800	0.729				
685	G2	Z20	12	338.00	0.003	0.432	0.000	Pressurized	2.348	0.391	1.335	1.217				
69	Z285E	Z284E	6	406.76	0.068	0.000	0.000	Free Surface	0.000	0.000	0.948	0.865				
691	Z22	Z23	24	70.00	0.004	2.812	0.036	Pressurized	4.054	0.374	9.436	8.605				
71	Z284E	Z283E	6	117.02	0.053	0.000	0.000	Free Surface	0.000	0.000	0.840	0.766				
717	Z23	Z24	24	416.86	0.003	2.812	0.036	Pressurized	3.709	0.400	8.343	7.608				
719	Z24	S-34	24	486.14	0.001	2.812	0.036	Pressurized	2.175	0.608	4.099	3.738				
73	Z283E	Z26E	6	175.39	0.057	0.000	0.000	Free Surface	0.000	0.000	0.869	0.793				

LOAPUD MSA Buildout PWWF (based on additional flows shown on Figure 4, 5 & 6)

ID	From ID	To ID	Diam. (in)	Length (ft)	Slope	Total Flow (mgd)	Peakable Flow (mgd)	Flow Type	Velocity (ft/s)	d/D	Full Flow (mgd)	Flow @ d/D = .75 (mgd)	Replace Diameter (in)	Replace Velocity (ft/s)	Replace d/D	Replace Cost ($)
75	Z26E	Z16E	6	199.57	0.123	0.000	0.000	Free Surface	0.000	0.000	1.276	1.164				
77	Z16E	Z15E	8	216.27	0.108	0.000	0.000	Free Surface	0.000	0.000	2.568	2.341				
772	C-1	S-9	8	70.00	0.101	8.279	0.060	Pressurized	36.696	1.000	2.490	2.271	15	17.678	0.571	$8,400
774	S-17.3	S-16	30	388.00	0.002	21.708	2.345	Pressurized	6.842	1.000	11.608	10.586	48	5.086	0.520	$81,480
776	S-17.2	S-17.3	30	130.00	0.002	21.708	2.345	Pressurized	6.842	1.000	12.555	11.448	48	5.399	0.496	$27,300
778	S-17.1	S-17.2	30	244.00	0.002	21.708	2.345	Pressurized	6.842	1.000	11.541	10.524	48	5.068	0.521	$51,240
780	S-58A	S-58	27	394.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.338	7.603	36	4.387	0.691	$72,890
782	S-57A	S-57	27	283.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.686	7.920	36	4.537	0.671	$52,355
784	S56A	S-56B	27	401.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.737	7.968	36	4.560	0.668	$74,185
786	S-56B	S-55	27	292.00	0.002	14.785	1.677	Pressurized	5.753	1.000	8.631	7.870	36	4.515	0.674	$54,020
788	S-55A	S-55B	27	370.00	0.002	15.242	1.747	Pressurized	5.931	1.000	8.667	7.903	36	4.559	0.687	$68,450
79	Z15E	Z10E	8	304.61	0.079	0.000	0.000	Free Surface	0.000	0.000	2.201	2.007				
790	S-55B	S-55C	27	110.00	0.002	15.277	1.753	Pressurized	5.945	1.000	8.769	7.997	36	4.606	0.682	$20,350
792	S-55C	S-55D	27	548.00	0.002	15.277	1.753	Pressurized	5.945	1.000	8.616	7.857	36	4.533	0.691	$101,380
794	S-55D	S-55E	27	310.00	0.002	15.277	1.753	Pressurized	5.945	1.000	8.681	7.916	36	4.562	0.688	$57,350
796	S-55E	S-55F	27	479.00	0.002	15.277	1.753	Pressurized	5.945	1.000	9.170	8.362	36	4.775	0.660	$88,615
798	S-55F	S-55G	27	250.00	0.007	15.277	1.753	Free Surface	7.190	0.771	16.256	14.823	30	7.364	0.622	$42,500
802	S-55G	S-55H	27	102.00	0.032	15.277	1.753	Pressurized	13.386	0.456	35.826	32.669				
804	S-55H	S-34	27	135.00	0.082	15.277	1.753	Pressurized	18.926	0.352	57.550	52.479	48	17.832	0.162	$28,350
806	S-62A	S-61	27	423.00	0.001	14.785	1.677	Pressurized	5.753	1.000	6.324	5.767	48	3.618	0.502	$88,830
808	S-69A	S-68	27	70.00	0.002	14.601	1.649	Pressurized	5.682	1.000	9.595	8.750	36	4.906	0.620	$12,950
81	Z10E	Z9E	8	97.71	0.049	0.000	0.000	Free Surface	0.000	0.000	1.728	1.576				
812	S-108A	S-106	15	249.00	0.049	7.514	0.558	Free Surface	13.028	0.683	9.285	8.467				
814	S-115A	S-115	15	251.00	0.037	7.452	0.549	Free Surface	11.465	0.764	8.010	7.304	18	11.789	0.542	$35,140
84	Z9E	Z3E	8	206.14	0.050	0.000	0.000	Free Surface	0.000	0.000	1.756	1.601				
86	S-204	S-203	12	137.54	0.021	1.682	0.000	Free Surface	6.594	0.502	3.341	3.047				
87	Z3E	Z-17	8	90.47	0.048	0.000	0.000	Free Surface	0.000	0.000	1.707	1.557				
88	S-202	S-201	12	122.23	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.044				
89	Z-17	Z-16	10	401.63	0.012	0.482	0.000	Free Surface	3.930	0.380	1.576	1.437				
90	S-203	S-202	12	66.04	0.021	1.682	0.000	Free Surface	6.586	0.502	3.338	3.043				
91	Z-16	Z-15	10	274.03	0.013	0.482	0.000	Free Surface	3.967	0.377	1.598	1.457				
92	J-1	L-1	10	12.00	0.002	0.426	0.066	Free Surface	1.798	0.637	0.580	0.529				
93	Z-15	Z-14	10	198.71	0.009	0.482	0.000	Free Surface	3.504	0.414	1.348	1.229				
94	G105	G104	10	180.00	0.031	0.000	0.000	Free Surface	0.000	0.000	2.482	2.263				
95	Z6D	Z-14	6	135.00	0.027	0.000	0.000	Free Surface	0.000	0.000	0.594	0.541				
96	G93A	G93	10	373.16	0.002	0.000	0.000	Free Surface	0.000	0.000	0.709	0.646				
97	Z-14	L-2	10	110.88	0.011	1.386	0.139	Free Surface	4.750	0.771	1.471	1.341	12	4.885	0.546	$11,088
98	Z20	Z22	24	505.68	0.003	2.812	0.036	Pressurized	3.783	0.394	8.575	7.819				
MTID	MTIDAIN	MTIDALS	8	5	0.2	1.766	0.272	Free Surface	15.562	0.502	3.502	3.193				
WYM	WYMAN	WYMANSRAVINE	8	5	0.3	12.82	1.972	Pressurized	56.822	1	4.289	3.911	15	29.705	0.535	600