Sarasota County

Sarasota County
Reclaimed Water Master Plan

May 2013

McKIM&CREED

Reclaimed Water Master Plan

prepared for

Sarasota County

May 2013

Prepared By:

McKIM&CREED

378 Interstate Court
Sarasota, FL 34240
(941) 379-3404

Blake Peters, PE
Florida Licensed Professional Engineer
No. 64429

Date

Sarasota County

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Reclaimed Water Master Plan

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ABBREVIATIONS

AADF	Average Annual Daily Flow
AWT	Advanced Wastewater Treatment
BEBR	Bureau of Economic and Business Research
CBOD5	Carbonaceous Biochemical Oxygen Demand
CIP	Capital Improvement Project
DI	Ductile Iron
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FPS	Feet per Second
GIS	Geographic Information System
GPD	Gallons per Day
GPM	Gallons per Minute
HDPE	High Density Polyethylene
LF	Linear Foot
LIDAR	Light Detection and Ranging
MG	Million Gallons
MGD	Million Gallons per Day
MMADF	Max Month Average Day Flow
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
RCW	Reclaimed Water
SCADA	Supervisory Control and Data Acquisition
SWFWMD	Southwest Florida Water Management District
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Loads
TSS	Total Suspended Solids
WQBEL	Water Quality Based Effluent Limits
WRF	Water Reclamation Facility
WUP	Water Use Permit

Model Elements

BRSP_1	Bee Ridge Storage Pond_1
BTPSV-1	Bent Tree Golf Course 1 Pressure Sustaining Valve
BTPSV-2	Bent Tree Golf Course 2 Pressure Sustaining Valve
BTSP-1	Bent Tree Storage Pond-1
BTSP-2	Bent Tree Storage Pond-2
CCSP_1	Central County Storage Pond-1
ETPSV-1	Eagle Trace Pressure Sustaining Valve
ETSP-1	Eagle Trace Storage Pond-1

ABBREVIATIONS (Continued)

FCPSV-1	Founder's Golf Club Pressure Sustaining Valve
FCPSV-2	Founder's Club Pressure Sustaining Valve
FCSP-1	Founders Club Storage Pond-1
FCSP-2	Founders Club Storage Pond-2
GCPSV-1	Gator Creek Golf Course Pressure Sustaining Valve
GCSP-1	Gator Creek Storage Pond-1
GPSV-1	Longmeadow Pressure Sustaining Valve
GSP-1	Longmeadow Storage Pond-1
HLPSV-1	Preserve at Heron Lake Pressure Sustaining Valve
HLSP-1	Preserve at Heron Lake Storage Pond-1
HOPSV-1	Heritage Oaks Pressure Sustaining Valve
HOSP-1	Heritage Oaks Storage Pond-1
ISPSV-1	Isles of Sarasota Pressure Sustaining Valve
ISSP-1	Isle of Sarasota Storage Pond-1
J	Junction
LOPSV-1	Laurel Oaks GC Pressure Sustaining Valve
LOPSV-2	Laurel Oaks GC Pressure Sustaining Valve
LOSP-1	Laurel Oak Storage Pond-1
LOSP-2	Laurel Oak Storage Pond-2
MCPSV-1	Misty Creek Pressure Sustaining Valve
MCSP-1	Misty Creek Storage Pond-1
OPSV-1	Oaks Golf Course Pressure Sustaining Valve
OSP-1	Oaks Storage Pond-1
P	Pipe
PMP-42	Proposed Master Pump Station
PPSV-1	Prestancia Pressure Sustaining Valve
PSBR1_1	Pump Station Bee Ridge 1_Pump 1
PSBR1_2	Pump Station Bee Ridge 1_Pump 2
PSBR1_3	Pump Station Bee Ridge 1_Pump 3
PSBR1_4	Pump Station Bee Ridge 1_Pump 4
PSBR2_5	Pump Station Bee Ridge 2_Pump 5
PSBR2_6	Pump Station Bee Ridge 2_Pump 6
PSBR2_7	Pump Station Bee Ridge 2_Pump 7
PSBR2_8	Pump Station Bee Ridge 2_Pump 8
PSCC1_2	Pump Station Central County 1_Pump 2
PSCC1_3	Pump Station Central County 1_Pump 3
PSCC1_4	Pump Station Central County 1_Pump 4
PSCC1_5	Pump Station Central County 1_Pump 5
PSP-1	Prestancia Storage Pond-1
PSPXN1_1	Pump Station Parcel X North 1_Pump 1

ABBREVIATIONS (Continued)

PSPXN1_2	Pump Station Parcel X North 1_Pump 2
PSPXN1_3	Pump Station Parcel X North 1_Pump 3
PSV-22	Miss Sarasota Softball Pressure Sustaining Valve
PSV-23	Oaks I Pressure Sustaining Valve
PUBPSV-1	Publix Pressure Sustaining Valve
PUBSP-1	Publix Storage Pond-1
PXNSP_1	Parcel X North Storage Pond_1
RHPSV-1	Foxfire Golf Club Pressure Sustaining Valve
RHSP-1	Red Hawk Storage Pond-1
SBPSV-1	Stoneybrook GC Pressure Sustaining Valve
SBSP-1	Stoneybrook Storage Pond-1
SGCPSV-1	Sarasota Golf Course Pressure Sustaining Valve
SGCSP-1	Sarasota Golf Club Storage Pond-1
SPSV-1	Serenoa Pressure Sustaining Valve
SSP-1	Serenoa Storage Pond-1
VWPSV-1	Village Walk Pressure Sustaining Valve
VWPSV-2	Village Walk Pressure Sustaining Valve
VWSP-1	Village Walk Storage Pond-1
VWSP-2	Village Walk Storage Pond -2

EXECUTIVE SUMMARY

Introduction

Sarasota County's goal is to provide utility services that meet the needs of current and future customers while protecting the environment and supporting the County's planning framework. The County uses reclaimed water to provide irrigation water to commercial users, residential users, parks, medians and golf courses to meet their needs and to reduce the use of valuable drinking water resources. In addition to providing irrigation water, the County also has the means to dispose of excess reclaimed water during wet weather periods when supplies exceed user demands. The County's primary goal for its reclaimed water system is to maximize the beneficial reuse of this resource for irrigation purposes.

The objective of this Master Plan is to guide the County in storing, distributing and maximizing the use of reclaimed water to meet the needs of existing and projected users over the next 20 years. This plan evaluates the existing reclaimed water system, creates an updated computer hydraulic model used to evaluate system components, identifies potential future reclaimed water users and projected demands, identifies areas needing improvements, provides preliminary design parameters for CIP projects needed for the reclaimed water system, and apportions the estimated costs over the next twenty years for the projected improvements. These recommended improvements address system capacity, system delivery pressure, storage, and disposal requirements needed to optimize reclaimed water availability.

Existing Reclaimed Water System

A hydraulic model was obtained from the County, which was then analyzed, further developed, and incorporated into a consolidated GIS database. The hydraulic model was updated with recent information, calibrated to approximate field measured conditions and brought into line with County hydraulic modeling standards. The model was used to evaluate the ability of the current system to deliver reclaimed water at minimum pressures needed for existing system

demands. Modeling components and strategies included piping, control valves, pumping systems, storage ponds, irrigation schedules, and disposal wells. The hydraulic modeling results indicated that the County's current reclaimed water system generally has the ability to deliver this resource at pressures needed to meet current demands. In the northwest portion of the County's reclaimed water system, the hydraulic modeling resulted in a calculated pressure of 30 psi, which is lower than the minimum pressure goal of 40 psi. Since the existing reclaimed water users in this area are served by irrigation systems that are fed directly from bulk storage ponds, the calculated pressure of 30 psi was deemed adequate in this area.

Demand Projections

This plan identifies future demands and develops estimates for those demands. The existing demands are documented along with their associated usage patterns and peaking factors. In 2011 the annual average daily flow demand was 5.56 mgd with a majority of the existing demand from bulk users with on-site storage ponds and private irrigation systems. Future demands are projected based on the feasibility and likelihood of certain parcels and areas within the County using reclaimed water during the planning period. A significant portion of the projected future demands are expected to occur in the Energy Economic Zone and areas east of I-75 south of Clark Road. Factors that were considered for future demand projections include the distance from the parcel to a reclaimed water pipe, irrigable acreage, land use type, and the potential for the County to obtain offset credits by providing reclaimed water to reduce groundwater pumping. Future reclaimed water usage is projected to increase by approximately 3.2 million gallons per day (mgd) during the 20-year planning period. Additional discussions regarding the viability of the County providing reclaimed water to several potential significant users such as Hi Hat Ranch, LT Ranch and Schroeder-Manatee Ranch in the future are also included.

Regulatory Requirements

A review and discussion of regulatory requirements, previous studies of the County's watersheds, along with a comparison to other local municipal reclaimed water systems' ordinances, costs, and water quality is included as part of this plan. Recommendations are provided which consider reclaimed water quality and watershed concerns, while ensuring the County's reclaimed water system is further developed and expanded to meet projected future demands. The County should continue monitoring groundwater quality in the vicinity of significant watersheds where reclaimed water is applied, educate the general public regarding the safety and use of reclaimed water, and monitor regulatory requirements for the application of reclaimed water.

A review of current County reclaimed water rules and regulations indicates the need for the County to consider additional reclaimed water incentives or continued education programs to promote the use of reclaimed water as an environmentally responsible alternative. Additionally, there are terms such as "reuse" and "reclaimed water" that are used interchangeably within the County Code of Ordinances; this terminology should be made consistent. Finally, it is recommended that the County Code of Ordinances be clarified in instances where the terms "water" and "wastewater" are used in a sentence, especially where is may be appropriate to include the term "reclaimed water."

Analyses and Hydraulic Modeling

Evaluations were performed to develop cost-effective and efficient solutions to address the components needed for the expansion of the County's reclaimed water system. The evaluations included the development of several hydraulic modeling scenarios used to represent projected future system growth and demands. Modeling scenarios were further developed to identify specific areas where improvements will be needed to provide the County's customers with the required level of service and delivery pressure for reclaimed water. Reclaimed water system analyses considered many alternatives needed to address future demands and pressure

requirements, while focusing on those alternatives that provide the best values for the County. Modeling results indicate the need to install new pipes to deliver reclaimed water to the areas where significant future demands are projected to occur; specifically in the area east of I-75 south of Clark Road and in the Energy Economic Zone. Low pressure in the northwest portion of the County's reclaimed water system, downstream of the Atlantic deep injection well, indicated the need for a booster pump station to increase system pressure in this area. A potential alignment for the north/south interconnect was also evaluated to minimize the length of interconnect piping by maximizing the existing North Master Reuse System infrastructure's capacity to transfer flow.

Reclaimed Water Storage

While regulations are satisfied for reclaimed water storage and wet weather disposal with the County's current reclaimed water system, the operations of the system, increasing flows, and locations of storage and disposal components led to an evaluation of the storage and disposal systems. The FDEP LandAp2010 water balance program was utilized to determine the storage requirements to meet the ten year wet weather recurrence interval. Although initial results indicated the County had sufficient storage capacity, operational limitations and regulatory requirements associated with the upcoming Central County deep injection well indicate the potential need for up to 12 million gallons (MG) of additional reclaimed water storage at the Bee Ridge Water Reclamation Facility (WRF) within the planning period. Additionally, the analyses project that the County will need an additional 8 mgd of reclaimed water disposal capacity during the planning period.

Reclaimed Water System Improvements

CIPs needed to address system deficiencies and to expand the reclaimed water system were developed for the 20-year planning period. Those projects having immediate or more pressing needs are further developed in the plan and include an allocation of project costs over the estimated period to complete the project. Projects were also recommended by identifying

current and anticipated operational limitations that impact the County's ability to store and utilize this valuable resource to the fullest extent possible. Cost estimates for these projects were derived using information obtained from similar planning documents and bid tabulations from recent construction projects. The CIPs listed in **Table ES-1** are anticipated to be programmed in the County's FY2014-FY2018 CIP. The CIPs summarized in **Table ES-2** are anticipated to be implemented through the year 2032.

Table ES-1: Recommended Reclaimed Water System CIPs – 5 Year CIP

Project ID[1]	Project Description	Cost
Wastewater Treatment Facilities		
10	Replace pond filters at the Parcel X north pond.	$900,000
19	Study to optimize reclaimed water quality from the Bee Ridge and Central County WRFs.	$80,000
Transmission System Improvements		
13	Construct 1,500 linear feet of 12-inch reclaimed water main to serve the National Cemetery and future development.	$200,000
Reclaimed Water System Improvements		
8	Hydraulic Site Capacity Evaluation	$50,000
20	Improvement to serve City of Sarasota reclaimed water customers in and around 17th Street.	$2,300,000
Total		**$ 3,530,000**

1. Refer to Figure 12-1.

Table ES-2: Recommended Reclaimed Water System CIPs – 2032

Project ID[1]	Project Description	Cost
Wet Weather Storage		
2	Construct three 4 MG ground storage tanks at the Bee Ridge WRF.	$12,400,000
3	Potential Deep Injection Well Site Evaluation	$150,000
4	Construct Deep Injection Well.	$6,000,000
Wastewater Treatment Facilities		
9	Replace pond filters at Central County WRF.	$1,000,000
Transmission System Improvements		
1	Construct a booster pump station and 865 linear feet of 16-inch reclaimed water main to increase pressure in the northwest area of the system.	$1,000,000
5	Construct 48,582 linear feet of 20-inch reclaimed water main to serve future developments and to provide a northern reclaimed water interconnect with the City of Venice.	$11,800,000
6	Construct 8,413 linear feet of 20-inch reclaimed water main to increase flow within the north/south interconnect and to increase delivery pressure during build-out.	$2,020,000
11	Construct 3,248 linear feet of 12-inch, and 11,182 linear feet of 10-inch reclaimed water main to serve future developments within the Energy Economic Zones.	$1,200,000
12	Construct 3,311 linear feet of 12-inch and 4,374 linear feet of 8-inch reclaimed water main to serve future development.	$580,000
14	Construct 32,203 linear feet of 20-inch reclaimed water main along the future roadway to serve future developments.	$6,960,000
15	Construct 11,339 linear feet of 10-inch reclaimed water main along future roadway to serve future developments.	$920,000
16	Construct 9,280 linear feet of 8-inch reclaimed water main to create a system loop and serve future developments.	$590,000
17	Construct 16,025 linear feet of 10-inch reclaimed water main to serve the Nathan Benderson Park.	$1,730,000

Table ES-2: Recommended Reclaimed Water System CIPs – 2032 (Continued)

Project ID[1]	Project Description	Cost
18	Construct 15,037 linear feet of 24 inch reclaimed water main to increase system pressures.	$3,790,000
Other Improvements		
7	Installation of reclaimed water management system for certain bulk storage ponds.	$1,150,000
Total		**$ 51,290,000**

1. Refer to Figure 12-1.

The summary of CIPs includes projects within the 20-year planning period. These reclaimed water system expansion projects should be evaluated at least every 5 years to adjust the County's capital improvement program to reflect actual needs as growth develops and other conditions change. The total cost of improvements will vary based on the alternatives selected to maximize reclaimed water delivery and system pressure.

1.0 INTRODUCTION

1.1 Master Plan Objectives

Sarasota County (County) has established the goal of providing utility services that meet the needs of both current and future users while protecting the environment and supporting the County's planning framework. The main objective of this master plan is to provide a guidance document for the long term development and growth of the County's reclaimed water system. The master plan provides an assessment of the existing system, and identifies limitations and areas that will require expansion or modification to meet the future reclaimed water needs of the County. Although emphasis is placed on the North Master Reuse System, the South Reuse System is also considered as part of this plan as it may be beneficial for the County to interconnect the system at some point in the future. The Master Plan also provides the County with the guidance for developing a capital improvement program (CIP) for projects which support the growth of the County's reclaimed water system.

1.2 Methodology and Overview

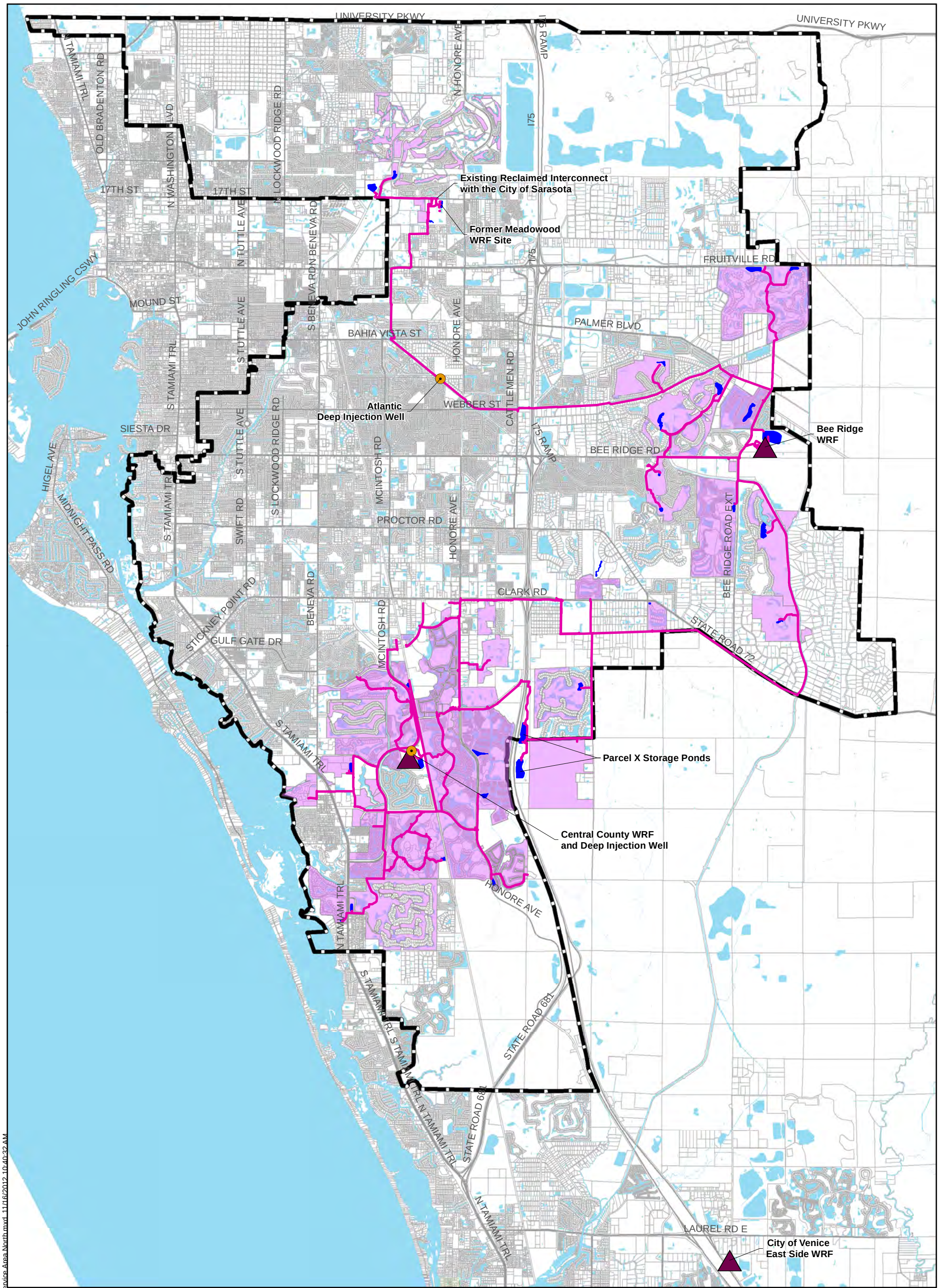
In order to evaluate the reclaimed water system and to identify improvements needed, a stepwise methodology was utilized for the master planning process. The first step of the process was data collection which consisted of numerous sources of data. Data sources included the Sarasota County Comprehensive Plan, Sarasota County Planning Department, Geographic Information System (GIS) data, light detection and ranging (LIDAR) data, hydraulic model data, future land use data, plant operating data, flow meter data, Supervisory Control and Data Acquisition (SCADA) data, field investigations, and related engineering reports and studies. A list of references used as part of this master plan is provided in **Appendix B**.

The second step of the process was an evaluation of the data for the County's reclaimed water system, which included: identifying potential reclaimed water users; developing the associated demand projections; and evaluating the system components for both the existing and future reclaimed water systems. The evaluation utilized hydraulic modeling software and a water balance program to calculate the current and projected wet weather storage and disposal requirements for the 20-year planning period. Current and future regulations and reclaimed water quality within the County's watersheds were also evaluated to help plan the future expansion of the system.

The final step of the process was the identification of future reclaimed water system infrastructure requirements based on the findings and the analysis. Improvement recommendations were completed as part of the Master Planning process, which include CIPs, cost estimates, and the recommended time period in which those projects should be completed and placed into service.

1.3 Existing Service Area

The County's reclaimed water system is divided into three service areas, North County, Central County and South County. The Sarasota County North Master Reuse System, which consists of the North and Central County service areas, is the primary subject area of this master plan. The Sarasota County South Master Reuse System, which consists of the South County service area, was also considered as it may be beneficial to interconnect the respective reuse areas at some point in the future. **Figures 1-1** and **1-2** show the Sarasota County North and South Master Reuse System boundaries, including service areas within these boundaries.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N HONORE AVE
I75
N TAMIAMI TRL
OLD BRADENTON RD
N WASHINGTON BLVD
N LOCKWOOD RIDGE RD
17TH ST
17TH ST
Existing Reclaimed Interconnect with the City of Sarasota
Former Meadowood WRF Site
S BENEVA RD
N BENEVA RD
N TUTTLE AVE
I75
FRUITVILLE RD
JOHN RINGLING CSWY
MOUND ST
S TUTTLE AVE
PALMER BLVD
BAHIA VISTA ST
HONORE AVE
CATTLEMEN RD
S TAMIAMI TRL
Atlantic Deep Injection Well
WEBBER ST
SIESTA DR
S LOCKWOOD RIDGE RD
I75 RAMP
Bee Ridge WRF
BEE RIDGE RD
HIGEL AVE
MIDNIGHT PASS RD
S TAMIAMI TRL
SWIFT RD
S TUTTLE AVE
MCINTOSH RD
PROCTOR RD
HONORE AVE
BEE RIDGE ROAD EXT
CLARK RD
STICKNEY POINT RD
GULF GATE DR
BENEVA RD
STATE ROAD 72
S TAMIAMI TRL
Parcel X Storage Ponds
Central County WRF and Deep Injection Well
N TAMIAMI TRL
HONORE AVE
S TAMIAMI TRL
STATE ROAD 681
STATE ROAD 681
N TAMIAMI TRL
N TAMIAMI TRL
LAUREL RD E
City of Venice East Side WRF
N
W
E
S
Legend
Deep Injection Well
Water Reclamation Facility
Reclaimed Pipe
Existing Service Area
Reuse Storage Ponds
Service Area Boundary
McKIM&CREED
Sarasota County
Figure 1-1
North Master Reuse System
Existing Service Area
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Existing Reclaimed Water Interconnect with the City of Venice

Center Road Deep Injection Well

Venice Gardens RO WTF Deep Injection Well

Venice Gardens WRF and Deep Injection Well

ALBEE FARM RD S
ALBEE FARM RD
PINEBROOK RD
US 41 BYPASS N
N TAMIAMI TRL
E VENICE AVE
I75 RAMP
I75
JACARANDA BLVD
N RIVER RD
US 41 BYPASS S
CENTER RD
JACKSON RD
VENICE EAST BLVD
S TAMIAMI TRL
ROCKLEY BLVD
ENGLEWOOD RD
MANASOTA BEACH RD
MANASOTA KEY RD

N
W
E
S

McKIM&CREED

Sarasota County

Legend

- Deep Injection Well
- Water Reclamation Facility
- Reclaimed Pipe
- Existing Service Area
- Reuse Storage Pond
- Service Area Boundary

Figure 1-2
South Master Reuse System
Existing Service Area

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The Bee Ridge and Central County WRFs receive wastewater flow from the North County Service Area with the exception of those areas served by Aqua Utilities Inc., which is a private utility system located in the northern end of the County. The Bee Ridge WRF is currently permitted to treat 8.7 mgd based on a 3 month rolling average daily flow. The Meadowood, Atlantic, South Gate, and Gulf Gate WRFs historically treated wastewater and produced reclaimed water within this service area; all four of these facilities were decommissioned between 2009 and 2010. The Gulf Gate and South Gate WRFs were replaced with master pump stations. Wastewater from the Gulf Gate master pump station is transferred to the Central County WRF which is permitted to treat 4.6 mgd on a 3 month rolling average daily flow. The Lockwood Ridge Interconnect Force Main Project, which is currently in construction, will provide the necessary infrastructure to interconnect the South Gate and Gulf Gate master pump stations. Once completed, the force main will provide the County with the operational flexibility to direct flow from both the Gulf Gate and South Gate master pump stations to either the Bee Ridge or Central County WRF. After completion of the Siesta Key Force Main Project all of the available reclaimed water within the Sarasota County North Master Reuse System will be produced at the Bee Ridge and Central County WRFs.

Reclaimed water meeting Part III public access standards is produced by the Bee Ridge and Central County WRFs within the Sarasota County North Master Reuse System. The County has an agreement with the City of Sarasota to send or receive up to 2.0 mgd annual average daily flow (AADF) of reclaimed water through an interconnect located on 17th Street, just west of the decommissioned Meadowood WRF. Effluent from the Bee Ridge WRF is either utilized for public access reclaimed water or disposed of using a deep injection well located at the decommissioned Atlantic WRF. The County's reclaimed water system customers consist of residential developments, commercial areas, common areas, and golf courses. The majority of the residential customers are bulk customers, who receive reclaimed water from on-site storage ponds for withdrawal

by private irrigation systems. The golf courses are supplied with reclaimed water by filling their on-site ponds, which are used to supply their respective private irrigation systems. **Figure 1-3** shows the customers within the Sarasota County North Master Reuse System service area that utilized reclaimed water in 2011.

Reclaimed water meeting Part III public access standards is provided to the South Master Reuse System by the Venice Gardens WRF which is permitted to treat 2.0 mgd annual average daily flow. Up to 3.0 mgd of reclaimed water meeting Part III public access standards may be also be provided to the County by the City of Venice Eastside WRF per an agreement with the City of Venice. Reclaimed water not utilized for beneficial reuse is disposed of using deep injection wells. The South Master Reuse System includes the following deep injection wells:

- Venice Gardens Deep Injection Well (7.9 mgd peak hourly flow)
- Venice Gardens RO Water Treatment Plant (1.86 mgd peak hourly flow)
- Center Road Deep Injection Well (4.0 mgd peak hourly flow)

The public access reclaimed water system customers within the South Master Reuse System has a similar demographic as the North Master Reuse System with the system supplying residential developments, commercial areas and golf courses. The golf courses are supplied with reclaimed water by filling their on-site ponds which they use to supply their respective private irrigation systems.

Existing Users

1	Stonebridge
2	Village Walk
3	Arielle
4	Huntington Point
5	Turtle Rock
6	Heritage Oaks Golf and Country Club
7	Stoneybrook Golf and Country Club
8	Eagle Trace Estates
9	Prestancia
10	Wellington Chase
11	Red Hawk Reserve
12	Silver Oak/The Enclave
13	Preserve at Heron Lake
14	Stoneybrook Estates
15	Villa Mirada
16	Pelican Cove
17	Sarasota Square Mall
18	Botanica
19	Palmer Park of Commerce
20	Eagle Trace Estates
21	Mayfair
22	17th Street Soccer Fields
23	Isles of Sarasota
24	Plaza De Flores
25	La Venezia
26	Sarasota Golf Club
27	Laurel Oaks Country Club
28	Bent Tree Country Club
29	Shea, James (SFH)
30	Serenao Golf Course
31	Pelican Cove Condominium
32	The Meadows and Groves Golf Course
33	Pool Water Products
34	Palmer Ranch Healthcare and Rehabilitation
35	Potter Park
36	The Hamptons
37	Palmer Ranch Master Homeowner's Association
38	Pinestone
39	Marbella
40	Alterra Healthcare Corp.
41	The Founders Club
42	Norman's Liquors
43	Lowes Home Center
44	USPS
45	Honore Ave Fire Station
46	R F Carlson Co
47	Serenade Condominiums
48	Sawyer Loop Partners
49	Glenridge
50	Bee Ridge Publix Shopping Center
51	Misty Creek Golf Club
52	Northridge Publix Shopping Center
53	Oaks Club
54	CVS Pharmacy
55	Sarasota Memorial Hospital Health Center
56	Gator Creek Golf and Country Club
57	Dorman, Terry (SFH)
58	Miss Sarasota Softball
59	17th Street Fire Station
60	Bayside Sod
61	Sunrise Golf Course
62	Deer Creek
63	The Oaks
64	Valencia at Prestancia

Central County WRF

Parcel X Storage Ponds

Bee Ridge WRF

Legend

- Deep Injection Well
- Water Reclamation Facility
- Sarasota County Existing Reclaimed Pipe
- Reuse Storage Pond
- Existing User
- Existing User - No Demand in 2011

N W E S

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Figure 1-3
North Master Reuse System
Existing Users

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2.0 RECLAIMED WATER SYSTEM COMPONENTS

The County's reclaimed water system includes storage and pumping facilities located at the Bee Ridge and Central County WRFs, Parcel X North and South storage ponds, transmission and distribution piping, delivery control components (e.g., control valves, flow meters, pressure sustaining valves, etc.) at the end user locations, and bulk user storage ponds. This section summarizes the major components within the Sarasota County North and South Master Reuse Systems, which are shown respectively in **Figures 2-1** and **2-2.**

2.1 Reclaimed Water Distribution System

The County's distribution system that delivers reclaimed water to the users includes a series of pipes ranging in size from 4 inches up to 36 inches. For purposes of this master plan, the reclaimed water system pipes that are privately owned (downstream of a master meter or bulk user pond serving a private irrigation system) were not evaluated. The resulting piping network is referred to as the North Master Reuse System base system in this master plan. A summary of reclaimed water system pipes within the North Master Reuse System is provided in **Table 2-1**.

Hammock Place Storage RCW Pond (16 MG)

Meadowood Storage RCW Pond 1 and Pond 2 (3.8 MG)

Atlantic Deep Injection Well 1 (4.87 mgd, PHF)

Bee Ridge Storage RCW Pond 1 (145.2 MG)

Bee Ridge Storage RCW Tank 1 (2 MG)

Bee Ridge WRF

Central County Deep Injection Well 1 (18.2 mgd, PHF, Pending)

Central County WRF

Central County Storage RCW Pond 1 (19.6 MG)

Parcel X North Storage RCW Pond 1 (36 MG)

Parcel X South Storage RCW Pond 1 (68 MG)

N TUTTLE AVE
N BENEVA RD
17TH ST
175
N HONORE AVE
175 RAMP
FRUITVILLE RD
PALMER BLVD
S TUTTLE AVE
S BENEVA RD
BAHIA VISTA ST
WEBBER ST
CATTLEMEN RD
BEE RIDGE RD
S LOCKWOOD RIDGE RD
MCINTOSH RD
PROCTOR RD
SWIFT RD
CLARK RD
BEE RIDGE ROAD EXT
STATE ROAD 72
S TAMIAMI TRL
STATE ROAD 681

Legend

- Water Reclamation Facility
- Deep Injection Well
- Sarasota County Existing Reclaimed Pipe
- Reuse Storage Pond
- Service Area Boundary

N W E S

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Sarasota County

Figure 2-1
North Master Reuse System
Existing System

Venice Gardens
Reverse Osmosis WTP
Deep Injection Well 1
(1.86 mgd, PHF)

Center Road Deep Injection
Well 1 (4.0 mgd, PHF)

Venice Gardens
Storage RCW
Pond 1 (1MG)

Venice Gardens
Deep Injection
Well 1 (7.9 MGD, PHF)

Venice Gardens
WRF

Venice Gardens
Storage RCW
Tank 1 (3 MG)

ALBEE FARM RD
I75 RAMP
I75 RAMP
I75 RAMP
I75
N RIVER RD
JACARANDA BLVD
E VENICE AVE
US 41 BYPASS S
PINEBROOK RD
JACKSON RD
CENTER RD
VENICE EAST BLVD
ROCKLEY BLVD
S TAMIAMI TRL
ENGLEWOOD RD
MANASOTA BEACH RD
MANASOTA KEY RD

N
W E
S

McKIM&CREED

Sarasota County

Legend

- Water Reclamation Facility
- Deep Injection Well
- Sarasota County Existing Reclaimed Pipe
- Reuse Storage Pond
- Service Area Boundary

Figure 2-2
South Master Reuse System
Existing System

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Table 2-1: Reclaimed Water System Pipe Summary[1]

Pipe Diameter (in.)	Pipe Length (ft.)	Contribution (%)
4	68,966	17.8%
6	36,717	9.5%
8	46,440	12.0%
10	36,192	9.4%
12	62,369	16.1%
14	13,842	3.6%
16	105,662	27.3%
18	1,984	0.5%
20	5,553	1.4%
24	7,606	2.0%
36	1,296	0.4%
Total	**386,627**	**100%**

1. Pipe lengths based on Sarasota County North Master Reuse System reclaimed water model (WaterCAD), provided by the County.

2.2 Reclaimed Water Delivery Control Devices

Pressure sustaining valves and pond level switches are used throughout the system where reclaimed water is discharged into storage ponds. These control devices allow the bulk user ponds to fill when there is adequate system pressure, which is based on a predetermined set point. The purpose of using the control devices is to only fill the bulk storage ponds when the system pressure is high enough, so that that demands are met for those users connected directly to the County's pressurized distribution system. The settings of the pressure sustaining valves vary based on location. In general, the County's goal is to maintain at least 40 pounds per square inch (psi) at the master meters.

2.3 Reclaimed Water Storage Facilities

The County's reclaimed water system includes several water storage locations, which help to meet demands, while also helping to maximize the beneficial use of reclaimed water. The existing storage capacity of the County's reclaimed water system is 290.6 million gallons as identified in the North Master Reuse System master reuse permit and

as summarized in **Table 2-2**. The location of the reclaimed water storage ponds is shown in **Figure 2-1**. Approximately 50% of the 290.6 million gallons of storage is provided by the Bee Ridge WRF on-site pond. With the exception of the Hammock Place Pond, reclaimed water stored in the ponds listed in **Table 2-2** may be pumped back into the system to satisfy demands. The remaining ponds in the North Master Reuse System are bulk user storage ponds that are used to supply private irrigation systems and are not configured to pump back into the reclaimed water system.

Table 2-2: Summary of Reclaimed Water System Storage

Site Abbreviation[1]	Storage System Name	Number of Ponds	Location	Storage Type	Volume (MG)
HPSP-1	Hammock Place Pond	1	Hammock Place Drive/17th Street	Unlined	16
MWSP-1 MWSP-2	Meadowood Ponds 1 and 2	2	Meadowood WRF - Decommissioned	Unlined	3.8
BRSP-1	Bee Ridge Storage Pond	1	Bee Ridge WRF	Clay Lined	145.2
BRST-1	Bee Ridge Ground Storage Tank	1	Bee Ridge WRF	Above Ground Storage Tank	2.0
CCSP-1	Central County Storage Pond	1	Central County WRF	Clay Lined	19.6
PXNSP-1	Parcel X North Pond	1	East of I-75, Parcel X North	Membrane Lined	36
PXSSP-1	Parcel X South Pond	1	East of I-75, Parcel X South	Membrane Lined	68
Total					**290.6**

1. Storage name abbreviation followed by pond or tank number.

Table 2-3 shows the bulk user storage ponds that have overflow structures, which during periods of heavy precipitation, may periodically discharge into the stormwater drainage system. The remaining storage ponds listed in **Table 2-4** are bulk user storage ponds that do not discharge to the stormwater system.

Table 2-3: Bulk User Storage Ponds with Overflow Structures

Site Abbreviation[1]	Storage System Name	Monitoring Group Number	Location	Storage Type	Receiving Water Body
BTSP-1	Bent Tree GC Front	D-001	Bent Tree GC	Unlined Pond	Lake Sarasota
BTSP-2	Bent Tree GC Back	D-002	Bent Tree GC	Unlined Pond	Lake Sarasota
GCSP-1	Gator Creek GC	D-003	Gator Creek GC	Unlined Pond	Cow Pen Slough
HOSP-1	Heritage Oaks GC	D-004	Heritage Oaks GC	Unlined Pond	Cow Pen Slough
GSP-1	Groves Pond	D-005	MW Groves GC	Unlined Pond	Phillippi Creek
FCSP-1	Founders Club West	D-006	Founders Club	Lined Pond	Phillippi Creek
FCSP-2	Founders Club East	D-007	Founders Club	Lined Pond	Phillippi Creek
PSP-1	TPC GC	D-008	Prestancia GC	Unlined Pond	Little Sarasota Bay
VWSP-1	Village Walk North	D-009	Village Walk/Honore Ave.	Unlined Pond	Little Sarasota Bay
VWSP-2	Village Walk South	D-010	Village Walk/Honore Ave.	Unlined Pond	Little Sarasota Bay
ISSP-1	Isles of Sarasota	D-011	Isles of Sarasota	Unlined Pond	Little Sarasota Bay
SBSP-1	Stoneybrook GC	D-012	Stoneybrook GC	Unlined Pond	Little Sarasota Bay
OSP-1	Oaks GC	D-013	Oaks GC II	Lined Pond	Little Sarasota Bay

1. Storage name abbreviation followed by pond number.

Table 2-4: Bulk User Storage Ponds

Site Abbreviation[1]	Storage System Name	Location	Storage Type
LOSP-1	Laurel Oaks GC	Laurel Oaks GC	Unlined
LOSP-2	Laurel Oaks GC	Laurel Oaks GC	Unlined
MCSP-1	Misty Creek	Misty Creek GC	Unlined
RHSP-1	Red Hawk	Red Hawk Reserve/Foxfire	Unlined
HLSP-1	Heron Lake	Preserve at Heron Lake	Unlined
SGCSP-1	Sarasota GC	Sarasota Golf Club	Unlined
SSP-1	Serenoa GC	Serenoa Golf Club	Unlined
OSP-1	The Oaks GC	The Oaks GC	Unlined
PUBSP-1	Northridge Rd Publix	Northridge Rd Publix	Unlined
ETSP-1	Eagle Trace	Eagle Trace Estates	Unlined

1. Storage name abbreviation followed by pond number.

2.4 Reclaimed Water Pumping Facilities

Reclaimed water pumping systems are included in the County's reclaimed water system and serve to transfer and pressurize reclaimed water to meet user demands. Reclaimed water pumping facilities are located at the Bee Ridge WRF, Central County WRF, former Atlantic WRF, and the Parcel X North and South ponds. Additionally, the reclaimed water pumping facilities at the decommissioned Meadowood WRF are still in operation to pump from the Meadowood storage ponds. **Table 2-5** summarizes the pumping systems located at these facilities.

Table 2-5: Reuse Pump Station Summary

Abbreviation[1]	Description	Type	Qty	Capacity/Pump[2]
Bee Ridge Reuse Pump Station #1 (BRRPS-1)				
PSBR1-1 PSBR1-2 PSBR1-3	Effluent Pumps 1-3	Vertical Turbine	3	2,100 gpm
PSBR1-4	Effluent Pump 4	Vertical Turbine	1	800 gpm
Bee Ridge Reuse Pump Station #2 (BRRPS-2)				
PSBR2-5 PSBR2-6 PSBR2-7 PSBR2-8	Effluent Pumps 5-8	Vertical Turbine	4	2,400 gpm
Central County WRF Effluent Pump Station (CCRPS-1)				
PSCC1-2 PSCC1-3	Effluent Pumps 2-3	Vertical Turbine	2	1,300 gpm
PSCC1-4 PSCC1-5	Effluent Pumps 4-5	Vertical Turbine	2	3,000 gpm
Former Atlantic WRF Effluent Pump Station (ATLRPS-1)				
PSATL1-1	Effluent Pumps	Vertical Split Case	2	2,500 gpm
Parcel X South Storage Pond (PXSSP-1)				
PSPXS1-1 PSPXS1-2	South Pond Effluent Pumps	Submersible	2	1,700 gpm
Parcel X North Storage Pond (PXNSP-1)				
PSPXN1-1 PSPXN1-2	North Pond Effluent Pumps 1-2	Vertical Turbine	2	1,000 gpm
PSPXN1-3	North Pond Effluent Pump 3	Vertical Turbine	1	500 gpm
Meadowood Pond 1 and 2 (MWSP1-1, MWSP1-2)				
PSMW1-1	Effluent Pump 1	Vertical Turbine	1	400 gpm
PSMW1-2	Effluent Pump 2	Vertical Turbine	1	500 gpm

1. Pump Station abbreviation followed by pump number.
2. Gallons per minute (gpm)

The Bee Ridge WRF has two effluent pump stations, each with four vertical turbine pumps, which supply the reclaimed water system. Pump Station #1 withdraws from the

2 million gallon ground storage tank, while Pump Station #2 withdraws from the storage pond.

The Central County WRF has an effluent pump station that withdraws from the on-site storage pond. The pump station includes four vertical turbine pumps numbered 2-5 (pump 1 is not installed). Reclaimed water from storage pond is sent through disk filters prior to discharging into the reclaimed water system.

The Atlantic WRF has been decommissioned; however, the effluent pump station remains in service to assist with wet weather disposal. The pump station serves to pump from the reclaimed water system into the Atlantic deep injection well, during extended periods when the amount of reclaimed water available exceeds the demands. Plans have been prepared to demolish the plant site, while leaving the deep injection well and effluent pump station in place.

The Parcel X north and south ponds each have a dedicated reclaimed water pump station. The south pond pump station includes two submersible pumps in a wetwell that transfers flow from the south pond to the north pond. The south pond pumps are manually operated and not connected to the SCADA system. The north pond has three vertical turbine pumps which send reclaimed water back into the reclaimed water distribution system. The north pond pumps can be remotely monitored and turned on and off through the SCADA system.

2.5 Pond Filters

To reduce maintenance associated with plugging of irrigation sprinkler heads within the distribution system, reclaimed water stored in ponds should be filtered prior to entering into the reclaimed water distribution system. The on-site storage ponds at the Central County WRF have *Arkal Diamond* and *Everfilt* filters which are in poor condition and are difficult to maintain because finding replacement parts is problematic. The Parcel X north pond has *Arkal Diamond* filters, which are no longer in operation due to their

condition. Algae, sand, and other suspended solids in these ponds have the potential to plug irrigation heads and can cause other costly operational and maintenance issues within the reclaimed water system. Replacement of these pond filtration systems is recommended to address these issues.

2.6 Deep Injection Well

The North Master Reuse System is permitted to dispose of reclaimed water at the former Atlantic WRF deep injection well. The well is permitted for 4.87 mgd peak hourly flow to a Class G-IV ground water well. This deep injection well will remain in service following the proposed demolition of the former Atlantic WRF. A deep injection well rated for 18.2 mgd has been constructed at the Central County WRF and is anticipated to be operational in 2013.

3.0 EXISTING RECLAIMED WATER DEMANDS

The County's existing reclaimed water demands were evaluated to identify the type of reclaimed water users, the quantity of reclaimed water produced and beneficially reused and the quantity disposed of into the deep injection well. This section summarizes each of these aspects to set the frame work for establishing demands for the existing conditions hydraulic model and provides background information used to establish projections for future reclaimed water demands and peak factors.

3.1 Existing Wastewater Flow Summary

Wastewater flows within the North Master Reuse System were historically treated at multiple WRFs as discussed in **Section 1.3**. The wastewater flows over the past 10 years for the Bee Ridge, Central County, Meadowood, Atlantic, South Gate and Gulf Gate WRFs are summarized in **Table 3-1**. The decommissioning of the Meadowood, Atlantic, Gulf Gate and South Gate WRFs are evident by the corresponding increase of wastewater flow to the Bee Ridge and Central County WRFs. On average, wastewater flows decreased by approximately 0.6% per year between 2002 and 2006, and increased by 5.8% per year between 2007 and 2011. Wastewater flows decreased by approximately 510,000 gallons per day (gpd) in 2009, but rebounded above 2008 levels in 2010. Rainfall data was obtained from the Southwest Florida Water Management District (SWFWMD) database and reviewed to determine if the decrease in flow in 2009 had a correlation to rainfall. The rainfall totals during 2008, 2009 and 2010 were relatively consistent; therefore rainfall did not appear to be a factor in the 2009 flow decrease. Potable water consumption data provided by the County indicated a decrease of approximately 1.88 mgd from 2008 to 2009, which corresponds to reduced wastewater flows recorded during the same period. It is recommended the County continue to monitor flows, identify discrepancies, and address these discrepancies as they occur.

Table 3-1: Average Annual Wastewater Flows (mgd)

Year	Facility						Total
	Bee Ridge	Central County	Meadowood[1]	Atlantic[2]	South Gate[3]	Gulf Gate[3]	
2002	1.53	1.94	0.52	0.40	1.14	1.46	6.99
2003	1.73	1.94	0.53	0.41	1.39	1.52	7.52
2004	1.56	2.12	0.52	0.41	1.10	1.33	7.04
2005	1.46	2.38	0.52	0.37	1.14	1.37	7.24
2006	1.43	2.39	0.50	0.30	0.94	1.22	6.78
2007	1.68	2.50	0.47	0.25	0.83	1.08	6.81
2008	2.06	3.23	0.44	0.30	0.80	0.95	7.78
2009	3.58	3.40	-	0.29	-	-	7.27
2010	4.60	3.72	-	-	-	-	8.32
2011	4.82	4.01	-	-	-	-	8.83

1. Facility decommissioned; October 2008
2. Facility decommissioned; September 2009
3. Facility decommissioned; June 2008

3.2 Reclaimed Water Demand Patterns

Reclaimed water produced by the Bee Ridge and Central County WRFs is either transferred into the reclaimed water system to meet demands or discharged into the Atlantic deep injection well. A summary of reuse and disposal flows for the North Master Reuse System between 2007 and 2011 is summarized in **Table 3-2**. The reuse system IDs provided in **Table 3-2** are as specified in the North Master Reuse System permit.

Table 3-2: Average Annual Flows to North Master Reuse System (mgd)

Reuse System ID	Year				
	2007	2008	2009	2010	2011
Reuse					
R-001[1]	4.42	4.97	5.66	5.80	6.72
Disposal					
U-001[2]	0.92	0.92	1.53	2.52	2.10
Total[3]	5.34	5.89	7.19	8.32	8.82

1. Sarasota County North Master Reuse System
2. Atlantic deep injection well
3. Total calculated by adding R-001 and U-001. 2007 and 2008 do not include flow to surface water discharge at South Gate WRF and Gulf Gate WRF.

Reclaimed water demands associated with reuse system R-001 were evaluated from 2002 through 2011 based on flow meter data provided by the County. The annual average daily flow demand, maximum month average daily flow (MMADF) demand, and maximum month peak factor for each year was calculated and is summarized in **Table 3-3**. The annual average daily flow demand during this period is shown in **Figure 3-1** which shows the annual average daily flow demands have increased by approximately 2.9 mgd over the last 10 years.

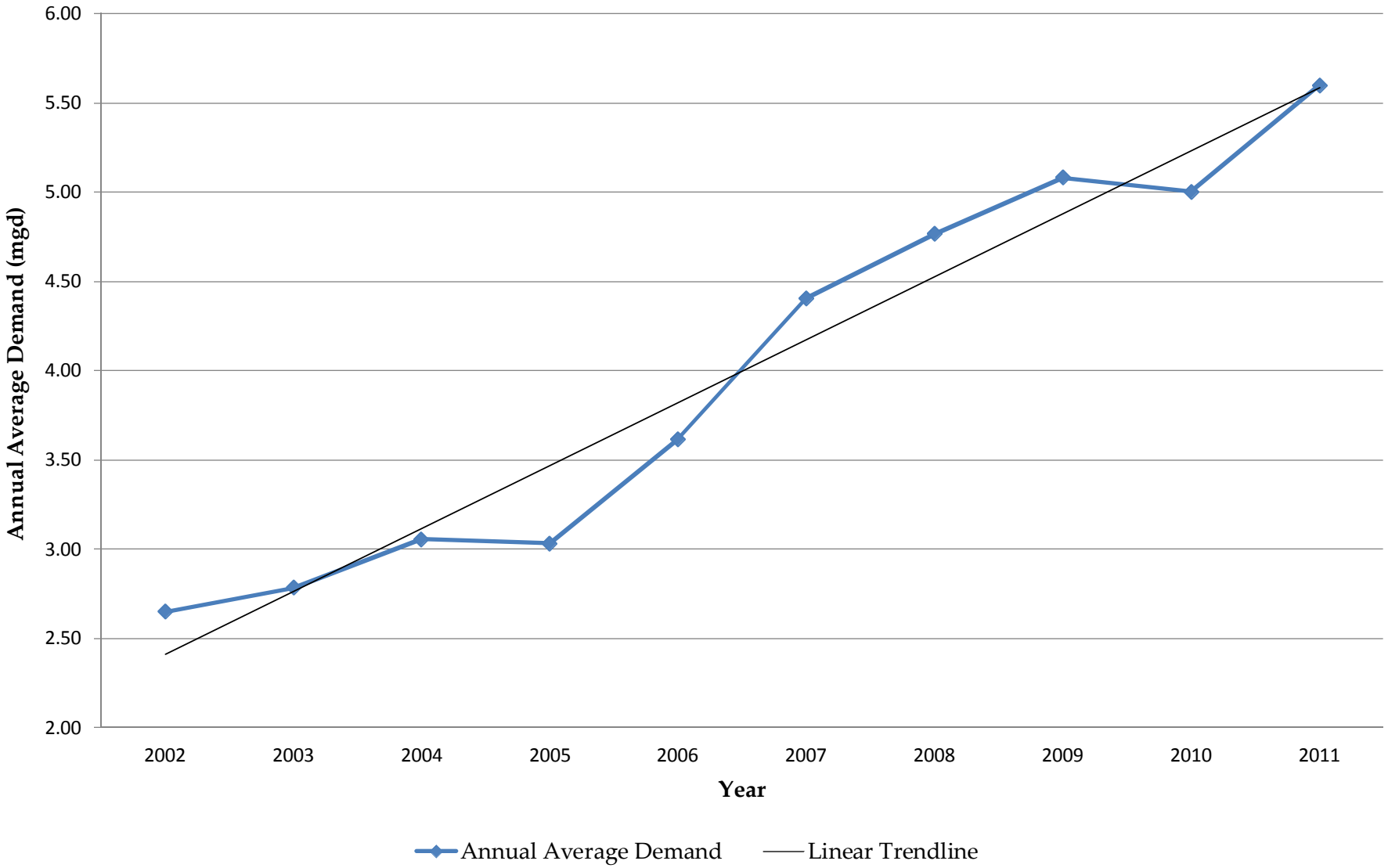
Table 3-3: Reclaimed Water Demand Summary and Peak Use[1]

Year	Maximum Month Demand (mgd)	Annual Average Demand (mgd)	Maximum Month Peak Factor
2002	4.08	2.65	1.54
2003	4.77	2.78	1.72
2004	5.02	3.06	1.64
2005	5.09	3.03	1.68
2006	5.71	3.62	1.58
2007	7.55	4.41	1.71
2008	7.26	4.76	1.53
2009	6.91	5.08	1.36
2010	8.63	5.00	1.73
2011	7.69	5.56	1.38
Max Peak Factor			**1.73**

1. Metered flow does not include flow into the deep injection well.

Reclaimed water users within the North Master Reuse System can be classified as either bulk users or direct users. Bulk users receive reclaimed water from on-site storage ponds for withdrawal by private irrigation systems. The on-site ponds are fed from the reclaimed water system during periods of low demands and while pressures are high. Direct users receive reclaimed water directly from the pressurized reclaimed water distribution system. Demands for bulk and direct users are summarized in the following sections.

Figure 3-1
Historical AADF Demand - North Master Reuse System
2002-2011



3.2.1 Demographics

Reclaimed water is currently utilized by several types of users within the bulk and direct user classifications. **Table 3-4** summarizes the user types by the percent of reclaimed water used in 2011. Golf Courses were the largest users in 2011 with 49% of the reclaimed water demand, followed by single family residences.

Table 3-4: North County Service Area Demographics

Class	2011 Percent Use
Golf Courses	49%
Single Family Residences	35%
Medians	7%
Common Areas	5%
Multi-Family	4%
Total	**100%**

A majority of the existing reclaimed water demand within the North Master Reuse System are bulk users. This is demonstrated by the ratio of direct to bulk users summarized in **Table 3-5**, which indicates that approximately 33% of the reclaimed water used during the past 10 years was from direct users.

Table 3-5: Reclaimed Water Demand – Direct vs. Bulk Users

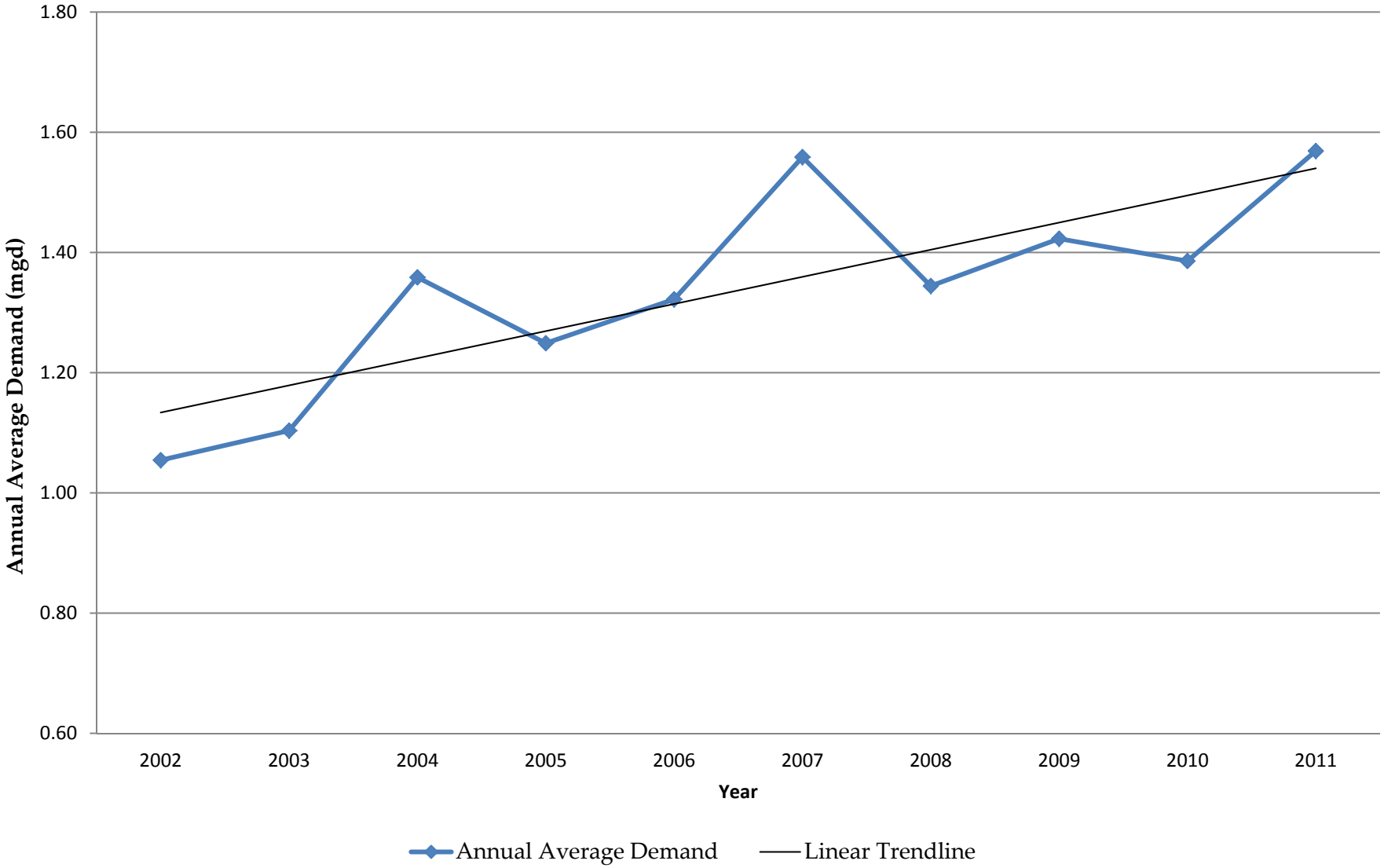
Year	Annual Average Demand (mgd) (Bulk Users)	Annual Average Demand (mgd) (Direct User)	Total Demand (mgd)	Ratio (Bulk/Direct)
2002	1.60	1.05	2.65	1.52
2003	1.69	1.10	2.79	1.54
2004	1.71	1.36	3.07	1.26
2005	1.80	1.25	3.05	1.44
2006	2.31	1.32	3.63	1.75
2007	2.88	1.56	4.44	1.85
2008	3.45	1.34	4.79	2.57
2009	3.68	1.42	5.10	2.59
2010	3.64	1.39	5.03	2.62
2011	4.04	1.57	5.61	2.57
Total	**26.80**	**13.36**	**40.16**	**2.01**
Percentage Direct User – 10 Year Average				**33%**
Percentage Bulk User – 10 Year Average				**67%**

Bulk users have private irrigation systems supplied by reclaimed water storage ponds which are located within the user's property as previously discussed. The bulk user ponds are filled during low demand periods and water is pumped from the ponds to the end users irrigation systems. Bulk users include golf courses and single family residences within developments that have bulk storage ponds. The direct users generally consist of medians, commercial and industrial properties, and single/multi-family residences.

3.2.2 Direct Reclaimed Water User Demands and Patterns

The County provides reclaimed water to direct users which include parks, medians, and development master meters. Direct user meter data provided by the County from 2002 through 2011 was reviewed and summarized in **Table 3-6** and **Figure 3-2**. The maximum month peaking factor is the maximum month demand for a given year divided by the annual average daily flow. The highest

Figure 3-2
Historical AADF Demand - Direct Users
2002-2011



maximum month peaking factor within the ten year review period occurred in 2010 and was 1.63, and was used to represent a conservative value for use in the hydraulic modeling analyses.

Table 3-6: Direct User Reclaimed Water Demand Summary[1]

Year	Maximum Month Demand (mgd)	Annual Average Demand (mgd)	Maximum Month Peak Factor
2002	1.61	1.05	1.53
2003	1.72	1.09	1.58
2004	1.87	1.34	1.40
2005	1.82	1.23	1.48
2006	1.76	1.30	1.35
2007	2.15	1.53	1.41
2008	1.96	1.32	1.48
2009	1.72	1.40	1.23
2010	2.21	1.36	1.63
2011	2.04	1.53	1.33
Max Peak Factor			**1.63**

1. Metered flow does not include flow into the deep injection well.

3.2.3 Bulk Reclaimed Water User Demands and Patterns

Bulk user meter data was analyzed to observe trends in demands, estimate pond filling rates, and for reference during the model calibration process as discussed in **Section 10**. Reclaimed water flows into the bulk ponds are metered by the County for billing. When a bulk user meter is downstream of a master meter, the bulk user meter is referred to as a "deduct meter" and the metered values are subtracted from the master meter so demands are not accounted for twice. Bulk user meter data from 2002 through 2011 was reviewed and is summarized in **Table 3-7**. **Figure 3-3** shows the historical bulk user annual average daily flow demands and a trendline of the demands which illustrates the historical demand increase.

Table 3-7: Bulk User Reclaimed Water Demand Summary

Year	Maximum Month Demand (mgd)	Annual Average Demand (mgd)	Maximum Month Peak Factor
2002	2.83	1.60	1.77
2003	3.28	1.69	1.94
2004	3.25	1.71	1.90
2005	3.27	1.80	1.82
2006	4.11	2.31	1.78
2007	5.39	2.88	1.87
2008	5.31	3.45	1.54
2009	5.34	3.68	1.45
2010	6.72	3.64	1.85
2011	5.74	4.04	1.42
Max Peak Factor			**1.94**

3.2.4 Deep Injection Well Demand and Patterns

The deep injection well at the former Atlantic WRF has historically disposed of excess reclaimed water during wet weather periods. The deep injection well is generally operated to dispose of reclaimed water 24 hours a day except for periods when storage pond levels are low; typically in May or June of each year. Deep injection well meter data was obtained from the County from 2002 through 2011 and was reviewed and summarized in **Table 3-8**. Annual Average flows into the well ranged from 0.58 mgd to 2.52 mgd during this 10 year period, while the maximum month peaking factor within this 10 year period was 3.07. **Figure 3-4** illustrates the flows into the deep injection well and although wide variations of flows occur on a year-to-year basis, the trendline indicates that the flows have generally increased over this period.

Figure 3-3
Historical Bulk Users Annual Average Demand
2002-2011

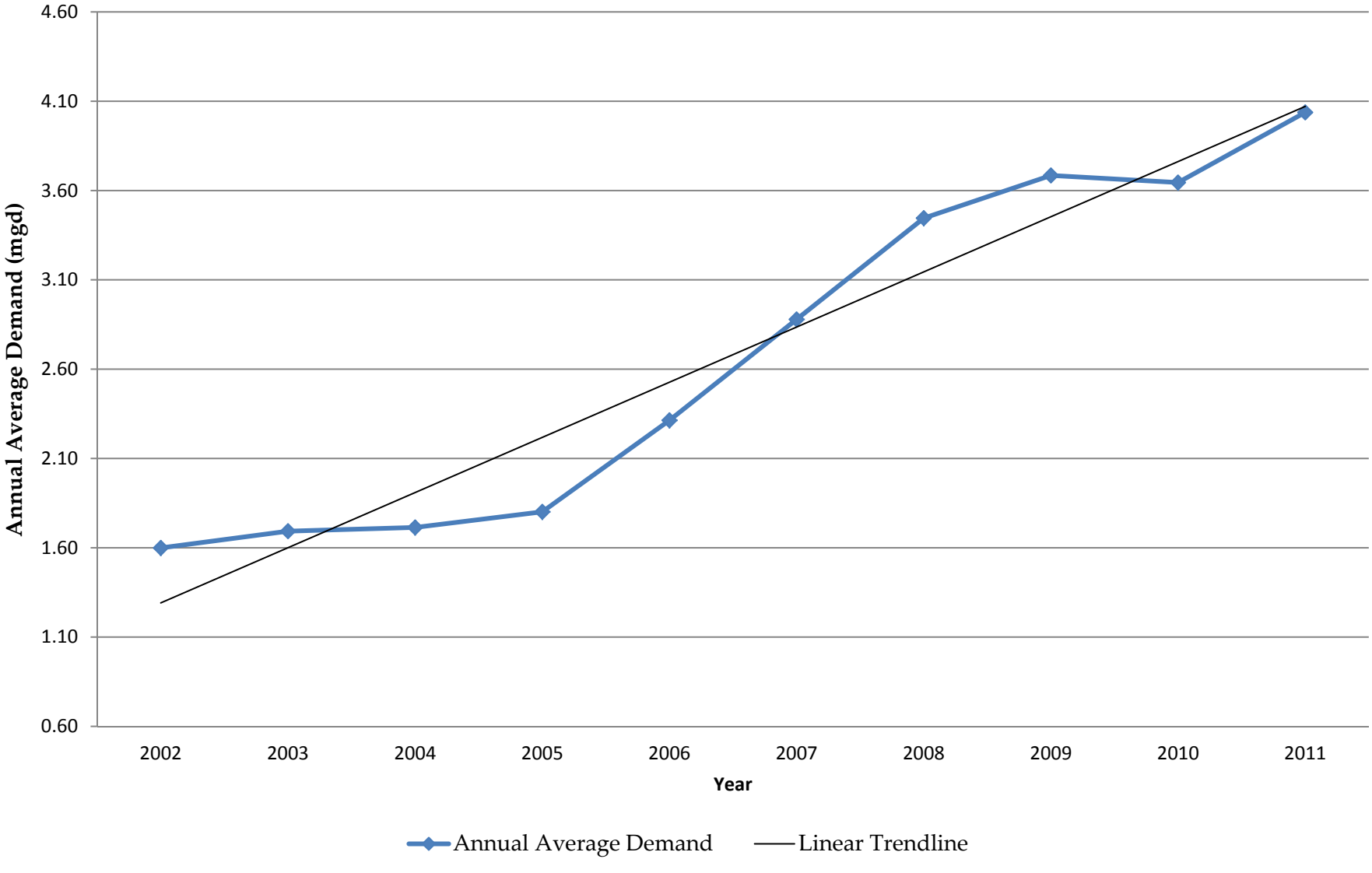
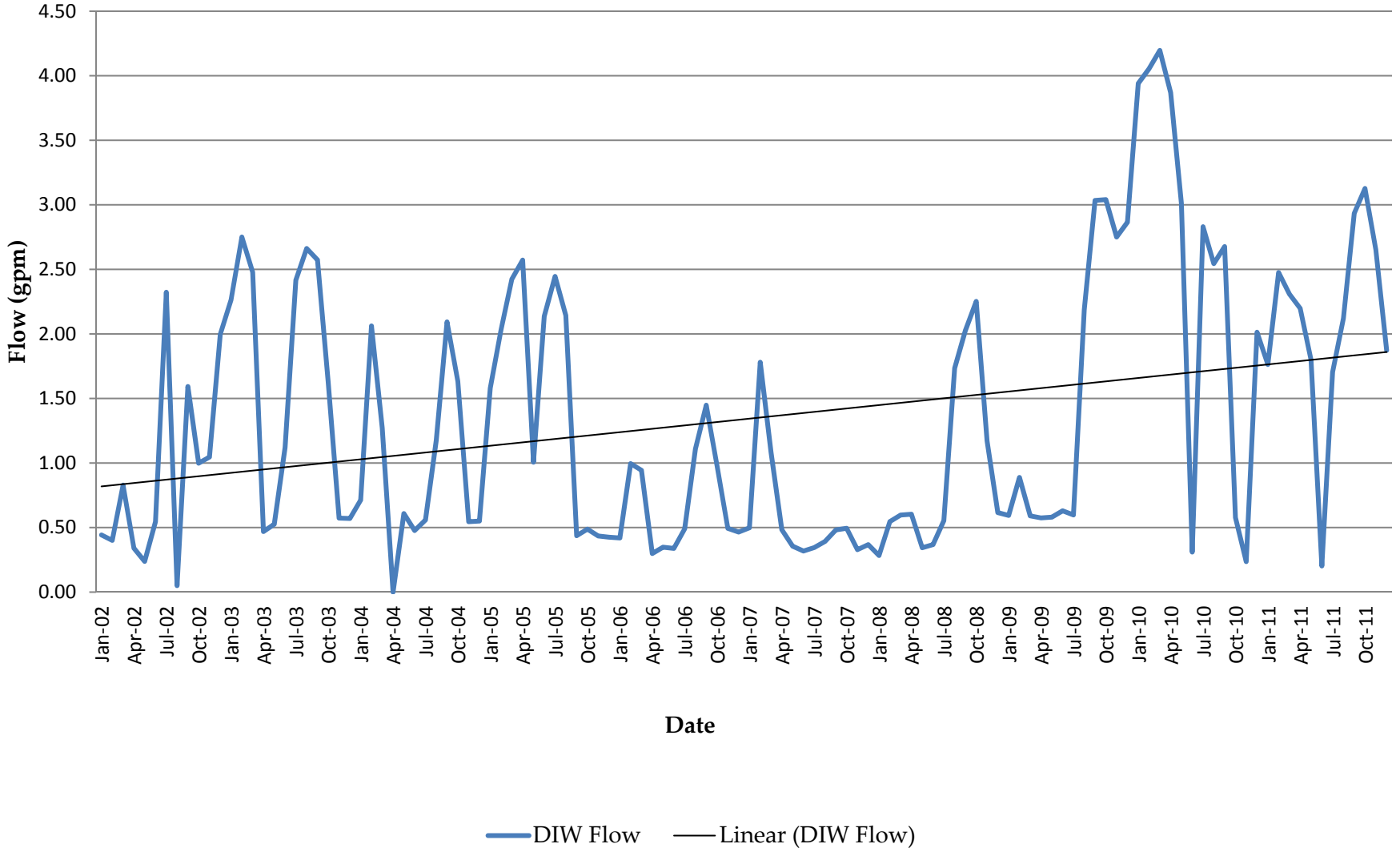


Table 3-8: Deep Injection Well Flow Summary

Year	Maximum Month Flow (mgd)	Annual Average Flow (mgd)	Maximum Month Peak Factor
2002	2.32	0.90	2.58
2003	2.75	1.67	1.65
2004	2.09	0.97	2.15
2005	2.57	1.51	1.70
2006	1.45	0.69	2.10
2007	1.78	0.58	3.07
2008	2.25	0.92	2.45
2009	3.04	1.53	1.99
2010	4.20	2.52	1.67
2011	3.13	2.10	1.49
Max Peak Factor			**3.07**
Average Peak Factor			**2.08**

Figure 3-4
Deep Injection Well Flow
2002-2011



4.0 POTENTIAL RECLAIMED WATER USERS AND DEMANDS

Identification of potential reclaimed water users and projected demands provides the basis to evaluate the ability of the existing system to serve these potential users and necessary improvements to provide service to these users. This section establishes the process used to identify the potential reclaimed water users by summarizing the factors that contribute to their selection. This section also provided projected demands based on future land use, irrigable area percentages, applications rates and development growth rates. Groundwater offsets associated with potential users which the County may provide beneficial reclaimed water to were also evaluated in this section.

4.1 Wastewater Flow Projections

Reclaimed water is a product of wastewater treatment meeting all applicable regulations, while projected wastewater flows represent an upper limit for available reclaimed water supply. Wastewater flow projections for the planning periods 2015, 2020, 2025, 2030 and 2032 were provided by the County. A summary of the projected annual average daily flow wastewater flows is presented in **Table 4-1**.

Table 4-1: Wastewater Flow Projections

Facility	Wastewater Flow (mgd)				
	2015	2020	2025	2030	2032
Bee Ridge WRF	5.6	7.7	8.4	9.1	9.4
Central County WRF	4.5	4.9	5.3	5.8	6.0
Siesta Key WRF[1]	1.4	0	0	0	0
Total	**11.5**	**12.6**	**13.7**	**14.9**	**15.4**

1. Plant is anticipated to be decommissioned by 2016.

4.2 Potential Reclaimed Water Users

A key component of this master plan is determining where future reclaimed water users are most likely to be located and the corresponding increase in reclaimed water demand through the planning period. The general methodology for this process was to first

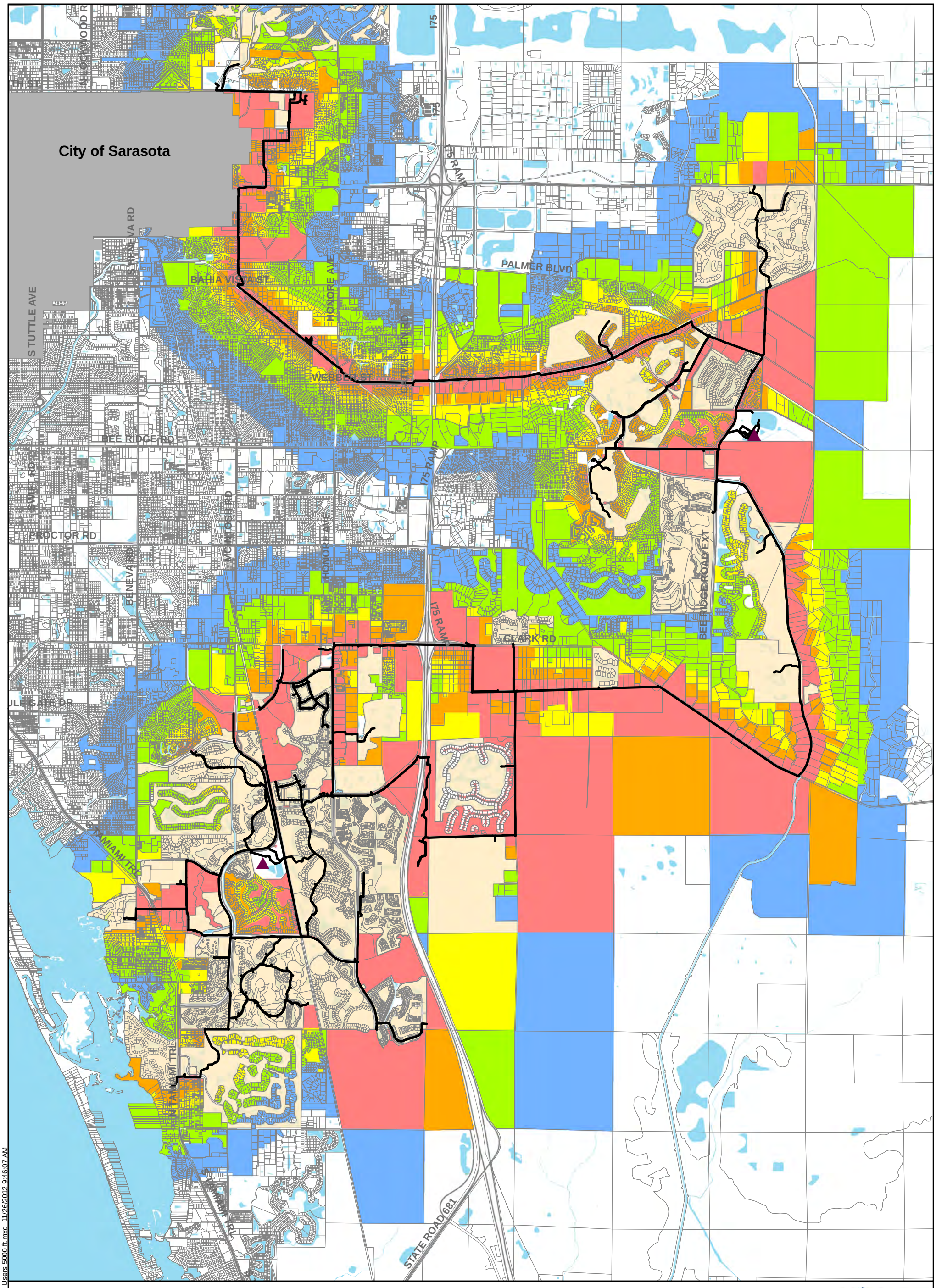
identify potential reclaimed water users (by parcels), develop criteria to rank them, then to analyze key factors used to determine which of the potential users are most likely to be developed within the 20-year planning period. Reclaimed water demand projections were then calculated for the anticipated future users. The following subsections provide a detailed description of this process.

4.2.1 Potential Users

Before specific parcels could be identified as future reclaimed water users, it was necessary to identify parcels beyond the limits of the existing reclaimed water system for evaluation. The first factor used to identify potential users was the distance of the parcel from an existing reclaimed water pipeline. A maximum distance of 5,000 feet from the existing reclaimed water pipeline was selected as an initial starting point since it represented a reasonable maximum distance to construct infrastructure to serve new users. County GIS data was then used to identify the parcels meeting the designated distance criteria. If any part of a parcel boundary was within the specified distance it was selected for inclusion. Subsets of parcel distances from existing pipelines were created for parcels located 150, 750, 1,500, 3,000, and 5,000 feet away from a reclaimed water pipeline. These distances were established from a review of the GIS data with respect to the number, type, and size of the parcel within specified distances. **Figure 4-1** shows the parcels within the 5,000 foot limit and includes both the parcels that currently receive reclaimed water and those who do not.

4.2.2 Feasibility Factor

A procedure was established to rank the potential reclaimed water users based on parcel characteristics. The characteristics considered were projected irrigation demand, distance from an existing reclaimed water pipeline, presence of a water use permit, and the potential offsets available if the subject parcel holds a water


City of Sarasota
I75
I75 RAMP
PALMER BLVD
BAHIA VISTA ST
WEBBER ST
BEE RIDGE RD
PROCTOR RD
CLARK RD
BEE RIDGE ROAD EXT
HONORE AVE
BENEVA RD
S TUTTLE AVE
COLLEGE RD
S TAMIAMI TRL
STATE ROAD 681
Legend
Water Reclamation Facility
Existing Reclaimed Pipe
Existing Service Area
Potential Users
5000 feet
3000 feet
1500 feet
750 feet
150 feet
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W
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McKIM&CREED
Sarasota County
Figure 4-1
Potential Reclaimed Water Users
5,000 ft From Existing Reclaimed Pipe
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use permit. Projected irrigation demands were calculated for each parcel based on the irrigation application rate discussed in **Section 4.3.1**. The resultant demand was then divided by the distance of the parcel from the existing reclaimed water pipeline to determine a feasibility factor, which is defined as the calculated likelihood of the respective parcel to receive reclaimed water during the planning period. Parcels with a high feasibility factors generally had large projected irrigation demands and were in close proximity to an existing reclaimed water pipeline. The resulting feasibility factors were multiplied by the water use permit factors provided in **Table 4-2,** based on the presence and capacity of a water use permit, to arrive at a final feasibility factor.

Table 4-2: Water Use Permit - Factor

Water Use Permit Capacity (gpd)	Factor
None	1.0
0-10,000	1.25
10,000-100,000	1.5
100,000-1,000,000	1.75
1,000,000-Max	2.0

The parcels were then sorted into tiers based on their feasibility factor value and are summarized in **Table 4-3.**

Table 4-3: Parcel Ranking by Feasibility Factor

Tier	Feasibility Factor
1	1,001-18,000
2	101-1,000
3	21-100
4	0-20

Tier 4 represents the parcels with the lowest ranking as potential future users of reclaimed water. The range of 0-20 was selected since it captured a majority of single family residential lots that are close to a reclaimed water pipeline but due to their small size, were not not likely to use reclaimed water service. Tiers 2 and

3 generally represent larger parcels in relative close proximity to an existing reclaimed water pipeline or parcels with small to moderate water use permits. Tier 1 generally represents large to moderate size parcels with water use permits. **Figure 4-2** shows the parcels color coded by tier. **Table 4-4** summarizes the average parcel size, calculated irrigation demand, and total water use permit capacity for each tier.

Table 4-4: Average Tier Characteristics[1]

Tier	Parcel Distance From Reclaimed Water Pipeline (ft)[2]	Parcel Size (acres)	Calculated Irrigation Demand (gpd)	Water Use Permit – Permitted Capacity (gpd)[1]
1	200	279	431,225	228,960
2	592	59	68,959	130,083
3	724	13	14,686	40,831
4	3,155	1	711	29,971

1. Several water use permits contain multiple parcels therefore not to be interpreted as average per parcel.
2. Average per parcel.

The four tiers identified in this Section represent a total of 77 mgd of potential reclaimed water demand. In order to arrive at the projected reclaimed water demands anticipated during the planning period, the tier 1 through 4 parcels were further evaluated. **Section 4.2.3** discusses the drivers used to select the potential reclaimed water users within tiers 1 through 4 as well as parcels that were not previously considered. In general the potential reclaimed water users identified in **Section 4.3.3** were associated with tier 1 and 2 parcels, while tier 3 and 4 parcels were generally not considered as viable planning period users. It is important to note that even though a parcel was not selected as part of this evaluation, each parcel would still be eligible to utilize reclaimed water at some point in the future.

City of Sarasota
17TH ST
N LOCKWOOD RIDGE RD
N BENEVA RD
N TUTTLE AVE
S BENEVA RD
S TUTTLE AVE
S TAMIAMI TRL
BAHIA VISTA ST
WEBBER ST
S LOCKWOOD RIDGE RD
SWIFT RD
MCINTOSH RD
PROCTOR RD
HONORE AVE
CATTLEMEN RD
I75
I75 RAMP
FRUITVILLE RD
PALMER BLVD
BEE RIDGE RD
BEE RIDGE ROAD EXT
CLARK RD
STATE ROAD 72
STATE ROAD 681
STICKNEY POINT RD
GULF GATE DR
MIDNIGHT PASS RD
N TAMIAMI TRL

Legend

- Water Reclamation Facility
- Sarasota County Existing Reclaimed Pipe
- City of Sarasota Reclaimed Pipe
- Existing Service Area

Tiers

- Tier 1
- Tier 2
- Tier 3
- Tier 4

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Figure 4-2
Tiered Ranking of Potential Reclaimed Water Users

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4.2.3 Potential Reclaimed Water User Drivers

To refine the selection of potential reclaimed water users, five drivers were analyzed. The drivers were intended to identify the most feasible future reclaimed water users for consideration in this master plan and as the basis of the hydraulic model analysis. The evaluated drivers were:

- Future Roadways
- Parks
- County Planning Documents
- Proximity to Proposed North/South Reclaimed Water Interconnect
- Proximity to Existing Reclaimed Water Pipeline

The rationale is that these drivers influence which parcels will be developed during the 20-year planning period and correspond to the locations where future reclaimed water users and their corresponding demands will be located. Each driver is summarized below.

Future Roadways - The 2025 Future Thoroughfare Plan, provided in the Sarasota County Comprehensive Plan, was referenced as an indicator where future development may occur and where future reclaimed water piping would be required to serve future customers along these corridors. A benefit of serving these future users is the cost savings associated with constructing reclaimed water pipes at the same time as the new roadway. The 2025 Future Thoroughfare Plan is provided in **Appendix C**.

Parks - Sarasota County parks were selected as potential reclaimed water users due to the benefits they provide the general public at large. Parks generally have significant reclaimed water demand because of the percentage of the land that is

irrigated as compared to other land use types. The parks selected for inclusion were immediately adjacent to or in the general vicinity of an existing reclaimed water pipe.

Planning Documents - The Sarasota County Planning Department provided input regarding potential areas of development. The primary source of information used to develop this master plan was active and pending petitions filed with the County. Petitions are development applications that are typically requests for rezoning or requests for special exception from the Sarasota County Code. Petitions that are in the process of review, but have not received approval by the Sarasota County Planning Commission and Board of County Commission, are called active or pending petitions. The parcels identified on the petitions were assumed to represent areas where development will take place within the 20-year planning period. The locations of the parcels with active or pending petitions are provided in **Figure 4-3** which was provided by the County for this report. Other sources of planning information were supporting documents that were submitted with the petitions. These documents generally included details of the proposed development such as future use, acreages, and development phasing.

Proximity to Proposed North/South Interconnect - A planned north/south interconnect that would facilitate the transfer of reclaimed water between Sarasota County's north and south reclaimed water service areas and the City of Venice was identified in the Wastewater Management Plan Report dated June 2009, prepared by Greeley and Hansen. The presence of a north/south interconnect was assumed to promote new reclaimed usage along its alignment and thus increased the number of potential reclaimed water users. A variation of the proposed north/south interconnect alignment is discussed further in **Section 11.3.3**.

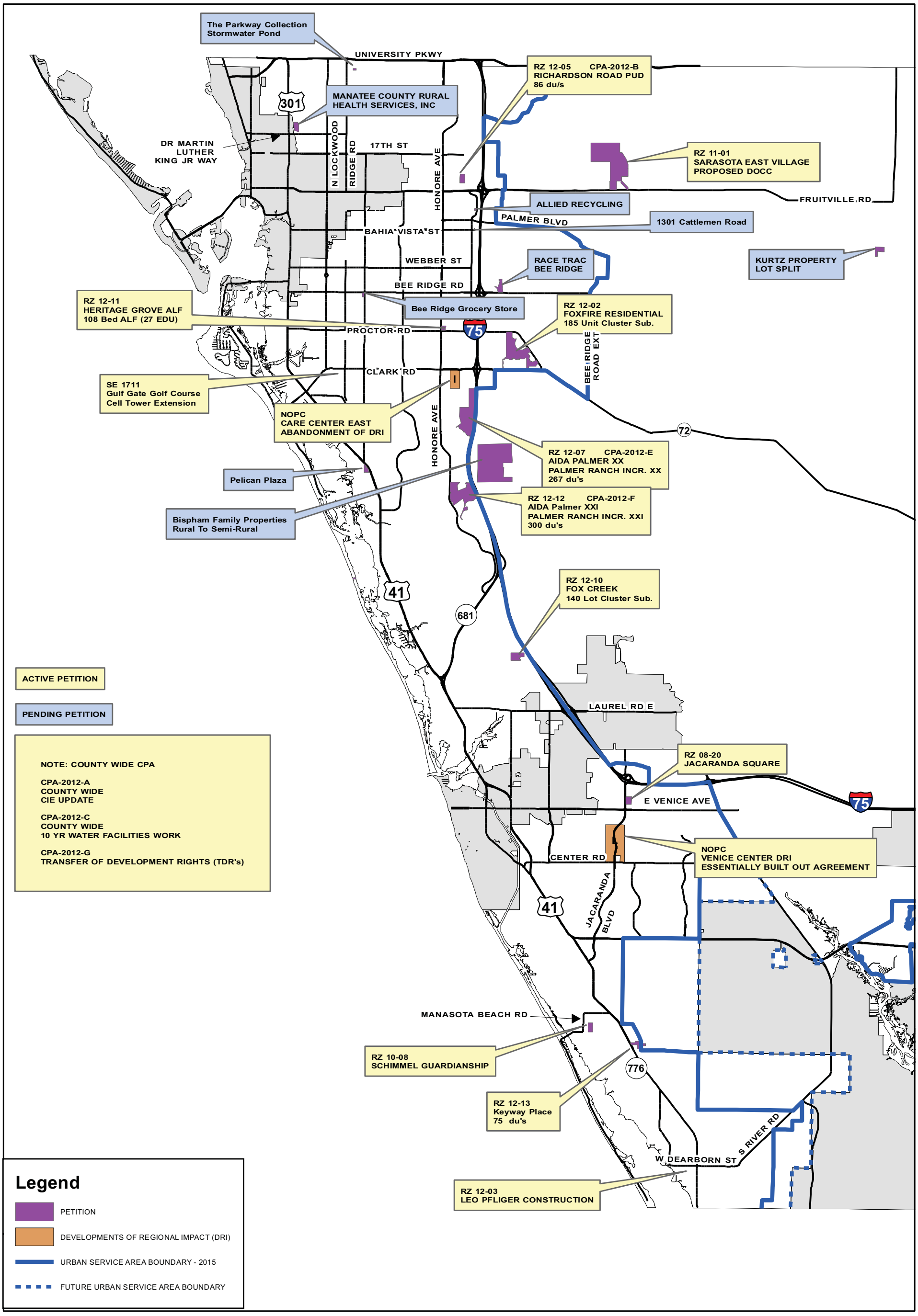

Figure 4-3
Planning Services Active and Pending Petitions

N W E S

0 2.5 5
Miles

Map published using ArcGIS 10.0 by ckusner on Thursday, October 04, 2012

Draft: For Discussion: Purposes Only

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Proximity to Existing Reclaimed Water Pipeline - Another factor considered as part of the selection of potential reclaimed water customers is the proximity of the potential customer to an existing reclaimed water pipeline. Identifying future users in close proximity to an existing reclaimed water pipeline allows the County to provide service for future reclaimed water demands, while minimizing capital improvement costs.

4.2.4 Summary of Potential Reclaimed Water Users

Potential reclaimed water users are parcels identified to receive reclaimed water within the planning period. These parcels were selected based on consideration of the drivers discussed in **Section 4.2.3** and input by County staff. As shown in **Table 4-5**, a parcel's "proximity to a future roadway" and "planning documents" had the greatest influence on the parcels identified when evaluated on a percentage basis by acreage and demand. The potential reclaimed water user locations are shown in **Figure 4-4**.

Table 4-5: Potential Reclaimed Water Users – Driver Percentages

Driver	Percent by Acreage	Percent by Demand
Planning Documents	28%	36%
Proximity to a Future Roadway	45%	32%
Proximity to the North/South	14%	13%
Proximity to an Existing Reclaimed Water Pipeline	9%	12%
Parks	4%	7%
Total	100%	100%

City of Sarasota

City of Venice

North/South Interconnect

N WASHINGTON BLVD
N TUTTLE AVE
LOCKWOOD RIDGE RD
17TH ST
S TUTTLE AVE
N HONORE AVE
HONORE AVE
S TAMIAMI TRL
BAHIA VISTA ST
N BENEVA RD
CATTLEMEN RD
BEE RIDGE RD
PROCTOR RD
SWIFT RD
BENEVA RD
S LOCKWOOD RIDGE RD
GULF GATE DR
MIDNIGHT PASS RD
CLARK RD
BEE RIDGE ROAD EXT
FRUITVILLE RD
STATE ROAD 681
LAUREL RD E

76
32
79
78
75
64
24
58
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50
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27
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54
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40
33
45
62
63
49
46
3
71
34
5
8
86b
4
74
83
55
56
77
44
52
61
1
14
2
19
81

Legend

- Deep Injection Well
- Water Reclamation Facility
- Future Roadway 2025
- Incorporated Area
- Sarasota County Existing Reclaimed Pipe
- Sarasota County Future Reclaimed Pipe
- City of Sarasota Reclaimed Pipe
- City of Venice Reclaimed Pipe
- North/South Interconnect
- Existing Service Area
- Potential Reclaimed Water User

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Figure 4-4
Potential Reclaimed Water Users

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4.3 Reclaimed Water Demand Projections

The reclaimed water demand projections were based on the potential reclaimed water users identified in **Section 4.2**. This section summarizes how future land use, irrigable area percentages, application rates and development growth rates were used to project future reclaimed water demands. Demands were projected for both the 20-year planning period, and when the reclaimed water system is built-out.

4.3.1 Irrigable Percentages and Application Rates

Projections of reclaimed water demand were based on irrigation application rates for the land use type and acreage of the parcel being analyzed. The irrigable percentage is a measure of the net land area which would be irrigated by reclaimed water. This measure takes into account buildings, roads, sidewalks and non-irrigated acreage typical for each land use category. **Table 4-6** shows the irrigable percentages and application rates that were used in the reclaimed water demand projections. Application rates vary by location and are influenced by soil-plant relationships and other hydrogeologic conditions. Chapter 62-610.423 of the Florida Administrative Code (F.A.C.) recommends a maximum application rate of two inches per week with higher rates requiring an engineering report for justification. The application rates for existing reclaimed water users were evaluated in order to determine the appropriate application rate for future users. Based on a review of this information, an application rate of 0.5-inch per week was determined to be representative of a moderate application rate within the County.

Table 4-6: Reclaimed Water Demand by Land Use Type

Land Use Type	Irrigable Percentage	Application Rate
Agriculture	90%	0.5 in/week
Golf Course	70%	
Residential (Moderate to High Density)	60%	
Residential (Low Density)[1]	30%	
Commercial/Light Industrial	20%	

1. Assumes 50% of low density parcel acreage is natural lands and therefore not irrigated.

4.3.2 Development Growth Rate

In order to assist with demand projections, it was necessary to estimate the development growth rate to project the rate of increase in reclaimed water demand within the planning period. Applicable development growth rates were established based on information in County planning documents when available. Those parcels that did not have documentation indicating an anticipated growth rate were assumed to match the population growth rates based on the Bureau of Economic and Business Research (BEBR), Volume 44, Bulletin 159, June 2011, Projections of Florida Population by County 2010-2040. **Table 4-7** summarizes the development growth rate for each planning period. These rates were used as the basis for determining projected reclaimed water demands.

Table 4-7: Development Growth Rate by Planning Period

Area	ID[3]	Year				
		2015	2020	2025	2030	2032
Palmer Ranch, Increment XX[1]	3	40%	100%	100%	100%	100%
Fire Fox[1]	7	28%	100%	100%	100%	100%
Sarasota Associates A-1[1]	76	100%	100%	100%	100%	100%
Palmer Ranch, Increment XVI[1]	55	0%	100%	100%	100%	100%
Palmer Ranch, Increment XXI[1]	56	20%	100%	100%	100%	100%
Other Areas[2]	Varies	5.4%	11.9%	18.2%	24.0%	26.2%

1. Based on phasing information from the Sarasota County Planning Department.
2. Based on BEBR projections.
3. See Figure 4-4.

4.3.3 Reclaimed Water Projected Demands

The demands associated with the potential reclaimed water users are summarized in **Table 4-8** for the year 2032 and at build-out**.** The projected demands are based on the irrigable percentages, application rate, and development growth rates discussed in **Sections 4.3.1** and **4.3.2**.

Table 4-8: Potential Reclaimed Water Users - Projected Demands

ID[1]	Owner	Irrigable Acreage	2032 Demand (gpd)	Build-Out Demand (gpd)
1	McCann Holdings Ltd	633	158,949	670,669
2	SDC Communities Inc/Vott-D LLC	221	60,991	257,345
3	Palmer Ranch Holdings Ltd	77	90,150	90,150
4	Albritton Groves Ltd	328	45,212	190,770
5	Indiantown Dairy Farm Inc	2,829	390,154	1,646,221
6	The Ryland Group, Inc.	27	7,482	31,569
7	Foxfire Properties LLC	189	197,941	197,941
8	Sarasota County	82	95,667	95,667
14	McCann Holding Ltd	99	27,232	114,904
19	Mission Valley Golf and Country Club Inc.	166	182,270	182,270
24	Ringling Properties LLC	30	8,242	34,777
27	SRH Hunt Inc.	10	917	3,869
29	Wynnstay Hunt Inc.	15	1,387	5,850
32	Sarasota County	143	47,688	47,688
33	Wynnstay Hunt Inc.	27	2,460	10,381
34	McCann Holdings Ltd.	33	4,593	19,381
35	Sarasota County	16	4,283	18,074
36	Wynnstay Hunt Inc.	17	1,552	6,549
39	Ringling Properties LLC	10	1,317	5,556
40	Bedstone Holdings Inc	39	5,381	22,706
41	Terry D Reed	35	9,783	41,278
44	Fairmont Sarasota LLC	14	6,435	27,152
45	Wynnstay Hunt Inc.	33	2,998	12,652
46	Civix Sunrise Golf Course LLC	116	157,167	157,167
48	BRSG Real Estate Holdings LLC	29	2,632	11,106
49	Wynnstay Hunt Inc.	39	10,771	45,445
50	Sarasota County	227	395,678	395,678
52	McCann Holdings Ltd	595	81,991	345,954
54	SRH Hunt Inc.	10	925	3,903
55	Palmer Ranch Holdings Ltd	15	5,819	5,818
56	Palmer Ranch Holdings Ltd	90	105,033	105,033
57	Sarasota County	16	18,483	18,483
58	Ringling Properties LLC	30	4,106	17,326
61	McCann Holdings Ltd	252	34,751	146,628
62	Wynnstay Hunt Inc.	6	512	2,162
63	Wynnstay Hunt Inc.	16	1,450	6,118

Table 4-8: Potential Reclaimed Water Users - Projected Demands (Continued)

ID[1]	Owner	Irrigable Acreage	2032 Demand (gpd)	Build-Out Demand (gpd)
64	Sarasota-Manatee Jewish	17	4,609	19,446
70	Palmer Place LLC	388	53,518	225,815
71	Irwin D Campbell	75	10,278	43,366
74	Dept Of Veterans Affairs Natl	292	80,533	339,800
75	Lindvest Sarasota East, Ltd.	59	16,343	68,958
76[2]	Sarasota Associates A-1 LLC	262	152,337	152,337
77	Gianfranco Strazzera	514	70,871	299,034
78	Lindvest Sarasota East, Ltd.	100	27,622	116,550
79	Lindvest Fruitville Ltd	289	79,737	336,442
83	Bispham Family Limited Partnership	510	140,752	593,889
81	Calusa Lakes Community Assoc Inc	258	324,638	324,638
86b	L T Partners LLLP	67	19,880	83,883
	Total	**9,345**	**3,153,520**	**7,598,398**

1. See Figure 4-4; IDs for future potential users not included – see Section 5.
2. Located within the Evers Watershed.

Table 4-9 provides a summary of the potential reclaimed water user demands by planning period.

Table 4-9: Summary of Reclaimed Water Demand by Driver

Driver	Demand (gpd)				
	2015	2020	2025	2030	2032
Proximity to a Future Roadway	70,489	198,650	326,812	454,973	506,238
Parks	66,171	66,171	461,849	557,516	557,516
Planning	340,857	762,359	898,539	1,034,719	1,089,191
Proximity to the North/South Interconnect	20,687	58,299	95,911	133,523	655,475
Proximity to an Existing Reclaimed Water Pipeline	26,168	73,746	121,324	168,902	345,100
Total	**524,372**	**1,159,225**	**1,904,435**	**2,349,633**	**3,153,520**

Table 4-10 shows the projected reclaimed water demand and wastewater flow during the planning period. Based on information provided by Florida Department of Environmental Protection (FDEP) and the County, approximately 65-70% of the reclaimed water produced by the County is currently being utilized for beneficial reuse.

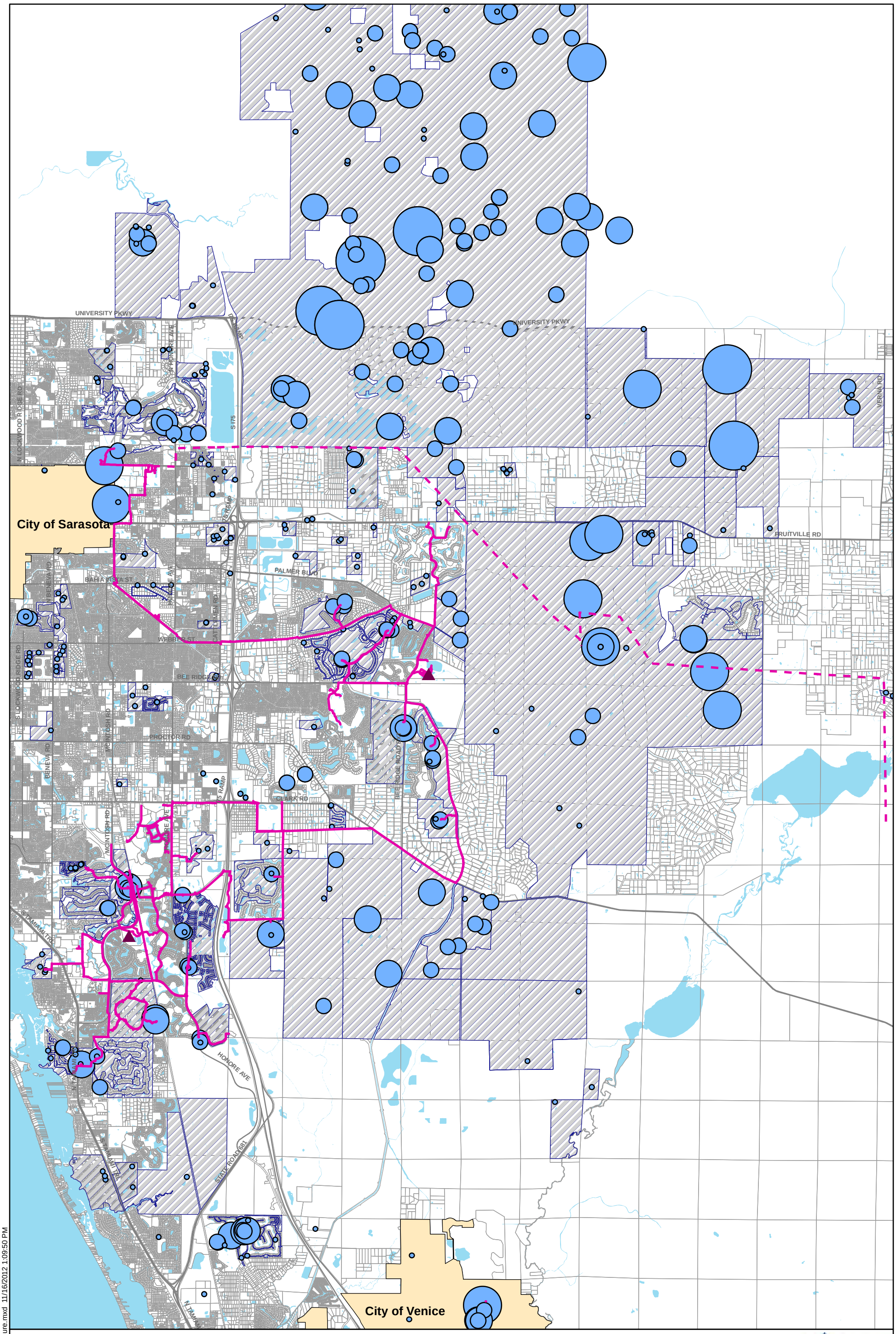
Table 4-10: Reclaimed Water Utilization Rate by Planning Year

Year	Wastewater Flow (mgd)	Reclaimed Water Demand (mgd)	Demand as Percent of Wastewater Flow
2011	8.8	6.7	76%
2015	11.4	7.2	63%
2020	12.6	7.9	63%
2025	13.7	8.6	63%
2030	14.9	9.1	61%
2032	15.3	9.9	65%

The percentages of reclaimed water utilized for beneficial reuse are in compliance with Sarasota County's water use permit which requires at least 50% of the total annual treated effluent flow is to be beneficially reused. Should the County elect to achieve the District's 2010 Regional Water Supply Plan long-term goal of achieving 75% utilization of all wastewater plant flows, an additional 1.6 mgd of reclaimed water demand will be needed within the planning period. Based on this information, it is recommended that the County continue to identify reclaimed water users as the system develops and expands during the planning period.

4.4 Potential Groundwater Offsets

The County has the potential to obtain groundwater offsets for parcels where reclaimed water is proposed when the subject parcel has an existing water use permit. **Figure 4-5** shows the locations of the irrigation, augmentation, re-pump, livestock, reuse, general recreational, and general agricultural water use permits in the vicinity of the potential


UNIVERSITY PKWY
UNIVERSITY PKWY
S I-75
N LOCKWOOD RIDGE RD
City of Sarasota
PALMER BLVD
BAHIA VISTA ST
WEBBER ST
BEE RIDGE RD
PROCTOR RD
CLARK RD
MCINTOSH RD
BENEVA RD
HONORE AVE
BEE RIDGE ROAD E
FRUITVILLE RD
VERNA RD
STATE ROAD 681
City of Venice
Legend
Water Reclamation Facility
Sarasota County Existing Reclaimed Pipe
City of Sarasota Reclaimed Pipe
Permitted Irrigation Area
Incorporated Area
Wells (Permitted Capacity)
0.9 - 5.0 MGD
0.6 - 0.9 MGD
0.3 - 0.6 MGD
0.1 - 0.3 MGD
0.0 - 0.1 MGD
N
W
E
S
McKIM&CREED
Sarasota County
Figure 4-5
Water Use Permit
Wells and Irrigation Areas
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users as well as a graphic illustration of their permitted capacity. Water use permits with usage types not considered applicable for an offset were existing public supply wells and wells for fire suppression were not shown. An eligible groundwater offset is the reduction in groundwater withdraws as a result of receipt of an alternative water supply such as reclaimed water.

The calculation to determine the quantity of the groundwater offset is specified in 40D-2.101(6)(c), F.A.C. The calculation includes the following parameters:

- Sum of the total groundwater pumped during the receiver's three highest-use calendar years during the six consecutive years prior to the use of the alternative water supply.
- Divide the sum of the three highest-use years' pumpage by three.
- Subtract the proposed reduction in pumpage due to the use of reclaimed water from the three highest–use calendar years to arrive at the eligible offset.
- For first delivery of reclaimed water after January 1, 2000 the groundwater replacement credit is 90% of the eligible offset calculated.

Based on the projected demands shown in **Table 4-8**, groundwater offsets were calculated for potential reclaimed water users by using the historical pumpage information as summarized in **Table 4-11**.

Table 4-11: Calculated Groundwater Offsets

ID	Owner Name	Water Use Permit Number	Calculated Groundwater Offset (gpd)[1]
4	Albritton Groves Ltd.	20 009361.006	126,209
83	Bispham Family Limited Partnership	20 003890.008	189,838
81	Calusa Lakes Community Assoc Inc.	20 010823.005	410,938
74	Department of Veterans Affairs Natl	20 013347.001	61,279
79	Lindvest Fruitville Ltd.	20 008226.006	26,775
19	Mission Valley Golf and Country Club Inc.	20 003941.008	187,289

1. Based on groundwater withdrawal data from January 2006 through December 2011.
2. See Figure 4-4.

4.5 Reclaimed Water User and Demand Summary

This section provides a description of the procedures, information, and assumptions used to generate projected reclaimed water users and their associated demands for the planning period. Summaries of these users, the types of users, and the amount of reclaimed water used for beneficial reuse were also provided in this section. Although not identified in this master plan as reclaimed water users during the planning period, future potential reclaimed water users were considered and discussed in **Section 5**.

5.0 FUTURE POTENTIAL RECLAIMED WATER USERS

This section discusses those parcels that were not identified as reclaimed water users within the 20-year planning period and do not have CIPs associated with them for this master plan. Although these parcels are not included in the CIPs in this master plan, it is possible that one or more of these parcels could become a future reclaimed user(s) which may require new infrastructure to serve the respective parcel(s). Data summarizing these other parcels, including irrigable area, potential reclaimed water use, water use permit information, and historical groundwater pumping are also included in this section.

5.1 Other Potential Parcels

Other potential parcels are defined as parcels that could use reclaimed water but are not likely to use reclaimed water within the next 20 years. The primary reasons why these parcels were not included as future County reclaimed water users were:

- Parcels are currently developed.
- Parcels are primarily passive agricultural enterprises with limited water use withdrawals.
- Significant uncertainty of potential large reclaimed water users becoming future reclaimed water customers.
- Parcels identified by the County that were unlikely to express interest in using reclaimed water during the planning period.

In general, and due to the capital costs and construction concerns associated with installing reclaimed water pipes in these areas, those parcels that are currently developed but not currently served with reclaimed water are not likely to have

significant future reclaimed water demands. As such, these parcels are not projected to receive reclaimed water during the planning period.

5.2 Potential Large Reclaimed Water Users

Hi Hat Ranch and LT Ranch have the potential to become large users of reclaimed water. These parcels are currently using groundwater wells for irrigation which is more cost-effective for the parcel owners than irrigation with reclaimed water. Additionally, these parcels are not likely to take reclaimed water due to the expense and when groundwater is a more reliable alternative. As such, it is unlikely that the County will provide reclaimed water to Hi Hat or to LT Ranch in the near future. The future potential large reclaimed water user, Schroeder-Manatee Ranch, has the potential for 2.8 mgd of future reclaimed water demand. However, in Manatee County Schroeder-Manatee Ranch is required to use effluent treated to the levels produced by Advanced Wastewater Treatment (AWT) due to being partially located within the Beneficial Reuse Area of the Evers Reservoir Watershed, which is part of the Braden River watershed.

The other remaining future reclaimed water parcels were those identified by the County as parcels that are unlikely to develop in the near future and whose projected reclaimed water demands extend beyond the 20-year planning period. **Table 5-1** summarizes the calculated reclaimed water demands based on irrigable acreage and land-use for these parcels, while **Figure 5-1** shows the location of these parcels.

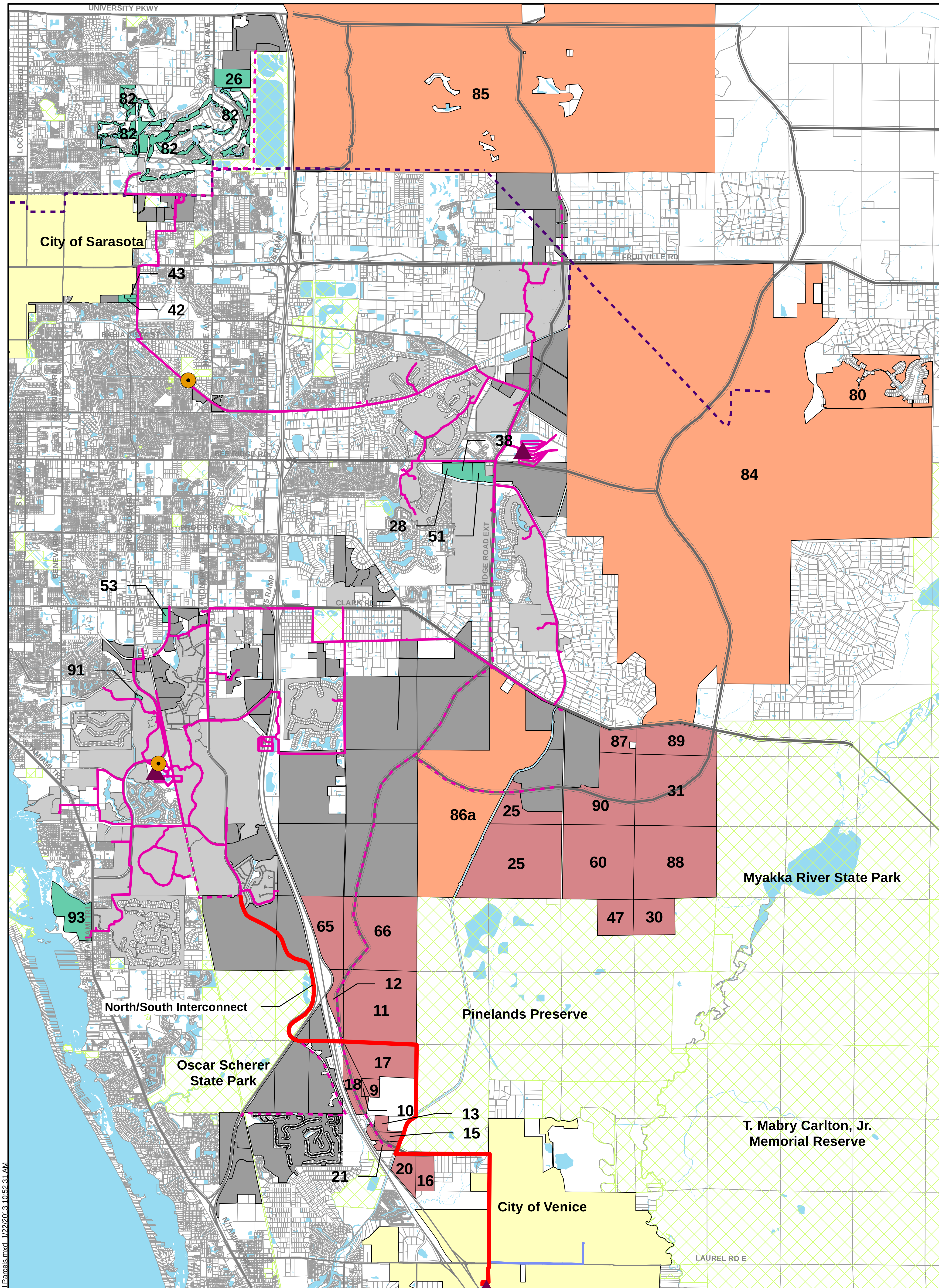
Table 5-1: Other Potential Parcels – Project Demands

ID[1]	Owner	Irrigable Acreage	Build-Out Demand (gpd)
9	McCann East LP	30	17,661
10	McCann East LP	10	6,021
11	McCann East LP	654	380,412
12	McCann East LP	88	51,026
13	Browers Groves Inc.	30	17,498
15	Stephen T Deans Sr	41	23,791

Table 5-1: Other Potential Parcels – Projected Demands (Continued)

ID[1]	Owner	Irrigable Acreage	Build-Out Demand (gpd)
16	Philip V Burket	82	47,819
17	McCann East LP	274	159,384
18	McCann East LP	111	64,373
20	Philip V Burket	89	51,636
21	Dr. Steven T Deans	26	15,046
25	Sarasota County Board of County Commissioners	982	571,465
26	Las Palmas Condominiums[2]	50	58,184
28	Frank J Dewane	10	11,637
30	Lewis H Hawkins	181	210,688
31	Lewis H Hawkins	709	825,254
37	Sarasota County	6	2,142
38	Grace Baptist Church	12	13,382
42	Sarasota-Manatee Jewish	12	13,620
43	Sarasota-Manatee Jewish	5	5,652
47	Lewis H Hawkins	159	185,082
51	Church of the Rock of Sarasota County	19	22,110
53	AN Luxury Imports of Sarasota County	10	7,884
60	Lewis H Hawkins	651	757,528
65	McCann East LP	265	154,047
66	McCann East LP	662	385,160
80	Oakford Golf Club	487	440,000
82	Meadows Country Club Inc.[2]	328	520,000
84	Hi Hat Ranch LLLP & City Of Sarasota	13,238	1,250,000
85	Schroeder-Manatee Ranch Inc	5,260	2,792,600
87	Lewis H Hawkins	104	120,692
88	James A Hawkins	733	852,501
89	James A Hawkins	286	332,320
90	James A Hawkins	484	562,815
91	Valencia at Prestancia	2	13,500
92	Deer Creek	21	137,500
93	The Oaks	102	651,000
86a	L T Partners LLLP	1,786	315,894
	Total	**27,999**	**12,047,324**

1. See Figure 5-1.
2. Located within the Braden River Watershed.



Legend

N W E S

Deep Injection Well
Water Reclamation Facility
North/South Interconnect
Incorporated Area
Natural Lands

Sarasota County Existing Reclaimed Pipe
Sarasota County Future Reclaimed Pipe
City of Sarasota Reclaimed Pipe
City of Venice Reclaimed Pipe
Future Roadway 2025

Existing Service Area
Potential Reclaimed Water Users

Other Potential Parcels

Developed
Potential Large Reclaimed Water User
Other Potential Parcels

McKIM&CREED

Sarasota County

Figure 5-1
Other Potential Parcels

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5.3 Future Potential Large Reclaimed Water Users

A list of future potential large reclaimed water users was formulated in conjunction with County staff during preliminary scoping for this master plan. The list consists of large properties with irrigation demands not currently served by the Sarasota County reclaimed water system. These properties were identified based on their potential reclaimed water demand and groundwater offsets, along with the potential for the County to develop strategic partnerships with the owners of these large tracks of land. These users are described in the following subsections.

5.3.1 Schroeder-Manatee Ranch

Schroeder-Manatee Ranch utilizes groundwater, surface water and reclaimed water to meet its non-potable water needs as outlined in its water use permit. The non-potable water sources are developed and distributed to Schroeder-Manatee Ranch through Braden River Utilities. As specified in the *Schroeder-Manatee Ranch CY2007-2011 Annual Operations Plan, Implementation of Conservation Plan, and Alternative Water Supply Feasibility Report dated March 19, 2012, by Progressive Water Resources*, Schroeder-Manatee Ranch operates using reclaimed water as its first source, followed by surface water, storm water and groundwater. **Table 5-2** summarizes Schroeder-Manatee Ranch's non-potable water use during 2011.

Table 5-2: Schroeder-Manatee Ranch Non-Potable Water Use – 2011[1]

Water Source		Annual Average Daily Use (mgd)	Percent Daily Use by Source
Groundwater		6.37	55%
Alternative Water Supply	Surface Water	0.92	8%
	Reclaimed Water	4.33	37%
Total		11.62	100%

1. Quantities per Table 5 of Schroeder-Manatee Ranch CY2007-2011 Annual Operations Plan, Implementation of Conservation Plan, and Alternative Water Supply Feasibility Report dated March 19, 2012, by Progressive Water Resources.

As discussed in **Section 6**, reclaimed water irrigation within the Evers Watershed was prohibited by the Manatee County Comprehensive Plan until Manatee County modified its policy in June 2010. The modification of the policy for irrigation within the Evers Watershed along with the amount of groundwater used in 2011 suggests an opportunity for Sarasota County to serve Schroeder-Manatee Ranch at some time in the future. The City of Sarasota has an agreement to provide 1.5 to 2.0 mgd of reclaimed water for use within the Evers Watershed, while the City of Bradenton is also anticipated to supply 2.0 to 4.0 mgd of reclaimed water within the same watershed. As discussed in **Section 6**, both of these municipalities have facilities designed and permitted to produce reclaimed water in accordance with advanced wastewater treatment requirements. The cost of providing reclaimed water to Schroeder-Manatee Ranch is expected to be significantly higher (estimated at $2.92 to $3.55 per 1,000 gallons) due to the costs of the facilities and components needed to meet the higher treatment requirements.

5.3.2 Hi Hat Ranch

Hi Hat Ranch represents a large agricultural area that periodically utilizes reclaimed water from the City of Sarasota to provide a portion of the irrigation water for sod, pasture and citrus. The amount of reclaimed water supplied by the City of Sarasota to Hi Hat Ranch has decreased over the years from approximately 4.0 mgd to 1.0 mgd due in part to increased demands within the City of Sarasota. The current water use permit specifies the annual average reclaimed water supply by the City of Sarasota to Hi Hat Ranch is 1,269,700 gpd. The total permitted annual average irrigation demand is 3,884,200 gpd with 1,269,700 gpd of the quantity placed on standby since it is proposed to be satisfied with reclaimed water. The increase in the City's obligation to supply reclaimed water to Schroeder-Manatee Ranch may provide the County with the opportunity to provide reclaimed water to Hi Hat Ranch at some point in the future. It should be noted that Hi Hat ranch has experienced difficulty with the maintenance of its irrigation system due to solids entering into the irrigation system from the reclaimed water storage pond. Based on a meeting with the County and representatives of Hi Hat Ranch on August 16, 2012, Hi Hat Ranch would likely only take reclaimed water when they need it, may require the County to lease an easement for pipes and/or a ground storage tank, and may not be willing to pay reclaimed water rates in accordance with the County's current structure. **Table 5-3** summarizes the Hi Hat Ranch non-potable water use during 2007, as provided by Table G of Water Use Permit application prepared by Entrix Water Solutions dated July 16, 2008.

Table 5-3: Hi Hat Ranch Non-Potable Water Use – 2007

Water Source		Annual Average Daily Use (mgd)	Percent Daily Use by Source
Pumpage[1]		0.88	30.4%
Alternative Water Supplies	Surface Water	0	0%
	Reclaimed Water	2.01	69.6%
Total		2.89	100%

1. Pumpage total was assumed to be 100% from groundwater wells.

5.3.3 LT Ranch

LT Ranch is a large agricultural area that uses groundwater to irrigate hay and sod and has not historically nor currently receives reclaimed water. The current water use permit specifies the annual average irrigation demand is 1,128,000 gpd. A Reclaimed Water Feasibility Study dated December 20, 2011 by Cardno Entrix was prepared as a requirement of the water use permit. The Study summarized that based on the annual reclaimed water costs and the construction cost for the required infrastructure to transmit and store the reclaimed water; it was not cost effective for LT Ranch to switch from groundwater to reclaimed water. **Table 5-4** summarizes their water use from November 2010 through November 2011, as per the Reclaimed Water Feasibility Study prepared by LT Partners dated December 20, 2011.

Table 5-4: LT Ranch Non-Potable Water Use
November 2010 - November 2011

Water Source		Annual Average Daily Use (mgd)	Percent Daily Use by Source
Groundwater		0.311	100%
Alternative Water Supplies[1]	Surface Water	N/A	N/A
	Reclaimed Water	N/A	N/A
Total		0.311	100%

1. Alternative water supplies are currently not utilized.

5.4 Summary

Future reclaimed water users included in this section have the potential to significantly influence the projected reclaimed water demands and future infrastructure planning should development occur within these parcels. Although these parcels are not included in the CIPs in this master plan, one or more of these parcels may develop and become a future reclaimed user which would require additional reclaimed water infrastructure to serve the respective parcel(s). It is recommended that the County continue to communicate and schedule periodic meetings with Schroeder-Manatee Ranch, LT Ranch and Hi Hat Ranch.

6.0 REGULATORY REVIEW

Both current and future regulations will play a role in how the County expands its reclaimed water system. This section provides an overview of the regulations associated with the North Master Reuse System permit, groundwater monitoring plan, County operating protocols and ordinances, SWFWMD policies, and existing customer agreements. Potential future regulations are discussed to identify impacts these regulations could have on the future reclaimed water system.

6.1 North Master Reuse System Permit

The North Master Reuse System operates under domestic wastewater facility permit FL0177008, a copy of the permit is provided in **Appendix D**. The Bee Ridge and Central County WRFs provide the reclaimed water meeting Part III public access standards for the North Master Reuse System but are separately permitted wastewater treatment facilities. The permit specifies that 11.8 mgd annual average daily flow is permitted for slow-rate public access under system R-001 within the boundary of the North Master Reuse System. Reclaimed water supplies of 7.5 mgd and 4.5 mgd are specified by the Bee Ridge and Central County WRFs, respectively. Up to 2.0 mgd annual average daily flow of reclaimed water may be provided or received from the City of Sarasota Master Reuse System (R-002) – FL0040771. The North Master Reuse System is not permitted for surface water discharge other than reclaimed water that may intermittently discharge from bulk storage ponds into the County stormwater system. Reclaimed water may be stored in the ponds or disposed of in the deep injection well (U-001).

Reclaimed water discharged into the North Master Reuse System is required to meet specific effluent quality limitations as specified in the FDEP operating permits for the Bee Ridge WRF and Central County WRF. A summary of the permitted effluent limitations of reclaimed water to the North Master Reuse System is shown in **Table 6-1.**

Table 6-1: Permitted Effluent Limitation – North Master Reuse System

Parameter	Units	Limit Type	Annual Average	Monthly Average	Weekly Average	Single Sample
Flow	mgd	Maximum	11.8	-	-	-
$CBOD_5$	mg/l	Maximum	20.0	30.0	45.0	60.0
TSS	mg/l	Maximum	-	-	-	5.0
Coliform, Fecal[1]	Count/ 100mL	See Note 1 below	-	-	-	25
Total Residual Chlorine	mg/L	Minimum	-	-	-	1.0
Turbidity[2]	NTU, single sample	Maximum				2.7
pH	st. units	Range	-	-	-	6.0-8.5

1. Over a 30-day period, at least 75% of the fecal coliform values shall be below detection limits.
2. As specified in Operating Protocol at Bee Ridge and Central County WRF, Alarm 1.

6.2 Groundwater Monitoring Plan

The requirements for groundwater monitoring are provided in the WRF operating permit - Section III GROUND WATER REQUIREMENTS. The requirements are for the installation and monitoring of groundwater wells at specific large user sites. The wells generally include an up-gradient well for establishing background groundwater quality, an intermediate well, and a down gradient well located 100 feet from the application site representing the edge of the zone of discharge for compliance monitoring. The intention of the monitoring program is to assure the groundwater down gradient from the application site meets compliance limits in the surficial aquifer. The wells required by the permit are identified in **Table 6-2**.

Table 6-2: Groundwater Monitoring Wells

Monitoring Well ID	Alternate Well Name and/or Description of Monitoring Location	Depth (feet)	Aquifer Monitored
MWC-GC-6	GC-6, Gator Creek Golf Course	16.45	Surficial
MWI-GC-7	GC-7, Gator Creek Golf Course	16.9	Surficial
MWI-MC-9	MC-9, Misty Creek Golf Course	13.5	Surficial
MWB-LO-1	LO-1, Laurel Oaks Golf Course	14.4	Surficial
MWC-LO-2	LO-2, Laurel Oaks Golf Course	17.0	Surficial
MCW-LO-3	LO-3, Laurel Oaks Golf Course	14.3	Surficial
MWC-LO-4	LO-4, Laurel Oaks Golf Course	16.5	Surficial
MWC-LO-5	LO-5, Laurel Oaks Golf Course	14.4	Surficial
MWC-MW-1A	MW-1A, Hammock Place	17.2	Surficial
MWI-MW-2A	MW-2A, Highlands Golf Course	20.5	Surficial
MWC-MW-3A	MW-3A, Groves Golf Course	24.4	Surficial
MWB-UG-1	UG-1, TPC Golf Course	18.4	Surficial
MWC-MW-9	MW-9, Oaks Golf Course	18.9	Surficial
MWI-RH-1	RH-1, Red Hawk Reserve	18.0	Surficial

The parameters for the groundwater compliance wells are shown in **Table 6-3**. If the natural groundwater quality, as reported from results of testing the background well, is higher than the limits in **Table 6-3**, the natural groundwater quality is the limitation for compliance.

Table 6-3: Groundwater Quality Limits

Parameter	Permit Level	Units	Sample Type	Monitoring Frequency
Water Level Relative to NGVD	Report	FEET	In-Situ	Quarterly
Nitrogen, Nitrate, Total (as N)	10	MG/L	Grab	Quarterly
Solids, Total Dissolved (TDS)	500	MG/L	Grab	Quarterly
Arsenic, Total Recoverable	10	UG/L	Grab	Quarterly
Chloride (as Cl)	250	MG/L	Grab	Quarterly
Cadmium, Total Recoverable	5	UG/L	Grab	Quarterly
Chromium, Total Recoverable	100	UG/L	Grab	Quarterly
Lead, Total Recoverable	15	UG/L	Grab	Quarterly
Coliform, Fecal	4	#/100ML	Grab	Quarterly
pH	6.5 to 8.5	SU	In-Situ	Quarterly
Sulfate, Total	250	MG/L	Grab	Quarterly
Turbidity	Report	NTU	In-Situ	Quarterly
Sodium, Total Recoverable	160	MG/L	Grab	Quarterly
Specific Conductance	Report	UMHO/CM	In-Situ	Quarterly
Temperature (C), Water	Report	DEG.C	In-Situ	Quarterly
Oxygen, Dissolved (DO)	Report	MG/L	In-Situ	Quarterly

6.3 Operating Protocol

The County has a formal Reuse Operating Protocol for the North Master Reuse System which contains the operating protocols (see **Appendix E**) for both the Bee Ridge Public Access Reuse System and the Central County Reuse Public Access System to assure compliance with FDEP Rule 62-610 F.A.C. The requirements for the operating protocol are specified under 62-610.320 (6) Operating Protocols. The operating protocol is required to address the following:

- Set points for parameters measured by on-line equipment
- Procedures when continuous analyzers are out of service
- Physical steps and procedures when substandard water is produced
- Physical steps and procedures when treatment returns to normal

The protocol must be periodically reviewed and revised, as appropriate, to ensure satisfactory system performance. The protocol must be submitted to the FDEP with each permit renewal and when any revision occurs.

A review of the County's Reuse Operating Protocols was conducted and the applicable requirements noted above were included in the documents.

6.4 Reclaimed Water Ordinances

Section 125.01(1)(k), Florida Statutes, provides specific legislative authorization for municipalities to provide and regulate waste and sewage collection and disposal, along with water and alternative water supplies, which may include reclaimed water and water from aquifer storage and recovery and desalination systems, and conservation programs. Under the County's comprehensive plan, land development regulations and County utility code, new projects are required to supply adequate utility service, and protect and preserve groundwater resources and natural systems.

The County's comprehensive plan includes guiding policies governing water resources and the use of reclaimed water. The main water policies outlined in the comprehensive plan include:

- Water conservation.
- Safe, efficient, economical, and sustainable water supply.
- Explore alternative water supplies in cooperation with state, regional and local agencies.
- Maximize existing and available potable water facilities and discourage urban sprawl.
- Correct water facility deficiencies and establish priorities for replacement.
- Require new development to connect to central water systems and ensure permits are conditioned based upon adequate potable water capacity.

- Protect water resources, habitats and natural systems.

Discussions with County staff have indicated that for new developments which are subject to rezoning, comprehensive plan amendment, special exception or development review, County staff will require that an applicant demonstrate how the proposed development intends to comply with the two main comprehensive plan water policies (1.3.1, and 3.3.4) related to reclaimed water.

WATER Policy 1.3.1. - The County shall continue implementation of the reuse policies in the Wastewater Management Plan in order to reduce the demand on potable water supplies and withdrawals from groundwater aquifers.

WATER Policy 3.3.4. - New development shall prioritize meeting irrigation needs through (1) demand management strategies, (2) reclaimed water, if available, (3) rain water or stormwater, and finally, (4) community ground water wells.

In certain cases, County staff can recommend stipulations related to the use of reclaimed water for new developments in order to clarify how the development will be regulated. For existing parcels that have the proper zoning and land use entitlements, the Water Efficient Landscaping Regulations (codified in Chapter 22-151 through 22-160 of the Sarasota County Code) require connection to reclaimed systems that have adequate capacity for any property within 150 feet of an existing reclaimed water line. It is not uncommon for individual subdivision lots to be greater than 150 feet away from an existing reclaimed line, and typically this regulation would only affect someone building a new irrigation system and would not be used to require someone with an existing irrigation system to change their source of supply.

Chapter 74 of the Sarasota County Code of Ordinances contains the Land Development Regulations that govern the unincorporated portions of the County. Development that is served by independent utility providers like Aqua Utilities of Florida, South Gate / Pluris, Englewood Water District, or Sarasota County Utilities which are required under

the code to provide a letter of water, sewer or reclaimed water availability prior to obtaining development approval.

The Sarasota County Code of Ordinances, Part II, Chapter 126, Article III, Sec. 126-81 references the Sarasota County Uniform Water, Wastewater and Reclaimed Water Systems Code (Utility Code) as the official Code of Sarasota County relating to the planning, design, permitting and construction of water, wastewater and reclaimed water systems within the County. The Utility Code declares Sarasota County's intention to provide central water, wastewater, and reclaimed water service to the unincorporated area of the County and to those municipalities and private utilities that enter into bulk service agreements, dependent on service capacity, cost-effectiveness and in accordance with the Sarasota County's Comprehensive Plan.

Under the County Utility Code, new projects are required to connect to potable water supply systems and central sanitary sewerage systems. Capacity for the new projects is based upon the number of equivalent dwelling units and the distance from existing facilities. Some of the elements regarding reclaimed water within the Utility Code include specifications regarding the design, materials and construction of reclaimed water lines. Currently the Utility Code does not specifically detail the requirements for when a development is required to connect to reclaimed water.

The County has a mandatory connection ordinance for connection to Sarasota County Utility's system (Chapter 126, Article II, Sec. 126-58); however, this ordinance only applies to wastewater connections and does not mention reclaimed water connections. The County's concurrency management ordinance (Chapter 94, Article VII, Exhibit A) identifies potable water and sanitary sewer levels of service but does not mention reclaimed water. Likewise, the Neighborhood Initiated Potable Water and/or Sewer Line Extension Program Ordinance (Chapter 126, Article V, Sec. 126-200, Or 2007-085) does not specifically mention reclaimed water systems. However, the intent of the program is

to allow it to be used for extending reclaimed water to neighborhoods who would want to participate in a line extension.

A review of the County's current set of rules and regulations leads to the following conclusions and recommendations:

- The requirement to connect to reclaimed water for a development is primarily derived from the irrigation code which requires parcels being developed within 150 feet of an existing reclaimed water line to connect. The requirement to connect under this part of the code would only apply to new irrigation systems that are being installed that require a County permit.

- The requirement to connect to reclaimed water for new development that is not within 150 feet of an existing reclaimed water line is primarily based on the ability of the applicant to demonstrate how the proposed development will comply with comprehensive plan water policies 1.3.1, and 3.3.4. But there is no clear criteria outlined in the land development regulations governing reclaimed water connections for new development similar to what is done for water and wastewater service which utilizes the size of the development in equivalent residential units (EDUs) and distance to existing facilities.

- Since a requirement to use reclaimed water may end up in a special condition or zoning stipulation, it is important to note that such a requirement may be difficult to enforce, especially after the parcel has been fully developed or after an irrigation system has been subsequently modified. Also homeowners may choose not to regularly use reclaimed water as was originally intended or may simply choose to rely on other sources.

  It should be noted that even for parcels connected to reclaimed water; it is difficult to predict the volume of reclaimed water that will be used at any

particular time due to the fact that at certain times of the year or under certain conditions, reclaimed water may not be available or conditions may not be suitable for use. Therefore, it may be necessary for the County to consider other incentives or continued neighborhood outreach programs like the County's Neighborhood Environmental Stewardship Team (NEST) which helps to educate and promote reuse and reclaimed water as a more environmentally responsible alternative when compared against other supplies. Education, conservation, and the voluntary use of reclaimed water may hold the greatest potential for achieving the desirable use of reclaimed water and result in the most beneficial outcome for the community while protecting the County's streams and waterways.

- The County code does not require an owner of an existing irrigation system to connect to the reclaimed water system.

- For clarity, the County may want to consider adding language regarding reclaimed water to the neighborhood initiated line extension program ordinance.

- There could be additional clarity incorporated into the Sarasota County Code of Ordinances regarding when a particular regulation or passage applies to reclaimed water systems to make it clear to the reader. There are instances where the terms water and wastewater are used in a sentence that it may be appropriate to include the term reclaimed water, or alternatively, clarify that reclaimed water systems are considered to be part of the central wastewater collection system.

- Additionally, the terms reuse and reclaimed water are interchanged in different sections of the County code of ordinances (depending on the age of the last revision). It is recommended this terminology be made consistent and the

County may want to consider using the term "reuse" to refer to all types of non-potable water supply sources inclusive of reclaimed water, stormwater, etc.

It was beyond the scope of this master plan to document how the County uses the irrigation code to actively pursue mandatory connections, handle connection enforcement issues, or code enforcement of the once a week watering restrictions. The County may want to consider performing additional studies to further document these items.

6.5 SWFWMD Policies

The Southwest Florida Water Management District is recognized as a leader in the promotion and development of reclaimed water and alternative water sources. Through their Cooperative Funding Initiative program, the District has contributed to more than 300 reuse projects district wide to help communities develop and expand their reclaimed water systems. This reclaimed water master plan is being jointly funded by the County and the district through this cooperative funding program.

The district's 2010 Regional Water Supply Plan describes its long-term goal of achieving 75% utilization of all wastewater treatment plant flows and 75% offset efficiency of all reclaimed water used. It is recognized that in certain cases it may be possible to achieve efficiencies approaching 100% and the district continues to seek out those types of projects and the application of new technologies to improve utilization. Currently, Sarasota County's water use permit requires that more than 50% of the total annual treated effluent flow is to be reused beneficially. In actuality, the County has been able to achieve around 65% - 76% beneficial reuse annually.

District-wide, utilities currently use more than 149 mgd (44% utilization) of reclaimed water to offset 102 mgd (68% offset efficiency) in traditional potable water demands.

According to the district, reuse over the next 20 years is anticipated to continue to grow to more than 373 mgd and result in more than 280 mgd in offsets.

During the 2012 legislative session lawmakers passed house bill 639 under which a water management district "*…may require the use of reclaimed water in lieu of all or a portion of a proposed use of surface water or groundwater by an applicant when the use of uncommitted reclaimed water is available; is environmentally, economically, and technically feasible; and is of such quality and reliability as is necessary to the user.*" The approved bill went on to clarify that *"…a water management may neither specify any user to whom the reuse utility must provide reclaimed water nor restrict the use of reclaimed water provided by a reuse utility to a customer in a permit or, unless requested by the reuse utility, in a water shortage order or water shortage emergency order."*

Much of this legislation sets the stage for more collaboration between reclaimed water providers and the water management districts in matching up supplies and applicants seeking larger groundwater or surface water withdrawal permits in an effort to improve the utilization of reclaimed water across the state. For this legislation to be effective, it also requires the voluntary cooperation of the applicant in the management of their supplies so that the reuse and reclaimed sources are given priority when available.

Well and water use permitting responsibility resides with state agencies. For larger surface water withdrawals and well permits issued by SWFWMD, quantities are metered and regularly reported. For small well permits issued by the Department of Health, withdrawal quantities are not metered or tracked. For many users, groundwater is the preferred source for irrigation and at times it is difficult to convince someone to use a more costly source like reclaimed water.

Specific condition 14 in the County's water use permit that was issued by the District requires water use permit holders who have a wastewater treatment facility with an annual average design capacity equal to or greater than 100,000 gpd (which Sarasota

County has) to submit to the District an Annual Reclaimed Water Supplier Report. This report includes customer data on the previous year's quantities of reclaimed water, a map depicting the area served by reclaimed water and a projection of any area to be served within the next year.

The County's water use permit also includes specific condition 15 that requires the County to respond in a timely manner to inquiries about the availability of reclaimed water and if reclaimed water is or will be available to that area within the next six years. It also requires the County to provide a cost estimate for connection to the inquiring entity. Typically, the County provides such applicants with a copy of the utility connection fee ordinance and offers to work with the applicant's consulting engineer in developing any other preliminary costs in response to such inquiries.

6.6 Future Regulations Evaluation

The larger issue of surface water numeric nutrient limitations has the potential to impact the future use of reclaimed water in specific watersheds and basins. This issue may not primarily impact the reclaimed water distribution system as much as it would likely impact the operations at wastewater treatment plants. It has the potential in the future to require better quality reclaimed water in specific basins as part of an overall strategy to lower watershed nutrient loadings. Currently, the rule is in litigation and its full impact may not be known for some time.

The U.S. Environmental Protection Agency (EPA) updated its Guidelines for Water Reuse in 2012. Reclaimed water is one component of water reuse which has a variety of water recycling methods as its core strategy for meeting demands traditionally provided by potable sources. The EPA and all of the major State of Florida agency's (including the FDEP, Department of Agriculture and Consumer Services, and all of the water management districts) have adopted statements of support for water reuse.

The Florida Legislature has recognized the benefits of water reuse, and has provided guidance in balancing the need for alternative water supplies along with anti-degradation policies (Chapters 62-4 and 62-302, F.A.C.) to discourage reductions in quality of the state's surface waters while trying to protect the public interest when it comes to the feasibility of reuse, water supplies, and meeting future demands.

The FDEP is currently taking input on the development of new rules and policies related to the consumption of water and the utilization of water reuse. The program is entitled Consumptive Use Permitting Consistency (CUPcon) and is focusing on consistency in water use permitting, equitable policies in the statewide regulation of water resources, incentivizing behaviors that protect natural systems, and encourage conservation and the use of alternative water supplies.

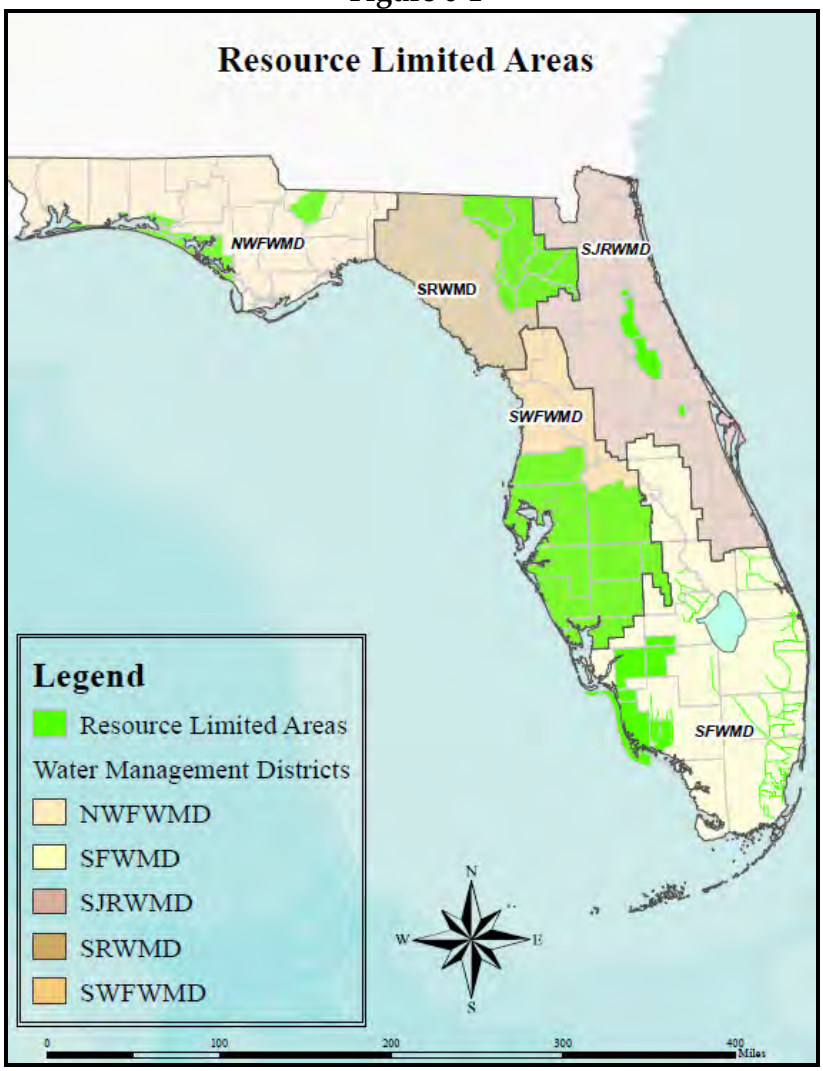
(http://www.dep.state.fl.us/water/waterpolicy/cupcon.htm)

The CUPcon program has several working groups focusing on stakeholder issues such as:

- Public Water Supply
- Agriculture
- Environmental Interests
- Industry
- Recreation/Small Commercial/Self Supply

This process has helped to identify water resource limited areas across the state where additional strategies may be required in addressing permitted withdrawals (see **Figure 6-1**).

Figure 6-1



FDEP Office of Water Policy, 2012 Rule Development Workshops

There is a clear need for the County to continue monitoring, evaluating, and participating in the upcoming legislation and regulations as they are being developed regarding reclaimed water and water use. Some of the topics in recent years that continue to be discussed at the state level include:

- Irrigation Rules
- Aquifer Storage and Recovery (ASR)
- Mandatory Reuse Zones

- Funding Incentives
- Aquifer Recharge and Indirect Potable Reuse
- Credits and offsets for providing the reclaimed water

It's clear that the trend will be toward more proactive ways to manage all water types, develop potable water offsets, emphasize water conservation, use demand management techniques such as rain sensors and watering restrictions, and develop policies for the application of the right water in the right place to promote successful outcomes and to protect the environment.

6.7 Customer Agreements

6.7.1 Summary of Agreements

Existing and anticipated future reuse agreements were provided by the County, reviewed, and summarized. In general, the agreements include the date of the agreement, duration of the agreement, flow, renewal period and automatic renewal conditions. Of particular note, the County has an Interlocal Agreement with the City of Sarasota, which allows for the transfer of reclaimed water to/from each party. The agreement requires notification and consent by the County and the City regarding both the availability to provide and receive reclaimed water. The agreements are summarized in **Appendix F**.

6.7.2 Evaluation of Agreements

With respect to evaluation of the Agreements, this master plan is limited to the agreement with City of Sarasota. The City of Sarasota agreement includes requirements for:

Purpose – Includes providing for the construction, operation and maintenance of the Agreement.

Interconnection – Defines the County's responsibility for design and construction of the interconnection; while also coordinating with the City of Sarasota so as not to interfere with the City's reuse system operation.

Term – Remains in effect until terminated by ***either party***, with thirty (30) days advance written notice.

Use - The Interlocal agreement requires notification and consent by the County and the City regarding both the availability to provide and receive reclaimed water.

Charges - When one party provides reclaimed water to the other party, the party sending the water to the other will bill the receiving entity at 50% of the receiving party's prevailing billing rate.

Water Standards and Liability – Requires reclaimed water flowing through the interconnection to comply with Chapter 62-610, F.A.C. and to comply with the conditions of the wastewater permits of the receiving party. Removes liability for water quality or pressure issues should these issues arise out of control of either party.

Approvals and Funding – Provides the County with the authority to terminate the Agreement should funding from the SWFWMD be unavailable.

Completion and Maintenance – Requires the interconnection be complete within 24-months of cooperative funding approval.

Severability – Requires good faith negotiation by both parties in the event of any provisions of the Agreement is determined to be invalid, illegal, or unenforceable.

Disclaimer of Joint Venture – Representation of both parties that the Agreement is not intended as a Joint Venture.

Applicable Law – Governed by the State of Florida.

Waiver – Defines conditions if Agreement is breached by either party.

Extent of Interlocal Agreement – The Agreement supersedes all other prior agreements and can only be modified in writing.

No Prohibition of Further Extension – Either party may extend their respective systems to serve additional customers.

Notices – Provides contact information for notifications associated with the Agreement.

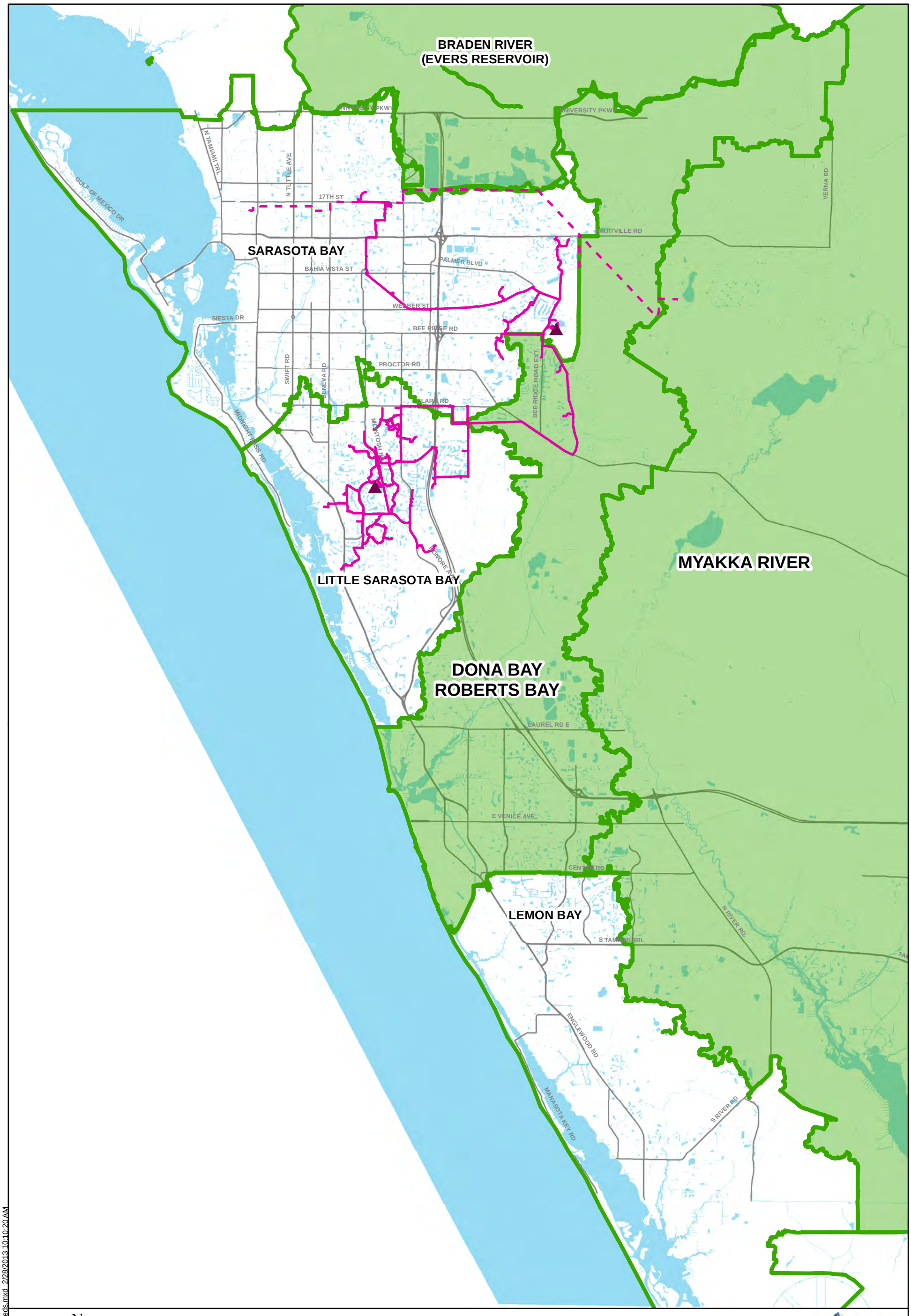
7.0 RECLAIMED WATER QUALITY AND WATERSHED PROTECTION

This Section includes a review and discussion of regulatory requirements, previous studies of the County's watersheds, and comparisons of other local municipal reclaimed water system ordinances, costs, and water quality. Recommendations are provided which consider reclaimed water quality and watershed concerns while assuring the County's reclaimed water system is further developed and expanded to meet projected future demands.

7.1 Watershed Protection

Sarasota County contains five dominate watersheds with 20 drainage basins: (1) Sarasota Bay Watershed, (2) Little Sarasota Bay Watershed, (3) Dona Bay Watershed, (4) Lemon Bay Watershed, and (5) Myakka River Watershed. **Figure 7-1** shows the limits of Watersheds in the County and includes highlighted watersheds that have been deemed as "environmentally significant" per the County's Comprehensive Plan. For purposes of this report, "environmentally significant" means watersheds identified in the Comprehensive Plan that tend to have higher levels of protection or are viewed as needing greater protection.

Both the EPA and the FDEP have conducted studies of watersheds located within the County during the past decade. Based on these studies, several listed impaired waters fall within the limits of the County. **Figure 7-2** provides a summary of the FDEP and US EPA Listed Impaired Waters. The listed waters are impaired due to bacteria, dissolved oxygen, nutrients, or other criteria. Although these studies did not identify any significant sources that would require abatement, as the County moves ahead with the planning and expansion of the reclaimed water system, the possibility exists that additional regulations may be required such as additional treatment for reclaimed water, groundwater monitoring, or reclaimed water irrigation set-backs from surface water bodies.


BRADEN RIVER
(EVERS RESERVOIR)
UNIVERSITY PKWY
N TAMIAMI TRL
N TUTTLE AVE
17TH ST
GULF OF MEXICO DR
SARASOTA BAY
BAHIA VISTA ST
PALMER BLVD
WEBBER ST
SIESTA DR
BEE RIDGE RD
SWIFT RD
GENEVA RD
PROCTOR RD
CLARA RD
MIDNIGHT PASS RD
MCINTOSH RD
BEE RIDGE ROAD EXT
FRUITVILLE RD
VERNA RD
LITTLE SARASOTA BAY
DONORE RD
MYAKKA RIVER
DONA BAY
ROBERTS BAY
LAUREL RD E
E VENICE AVE
CENTER RD
N RIVER RD
LEMON BAY
S TAMIAMI TRL
ENGLEWOOD RD
MANASOTA KEY RD
S RIVER RD
N
W
E
S
Legend
Water Reclamation Facility
City of Sarasota Reclaimed Pipe
Sarasota County Existing Reclaimed Pipe
Watershed
Environmentally Significant Watershed Per Comprehensive Plan
Sarasota County
McKIM&CREED
Figure 7-1
Watersheds
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FDEP Impaired Waters

ID	Waterbody	Bacteria	Dissolved Oxygen	Nutrients	Other
1	ALLIGATOR CREEK			X	
2	ALLIGATOR CREEK TIDAL	X	X	X	
3	APOLLO WATERWAY			X	
4	BOWLEES CREEK	X		X	
5	CATFISH CREEK TIDAL				X
6	CEDAR CREEK			X	
7	CLARK LAKE			X	
8	CLOWERS CREEK	X		X	X
9	CLOWERS CREEK TIDAL			X	
10	COW PEN SLOUGH		X	X	
11	CURRY CREEK				X
12	DIRECT RUNOFF TO BAY	X	X		
13	DIRECT RUNOFF TO BAY		X		
14	ELLIGRAW BAYOU				X
15	FORKED CREEK			X	X
16	GOTTFRIED CREEK	X	X	X	
17	HUDSON BAYOU TIDAL	X	X		
18	LEMON BAY	X			
19	MUD LAKE SLOUGH	X			
20	MYAKKA RIVER		X	X	X
21	MYAKKA RIVER		X		
22	MYAKKA RIVER		X	X	
23	MYAKKA RIVER	X		X	
24	MYAKKA RIVER	X			
25	MYAKKA RIVER			X	
26	MYAKKA RIVER (UPPER)	X			
27	NORTH CREEK TIDAL			X	X
28	NORTH LEMON BAY			X	
29	OGLEBAY CREEK	X			X
30	PHILIPPI CREEK	X			
31	RATTLESNAKE SLOUGH			X	
32	RINGLING CAUSEWAY	X			
33	ROCK CREEK		X		
34	ROCK CREEK		X		
35	RUNOFF			X	
36	SARASOTA BAY	X			
37	SOUTH CREEK		X	X	
38	UPPER LAKE MYAKKA			X	
39	VENICE FISHING PIER	X			
40	WHITAKER BAYOU TIDAL	X		X	X

* Does not include those WBIDs listed only for mercury

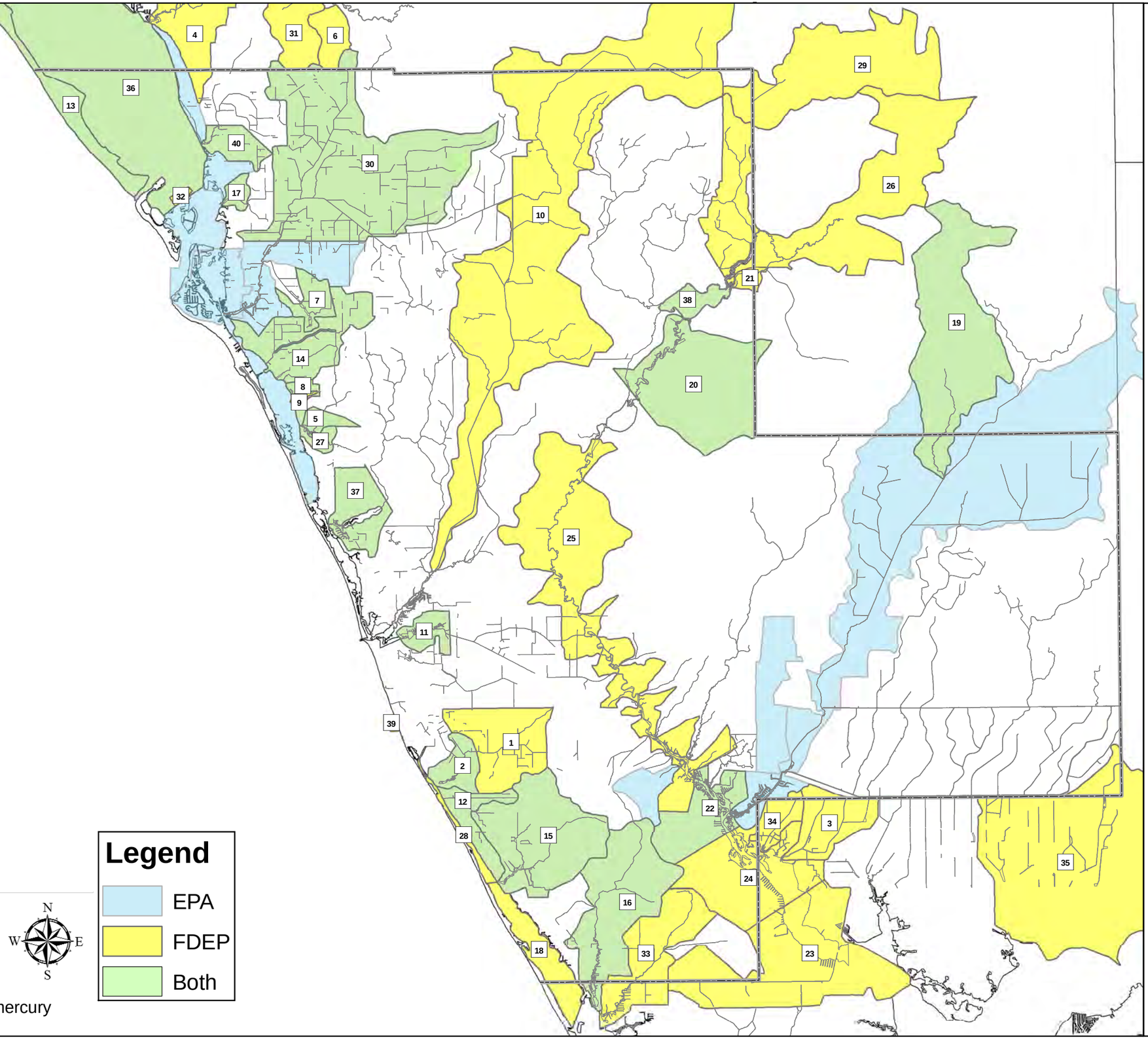


Figure 7-2
FDEP and US EPA Listed Impaired Waters

This map was produced by Sarasota County Department of Water Resources.

Sarasota County

McKIM&CREED

It is recommended that the County continue to monitor for regulations which could impact the management of the County's reclaimed water system at some point in the future.

7.2 Watersheds and Local Municipalities

In consideration of its overall reclaimed water policy, SWFWMD encourages local Utilities to utilize reclaimed water to reduce the demands on regional water supplies. Periodically, the District develops task force committees to address issues that may be impacting water use, offer strategies for improvement, and eventually shape the District's policy. A task force consisting of District Staff and local utility representatives was formed in September 2006 to formulate a plan to enhance reclaimed water usage, which resulted in a key recommendation in 2007 regarding the use of reclaimed water within protected Watersheds:

- ***Task Force Recommendation:*** *Use Reclaimed Water in Regions Where it has Previously Been Disallowed - The District supports the use of reclaimed water within the watershed and plans to encourage utilities that prohibit reclaimed water use within the watershed to change their policy. This will be considered in the review process of reclaimed water project funding applications.*

It is important to note that as a result of the District's recommendation, Manatee County modified its watershed protection policy included in the Manatee County Comprehensive Plan. The Policy originally included a stated objective to "maintain or improve the water quality and quantity in Lake Manatee and Evers Reservoir Watershed Overlay District." The original policy prohibited the disposal of treated effluent from any public wastewater treatment plant or the disposal of any sludge within the County's Watershed Overlay District. In June 2010, Manatee County modified this policy to *allow application of reclaimed water from public facilities meeting Advanced Wastewater Treatment (AWT) standards as defined in Section 403.086 of the Florida*

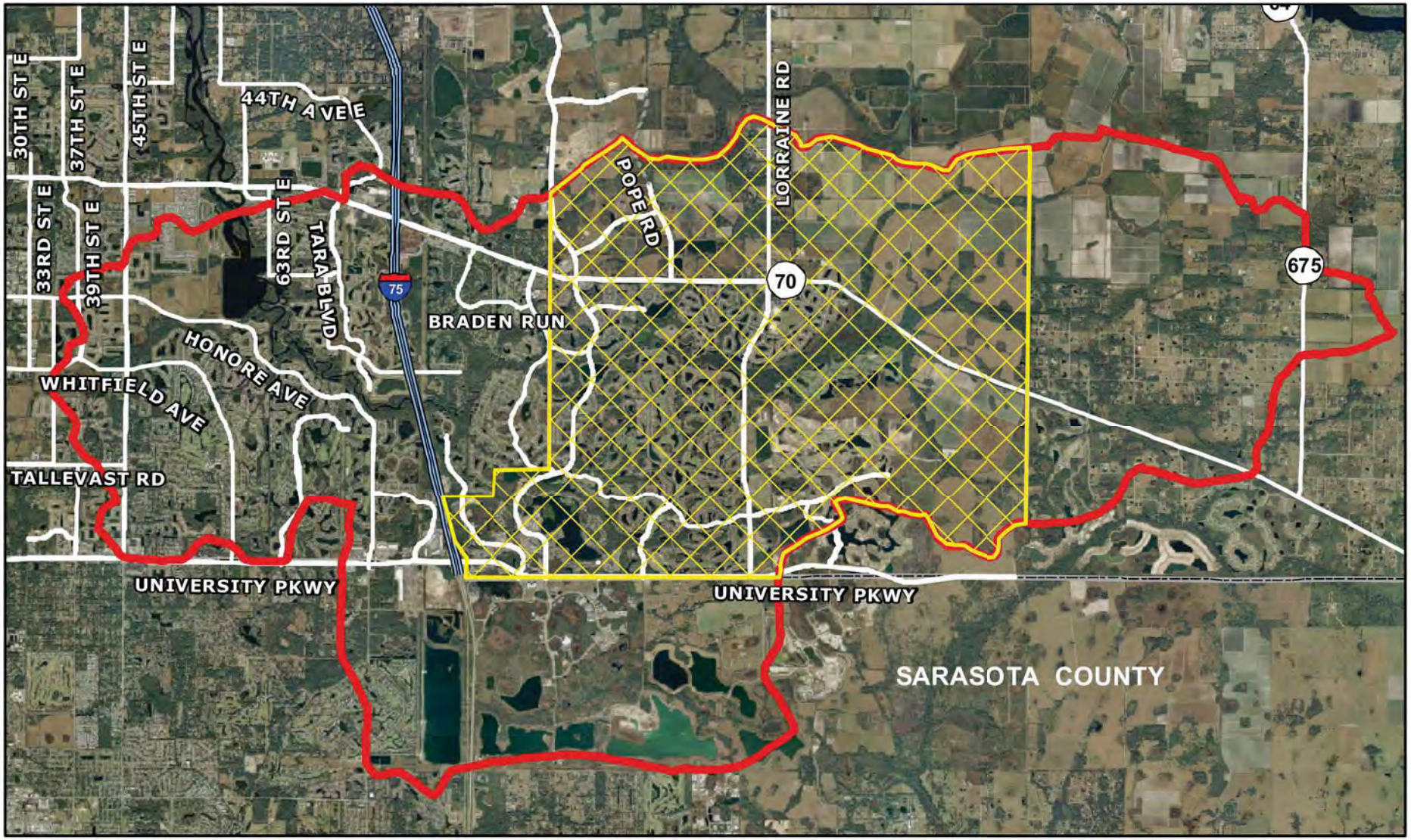
Statutes and that provide reclaimed water pursuant to Chapter 62-610, Part III, of the Florida Administrative Code. Per the Manatee County Comprehensive Plan, the application of reclaimed water is limited to an area within the Evers Watershed (see area with yellow hatching) shown in **Figure 7-3.**

A review of Section 403.086 of the Florida Statute was performed on the criteria established for AWT standards that apply to the Manatee County portion of the watershed.

- Subsection 4 of Section 403.086 of the Florida Statute defines advanced wastewater treatment as, "that treatment which will provide a reclaimed water product that:
    - Contains not more, on a permitted annual average basis, than the following concentrations:
        - Biochemical Oxygen Demand ($CBOD_5$): 5 mg/l
        - Suspended Solids: 5 mg/l
        - Total Nitrogen, expressed as N: 3 mg/l
        - Total Phosphorus, expressed as P: 1 mg/l
        - Has received high level disinfection, as defined by rule of the department."

Based on this review should the County wish to send reclaimed water to areas within the Evers watershed it is recommended that the County meet with the City of Bradenton and Manatee County to discuss this alternative.

Beneficial Reuse Area of the Evers Reservoir Watershed



EVERS WATERSHED OVERLAY

RECLAIMED WATER AREA

Map Author: pauh
Creation Date: 4/10
Map Document Name: C:\PLANNING\Misc\Kathleen\

This map was developed by the Manatee County Geographic Information Systems Division. It is provided for general reference and is not warranted in any way. Errors from non-coincidence of features from different sources may exist. The Manatee County BOCC shall be held harmless for inappropriate or unintended uses of the information.

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McKIM&CREED
1365 Hamlet Avenue
Clearwater, FL 33756
Phone: (727)442-7196, Fax: (727)461-3827
www.mckimcreed.com

MANATEE COUNTY FLORIDA

BENEFICIAL REUSE AREA OF THE EVERS RESERVOIR WATERSHED

FIGURE 7-3

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7.3 Current County Reclaimed Water Watershed Protection Policy

The County currently does not have any official policies in-place that address where reclaimed water may be used, especially with respect to irrigating within watersheds deemed as environmentally significant. The watersheds of Cow Pen Slough, the Myakka River, Deer Prairie Slough, Big Slough, and Evers are designated areas of special environmental significance. Per Policy 4.2.2 of the Comprehensive Plan, the County plans to "Support the efforts and consider recommendations from intergovernmental organizations concerning Sarasota's bays, the Myakka River watershed, and the Evers watershed."

Of note regarding drainage basins within the County; Cow Pen Slough, Big Slough, and Myakka River are either Class I waters, environmentally significant areas, or drinking water sources. Current scientific evidence suggests that reclaimed water can be used safely within these basins. Additionally, all County watersheds are nitrogen sensitive and some have current regulatory issues. Continued management and controlling the use of fertilizers in watersheds can have the greatest impact on nitrogen levels. It is also important to use reclaimed water properly so that it does not also contribute to this issue. The County is also subject to the Tampa Bay Nitrogen Management Consortium and a water quality based effluent limit for stormwater relating to their TMDL and Reasonable Assurance Plan.

Based on the information obtained during the preparation of this report, it does not appear that the County needs to develop policies related to reclaimed water watershed protection. However, it is recommended the County continue to monitor pending regulations and other local municipal ordinances and policies which may impact and necessitate specific reclaimed water policies be developed to ensure that reclaimed water can continue to be beneficially reused while meeting watershed regulations, from a federal, state and local level.

7.4 Reclaimed Water Quality

The County's reclaimed water system conforms to State standards for Part III Reclaimed Water, permitted for slow-rate land application, public access areas, residential irrigation, and edible crops (Chapter 62-610.460, FAC). These standards require the reclaimed water to include secondary treatment, high-level disinfection, and limit total suspended solids (TSS) to 5.0 mg/L. The specifics of the County's reclaimed water quality requirements are summarized in **Table 7-1**.

Table 7-1: Summary of County Reclaimed Water Quality Requirements

Definition	Attribute	Requirements
Secondary Treatment [Chapter 62-600.420(1)(a)]	$CBOD_5$	$\leq$ 20 mg/L or $\geq$ 90% removal
High-Level Disinfection (Chapter 62-600.440 (5))	Fecal Coliform	Undetectable (per 100 mL)
	Chlorine Residual	$\geq$ 1.0 mg/L
	Chlorine Contact Time	$\geq$ 15 mins (@ PHF*)
Public Access Application of Reclaimed Water [Chapter 62-610.460(1)]	TSS	$\leq$ 5.0 mg/L

On an annual basis, the FDEP requires an expanded water quality monitoring report from the County's water reclamation facilities that produce reclaimed water. The expanded reporting requirements include testing for inorganic, volatile organic, trichloroethane, organic, radiological, and secondary chemical parameters. This testing is similar to testing performed on drinking water.

7.5 Advanced Wastewater Treatment and Reclaimed Water Quality Comparisons

Advanced wastewater treatment standards are defined in the Florida Statutes and Chapter 62-610, Part III, of the Florida Administrative Code and would be applicable if future regulatory conditions or local municipal ordinances dictate. **Table 7-2** provides a summary of annual average reclaimed water quality requirements to meet these criteria.

Table 7-2: Reclaimed Water Quality Requirements

Parameter	Advanced Secondary Treatment Standards	Advanced Wastewater Treatment Standards Florida Statue, Section 403.086
Biochemical Oxygen Demand (CBOD5)	20 mg/L	5 mg/L
Suspended Solids	5 mg/L	5 mg/L
Nitrogen, Total (as N)	N/A[1]	3 mg/L
Total Phosphorus, as P	N/A[1]	1 mg/L

1. Not a part of existing permit limitations.

Reclaimed water data was obtained from the County along with data from Manatee County, City of Sarasota, and City of Bradenton. While analyzing and comparing reclaimed water information, it is important to note that both the City of Sarasota and the City of Bradenton have permitted surface water discharges for treated effluent. As per regulatory requirements, surface water discharges are limited to TSS levels of 5 mg/L; total Nitrogen levels of 3 mg/L, and total Phosphorus levels of 1 mg/L. In order to meet these surface water discharge limitations, advanced treatment of wastewater is required. **Table 7-3** provides a summary comparison of key reclaimed water quality parameters "annual averages" for the County and other local municipalities. The County's reclaimed water is permitted for land application and for temporary storage in stormwater ponds and it is not intended to be directly discharged to surface waters such as drainage canals or streams.

Table 7-3: Reclaimed Water Comparison with Local Municipalities

Municipality	$CBOD_5$ (mg/L)	TSS (mg/L)	Total Nitrogen (as N) mg/L	Total Kjeldahl Nitrogen (TKN) mg/L	Total Phosphorus (as P) mg/L
City of Sarasota[1]	1.2	0.7	2.2	-------	0.2
Manatee County NWRF[2]	2.0	1.1	-------	4.8	4.0
Manatee County SEWRF[2]	2.0	1.4	-------	3.9	2.6
Manatee County SWWRF[2]	1.2	1.7	-------	1.3	2.3
Sarasota County Central County WRF[3]	2.0	0.8	9	2.6	1.9
Sarasota County Bee Ridge WRF[4]	2.0	0.7	14	1.3	1.4
Sarasota County Atlantic Deep Injection Well[1]	-------	-------	13.6	1.3	-------
City of Bradenton[2]	2.0	0.8	2.0	-------	0.5

1. 2011 data.
2. 2010 data.
3. 2011 Central County data (values for total nitrogen are estimated).
4. 2012 data up to April 20 (values for total nitrogen are estimated).

As indicated in **Table 7-3**, the County's effluent nitrogen and phosphorus levels are higher than the effluent from the City of Bradenton and City of Sarasota WRFs, which both utilize AWT for nitrogen and phosphorus reduction. This difference is expected due to the additional level of treatment provided by the respective treatment facilities.

Reclaimed water cost information was obtained from the County and a comparison of costs with other local municipalities was prepared. Each municipality has significant differences in how reclaimed water fees are applied to the users. In some cases, a monthly user fee is applied and the customer is billed for this fee no matter how much reclaimed water is used per month. In other cases, there are significant unit cost differences associated with the amount of reclaimed water use per month. Generally, the more water is used per month, the lower the unit cost ($/1,000 gal.) of the reclaimed water. In order to simplify the comparisons, costs are compared for typical single family residential users, along with large users (golf courses). **Table 7-4** presents a summary comparison of calculated monthly reclaimed water system costs for local municipalities.

Table 7-4: Reclaimed Water Cost Comparison with Local Municipalities

Municipality	AWT (Y/N)	Average Monthly Single Family Reclaimed Water Cost[1]	Average Monthly Bulk User Reclaimed Water Cost[2]
City of Sarasota	Y	$27.37[3]	$4,127
Manatee County	N	$9.60	$1,955
Sarasota County	N	$5.63	$2,715
City of Bradenton[4]	Y	$15.30	$3,734

1. Reclaimed water usage of 12,800 gal/month (0.5 in./acre/week * 0.25 acre per residence).
2. Based on 200 acre golf course with 0.5 in. /acre /week application rate.
3. Includes $14.31 monthly service charge; and $1.02 per,1,000 gallon rate.
4. Includes a monthly customer charge based on meter size, $5.00 residential and $150.00 bulk user.

As shown in **Table 7-4**, the County's monthly reclaimed water fees generally fall between the lower cost of Manatee County and the City of Bradenton, and are significantly lower than monthly fees calculated for the City of Sarasota.

7.6 Cost Impact of Advanced Wastewater Treatment

Although not currently required for the County's reclaimed water system, should the County elect to modify its WRFs to advanced wastewater treatment standards, additional treatment processes and operational modifications would be required, primarily for the reduction of nitrogen and phosphorus.

The operating and capital cost to modify the Bee Ridge WRF to produce 1.5 mgd of AWT effluent was included in the *Bee Ridge WRF Advanced Wastewater Treatment Facility Feasibility Study dated March 2011 by Stantec.* The report included the evaluation of two (2) treatment process options to reduce treated effluent nitrogen and phosphorus levels to AWT standards. The recommended alternative would accomplish phosphorus removal and denitrification in a 1.5 mgd side stream. Secondary clarifier effluent would be pumped to an Actiflo™ ballasted clarifier phosphate removal system where ferric chloride and polymer are added. Once through the sedimentation system, the clarified wastewater would then be treated with a denitrification filter, followed by disinfection. **Table 7-5** provides a planning level summary of the capital costs associated with this modification (with and without additional storage) to provide 1.5 mgd AWT at the Bee Ridge WRF.

Table 7-5[1]: Bee Ridge AWT Capital Costs

Item	Without Storage	With Storage
On-Site Improvements	$11,026,500	$15,336,500
Off-Site Improvements	$2,662,632	$2,662,632
Total	**$13,689,132**	**$17,999,132**

1. Per Table 6-1 of the Bee Ridge WRF Advanced Wastewater Treatment Facility Feasibility Study dated March 2011 by Stantec.

Annual operations and maintenance costs for the AWT facility are provided **Table 7-6** below.

Table 7-6: AWT Annual Operational and Maintenance Costs

Description	With Storage
Chemicals	$123,120
Sludge Treatment and Disposal	$112,230
Labor	$148,000
Power	$50,000
Maintenance Equipment	$24,408
Other Miscellaneous Costs	$41,861
Total Annual O&M	**$499,619**
Cost Per 1,000 gallons (including amortized capital cost)[2]	$3.55

1. Information from Table 5-11 of the Bee Ridge WRF Advanced Wastewater Treatment Facility Feasibility Study; dated March 2011 by Stantec.
2. Calculation uses 5% rate for 20-Year Period

7.7 Reclaimed Water Quality and Watershed Summary

In order for the County to utilize reclaimed water to the fullest extent possible, while also considering regulations, reclaimed water quality, and costs; the following items are noted with respect to this Section and the County's plan to expand the reclaimed water system in the future:

- Reclaimed water produced by the County meets all applicable regulatory standards.
- The County should continue with its monitoring of groundwater quality in the vicinity of significant watersheds where reclaimed water is applied.
- The County should continue with its general public education regarding the safety and use of its reclaimed water.
- The County should continue to monitor regulatory requirements for application of reclaimed water.
- The County's reclaimed water rate structure appears to be in general alignment with other local municipalities.

8.0 RECLAIMED WATER STORAGE AND DISPOSAL

The County's reclaimed water system utilizes ground storage tanks and ponds for seasonal storage and the Atlantic deep injection well for wet weather disposal. Analyses were conducted to evaluate the existing and future wet weather storage and disposal requirements for the County's reclaimed water system. This section summarizes the regulatory requirements for system storage, establishes the values used as part of the analyses and discusses the County reclaimed water systems' storage and disposal capacity requirements.

8.1 Storage Requirements

Chapter 62-610 of the F.A.C. specifies the storage requirements associated with slow-rate land application systems. The County's reclaimed water system is a public access reclaimed water system and is specifically regulated under the requirements of section 62-610.464. These requirements are summarized as follows:

- System storage is not required where another permitted reuse or effluent disposal system is available. If storage is not required, flow equalization or reclaimed storage needed to match diurnal demand patterns must be evaluated.
- Unless exempt, storage ponds shall have sufficient capacity to assure retention of reclaimed water under adverse weather conditions, maintenance of equipment, or other conditions that would preclude land application.
- System storage shall be established by determining the volume of storage required for a ten-year recurrence interval using representative area weather data.
- Minimum storage capacity shall be three times the permitted annual average daily flow of the reclaimed system for which no alternative disposal system is permitted.

- Analytical means (water balance calculations such as the FDEP LandAp2010 program) shall be used to determine system storage needs.
- A minimum of 20 years of climatic data shall be used in storage volume determinations.
- Reclaimed water storage ponds do not have to be lined.

8.2 Hydraulic Site Capacity

The Hydraulic Site Capacity is defined as the rate that the soils and receiving aquifer can safely remove water from a site without ponding or runoff of reclaimed water. The 17th Street Park, located in the northwest area of the County's reclaimed water system, was selected and utilized as a representative site where reclaimed water is applied in the County's reclaimed water system. The hydraulic site capacity was calculated from groundwater elevation data obtained from groundwater monitoring wells near the 17th Street Park, which resulted in a calculated hydraulic site capacity value of 0.7 inches/week. It is important to note that the value of 0.7 inches/week used for this analysis appears to be conservative when compared to adjacent municipalities (City of Venice and Manatee County) who have used values of approximately 1.4 inches/week. The use of a conservative value for the hydraulic site capacity results in predicting that more wet weather storage would be needed as compared to using a more aggressive hydraulic site capacity value.

8.3 Reclaimed Water System Storage Capacity Evaluation

An evaluation was performed to estimate wet weather storage and disposal requirements for the County's reclaimed water system. The evaluation included the use of LandAp2010, which is a water balance computer application developed by the University of Florida that estimates storage requirements and wet-weather discharges for slow rate land application systems. LandAp2010 uses rainfall, reclaimed water

inflow, evapotranspiration and ground water outflow data to calculate the amount of storage needed during wet weather periods when reclaimed water is not applied. The storage requirements calculated are based on a 10-year recurrence interval based on 20 years of weather data as required per Chapter 62-610.414 F.A.C. The results for the LandAp2010 analysis are provided in **Appendix G.**

The County's existing reclaimed water storage capacity is 290.6 MG per the County's reclaimed water system permit. The County's Wastewater Management Plan identifies an additional 29 MG of available reclaimed water storage within the golf course storage ponds. During the preparation of this master plan, the total storage at the Parcel X ponds was adjusted from the current permitted capacity of 104 MG to 104.4 MG, based on the County's pond volume spreadsheet that was used for this report. Based on this information, the value of 320 MG was used to represent the system's existing total available storage to evaluate reclaimed water storage requirements.

Wet weather storage requirements were calculated for both existing conditions and for future planning period conditions. The wet weather storage calculations were performed in LandAp2010 and included the following input:

- Hydraulic Site Capacity – set to 0.7 inches/week
- Irrigable acreage
- Hydraulic Loading Rate

The future irrigable acreages were calculated by adding the irrigable acreage of the potential reclaimed water user parcels per planning year to the existing irrigable acreage. The irrigable acreages are shown in **Table 8-1**.

Table 8-1: Irrigable Acreage

Year	Irrigable Acreage
2011	5,250
2015	5,502
2020	6,084
2025	7,047
2030	8,242
2032	9,510
Build-Out	13,386

The hydraulic loading rate is the rate that reclaimed water is applied to the irrigable acreage. By setting the rate to match the existing and projected reclaimed water demands, and using the aforementioned inputs, the LandAp2010 program calculates the required wet weather storage for each planning year. **Table 8-2** summarizes the calculated wet weather storage requirements.

Table 8-2: Wet Weather Storage Requirements

Year	Required Storage (MG)	Existing Storage (MG)	Storage Balance (MG)[1]	AADF Reclaimed Water Demand (mgd)
2011	229.6	320.0	-90.4	6.7
2015	262.9	320.0	-57.1	7.7
2020	286.8	320.0	-33.2	8.4
2025	300.5	320.0	-19.5	8.8
2030	317.6	320.0	-2.4	9.3
2032	321.0	320.0	1.0	9.4

1. Negative value = Excess Storage Available; Positive Value = Additional Storage required.

The calculated results from this methodology, which include the irrigable acreage and projected demands of the potential reclaimed water users, indicate the County has sufficient wet weather storage to meet the 10-year recurrence interval for the current annual average daily flow (AADF) reclaimed water demand of 6.72 mgd. The results

also indicate that the current wet weather reclaimed water storage capacity is adequate through 2030.

8.4 Deep Injection Well Capacity Evaluation

Similar to the approach used to calculate reclaimed water storage, the LandAp2010 application was utilized to calculate wet weather discharges. Wet weather discharges occur when the volume of reclaimed water exceeds the system storage volume. Since the County is currently not permitted for surface discharge, the total discharge volume and maximum disposal flow rate are applicable for deep injection well disposal.

Wet weather storage disposal requirements were calculated for both existing conditions and for future planning period. The wet weather disposal calculations were performed in LandAp2010 and used the following input data:

- Hydraulic Site Capacity – set to 0.7 inches/week
- Irrigable acreage
- Hydraulic Loading Rate

The future irrigable acreages were the same as those used in the wet weather storage calculation and are summarized in **Table 8-1**.

8.4.1 Existing Conditions Capacity Evaluation

For the wet weather disposal calculation in LandAp2010, the hydraulic loading rate was set to calculate the volume of reclaimed water that needs to be disposed of during the 10-year wet weather recurrence interval once the 320 MG of available reclaimed water storage is exceeded. **Table 8-3** summarizes the calculated wet weather disposal requirements.

Table 8-3: Wet Weather Disposal Calculation Summary

Year	Projected Discharge (MG)	Discharge Days	Calculated Deep Injection Well Capacity Needed (mgd)
2011	679	77	8.8
2015	1,584	138	11.5
2020	1,777	141	12.6
2025	1,945	142	13.7
2030	2,101	141	14.9
2032	2,122	138	15.4

The calculated results show the 2011 discharge volume of 679 MG was relatively close to the actual 2011 recorded deep injection well discharge volume of 764 MG. The discharge flow was calculated by dividing the discharge volume by the number of discharge days. It is noted that this analysis shows the discharge flows are approximately equal to the annual average reclaimed water supply. Based on this information, the amount of deep injection well disposal capacity needed for each planning year appears to be approximately equal to the annual average day reclaimed water supply. Further, the analysis suggests that the deep injection well capacity needed by 2032 is approximately 15.4 mgd.

Since the current capacity of the Atlantic deep injection well is 4.87 mgd, the analysis performed in the section indicates that the County's reclaimed water system currently does not have enough deep injection well capacity. The future addition of the Central County deep injection well is anticipated to add 18.6 mgd of deep injection well capacity for a total disposal capacity of 23.47 mgd. Based on this information, total deep injection well disposal capacity of 23.47 mgd should exceed the projected annual average reclaimed water supply of 15.4 mgd.

Subsequent to the deep injection well analysis summarized above, the County indicated that the water quality requirements for disposal at the Central County deep injection well will include limits on suspended solids and a requirement for

chlorine residual. Due to these requirements, the County would likely be limited to only sending reclaimed water into the Central County deep injection well that is produced at the Central County WRF. This limitation is due in part to current operational limitations and existing facilities at the Bee Ridge WRF. Should the County need to transfer reclaimed water from the Bee Ridge WRF to the Central County deep injection well at some point in the future, additional storage and pumping would be required so that the reclaimed water would not be sent to a storage pond prior to being transferred to the Central County deep injection well. The following sections provide an alternative analysis that was conducted to consider these limitations and to determine additional storage requirements for the County's reclaimed water system.

8.4.2 Alternative Conditions Capacity Evaluation

Similar to the previous evaluation, this evaluation assumed that all of the reclaimed water produced during a given period will need to be stored or disposed of during wet weather conditions. Further, this scenario assumes a worst case wet weather situation during which all of the reclaimed water produced by the County's WRFs will need to be disposed of via deep injection wells. As noted in **Section 8.4.1**, the County is anticipated to be able to dispose of reclaimed water using the projected 18.6 mgd Central County deep injection well, along with the existing 4.87 mgd Atlantic deep injection well.

For this evaluation, all of the reclaimed water produced at the Central County WRF is assumed to flow directly into the Central County deep injection well. Also, 4.87 mgd of the reclaimed water produced at the Bee Ridge WRF is assumed to flow into the Atlantic deep injection well. Therefore, the remaining reclaimed water produced at the Bee Ridge WRF will need to be stored on site and then transferred to the Central County deep injection well.

To estimate the amount of additional storage required at the Bee Ridge WRF, a maximum day flow was calculated utilizing a 2.0 peaking factor for the County's WRFs. This peaking factor is conservative and is used for planning purposes to estimate the maximum amount of reclaimed water storage and deep well capacity that may occur during the planning period. The storage required at the Bee Ridge WRF was then estimated by adding the calculated maximum daily flows from the Bee Ridge and Central County WRFs and then deducting the flows to the Atlantic and Central County deep injection wells (4.87 mgd, and maximum daily flow produced by the Central County WRF, respectively). The resultant flow is assumed to occur over a 24-hour period and is estimated as the volume (one day of storage) of additional reclaimed water storage needed at the Bee Ridge WRF.

Based on the summary in **Table 8-4**, which provides a summary of this wet weather storage evaluation, it is projected that the County will need a total of approximately 13.85 MG of reclaimed water storage at the Bee Ridge WRF in the planning period. Approximately 11.85 MG of additional storage is indicated by this analysis since 2 MG of the necessary 13.85 MG currently exists.

The capacity of the Central County deep injection well was calculated to estimate additional deep injection well capacity requirements and when the County would need to plan for this additional deep injection well capacity. Per **Table 8-4**, it is projected that the County will need to add approximately 7.18 MG of additional deep injection well capacity during the planning period. After 2016, there will need to be another method of disposal. By 2032, it is determined that there will be a deficit of disposal capacity of 7.18 mgd.

Table 8-4: Wet Weather Storage Evaluation Summary

Year	Bee Ridge Flow (mgd)	Central County Flow (mgd)	Bee Ridge Storage Required (mgd)[1]	Remaining Capacity in DIW (mgd)	DIW Capacity[2] (mgd)
2012	10.34	8.37	5.47	10.23	4.76
2016	14.25	9.08	9.38	9.52	0.14
2032	18.72	11.93	13.85	6.67	-7.18

1. Includes 2 MG of existing reclaimed water storage capacity.
2. Positive = Excess Capacity, Negative = Deficient Capacity

8.5 Reclaimed Water Storage and Disposal Summary

Based on the information in this section, it is recommended the County add new reclaimed water storage tanks and a new deep injection well into the CIP program. Approximately 12 MG of additional reclaimed water storage (ground storage tanks) is recommended for installation at the Bee Ridge WRF, while approximately 8 mgd of additional deep injection well capacity is recommended. The new deep injection well should be located as close as possible to the vicinity of the Bee Ridge WRF, since this location would allow some of the reclaimed water being sent to the Atlantic deep injection well to be sent to this new deep injection well, and may move the need for a booster pump station in this area further into the future. An evaluation to determine a suitable location for a deep injection well in the Bee Ridge WRF area and to determine the capacity of the well is also recommended.

9.0 RECLAIMED WATER MODEL DEVELOPMENT

Development of the County's reclaimed water system hydraulic model utilized the best available information to simulate the County's reclaimed water system. This section summarizes the methodology used to develop the model, the data used to populate the model elements, the quality control procedures used to verify the data entered into the hydraulic model, the model assumptions, and the hydraulic model standards that were incorporated into the final model.

9.1 Model Development

The current version of the County's reclaimed water hydraulic model was provided by the County. The model was overlaid with reclaimed water data in the GIS to compare the two sets of data. Using a combination of record drawings, input from County staff, and GIS layer attributes, model elements were modified, inactivated, deleted or added to create the representative base hydraulic model. LIDAR data provided by the County was used to establish elevations of model elements. Pump curves were obtained from the County and the associated pump data was entered for the effluent pumps at the Bee Ridge WRF and Central County WRF. The base hydraulic model elements are provided in **Appendix H**. The model was set up to be analyzed under steady-state conditions, which is an instantaneous "snapshot" of the system.

9.2 Model Data

Data from numerous sources were utilized to develop the base hydraulic model. The following provides a summary of the data used to develop the base hydraulic model:

GIS - The County's GIS data was obtained and used to confirm and update the pipe layout and diameters in the model. The GIS data was also used to verify public vs. private infrastructure for modeling purposes. Meter locations in the County's GIS data were used as base points for demand allocation. In cases where meter information was

unavailable or incomplete, GIS nodes were added, removed, and relocated as necessary based on discussions with the County, aerial photo reviews, and detailed review of the County's service agreements for each user. The user agreements generally contained an exhibit detailing the point of connection which was used in the model as the meter location.

LIDAR - The County provided a raster data set in GIS representing elevation data for the County. The LIDAR data was used to assign node and pond elevations in the model. Model elements were exported in GIS shapefile format and then spatial analyst tools were used in ArcMap to interpolate the elevations from the raster data. Elevations were then imported back into the hydraulic model.

Record Drawings - The County provided record drawings for the Bee Ridge WRF, Central County WRF, and Parcel X ponds. Data such as plant flow schematics, pump curves, pump station configuration, and pipe diameters were obtained from this information and incorporated into the hydraulic model.

Pump Curves - Manufacturer's pump curves were provided for the pumps at the Central County WRF effluent pump station and for the Bee Ridge WRF pumps at Effluent Pump Station #1 and #2. The pump curves entered into the model are provided in **Appendix I**.

SCADA - The County provided available SCADA data for the Bee Ridge and Central County WRFs. The data included discharge pressures and flows, taken every ten minutes between February 2011 and July 2012 for the effluent pump stations at the Bee Ridge and Central County WRFs. This data was used to help verify the model demands and pressures at the WRFs.

Pressure Loggers – A pressure logger is an external device that records system pressures at regular intervals. Pressure loggers were installed by the County at three (3) points located within the system as shown on **Figure 9-1**. Large diameter transmission lines

Pressure Logger # 1
Meadowood WRF

Bee Ridge
WRF

Pressure Logger # 2
Serenoa Golf Course

Central County
WRF

Pressure Logger # 3
McIntosh Road

17TH ST
N LOCKWOOD RIDGE RD
N BENEVA RD
S BENEVA RD
HONORE AVE
I75
I75 RAMP
FRUITVILLE RD
PALMER BLVD
BAHIA VISTA ST
WEBBER ST
CATTLEMEN RD
BEE RIDGE RD
BEE RIDGE ROAD EXT
PROCTOR RD
MCINTOSH RD
CLARK RD
STATE ROAD 72
S LOCKWOOD RIDGE RD
BENEVA RD
S TAMIAMI TRL
N TAMIAMI TRL

Legend

Sarasota County Existing Reclaimed Pipe

Water Reclamation Facility

4 inch
6 inch
8 inch
10 inch
12 inch
14 inch
16 inch
18 inch
20 inch
24 inch

N
W
E
S

McKIM&CREED

Sarasota County

Figure 9-1
Pressure Logger Locations

S:\1038\00047\91-GIS\Figures\Pressure Logger Locations.mxd 11/26/2012 10:14:28 AM

were selected for pressure logger installation to provide the best information available for model calibration. Pressure readings were automatically taken every 2 minutes from July 2, 2012 to July 10, 2012 by the pressure logger. The pressure readings within the system were used to validate calculated pressures in the hydraulic model as discussed in **Section 10**.

9.3 Connectivity

A comparison of GIS and model element data led to several areas within the model requiring clarification regarding system connectivity. Some of the connectivity issues identified and requiring verification were pipes shown within the model and not in GIS, ponds receiving reclaimed water, pipes from decommissioned WRFs, private pipelines, and resolving gaps between existing pipes. Pipes were added to the model as required by digitizing the County's GIS reclaimed water piping. The remaining connectivity issues were resolved by coordinating with the County and obtaining input and clarifications.

9.4 Model Quality Control

Model elements within the existing model were reviewed to provide reasonable assurance to their accuracy and to ensure hydraulic model results provide a reasonable representation of actual conditions in the reclaimed water system. Pipes that included user defined lengths were reviewed and compared to available data for accuracy. Pipe diameters were reviewed to verify that their diameters matched the GIS information. Pipe diameters in conflict with another set of data were typically resolved by coordinating with the County and obtaining input and additional information from the

County. The number of pumps and assigned pump curves were also reviewed and updated as necessary. Since the scenarios included in the original model provided by the County lacked documentation, and as directed by the County, each of the existing

scenarios in the original model were deleted. New scenarios and alternatives were created based on the County's modeling standards so that the model can be provided to the County and updated by the County or others in the future in accordance with County standards.

9.5 Model Assumptions

While preparing a hydraulic model of this type, it is typical that not all data to provide a "perfect" model is available. As such, assumptions need to be developed and documented to assist with hydraulic model development. For example, flows into and out of Parcel X ponds are currently not metered. The ponds are generally filling during two months of the year during the wet season when reclaimed water demand is low. During the dry season the pumps are manually turned on to supplement the reclaimed water supply to meet demand. As such, it was assumed that during the annual average daily flow and maximum month average daily flow demand scenario, flow is neither entering nor leaving the ponds at Parcel X. During the maximum month average daily flow scenario it was assumed that flows from Parcel X would be required to supplement the system.

Pressure sustaining valves were used to simulate the flows into the bulk user ponds. Since specific pressure settings for these valves were unavailable during the preparation of this report, each of the pressure sustaining valves was initially assumed to be set at 50 psi. Total bulk user demands were estimated by comparing SCADA and meter data; SCADA data representing the total system supply rate from both WRFs. By deducting the direct user and deep injection well meter data, the remaining supply corresponds with the estimated bulk user demand. This bulk user demand was assumed to represent the maximum available flow to the bulk users for each scenario. **Table 9-1** summarizes the calculations performed to arrive at the estimated bulk user demands.

Table 9-1: Bulk User Demand Calculations

SCADA AADF (gpm)	Direct User Metered Demand (gpm)[1]	Deep Injection Well Metered Flow (gpm)	Estimated Bulk User Demand (gpm)
AADF Demand Scenario			
4,544	2,179	1,458	907
MMADF Demand Scenario			
11,834	3,552	2,172	6,110

1. Peaking factors applied to the flows per Table 3-6.

In order to simulate the bulk user demands, pressure sustaining valves were utilized in the hydraulic model. The use of pressure sustaining valves provides a more accurate representation of instantaneous flows into the bulk ponds as compared to bulk ponds meter data, which only provides a total monthly flow into each pond. For the maximum month average daily flow demand scenario, all ponds were set to pressure sustaining valve control and the model was used to calculate filling rates. Filling rates were calculated by the model and were significantly impacted by system pressures and WRF pumping parameters. Due to the significantly reduced demand for annual average daily flow periods, ponds were manually set to open or closed to match the flow meter data provided by the County.

9.6 Hydraulic Model Standards

Hydraulic standards were utilized as criteria for evaluating the adequacy of existing and proposed reclaimed water piping and pumping facilities. The hydraulic model standards used are as shown in **Table 9-2** below.

Table 9-2: Hydraulic Model Standards for the Reclaimed Water System

Description	Standard	Comments
Maximum Design Velocity	7 fps	All Pipes
Minimum Pipeline Pressure	40 psi	All Pipes
Hazen Williams Friction Coefficient (C)	130	All Pipes
Max Headloss (psi/1,000 linear feet)	8 psi	All Pipes

Standards regarding the hydraulic model setup and organization were implemented in accordance with **Table 9-2**. The Sarasota County Wastewater Model User Guide dated September 7, 2011 was used as the basis for modeling standards. The existing reclaimed water system hydraulic model was updated in accordance with these standards.

10.0 HYDRAULIC MODEL CALIBRATION

Following the development of the reclaimed water system hydraulic model, the model was calibrated to adjust the modeling parameters to produce results that are in general accordance with measured parameters in the existing reclaimed water system. Once the hydraulic model is calibrated, it is then used as a tool to predict the needs of the future reclaimed water system. This section summarizes the data used to calibrate the model, the calibration methodology used, and the calibration results.

10.1 Water Reclamation Facility Model Elements

The major hydraulic model components represented at each WRF within the North Master Reuse System include the effluent pumps and their associated controls. Pump curves for each pump station in the model were verified with the manufacturer's curve data. The pumps at both WRFs are operated by variable frequency drives; the controls for the variable frequency drives were built into the hydraulic model. Each variable frequency drive was set to maintain a specific pressure at the plant effluent, which was determined from SCADA data provided by the County. The average pressure recorded at the Bee Ridge WRF was 62 psi and the average pressure at the Central County WRF was 82.5 psi. **Figures 10-1** and **10-2** respectively illustrate the recorded discharge pressure at the Bee Ridge and Central County WRFs from December 2011 to July 2012.

Figure 10-1
Bee Ridge WRF
SCADA - Discharge Pressure

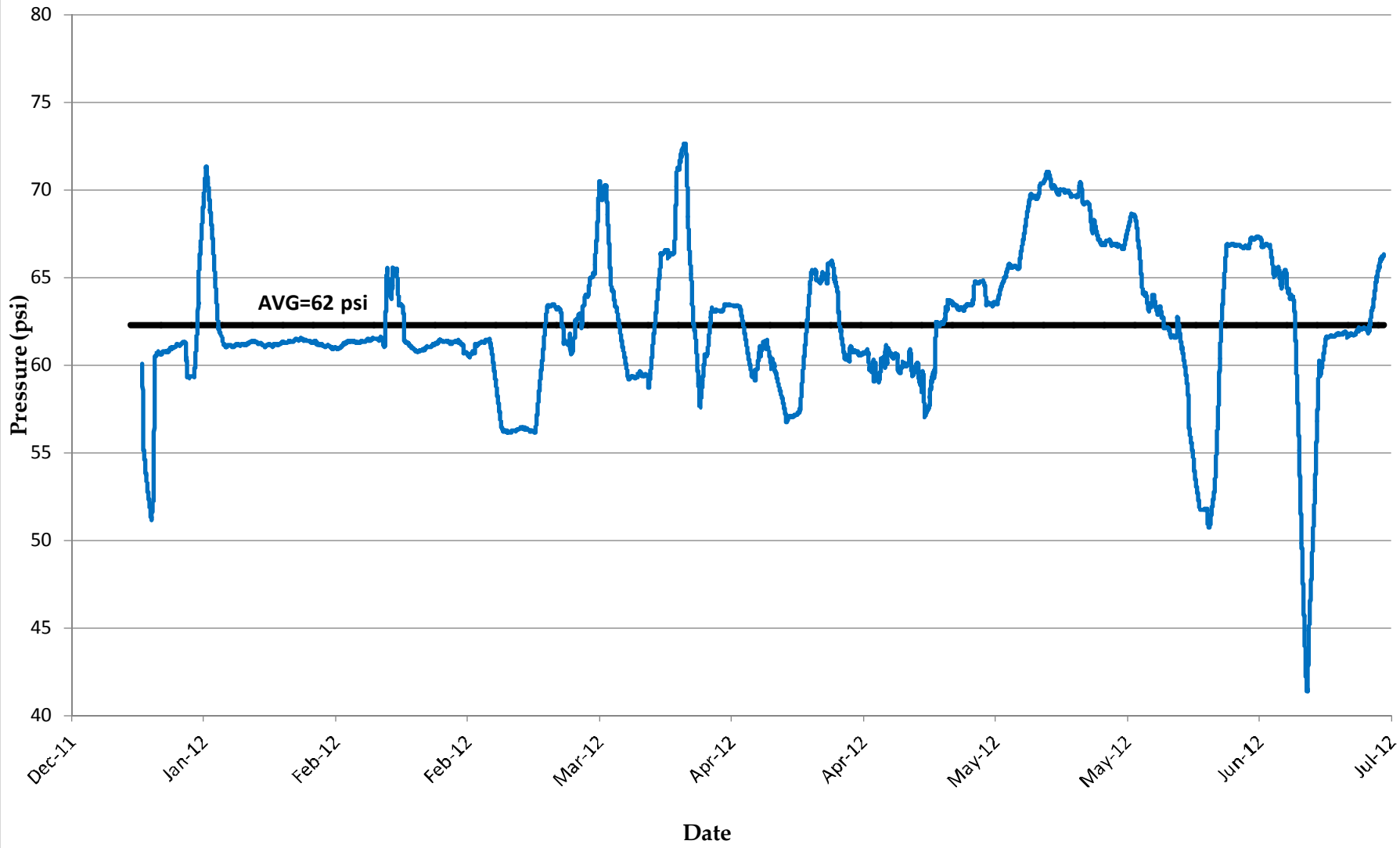
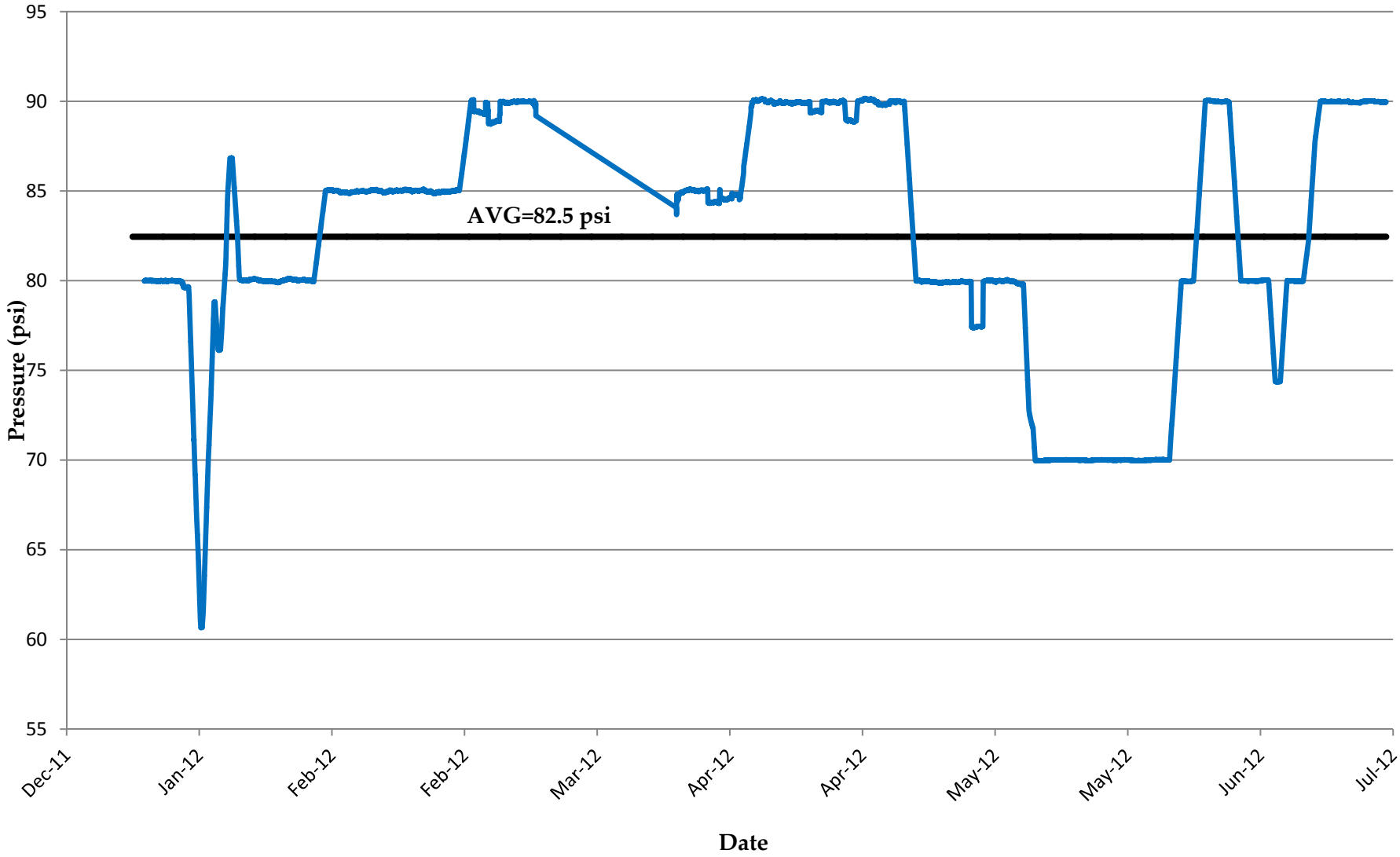


Figure 10-2
Central County WRF
SCADA - Discharge Pressure



10.2 Model Demands

Demands used for model calibration consisted of direct and bulk user demands as well as flow into the Atlantic deep injection well. The direct reclaimed water users were allocated in the model based on the metered demands and locations. Meter locations were represented in the hydraulic model by assigning meters to the closest node location. The demands were assigned by linking the nodes to a spreadsheet containing the meter demands. This methodology allows the direct user demands to be updated by the spreadsheet. The demands in the spreadsheet were then synchronized into the hydraulic model. For the annual average daily flow scenario, a peaking factor of 2.0 was applied to the direct users to simulate the instantaneous flow rates associated with an assumed 12 hour/day watering schedule. For the maximum month average daily flow scenario, the direct user peaking factor of 1.63 (previously provided in **Table 3-6**), was applied in addition to the 2.0 delivery peaking factor for a combined peaking factor of 3.3. The 1.63 peaking factor correlates to a 163% increase in direct user irrigation demands during the maximum month.

The bulk reclaimed water users were allocated in the model by assigning bulk user ponds to the closest node location. The calculated maximum filling rate was used as a benchmark to determine an approximate pressure sustaining valve (PSV) setting for each pressure sustaining valve in the hydraulic model. The PSV setting at each pond was adjusted during calibration model runs to limit the pond fill rate to the maximum calculated value. Estimated maximum fill rates were obtained from monthly meter data for each pond as summarized in **Table 10-1**.

Table 10-1: Metered Bulk Pond Maximum Fill Rates

Bulk User	Model ID	2011 Avg Monthly Demand (gal/month)	2011Average Daily Demand (gpd)[1]	2011 Maximum Pond Fill Rate (gpm)[2]
Isles of Sarasota	ISPSV-1	7,754,667	254,948	708.19
Village Walk	VWPSV-1	4,651,875	152,938	424.83
Preserve at Heron Lake	HLPSV-1	2,760,300	90,750	252.08
Foxfire Golf Club	RHPSV-1	3,283,333	107,945	299.85
Publix	PUBPSV-1	373,833	12,290	34.14
Serenoa	SPSV-1	1,253,250	41,203	114.45
Oaks Golf Course	OPSV-1	8,774,000	288,460	801.28
Founder's Golf Club	FCPSV-1	7,113,875	233,881	649.67
Founder's Club Development	FCPSV-2	9,044,917	297,367	826.02
Heritage Oaks	HOPSV-1	16,962,500	557,671	1,549.09
Gator Creek Golf Course	GCPSV-1	5,118,667	168,285	467.46
Misty Creek	MCPSV-1	5,386,909	177,104	491.96
Sarasota Golf Course	SGCPSV-1	4,472,333	147,036	408.43
Bent Tree Golf Course	BTPSV-2	770,083	25,318	70.33
Prestancia	PPSV-1	10,502,750	345,296	959.16
Village Walk	VWPSV-2	6,241,182	205,190	569.97
Longmeadow	GPSV-1	8,048,075	264,594	734.98
Laurel Oaks GC	LOPSV-1	10,089,000	331,693	921.37
Stoneybrook GC	SBPSV-1	9,992,833	328,531	912.59

1. Average month demand divided by 30.42 (average days per month).
2. Maximum pond fill rates calculated based on an assumed 6 hr/day filling cycle.

A fixed demand was placed on a node representing the Atlantic deep injection well based on the 2011 deep injection well meter flows. For the annual average daily flow scenario, the demand was set to 2.1 mgd. A peaking factor for flows into the deep injection well was not applied to the annual average daily flow scenario since flows are typically injected 24 hours a day. For the maximum month average daily flow scenario, the demand was set to 3.13 mgd to reflect the maximum month average daily flow in 2011, corresponding to a maximum month average daily flow peaking factor of 1.49. **Table 10-2** summarizes the peak factors used to calibrate the hydraulic model. These

peaking factors were also used to evaluate the existing and future scenarios discussed further in **Section 10.6**.

Table 10-2: Model Calibration Peak Factors

Peak Factors	ADF	MMADF	Comment
Direct Users	2.0	3.3[1]	Assumes 12 hr/day delivery
Atlantic Deep Injection Well	1.0	1.49	Assumes 24 hr/day delivery

1. MMADF calculated using a peak factor of 1.63 from **Table 3-6.**
2. MMADF for 2011.

10.3 WRF Reclaimed Water Supply

The annual average day and maximum month reclaimed water supplies were estimated for both WRFs based on analysis of 12 months of SCADA data. SCADA data provided for Bee Ridge WRF and Central County WRF included the effluent flow rates from each of the effluent pump stations. The two pump station flows at Bee Ridge were combined to calculate the total effluent flow from the Bee Ridge WRF. A summary of the effluent flow rates is provided in **Table 10-3**.

Table 10-3: SCADA - Effluent Flow Rates

Water Reclamation Facility	AADF (gpm)	MMADF (gpm)
Bee Ridge	2,049	6,457
Central County	2,495	5,377
TOTAL	4,544	11,834

The SCADA WRF effluent flow rates provided a comparison for the modeled effluent flow rates as discussed in **Section 10.6**. In a properly calibrated model, the flows at the WRFs will closely match the SCADA flow rates. The effluent flow from the WRFs will be varied in the hydraulic model by manually starting and stopping pumps.

10.4 Calibration Model Scenarios

Once the model demands and model element parameters were set in the model, an iterative calibration approach was used for each demand scenario. Following each model simulation the WRFs' effluent flows, discharge pressures, and bulk pond fill rates were evaluated. Parameters that did not fall within acceptable target limits were adjusted in the model accordingly and the model was re-run until all goals were met. The model was determined to be calibrated when it met the following three goals:

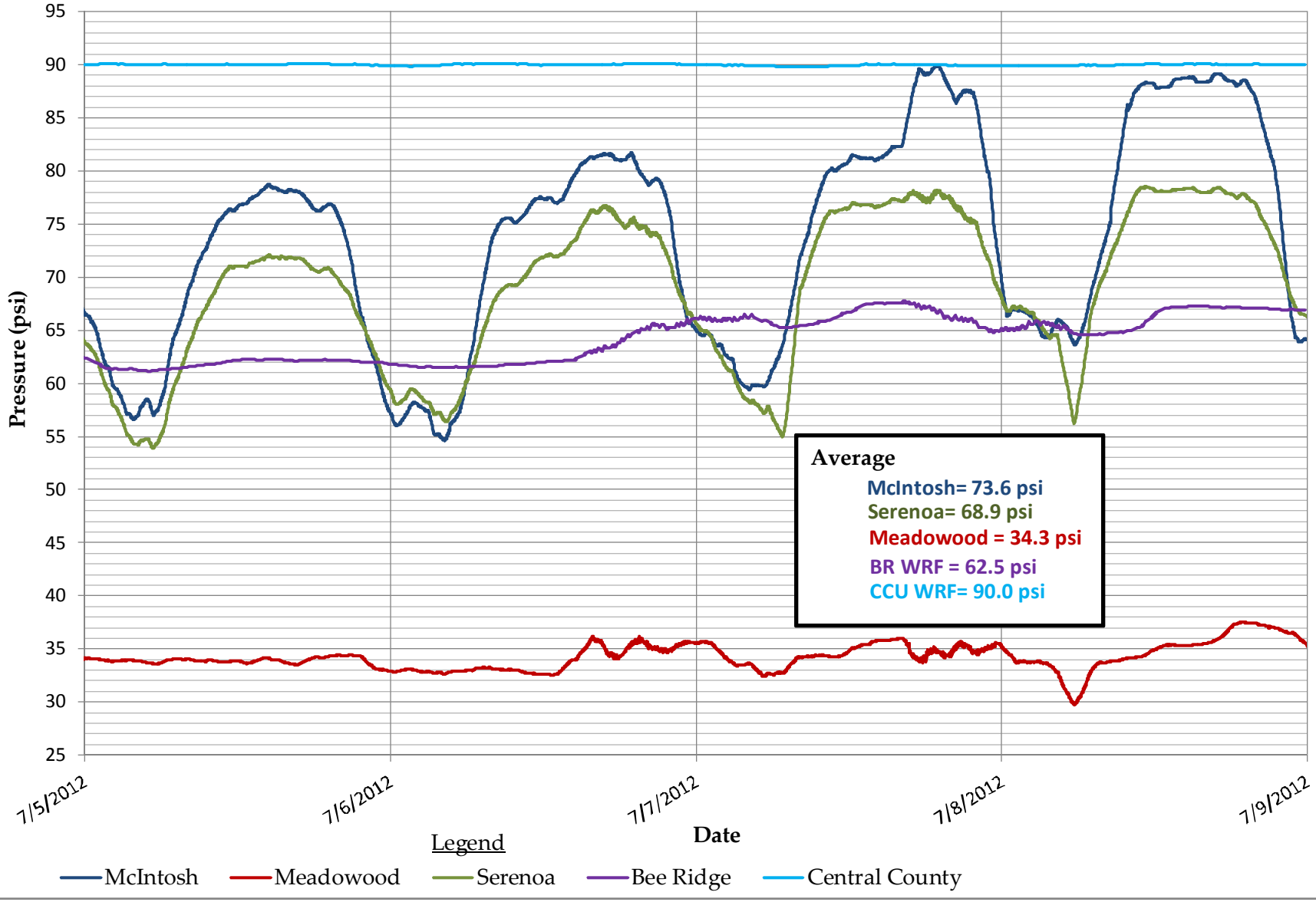
- The effluent flow rate at each WRF is within 10% (+/-) of SCADA effluent flow for maximum month average daily flows summarized in **Section 10.3** above.
- The pressure at each WRF is within 5% (+/-) of the average SCADA pressure as shown in **Figures 10-1** and **10-2**.
- Bulk pond filling rates do not exceed the maximum filling rates estimated from 2011 meter data.

10.5 Model Validation

Model results were further validated using pressure data provided by the County from three pressure loggers as discussed in **Section 9.2**. The data from the pressure loggers was analyzed with SCADA data and compared to hydraulic model results.

Pressure readings were collected by the pressure loggers for nine consecutive days. Review of the data showed that there was a consistent cyclical pattern for pressure readings taken over a four day period from July 5, 2012 through July 8, 2012. The data associated with the days outside of this period deviated from the cyclical pattern and therefore were not used for model validation. **Figure 10-3** shows the pressure logger data over the 4 day period.

Figure 10-3
Pressure Logger Data



The field locations of pressure loggers were then applied to the hydraulic model. The pressure in the hydraulic model at these locations was then compared to the pressure recorded by the pressure loggers. The results of the pressure comparisons confirmed that the model results were comparable to the pressure logger measurements with the exception of the pressure near the decommissioned Meadowood WRF (See **Table 10-4**). The pressure calculated by the reclaimed water hydraulic model is higher than the pressure recorded by the pressure logger. This deviation was likely due to assumptions used in the model for the Atlantic deep injection well demand and the simulated filling rate at the Longmeadow pond, which may not correlate with actual Atlantic deep well injection and/or Longmeadow pond filling rates. Deviations in this area of the reclaimed water system are also compounded since the pressure logger was located at the end of a 16-inch pipeline, which has a relatively high velocity and associated pressure drop. Based on this information, the pressure logger data confirms calculated pressures are in general accordance with measured pressure and helps with model validation.

Table 10-4: Field Data vs. Model Results

Pressure Logger Location[1]	Pressure Logger Avg (psi)	Hydraulic Model AADF (psi)	Hydraulic Model MMADF (psi)
Meadowood	34.3	46.9	36.0
Serenoa	68.9	69.2	65.2
McIntosh	73.6	79.2	71.7

1. Refer to Figure 9-1.

10.6 Model Calibration Results

10.6.1 Annual Average Day Scenario

The annual average daily flow calibration commenced with the PSVs at each bulk pond set to 'closed'. Bulk ponds were then manually called to open and fill until the model demands and WRF flows were relatively close with SCADA data. Since the combination of bulk ponds open at any one time varies, the open

bulk ponds were randomly selected. The results of the comparison are in **Table 10-5**.

Table 10-5: Model Results and SCADA Data Comparison - AADF

Water Reclamation Facility	Model Result Flow and pressure	SCADA Data Flow and Pressure	Flow % Difference	Pressure % Difference
Bee Ridge	2,538 gpm @ 61.9 psi	2,049 gpm @ 62 psi	21.3[1]	0.2
Central County	3,046 gpm @ 78.9 psi	2,495 gpm @ 82.5 psi	19.9	4.5

1. Not considered significant due to the uncertainty of the number of bulk ponds filling at one time. See Table 10-7 for additional information regarding model validation.

Bulk pond filling rates in the calibrated model are provided in **Table 10-6**. Bulk ponds that were assumed closed are shown with zero flow.

Table 10-6: Bulk Pond Filling Rates

ID	Label	Elevation (ft)	Bulk User	Flow (In net gal/min)	Pond Valve Status
1844	ISSP-1	17.61	Isles of Sarasota	0.00	Closed
1860	VWSP-1	21.47	Village Walk	0.00	Closed
1879	HLSP-1	34.87	Preserve at Heron Lake	0.00	Closed
1885	RHSP-1	33.80	Foxfire Golf Club	0.00	Closed
1894	PUBSP-1	27.41	Publix	0.00	Closed
1898	SSP-1	24.60	Serenoa	0.00	Closed
1905	OSP-1	19.33	Oaks Golf Course	0.00	Closed
1913	FCSP-1	36.91	Founder's Golf Club	0.00	Closed
1917	FCSP-2	36.12	Founder's Club Development	0.00	Closed
1921	HOSP-1	36.64	Heritage Oaks	0.00	Closed
1925	GCSP-1	26.14	Gator Creek Golf Course	0.00	Closed
1929	MCSP-1	35.33	Misty Creek	0.00	Closed

Table 10-6: Bulk Pond Filling Rates (Continued)

ID	Label	Elevation (ft)	Bulk User	Flow (In net gal/min)	Pond Valve Status
1933	SGCSP-1	31.97	Sarasota Golf Course	0.00	Closed
1937	BTSP-1	33.01	Bent Tree Golf Course 1	0.00	Closed
1941	BTSP-2	30.91	Bent Tree Golf Course 2	0.00	Closed
1945	PSP-1	22.23	Prestancia (TPC)	412.21	Open
1964	ETSP-1	26.28	Eagle Trace	0.00	Closed
1970	VWSP-2	18.83	Village Walk	0.00	Closed
1980	GSP-1	23.41	Longmeadow (Goves) No.)	396.43	Open
1996	R-29	17.68	Oaks I (not in use)	0.00	Closed
2080	LOSP-1	32.00	Laurel Oaks GC Pond	0.00	Closed
2084	LOSP-2	31.00	Laurel Oaks GC Pond	940.16	Open
2096	SBSP-1	19.57	Stoneybrook GC Pond	0.00	Closed

10.6.2 Maximum Month Scenario

After adjusting the PSV settings to calibrate the Peak Month demand scenario, the resultant flow and pressure at the Bee Ridge and Central County water reclamation facilities compared with SCADA data is summarized in **Table 10-7**.

Table 10-7: Model Results and SCADA Data Comparison - MMADF

Water Reclamation Facility	Model Result Flow and pressure	SCADA Data Flow and Pressure	Flow % Difference	Pressure % Difference
Bee Ridge	6,363 gpm @ 61.9 psi	6,457 gpm @ 62 psi	1.5	0.2
Central County	5,717 gpm @ 83.6 psi	5,377 gpm @ 82.5 psi	6.1	1.3

As shown in **Table 10-7**, the results of the calibrated model are well within the targeted ranges to confirm model calibration and validation.

Bulk pond filling rates in the calibrated model are provided in **Table 10-8**. Bulk ponds that were assumed closed are shown with zero flow.

Table 10-8: Bulk Pond Filling Rates

ID	Label	Elevation (ft)	Bulk User	Flow (gal/min)	Pond Valve Status
1844	ISSP-1	17.61	Isles of Sarasota	501.69	Open
1860	VWSP-1	21.47	Village Walk	410.56	Open
1879	HLSP-1	34.87	Preserve at Heron Lake	97.42	Open
1885	RHSP-1	33.80	Foxfire Golf Club	285.94	Open
1894	PUBSP-1	27.41	Publix	7.52	Open
1898	SSP-1	24.60	Serenoa	0.00	Closed
1905	OSP-1	19.33	Oaks Golf Course	785.26	Open
1913	FCSP-1	36.91	Founder's Golf Club	552.49	Open
1917	FCSP-2	36.12	Founder's Club Development	500.40	Open
1921	HOSP-1	36.64	Heritage Oaks	1,446.67	Open
1925	GCSP-1	26.14	Gator Creek Golf Course	431.23	Open
1929	MCSP-1	35.33	Misty Creek	412.53	Open
1933	SGCSP-1	31.97	Sarasota Golf Course	0.00	Closed
1937	BTSP-1	38.61	Bent Tree Golf Course 1	87.69	Open
1941	BTSP-2	26.71	Bent Tree Golf Course 2	77.35	Open
1945	PSP-1	18.51	Prestancia (TPC)	521.38	Open
1964	ETSP-1	26.28	Eagle Trace	0.00	Closed
1970	VWSP-2	17.72	Village Walk	485.62	Open
1980	GSP-1	23.35	Longmeadow (Groves)	236.80	Open
1996	R-29	17.68	Oaks I (not in use)	0.00	Closed
2080	LOSP-1	32.00	Laurel Oaks GC Pond	0.00	Closed
2084	LOSP-2	31.00	Laurel Oaks GC Pond	743.61	Open
2096	SBSP-1	18.50	Stoneybrook GC Pond	404.18	Open

11.0 EVALUATION OF RECLAIMED WATER SYSTEM

The evaluation of the reclaimed water system includes the data and analysis previously discussed in this master plan. This section summarizes the scenarios developed to evaluate the existing and future reclaimed water system, the hydraulic model results, and the improvement alternatives identified to resolve system deficiencies and expand the reclaimed water system to meet projected future demands. A review of the improvements needed to expand the system backbone piping to serve the future reclaimed water users at build-out as well as alternatives to maximize flow within the proposed north/south interconnect are also presented. The results of the hydraulic model evaluation formed the basis of determining the CIPs discussed in **Section 12**.

11.1 Hydraulic Model Scenario Development

Hydraulic modeling scenarios were developed to evaluate the reclaimed water system's capacity to meet existing and future demands. The scenarios modeled were:

- Existing Conditions, Average Day and Maximum Month Demand
- Year 2032, Maximum Month Demand
- Build-out, Average Day Demand

These scenarios were developed to identify system deficiencies and the improvements required to address them through the 2032 planning period. Each potential reclaimed water user was assumed to have growth in accordance with the discussion in **Section 4.3.2**. This methodology allows 2032 demands to be entered at each parcel and the applicable CIP needed to address system deficiencies to be identified. As the phasing plan for future developments is better identified, the corresponding CIPs can be referenced from this report and updated in the hydraulic model if actual demands differ from those included in this report. The build-out scenario was developed to identify the

improvements needed for the reclaimed water system if all of the potential reclaimed water users identified in this report were built-out and served with reclaimed water.

A second group of scenarios were established to evaluate the potential alignment and capacity of the proposed north/south interconnect that will also connect the County reclaimed water system to the City of Venice. The objective of this analysis was to minimize the length of interconnect piping by maximizing the existing North Master Reuse System infrastructure's capacity to transfer flow. These scenarios consisted of two transmission main looping alternatives along with varying the diameter of the north/south interconnect pipeline.

11.2 Hydraulic Modeling Results

Before alternatives were developed to resolve system deficiencies, the scenarios discussed in **Section 11.1** were simulated in the hydraulic model with the necessary piping to serve new users but without system improvements to address deficiencies. The intent was to identify existing system deficiencies as well as the types of deficiencies the future reclaimed water users may create for the reclaimed water system. This methodology allows for CIPs to not only resolve the deficiency the improvement is targeted for, but also to contribute to the resolution of future system deficiencies. **Sections 11.2.1** through **11.2.3** summarize the hydraulic model results prior to the addition of system improvements that address system deficiencies. **Section 11.3** discussed the alternatives evaluated and selected to resolve the system deficiencies.

11.2.1 Existing Conditions Scenario

A review of the existing conditions maximum month average daily flow hydraulic model scenario indicates that the components of the County's existing reclaimed water system generally meet existing system demands. As shown in **Figure 11-1**, the only area of note was in the northwest portion of the County's

reclaimed water system, where the pressure dropped below 40 psi. The pressure drop appears to be the result of the flow into the Atlantic deep injection well through the existing 16-inch pipe. Since the existing users downstream of the Atlantic deep injection well are served by irrigation systems withdrawing from bulk ponds, and not served directly by pressure in the distribution main, the calculated pressure of 30 psi was deemed adequate to fill these bulk ponds. Flow tests in this area are recommended to verify if these bulk ponds receive adequate flows and if the current pressure sustaining valve settings may need to be adjusted to increase the flow of water into the bulk ponds in this area. **Figure 11-1** shows that the calculated pressures in the remainder of the North Master Reuse System are greater than 40 psi and therefore, do not require pressure related improvements.

11.2.2 2032 System Scenario

The 2032 maximum month scenario added the projected future reclaimed water users to the system. **Figure 11-2** shows the system pressure of the maximum month average daily flow 2032 hydraulic modeling scenario using the existing reclaimed water system components, along with new piping system components needed to expand the system. The low pressure area in the northwest portion of the County's reclaimed water system (identified in the existing conditions scenario) dropped below 20 psi downstream of the Atlantic deep injection well. Low system pressure is anticipated to make it difficult for bulk user storage ponds to receive the quantity of reclaimed water they need to meet demands and for direct users to pressurize their irrigation systems.

11.2.3 Build-out System Scenario

To determine system requirements when the potential reclaimed water users are built-out, an annual average daily flow build-out hydraulic model scenario was

Atlantic Deep Injection Well

Bee Ridge WRF

Parcel X Ponds

Central County WRF

N

W E

S

Pressure

-150 - 0.9	25.1 - 30	60.1 - 70
1 - 12	30.1 - 40	70.1 - 80
12.1 - 19.9	40.1 - 50	80.1 - 100
20 - 25	50.1 - 60	100.1 - 150

Legend

Reclaimed Water Pipes

Reuse Storage Pond

McKIM&CREED

Sarasota County

Figure 11-1
System Pressure
MMADF Existing Conditions

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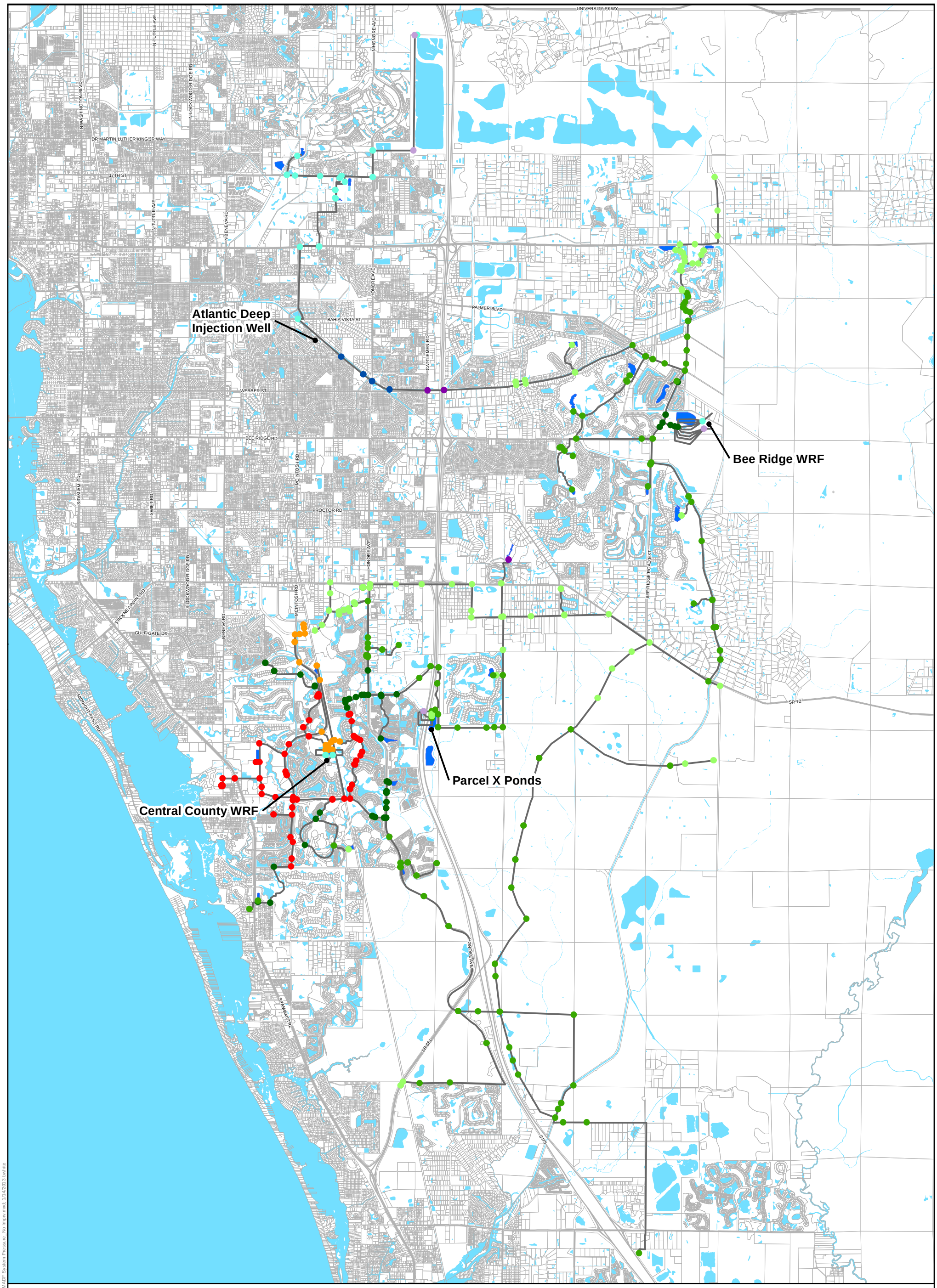

Atlantic Deep Injection Well
Bee Ridge WRF
Parcel X Ponds
Central County WRF
UNIVERSITY PKWY
N TUTTLE AVE
N WASHINGTON BLVD
N LOCKWOOD RIDGE RD
N HONORE AVE
DR MARTIN LUTHER KING JR WAY
17TH ST
N BENEVA RD
HONORE AVE
PALMER BLVD
BAHIA VISTA ST
CATTLEMEN RD
WEBBER ST
BEE RIDGE RD
MCINTOSH RD
PROCTOR RD
S TAMIAMI TRL
SWIFT RD
S LOCKWOOD RIDGE RD
STICKNEY POINT RD
GULF GATE DR
BENEVA RD
MIDNIGHT PASS RD
BEE RIDGE ROAD EXT
SR 72
SR 681
S TRL
N
S
E
W
Pressure
-150 - 0.9
1 - 12
12.1 - 19.9
20 - 25
25.1 - 30
30.1 - 40
40.1 - 50
50.1 - 60
60.1 - 70
70.1 - 80
80.1 - 100
100.1 - 150
Legend
Pipes
Reclaimed Water Storage Ponds
McKIM&CREED
Sarasota County
Figure 11-2
System Pressure
MMADF 2032 Planning Year
without Improvements
S:\1038\00479\1-GIS\91b-Map Doc\Figure 11-2 2032 MMADF System Pressure_No Improv.mxd: 1/14/2013 bwhite

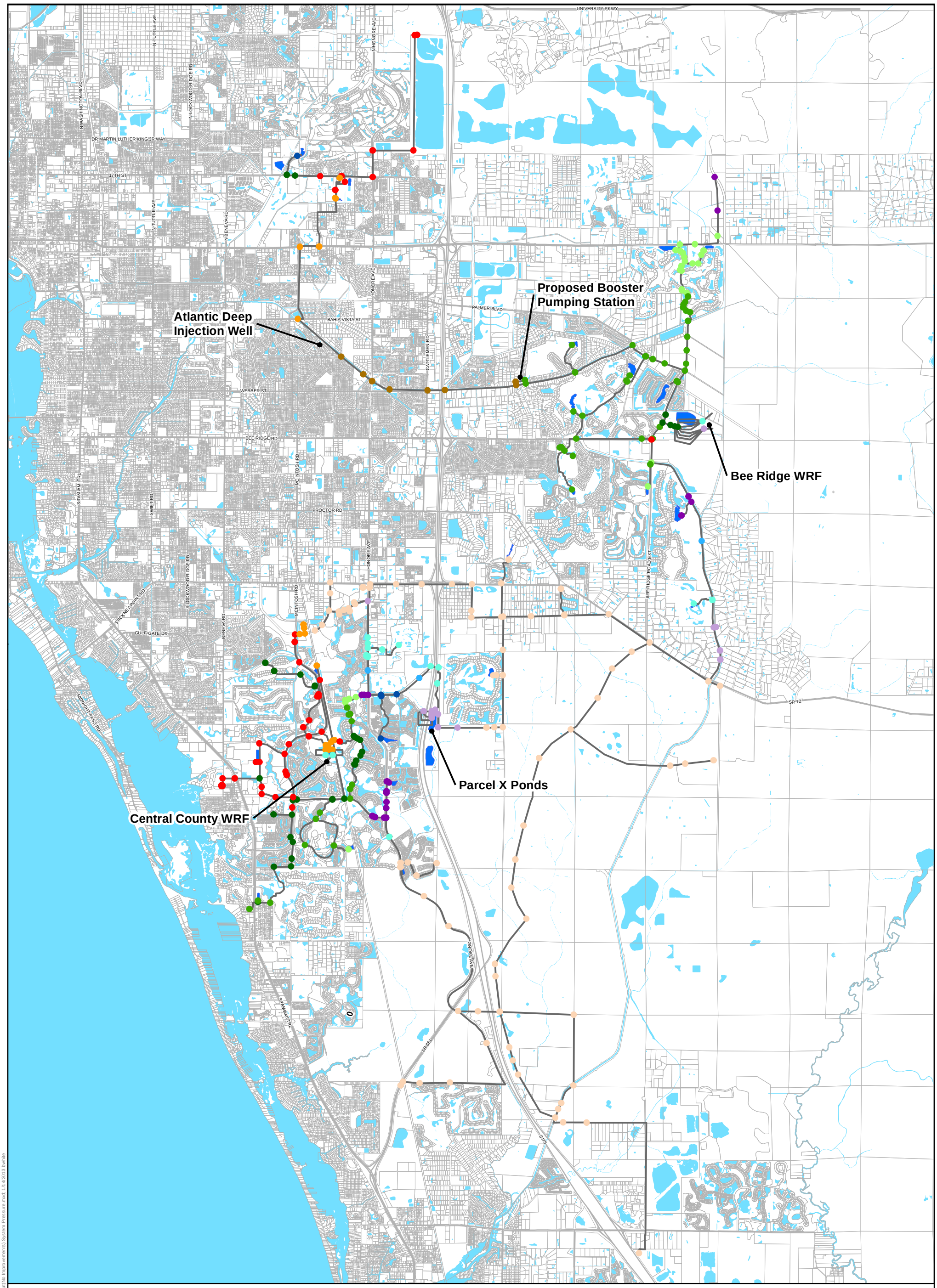
utilized. The intent of this scenario was to identify major improvements needed to the backbone infrastructure of the County's reclaimed water system when the potential reclaimed water users are built-out. **Figure 11-3** shows the system pressure of the build-out scenario without any improvements beyond the 2032 scenario. The pressure drops well below system requirements in several areas, particularly in areas east of I-75.

11.3 Description and Evaluation of Alternatives

Alternatives were developed, simulated in the hydraulic model, and evaluated to resolve the deficiencies previously discussed in **Sections 11.2.2** and **11.2.3**. Alternatives were also developed and simulated to minimize the length of the north/south interconnect piping by maximizing the existing North Master Reuse System infrastructure's capacity to transfer flow. The intent of developing alternatives was to determine the most feasible and cost effective CIPs.

11.3.1 2032 System

The low pressure area in the northwest portion of the County's reclaimed water system (identified in the existing conditions scenario) needs to be addressed to provide reclaimed water service in accordance with County goals for users in this area directly served by the reclaimed water system. To resolve these pressure issues in the northwest portion of the North Master Reuse System, three alternatives were evaluated. The first alternative evaluated was the installation of new higher head pumps at the Bee Ridge WRF. To achieve 40 psi in the northwest portion of the County, the calculated pressure required at the Bee Ridge WRF effluent pumps was over 100 psi, which exceeds typical design standards for WRF effluent pumping systems. As such, the first alternative was removed from further consideration. The second alternative evaluated was the installation of approximately 22,000 linear feet of 16-inch transmission main



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W E

S

McKIM&CREED

Pressure (psi)

-150 - 0.9	25.1 - 30	60.1 - 70
1 - 12	30.1 - 40	70.1 - 80
12.1 - 19.9	40.1 - 50	80.1 - 100
20 - 25	50.1 - 60	100.1 - 150

Legend

Reclaimed Water Pipes

Reuse Storage Pond

Sarasota County

Figure 11-3
System Pressure
AADF Build-Out
without Improvements

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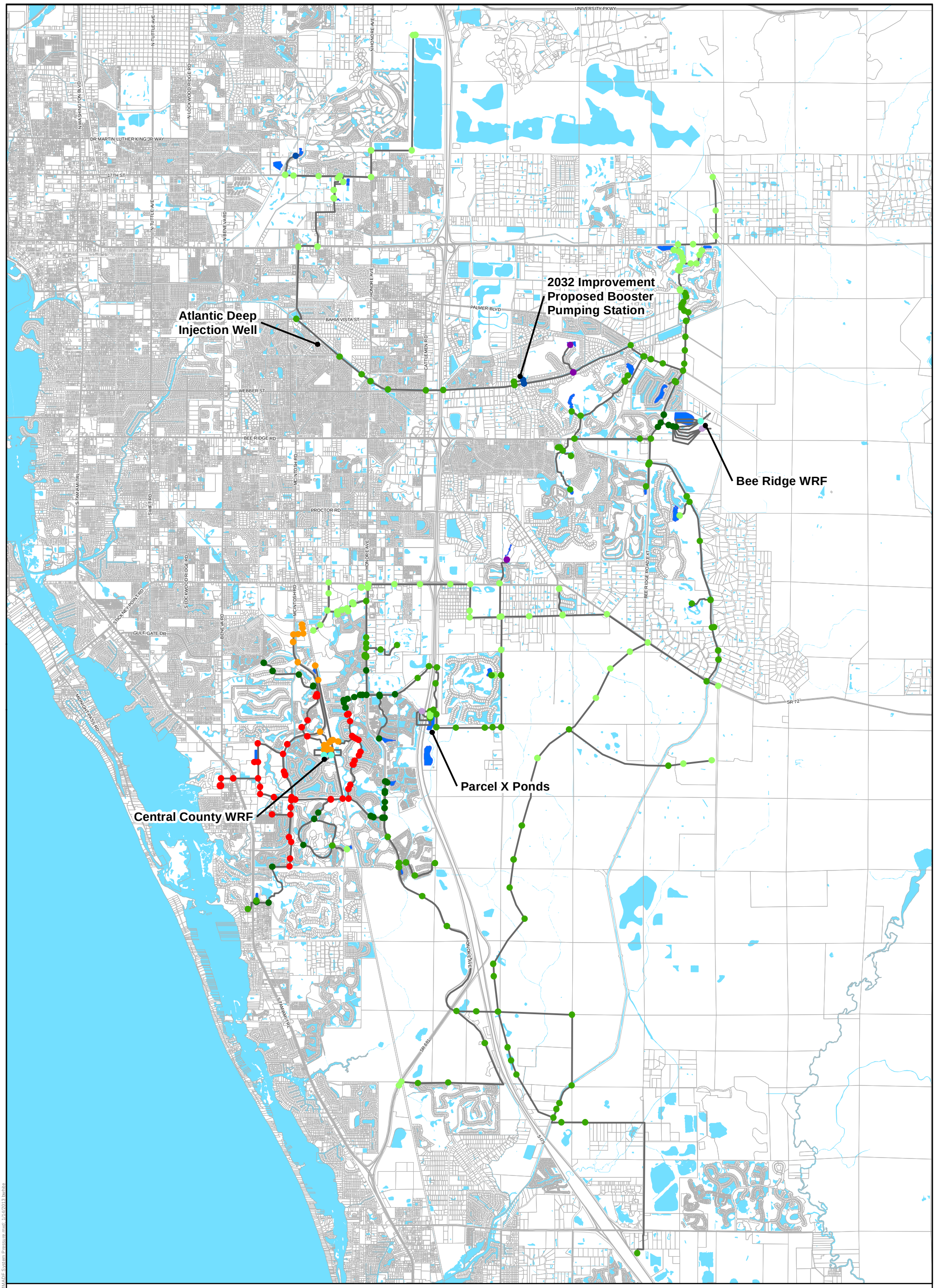
piping that would be installed and operated in parallel with the existing 16-inch pipeline along Phillippi Creek between Palmer Blvd. and the Atlantic Deep Injection Well. The results of installing this parallel pipeline were simulated in the hydraulic model, resulting in an increase the minimum pressure in the northwest portion of the County to 36 psi. The final alternative included the evaluation of a new booster pump station along the existing 16-inch pipeline along Phillippi Creek. A potential location for the booster pump station is a vacant parcel at the intersection of Sarasota Golf Club and Leewynn Drive located east of I-75 and adjacent to the existing 16-inch pipe. As shown in **Figure 11-4,** the booster pump station was incorporated into the hydraulic model and the result was an increase in minimum system pressure above 40 psi for all direct users. A conceptual review of the capital costs associated with the parallel pipeline and booster pump station alternatives were evaluated to determine the most cost effective alternative. The opinion of probable construction cost for the booster pump station and parallel 16-inch pipeline is $875,000 and $3,200,000 respectively. The cost associated with a parallel 16-inch pipeline is anticipated to cost more than three times the cost for the booster pump station. As such, the installation of the booster pump station is recommended.

In addition to the booster pump station, new transmission and distribution pipelines will be needed to extend service to the proposed reclaimed water users, and to ensure demands and pressure requirements for future users will be met. A detailed summary of these pipeline improvements, along with other reclaimed water system improvements needed for the planning period are provided in **Appendix A**.


Atlantic Deep Injection Well
2032 Improvement Proposed Booster Pumping Station
Bee Ridge WRF
Parcel X Ponds
Central County WRF
UNIVERSITY PKWY
DR MARTIN LUTHER KING JR WAY
17TH ST
PALMER BLVD
BAHIA VISTA ST
WEBBER ST
BEE RIDGE RD
PROCTOR RD
GULF GATE DR
SR 72
SR 681
N TUTTLE AVE
N WASHINGTON BLVD
N LOCKWOOD RIDGE RD
N HONORE AVE
N BENEVA RD
HONORE AVE
CATTLEMEN RD
MCINTOSH RD
BEE RIDGE ROAD EXT
S TAMIAMI TRL
SWIFT RD
STICKNEY POINT RD
MIDNIGHT PASS RD
S 75
N
S
E
W
Pressure (psi)
-150 - 0.9
1 - 12
12.1 - 19.9
20 - 25
25.1 - 30
30.1 - 40
40.1 - 50
50.1 - 60
60.1 - 70
70.1 - 80
80.1 - 100
100.1 - 150
Legend
Reclaimed Water Pipes
Reuse Storage Pond
McKIM&CREED
Sarasota County
Figure 11-4
System Pressure
MMADF 2032 Planning Year
with Improvements
S:\1038.004791-GIS\91b-Map Doc\Figure 11-4 2032 MMADF System Pressure.mxd, 1/14/2013 bwhite

11.3.2 Build-out System

In order to serve the potential reclaimed water users once their corresponding parcels are built-out, several improvements will be needed to address system demand and pressure needs. The main improvements needed were simulated to significantly boost system pressure to meet projected build-out demands. Two main alternatives were evaluated that include looping and expanding the system backbone in an effort to utilize the existing system infrastructure to the fullest extent possible. The first improvement evaluated was a 20-inch loop (model element P-1311) extending the existing pipeline along the Legacy Trail from Central Sarasota Parkway, south to Preymore Street, and east to connect to the north/south interconnect along Honore Avenue. The second improvement includes the installation of a 24-inch pipe (P-1293) from the Bee Ridge WRF to the existing 16-inch pipe on Clark Road. These improvements were incorporated into the hydraulic model and the incorporation of both of these improvements is predicted to provide adequate flow and pressure to reach areas east of I-75 and boost the minimum reclaimed water system pressure above 40 psi. **Figure 11-5** shows the system pressure with these improvements incorporated into the hydraulic model. A detailed summary of these pipeline improvements including the improvements required to address the build-out scenario deficiencies are provided in **Appendix A**.

Atlantic Deep Injection Well

Proposed Booster Pumping Station

Bee Ridge WRF

Build-Out Improvement Proposed 24" Pipeline

Parcel X Ponds

Central County WRF

Build-Out Improvement Proposed 20" Pipeline

UNIVERSITY PKWY
N TUTTLE AVE
N WASHINGTON BLVD
N LOCKWOOD RIDGE RD
N HONORE AVE
DR MARTIN LUTHER KING JR WAY
17TH ST
N BENEVA RD
HONORE AVE
PALMER BLVD
BAHIA VISTA ST
CATTLEMEN RD
WEBBER ST
BEE RIDGE RD
MCINTOSH RD
PROCTOR RD
S TAMIAMI TRL
SWIFT RD
S LOCKWOOD RIDGE RD
STICKNEY POINT RD
GULF GATE DR
BENEVA RD
MIDNIGHT PASS RD
BEE RIDGE ROAD EXT
SR 72
HONORE AVE
SR 681
SR 72

Pressure (psi)

-150 - 0.9	25.1 - 30	60.1 - 70
1 - 12	30.1 - 40	70.1 - 80
12.1 - 19.9	40.1 - 50	80.1 - 100
20 - 25	50.1 - 60	100.1 - 150

Legend

Reclaimed Water Pipes

Reuse Storage Pond

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W E
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Sarasota County

Figure 11-5
System Pressure
AADF Build-Out
with Improvements

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11.3.3 North/South Interconnect

The hydraulic model was utilized to evaluate the capacity of the existing system with respect to its ability to transfer flow along the north/south interconnect while maintaining a minimum system pressure of 40 psi at the southernmost end of the interconnect. The alternatives evaluated for this scenario included:

- Alternative 1 – Evaluates the maximum transfer flow rate through the north/south interconnect using existing piping. For this master plan, the north/south interconnect is assumed to be 20-inches in diameter. The proposed north/south interconnect begins at the existing 12-inch pipeline on Honore Avenue near Aviano Lane, extending southeast across I-75 to the Venice Eastside WRF, approximately 48,582 feet (model elements, P-1238 through P-1245, P-1274, P-1275, P-1247 and P-1248).
- Alternative 2 – Using Alternative 1 as a base, this alternative adds a 20-inch pipeline loop along the Legacy Trail from Central Sarasota Parkway south to Preymore Street and east to connect to the north/south interconnect along Honore Avenue. The proposed 20-inch pipeline is approximately 8,413 feet in length (model element P-1311).
- Alternative 3 – Using Alternative 1 as a base, this alternative adds a 12-inch pipeline loop along Honore Avenue from the existing 14-inch pipeline at Palmer Ranch Parkway south to the existing 12-inch pipeline at Central Sarasota Parkway. The proposed 12-inch pipeline loop is approximately 9,550 feet in length (model element P-1312).
- Alternative 4 - Using Alternative 1 as a base, this alternative adds the proposed loops from both Alternative 2 and Alternative 3.

- Alternative 5a - Using Alternative 2 as a base, this alternative upsizes the proposed north/south interconnect from 20-inch to 24-inch.
- Alternative 5b - Using Alternative 2 as a base, this alternative upsizes the proposed north/south interconnect to 30-inch.

Table 11-1 summarizes the modeled capacity within the north/south interconnect and includes the opinion of probable construction cost for each alternative. Based on the modeling results, the 20-inch loop associated with Alternative 2 provides the greatest increase in flow from a single loop alternative. Alternative 2 increased the flow through the existing distribution system (Alternative 1) by 1,050 gpm. The 12-inch loop associated with Alternative 3 provided a 150 gpm increase in flow over Alternative 1. Alternative 4, which combined the loops from Alternatives 2 and 3, provided a 300 gpm increase in capacity when compared to Alternative 2. Increasing the diameter of the north/south interconnect in conjunction with the alternative 2 provides a significant increase in capacity. To assist the County with making a decision regarding the north/south interconnect diameter, Alternatives 5a and 5b were developed. Alternative 5a, which increased the diameter from 20-inch to 24-inch, increased the flow from Alternative 2 by 1,300 gpm. Alternative 5b, which increased the diameter from 20-inch to 30-inch increased the flow from Alternative 2 by 2,500 gpm. It appears that Alternative 2 is more cost effective than Alternatives 3 and 4 regarding maximizing the capacity within a 20-inch north/south interconnect given the ratio of increased flow per capital cost. Alternatives 5a and 5b are both relative cost effective ways to significantly increase the capacity of the north/south interconnect.

Table 11-1: North/South Interconnect Capacity by Alternative

Alternative	Flow (gpm)	Cost
1	1,750	$ 11,800,000
2	2,800	$ 13,820,000
3	1,900	$ 12,660,000
4	3,100	$ 14,680,000
5a	4,100	$ 16,090,000
5b	5,300	$ 17,660,000

Based on the results and costs summarized in **Table 11-1**, Alternative 2 is recommended for implementation. Should the County wish to increase the ability to transfer flow in the north/south interconnect, Alternatives 5a or 5b would build upon Alternative 2, while upsizing the north/south interconnect to provide additional flow capacity. The referenced model elements can be found on the model element ID map provided in **Appendix H**. Detailed reports of the model results are provided in **Appendices J** through **N**.

12.0 CAPITAL IMPROVEMENT PROGRAM

Based on the analysis, evaluations, and cost opinions included in previous sections, CIPs are needed to address the County's reclaimed water system requirements through the planning and build-out periods. This section summarizes the proposed CIPs and the cost factors used to estimate the reclaimed water system CIP costs. The system improvements and their estimated costs are intended to provide the County with the information necessary to update the five year CIP reclaimed water system projects.

12.1 Cost Factors

The cost factors used to estimate the reclaimed water system CIP costs are presented in **Tables 12-1** and **12-2**. Each of the cost factors includes design, administrative, construction, and contingency. **Table 12-3** shows the percentages of construction cost used to estimate the overall cost of the projects. The pipe cost estimates were derived from contractor bids for projects in Sarasota County and surrounding areas from 2009 through 2012.

Table 12-1: Pipe Project Cost Estimates

Pipe Size	Installed Cost (2012-$/LF)
6"	$54
8"	$63
10″	$81
12″	$90
14"	$108
16"	$144
18"	$180
20"	$216
24"	$252

Table 12-2: Directionally Drilled Pipe Project Cost Estimates

Directional Drill Pipe Size	Equivalent Pipe Size (DI or PVC)	Installed Cost (2012-$/LF)
6″ HDPE	4″	$90
8″ HDPE	6″	$135
10″ HDPE	8″	$180
12″ HDPE	10″	$216
14″ HDPE	12″	$225
16″ HDPE	14″	$235
18″ HDPE	16″	$378
20″ HDPE	18″	$422
24″ HDPE	20″	$468
30″ HDPE	24″	$617

Table 12-3: Pipeline Project Costs
Assumed Percentage of Construction Cost

Item	Percent of Construction
Pipes, Valves and Fittings	40%
County Administrative	10%
Engineering	20%
Contingency	30%
Total	100%

12.2 Project Costs and Recommended Phasing Implementation

CIPs needed to address system deficiencies and to expand the reclaimed water system were developed for the 20-year planning period. Projects were also recommended by identifying current and anticipated operational limitations that impact the County's ability to store and utilize this valuable resource to the fullest extent possible. All of the recommended CIPs are listed in **Table 12-4** and are sorted by improvement category. The list of projects includes the projects that are anticipated to be programmed in the County's FY2014-FY2018 CIP. The remaining CIPs are anticipated to be implemented through the year 2032. **Figure 12-1** shows the locations of the CIP improvement projects.

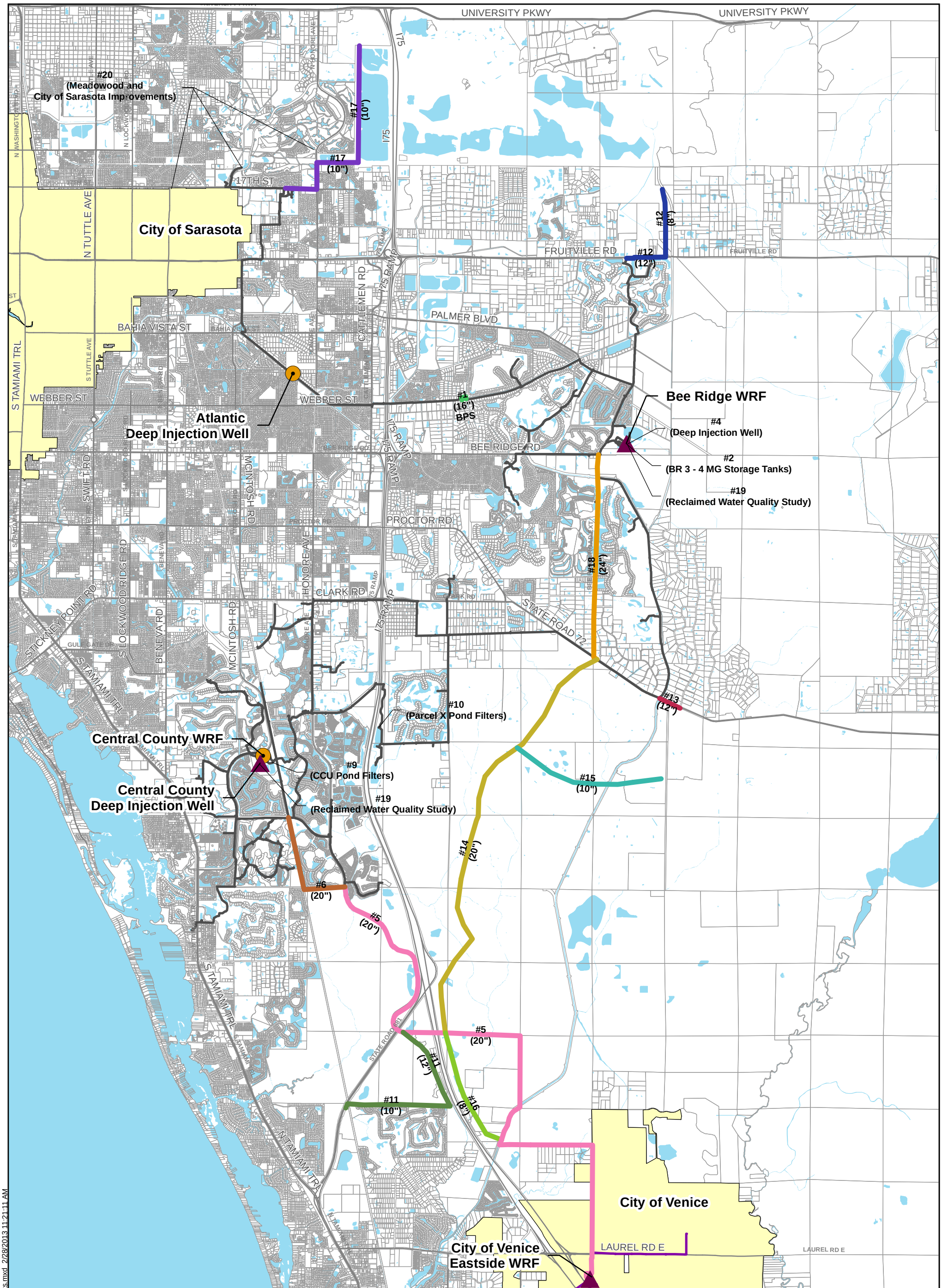
Table 12-4: Recommended Reclaimed Water System CIPs

Project No[1]	Project Title	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020-FY2024	FY2025-FY2029	FY2030-FY2035	Future Funding	Total Cost
Part I - RECLAIMED WATER SYSTEM												
Wet Weather Storage												
2	Bee Ridge WRF Ground Storage Tanks	0	0	0	0	0	0	4,400,000	4,000,000	0	4,000,000	12,400,000
3	Deep Injection Well Site Evaluation	0	0	0	0	0	150,000	0	0	0	0	150,000
4	Deep Injection Well	0	0	0	0	0	0	0	0	0	6,000,000	6,000,000
Wastewater Treatment Facilities												
9	Central County WRF Pond Filter Replacement	0	0	0	0	0	1,000,000	0	0	0	0	1,000,000
10	Parcel X North Pond Filter Replacement	0	0	0	50,000	850,000	0	0	0	0	0	900,000
19	Reclaimed Water Quality Study	0	80,000	0	0	0	0	0	0	0	0	80,000
Transmission System Improvements												
1	Reclaimed Booster Pump Station	0	0	0	0	0	0	0	1,000,000	0	0	1,000,000
5	North/South Interconnect Reuse Main	0	0	0	0	0	0	4,000,000	7,800,000	0	0	11,800,000
6	Legacy Trail Reuse Main Loop	0	0	0	0	0	0	0	2,020,000	0	0	2,020,000
11	Energy Economic Zone Reuse Main	0	0	0	0	0	0	1,200,000	0	0	0	1,200,000
12	Sarasota East Village Development Reuse Main	0	0	0	0	0	0	0	0	0	580,000	580,000

Table 12-4: Recommended Reclaimed Water System CIPs (Continued)

13	Clark Road Extension to National Cemetery Reuse Main	0	0	0	0	40,000	160,000	0	0	0	0	200,000
14	Future Roadway Development Reuse Main	0	0	0	0	0	0	0	0	0	6,960,000	6,960,000
15	Future Roadway Extension East Reuse Main	0	0	0	0	0	0	0	0	0	920,000	920,000
16	Future Roadway Extension South Reuse Main	0	0	0	0	0	0	0	0	0	590,000	590,000
17	Nathan Benderson Park Reuse Main	0	0	0	0	0	0	0	0	0	1,730,000	1,730,000
18	Bee Ridge Road Extension Reuse Main	0	0	0	0	0	0	0	0	0	3,790,000	3,790,000
Reclaimed Water System Improvements												
8	Hydraulic Site Capacity Evaluation	0	0	50,000	0	0	0	0	0	0	0	50,000
20	Meadowood & City of Sarasota Improvements	200,000	800,000	1,300,000	0	0	0	0	0	0	0	2,300,000
Reclaimed Water System Total		200,000	880,000	1,350,000	50,000	890,000	1,310,000	9,600,000	14,820,000	0	24,570,000	53,670,000
PART II - OTHER IMPROVEMENTS												
7	Reclaimed Water Delivery Management System	0	0	0	0	0	0	400,000	400,000	350,000	0	1,150,000
Other Improvements Total		0	0	0	0	0	0	400,000	400,000	350,000	0	1,150,000
TOTAL RECLAIMED WATER PROJECTS		200,000	880,000	1,350,000	50,000	890,000	1,310,000	10,000,000	15,220,000	350,000	24,570,000	54,820,000

1. Refer to Figure 12-1.


UNIVERSITY PKWY
UNIVERSITY PKWY
I75
#20
(Meadowood and
City of Sarasota Improvements)
#17
(10")
#17
(10")
17TH ST
City of Sarasota
N TUTTLE AVE
FRUITVILLE RD
#12
(8")
#12
(12")
FRUITVILLE RD
CATTLEMEN RD
I75 RAMP
PALMER BLVD
BAHIA VISTA ST
S TAMIAMI TRL
S TUTTLE AVE
WEBBER ST
WEBBER ST
#1
(16")
BPS
Atlantic
Deep Injection Well
Bee Ridge WRF
#4
(Deep Injection Well)
#2
(BR 3 - 4 MG Storage Tanks)
#19
(Reclaimed Water Quality Study)
BEE RIDGE RD
I75 RAMP
I75 RAMP
PROCTOR RD
#18
(24")
HONORE AVE
CLARK RD
I75 RAMP
STATE ROAD 72
STICKNEY POINT RD
S LOCKWOOD RIDGE RD
BENEVA RD
MCINTOSH RD
#10
(Parcel X Pond Filters)
#13
(12")
Central County WRF
#9
(CCU Pond Filters)
#19
(Reclaimed Water Quality Study)
#15
(10")
Central County
Deep Injection Well
#14
(20")
#6
(20")
#5
(20")
STATE ROAD 681
#5
(20")
#11
(12")
#16
(8")
#11
(10")
N TAMIAMI TRL
City of Venice
City of Venice
Eastside WRF
LAUREL RD E
LAUREL RD E
N
W
E
S
Legend
Water Reclamation Facility
Deep Injection Well
Existing Sarasota County Reclaimed Pipe
City of Venice Reclaimed Pipe
Incorporated Area
McKIM&CREED
Sarasota County
Figure 12-1
Capital Improvement Projects
S:\1038\0047\91-GIS\Figures\CIP Projects.mxd 2/28/2013 11:21:11 AM

12.3 Cost Summary

The summary of CIPs includes both reclaimed water system projects within the 5-year planning period, as well as those projects needed for the reclaimed water system through the year 2032. These reclaimed water system expansion projects should be evaluated at least every 5 years to adjust the County's CIP to reflect actual needs as growth develops and other factors are considered. The cost of all identified reclaimed water system CIP improvements within the 20-year planning period is $54,820,000.

APPENDIX A

CIP SUMMARIES

CIP #1 FY 2025-2029
Reclaimed Water Distribution System Improvement – Reclaimed Booster Pump Station
(Reclaimed Booster Pump Station for North Reclaimed Water System Expansion)

This multi-year project consists of the design and construction of a booster pump station along with approximately 865 LF (by open cut) of 16-inch reclaimed water main at a vacant lot located just north of an existing 16-inch reclaimed water main near the intersection of Leewynn Place and Sarasota Golf Club Drive. The project will increase the pressure north of the Atlantic deep injection well, improving the ability to deliver reclaimed water to additional customers. The addition of the Sarasota-Manatee Jewish Federation Campus and the Sarasota County parks along 17th Street will provide 0.07 mgd of reclaimed water to offset 0.04 mgd of potable quality water. The project will also boost pressures at the City of Sarasota and Sarasota County Interconnect, Meadowood and City of Sarasota Improvements (CIP #20) and allow for expansion north to provide service to Nathan Benderson Park (CIP#17). The booster pump station is anticipated to be sized for at least 5.0 mgd to serve existing and future users as well as the Atlantic Deep Injection Well.

The associated cost with this project is estimated at $1,000,000, which includes construction, administrative, engineering, and contingency costs.

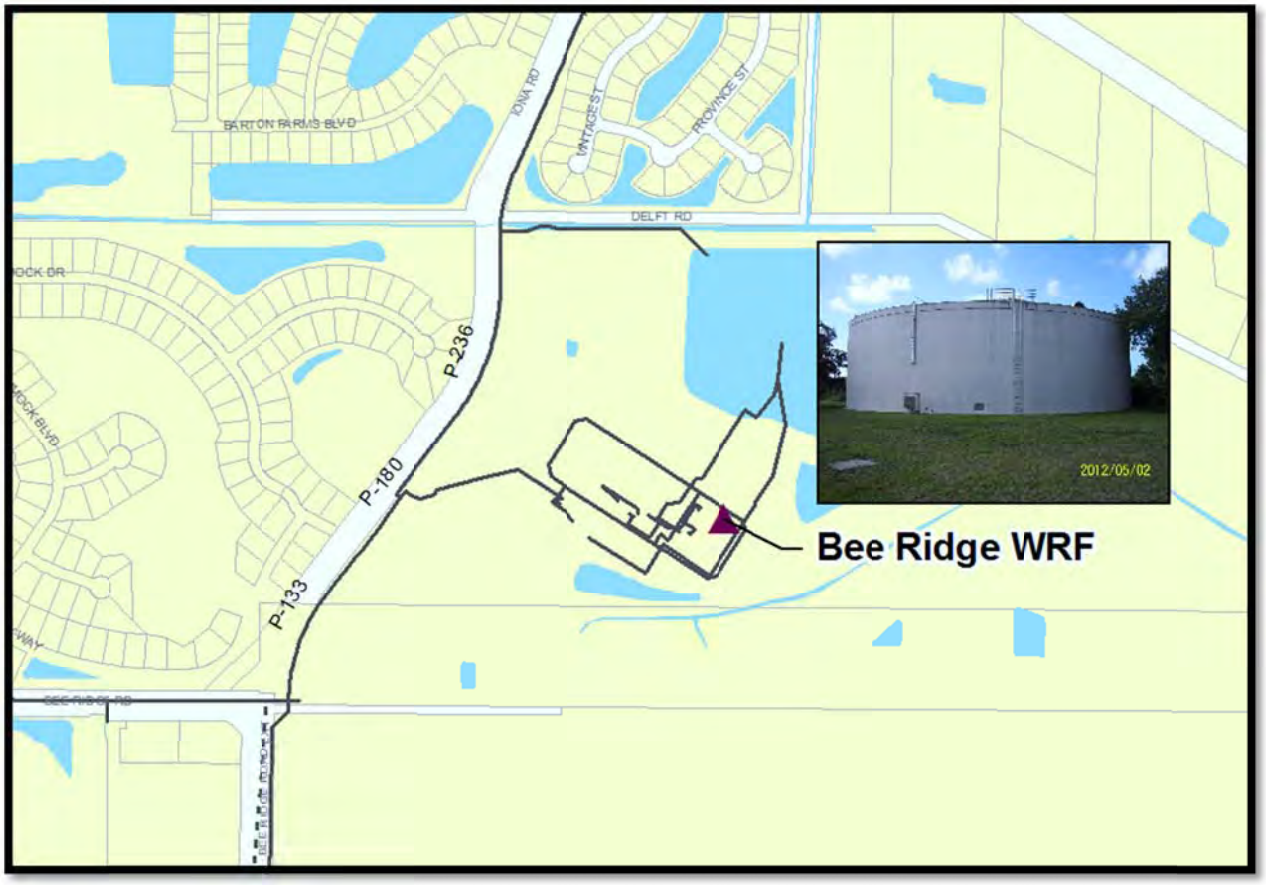
Legend

CIP Improvement
Proposed Pipe (Other CIP Improvement)
Existing Sarasota County Reclaimed Pipe
City of Sarasota Reclaimed Pipe

CIP #2 FY 2020-2024, FY 2025-2029
Reclaimed Water Storage System Improvement – Bee Ridge WRF Ground Storage Tanks
(Bee Ridge WRF Diurnal Storage to Maximize Beneficial Reuse)

This multi-year project consists of the design and construction of three 4 MG reclaimed water ground storage tanks at the Bee Ridge WRF using a phased approach. The additional 12 MG of storage is needed for operational storage and for meeting compliance requirements associated with reclaimed water disposal at the anticipated Central County deep injection well. The benefit of the project is that the storage tanks will provide diurnal storage capacity needed to maximize the quantity of beneficial reuse available to the Sarasota County reclaimed water system. This storage will be phased in over time and could include different tank size combinations to reach the 12 MG mark.

The associated cost with this project is estimated at $12,400,000, which includes design, construction, administrative, engineering, and contingency costs.



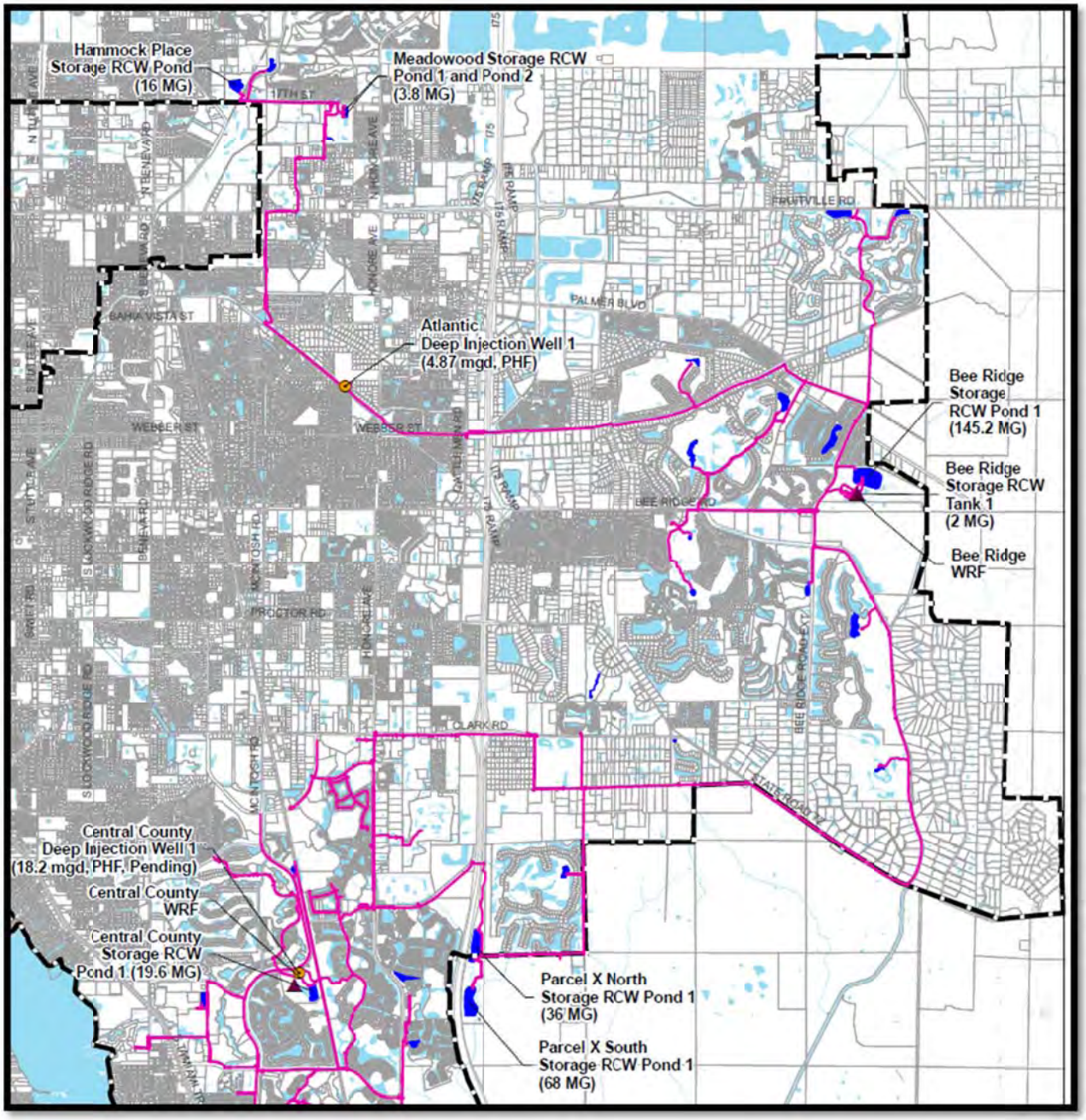
Legend

CIP Improvement
Proposed Pipe (Other CIP Improvement)
Existing Sarasota County Reclaimed Pipe
City of Sarasota Reclaimed Pipe

CIP #3 FY 2019
Reclaimed Water System Improvement – Potential Deep Injection Well Site Evaluation

This project consists of the evaluation of the County's sites for the construction of a potential deep injection well. Before the proposed deep injection well for reclaimed water disposal is designed and constructed (CIP #4), the location of the deep injection well must be determined. Therefore, it is recommended that a deep injection well location evaluation be performed for the north service area. The location should be focused north of Clark Road to allow for disposal directly from Bee Ridge WRF. The study will review existing ambient groundwater quality information and look at other disposal options that maybe appropriate for the Bee Ridge facility.

The associated cost with this project is estimated at $150,000.



CIP #4 FY To Be Determined
Reclaimed Water Facility Improvement – Deep Injection Well

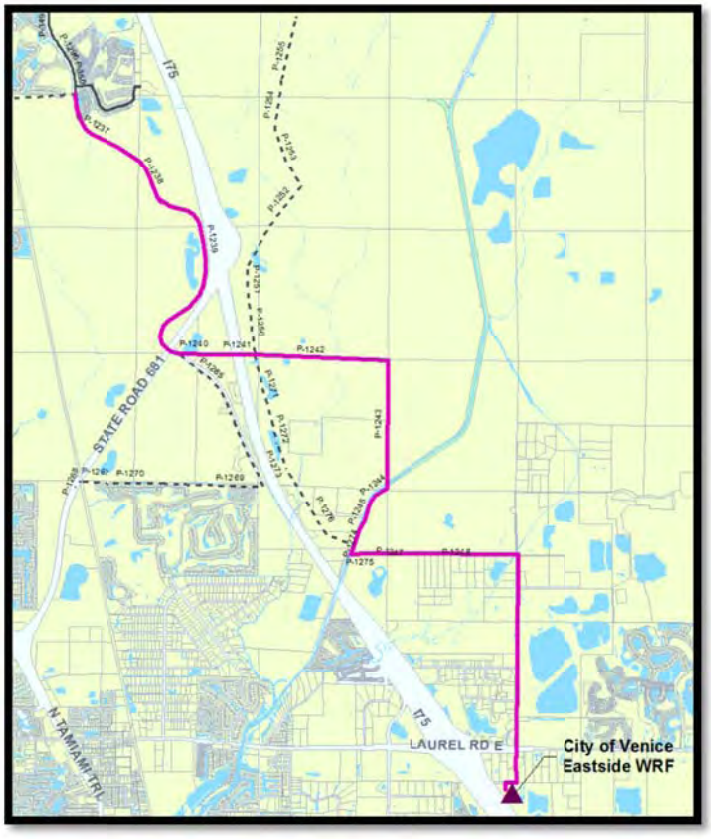
This project has been identified for future funding for fiscal years to be determined for the design and construction of a deep injection well. To account for wet weather disposal requirements, an 8 mgd deep injection well is recommended. The new deep injection well should be located as close as possible to the vicinity of the Bee Ridge WRF. This project will be based on the evaluation to determine a suitable location for the deep injection well (CIP#3) or other appropriate disposal options.

The associated cost with this project is estimated at $6,000,000, which includes construction, administrative, engineering, and contingency costs.

CIP #5 FY 2020-2024, FY 2025-2029
Reclaimed Water Distribution System Improvement – North/South Regional Interconnect (Sarasota County – City of Venice Reclaimed Water Interconnect)

This multi-year project consists of the design and construction of a second interconnect between Sarasota County and the City of Venice reclaimed water systems using a phased approach. The project includes the construction (by open cut and horizontal directional drill) of 14,527 LF of 20-inch reclaimed water main (model elements P-1237 - P-1239) from the existing 12-inch main south along Honore Avenue to the east side of State Road 681 to serve the Energy Economic Zone (CIP #11). Further, the interconnect requires the construction of 8,587 LF of 20-inch reclaimed water main (by open cut and horizontal directional drill - model elements P-1240 - P-1245, P-1247, P-1248, P-1274, P-1275,) east to Pinelands Preserve; south 8,092 LF to Rustic Road; east 7,169 LF along Rustic Road; south 10,207 LF along Knights Trail Road to connect to the City of Venice Eastside WRF. The total length of 20-inch reclaimed water main for this project is 48,582 LF.

The project has the potential to serve both future development and agricultural enterprises along the route, specifically two (2) McCann Holdings Ltd parcels, three (3) McCann East LP parcels, Browers Groves Inc, two (2) Stephen T Deans Sr, two (2) Philip V Burket parcels with a projected demand of 1.24 mgd of reclaimed water to offset 0.62 mgd of potable quality water. The measurable benefit of the project is the physical construction of the 20-inch transmission main which will allow for the continued expansion of the County's reclaimed water system and enable the increased capability for beneficial use of reclaimed water within the County and the City of Venice.



Furthermore this project combined with the cooperation of the City of Venice would give the County the capability to move its reclaimed water supplies through the City of Venice to County customers in the southern part of the county. The project has the added benefit of allowing reclaimed water flows in either direction and could set the stage for a more regional approach to reclaimed water supply. Future interconnects between the County, the City of North Port and Englewood Water District would be needed to complete this regional supply strategy.

The associated cost with this project is estimated at $11,800,000, which includes construction, administrative, engineering, and contingency costs.

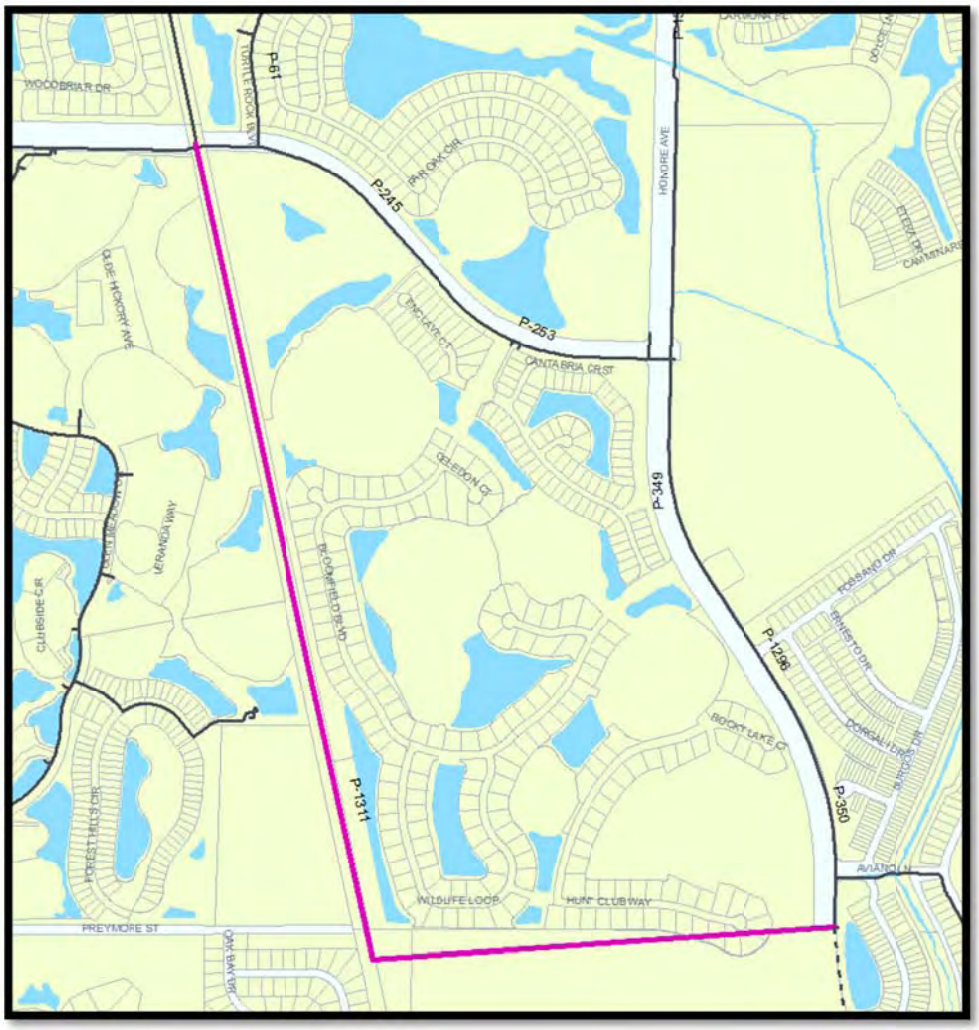
Legend

CIP Improvement
Proposed Pipe (Other CIP Improvement)
Existing Sarasota County Reclaimed Pipe
City of Sarasota Reclaimed Pipe

CIP #6 FY 2025-2029
Reclaimed Water Distribution System Improvement
(Reclaimed Water Transmission Main to Support Sarasota County – City of Venice North/South Interconnect)

This multi-year project for the design and construction of 5,173 LF of 20-inch reclaimed water main (by open cut - model element P-1211) south along the Legacy Trail, and east 3,240 LF (by open cut) to Honore Avenue. The total length of 20-inch reclaimed water main for this project is 8,413 LF. In order to, increase flows within the 20-inch interconnect (CIP #5) and to improve the delivery or reclaimed water during peak demands and at system build-out, the construction of a new 20-inch reclaimed water main is recommended. The benefit of the project is the ability to increase flows and pressures through the new 20-inch transmission main which will facilitate the continued expansion of the Sarasota County reclaimed water system and improve regional capabilities.

The associated cost with this project is estimated at $2,020,000, which includes construction, administrative, engineering, and contingency costs.



CIP #7 FY 2020-2024, FY 2025-2029, FY 2030-2035
Reclaimed Water Distribution System Improvement – Delivery Management System
(Bulk User Delivery Management System, Valves/Controls/Telemetry)

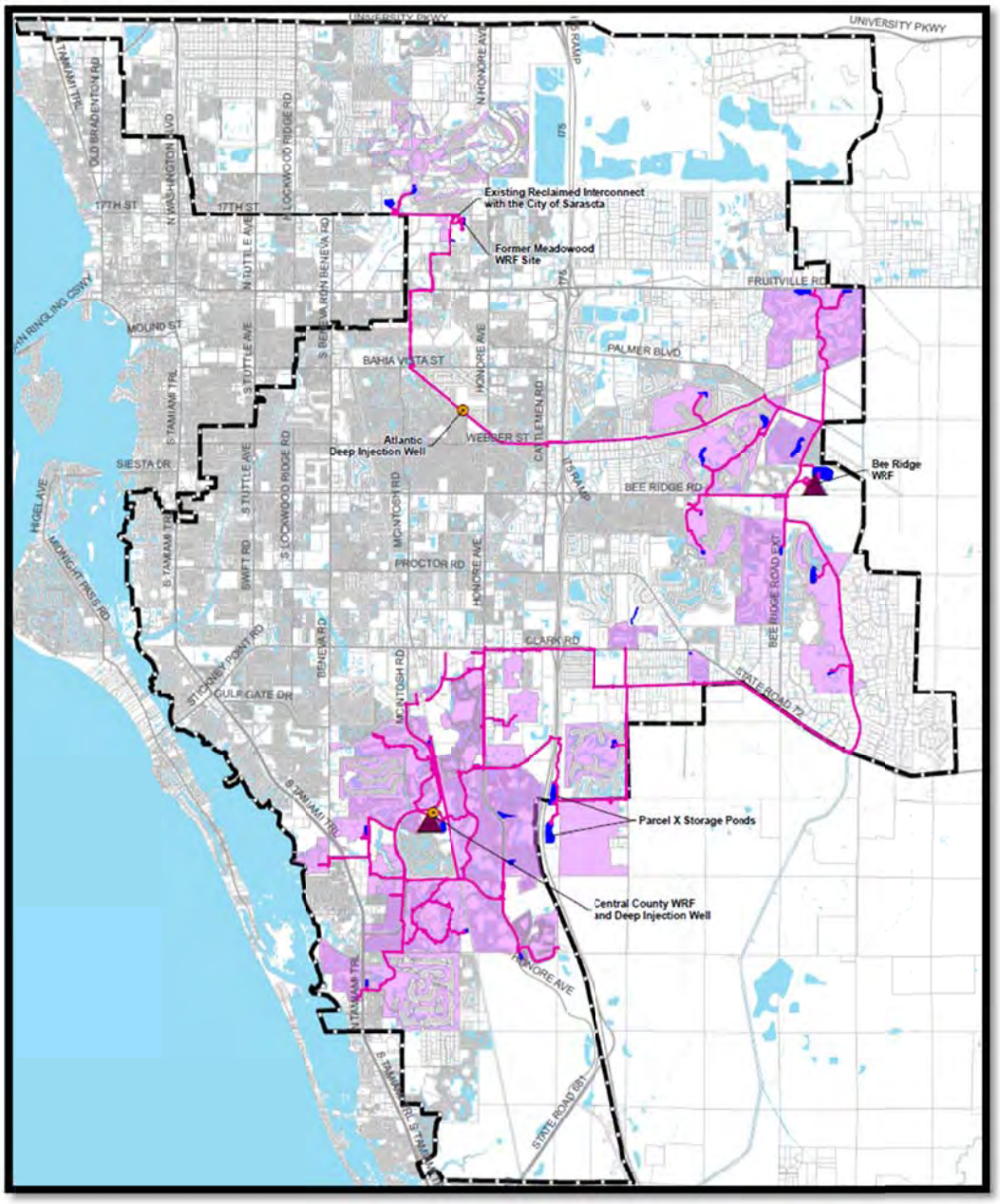
This multi-year project consists of the installation of a delivery management system consisting of pressure sustaining valves, flow meters, automated valves, and telemetry at each bulk user's reclaimed water delivery point using a phased approach. The bulk users within the system receive reclaimed water by filling their on-site storage ponds. The flow to the ponds is currently controlled by a pressure sustaining valve and in most cases a mechanical pond level float. The benefit of the project is the increased efficiency and monitoring of reclaimed water delivery throughout the system and the reduced occurrence of pressure drops in the system due to bulk user service.

The associated cost with this project is estimated at $50,000 per site, which includes construction, administrative, engineering, and contingency costs. Total cost for all 23 sites is $1,150,000.

CIP #8 FY 2016
Reclaimed Water System Improvement - Hydraulic Site Capacity Evaluation
(Reclaimed Water Efficiency Study)

This project consists of the evaluation of the hydraulic site capacity for multiple sites within the north service area. The hydraulic site capacity is the rate that soils and receiving aquifer can safely remove water from a site without ponding or runoff of reclaimed water. This value is used to determine the capacity of a site to irrigate with reclaimed water under wet weather conditions to ultimately determine the required wet weather storage. The benefit of this project is the ability for the County to identify customers that could receive more reclaimed water, are using more reclaimed water than is needed for irrigation, and verification of wet weather storage requirements.

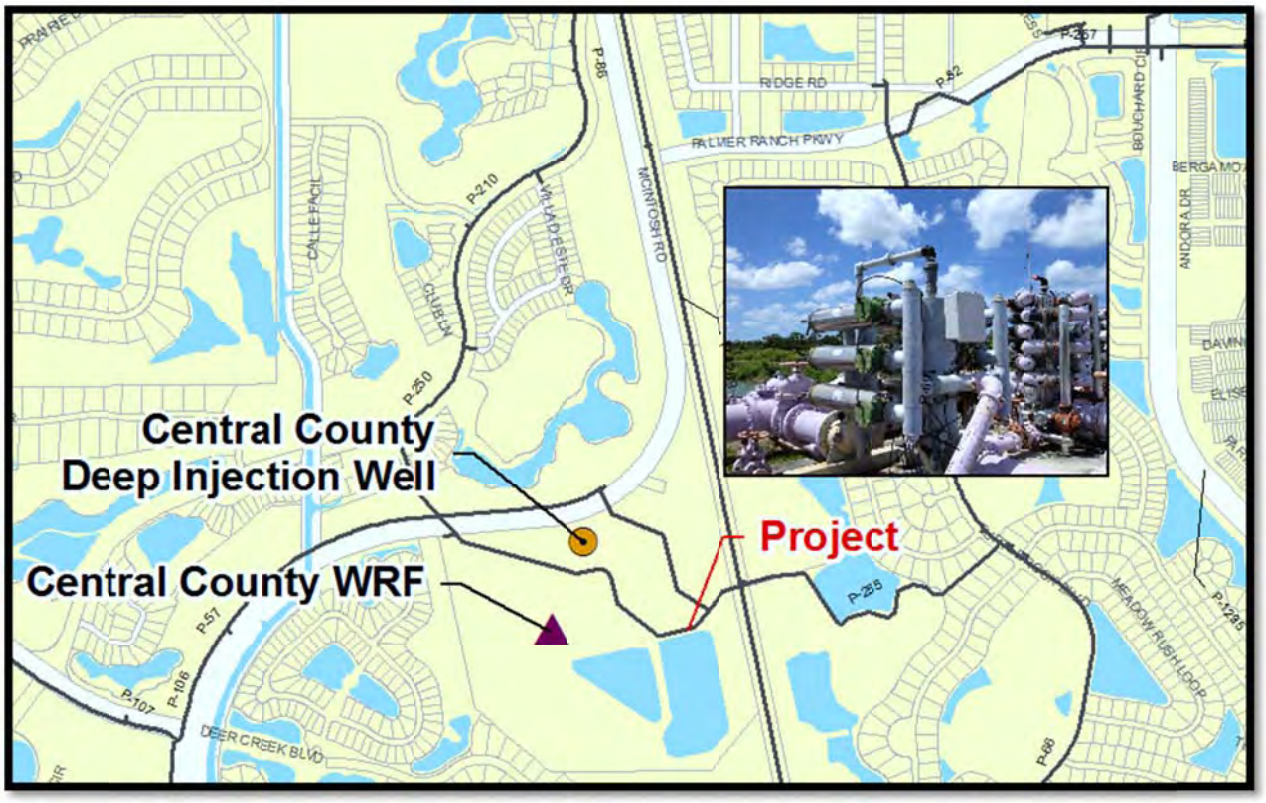
The associated cost with this project is estimated at $50,000, which includes administrative, engineering, and contingency costs.



CIP #9 FY 2019
Reclaimed Water Facility Improvement – Pond Filter Replacement at Central County WRF

This project consists of the design and construction for the replacement of the pond filtration system located at the Central County WRF because it is in poor condition. There is no measurable direct increase in the amount of beneficially used reclaimed water as a result of this project. The benefit is that the new filters will help to remove algae, sand, and other suspended solids from this source which can cause plugging of irrigation system heads and other operational and maintenance issues.

The associated cost with this project is estimated at $1,000,000 which includes construction, administrative, engineering, and contingency costs.



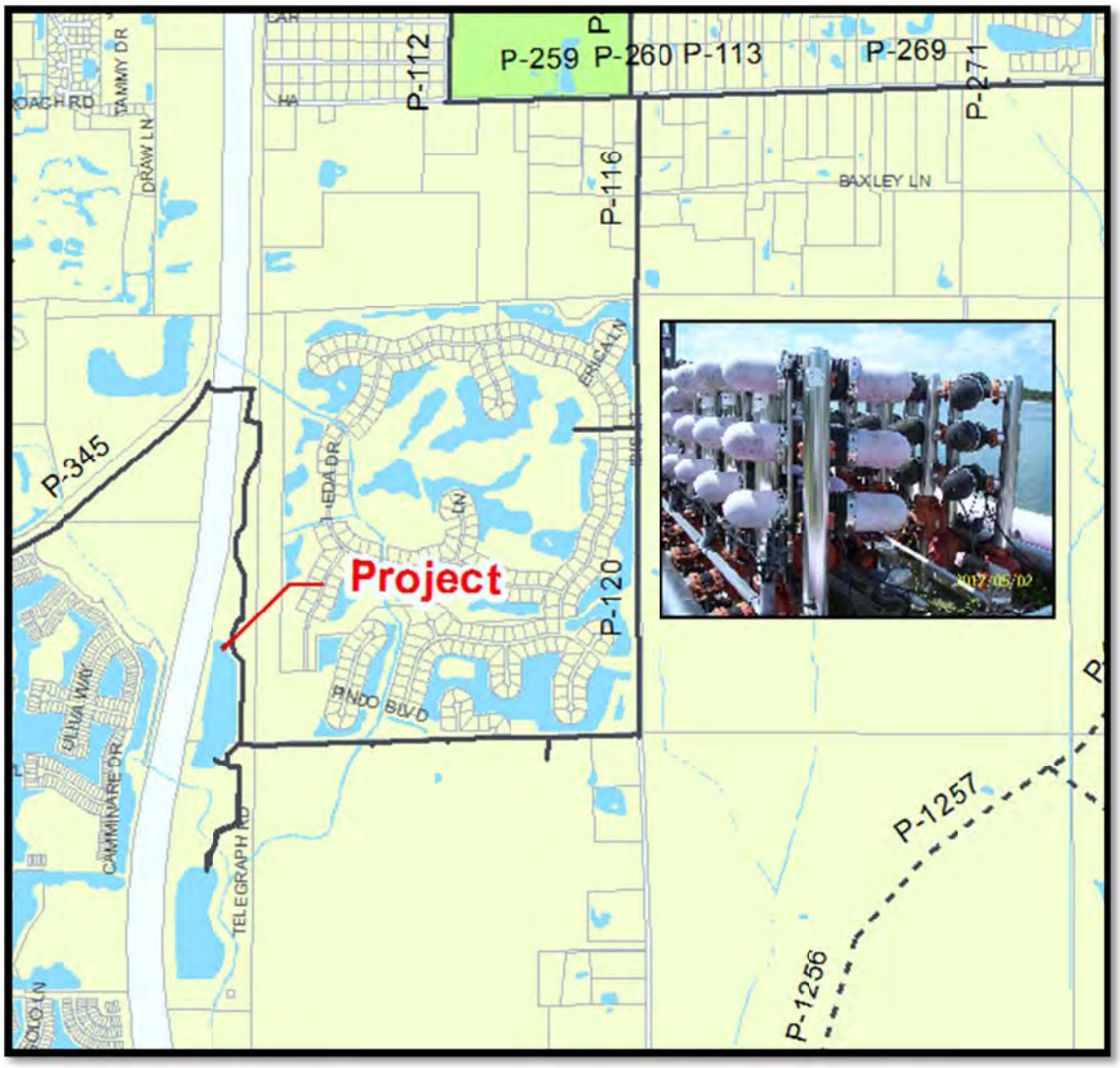
Legend

CIP Improvement
Proposed Pipe (Other CIP Improvement)
Existing Sarasota County Reclaimed Pipe
City of Sarasota Reclaimed Pipe

CIP #10 FY 2017-2018
Reclaimed Water Facility Improvement – Pond Filter Replacement at Parcel X North Pond

This multi-year project consists of the design and construction for the replacement of the pond filtration system located at the Parcel X north pond because it is no longer functional. There is no measurable direct increase in the amount of beneficially used reclaimed water. The benefit is that the new filters will help to remove algae, sand, and other suspended solids from this source which can cause plugging of irrigation system heads and other operational and maintenance issues.

The associated cost with this project is estimated at $900,000, which includes construction, administrative, engineering, and contingency costs.



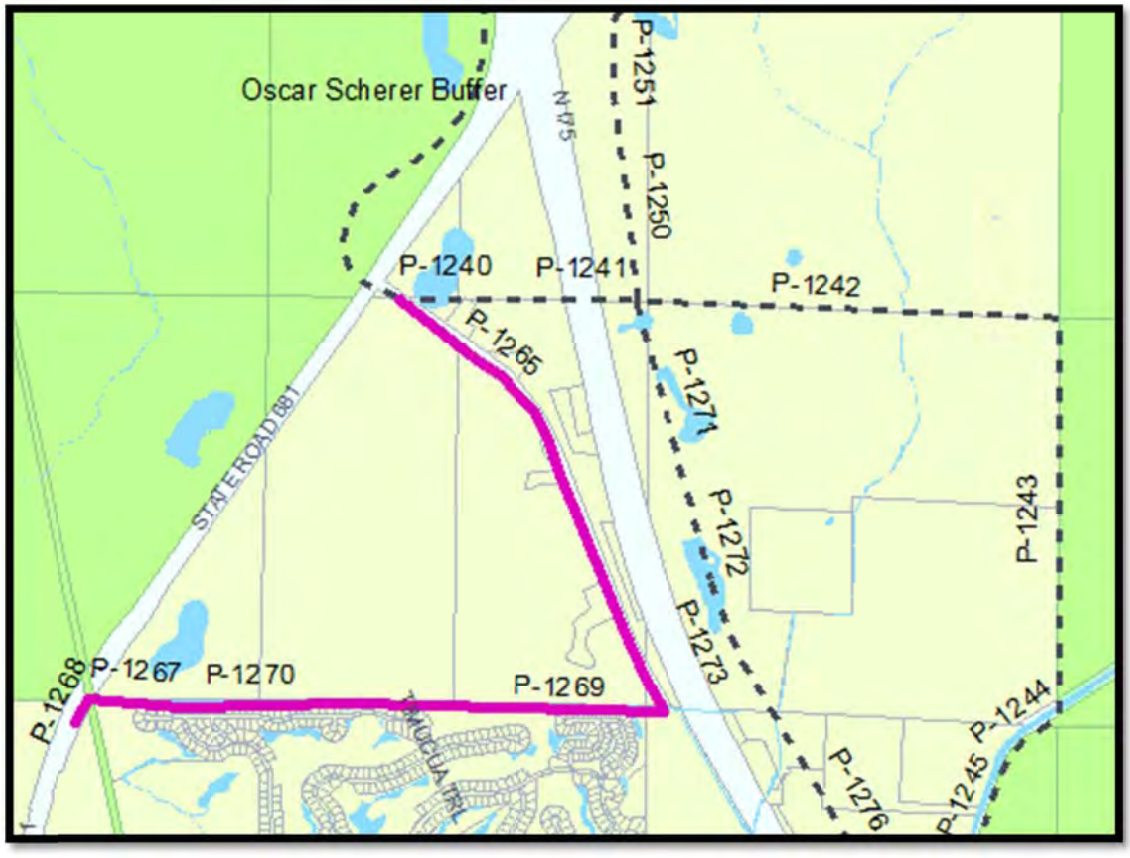
Legend

CIP Improvement
Proposed Pipe (Other CIP Improvement)
Existing Sarasota County Reclaimed Pipe
City of Sarasota Reclaimed Pipe

CIP #11 FY 2020-2024
Reclaimed Water Distribution System Improvement
(Energy Economic Zone Reclaimed Water Transmission Main)

This multi-year project for the design and construction of 3,248 LF of 12-inch reclaimed water main (model element P-1265, by open cut) south along Honore Avenue, along with the construction of 11,182 LF of 10-inch reclaimed water main (model elements P-1269, P-1270, P-1267, P-1268) south to the end of Honore Avenue and east along the north property line of Calusa Lakes Golf Club to serve the Energy Economic Zones, Calusa Lakes Golf Club, Mission Valley Golf and Country Club, Village on the Trail, and McCann Holding Ltd parcels using a phased approach. The benefit of this project is the expansion of the County's reclaimed water system to improve utilization. The project projected to provide 1.55 mgd of reclaimed water demand to offset 1.12 mgd of potable quality water. The piping associated with this project will connect to the pipe associated with CIP #5.

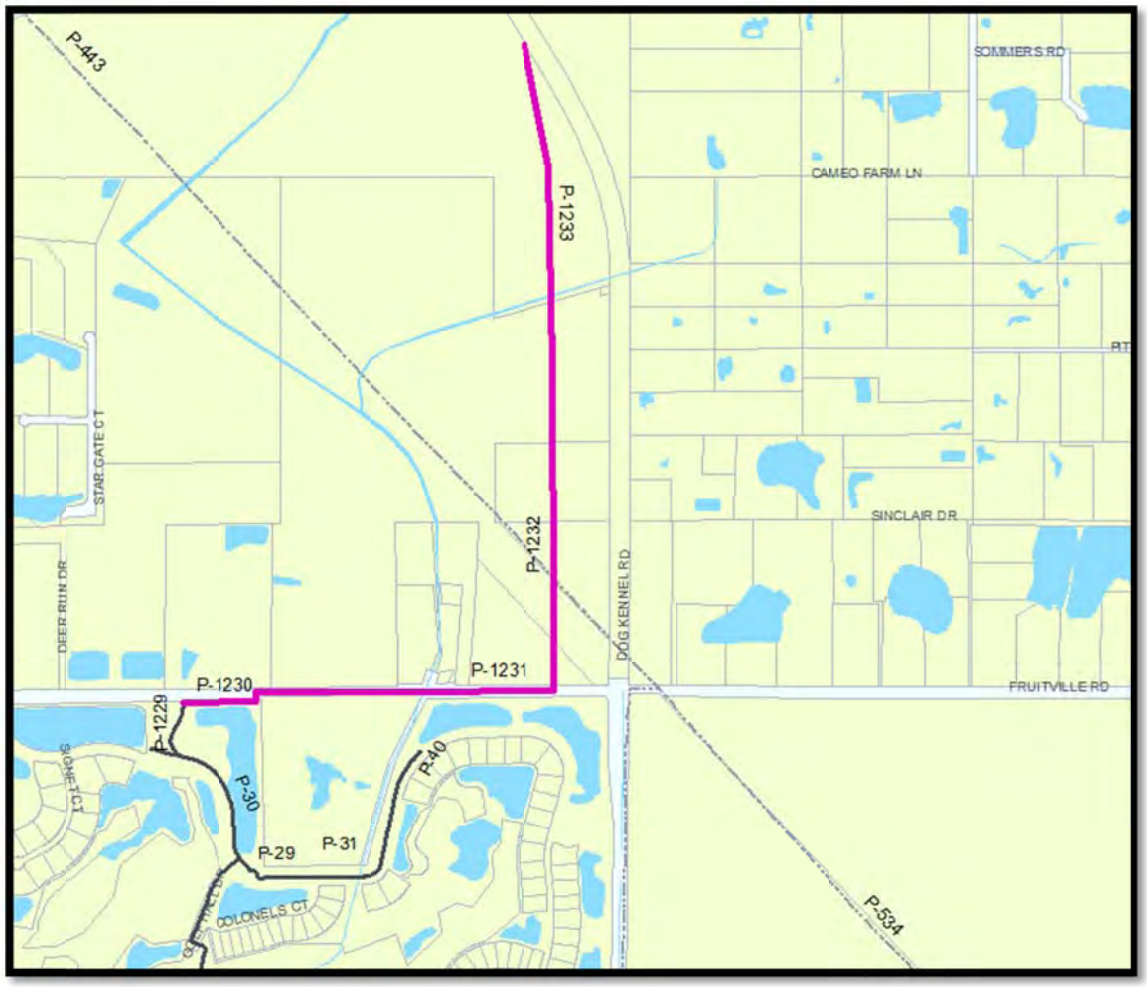
The associated cost with this project is estimated at $1,200,000, which includes construction, administrative, engineering, and contingency costs.



CIP #12 FY To Be Determined
Reclaimed Water Distribution System Improvement
(Sarasota East Village Reclaimed Water Transmission Main)

This project is contingent upon development of subdivisions and has been identified for future funding for fiscal years to be determined for the design and construction of a 12-inch reclaimed water main (model elements P-1230 and P-1231) from the existing reclaimed water main approximately 3,311 LF (by open cut) east along Fruitville Road; and north along Dog Kennel Road. An 8-inch reclaimed water main (model elements P-1232, P-1233) continuing north along Dog Kennel Road approximately 4,374 LF (by open cut) is also included with this project. The project is projected to supply the Sarasota East Village Development of Critical Concern (DOCC), which will result in service of 668 single family residential units and 681 multi-family units. The project will provide 0.52 mgd of reclaimed water to offset 0.26 mgd of potable quality water.

The associated cost with this project is estimated at $580,000, which includes construction, administrative, engineering, and contingency costs.



Legend

CIP Improvement
Proposed Pipe (Other CIP Improvement)
Existing Sarasota County Reclaimed Pipe
City of Sarasota Reclaimed Pipe

CIP #13 FY 2018-2019
Reclaimed Water Distribution System Improvement
(National Cemetery Reclaimed Water Transmission Main)

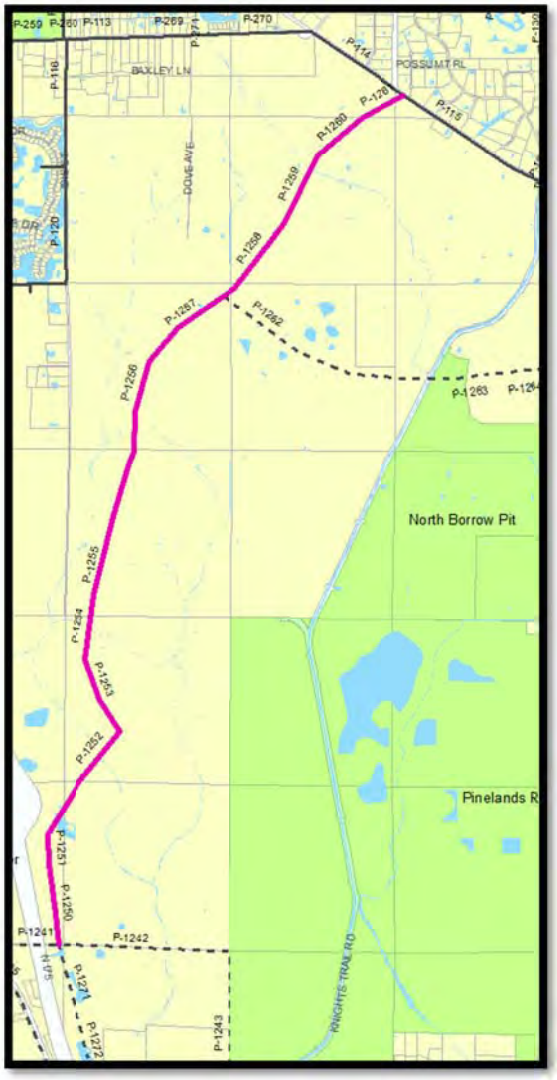
This multi-year project for the design and construction of approximately 1,800 LF of 12-inch reclaimed water main (model element P-1236, by open cut) from the existing 16-inch east at the intersection of Clark Road and Cow Pen Slough to serve Albritton Groves and the National Cemetery. The project is projected to provide 0.53 mgd of reclaimed water to offset 0.33 mgd of potable quality water.

The associated cost with this project is estimated at $200,000, which includes construction, administrative, engineering, and contingency costs.

CIP #14 FY To Be Determined
Reclaimed Water Distribution System Improvement
(North-South Future Roadway Expansion Reclaimed Water Transmission Main)

This multi-year project has been identified for future funding for fiscal years to be determined for the design and construction of approximately 32,203 LF of 20-inch reclaimed water main (model elements P-1250 - P-1261) to connect to the existing 16-inch reclaimed water main at the intersection of Clark Road and Bee Ridge Road Ext to serve future developments on the parcels of Indiantown Dairy Farm, Gianfranco Strazzera, and two (2) McCann East LP parcels using a phased approach. This project should be programmed to be constructed (by open cut) during roadway construction from the existing 16-inch south along the 2025 future roadway. The project is projected to provide 2.48 mgd of reclaimed water to offset 1.24 mgd of potable quality water at the time the residential developments are built out. The project will also support future development or agricultural interests along the pipeline for yet to be specified customers. The estimated flows and offsets for the future developments have not been quantified.

The associated cost with this project is estimated at $6,960,000, which includes construction, administrative, engineering, and contingency costs.



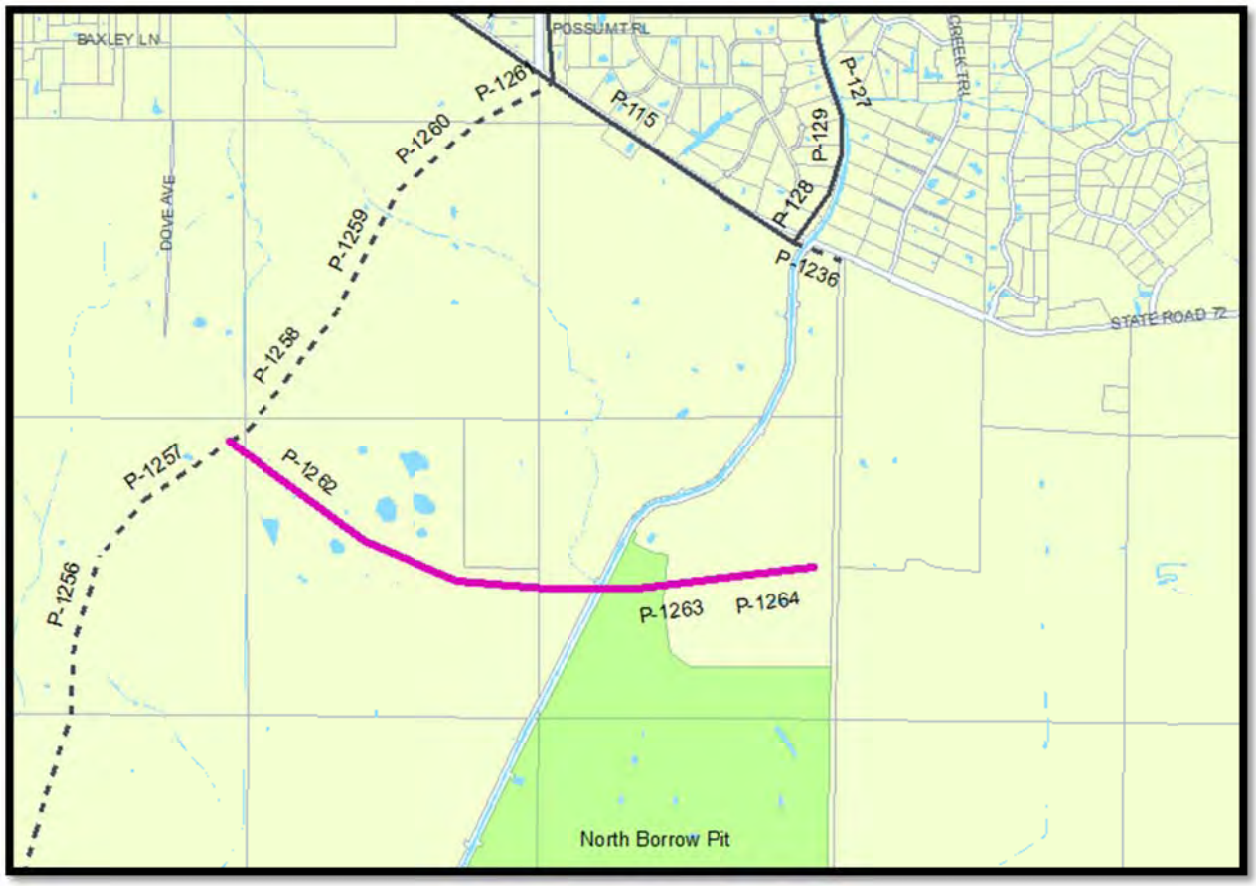
Legend

CIP Improvement
Proposed Pipe (Other CIP Improvement)
Existing Sarasota County Reclaimed Pipe
City of Sarasota Reclaimed Pipe

CIP #15 FY To Be Determined
Reclaimed Water Distribution System Improvement
(East Future Roadway Expansion Reclaimed Water Transmission Main)

This project has been identified for future funding for fiscal years to be determined for the design and construction of approximately 11,339 LF (by open cut) of 10-inch reclaimed water main (model elements P-1262, P-1263, P-1264) be constructed and phased in conjunction with the 2025 roadway construction. As part of the 2025 future roadway throroughfare plan, a road will be constructed from Clark Road eastward along the future roadway. This project main will connect to the proposed 20-inch main along the future roadway running north and south (CIP #14) and serve parcels owned by LT Partners LLP and the Sarasota County Board of County Commissioners. This project is projected to provide future planned residential developments with 0.89 mgd of reclaimed water to offset 0.44 mgd potable quality water. An additional benefit is the physical construction of the 10-inch transmission main which will allow for the continued expansion of the County's reclaimed water system to improve utilization.

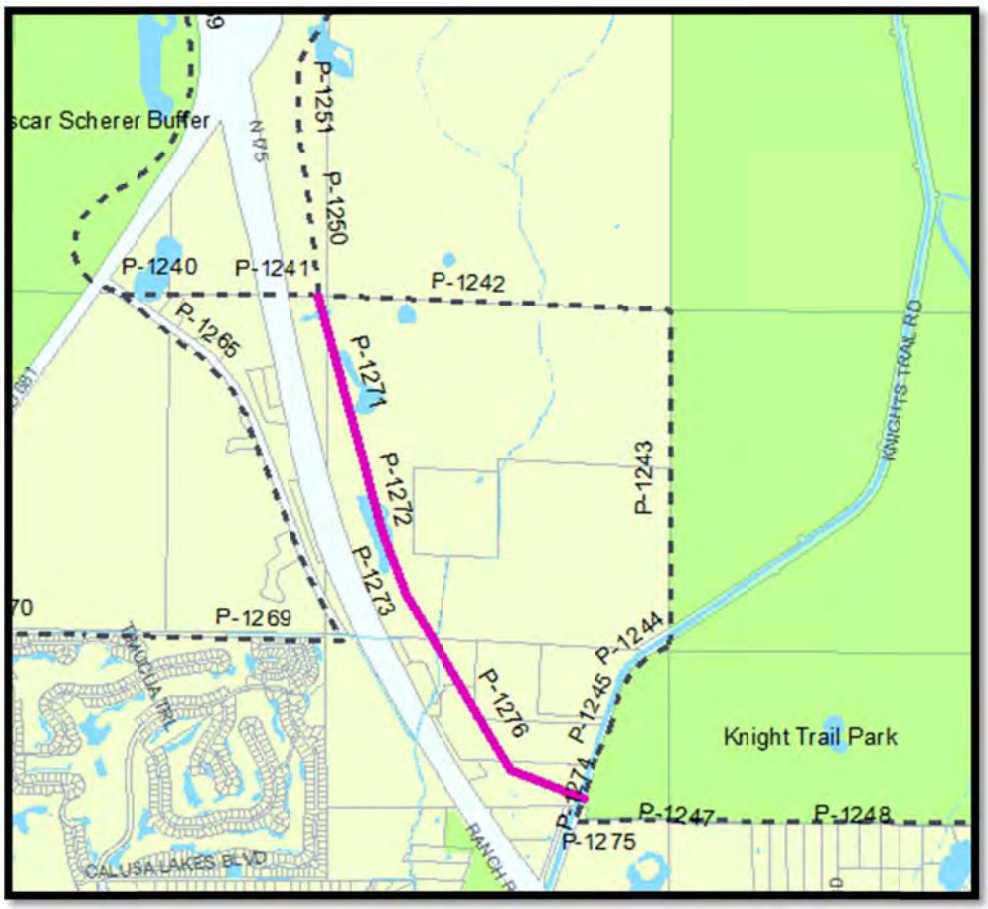
The associated cost with this project is estimated at $920,000, which includes construction, administrative, engineering, and contingency costs.



CIP #16 FY To Be Determined
Reclaimed Water Distribution System Improvement
(Sarasota County-City of Venice North/South Interconnect Reclaimed Water Transmission Main Loop)

This project has been identified for future funding for fiscal years to be determined for the design and construction of approximately 9,280 LF of 8-inch reclaimed water main (model elements P-1271, P-1272, P-1273, P-1276, by open cut) from the proposed 20-inch interconnect reclaimed water main using a phased approach. As part of the 2025 future roadway throroughfare plan, the road from Clark Road will continue southward to Rustic Road to serve three (3) McCann East LP parcels. The project is projected to provide 0.09 mgd of reclaimed water to offset 0.04 mgd potable quality water. An additional benefit is the physical construction of the 8-inch transmission main which will allow for the continued expansion of the County's reclaimed water system and create a system loop that will aid in delivery flows and pressures needed to provide reclaimed water to future developments or agricultural interests.

The associated cost with this project is estimated at $590,000, which includes construction, administrative, engineering, and contingency costs.



CIP #17 To Be Determined
Reclaimed Water Distribution System Improvement
(Nathan Benderson Park Reclaimed Water Transmission Main)

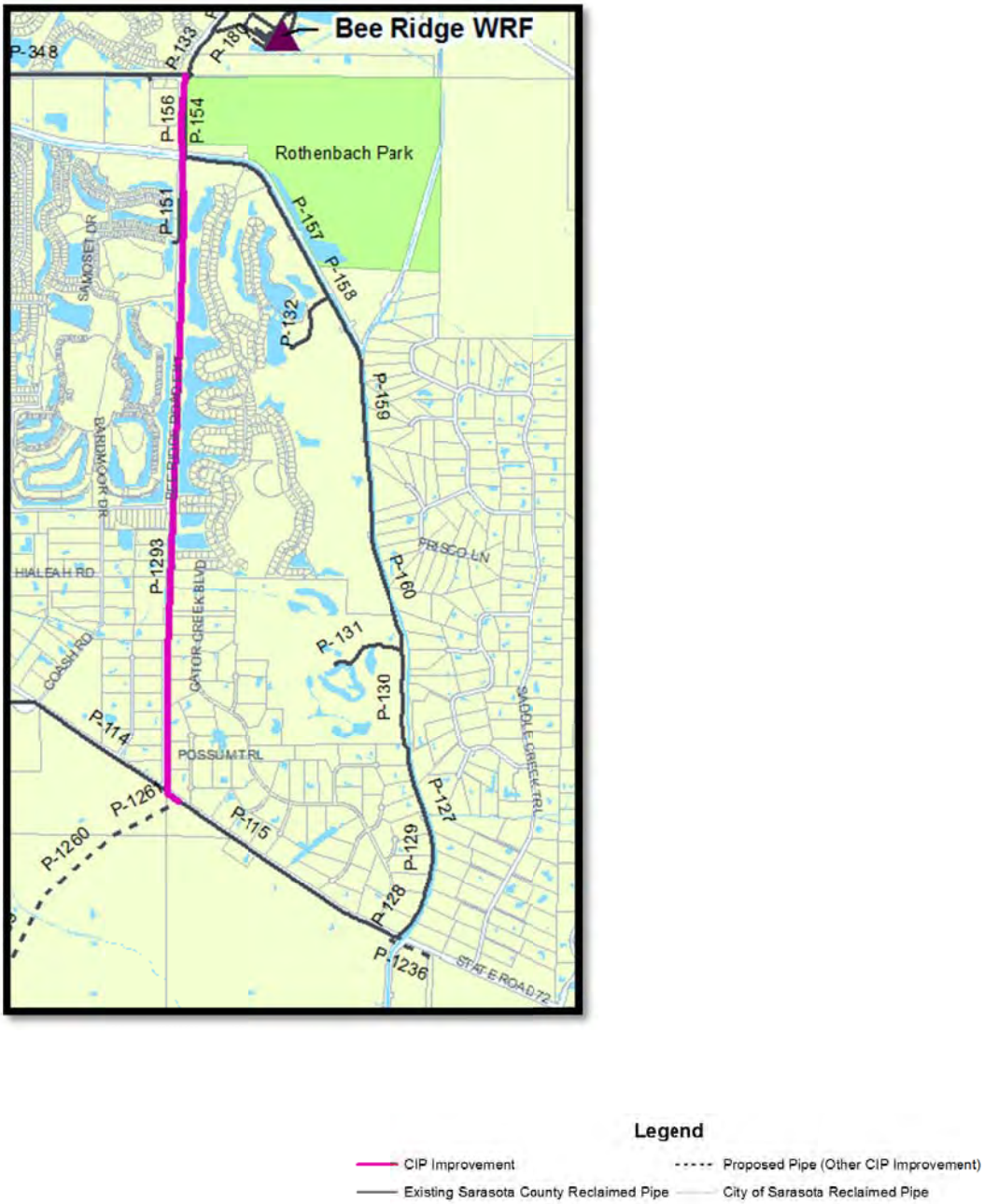
This project has been identified for future funding for fiscal years to be determined for the design and construction of a 10-inch reclaimed water main (model elements P-1222, P-1223, P-1224, P-1234, and P-1235) from the existing 8-inch main east along 17th street for approximately 2,302 LF (by horizontal directional drill); north along Honore Avenue approximately 1,976 LF (by horizontal directional drill); east 3,032 LF to Nathan Benderson Park (by open cut); north approximately 8,560 LF (by open cut) along Nathan Benderson Park; and northeast approximately 155 LF (by open cut). The total length of 10-inch reclaimed water main for this project is 16,025 LF and will serve the Nathan Benderson Park, Sarasota Interstate Park of Commerce and a potential customer Las Palmas Condominiums. The project is projected to provide at least 0.15 mgd reclaimed water to offset 0.08 mgd of potable quality water, with the potential to increase based on connection of existing developments in the area. The project should be constructed after the booster pump station (CIP #1) is constructed since there will be system limitations on the delivery of reclaimed water at the end of the proposed line based on future demands and the operation of the Atlantic Deep well.

The associated cost with this project is estimated at $1,730,000, which includes construction, administrative, engineering, and contingency costs.

CIP #18 FY To Be Determined
Reclaimed Water Distribution System Improvement
(Bee Ridge Rd Ext. Reclaimed Water Transmission Main for System Expansion)

This project has been identified for future funding for fiscal years to be determined for the design and construction of a 24-inch reclaimed water main (model element P-1293 and P-156, by open cut) from the existing 24-inch at the intersection of Bee Ridge Road and Bee Ridge Road Ext., approximately 15,037 LF south along Bee Ridge Road Extension to Clark Road. In order to increase flows within the north/south interconnect (CIP #5) and to provide adequate reclaimed water delivery pressures at system build-out, the construction of a new 24-inch reclaimed water main is recommended. The measurable benefit of the project is the physical construction of the 24-inch transmission main which will allow for the continued expansion of the County's reclaimed water system and enable the increased capability of beneficial use of reclaimed water.

The associated cost with this project is estimated at $3,790,000, which includes construction, administrative, engineering, and contingency costs.



CIP #19 FY 2015
Reclaimed Water Quality Study
(Reclaimed Water Nutrient Reduction Study)

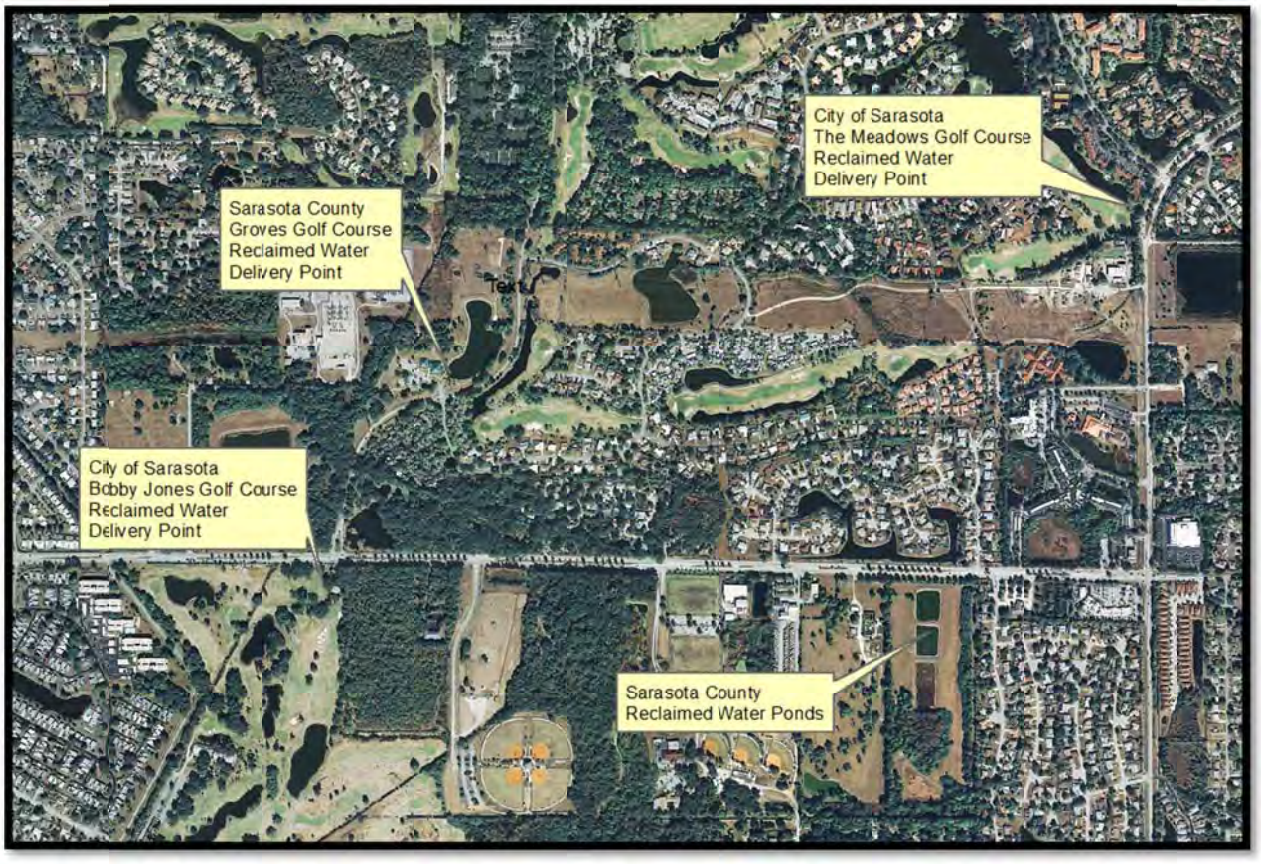
This project consists of an evaluation of the Bee Ridge and Central County Water Reclamation Facilities to determine changes in the facilities or system operating protocols to reduce the nitrogen and phosphorus levels in the reclaimed water. This hands-on study includes working with County staff to implement changes that enhance the way the plants operate and to optimize the different parts of the treatment process. Changes to existing equipment, sample collection and testing, along with developing a list of future improvements will all be part of the study. The benefit of the project will be in developing additional monitoring and controls for these key nutrients and thus reducing nutrients in applied reclaimed water.

The associated cost with this project is estimated at $80,000, which includes administrative, engineering, and contingency costs.

CIP #20 FY 2014
Meadowood and City of Sarasota Improvements
(Sarasota County – City of Sarasota Reclaimed Water Efficiency Improvements)

This project involves the City of Sarasota by having Sarasota County provide reclaimed water to the City's customer's Bobby Jones Golf Course, The Meadows Golf Course and City reclaimed water customers in and around the 17th Street park area thereby allowing the City to send an equal quantity of reclaimed water to developments in Lakewood Ranch. The project is projected to provide at least 0.11 mgd of potable quality water offset based on historical data for The Meadows Golf Course alone. Serving Bobby Jones Golf Course would only increase the offset and is yet to be determined but this project has the potential to allow the City to send an estimated additional 0.5 mgd – 1.0 mgd of reclaimed water to offset potable quality irrigation use by developments within Lakewood Ranch. The City's reclaimed water contains lower levels of Nitrogen and Phosphorous because their wastewater treatment facility treats to Advanced Wastewater Standards. Bradenton River Utilities needs to use this lower nutrient water within Manatee County as part of an overall protection strategy to control algae and water treatment cost within the City of Bradenton's Evers Reservoir. Discussions with the City of Sarasota will include a review of the current reclaimed water agreement between the City and the County along with further identification of the potential offsets.

The associated cost with this project is estimated at $2,300,000, which includes administrative, engineering, and contingency costs.



APPENDIX B

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References

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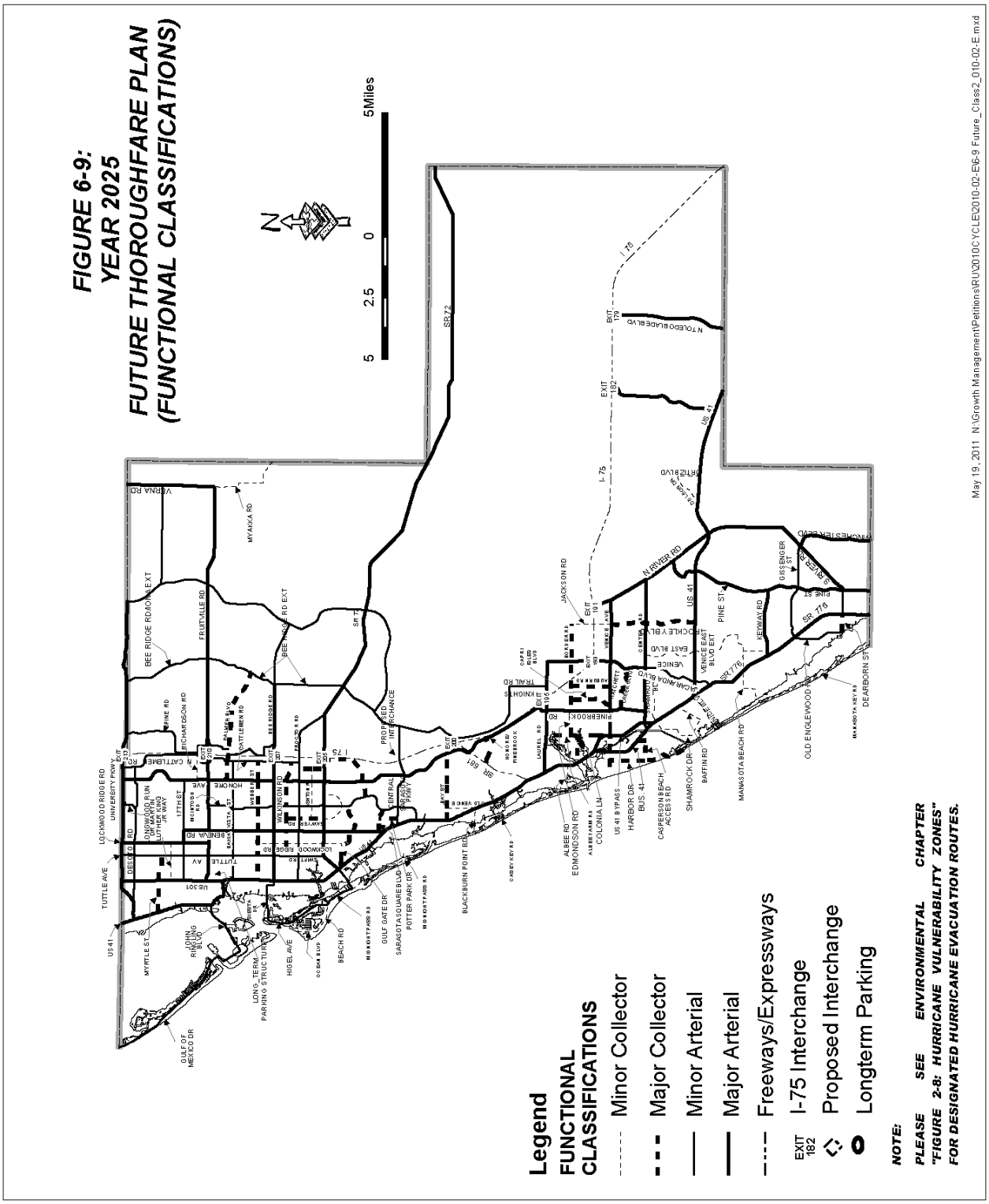
APPENDIX C

2025 FUTURE THOROUGHFARE PLAN

Figure 6-9: Year 2025 Future Thoroughfare Plan (Functional Classifications)



APPENDIX D

SARASOTA COUNTY MASTER REUSE SYSTEM PERMIT

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Herschel T. Vinyard Jr.
Secretary

STATE OF FLORIDA
DOMESTIC WASTEWATER FACILITY PERMIT

PERMITTEE:

Sarasota County Environmental Services

PERMIT NUMBER:	FL0177008
PA FILE NUMBER:	FL0177008-005-DW1R/NR
ISSUANCE DATE:	October 11, 2010
PA FILE NUMBER:	FL0177008-006-DWF/MM
REVISION DATE:	August 3, 2011
EXPIRATION DATE:	October 10, 2015

RESPONSIBLE AUTHORITY:

Mr. Verne Hall
Utilities Facilities Manager
1001 Sarasota Center Blvd.
Sarasota, FL 34240
vehall@scgov.net
(941) 232-6239

FACILITY:

Sarasota County North Master Reuse System (SCNMRS)
Sarasota County Environmental Services-Utilities
1001 Sarasota Center Blvd.
Sarasota, FL 34240
Sarasota County

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and applicable rules of the Florida Administrative Code (F.A.C.) and constitutes authorization to discharge to waters of the state under the National Pollutant Discharge Elimination System. The above named permittee is hereby authorized to operate the facilities shown on the application and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

REUSE:

Land Application: An existing 11.8 MGD annual average daily flow (AADF) permitted capacity slow-rate public access system (R-001) consisting of a general service area located in northern Sarasota County as defined by the map titled Permit Area North County Master Reuse Area 2003, Figure 2, dated 11/09/2003.

Reclaimed water meeting Part III public access standards is provided by two existing, separately-permitted Sarasota County Utilities operated wastewater treatment facilities, as follows:

Bee Ridge WRF - FLA013372 - up to 7.5 MGD AADF

Central County WRF - FLA013455 - up to 4.5 MGD AADF

Additional reclaimed water meeting the Part III public access standards may also be provided under agreement from the following source facilities outside of the Sarasota County Utilities systems:

City of Sarasota WWTP/Master Reuse System (R-002) - FL0040771- up to 2.0 MGD AADF

Current storage capacity of 290.6 MG is available both within the reuse system and at the county-owned source wastewater treatment facilities. Reject storage at the source plants is not included.

In addition, as alternative disposal, reclaimed water from the Sarasota County North Master Reuse System may be directed to the underground injection well described below.

Effluent quality is continuously monitored at the source wastewater treatment plants for turbidity as a measure of TSS and chlorine residual as a measure of disinfection effectiveness. For all source plants, the on-site and off-site storage is controlled, sequenced, and operated during staff and unstaffed periods according to procedures set forth in an Operating Protocol established for each source plant in order to assure maximum reliability and safeguards on the quality of the reclaimed water.

The Sarasota County Master Reuse System serves as a source facility for up to 2.0 MGD AADF transferred to the City of Sarasota Master Reuse System, (FL0040771), a Part III Public access master reuse system serving several golf courses and agricultural operations outside the city limits of Sarasota.

Intermittently Discharging Stormwater Storage Ponds for Part III Reclaimed Water:

Reclaimed water is stored in a stormwater storage lake system at Bent Tree GC Front, identified by monitoring group number D-001 and monitoring location number STM-01. STM-01 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Lake Sarasota. STM-01 is located at approximately latitude 27° 17' 43.68" N, longitude 82° 25' 6.16" W.

Reclaimed water is stored in a stormwater storage lake system at Bent Tree GC Back, identified by monitoring group number D-002 and monitoring location number STM-02. STM-02 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Lake Sarasota. STM-02 is located at approximately latitude 27° 17' 16.58" N, longitude 82° 25' 6.66" W.

Reclaimed water is stored in a stormwater storage lake system at Gator Creek GC, identified by monitoring group number D-003 and monitoring location number STM-03. STM-03 may intermittently discharge through a control structure during storm events to a pond system and ultimately to Cow Pen Slough. STM-03 is located at approximately latitude 27° 15' 53.94" N, longitude 82° 23' 23.26" W.

Reclaimed water is stored in a stormwater storage lake system at Heritage Oaks GC, identified by monitoring group number D-004 and monitoring location number STM-04. STM-04 may intermittently discharge through a control structure during storm events to a pond system and ultimately to Cow Pen Slough. STM-04 is located at approximately latitude 27° 17' 21.54" N, longitude 82° 24' 3.69" W.

Reclaimed water is stored in a stormwater storage lake system at Groves Reservoir, identified by monitoring group number D-005 and monitoring location number STM-05. STM-05 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Phillipe Creek. STM-05 is located at approximately latitude 27° 21' 22.41" N, longitude 82° 28' 50.62" W.

Reclaimed water is stored in a stormwater storage lake system at Founders Club West identified by monitoring group number D-006 and monitoring location number STM-06. STM-06 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Phillipe Creek. STM-06 is located at approximately latitude 27° 20' 15" N, longitude 82° 24' 1" W.

Reclaimed water is stored in a stormwater storage lake system at Founders Club East, identified by monitoring group number D-007 and monitoring location number STM-07. STM-07 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Phillipe Creek. STM-07 is located at approximately latitude 27° 20' 12" N, longitude 82° 23' 5.7" W.

Reclaimed water is stored in a stormwater storage lake system at TPC Golf Course, identified by monitoring group number D-008 and monitoring location number STM-08. STM-08 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Little Sarasota Bay. STM-08 is located at approximately latitude 27° 14' 91" N, longitude 82° 28' 56" W.

Reclaimed water is stored in a stormwater storage lake system at Village Walk North, identified by monitoring group number D-009 and monitoring location number STM-09. STM-09 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Little Sarasota Bay. STM-09 is located at approximately latitude 27° 14' 23" N, longitude 82° 27' 47" W.

Reclaimed water is stored in a stormwater storage lake system at Village Walk South, identified by monitoring group number D-010 and monitoring location number STM-10. STM-10 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Little Sarasota Bay. STM-10 **is** located at approximately latitude 27° 13' 73" N, longitude 82° 27 '46" W.

Reclaimed water is stored in a stormwater storage lake system at Isles of Sarasota SD, identified by monitoring group number D-011 and monitoring location number STM-11. STM-11 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Little Sarasota Bay. STM-11 is located at approximately latitude 27° 12' 68" N, longitude 82° 27' 40" W.

Reclaimed water is stored in a stormwater storage lake system at Stoneybrook Golf Course, identified by monitoring group number D-012 and monitoring location number STM-12. STM-12 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Little Sarasota Bay. STM-12 is located at approximately latitude 27° 12' 91" N, longitude 82° 28' 11" W.

Reclaimed water is stored in a stormwater storage lake system at Oaks Golf Club II, identified by monitoring group number D-013 and monitoring location number STM-13. STM-13 may intermittently discharge through a control structure during storm events to a ditch system and ultimately to Little Sarasota Bay. STM-13 is located at approximately latitude 27° 12' 35" N, longitude 82° 29' 34" W.

DISPOSAL:

Underground Injection: An existing 4.87 MGD peak hourly flow (PHF) permitted capacity underground injection well system U-001 consisting of one Class I underground injection well permitted under Department permit number 040039-008-UO, discharging to Class G-IV ground water. Underground injection well system U-001 is located approximately at latitude 27 ° 18' 54" N, longitude 82 ° 28' 10" W.

The parameters required to be monitored for the UIC well; CBOD (5day), Total Suspended Solids, and pH are sampled at the individual source wastewater facilities and reported on their respective DMRs.

IN ACCORDANCE WITH: The limitations, monitoring requirements, and other conditions set forth in Pages 1 through 19 of this permit.

I. RECLAIMED WATER AND EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Reuse and Land Application Systems

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to direct reclaimed water to Reuse System R-001 and Underground Injection Well U-001. Such reclaimed water shall be limited and monitored by the permittee as specified below:

			Reclaimed Water Limitations				Monitoring Requirements			
Parameter	Units	Max/Min	Annual Average	Monthly Average	Weekly Average	Single Sample	Monitoring Frequency	Sample Type	Monitoring Location Site Number	Notes
Flow (Total Flow, SCNMRS)	MGD	Maximum	11.8	Report	-	-	Monthly	Calculation	FLW-01	-
Flow (From Bee Ridge WRF)	MGD	Maximum	Report	Report	-	-	Continuous	Meter	FLW-02	See Cond.I.A.4
Flow (From Central County WRF)	MGD	Maximum	Report	Report	-	-	Continuous	Meter	FLW-03	See Cond.I.A.4
Flow (To U-001)	MGD	Maximum	4.87	Report	-	-	Continuous	Meter	FLW-06	See Cond.I.A.4
Flow (From City of Sarasota)	MGD	Maximum	2.0	Report	-	-	Continuous	Meter	FLW-07	See Cond.I.A.4

2. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to direct reclaimed water to the City of Sarasota's Public Access reuse system. Such reclaimed water shall be limited and monitored by the permittee as specified below:

			Reclaimed Water Limitations				Monitoring Requirements			
Parameter	Units	Max/Min	Annual Average	Monthly Average	Weekly Average	Single Sample	Monitoring Frequency	Sample Type	Monitoring Location Site Number	Notes
Flow (To the City of Sarasota)	MGD	Maximum	2.0	Report	-	-	Continuous	Meter	FLW-10	See Cond.I.A.4

3. Reclaimed water samples shall be taken at the monitoring site locations listed in Permit Condition I. A. 1. and as described below:

Monitoring Location	Description of Monitoring Location
FLW-01	Total flow to R-001, Calculated [(FLW-02 + FLW-03 + FLW-07) – (FLW-06 + FLW-10)]
FLW-02	Total flow contribution from Bee Ridge WRF
FLW-03	Total flow contribution from Central County WRF
FLW-06	Total flow returned to deep injection well U-001
FLW-07	Total flow from the City of Sarasota
FLW-10	Total flow to the City of Sarasota

4. Recording flow meters and totalizers shall be utilized to measure flow and calibrated at least annually. *[62-601.200(17) and .500(6)]*

5. Discharge of reclaimed water to the lakes listed in the table below shall only occur when the elevation of the water in each lake is less than the corresponding control elevation listed in the table below. A list of all days during a month on which discharges from each lake to the receiving water body occurred shall be attached to the DMR form. For each day on which discharge occurred, the approximate number of hours of discharge shall be noted. *[62-610.830(1) and (3)]*

Monitoring Location Site Number	**Name of Storage Lake/Description of Monitoring Location**	**Control Elevation (ft. M.S.L.)**	**Receiving Water Body**
STM-01	Bent Tree Front – D-001		Lake Sarasota
STM-02	Bent Tree Back –D-002		Lake Sarasota
STM-03	Gator Creek – D-003		Cow Pen Slough
STM-04	Heritage Oaks – D-004		Cow Pen Slough
STM-05	Groves Reservoir – D-005		Phillipe Creek
STM-06	Founders Club West – D-006		Phillipe Creek
STM-07	Founders Club East –D-007		Phillipe Creek
STM-08	TPC Golf Course–D-008		Little Sarasota Bay
STM-09	Village Walk North–D-009		Little Sarasota Bay
STM-10	Village Walk South–D-010		Little Sarasota Bay
STM-11	Isles of Sarasota SD–D-011		Little Sarasota Bay
STM-12	Stoneybrook Golf Course–D-012		Little Sarasota Bay
STM-13	Oaks Golf Club II–D-013		Little Sarasota Bay

6. The source treatment facilities shall be operated in accordance with all approved operating protocols. Only reclaimed water that meets the criteria established in the approved operating protocols may be released to system storage or to the reuse system. Reclaimed water that fails to meet the criteria in the approved operating protocols shall be directed to each facilities permit designated reject location. The operating protocols shall be reviewed and updated periodically to ensure continuous compliance with the minimum treatment and disinfection requirements. Updated operating protocols shall be submitted to the Department for review and approval upon revision of the operating protocols and with each permit application. *[62-610.320(6) and 62-610.463(2)]*

7. Parameters which must be monitored as a result of a surface water discharge shall be analyzed using a sufficiently sensitive method to assure compliance with applicable water quality standards and effluent limitations in accordance with 40 CFR (Code of Federal Regulations) Part 136. Parameters which must be monitored as a result of a ground water discharge (i.e., underground injection or land application system) shall be analyzed in accordance with Chapter 62-601, F.A.C. All monitoring shall be representative of the monitored activity. *[62-620.320(6)]*

8. The permittee shall provide safe access points for obtaining representative influent, reclaimed water, and effluent samples which are required by this permit. *[62-601.500(5)]*

9. Monitoring requirements under this permit are effective on the first day of the second month following permit issuance. Until such time, the permittee shall continue to monitor and report in accordance with previously effective permit requirements, if any. During the period of operation authorized by this permit, the permittee shall complete and submit to the Department Discharge Monitoring Reports (DMRs) in accordance with the frequencies specified by the REPORT type (i.e., monthly, toxicity, quarterly, semiannual, annual, etc.) indicated on the DMR forms attached to this permit. Monitoring results for each monitoring period shall be submitted in accordance with the associated DMR due dates below, unless specified otherwise in the permit.

REPORT Type	Monitoring Period	Due Date
Monthly or Toxicity	first day of month – last day of month	28th day of following month
Quarterly	January 1 - March 31 April 1 – June 30 July 1 – September 30 October 1 – December 31	April 28 July 28 October 28 January 28
Semiannual	January 1 – June 30 July 1 – December 31	July 28 January 28
Annual	January 1 – December 31	January 28

DMRs shall be submitted for each required monitoring period including months of no discharge. The permittee shall make copies of the attached DMR form(s) and shall submit the completed DMR form(s) to the Department at the address specified in Permit Condition I.A. 22 by the twenty-eighth (28th) of the month following the month of operation.

Originals to:
Florida Department of Environmental Protection
Wastewater Compliance Evaluation Section, Mail Station 3551
Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Copies to:
Florida Department of Environmental Protection
Domestic Wastewater Program
Southwest District Office
13051 N. Telecom Parkway
Temple Terrace, FL 33637-0926

[62-620.610(18)][62-601.300(1), (2), and (3)]

10. The permittee shall submit an Annual Reuse Report using DEP Form 62-610.300(4)(a)2. on or before January 1 of each year. *[62-610.870(3)]*

11. The permittee shall maintain an inventory of storage systems. The inventory shall be submitted to the Department at least 30 days before reclaimed water will be introduced into any new storage system. The inventory of storage systems shall be attached to the annual submittal of the Annual Reuse Report. *[62-610.464(5)]*

12. Unless specified otherwise in this permit, all reports and other information required by this permit, including 24-hour notifications, shall be submitted to or reported to, as appropriate, the Department's Southwest District Office at the address specified below:

Southwest District Office
13051 N. Telecom Parkway
Temple Terrace, FL 33637-0926

Phone Number - 813-632-7600
FAX Number - 813-632-7662

All FAX copies shall be followed by original copies. All reports and other information shall be signed in accordance with the requirements of Rule 62-620.305, F.A.C. *[62-620.305]*

II. RESIDUALS MANAGEMENT REQUIREMENTS

This section is not applicable to this facility.

III. GROUND WATER REQUIREMENTS

Operational Requirements

1. For the Part III Public Access system, all ground water quality criteria specified in Chapter 62-520, F.A.C., shall be met at the edge of the zone of discharge. The zone of discharge shall extend horizontally 100 feet from the application site or to user's site property line, whichever is less, and vertically to the base of the surficial aquifer. *[62-520.200(27)] [62-520.465]*

2. The ground water minimum criteria specified in Rule 62-520.400 F.A.C., shall be met within the zone of discharge. *[62-520.400 and 62-520.420(4)]*

3. During the period of operation authorized by this permit, the permittee shall sample ground water in accordance with this permit and the approved ground water monitoring plan prepared in accordance with Rule 62-520.600, F.A.C. *[62-520.600][62-610.463(3)]*

4. The following monitoring wells shall be sampled in accordance with the monitoring frequencies specified in Permit Condition III.5. for Reuse System R-001. Quarterly sampling must be reasonably spaced to be representative of potentially changing conditions.

Monitoring Well ID	Alternate Well Name and/or Description of Monitoring Location	Depth (Feet)	Aquifer Monitored	New or Existing
MWC-GC-6	GC-6, Gator Creek Golf Course	16.45	Surficial	existing
MWI-GC-7	GC-7, Gator Creek Golf Course	16.9	Surficial	existing
MWI-MC-9	MC-9, Misty Creek Golf Course	13.5	Surficial	existing
MWB-LO-1	LO-1, Laurel Oaks Golf Course	14.4	Surficial	existing
MWC-LO-2	LO-2, Laurel Oaks Golf Course	17.0	Surficial	existing
MWC-LO-3	LO-3, Laurel Oaks Golf Course	14.3	Surficial	existing
MWC-LO-4	LO-4, Laurel Oaks Golf Course	16.5	Surficial	existing
MWC-LO-5	LO-5, Laurel Oaks Golf Course	14.4	Surficial	existing
MWC-MW-1A	MW-1A, Hammock Place	17.2	Surficial	existing
MWI-MW-2A	MW-2A, Highlands Golf Course	20.5	Surficial	existing
MWC-MW-3A	MW-3A, Groves Golf Course	24.4	Surficial	existing
MWB-UG-1	UG-1, TPC Golf Course	18.4	Surficial	existing

Monitoring Well ID	Alternate Well Name and/or Description of Monitoring Location	Depth (Feet)	Aquifer Monitored	New or Existing
MWC-MW-9	MW-9, Oaks Golf Course	18.9	Surficial	existing
MWI-RH-1	RH-1, Red Hawk Reserve	18.0	Surficial	existing

MWB = Background; MWI = Intermediate; MWC = Compliance

[62-520.600][62-610.463]

5. The following parameters shall be analyzed for each of the monitoring wells identified in Permit Condition III. 4:

Parameter	Compliance Well Limit	Units	Sample Type	Monitoring Frequency
Water Level Relative to NGVD	Report	FEET	In-situ	Quarterly
Nitrogen, Nitrate, Total (as N)	10	MG/L	Grab	Quarterly
Solids, Total Dissolved (TDS)	500	MG/L	Grab	Quarterly
Arsenic, Total Recoverable	10	UG/L	Grab	Quarterly
Chloride (as Cl)	250	MG/L	Grab	Quarterly
Cadmium, Total Recoverable	5	UG/L	Grab	Quarterly
Chromium, Total Recoverable	100	UG/L	Grab	Quarterly
Lead, Total Recoverable	15	UG/L	Grab	Quarterly
Coliform, Fecal	4	#/100ML	Grab	Quarterly
pH*	6.5 to 8.5	SU	In-Situ	Quarterly
Sulfate, Total	250	MG/L	Grab	Quarterly
Turbidity*	Report	NTU	In-Situ	Quarterly
Sodium, Total Recoverable	160	MG/L	Grab	Quarterly
Specific Conductance*	Report	UMHO/CM	In-Situ	Quarterly
Temperature (C), Water*	Report	DEG.C	In-Situ	Quarterly
Oxygen, Dissolved (DO)*	Report	MG/L	In-Situ	Quarterly

* The field parameters shall be sampled per DEP–SOP-001/01, FS 2200 Groundwater Sampling and recorded, (see Figure FS 2200-2 Groundwater Purging Procedure and Form FD 9000-24, Groundwater Sampling Log). The field parameters to be reported on Part D of GW DMR shall be the last sample recorded.

[62-520.600(11)(b)] [62-601.300(3), 62-601.700, and Figure 3 of 62-601][62-601.300(6)] [62-520.310(5)]

6. If the concentration for any constituent listed in Permit Condition III. 5. in the natural background quality of the ground water is greater than the stated maximum, or in the case of pH is also less than the minimum, the representative natural background quality shall be the prevailing standard. *[62-520.420(2)]*

7. In accordance with Part D of Form 62-620.910(10), water levels shall be recorded before evacuating wells for sample collection. Elevation references shall include the top of the well casing and land surface at each well site (NGVD allowable) at a precision of plus or minus 0.1 foot. *[62-520.600(11)(c)]*

8. Ground water monitoring wells shall be purged prior to sampling to obtain representative samples. *[62-601.700(5)]*

9. Analyses shall be conducted on unfiltered samples, unless filtered samples have been approved by the Department's Southwest District Office as being more representative of ground water conditions. *[62-520.310(5)]*

10. Ground water monitoring parameters shall be analyzed in accordance with Chapter 62-601, F.A.C. *[62-610.320(3) and 62-620.610(18)]*

11. For permit renewal, the permittee shall submit, to the Southwest District Office, the results of sampling monitoring wells specified in the Department-approved monitoring plan for the primary and secondary drinking water parameters included in Chapter 62-550, F.A.C., (excluding asbestos, acrylamide, Dioxin, butachlor, epichlorohydrin, pesticides, and PCBs, unless reasonably expected to be a constituent of the discharge or an artifact of the site). Additional volatile and semivolatile parameters as specified in the ground water monitoring plan or permit shall be analyzed. Sampling shall occur no sooner than 180 days before submittal of the renewal application. *[62-520.600(5)(b)]*

12. Ground water monitoring test results shall be submitted on Part D of Form 62-620.910(10). For reuse or land application projects, results shall be submitted with the DMR for each month listed in the following schedule. The submitted results shall be for each year during the period of operation allowed by this permit in accordance with Permit Condition I.A.18. *[62-520.600(11)(b)] [62-601.300(3), 62.601.700, and Figure 3 of 62-601] [62-620.610(18)]*

SAMPLE PERIOD	REPORT DUE DATE
January - March	April 28
April - June	July 28
July - September	October 28
October - December	January 28

13. If any monitoring well becomes inoperable or damaged to the extent that sampling or well integrity may be affected, the permittee shall notify the Department's Southwest District Office within two business days from discovery, and a detailed written report shall follow within ten days after notification to the Department. The written report shall detail what problem has occurred and remedial measures that have been taken to prevent recurrence or request approval for replacement of the monitoring well. All monitoring well design and replacement shall be approved by the Department before installation. *[62-520.600(6)(l)]*

14. All piezometers and wells that are not reasonably expected to be used are to be plugged and abandoned in accordance with subsection 62-532.500(4), F.A.C. The permittee shall submit a written report to the Department's office that issued the permit providing verification of the plugging including the well abandonment log when available; *[62-520.600(6)(k)]*

IV. ADDITIONAL REUSE AND LAND APPLICATION REQUIREMENTS

Part III Public Access System (R-001)

1. Use of reclaimed water is authorized within the general service area identified in the attached map. The following uses of reclaimed water are authorized within this general service area: Aesthetic Purposes (decorative ponds, pools, and fountains), Athletic Complexes and Parks, Business, Commercial and Industrial Parks, Construction Dust Control, Fire Protection, Golf Course Irrigation, Golf Courses, Other Landscape Irrigation, Residential Developments, Residential Irrigation, Retail Nurseries, Ferneries, and Sod Farms, Toilet Flushing. *[62-620.630(10)(d)]*

2. This reuse system includes the following major users (i.e., using 0.1 MGD or more of reclaimed water):

User Name	User Type	Capacity (MGD)	Acreage
Sunrise Golf Club	Golf Courses	0.220	110
Oaks Golf Course	Golf Courses	0.460	230
TPC Golf Course at Prestancia	Golf Courses	0.360	180
Stoneybrook Golf & CC	Golf Courses	0.390	195
Turtle Rock	Residential Developments	1.156	578
Bent Tree Golf Course	Golf Courses	0.240	120
Laurel Oak Estates Golf Club	Golf Courses	0.500	250
Misty Creek Golf Course	Golf Courses	0.692	346

User Name	User Type	Capacity (MGD)	Acreage
Gator Creek Golf Club	Golf Courses	0.450	225
Sarasota Golf Club	Golf Courses	0.344	172
Highlands Front Nine Golf Course	Golf Courses	0.122	61
Groves Golf Course	Golf Courses	0.116	58
Meadowood Utility Site	Construction Dust Control	0.122	61
Twin Lakes Park	Athletic Complexes and Parks	0.246	123
Village Walk	Residential Developments	0.384	192
Serenoa Golf Club	Golf Courses	0.200	100
Palmer Park of Commerce	Business, Commercial and Industrial Parks	0.480	240
Golf PUD	Golf Courses	0.460	230
Bayside Sod Farm	Retail Nurseries, Ferneries, and Sod Farms	0.600	300
Saddle Creek Residential Development	Residential Developments	1.00	500
Bent Tree Residential Development	Residential Developments	0.700	350
Laurel Oak Residential Development	Residential Developments	0.2	100
Lake Sarasota Residential Develop me	Residential Developments	0.440	220
Misty Creek Residential Development	Residential Developments	0.220	110
Heritage Oaks Resid/ GC	Golf Courses	0.364	182
Laurel Lakes Residential Development	Residential Developments	0.366	183
Bee Ridge Landfill	Other Landscape Irrigation	0.300	150
Sarasota Square Mall	Other Landscape Irrigation	0.178	89
Oaks I Homeowners Association	Residential Developments	0.210	105
The Hamptons	Residential Developments	0.286	143
Pelican Cove	Residential Developments	0.150	75
Glenridge at Palmer Ranch	Residential Developments	0.180	90
Foxfire GC & Residential	Golf Courses	0.400	200
Silver Oak Ventures	Residential Developments	0.388	194
The Founders Club	Golf Courses	1.420	710
Savoy at Palmer Ranch	Residential Developments	0.110	55
Sarasota Memorial Hospital	Other Landscape Irrigation	0.160	80

[62-610.800(5)][62-620.630(10)(b)]

3. New major users of reclaimed water (i.e., using 0.1 MGD or more) may be added to the reuse system using the general permit described in Rule 62-610.890, F.A.C., if the requirements in this rule are complied with. Application for use of this general permit shall be made using Form 62-610.300(4)(a)1. *[62-610.890]*

4. Cross-connections to the potable water system are prohibited. *[62-610.469(7)]*

5. A cross-connection control program shall be implemented and/or remain in effect within the areas where reclaimed water will be provided for use. *[62-610.469(7)]*

6. The permittee shall conduct inspections within the reclaimed water service area to verify proper connections, to minimize illegal cross-connections, and to verify the proper use of reclaimed water. Inspections are required when a customer first connects to the reuse distribution system. Subsequent inspections are required as specified in the cross-connection control and inspection program. *[62-610.469(7)(h)]*

7. If a cross-connection between the potable and reclaimed water systems is discovered, the permittee shall:

   a. Immediately discontinue potable water and/or reclaimed water service to the affected area.

b. If the potable water system is contaminated, clear the potable water lines.

c. Eliminate the cross-connection.

d. Test the affected area for other possible cross-connections.

e. Within 24 hours, notify the Southwest District Office's domestic wastewater and drinking water programs.

f. Within 5 days of discovery of a cross-connection, submit a written report to the Department detailing: a description of the cross-connection, how the cross-connection was discovered, the exact date and time of discovery, approximate time that the cross-connection existed, the location, the cause, steps taken to eliminate the cross-connection, whether reclaimed water was consumed, and reports of possible illness, whether the drinking water system was contaminated and the steps taken to clear the drinking water system, when the cross-connection was eliminated, plan of action for testing for other possible cross-connections in the area, and an evaluation of the cross-connection control and inspection program to ensure that future cross-connections do not occur. *[62-555.350(3) and 62-555.360][62-620.610(20)]*

8. Maximum obtainable separation of reclaimed water lines and potable water lines shall he provided and the minimum separation distances specified in Rule 62-610.469(7), F.A.C., shall be provided. Reuse facilities shall be color coded or marked. Underground piping which is not manufactured of metal or concrete shall be color coded using Pantone Purple 522C using light stable colorants. Underground metal and concrete pipe shall be color coded or marked using purple as the predominant color. *[62-610.469(7)]*

9. In constructing reclaimed water distribution piping, the permittee shall maintain a 75-foot setback distance from a reclaimed water transmission facility to public water supply wells. No setback distances are required to other potable water supply wells or to any nonpotable water supply wells. *[62-610.471(3)]*

10. A setback distance of 75 feet shall be maintained between the edge of the wetted area and potable water supply wells, unless the utility adopts and enforces an ordinance prohibiting potable water supply wells within the reuse service area. No setback distances are required to any nonpotable water supply well, to any surface water, to any developed areas, or to any private swimming pools, hot tubs, spas, saunas, picnic tables, barbecue pits, or barbecue grills. *[62-610.471(1), (2), (5), and (7)]*

11. Reclaimed water shall not be used to fill swimming pools, hot tubs, or wading pools. *[62-610.469(4)]*

12. Low trajectory nozzles, or other means to minimize aerosol formation shall be used within 100 feet from outdoor public eating, drinking, or bathing facilities. *[62-610.471(6)]*

13. A setback distance of 100 feet shall be maintained from indoor aesthetic features using reclaimed water to adjacent indoor public eating and drinking facilities. *[62-610.471(8)]*

14. The public shall be notified of the use of reclaimed water. This shall be accomplished by posting of advisory signs in areas where reuse is practiced, notes on scorecards, or other methods. *[62-610.468(2)]*

15. All new advisory signs and labels on vaults, service boxes, or compartments that house hose bibbs along with all labels on hose bibbs, valves, and outlets shall bear the words "do not drink" and "no beber" along with the equivalent standard international symbol. In addition to the words "do not drink" and "no beber," advisory signs posted at storage ponds and decorative water features shall also bear the words "do not swim" and "no nadar" along with the equivalent standard international symbols. Existing advisory signs and labels shall be retrofitted, modified, or replaced in order to comply with the revised wording requirements. For existing advisory signs and labels this retrofit, modification, or replacement shall occur within 365 days after the date of this permit. For labels on existing vaults, service boxes, or compartments housing hose bibbs this retrofit, modification, or replacement shall occur within 730 days after the date of this permit. *[62-610.468 & 62-610.469]*

16. The permittee shall ensure that users of reclaimed water are informed about the origin, nature, and characteristics of reclaimed water; the manner in which reclaimed water can be safely used; and limitations on the use of reclaimed water. Notification is required at the time of initial connection to the reclaimed water distribution system and annually after the reuse system is placed into operation. A description of on-going public notification activities shall be included in the Annual Reuse Report. *[62-610.468(6)]*

17. Routine aquatic weed control and regular maintenance of storage pond embankments and access areas are required. *[62-610.414 & 62-610.464]*

18. Overflows from emergency discharge facilities on storage ponds shall be reported as an abnormal event to the Department's Southwest District Office within 24 hours of an occurrence. The provisions of Rule 62-610.800(9), F.A.C., shall be met. *[62-610.800(9)]*

V. OPERATION AND MAINTENANCE REQUIREMENTS

1. During the period of operation authorized by this permit, the Sarasota County North Master Reuse System shall be operated under the supervision of a(n) operator(s) certified in accordance with Chapter 62-602, F.A.C. In accordance with Chapter 62-699, F.A.C. The Sarasota County North Master Reuse System shall be operated under the supervision of the Sarasota County Utilities' Operations Division and in accordance with the requirements of the approved Operating Protocol.

   [62-620.630(3)] [62-699.310] [62-610.462]

2. The application to renew this permit shall include an updated capacity analysis report prepared in accordance with Rule 62-600.405, F.A.C. *[62-600.405(5)]*

3. The application to renew this permit shall include a detailed operation and maintenance performance report prepared in accordance with Rule 62-600.735, F.A.C. *[62-600.735(1)]*

4. The permittee shall maintain the following records and make them available for inspection at the Sarasota County utilities administrative offices.

   a. Records of all compliance monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation and a copy of the laboratory certification showing the certification number of the laboratory, for at least three years from the date the sample or measurement was taken;

   b. Copies of all reports required by the permit for at least three years from the date the report was prepared;

   c. Records of all data, including reports and documents, used to complete the application for the permit for at least three years from the date the application was filed;

   d. Monitoring information, including a copy of the laboratory certification showing the laboratory certification number, related to the residuals use and disposal activities for the time period set forth in Chapter 62-640, F.A.C., for at least three years from the date of sampling or measurement;

   e. A copy of the current permit;

   f. A copy of the current operation and maintenance manual as required by Chapter 62-600,. F.A.C.;

   g. A copy of the facility record drawings;

   h. Copies of the licenses of the current certified operators; and

i. Copies of the logs and schedules showing plant operations and equipment maintenance for three years from the date of the logs or schedules. The logs shall, at a minimum, include identification of the plant; the signature and certification number of the operator(s) and the signature of the person(s) making any entries; date and time in and out; specific operation and maintenance activities; tests performed and samples taken; and major repairs made. The logs shall be maintained on-site in a location accessible to 24-hour inspection, protected from weather damage, and current to the last operation and maintenance performed.

[62-620.350]

VI. SCHEDULES

1. The permittee shall adhere to the following schedule:

	Implementation Step	Completion Date
1.	Install monitoring devices, implement a reporting protocol and provide the control elevations with longitudes and latitudes and begin reporting for all intermittently discharging stormwater storage ponds for Part III Reclaimed Water.	Within 30 months of permit issuance.
2.	Submit an addendum to the approved ground water monitoring plan for Department approval to address which wells that will be sampled in accordance with Specific Condition III.11. The addendum must include justification for the selected wells and must be approved by the Department prior to sampling.	No later than 360 days before the permit expires.

VII. INDUSTRIAL PRETREATMENT PROGRAM REQUIREMENTS

This facility is not required to have a pretreatment program at this time. *[62-625.500]*

VIII. OTHER SPECIFIC CONDITIONS

1. The permittee shall apply for renewal of this permit at least 180 days before the expiration date of the permit using the appropriate forms listed in Rule 62-620.910, F.A.C., including submittal of the appropriate processing fee set forth in Rule 62-4.050, F.A.C. The existing permit shall not expire until the Department has taken final action on the application renewal in accordance with the provisions of 62-620.335(3) and (4), F.A.C. *[62-620.335(1)-(4)]*

2. Florida water quality criteria and standards shall not be violated as a result of any discharge or land application of reclaimed water or residuals from this facility. *[62-620.320(9) and 62-302.500(2)(e)][62-610.850(1)(a) and (2)(a)]*

3. In the event that the treatment facilities or equipment no longer function as intended, are no longer safe in terms of public health and safety, or odor, noise, aerosol drift, or lighting adversely affects neighboring developed areas at the levels prohibited by Rule 62-600.400(2)(a), F.A.C., corrective action (which may include additional maintenance or modifications of the permitted facilities) shall be taken by the permittee. Other corrective action may be required to ensure compliance with rules of the Department. Additionally, the treatment, management, use or land application of residuals shall not cause a violation of the odor prohibition in Rule 62-296.320(2), F.A.C. *[62-600.410(8) and 62-640.400(6)]*

4. The deliberate introduction of stormwater in any amount into collection/transmission systems designed solely for the introduction (and conveyance) of domestic/industrial wastewater; or the deliberate introduction of stormwater into collection/transmission systems designed for the introduction or conveyance of combinations of storm and

domestic/industrial wastewater in amounts which may reduce the efficiency of pollutant removal by the treatment plant is prohibited, except as provided by Rule 62-610.472, F.A.C. *[62-604.130(3)]*

5. Collection/transmission system overflows shall be reported to the Department in accordance with Permit Condition IX. 20. *[62-604.550] [62-620.610(20)]*

6. The operating authority of a collection/transmission system and the permittee of a treatment plant are prohibited from accepting connections of wastewater discharges which have not received necessary pretreatment or which contain materials or pollutants (other than normal domestic wastewater constituents):

   a. Which may cause fire or explosion hazards; or

   b. Which may cause excessive corrosion or other deterioration of wastewater facilities due to chemical action or pH levels; or

   c. Which are solid or viscous and obstruct flow or otherwise interfere with wastewater facility operations or treatment; or

   d. Which result in the wastewater temperature at the introduction of the treatment plant exceeding 40°C or otherwise inhibiting treatment; or

   e. Which result in the presence of toxic gases, vapors, or fumes that may cause worker health or safety problems.

   [62-604.130(5)]

7. The treatment facility, storage ponds, rapid infiltration basins, and/or infiltration trenches shall be enclosed with a fence or otherwise provided with features to discourage the entry of animals and unauthorized persons. *[62-600.400(2)(b)]*

8. Screenings and grit removed from the wastewater facilities shall be collected in suitable containers and hauled to a Department approved Class I landfill or to a landfill approved by the Department for receipt/disposal of screenings and grit. *[62-701.300(1)(a)]*

9. The Permittee shall provide verbal notice to the Department as soon as practical after discovery of a sinkhole within an area for the management or application of wastewater, wastewater residuals (sludges), or reclaimed water. The Permittee shall immediately implement measures appropriate to control the entry of contaminants, and shall detail these measures to the Department in a written report within 7 days of the sinkhole discovery. *[62-4.070(3)]*

10. The permittee shall provide adequate notice to the Department of the following:

    a. Any new introduction of pollutants into the facility from an industrial discharger which would be subject to Chapter 403, F.S., and the requirements of Chapter 62-620, F.A.C. if it were directly discharging those pollutants; and

    b. Any substantial change in the volume or character of pollutants being introduced into that facility by a source which was identified in the permit application and known to be discharging at the time the permit was issued.

       Adequate notice shall include information on the quality and quantity of effluent introduced into the facility and any anticipated impact of the change on the quantity or quality of effluent or reclaimed water to be discharged from the facility.

       [62-620.625(2)]

IX. GENERAL CONDITIONS

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are binding and enforceable pursuant to Chapter 403, Florida Statntes. Any permit noncompliance constitutes a violation of Chapter 403, Florida Statutes, and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision. *[62-620.610(1)]*

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviations from the approved drawings, exhibits, specifications or conditions of this permit constitutes grounds for revocation and enforcement action by the Department. *[62-620.610(2)]*

3. As provided in Subsection 403.087(6), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor authorize any infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit or authorization that may be required for other aspects of the total project which are not addressed in this permit. *[62-620.610(3)]*

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title. *[62-620.610(4)]*

5. This permit does not relieve the permittee from liability and penalties for harm or injury to human health or welfare, animal or plant life, or property caused by the construction or operation of this permitted source; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. *[62-620.610(5)]*

6. If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee shall apply for and obtain a new permit. *[62-620.610(6)]*

7. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. *[62-620.610(7)]*

8. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit revision, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. *[62-620.610(8)]*

9. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, including an authorized representative of the Department and authorized EPA personnel, when applicable, upon presentation of credentials or other documents as may be required by law, and at reasonable times, depending upon the nature of the concern being investigated, to:

   a. Enter upon the permittee's premises where a regulated facility, system, or activity is located or conducted, or where records shall be kept under the conditions of this permit;

   b. Have access to and copy any records that shall be kept under the conditions of this permit;

   c. Inspect the facilities, equipment, practices, or operations regulated or required under this permit; and

d. Sample or monitor any substances or parameters at any location necessary to assure compliance with this permit or Department rules.

[62-620.610(9)]

10. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data, and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except as such use is proscribed by Section 403.111, Florida Statutes, or Rule 62-620.302, Florida Administrative Code. Such evidence shall only be used to the extent that it is consistent with the Florida Rules of Civil Procedure and applicable evidentiary rules. *[62-620.610(10)]*

11. When requested by the Department, the permittee shall within a reasonable time provide any information required by law which is needed to determine whether there is cause for revising, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also provide to the Department upon request copies of records required by this permit to be kept. If the permittee becomes aware of relevant facts that were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be promptly submitted or corrections promptly reported to the Department. *[62-620.610(11)]*

12. Unless specifically stated otherwise in Department rules, the permittee, in accepting this permit, agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, F.A.C., shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard. *[62-620.610(12)]*

13. The permittee, in accepting this permit, agrees to pay the applicable regulatory program and surveillance fee in accordance with Rule 62-4.052, F.A.C. *[62-620.610(13)]*

14. This permit is transferable only upon Department approval in accordance with Rule 62-620.340, F.A.C. The permittee shall be liable for any noncompliance of the permitted activity until the transfer is approved by the Department. *[62-620.610(14)]*

15. The permittee shall give the Department written notice at least 60 days before inactivation or abandonment of a wastewater facility and shall specify what steps will be taken to safeguard public health and safety during and following inactivation or abandonment. *[62-620.610(15)]*

16. The permittee shall apply for a revision to the Department permit in accordance with Rules 62-620.300 and the Department of Environmental Protection Guide to Wastewater Permitting at least 90 days before construction of any planned substantial modifications to the permitted facility is to commence or with Rule 62-620.325(2) for minor modifications to the permitted facility. A revised permit shall be obtained before construction begins except as provided in Rule 62-620.300, F.A.C. *[62-620.610(16)]*

17. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The permittee shall be responsible for any and all damages which may result from the changes and may be subject to enforcement action by the Department for penalties or revocation of this permit. The notice shall include the following information:

    a. A description of the anticipated noncompliance;

    b. The period of the anticipated noncompliance, including dates and times; and

    c. Steps being taken to prevent future occurrence of the noncompliance.

[62-620.610(17)]

18. Sampling and monitoring data shall be collected and analyzed in accordance with Rule 62-4.246, Chapters 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate.

    a. Monitoring results shall be reported at the intervals specified elsewhere in this permit and shall be reported on a Discharge Monitoring Report (DMR), DEP Form 62-620.910(10).

    b. If the permittee monitors any contaminant more frequently than required by the permit, using Department approved test procedures, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

    c. Calculations for all limitations which require averaging of measurements shall use an arithmetic mean unless otherwise specified in this permit.

    d. Except as specifically provided in Rule 62-160.300, F.A.C., any laboratory test required by this permit shall be performed by a laboratory that has been certified by the Department of Health Environmental Laboratory Certification Program (DOH ELCP). Such certification shall be for the matrix, test method and analyte(s) being measured to comply with this permit. For domestic wastewater facilities, testing for parameters listed in Rule 62-160.300(4), F.A.C., shall be conducted under the direction of a certified operator.

    e. Field activities including on-site tests and sample collection shall follow the applicable standard operating procedures described in DEP-SOP-001/01 adopted by reference in Chapter 62-160, F.A.C.

    f. Alternate field procedures and laboratory methods may be used where they have been approved in accordance with Rules 62-160.220 and 62-160.330, F.A.C.

    [62-620.610(18)]

19. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule detailed elsewhere in this permit shall be submitted no later than 14 days following each schedule date. *[62-620.610(19)]*

20. The permittee shall report to the Department any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

    a. The following shall be included as information which must be reported within 24 hours under this condition:

        1. Any unanticipated bypass which causes any reclaimed water or effluent to exceed any permit limitation or results in an unpermitted discharge,

        2. Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,

        3. Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and

        4. Any unauthorized discharge to surface or ground waters.

    b. Oral reports as required by this subsection shall be provided as follows:

1. For unauthorized releases or spills of treated or untreated wastewater reported pursuant to subparagraph a.4 that are in excess of 1,000 gallons per incident, or where information indicates that public health or the environment will be endangered, oral reports shall be provided to the Department by calling the **STATE WARNING POINT TOLL FREE NUMBER (800) 320-0519**, as soon as practical, but no later than 24 hours from the time the permittee becomes aware of the discharge. The permittee, to the extent known, shall provide the following information to the State Warning Point:

   a) Name, address, and telephone number of person reporting;

   b) Name, address, and telephone number of permittee or responsible person for the discharge;

   c) Date and time of the discharge and status of discharge (ongoing or ceased);

   d) Characteristics of the wastewater spilled or released (untreated or treated, industrial or domestic wastewater);

   e) Estimated amount of the discharge;

   f) Location or address of the discharge;

   g) Source and cause of the discharge;

   h) Whether the discharge was contained on-site, and cleanup actions taken to date;

   i) Description of area affected by the discharge, including name of water body affected, if any; and

   j) Other persons or agencies contacted.

2. Oral reports, not otherwise required to be provided pursuant to subparagraph b.1 above, shall be provided to the Department within 24 hours from the time the permittee becomes aware of the circumstances.

c. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department shall waive the written report.

[62-620.610(20)]

21. The permittee shall report all instances of noncompliance not reported under Permit Conditions IX. 17., 18. and 19. of this permit at the time monitoring reports are submitted. This report shall contain the same information required by Permit Condition IX. 20 of this permit. *[62-620.610(21)]*

22. Bypass Provisions

a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless the permittee affirmatively demonstrates that:

   1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and

   2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

   3. The permittee submitted notices as required under Permit Condition IX. 22. b. of this permit.

b. If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least 10 days before the date of the bypass. The permittee shall submit notice of an unanticipated bypass within 24

hours of learning about the bypass as required in Permit Condition IX. 20. of this permit. A notice shall include a description of the bypass and its cause; the period of the bypass, including exact dates and times; if the bypass has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass.

c. The Department shall approve an anticipated bypass, after considering its adverse effect, if the permittee demonstrates that it will meet the three conditions listed in Permit Condition IX. 22. a. 1. through 3. of this permit.

d. A permittee may allow any bypass to occur which does not cause reclaimed water or effluent limitations to be exceeded if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Permit Condition IX. 22. a. through c. of this permit.

[62-620.610(22)]

23. Upset Provisions

a. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the permittee can identify the cause(s) of the upset;

2. The permitted facility was at the time being properly operated;

3. The permittee submitted notice of the upset as required in Permit Condition IX. 20. of this permit; and

4. The permittee complied with any remedial measures required under Permit Condition IX. 5. of this permit.

b. In any enforcement proceeding, the burden of proof for establishing the occurrence of an upset rests with the permittee.

c. Before an enforcement proceeding is instituted, no representation made during the Department review of a claim that noncompliance was caused by an upset is final agency action subject to judicial review.

[62-620.610(23)]

Executed in Hillsborough County, Florida.

STATE OF FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Jeffry S. Greenwell, P.E.
Water Facilities Administrator
Southwest District

APPENDIX E

OPERATING PROTOCOLS

SARASOTA COUNTY NORTH MASTER REUSE SYSTEM OPERATING PROTOCOL

SARASOTA COUNTY
ENVIRONMENTAL SERVICES, UTILITIES

SCNMRS

1001 Sarasota Center Blvd.
SARASOTA, FLORIDA 34240

FDEP PERMIT NUMBER: FLA177008

Prepared December 2004 by

Sarasota County Environmental Services, Utilities

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INTRODUCTION

The Sarasota County North Master Reuse System provides public access quality reclaimed water which meets the requirements of the State of Florida, Department of Environmental Protection (FDEP) Rule 62-610, Part III Slow-Rate Land Application Systems; Public Access Areas, Residential Irrigation and Edible Crops and operates under FDEP Domestic Wastewater Facility Permit Number FLA177008 issued on June 01, 2004, and expiring on May 31, 2009.

This reclaimed water is discharged to various golf courses and residential areas in the northern portion of Sarasota County, which are part of the Sarasota County North Master Reuse System.

The information contained in this operating protocol is a supplement to the Sarasota County Water Reclamation Facility(s) Operation and Maintenance Manual(s) and provides the necessary background information and operating procedures in order for the facility operators to maintain a safe water quality for distribution to the Sarasota County North Master Reuse System.

The North County Master Reuse System consists of a 11.805 MGD annual average daily flow (AADF) permitted capacity slow-rate public access system (R-001) consisting of a general service area located in northern Sarasota County.

Current wet weather storage of 309.744 MG is available both within the reuse system and at the county-owned source wastewater treatment facilities as storage capacity. Reject storage at the source facilities is not included.

In addition, as alternative disposal, effluent from both the Atlantic Brentwood Water Reclamation Facility (WRF) and the Sarasota County Master Reuse System may be directed to the Atlantic Brentwood Deep Injection Well (DIW), Permit No. U058-279106, up to the permitted limits of the DIW system (currently 4.87 MGD). To accomplish this, excess reclaimed water from the north master reuse system may be returned to the Atlantic Brentwood plant through the incoming flow meter, rechlorinated in the effluent storage/chlorine contact chamber, and transferred to the deep injection well. Gulf Gate Advanced Waste Water Treatment Plant (AWWTP) can redirect its effluent from the North Master Reuse System to a permitted 1.8 MGD AADF surface water discharge. Meadowood WRF can divert some of their effluent to on-site rapid infiltration basins with a permitted capacity of 0.135 MGD AADF. The alternative disposal systems and available wet weather storage are used in the water balance to calculate the permitted capacity of 11.805 MGD AADF of the North Master Reuse System.

The Sarasota County Master Reuse System serves as a source facility for up to 2.0 MGD AADF transferred to the City of Sarasota Master Reuse System, (FL0010771), a Part III public access master reuse system serving several golf courses and agricultural operations outside the city limits of Sarasota.

The Sarasota County North Master Reuse System is supervised and maintained by a Reclaimed Water System Manager, Facility Operations Supervisor II, (2) two reuse field techs, and the required staffing of the following (5) Water Reclamation Facilities (including operating protocols for each Facility).

BEE RIDGE PUBLIC ACCESS REUSE SYSTEM OPERATING PROTOCOL

SARASOTA COUNTY
ENVIRONMENTAL SERVICES, UTILITIES

BEE RIDGE
WATER RECLAMATION FACILITY

4001 IONA ROAD
SARASOTA, FLORIDA 34240

FDEP PERMIT NUMBER: FLA013372

Prepared December 2004 by

Sarasota County Environmental Services, Utilities

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INTRODUCTION

The Sarasota County Bee Ridge Water Reclamation Facility treats domestic wastewater and produces public access quality reclaimed water which meets the requirements of the state of Florida, Department of Environmental Protection (FDEP) Rule 62-610, Part III Slow-Rate Land Application Systems; Public Access Areas, Residential Irrigation and Edible Crops and operates under FDEP Domestic Wastewater Facility Permit Number FLA013372 issued on March 08, 2002 and expiring on March 08, 2007.

This reclaimed water is discharged to various golf courses and residential areas in the northern portion of Sarasota County which are part of the Sarasota County North Master Reuse System. The North Master Reuse System is operated under FDEP Permit Number FLA177008 issued on June 1, 2004, and expiring on May 31, 2009.

The information contained in this operating protocol is a supplement to the Sarasota County Bee Ridge Water Reclamation Facility (BRWRF) Operation and Maintenance Manual and provides the necessary background information and operating procedures in order for the facility operators to maintain a safe water quality for distribution to the BRWRF Public Access Reuse System.

1. DESCRIPTION OF THE BEE RIDGE PUBLIC ACCESS REUSE SYSTEM

1.1 System Overview

The purpose of the Bee Ridge Public Access Reuse System (BRPARS) is to provide outlets for distribution of treated wastewater effluent generated by the BRWRF. The BRPARS, at present, consists of public access quality slow rate land application by spray irrigation to six golf courses including the Bent Tree, Gator Creek, Heritage Oaks, Laurel Oaks, Misty Creek, and Sarasota Golf Course and in addition approximately 100 residential homes located in the Laurel Lakes subdivision. While the Sarasota County North Master Reuse System is currently permitted for an ultimate capacity of 11.805 million gallons per day (mgd) based on a 12 month rolling average, the average flow treated by the BRWRF during the last 12 months was approximately 1.653 mgd, with the average flow discharged to the BRPARS during the last 12 months being approximately 1.499 mgd. There are four facilities that can contribute flow to NCMRS. They are Atlantic WRF, Bee Ridge WRF, Central County WRF, and the Meadowood WRF.

The final effluent of the BRWRF is discharged to the BRPARS only when one or more of the four vertical turbine pumps at the BRPARS pump station are automatically activated by a pressure-sensing device at the pump station. Reuse is then pumped to the six golf courses Bent Tree, Laurel Oaks, Heritage Oaks, Gator Creek, Misty Creek, and Sarasota Golf Course reuse storage ponds. Laurel Lakes subdivision receives reuse from the pressurized line for irrigating. In order to provide a better understanding of the treatment processes at the BRWRF and the interrelated components of the BRPARS, a flow diagram illustrating the treatment plant, public access reuse system, and wet weather storage and disposal facilities is depicted in Exhibit 1.

1.2 Measuring Quantity of Flow to the System

The flow rate of the effluent discharged from the BRWRF is measured utilizing a Fisher Porter pressure transducer flow meter at the reuse pump station at BRWRF. The flow meter is used to continuously measure the amount of reuse used by BRPARS and translates this information as flow in million gallons per day units, which is continuously recorded on a seven-day circular chart. The total quantity of effluent discharged is manually recorded by a wastewater treatment plant operator certified by the FDEP (certified operator) every 24 hours from an electronic digital flow totalizer linked to the flow meter. The flow meter and totalizer are calibrated annually by a certified technician. Flows to the reclaimed water storage pond which provides storage for the BRPARS are measured by a Miltronics level indicating meter. The level reading is recorded everyday, manually by a certified plant operator and converted to million gallons per day storage. The Miltronics meter is checked for accuracy annually by a certified technician. The Bent Tree, Gator Creek, Heritage Oaks, Laurel Oaks, Misty Creek, and Sarasota Golf & Country Club reclaimed water storage ponds receive the there flow from the BRPARS pump station located at the BRWRF through a 16-inch reuse distribution line.

1.3 System Storage

In the event that the BRWRF daily effluent flow exceeds the daily amount of reclaimed water that the BRPARS golf courses and residential areas require for irrigation, a reclaimed water storage pond provides approximately 170 million gallons of storage capacity for system flexibility. The reclaimed water storage pond is inspected daily by a certified operator to ensure that the pond maintains adequate freeboard distance to the respective overflow level. These freeboard values are recorded daily. The freeboard values, in conjunction with system flow amounts are analyzed to determine the daily amount, if any, of public access quality effluent to

transmit to the BRPARS reclaimed water storage pond.

1.4 Water Quality Standards Established by the FDEP

Quality testing of the wastewater stream at the BRWRF is conducted for several reasons. Principal among these reasons are: (1) to provide data for control of the treatment plant's biological processes, and (2) to monitor effluent criteria established for public access reuse via the BRPARS.

Since the BRPARS provides reclaimed water from the BRWRF for reuse by irrigation of public access areas such as golf courses and private residences, it is crucial that this water be constantly monitored for total chlorine residual and turbidity in addition to it being regularly sampled and tested for other pertinent quality indicators to ensure that its quality remains consistently within FDEP established parameters. The FDEP rules for this type of reuse system are contained in Part III of Chapter 62-610, Florida Administrative Code (F.A.C.). Specifically, Rule 62-610.460, F.A.C., defines the treatment and water quality requirements for public access quality reclaimed water to the BRPARS as follows:

1. At minimum, secondary treatment standards for $CBOD_5$ (tested weekly);
2. pH between 6.0 and 8.5 (continuously monitored);
3. High-level disinfection (continuously monitored);
4. Total Suspended Solids (TSS) $\leq$ 5.0 mg/L after filtration prior to final disinfection (tested daily); and
5. Filtration (continuously provided) with standby chemical coagulant feed

High-level disinfection is defined in FDEP Rule 62-600.440(5), F.A.C., and requires the

following:

1. Total Chlorine Residual ≥ 1.0 mg/L after a minimum contact time of 15 minutes at peak hourly plant flow (continuously monitored);
2. Fecal Coliform Bacteria Colonies per 100 ml of sample (tested daily):
   (a) Seventy-five % of analyzed samples over a 30-day period have no detectable colonies.
   (b) No samples shall contain more than 25 colonies per 100 ml of sample.

1.5 Continuous Monitoring of Water Quality

Electronic analyzers that measure total chlorine residual and turbidity are utilized to provide continuous monitoring of the treatment plant's filtered and final effluent before it is discharged to the BRPARS. These analyzers relay their measurements to the operations building where they are automatically recorded on a seven-day circular chart by a multi-function chart recorder.

1.5.1 Total Chlorine Residual Analyzer

A fractional horsepower submersible pump transmits a representative sample of effluent from the discharge of the chlorine contact chambers and provides a continuous water flow to the Hach Model CL17 Total Chlorine Analyzer which is used for determining total chlorine content of the sample. A direct numerical read-out is displayed on the analyzer and is visible through a glass window in the door of its weatherproof cabinet. Additionally, this value is recorded on a seven-day circular chart located at the PLC panel at the chlorine building. Alarm #1 on the analyzer display is activated when total chlorine registers 1.5 mg/L or lower. Alarm #2 on the analyzer display is activated when total chlorine registers 1.2 mg/L or lower. The plant certified operator is alerted to these warning and reject alarm conditions by corresponding red LED lights on the

analyzer display panel. For enhanced reliability, an uninterruptible power supply (UPS) ensures the continuous operation of the analyzer so that momentary power losses will not cause a false alarm condition. The UPS also protects the instrument against power surges and voltage spikes.

1.5.2 Turbidity Analyzer

A fractional horsepower Bellows pump transmits a representative sample of effluent from the discharge of the two automatic backwash sand filters prior to disinfection and provides a continuous water flow to the Hach 1720D Turbidity Analyzer which is used for determining turbidity of the sample. The turbidity measurement provides an indication of the total suspended solids content of the sampled effluent. A direct numerical read-out is displayed on the analyzer and is visible through a glass window in the door of its weatherproof cabinet. Additionally, the value is recorded on a seven-day circular chart located at the PLC panel at the chlorine building. Alarm #1 on the analyzer display is activated when turbidity registers 2.7 NTUs or higher. Alarm #2 on the analyzer display is activated when turbidity registers 3.5 NTUs or higher. The plant certified operator is alerted to these warning and reject alarm conditions by corresponding red LED lights on the analyzer display panel. For enhanced reliability, an uninterruptible power supply (UPS) ensures the continuous operation of the analyzer so that power losses will not cause a false alarm condition. The UPS also protects the analyzer against power surges and voltage spikes.

2. OPERATION OF THE NORTH COUNTY PUBLIC ACCESS REUSE SYSTEM

2.1 Water Quality Standards Established for the System

Daily operation of the BRPARS is basically a monitoring and response action. Sampling,

testing, and analysis are accomplished through the use of electronic components and display devices and inform the certified operator by visual and audible means of any malfunction or unacceptable test results, either occurring presently or predicted to occur in the near future.

Acceptable operating criteria and tolerances have been established for each measured quality indicator. These indicators and their parameters are compiled in Table 1 for the convenience of the certified operators responsible for monitoring effluent transmitted to the BRPARS. BRWRF strives to operate the facility at a level that insures Reuse Quality Effluent at all times. When alternate disposal methods are utilized, all on-line analyzers, alarms, and automatic diversion systems are maintained in full operational mode. All the procedures for Section 2.2.4 are followed if a Reject Set point is triggered.

TABLE 1

BEE RIDGE PUBLIC ACCESS REUSE SYSTEM OPERATING STANDARDS

Quality Indicator	Normal Reading	Warning Setpoint	Reject Setpoint
Total Chlorine (mg/L)	3.0 to 5.0	≤ 1.5	≤ 1.2
Turbidity (NTU)	0.60 to 0.80	≥ 2.70	≥ 3.50
Total Suspended Solids (mg/L)	< 0.5 to 1.5	No samples greater than 5.0	
Fecal Coliform (colonies)	< 1	75% of all samples non-detectable No sample greater than 25 per 100 ml	

Even though the FDEP has established a lower limit of 1.0 mg/L for total chlorine residual for this type of reuse system, the lower limit established for the BRPARS for this parameter is 1.2 mg/L. This more conservative lower limit provides added quality assurance in case the

accuracy of the total chlorine analyzer drifts somewhat between comparisons or calibrations and displays a reading slightly higher than what the total chlorine residual actually is.

2.2 Operational Procedures for Staffed Periods

It is imperative that the facility certified operators are familiar with the total BRPARS operation and how it fits into and overlaps the normal functions of the treatment plant's daily sampling, testing, monitoring, and reporting duties. Vital components of the BRPARS operation include:

1. Monitoring and analysis of the quantity and quality of the effluent discharged to the BRPARS;
2. Daily comparison and calibration of the continuous analyzers and their corresponding laboratory instruments;
3. Comparison of continuous analyzer readings versus TSS and fecal coliform levels;
4. Procedures to follow in the event the final effluent fails to meet public access quality reclaimed water standards;
5. Returning the BRWRF chlorine contact chamber after effluent quality fails to meet public access quality reclaimed water standards;
6. Routine testing of the BRWRF effluent automatic diversion valves system and SCADA computer auto dialer;
7. Proper care and maintenance of the continuous analyzers; and
8. Procedures to follow in the event of a continuous analyzer failure.

2.2.1 Monitoring Water Quantity and Quality

The BRWRF is normally staffed at least sixteen hours per day, 7 days per week by a certified wastewater treatment plant operator to ensure the BRPARS receives the proper quantity and

quality of reclaimed water. Each day, the total quantity of plant effluent and the reclaimed water storage pond comprising the BRPARS received in the last 24 hours is recorded and the data analyzed by a certified treatment plant operator. The reuse water used by the BRPARS is set up in an automatic operation. Each golf course pond has and automatic fill structure to maintain proper pond levels. The golf course ponds are checked a minimum of three times per week to ensure proper operation. The BRPARS service area is pressurized twenty-four hours a day 7 days a week. The Laurel Lakes residents receive their reuse from the pressurized reuse line on their allotted watering days. To ensure the quality of the distributed effluent, the certified operator routinely inspects the continuous analyzers and recorder charts for flow quantity, total chlorine residual, turbidity and pH. The operator also collects daily samples from the filter and final effluents to be tested for TSS content and fecal coliform colony counts by a contract laboratory certified by the state of Florida, Department of Health and Rehabilitative Services (FDHRS).

2.2.2 Calibration of Continuous Analyzers and Lab Instruments

Accurate sampling results from the continuous total chlorine residual and turbidity analyzers are essential to the quality of the effluent being transmitted to the BRPARS. Both analyzers are checked daily for accuracy by a certified operator by comparing their analysis results with corresponding laboratory instruments on split samples. Chlorine residual analysis results from the Hach CL17 Total Chlorine Residual Analyzer are compared to the Hach DR2010 spectrophotometer and turbidity analysis results from the Hach 1720D Turbidity Analyzer are compared to the Hach 2100P Turbidimeter. In turn, both laboratory instruments are checked daily for accuracy by a certified operator with secondary standards certified by the instrument manufacturer. Additionally, both laboratory instruments are checked weekly with primary

standards and calibrated if necessary (calibration instructions are in Appendix A and C). Lastly, both continuous analyzers are checked monthly with primary standards and calibrated, if necessary (calibration instructions are in Appendix B and D). Both analyzers and laboratory instruments are inspected and calibrated annually by a certified instrument technician familiar with them.

2.2.3 Comparisons of Turbidity to TSS and TRC to Fecal Coliform

Whenever a grab sample for total suspended solids (TSS) analysis is collected from the filter effluent the turbidity reading from the continuous turbidity analyzer is recorded. Collection of this data is important for establishing a relationship between turbidity and TSS values at the BRWRF. This compiled data is used to determine the proper turbidity reject alarm set point.

Whenever a grab sample for fecal coliform analysis is collected from the chlorine contact chamber effluent the total residual chlorine (TRC) reading from the continuous total chlorine analyzer is recorded. Collection of this data is necessary for developing a better understanding of the minimum total chlorine residual required to maintain nondetectable fecal coliform counts in the final effluent.

2.2.4 Failure to Meet Established Standards for the System

Operational standards for the BRPARS consist primarily of two levels of alarm parameters for total chlorine residual and turbidity. These two levels are designated as warning setpoint alarms and as reject setpoint alarms for each analyzer with numerical values for each listed in Table 1 in Section 2.1. These two levels of alarms assist the operator in providing assurances that the BRPARS will operate without interruption. In particular, these two setpoint alarms initiate a

unique series of events at the treatment plant and require a different set of operational procedures to be followed by the certified operator on duty. Once a reject set point has been tripped, BRWRF automatic diversion valves will divert effluent flow to the reject pond after a five-minute delay. At that time flow will be diverted to the on-site reject pond.

2.2.4.1 Responding to Warning Setpoint Alarms

In some instances in which the final effluent of the BRWRF is being distributed to the BRPARS, conditions may prevail which cause the total chlorine residual of the plant effluent to decrease to 1.5 mg/L or, more rarely, the turbidity of the filter effluent to increase to 2.7 NTUs. At the point at which the chlorine residual or turbidity analyzers reach these warning setpoints, two events are automatically initiated:

1. The affected analyzer enters the warning setpoint Alarm #1 mode which is visually indicated to the operator by a red LED which lights on the analyzer display. Also a horn alarm will sound at the PLC cabinet located at the chlorine building.
2. The chlorine residual/turbidity chart recorder transmits an electronic signal to the plant SCADA computer located in the operations building. This signal, in turn, causes both an audible alarm at the PLC panel located at the chlorine room as well the SCADA computer. The SCADA computer will also call out to the operator's cell phone to alert them of an alarm. This warning system gives the operator as much time as possible to acknowledge the warning alarm, investigate its cause and correct the problem.

If one of the continuous analyzers reaches its warning setpoint as described in the above paragraph, the certified operator on duty shall:

1. Silence the alarm horn as soon as possible (the warning lamp stays lit as long as the affected analyzer is at or beyond its warning setpoint);
2. Examine the affected chart recorder chart and analyzer, along with its associated appurtenances to make sure that no apparent condition exists that would cause the chart recorder or analyzer to display an erroneous reading;
3. Collect a comparative grab sample from the affected analyzer and test it on the corresponding laboratory instrument to verify the reading from the analyzer;
4. If the analyzer reading appears to be valid, attempt to determine what is causing the substandard reading. Although the reason could be actual degradation of the effluent, the cause could also be sample contamination or sample interference;
5. If the warning alarm is caused by low chlorine residual, increase the chlorine feed rate accordingly;
6. If the warning alarm is caused by high turbidity and the filter effluent appears to be clear, inspect and clean the turbidity analyzer sample reservoir and tubing to make sure the sample is not being contaminated; and
7. Take any other necessary steps, if possible, to improve the quality of the plant effluent so that the warning alarm will be terminated and so that the effluent will not degrade to the point of violating established standards for the BRPARS, at which point procedures for reject setpoint alarms, as described in the second paragraph of Section 2.2.4.2 shall be followed.

2.2.4.2 Responding to Reject Setpoint Alarms

At the warning setpoint alarm stage, the plant effluent still meets standards for public access quality reclaimed water. If effluent quality continues to degrade so that total chlorine residual

decreases to 1.2 mg/L or turbidity increases to 3.5 NTUs, several events are automatically initiated:

1. The affected analyzer enters the reject setpoint Alarm #2 mode which will be visually indicated to the operator by a red LED which lights on the analyzer display, and the audible alarm will be activated at the PLC panel which signifies that the sampled effluent no longer meets quality standards established for the BRPARS.
2. The affected analyzer transmits an electronic signal to the BRWRF chlorine/turbidity PLC control panel which, in turn, causes a five-minute digital time delay relay within to begin counting down. Once this relay counts down to zero minutes, the automatic diversion valves located at BRWRF will divert effluent to the on site reject pond.
3. Upon receiving a chlorine value of 1.2 or lower from the chlorine analyzer or a turbidity value of 3.5 or higher from the turbidity analyzer, the chlorine/turbidity chart recorder transmits an electronic signal to the BRWRF SCADA computer which interprets the signal as either a chlorine or turbidity reject alarm. The BRWRF SCADA computer auto dialer will then call the operator on-duty cell phone during attend periods. For unattended periods, the SCADA computer will dial the on-call operator cell phone.
4. Upon actual Diversion of plant effluent to the reject pond the plant SCADA computer will indicate effluent flow direction to reject pond to also alert the operator of reject condition.
5. An inline "excess/reject" flow meter records the total amount of plant effluent being out of compliance with quality standards established for the BRPARS.

If one of the continuous analyzers reaches its reject setpoint as described in the preceding

paragraph, the certified operator on duty shall:

1. Make sure all procedures established for continuous analyzer warning setpoint alarms as described in the second paragraph of Section 2.2.4.1 have already been completed.
2. If the continuous analyzer warning setpoint alarm procedures have been ineffective and shutdown of the BRPARS is imminent, ensure that the automatic diversion valves operate within five minutes by checking the operational status of the automatic diversion valves. If the sequence fails, the operator shall manually activate the BRWRF diversion valves. This is done manually by using the "HAND-OFF-AUTO" (HOA) switch. The valve to the reject pond is closed first then both the storage pond and two million gallon storage tank valves are closed to ensure isolation of effluent to only the reject pond. Check the reject flow meter to make sure it is functioning so that the total amount of plant effluent that was not in compliance with quality standards established for the BRPARS can be recorded in the plant's daily log and appropriate data sheet.
3. Contact and inform the chief treatment plant operator of the status of the plant effluent and be prepared to follow any instructions received. If that person is not available, contact the appropriate water reclamation operations supervisor or the water reclamation facility manager, in that order.
4. Take any other necessary steps, if possible, to improve the quality of the plant effluent so that it does not degrade to the point of violating standards established by the FDEP for secondary treatment.
5. If the total chlorine residual decreases to 0.5 mg/L, collect a sample from the final effluent to be tested for fecal coliform by a contract laboratory certified by the FDOH. Make sure to inform the laboratory that the sample will have to be diluted so

that colony counts up to 800 can be reported.

6. If the turbidity increases to 10 NTUs, collect a sample from the filter effluent to be tested for TSS by a contract laboratory certified by the FDOH.

2.2.4.3 Standby Chemical Coagulant Feed System

When the filter effluent turbidity reaches 2.7 NTUs, the decision to add flocculation or coagulation agents such as alum or polymer will be made and then at that time the agent can be pumped to the two aeration/clarification basins to help lower the total suspended solids level of the clarifier effluent. The chemical feed system consists of a mixing/pumping station and transmission piping to each of the two aeration/clarification basins.

2.2.5 Procedures for Returning the System Pump Station to Service

If the certified operator on duty is successful in improving the quality of the plant effluent so that it again meets the quality standards established for the BRPARS, he or she shall place the BRPARS back in service after performing the following effluent quality assurance procedures. When the final effluent of the BRWRF fails to meet reclaimed water standards for an extended period of time, the certified operator shall first ensure that the final effluent quality is stable before returning the BRPARS to service. After the affected continuous analyzer is no longer in the reject Alarm #2 mode, the certified operator shall wait at least 60 minutes to ensure that the final effluent will remain in compliance with the standards established for the BRPARS. This procedure will also ensure that substandard effluent will not contaminate the BRWRF chlorine contact chamber. After this assurance, the certified operator may resume distributing effluent to the BRPARS, manually resetting the "REJECT RESET" button on the PLC panel dead front. Also, the operator shall inspect the reject flow meter to make sure it has stopped. As an added

assurance in protecting the water quality of the BRPARS, an electronic interlock in the BRWRF PLC panel prevents the "REJECT RESET" button from reactivating the diversion valves until the reject Alarm #2 output from the continuous analyzers is no longer being transmitted to the control panel.

2.2.6 Testing the Automatic Shutdown System and Telephone Autodialer

On a monthly basis, prepared samples are substituted for sampled effluent in each continuous analyzer so that each analyzer provides a readout that indicates the sampled effluent has degraded beyond the reject setpoint. This procedure induces a simulated reject alarm condition within the BRPARS monitoring system components. The certified operator then makes sure that the BRWRF diversion valves are activated by the reject Alarm #2 of each analyzer within the required five-minute time limit and that the warning lamps and horn are working properly. Also, on a monthly basis, the SCADA computer auto dialer is tested for proper operation at the same time to ensure that it initiates its dialing sequence at the same instant the BRWRF diversion valves automatically diverts effluent flow.

2.2.7 Care and Maintenance of the Continuous Analyzers

Both the total chlorine residual analyzer and the turbidity analyzer require proper care, regular maintenance, and cleaning to provide accurate sampling results. The BRWRF certified operator cleans appropriate parts, replaces tubing and components when necessary, and provides other essential maintenance as recommended by the manufacturer of each analyzer and described in the treatment plant maintenance schedules. All system warnings or system alarms from the analyzers are given prompt attention by the certified operator on duty so as to maintain their peak operating efficiency and accuracy.

2.2.8 Procedures for When the Continuous Analyzers Are Out of Service

In the event that either of the two continuous analyzers fails to provide proper test results, the BRPARS is permitted to remain in service only if hourly grab samples corresponding to the failed analyzer are collected and analyzed on the appropriate lab instrument by a certified plant operator in order to ensure that the plant effluent continues to meet public access reclaimed water standards for total chlorine residual and turbidity. This procedure continues until the failed analyzer is repaired or replaced and confirmed to be providing accurate test results for at minimum of 60 minutes. When either of the continuous analyzers is out of service, the BRWRF plant final effluent is diverted to the reject pond before the BRWRF is left unattended without a certified operator present to provide hourly sampling and testing of the plant's effluent. As an added assurance that the BRPARS will operate with little or no interruption, another Hach CL17 Total Chlorine Analyzer and another Hach 1720D Turbidity Analyzer are kept at the BRWRF as part of its spare parts inventory.

2.3 Operational Procedures for Unstaffed Periods

The BRWRF is normally staffed with a certified wastewater treatment plant operator from 7:00 a.m. to 11:00 p.m. seven days per week, 365 days per year. The facility is normally unstaffed from 11:00 p.m. to 7:00 a.m. each day. During this time period, the continuous total chlorine residual and turbidity analyzers provide the necessary assurances that the BRPARS is receiving water that meets reclaimed water standards regarding total chlorine residual and TSS. Also, the SCADA computer auto dialer will contact an on-call certified operator by telephone in the event that either of the continuous analyzers enters a reject alarm state.

2.3.1 Automated Responses to Alarms by System Components

In sequence, the following events are automatically initiated if either continuous analyzer enters a reject alarm state any time the treatment plant is not staffed by a certified operator:

1. The affected analyzer will transmit an electronic signal to the BRWRF PLC panel, which, in turn, causes a five-minute time delay relay within to begin counting down. Once this relay counts down to zero minutes, the BRWRF diversion valves automatically divert effluent flow to the on site reject pond.
2. Upon receiving a chlorine value of 1.2 or lower from the chlorine analyzer or a turbidity value of 3.5 or higher from the turbidity analyzer, the chlorine/turbidity chart recorder transmits an electronic signal to the SCADA computer, which interprets the signal as either a chlorine or turbidity reject alarm. The SCADA computer auto dialer will begin its call-out sequence after a five-minute delay. This delay is programmed into the SCADA computer so that it will begin its call-out sequence at the same instant that the BRWRF diversion valves activate. Once the SCADA computer contacts an on-call certified operator, it will orally transmit the applicable alarm condition from a list of several possible alarms. After the on-call certified operator receives the telephone call, he or she must acknowledge the call by inputting the correct series of numbers into the telephone keypad. If the call-out is not acknowledged properly, the SCADA computer will call the next stored telephone number. The autodialer will continue to call the numbers stored within its memory until the call-out is acknowledged. The main purpose of the five-minute delay programmed into the autodialer is to keep the on-call operator from being disturbed by a false alarm if effluent quality improves before the five-minute time delay relay in the BRWRF PLC panel times out, activating the diversion valves. When effluent

quality improves to the point of meeting BRPARS standards, the reject alarm of the affected analyzer will be deactivated which, in turn, will deactivate the time delay relay in the BRWRF PLC panel if it is still timing out, thus averting an unnecessary shutdown of the BRPARS.

2.3.2 Responding to Alarms During Unstaffed Periods

Once the on-call certified operator acknowledges the autodialer, he or she shall:

1. Immediately travel to the BRWRF to investigate the reason the chart recorder relay caused the SCADA computer auto dialer to call and to investigate the affected analyzer.
2. Upon arriving at the treatment plant, make sure that the BRWRF automatic diversion valves have indeed been activated by the affected continuous analyzer. If the automatic diversion sequence has failed, activate the BRWRF diversion valves manually by using the HOA switches on each valve, using the sequence of opening the reject pond valve first then closing either the storage pond or 2 million gallon storage tank valve next. Check the reject pond flow meter to make sure it is functioning so that the total plant effluent flow was not in compliance with standards established for the BRPARS can be later recorded in the plant's daily log and appropriate data sheet.
3. Make sure that the reject pond is indeed receiving the final effluent flow. Make sure that the pond "DRAIN" valve is closed.
4. Silence the alarm horn at the PLC panel at the chlorine room for the affected continuous meters that are in alarm.
5. Examine the affected chart recorder chart, analyzer, and its associated appurtenances

to make sure that no apparent condition exists that would cause the analyzer or chart recorder to display an erroneous reading.

6. Collect a comparative grab sample from the affected analyzer and analyze it on the corresponding laboratory instrument to verify the reading from the analyzer.
7. If the analyzer reading appears to be valid, attempt to determine what is causing the substandard reading. Although the reason could be actual degradation of the effluent, the cause could also be sample contamination or sample interference.
8. If the BRWRF diversion valves activation was caused by low chlorine residual, increase the chlorine feed rate accordingly.
9. If the BRWRF diversion valves activation was caused by high turbidity and the filter effluent appears to be clear, inspect and clean the turbidity analyzer sample reservoir and tubing to make sure the sample is not being contaminated.
10. Take any other necessary steps, if possible, to improve the quality of the plant effluent so that it does not degrade to the point of violating standards established by the FDEP for secondary treatment.
11. If all attempts at improving the quality of the plant effluent fail and the BRPARS will not be able to be re-activated, contact and inform the chief treatment plant operator of the status of the plant effluent and be prepared to follow any instructions received. If that person is not available, contact the appropriate water reclamation operations supervisor or water reclamation facility manager, in that order.
12. If the total chlorine residual decreases to 0.5 mg/L, collect a sample from the final effluent to be tested for fecal coliform by a contract laboratory certified by the FDOH. Make sure to inform the laboratory that the sample will have to be diluted so that colony counts up to 800 can be reported.

13. If the turbidity increases to 10 NTUs, collect a sample from the filter effluent to be tested for TSS by a contract laboratory certified by the FDOH.

14. If, however, the on-call certified operator is successful in improving the quality of the plant effluent so that it again meets the standards established for the BRPARS, he or she shall place the BRPARS back in service after performing the following effluent quality assurance procedures. When the final effluent of the BRWRF fails to meet reclaimed water standards for an extended period of time, the certified operator shall first ensure that the final effluent quality is stable before returning the BRPARS system to service. After the affected continuous analyzer is no longer in the reject Alarm #2 mode, the certified operator shall wait at least 60 minutes to ensure that the final effluent will remain in compliance with the standards established for the BRPARS.

15. After the quality assurance procedures described in Step 14 have been performed, the certified operator may resume distributing effluent to the NCPARS, manually placing the BRWRF diversion valves back into service by pushing the "REJECT RESET" button on the PLC panel dead front. Also, the on-call operator shall inspect the reject flow meter to make sure it has stopped.

16. Before leaving the plant site, the on-call operator must thoroughly document the events of his or her response to the system alarm in the treatment plant's daily log.

2.4 Wet Weather Storage and Disposal Procedures

As described in Section 1.8, the BRWRF provides a facility for storage or alternate disposal of treatment plant effluent during periods of extended wet weather. There are specific procedures for diverting final effluent to either the BRWRF storage pond or to the underground injection

well. These procedures are performed by a certified plant operator.

2.4.1 Procedures for Diverting Flow to the 170 MG storage pond

In order to divert the BRWRF final effluent to the on-site storage pond, the following steps must take place.

1. The on site 2 million gallon storage tank must be at the full level which is set with the use of the BRWRF plant SCADA computer by the Chief Plant Operator.
2. Once the desired full level is reached in the 2MG storage tank the automatic diversion valves will automatically switch the flow path of final effluent from BRWRF to the on site 170 million gallon reuse storage pond.
3. If the automatic diversion valves fail to operate automatically the valves can be switched manually by using the "H-O-A "switches located on the valve assemblies.
4. Indicator lights at the PLC panel at the chlorine building will indicate and OPEN/CLOSE status for each of the three diversion valves.

2.4.2 Procedures for Diverting Flow to the Underground Injection Wells

In order to pump to the Atlantic/Brentwood WRF Injection Well with BRWRF final effluent a certified operator must:

1. Contact the certified operator at the Atlantic/Brentwood WRF to in form he/she of intentions of using the Injection Well.
2. If conditions are applicable the Atlantic/Brentwood WRF operator will activate an inline Clay valve to open and allow reuse flow into the Injection Well.
3. The Atlantic/Brentwood WRF operator will record the influent reuse flow from the

BRWRF to the Injection Well with an ISCO in line flow meter; the operator will also insure that the proper log entry was recorded.

APPENDIX A

CALIBRATION PROCEDURES FOR THE HACH DR2010 SPECTROPHOTOMETER

Introduction

According to the instrument manufacturer, a spectrophotometer, unlike a turbidimeter, does not require routine calibration since its low voltage, low intensity referencing lamp is not normally subject to variations or diminishment in brightness, which, in turn, can cause measurement inaccuracies. For this reason, the only time the spectrophotometer is calibrated is when the lamp is changed and a lamp calibration is necessary. However, accuracy checks with primary or secondary standards are routinely performed to ensure proper instrument function. If it is determined that the spectrophotometer is not reading with accuracy and precision, it should be sent back to the manufacturer for repair or adjustment.

1. Accuracy checks using additions of primary chlorine standard shall be performed weekly. In addition, the spectrophotometer shall be checked daily for accuracy with the Hach SpecCheck secondary standards. The SpecCheck secondary standards will, in turn, have their values verified, and, if necessary updated, whenever the spectrophotometer is checked with primary chlorine standard.

2. Items needed for this accuracy check shall include the 25 ml sample cell included with the DR2010, the Hach 0.1 to 1.0 ml Tensette Pipet, Tensette Pipet disposable tip and a Hach 10 ml Voluette Ampule Standard 50 – 75 mg/L Cl_2. Make sure to use a new Tensette Pipet tip for these procedures.

3. Enter the stored program number for free and total chlorine DPD powder pillows by pressing **80 ENTER**. The display will show **Dial nm to 530**.

4. Rotate the wavelength dial until the small display shows **530 nm**. When the correct wavelength is dialed in, the display will quickly show **Zero Sample**, then **mg/L Cl_2**.

5. Fill a 25 ml sample cell (the blank) with 25 ml of demineralized water. Place it into the cell holder. Close the light shield.

6. Press **ZERO**. The display will show **Zeroing. . .** then **0.00 mg/L Cl_2**.

7. Remove the sample cell from the cell holder and add the contents of one 25 ml DPD Total Chlorine Powder Pillow to the sample cell. Stopper the sample cell and shake for 20 seconds in order to dissipate any bubbles which may form. Remove the stopper.

8. Wait three minutes and then place the sample cell into the cell holder. Close the light shield.

9. Press **READ**. The display will show **Reading. . .** then the result in mg/L chlorine will be displayed. Considering that the demineralized water should have no chlorine in it, the result should read **0.00 mg/L Cl_2,** or within several hundredths of 0.00 mg/L. If not, the sample cell or the demineralized water may be contaminated. Record the reading, which will be used in the calculation of the first standard addition accuracy check.

10. Remove the sample cell from the cell holder.

11. Snap the top off a Hach 10 ml Voluette Ampule Standard 50 – 75 mg/L Cl_2. Be sure to note its certificate value which will be used in the calculation of the first and subsequent standard addition values. The certificate value referred to in the formula in Steps 14, 19 and 24 is derived from the documentation contained in each carton of Hach chlorine ampules. After the following calculations have been completed for the first ampule in each carton and the standard values from these calculations have been recorded in the Calibration Log, subsequent accuracy checks by standard additions will not require the operator to recalculate the formulas in Steps 14, 19 and 24. Instead, the standard values already recorded in the Calibration Log for the first ampule in the carton can be used for all standard additions utilizing ampules from that same carton.

12. Use a Tensette Pipet to add 0.2 ml of the standard to the DPD reacted demineralized water already in the sample cell. Swirl to mix.

13. Place the spiked sample into the cell holder, close the light shield and read the spiked sample result by pressing **READ**. Record the reading for comparison to the calculated standard addition in the next step.

14. Calculate the equivalent concentration of mg/L chlorine added to the sample:

$$\text{mg/L Chlorine} = \frac{0.2\ (\text{volume of standard added}) \times \text{Certificate value (mg/L } Cl_2)}{25.2\ (\text{volume of sample} + \text{volume of standard added})}$$

15. The spiked sample result (Step 13) should be the same as the analyzed sample result in Step 9 plus the added, calculated mg/L Cl_2 (Step 14). If not, see "Standard Additions" in Section I of the *DR2010 Spectrophotometer Handbook* for more information on troubleshooting possible problems.

16. Remove the sample cell from the cell holder.

17. Use the Tensette Pipet to add another 0.2 ml of the chlorine standard to the sample cell. Swirl to mix.

18. Place the spiked sample into the cell holder, close the light shield and read the spiked sample result by pressing **READ**. Record the reading for comparison to the calculated standard addition in the next step.

19. Calculate the equivalent concentration of mg/L chlorine added to the sample by utilizing the formula in Step 14 except this time the denominator shall equal 25.4 instead of 25.2 due to the addition of another 0.2 ml of chlorine standard to the sample cell.

20. The spiked sample result (Step 18) should be the same as the analyzed sample result in Step 13 plus the added, calculated mg/L Cl_2 (Step 19). If not, see "Standard Additions" in Section I of the *DR2010 Spectrophotometer Handbook* for more information on troubleshooting possible problems.

21. Remove the sample cell from the cell holder.

22. Use the Tensette Pipet to add another 0.2 ml of the chlorine standard to the sample cell. Swirl to mix.

23. Place the spiked sample into the cell holder, close the light shield and read the spiked sample result by pressing **READ**. Record the reading for comparison to the calculated standard addition in the next step.

24. Calculate the equivalent concentration of mg/L chlorine added to the sample by utilizing the formula in Step 14 except this time the denominator shall equal 25.6 instead of 25.4 due to the addition of another 0.2 ml of chlorine standard to the sample cell.

25. The spiked sample result (Step 23) should be the same as the analyzed sample result in Step 18 plus the added, calculated mg/L Cl_2 (Step 24). If not, see "Standard Additions" in Section I of the *DR2010 Spectrophotometer Handbook* for more information on troubleshooting possible problems.

26. After the above procedures have been completed, verify the value of each Hach SpecCheck secondary standard. If the labeled values on the SpecCheck standards do not match the spectrophotometer readings for each standard, update the label values at this time to match the new readings.

27. Record all readings and results in the Calibration Log.

APPENDIX B

CALIBRATION PROCEDURES FOR THE HACH CL17 CHLORINE ANALYZER

1. This calibration procedure shall be performed monthly in addition to daily comparison checks for accuracy with the Hach DR2010 Spectrophotometer.

2. This procedure requires a new 15cc syringe, demineralized water and Hach Chlorine Calibration Standard 2.0 mg/L Cl_2, catalog number 20594-16. According to the analyzer manufacturer, the CL17 chlorine analyzer recognizes this standard as a 1.25 mg/l Cl_2 value.

3. After transporting the items needed for calibration to the chlorine analyzer, establish the zero mg/L reference by first observing the front of the CL17 pump module throughout a measurement cycle. Make note of the point where reagents are added as indicated by the flattening of the two center reagent tubes in the pump module.

4. Fill the syringe with 15cc of demineralized water. When the reagent tubes begin to flatten during the next cycle, remove the top plug on the colorimeter block and observe the color of the liquid in the sample cell. As the color begins to change from clear to red, immediately add 15cc of demineralized water through the hole in the top of the colorimeter block and replace the plug. This step will flush out the sample and reagents and replace them with the demineralized water.

5. Wait until the display is updated with the next reading by noting when the display changes or the pump motor restarts.

6. Set the zero reference by entering **0** with the number key and pressing the **ZERO** key.

7. Fill the syringe with 15cc of the Hach Chlorine Calibration Standard 2.0 mg/L Cl_2. When the reagent tubes begin to flatten during the next cycle, remove the top plug on the colorimeter block and observe the color of the liquid in the sample cell. As the color begins to change from clear to red, immediately add 15cc of the chlorine standard solution through the hole in the top of the colorimeter block and replace the plug. This step will flush out the sample and reagents and replace them with the chlorine standard solution.

8. Wait until the display is updated with the next reading by noting when the display changes or the pump motor restarts.

9. The display should read **1.25** mg/L Cl_2. The acceptable range is 1.15 to 1.35 mg/L Cl_2. If the display reads within this range, no further action is necessary.

10. If it is necessary to make a correction, immediately enter **1.25** with the number keys and press the **STD** key.

11. Record the zero reference, the initial standard reading, and also the corrected standard reading (if any) in the Calibration Log.

APPENDIX C

CALIBRATION PROCEDURES FOR THE HACH 2100P TURBIDIMETER

1. According to the instrument manufacturer, this calibration procedure shall be performed weekly due to possible variations or diminishment in the brightness of the turbidimeter's referencing lamp which could cause measurement inaccuracies. In addition, daily accuracy checks shall be performed with the Hach Gelex secondary standards. The Gelex secondary standards will, in turn, have their values verified, and, if necessary, updated, whenever the turbidimeter is recalibrated with primary formazin standards.

2. For best accuracy, use four matched and labeled sample cells for all measurements during calibration so that cell contamination is eliminated. Always insert the cell so the orientation mark placed on the cell during the matching procedure is correctly aligned.

3. The Hach StablCal primary standards must be thoroughly mixed in order to re-suspend the formazin polymers by gently inverting the cells three to four times before starting the calibration.

4. Prepare the sealed vial with the Hach StablCal <0.1 NTU standard. Use the traditional preparation techniques (cleaning the sample cell and oiling when needed). Make sure that no bubbles exist in the sample cell before inserting it into cell compartment.

5. Insert the sample cell in the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment. Close the lid. Press **I/O**.

6. Press **CAL**. The **CAL** and **S0** icons will be displayed (the **0** will flash). The 4-digit display will show the value of the S0 standard for the previous calibration.

7. Press **READ**. The instrument will count down from 60 to 0, read the blank and use it to calculate a correction factor for the 20.0 NTU standard measurement. The display will automatically increment to the next standard. Remove the sample cell from the cell compartment.

8. The display will show the **S1** (with the 1 flashing) and **20** NTU. Prepare the sealed vial with the Hach StablCal 20.0 NTU StablCal primary formazin standard. Use the traditional preparation techniques (cleaning the sample cell and oiling when needed). Make sure that no bubbles exist in the sample cell before inserting it into cell compartment. Insert the sample cell into the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment. Close the lid.

9. Press **READ**. The instrument will count down from 60 to 0, measure the turbidity, and store the value. The display will automatically increment to the next standard. Remove the sample cell from the cell compartment.

10. The display will show the **S2** and **100** NTU. Prepare the sealed vial with the Hach StablCal 100 NTU StablCal primary formazin standard. Use the traditional preparation techniques (cleaning the sample cell and oiling when needed). Make sure that no bubbles exist in the sample cell before inserting it into cell compartment. Insert the sample cell into the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment. Close the lid.

11. Press **READ**. The instrument will count down from 60 to 0, measure the turbidity and store the value. Then, the display will automatically increment to the next standard. Remove the sample cell from the cell compartment.

12. The display will show the **S3** and **800** NTU. Prepare the sealed vial with the Hach StablCal 800 NTU StablCal primary formazin standard. Use the traditional preparation techniques (cleaning the sample cell and oiling when needed). Make sure that no bubbles exist in the sample cell before inserting it into cell compartment. Insert the sample cell into the cell compartment by aligning the cell with the mark on the front of the cell compartment. Close the lid.

13. Press **READ**. The instrument will count down from 60 to 0, measure the turbidity and store the value. Then the display will increment back to the **S0** display. Remove the sample cell from the cell compartment.

14. Press **CAL** to accept the calibration. The instrument will return to measurement mode automatically.

15. After the above procedures have been completed, verify the value of each Hach Gelex secondary standard. If the labeled values on the Gelex standards do not match the turbidimeter readings for each standard, update the label values at this time to match the new readings.

16. Record all readings and results in the Calibration Log.

NOTES: Pressing **CAL** completes the calculation of the calibration coefficients. If calibration errors occurred during calibration, error messages will appear after **CAL** is pressed. If **E1** or **E2** appear, check the standard preparation and review the calibration. Repeat the calibration if necessary. If **CAL?** appears, an error may have occurred during calibration. If **CAL?** is flashing, the instrument is using the default calibration.

If the **I/O** key is pressed during calibration, the new calibration data is lost and the old calibration will be used for measurements. Once in calibration mode, only the **READ**, **I/O**, ↑, and → keys function. Signal averaging and range mode must be selected before entering the calibration mode.

APPENDIX D

CALIBRATION PROCEDURES FOR THE HACH SURFACE 1720D TURBIDITY ANALYZER

Introduction

According to the instrument manufacturer, the correlation between turbidity and nephelometric light scatter is a well-defined linear relationship from 0.012 to 40.0 NTU. This linearity includes the ultra-low measurement range between 0.12 and 1.00 NTU. At 0.012 NTU, the turbidity of pure water is closely approached, and lower turbidity levels are theoretically not achievable with aqueous solutions. To obtain the most accurate calibration for the working linear range of 0.012 to 40.0 NTU, the manufacturer recommends the use of a 20.0 NTU formazin standard. This concentration was chosen primarily for the reason that contamination and bubble errors have less effect on the calibration accuracy at 20.0 NTU than they would have on a lower calibration standard. Because the relationship between nephelometric light scatter and turbidity is linear in the range of 0.0 – 40.0 NTU, calibrating a turbidimeter using a high-end turbidity standard with a value of less than 20.0 NTU is not necessary and not recommended by the manufacturer.

1. This calibration procedure shall be performed monthly in addition to daily comparison checks for accuracy with the Hach 2100P Turbidimeter.

2. Prepare two Hach 1720D turbidity analyzer calibration cylinders by thoroughly cleaning them with a diluted laboratory detergent such as Liqui-Nox (1 part detergent to 20 parts water) and a soft brush. Perform a final rinse using demineralized water.

3. Thoroughly clean the 1720D head assembly using laboratory detergent, water and a soft brush as described in the instrument manual. Rinse thoroughly with demineralized water.

4. Prepare the Hach <0.1 NTU StablCal Solution bottle (950 ml) for use:

    a. Rinse the outside of the StablCal Solution bottle with water to remove dust or other debris adhering to the outside of the container. Do not shake or invert the <0.1 NTU StablCal Solution.

    b. Carefully remove the heat seal. Keep the bottle tightly capped until use.

    c. Slowly pour the entire contents of the 950 ml bottle of <0.1 NTU StablCal Solution into one of the clean calibration cylinders. Protect this prepared standard from contamination by covering with a dust-free material such as aluminum foil or plastic wrap.

5. Prepare the Hach 20.0 NTU StablCal primary formazin standard bottle (950 ml) for use:

   a. Rinse the outside of the StablCal primary formazin standard bottle with water to remove any dust or other debris adhering to the outside of the container.

   b. Gently invert the StablCal primary formazin standard at least 50 times to mix and re-suspend the formazin polymer.

   c. Carefully remove the heat seal. Keep the bottle tightly capped before use.

   d. Slowly pour the entire contents of the 20.0 NTU StablCal primary formazin standard into the second calibration cylinder. Protect this standard from contamination by covering with a dust-free material such as aluminum foil or plastic wrap.

6. Place the freshly cleaned turbidimeter head assembly into the calibration cylinder containing the <0.1 NTU StablCal Solution. Be sure the turbidimeter head is properly aligned.

7. Gently tap the calibration cylinder and then let it stand for a minimum of one minute to free any bubbles adhering to the photocell window.

8. Press the **MENU** key to access the Main Menu. Select **SENSOR MENU** and press the **ENTER** key.

9. Select the sensor to be calibrated using the arrow keys and press the **ENTER** key.

10. Select **CALIBRATION** from the menu choices and press **ENTER**.

11. Move the pointer to the **ZERO ELECTRONICS** menu line and press the **ENTER** key.

12. Press the **ENTER** key again to continue. The display will show **PLEASE WAIT** for approximately 30 seconds while dark values (light detected by the instrument when the lamp is not lit) are read. Do not remove the turbidimeter head during this waiting period.

13. Move the pointer to **NORMAL CAL** and press **ENTER** to begin the calibration.

14. The display will prompt you to fill the calibration cylinder with demineralized water (<0.1 NTU StablCal Solution) which was completed in Step 6. Press **ENTER** to begin reading the <0.1 NTU StablCal Solution value.

15. Press **ENTER** again to accept the reading of the <0.1 NTU StablCal Solution.

16. The display will prompt for the calibration standard value. Enter the 20.0 NTU calibration standard using the arrow keys. Press the **ENTER** key.

17. Place the turbidimeter head assembly into the calibration cylinder containing the 20.0 NTU StablCal primary formazin standard. Make sure it is properly aligned on the cylinder.

18. Gently tap the calibration cylinder and then let it stand for a minimum of one minute to free any bubbles adhering to the photocell window.

19. Press **ENTER** to begin reading the 20.0 NTU value.

20. Press **ENTER** again to accept the reading of the 20.0 NTU standard.

21. The screen will show **SUCCESSFUL CAL!**. Press **ENTER** to accept the calibration and store it in memory or, to exit without updating the calibration, move the pointer to **ABORT CALIBRATION** and press **ENTER**. If the 1720D detects an improper calibration, the message **QUESTIONABLE CAL!** will be displayed.

CENTRAL COUNTY REUSE PUBLIC ACCESS SYSTEM OPERATING PROTOCOL

SARASOTA COUNTY
ENVIRONMENTAL SERVICES, UTILITIES

CENTRAL COUNTY
WATER RECLAMATION FACILITY

7905 South McIntosh Road
Sarasota, Florida 34238

FDEP PERMIT NUMBER: FLA013455

Prepared December 2004 by

Sarasota County Environmental Services, Utilities

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INTRODUCTION

The Sarasota County Central County Water Reclamation Facility treats domestic wastewater and produces public access quality reclaimed water which meets the requirements of the state of Florida, Department of Environmental Protection (FDEP) Rule 62-610, Part III Slow-Rate Land Application Systems; Public Access Areas, Residential Irrigation and Edible Crops and operates under FDEP Domestic Wastewater Facility Permit Number FLA013372 issued on April 23, 2002 and expiring on April 22, 2007. This reclaimed water is discharged to various golf courses and residential areas in the northern portion of Sarasota County which are part of the Sarasota County North Master Reuse System. The North Master Reuse System is operated under FDEP Permit Number FLA177008 issued on June 1, 2004, and expiring on May 31, 2009. The information contained in this operating protocol is a supplement to the Sarasota County Central County Water Reclamation Facility (CCWRF) Operation and Maintenance Manual and provides the necessary background information and operating procedures in order for the facility operators to maintain a safe water quality for distribution to the CCWRF Public Access Reuse System.

1. DESCRIPTION OF THE CENTRAL COUNTY PUBLIC ACCESS REUSE SYSTEM

1.1 System Overview

The purpose of the Central County Public Access Reuse System (CCPARS) is to provide outlets for distribution of treated wastewater effluent generated by the CCWRF. The CCPARS, at present, consists of public access quality slow rate land application by spray irrigation to four golf courses including the Oaks Golf Course, Stoneybrook Golf Course, Pristancia Golf Course, Sunrise Golf Course, and in addition approximately 1000 residential homes located in the Turtle Rock, Willington Chase, and Pelican Cove subdivisions. While the Sarasota County North Master Reuse System is currently permitted for an ultimate capacity of 11.805 million gallons per day (mgd) based on a 12 month rolling average, the average flow treated by the CCWRF during the last 12 months was approximately 2.32 mgd, with the average flow discharged to the CCPARS during the last 12 months being approximately 2.21 mgd.

The final effluent of the CCWRF is discharged to the CCPARS is pressurized twenty-four hours a day. The golf course ponds are filled automatically and work off a float system designed to automatically fill and shut off effluent to maintain proper pond level. The residential customers of Turtle Rock, Willington Chase, and Pelican Cove Subdivisions are on scheduled watering days.

In order to provide a better understanding of the treatment processes at the CCWRF and the interrelated components of the CCPARS, a flow diagram illustrating the treatment plant, public access reuse system and wet weather storage and disposal facilities is depicted in Exhibit 1.

1.2 Measuring Quantity of Flow to the System

The flow rate of the effluent discharged from the CCWRF is measured utilizing a Hydro Ranger Flow Meter. This information is translated to the plant (Supervisory Control and Data Acquisition) SCADA computer as flow in million gallons per day units, which is continuously recorded. The total quantity of effluent discharged to each site is manually recorded by a wastewater treatment plant operator certified by the FDEP (certified operator) every 24 hours from an electronic digital flow totalizer linked to the flow meter. The flow meter and totalizer are calibrated annually by a certified technician. Flows from the reclaimed water storage pond which provide storage for the CCPARS are measured by a Hydro Ranger Flow Meter. The totalizer readings are recorded manually by a certified plant operator during periods when flows are directed from the pond. These flow meters are checked for accuracy annually by a certified technician. All golf courses are fed through the high service distribution pumps located at the CCWRF through a 30-inch reuse main.

1.3 System Storage

In the event that the CCWRF's daily effluent flow quantity exceeds the daily amount of reclaimed water that the CCPARS golf courses and residential areas require for irrigation, the North and South Parcel X reclaimed water storage ponds provides the extra needed effluent for system flexibility. The North and South Parcel X reclaimed water storage ponds are monitored daily by the Reuse SCADA System ensure that the pond is maintained adequately for freeboard distance to the respective overflow level. The freeboard values, in conjunction with system flow amounts are analyzed to determine the daily amount, if any, of public access quality effluent to

transmit to the CCPARS reclaimed water storage ponds.

1.4 Water Quality Standards Established by the FDEP

Quality testing of the wastewater stream at the CCWRF is conducted for several reasons. Principal among these reasons are: (1) to provide data for control of the treatment plant's biological processes, and (2) to monitor effluent criteria established for public access reuse via the CCPARS.

Since the CCPARS provides reclaimed water from the CCWRF for reuse by irrigation of public access areas such as golf courses and private residences, it is crucial that this water be constantly monitored for total chlorine residual and turbidity in addition to it being regularly sampled and tested for other pertinent quality indicators to ensure that its quality remains consistently within FDEP established parameters. The FDEP rules for this type of reuse system are contained in Part III of Chapter 62-610, Florida Administrative Code (F.A.C.). Specifically, Rule 62-610.460, F.A.C., defines the treatment and water quality requirements for public access quality reclaimed water to the BRPARS as follows:

1. At minimum, secondary treatment standards for $CBOD_5$ (tested weekly);
2. pH between 6.0 and 8.5 (continuously monitored);
3. High-level disinfection (continuously monitored);
4. Total Suspended Solids (TSS) $\leq$ 5.0 mg/L after filtration prior to final disinfection (tested daily); and
5. Filtration (continuously provided) with standby chemical coagulant feed.

High-level disinfection is defined in FDEP Rule 62-600.440(5), F.A.C., and requires the following:

1. Total Chlorine Residual ≥ 1.0 mg/L after a minimum contact time of 15 minutes at peak hourly plant flow (continuously monitored).

2. Fecal Coliform Bacteria Colonies per 100 ml of sample (tested daily):

   (a) Seventy-five % of analyzed samples over a 30-day period have no detectable colonies.

   (b) No samples shall contain more than 25 colonies per 100 ml of sample.

1.5 Continuous Monitoring of Water Quality

Electronic analyzers that measure total chlorine residual and turbidity are utilized to provide continuous monitoring of the treatment plant's filtered and final effluent before it is discharged to the CCPARS. These analyzers relay their measurements to the plant SCADA system where they are automatically recorded as historical data.

1.5.1 Total Chlorine Residual Analyzer

A fractional horsepower centrifical pump transmits a representative sample of effluent from the discharge of the chlorine contact chambers and provides a continuous water flow to the Hach Model CL17 Total Chlorine Analyzer which is used for determining total chlorine content of the sample. A direct numerical read-out is displayed on the analyzer and is visible through a glass window in the door of its weatherproof cabinet. Additionally, this value is recorded on the plant SCADA system and recorded in the historical data. Alarm #1 on the analyzer display is activated

when total chlorine registers 1.5 mg/L or lower. Alarm #2 on the analyzer display is activated when total chlorine registers 1.2 mg/L or lower. The plant certified operator is alerted to these warning and reject alarm conditions by corresponding red LED lights on the analyzer display panel and the plant SCADA computer call-out. For enhanced reliability, an uninterruptible power supply (UPS) ensures the continuous operation of the analyzer so that momentary power losses will not cause a false alarm condition. The UPS also protects the instrument against power surges and voltage spikes.

1.5.2 Turbidity Analyzer

A fractional horsepower centrifical pump transmits a representative sample of effluent from the discharge of the two automatic deep bed sand filters prior to disinfection and provides a continuous water flow to the Hach 1720D Turbidity Analyzer which is used for determining turbidity of the sample. The turbidity measurement provides an indication of the total suspended solids content of the sampled effluent. A direct numerical read-out is displayed on the analyzer. Additionally, the value is monitored by the plant SCADA system and is continually entered into Historical Data. Alarm #1 on the analyzer display is activated when turbidity registers 2.7 NTUs or higher. Alarm #2 on the analyzer display is activated when turbidity registers 3.5 NTUs or higher. The plant certified operator is alerted to these warning and reject alarm conditions by corresponding red LED lights on the analyzer display panel and the plant SCADA computer call-out. For enhanced reliability, an uninterruptible power supply (UPS) ensures the continuous operation of the analyzer so that power losses will not cause a false alarm condition. The UPS also protects the analyzer against power surges and voltage spikes.

1.6 Automated Response to System Alarms

The automatic diversion of the CCWRF's final effluent discharge to the on-site reject pond is accomplished through automatic diversion valves. In the event of any substandard effluent that does not meet permit requirements effluent will be automatically be diverted to the on-site reject pond. The automatic diversion valves are located downstream of the chlorine contact chamber. The storage valve automatically closes and the reject valve automatically opens to divert the substandard effluent. The notification of on-call certified operators during times that the discharge does not meet the criteria for public access quality reclaimed water is one of the system's most important features. This feature consists of several, interconnected components:

1. Alarm #2 outputs from the continuous analyzers that initiate CCPARS shutdown
2. Warning alarm output to the plant SCADA system and reject alarm output to the plant SCADA autodialer from the chlorine/turbidity analyzers.

1.6.1 Continuous Analyzer Reject Alarm Output

When either the total chlorine residual or turbidity analyzer detects effluent that does not meet standards established for public access quality reclaimed water transmitted to the CCPARS, namely 1.2 mg/L or more for chlorine and 3.5 NTUs or less for turbidity, an electronic reject alarm signal is transmitted by the affected instrument's Alarm #2 output to the CCWRF SCADA system.

1.6.2 Plant SCADA Autodialer

The Plant SCADA Autodialer located in the Operations Building receives the reject alarm output

from on-line analyzers. Upon receiving an alarm, the automatic dialer contacts the on-call certified operator by telephone or pager and reports which analyzer is in reject alarm status. The automatic dialer will continue to call a series of pre-programmed telephone numbers until its alarm status is acknowledged and disabled via telephone by an on-call certified operator on the call-out list. For enhanced reliability, the automatic dialer has a built-in battery backup to ensure that the on-call certified operator is notified of an alarm condition even if electrical power to the unit is interrupted. When electric power to the autodialer is lost for more than one minute, the autodialer begins its dialing sequence to inform the on-call operator that power has been lost for more than one minute, which could indicate a problem with the automatic start-up of the treatment plant's emergency back-up generator.

1.7 Standby Chemical Coagulant Feed System

When the filter effluent turbidity exceeds 3.5 NTUs, flocculation or coagulation agents such as alum or polymer can be pumped to the two aeration/clarification basins to help lower the total suspended solids level of the clarifier effluent. The chemical feed system consists of a mixing/pumping station and transmission piping to each of the two aeration/clarification basins.

1.8 Wet Weather Storage and Disposal Facilities

Adequate storage or alternate disposal of the treatment plant's final effluent during times of extended wet weather is an important component of the CCPARS since its customers do not generally utilize irrigation water during rainy periods and the golf course reclaimed water storage ponds can store only a limited amount of treatment plant effluent.

Wet weather storage for the CCPARS is provided by two facilities located off-site. Generally, these facilities are placed into service only after the storage capacity of all the golf course reclaimed water storage ponds has been exhausted.

2. OPERATION OF THE CENTRAL COUNTY PUBLIC ACCESS REUSE SYSTEM

2.1 Water Quality Standards Established for the System

Daily operation of the CCPARS is basically a monitoring and response action. Sampling, testing, and analysis are accomplished through the use of electronic components and display devices and inform the certified operator by visual and audible means of any malfunction or unacceptable test results, either occurring presently or predicted to occur in the near future.

Acceptable operating criteria and tolerances have been established for each measured quality indicator.. These indicators and their parameters are compiled in Table 1 for the convenience of the certified operators responsible for monitoring effluent transmitted to the CCPARS.

TABLE 1

CENTRAL COUNTY PUBLIC ACCESS REUSE SYSTEM OPERATING STANDARDS

Quality Indicator	Normal Reading	Warning Setpoint	Reject Setpoint
Total Chlorine (mg/L)	3.0 to 5.0	≤ 1.5	≤ 1.2
Turbidity (NTU)	0.60 to 0.80	≥ 2.70	≥ 3.50
Total Suspended Solids (mg/L)	< 0.5 to 1.5	No samples greater than 5.0	
Fecal Coliform (colonies)	< 1	75% of all samples non-detectable No sample greater than 25 per 100 ml	

Even though the FDEP has established a lower limit of 1.0 mg/L for total chlorine residual for this type of reuse system, the lower limit established for the CCPARS for this parameter is 1.2 mg/L. This more conservative lower limit provides added quality assurance in case the accuracy of the total chlorine analyzer drifts somewhat between comparisons or calibrations and displays a reading slightly higher than what the total chlorine residual actually is.

2.2 Operational Procedures for Staffed Periods

It is imperative that the facility certified operators are familiar with the total CCPARS operation

and how it fits into and overlaps the normal functions of the treatment plant's daily sampling, testing, monitoring, and reporting duties. Vital components of the CCPARS operation include:

1. Monitoring and analysis of the quantity and quality of the effluent discharged to the CCPARS;
2. Daily comparison and calibration of the continuous analyzers and their corresponding laboratory instruments;
3. Comparison of continuous analyzer readings versus TSS and fecal coliform levels;
4. Procedures to follow in the event the final effluent fails to meet public access quality reclaimed water standards;
5. Routine testing of the CCWRF SCADA autodialer;
6. Proper care and maintenance of the continuous analyzers; and
7. Procedures to follow in the event of a continuous analyzer failure

2.2.1 Monitoring Water Quantity and Quality

The CCWRF is normally staffed at least sixteen hours per day, 7 days per week by a certified wastewater treatment plant operator to ensure the CCPARS receives the proper quantity and quality of reclaimed water. Each day, the total quantity of plant effluent the reclaimed water storage ponds comprising the CCPARS received in the last 24 hours is recorded and the data analyzed by a certified treatment plant operator. The certified operator uses this information, in conjunction with reclaimed water storage pond freeboard levels, historical and expected needs of the CCPARS customers and rainfall amounts, to determine the proper quantity of plant effluent to distribute to each of the BRPARS reclaimed water storage ponds so that customer irrigation requirements are met without exceeding the storage capacity of the ponds. To ensure the quality of the distributed effluent, the certified operator routinely inspects the continuous analyzers and

recorder charts for flow quantity, total chlorine residual, turbidity and pH. The operator also collects daily samples from the filter and final effluents to be tested for TSS content and fecal coliform colony counts by a contract laboratory certified by the state of Florida, Department of Health and Rehabilitative Services (FDHRS).

2.2.2 Calibration of Continuous Analyzers and Lab Instruments

Accurate sampling results from the continuous total chlorine residual and turbidity analyzers are essential to the quality of the effluent being transmitted to the CCPARS. Both analyzers are checked daily for accuracy by a certified operator by comparing their analysis results with corresponding laboratory instruments on split samples. Chlorine residual analysis results from the Hach CL17 Total Chlorine Residual Analyzer are compared to the Hach DR2010 spectrophotometer and turbidity analysis results from the Hach 1720D Turbidity Analyzer are compared to the Hach 2100P Turbidimeter. In turn, both laboratory instruments are checked daily for accuracy by a certified operator with secondary standards certified by the instrument manufacturer. Additionally, both laboratory instruments are checked weekly with primary standards and calibrated if necessary (calibration instructions are in Appendix A and C). Lastly, both continuous analyzers are checked monthly with primary standards and calibrated, if necessary (calibration instructions are in Appendix B and D). Both analyzers and laboratory instruments are inspected and calibrated annually by a certified instrument technician familiar with them.

2.2.3 Comparisons of Turbidity to TSS and TRC to Fecal Coliform

Whenever a grab sample for total suspended solids (TSS) analysis is collected from the filter

effluent the turbidity reading from the continuous turbidity analyzer is recorded. Collection of this data is important for establishing a relationship between turbidity and TSS values at the CCWRF. This compiled data is used to determine the proper turbidity reject alarm set point.

Whenever a grab sample for fecal coliform analysis is collected from the chlorine contact chamber effluent the total residual chlorine (TRC) reading from the continuous total chlorine analyzer is recorded. Collection of this data is necessary for developing a better understanding of the minimum total chlorine residual required to maintain nondetectable fecal coliform counts in the final effluent.

2.2.4 Failure to Meet Established Standards for the System

Operational standards for the CCPARS consist primarily of two levels of alarm parameters for total chlorine residual and turbidity. These two levels are designated as warning setpoint alarms and as reject setpoint alarms for each analyzer with numerical values for each listed in Table 1 in Section 2.1. These two levels of alarms assist the operator in providing assurances that the CCPARS will operate without interruption. In particular, these two setpoint alarms initiate a unique series of events at the treatment plant and require a different set of operational procedures to be followed by the certified operator on duty.

2.2.4.1 Responding to Warning Setpoint Alarms

In some instances in which the final effluent of the CCWRF is being distributed to the CCPARS, conditions may prevail which cause the total chlorine residual of the plant effluent to decrease to 1.5 mg/L or, more rarely, the turbidity of the filter effluent to increase to 2.7 NTUs. At the point

at which the chlorine residual or turbidity analyzers reach these warning setpoints, two events are automatically initiated:

1. The affected analyzer enters the warning setpoint Alarm #1 mode which is visually indicated to the operator by a red LED which lights on the analyzer display.

2. The chlorine residual/turbidity analyzer transmits an electronic signal to the plant SCADA system. This warning system gives the operator as much time as possible to acknowledge the warning alarm, investigate its cause and correct the problem.

If one of the continuous analyzers reaches its warning setpoint as described in the above paragraph, the certified operator on duty shall:

1. Silence the alarm horn as soon as possible (the warning lamp stays lit as long as the affected analyzer is at or beyond its warning setpoint);
2. Examine the analyzer, along with its associated appurtenances to make sure that no apparent condition exists that would cause the analyzer to display an erroneous reading;
3. Collect a comparative grab sample from the affected analyzer and test it on the corresponding laboratory instrument to verify the reading from the analyzer;
4. If the analyzer reading appears to be valid, attempt to determine what is causing the substandard reading. Although the reason could be actual degradation of the effluent, the cause could also be sample contamination or sample interference;
5. If the warning alarm is caused by low chlorine residual, increase the chlorine feed rate accordingly;
6. If the warning alarm is caused by high turbidity and the filter effluent appears to be clear, inspect and clean the turbidity analyzer sample reservoir and tubing to make sure the

sample is not being contaminated; and

7. Take any other necessary steps, if possible, to improve the quality of the plant effluent so that the warning alarm will be terminated and so that the effluent will not degrade to the point of violating established standards for the CCPARS, at which point procedures for reject setpoint alarms, as described in the second paragraph of Section 2.2.4.2 shall be followed.

2.2.4.2 Responding to Reject Setpoint Alarms

At the warning setpoint alarm stage, the plant effluent still meets standards for public access quality reclaimed water. If effluent quality continues to degrade so that total chlorine residual decreases to 1.2 mg/L or turbidity increases to 3.5 NTUs, several events are automatically initiated:

1. The affected analyzer enters the reject setpoint Alarm #2 mode which will be visually indicated to the operator by a red LED which lights on the analyzer display, which signifies that the sampled effluent no longer meets quality standards established for the CCPARS.
2. The affected analyzer transmits an electronic signal to the BRPARS pump station control panel which, in turn, causes a five-minute digital time delay relay within to begin counting down. Once this relay counts down to zero minutes, the BRPARS pump station pumps are automatically shut down which, in turn, causes the pump station wetwell to fill up and overflow into a gravity line, thus diverting final plant effluent into one of two lined reject ponds.

3. Upon receiving a chlorine value of 1.2 or lower from the chlorine analyzer or a turbidity value of 3.5 or higher from the turbidity analyzer, the analyzer transmits an electronic signal to the telephone autodialer which interprets the signal as either a chlorine or turbidity reject alarm. The autodialer begins its call-out sequence after a five-minute delay.

If one of the continuous analyzers reaches its reject setpoint as described in the preceding paragraph, the certified operator on duty shall:

1. Make sure all procedures established for continuous analyzer warning setpoint alarms as described in the second paragraph of Section 2.2.4.1 have already been completed.
2. If the continuous analyzer warning setpoint alarm procedures have been ineffective and shutdown of the CCPARS is imminent, make sure that the gate to the designated reject pond is indeed open.
3. Contact and inform the chief treatment plant operator of the status of the plant effluent and be prepared to follow any instructions received. If that person is not available, contact the appropriate water reclamation facility supervisor or the water reclamation facility superintendent, in that order.

2.2.5 Procedures for Returning the System to Service

If the certified operator on duty is successful in improving the quality of the plant effluent so that it again meets the quality standards established for the CCPARS, he or she shall place the CCPARS back in service after performing the following effluent quality assurance procedures. After the affected continuous analyzer is no longer in the reject Alarm #2 mode, the certified

operator shall wait at least 30 minutes to ensure that the final effluent will remain in compliance with the standards established for the CCPARS. After this assurance, the certified operator may resume distributing effluent to the CCPARS, manually placing the CCPARS gate into service by closing the reject pond gate and then opening the storage pond gate.

2.2.6 Testing the Automatic Shutdown System and Telephone Autodialer

On a monthly basis, prepared samples are substituted for sampled effluent in each continuous analyzer so that each analyzer provides a readout that indicates the sampled effluent has degraded beyond the reject setpoint. This procedure induces a simulated reject alarm condition within the CCPARS monitoring system components. The certified operator then makes sure that the CCPARS automatic diversion valves switch by the reject Alarm #2 of each analyzer within the required five-minute time limit and that the warning signals are working properly. Also, on a monthly basis, the Plant SCADA autodialer is tested for proper operation at the same time to ensure that it initiates its dialing sequence at the same instant the CCPARS diversion valves activate.

2.2.7 Care and Maintenance of the Continuous Analyzers

Both the total chlorine residual analyzer and the turbidity analyzer require proper care, regular maintenance, and cleaning to provide accurate sampling results. The CCWRF certified operator cleans appropriate parts, replaces tubing and components when necessary, and provides other essential maintenance as recommended by the manufacturer of each analyzer and described in the treatment plant maintenance schedules. All system warnings or system alarms from the analyzers are given prompt attention by the certified operator on duty so as to maintain their peak

operating efficiency and accuracy.

2.2.8 Procedures for When the Continuous Analyzers Are Out of Service

In the event that either of the two continuous analyzers fails to provide proper test results, the CCPARS storage gate is permitted to remain in service only if hourly grab samples corresponding to the failed analyzer are collected and analyzed on the appropriate lab instrument by a certified plant operator in order to ensure that the plant effluent continues to meet public access reclaimed water standards for total chlorine residual and turbidity. This procedure continues until the failed analyzer is repaired or replaced and confirmed to be providing accurate test results for at least 30 minutes. When either of the continuous analyzers are out of service, the CCPARS reject gate is activated and the plant's final effluent diverted to the lined reject pond before the CCWRF is left unattended without a certified operator present to provide hourly sampling and testing of the plant's effluent. As an added assurance that the CCPARS will operate with little or no interruption, another Hach CL17 Total Chlorine Analyzer and another Hach 1720D Turbidity Analyzer are kept at the CCWRF as part of its spare parts inventory.

2.3 Operational Procedures for Unstaffed Periods

The CCWRF is normally staffed with a certified wastewater treatment plant operator from 7:00 a.m. to 11:00 p.m. seven days per week, 365 days per year. The facility is normally unstaffed from 11:00 p.m. to 7:00 a.m. each day. During this time period, the continuous total chlorine residual and turbidity analyzers provide the necessary assurances that the CCPARS is receiving water that meets reclaimed water standards regarding total chlorine residual and TSS. Also, the plant SCADA autodialer, which is armed by the treatment plant's evening shift

certified operator before leaving the plant unattended each night, will contact an on-call certified operator by telephone in the event that either of the continuous analyzers enters a reject alarm state.

2.3.1 Automated Responses to Alarms by System Components

In sequence, the following events are automatically initiated if either continuous analyzer enters a reject alarm state any time the treatment plant is not staffed by a certified operator:

1. The affected analyzer will transmit an electronic signal to the CCPARS plant SCADA system which, in turn, causes a five-minute time delay relay within to begin counting down. Once this relay counts down to zero minutes, the CCPARS automatic diversion valve system is activated, thus diverting final plant effluent into the lined reject pond.
2. Upon receiving a chlorine value of 1.2 or lower from the chlorine analyzer or a turbidity value of 3.5 or higher from the turbidity analyzer, the analyzer transmits an electronic signal to the plant SCADA autodialer which interprets the signal as either a chlorine or turbidity reject alarm. The autodialer will begin its call-out sequence after a five-minute delay. This delay is programmed into the autodialer so that it will begin its call-out sequence at the same instant that the CCPARS automatic diversion valves switch. Once the automatic telephone dialer contacts an on-call certified operator, it will orally transmit the applicable alarm condition from a list of several possible alarms. After the on-call certified operator receives the telephone call, he or she must acknowledge the call by inputting the correct series of numbers into the telephone keypad. If the call-out is not acknowledged properly, the automatic dialer telephone dialer will call the next stored telephone number. The autodialer will continue to call the numbers stored within its

memory until the call-out is acknowledged. The main purpose of the five-minute delay programmed into the autodialer is to keep the on-call operator from being disturbed by a false alarm if effluent quality improves before the five-minute time delay relay in the CCPARS analyzer control panel times out, switching the diversion gates.

2.3.2 Responding to Alarms During Unstaffed Periods

Once the on-call certified operator acknowledges the autodialer, he or she shall:

1. Immediately travel to the CCWRF to investigate the reason the analyzer caused the telephone autodialer to call and to investigate the affected analyzer.
2. Upon arriving at the treatment plant, make sure that the CCPARS automatic diversion valves have indeed been activated by the affected continuous analyzer.
3. Silence the alarm horn.
4. Examine the affected analyzer and its associated appurtenances to make sure that no apparent condition exists that would cause the analyzer to display an erroneous reading.
5. Collect a comparative grab sample from the affected analyzer and analyze it on the corresponding laboratory instrument to verify the reading from the analyzer.
6. If the analyzer reading appears to be valid, attempt to determine what is causing the substandard reading. Although the reason could be actual degradation of the effluent, the cause could also be sample contamination or sample interference.
7. If the CCPARS reject condition was caused by low chlorine residual, increase the chlorine feed rate accordingly.
8. If the CCPARS reject condition was caused by high turbidity and the filter effluent appears to be clear, inspect and clean the turbidity analyzer sample reservoir and tubing to

make sure the sample is not being contaminated.

9. If all attempts at improving the quality of the plant effluent fail and the CCPARS will not be able to be re-activated, contact and inform the chief treatment plant operator of the status of the plant effluent and be prepared to follow any instructions received. If that person is not available, contact the appropriate water reclamation facility supervisor or water reclamation facility superintendent, in that order.
10. If, however, the on-call certified operator is successful in improving the quality of the plant effluent so that it again meets the standards established for the CCPARS, he or she shall place the CCPARS back in service after performing the following effluent quality assurance procedures. After the affected continuous analyzer is no longer in the reject Alarm #2 mode, the certified operator shall wait at least 30 minutes to ensure that the final effluent will remain in compliance with the standards established for the CCPARS.
11. After the quality assurance procedures described in Step 11 have been performed, the certified operator may resume distributing effluent to the CCPARS, manually placing the CCPARS Diversion gates back into service.
12. Before leaving the plant site, the on-call operator must thoroughly document the events of his or her response to the system alarm in the treatment plant's daily log.

APPENDIX A

CALIBRATION PROCEDURES FOR THE HACH DR2010 SPECTROPHOTOMETER

Introduction

According to the instrument manufacturer, a spectrophotometer, unlike a turbidimeter, does not require routine calibration since its low voltage, low intensity referencing lamp is not normally subject to variations or diminishment in brightness, which, in turn, can cause measurement inaccuracies. For this reason, the only time the spectrophotometer is calibrated is when the lamp is changed and a lamp calibration is necessary. However, accuracy checks with primary or secondary standards are routinely performed to ensure proper instrument function. If it is determined that the spectrophotometer is not reading with accuracy and precision, it should be sent back to the manufacturer for repair or adjustment.

1. Accuracy checks using additions of primary chlorine standard shall be performed weekly. In addition, the spectrophotometer shall be checked daily for accuracy with the Hach SpecCheck secondary standards. The SpecCheck secondary standards will, in turn, have their values verified, and, if necessary updated, whenever the spectrophotometer is checked with primary chlorine standard.

2. Items needed for this accuracy check shall include the 25 ml sample cell included with the DR2010, the Hach 0.1 to 1.0 ml Tensette Pipet, Tensette Pipet disposable tip and a Hach 10 ml Voluette Ampule Standard 50 – 75 mg/L Cl_2. Make sure to use a new Tensette Pipet tip for these procedures.

3. Enter the stored program number for free and total chlorine DPD powder pillows by pressing **80 ENTER**. The display will show **Dial nm to 530**.

4. Rotate the wavelength dial until the small display shows **530 nm**. When the correct wavelength is dialed in the display will quickly show **Zero Sample**, then **mg/L Cl_2**.

5. Fill a 25 ml sample cell (the blank) with 25 ml of demineralized water. Place it into the cell holder. Close the light shield.

6. Press **ZERO**. The display will show **Zeroing. . .** then **0.00 mg/L Cl_2**.

7. Remove the sample cell from the cell holder and add the contents of one 25 ml DPD Total Chlorine Powder Pillow to the sample cell. Stopper the sample cell and shake for 20 seconds in order to dissipate any bubbles, which may form. Remove the stopper.

8. Wait three minutes and then place the sample cell into the cell holder. Close the light shield.

9. Press **READ**. The display will show **Reading. . .** then the result in mg/L chlorine will be displayed. Considering that the demineralized water should have no chlorine in it, the result should read **0.00 mg/L Cl_2,** or within several hundredths of 0.00 mg/L. If not, the sample cell or the demineralized water may be contaminated. Record the reading, which will be used in the calculation of the first standard addition accuracy check.

10. Remove the sample cell from the cell holder.

11. Snap the top off a Hach 10 ml Voluette Ampule Standard 50 – 75 mg/L Cl_2. Be sure to note its certificate value, which will be used in the calculation of the first and subsequent standard addition values. The certificate value referred to in the formula in Steps 14, 19 and 24 is derived from the documentation contained in each carton of Hach chlorine ampules. After the following calculations have been completed for the first ampule in each carton and the standard values from these calculations have been recorded in the Calibration Log, subsequent accuracy checks by standard additions will not require the operator to recalculate the formulas in Steps 14, 19 and 24. Instead, the standard values already recorded in the Calibration Log for the first ampule in the carton can be used for all standard additions utilizing ampules from that same carton.

12. Use a Tensette Pipet to add 0.2 ml of the standard to the DPD reacted demineralized water already in the sample cell. Swirl to mix.

13. Place the spiked sample into the cell holder, close the light shield and read the spiked sample result by pressing **READ**. Record the reading for comparison to the calculated standard addition in the next step.

14. Calculate the equivalent concentration of mg/L chlorine added to the sample:

$$\text{mg/L Chlorine} = \frac{0.2\ (\text{volume of standard added}) \times \text{Certificate value (mg/L } Cl_2)}{25.2\ (\text{volume of sample} + \text{volume of standard added})}$$

15. The spiked sample result (Step 13) should be the same as the analyzed sample result in Step 9 plus the added, calculated mg/L Cl_2 (Step 14). If not, see "Standard Additions" in Section I of the *DR2010 Spectrophotometer Handbook* for more information on troubleshooting possible problems.

16. Remove the sample cell from the cell holder.

17. Use the Tensette Pipet to add another 0.2 ml of the chlorine standard to the sample cell. Swirl to mix.

18. Place the spiked sample into the cell holder, close the light shield and read the spiked sample result by pressing **READ**. Record the reading for comparison to the calculated standard addition in the next step.

19. Calculate the equivalent concentration of mg/L chlorine added to the sample by utilizing the formula in Step 14 except this time the denominator shall equal 25.4 instead of 25.2 due to the addition of another 0.2 ml of chlorine standard to the sample cell.

20. The spiked sample result (Step 18) should be the same as the analyzed sample result in Step 13 plus the added, calculated mg/L Cl_2 (Step 19). If not, see "Standard Additions" in Section I of the *DR2010 Spectrophotometer Handbook* for more information on troubleshooting possible problems.

21. Remove the sample cell from the cell holder.

22. Use the Tensette Pipet to add another 0.2 ml of the chlorine standard to the sample cell. Swirl to mix.

23. Place the spiked sample into the cell holder, close the light shield and read the spiked sample result by pressing **READ**. Record the reading for comparison to the calculated standard addition in the next step.

24. Calculate the equivalent concentration of mg/L chlorine added to the sample by utilizing the formula in Step 14 except this time the denominator shall equal 25.6 instead of 25.4 due to the addition of another 0.2 ml of chlorine standard to the sample cell.

25. The spiked sample result (Step 23) should be the same as the analyzed sample result in Step 18 plus the added, calculated mg/L Cl_2 (Step 24). If not, see "Standard Additions" in Section I of the *DR2010 Spectrophotometer Handbook* for more information on troubleshooting possible problems.

26. After the above procedures have been completed, verify the value of each Hach SpecCheck secondary standard. If the labeled values on the SpecCheck standards do not match the spectrophotometer readings for each standard, update the label values at this time to match the new readings.

27. Record all readings and results in the Calibration Log.

APPENDIX B

CALIBRATION PROCEDURES FOR THE HACH CL17 CHLORINE ANALYZER

1. This calibration procedure shall be performed monthly in addition to daily comparison checks for accuracy with the Hach DR2010 Spectrophotometer.

2. This procedure requires a new 15cc syringe, demineralized water and Hach Chlorine Calibration Standard 2.0 mg/L Cl_2, catalog number 20594-16. According to the analyzer manufacturer, the CL17 chlorine analyzer recognizes this standard as a 1.25 mg/l Cl_2 value.

3. After transporting the items needed for calibration to the chlorine analyzer, establish the zero mg/L reference by first observing the front of the CL17 pump module throughout a measurement cycle. Make note of the point where reagents are added as indicated by the flattening of the two center reagent tubes in the pump module.

4. Fill the syringe with 15cc of demineralized water. When the reagent tubes begin to flatten during the next cycle, remove the top plug on the colorimeter block and observe the color of the liquid in the sample cell. As the color begins to change from clear to red, immediately add 15cc of demineralized water through the hole in the top of the colorimeter block and replace the plug. This step will flush out the sample and reagents and replace them with the demineralized water.

5. Wait until the display is updated with the next reading by noting when the display changes or the pump motor restarts.

6. Set the zero reference by entering **0** with the number key and pressing the **ZERO** key.

7. Fill the syringe with 15cc of the Hach Chlorine Calibration Standard 2.0 mg/L Cl_2. When the reagent tubes begin to flatten during the next cycle, remove the top plug on the colorimeter block and observe the color of the liquid in the sample cell. As the color begins to change from clear to red, immediately add 15cc of the chlorine standard solution through the hole in the top of the colorimeter block and replace the plug. This step will flush out the sample and reagents and replace them with the chlorine standard solution.

8. Wait until the display is updated with the next reading by noting when the display changes or the pump motor restarts.

9. The display should read **1.25** mg/L Cl_2. The acceptable range is 1.15 to 1.35 mg/L Cl_2. If the display reads within this range no further action is necessary.

10. If it is necessary to make a correction, immediately enter **1.25** with the number keys and press the **STD** key.

11. Record the zero reference, the initial standard reading and also the corrected standard reading (if any) in the Calibration Log.

APPENDIX C

CALIBRATION PROCEDURES FOR THE HACH 2100P TURBIDIMETER

1. According to the instrument manufacturer, this calibration procedure shall be performed weekly due to possible variations or diminishment in the brightness of the turbidimeter's referencing lamp, which could cause measurement inaccuracies. In addition, daily accuracy checks shall be performed with the Hach Gelex secondary standards. The Gelex secondary standards will, in turn, have their values verified, and, if necessary updated, whenever the turbidimeter is recalibrated with primary formazin standards.

2. For best accuracy, use four matched and labeled sample cells for all measurements during calibration so that cell contamination is eliminated. Always insert the cell so the orientation mark placed on the cell during the matching procedure is correctly aligned.

3. The Hach StablCal primary standards must be thoroughly mixed in order to re-suspend the formazin polymers by gently inverting their containers for at least 30 seconds immediately before adding the standards to the sample cells.

4. Rinse a clean sample cell with demineralized water several times. Then fill the cell to the line (about 15 ml) with Hach StablCal <0.1 NTU standard. Make sure that no bubbles exist in the sample cell before inserting it into cell compartment.

5. Insert the sample cell in the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment. Close the lid. Press **I/O**.

6. Press **CAL**. The **CAL** and **S0** icons will be displayed (the **0** will flash). The 4-digit display will show the value of the S0 standard for the previous calibration.

7. Press **READ**. The instrument will count down from 60 to 0, read the blank and use it to calculate a correction factor for the 20.0 NTU standard measurement. The display will automatically increment to the next standard. Remove the sample cell from the cell compartment.

8. The display will show the **S1** (with the 1 flashing) and **20** NTU. Fill a clean sample cell to the line with well mixed 20.0 NTU StablCal primary formazin standard. Make sure that no bubbles exist in the sample cell before inserting it into cell compartment. Insert the sample cell into the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment. Close the lid.

9. Press **READ**. The instrument will count down from 60 to 0, measure the turbidity and store the value. The display will automatically increment to the next standard. Remove the sample cell from the cell compartment.

10. The display will show the **S2** and **100** NTU. Fill a clean sample cell to the line with well mixed 100 NTU StablCal primary formazin standard. Make sure that no bubbles exist in the sample cell before inserting it into cell compartment. Insert the sample cell into the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment. Close the lid.

11. Press **READ**. The instrument will count down from 60 to 0, measure the turbidity and store the value. Then, the display will automatically increment to the next standard. Remove the sample cell from the cell compartment.

12. The display will show the **S3** and **800** NTU. Fill a clean sample cell to the line with well mixed 800 NTU StablCal primary formazin standard. Make sure that no bubbles exist in the sample cell before inserting it into cell compartment. Insert the sample cell into the cell compartment by aligning the cell with the mark on the front of the cell compartment. Close the lid.

13. Press **READ**. The instrument will count down from 60 to 0, measure the turbidity and store the value. Then the display will increment back to the **S0** display. Remove the sample cell from the cell compartment.

14. Press **CAL** to accept the calibration. The instrument will return to measurement mode automatically.

15. After the above procedures have been completed, verify the value of each Hach Gelex secondary standard. If the labeled values on the Gelex standards do not match the turbidimeter readings for each standard, update the label values at this time to match the new readings.

16. Record all readings and results in the Calibration Log.

NOTES: Pressing **CAL** completes the calculation of the calibration coefficients. If calibration errors occurred during calibration, error messages will appear after **CAL** is pressed. If **E1** or **E2** appear, check the standard preparation and review the calibration. Repeat the calibration if necessary. If **CAL?** appears, an error may have occurred during calibration. If **CAL?** is flashing, the instrument is using the default calibration.

If the **I/O** key is pressed during calibration, the new calibration data is lost and the old calibration will be used for measurements. Once in calibration mode, only the **READ**, **I/O**, ↑, and → keys function. Signal averaging and range mode must be selected before entering the calibration mode.

APPENDIX D

CALIBRATION PROCEDURES FOR THE HACH 1720C TURBIDITY ANALYZER

Introduction

According to the instrument manufacturer, the correlation between turbidity and nephelometric light scatter is a well-defined linear relationship from 0.012 to 40.0 NTU. This linearity includes the ultra-low measurement range between 0.12 and 1.00 NTU. At 0.012 NTU, the turbidity of pure water is closely approached, and lower turbidity levels are theoretically not achievable with aqueous solutions. To obtain the most accurate calibration for the working linear range of 0.012 to 40.0 NTU, the manufacturer recommends the use of a 20.0 NTU formazin standard. This concentration was chosen primarily for the reason that contamination and bubble errors have less effect on the calibration accuracy at 20.0 NTU than they would have on a lower calibration standard. Because the relationship between nephelometric light scatter and turbidity is linear in the range of 0.0 – 40.0 NTU, calibrating a turbidimeter using a high-end turbidity standard with a value of less than 20.0 NTU is not necessary and not recommended by the manufacturer.

1. This calibration procedure shall be performed monthly in addition to daily comparison checks for accuracy with the Hach 2100P Turbidimeter.

2. Prepare two Hach 1720C turbidity analyzer calibration cylinders by thoroughly cleaning them with a diluted laboratory detergent such as Liqui-Nox (1 part detergent to 20 parts water) and a soft brush. Perform a final rinse using demineralized water.

3. Remove the head assembly from the 1720C turbidimeter body. Thoroughly clean the head assembly including the lamp, lens and photocell window with laboratory detergent, water and a soft brush as described in the instrument manual. Perform a final rinse using demineralized water.

4. Prepare the Hach <0.1 NTU StablCal Solution bottle (950 ml) for use:

    a. Rinse the outside of the StablCal Solution bottle with water to remove dust or other debris adhering to the outside of the container. Do not shake or invert the <0.1 NTU StablCal Solution.

    b. Carefully remove the heat seal. Keep the bottle tightly capped until use.

    c. Slowly pour the entire contents of the 950 ml bottle of <0.1 NTU StablCal Solution into one of the clean calibration cylinders. Protect this prepared standard from contamination by covering with a dust-free material such as aluminum foil or plastic wrap.

5. Prepare the Hach 20.0 NTU StablCal primary formazin standard bottle (950 ml) for use:

   a. Rinse the outside of the StablCal primary formazin standard bottle with water to remove any dust or other debris adhering to the outside of the container.

   b. Gently invert the StablCal primary formazin standard at least 50 times to mix and re-suspend the formazin polymer.

   c. Carefully remove the heat seal. Keep the bottle tightly capped before use.

   d. Slowly pour the entire contents of the 20.0 NTU StablCal primary formazin standard into the second calibration cylinder. Protect this standard from contamination by covering with a dust-free material such as aluminum foil or plastic wrap.

6. Place the freshly cleaned turbidimeter head assembly into the calibration cylinder containing the <0.1 NTU StablCal Solution. Be sure the turbidimeter head is properly aligned.

7. Gently tap the calibration cylinder and then let it stand for a minimum of one minute to free any bubbles adhering to the photocell window.

8. Press **SYS RESET** and **6 SIG AVG** and allow the water to stand until the turbidity reading stabilizes. Press **0.0 STD**. This step stores the light scatter level in the <0.1 StablCal Solution so that the <0.1 StablCal Solution turbidity is compensated for in the formazin standard.

9. Place the turbidimeter head assembly into the calibration cylinder containing the 20.0 NTU StablCal primary formazin standard. Make sure it is properly aligned on the cylinder.

10. Gently tap the calibration cylinder and then let it stand for a minimum of one minute to free any bubbles adhering to the photocell window.

11. Allow to stand until the reading stabilizes. Press **20.0 STD**. The display will show the value of the 20.0 NTU StablCal primary formazin standard.

12. Replace the instrument head assembly into the 1720C turbidimeter body. The instrument is now calibrated.

APPENDIX F

SUMMARY OF AGREEMENTS

ID	Customer	Meter #	Alternate Name	Parcel ID	Acres/homes	Type of Use	Yr of Connection	Maximum GPD on Agreement	Date of Agreement	Date of Next Renewal
102	Palmer Venture	97900037	Huntington Pointe(612012)	0133-01-0036	4.04	CA	1991	20,000	4/12/1991	4/12/2021
104	Stoneybrook Commons Association, Inc.	922278	Stoneybrook Estates(612898)	0134-05-0014	3.00	CA	1992	45,269	6/22/1992	6/22/2022
106	Marbella Community Association, Inc.	92334867	Marbella Entrance(611902)	0100-16-0013	1.00	CA	1993	5,420	2/2/1993	2/2/2013
107	Sarasota Square Mall	20083083	Sarasota Shoppingtown - 8201 S. Tamiami Tr.(630112)	0123-11-0008	87.00	CA	1999	80,000	4/9/1999	4/9/2019
108	Venice Golf & Country Club	00920822	Venice G&C Club Golf Course	0422-09-0001	185	GC	1990	250,000	12/6/1991	
110	Stoneybrook Golf & Country Club of Sarasota, Inc	200808456	Master Meter (Stoneybrook G&C Club 612906)	0134-04-0001	170	GC	1993	445,000	12/28/1993	12/28/2013
112	Saraman Corp. (assigned to Reed Mapes, Inc.)	61164020	Pinestone at Palmer Ranch(614710)	0124-09-1001	8.00	MF	1995	150,000	2/7/1995	2/7/2015
113	Alternative Living Services, Inc.	95650649	Alterra Healthcare (McIntosh Rd. 614714)	0124-09-0003	3.20	CA	1995	25,000	6/20/1995	6/20/2015
114	Oaks I Homeowner's Association, Inc.		Oaks I (Tamiami Trail North 336)	0131-09-0004	105	SFH	1995	300,000	4/21/1995	4/21/2015
117	Mirada Construction Company	9565D596	Monte Verde at Villa Mirada(611962)	0116-04-0024	2.34	CA	1995	17,000	5/18/1995	5/18/2015
118	Centex Real Estate Corporation	S3983601	Wellington Chase East (#626842)	0097-15-0042	111.00	SFH	1995	under other agrmt.	11/22/1995	11/22/2015
118	Centex Real Estate Corporation	S3983602	Wellington Chase West (626840)	0097-15-0042	111.00	SFH	1995	160,000	11/22/1995	11/22/2015
121	Palmer Ranch Master Property Owner's Association	S1164 025	Northridge Road(626766)	0097-15-0042	55.00	M	1995	227,000	10/2/1995	10/2/2015
122	Palmer Park of Commerce Tract Owner's Association	20013900RD	7900 McIntosh Road (Palmer Park of Commerce 626760)	0	12.00	M	1992	65,000	8/27/1995	8/27/2015
123	Isles of Sarasota Home Owners DiVosta LP (517372)	00049527	Isles of Sarasota 1907 Burgos (517372)	0138-01-0001	216.00	SFH	2006	300,000	11/28/2005	11/28/2015
124	Palmer Ranch Enterprises, Inc.	961216A	Placid Forest - a/k/a Stonebridge(611082)	0116-02-0031	100.00	SFH	1995	31,000	12/29/1995	12/29/2015
126	Pelican Cove Condominium Association, Inc.	6983608	1615 Pelican Point Drive (Pelican Cove 627656)	0126-08-0001	75		1998	100,000	1/7/1998	1/7/2018
127	Venice East Golf Association, Inc.	09903178	Venice East Golf Course	0446-13-0010	37.15	GC	1997	100,000	3/4/1997	3/4/2017
128	Miguel A. Santos	94341024	6925 Mandarin Road(108568)	0096-13-0003	1.00	SFH	1997	1,000		
129	Sarasota Golf Club, Inc.	00203174	Sarasota Golf Course (1801 Par Place)	0236-02-0001	90.00	GC	1994	200,000	8/2/1994	8/2/2014
130	Misty Creek Country Club, Inc.	20071215	Misty Creek Golf Course	0269-00-1020	110.00	GC	1995	360,000	3/20/1995	3/20/2015
131	Gator Creek Golf Club, Inc.	20070463	Gator Creek Golf Course	0279-00-1010	120.00	GC	1994	190,000	12/12/1994	12/12/2014
132	R.F. Carlson Co.	10308621	R.F.Carlson (6551Palmer Park Cir.613170)	0098-04-0007	1.50	CA	1997	5,000	3/5/1997	3/5/2017
133	Grayso Corporation	B4973633	Serenoa Golf Course (548244)	0287-03-0017	250.00	GC	1997	295,000	3/25/1997	3/25/2017
134	Heritage Oaks c/o U.S. Home Corporation	20063669	Heritage Oaks(632022)	0258-15-0010	220.00	GC	1997	500,000	4/16/1997	4/16/2017
135	Jacaranda Golf & Country Club	631826B4	Jacaranda Golf Course	0438-12-0001	64	GC	1982	900,000	2004	2014
137	Bent Tree Country Club, Inc.	90S99577	Bent Tree Golf Course	0257-14-0025	153.00	GC	1989	250,000	9/4/2001	9/4/2021
138	Tri-Way Development Corporation	20070904	Barton Farms	0245-13-0027	110.00	SFH	1997	500,000	10/10/1997	10/10/2017
140	Sarasota Memorial Hospital	59111556	SMH - 6075 Rand East Meter	0095-03-0001	20.00	CA	1999	95,000	1/12/1999	1/12/2019
141	PLAZA DE FLORES CONDO ASSOC	97900030	4700 Central Sarasota Pkwy. North(626814)		8.00	MF	1998	27,000	7/27/1998	7/27/2018
141	PLAZA DE FLORES CONDO ASSOC	97900098	4700 Central Sarasota Pkwy. South(626816)		8.00	MF	1998	28,000	7/28/1998	7/28/2018
142	Bayside Sod, Inc.	C6935316	7850 Ibis Avenue (Bayside Sod 187092)	0309-00-1000	300.00	SD	1997	1,200,000	8/18/1997	8/18/2017
143	Bay Village of Sarasota, Inc.	3983615	Bay Village (8400 Vamo Road 630662)	0126-08-0001	15.00	CA	1999	35,000	7/6/1999	7/6/2019
144	Villa Mirada	95650650	Villa Mirada - 4634 Mirada Way(611960)	0116-04-0024	10.00	CA	1998	30,000		
145	Silver Oak	B4993631	4450 Central Sarasota Pkwy. (Silver Oak 631422)	0137-04-0022	70.00	SFH	1998	160,000	12/24/1998	12/24/2018
146	HAMPTONS OF SARASOTA	20020198	6500 Honore Avenue (6" meter Hamptons)(628298)	0098-15-0031	100.00	SFH	1998	160,000	6/20/2003	
147	Pelican Pointe Golf & Country Club	20011662	Pelican Pointe Golf Course & Common Areas & SFH's	0425-15-0020	248	GC	1986	500,000	4/9/2003	4/9/2013
148	LaVenezia at Palmer Ranch	61164026	4100 Central Sarasota Pkwy.(612576)	0132-01-0003	9.60	MF	1997	46,500	11/19/1997	11/19/2017
149	Sawyer Loop Partners (D.L. Porter Construction)	97900053	6572 Palmer Park Circle(109074)	0098-05-0002	1.10	CA	1997	5,000		
151	Palmer Park of Commerce	97900028	Sawyer Loop Road(109064)	0098-03-0007	2.00	M	1997	5,000		
151	Palmer Ranch Master Homeowner's Association	2011661	Central Sarasota Parkway (#626764)		26.00	M	1995	53,000		
151	Palmer Ranch Master Homeowner's Association	61164024	Central Sarasota Parkway (#626770) Stonybrk.		8.00	M	1995	under other agrmt.		
151	Palmer Ranch Master Homeowner's Association	920962	McIntosh Road (#626762)	0124-09-0002	10.00	M	1995	under other agrmt.		
151	Palmer Ranch Master Homeowner's Association	922457	Sarasota Square Blvd.(626758)	0113-01-0100	23.01	M	1992	117,856		
152	ECKERD / CVS # 05211-01	97900029	Eckerd Corp. (5200 Clark Road 632722)	0097-01-0001	1.97	CA	2000	5,000	3/29/2000	3/29/2021
155	The Glenridge on Palmer Ranch	B4993632	Glenridge on Palmer Ranch(512236)	0117-00-2040	90.00	CA	2003	200,000	9/12/2002	9/12/2022
156	CYPRESS MAYFAIR LIMITED	20110136	5010 Central Sarasota Pkwy. Mayfair (493680)	0134-01-0005	15.00	MF	2000	97,000	4/7/2000	4/7/2020
157	DiVosta Company (494266)	20011658	VillageWalk(494266)	0119-14-0012	70	SFH	2001	200,000	9/24/2001	9/24/2021
157	DiVosta Company, Reuse #2	00049690	VillageWalk, Reuse #2(501786)	0119-11-0100	70	SFH	2003	200,000	9/18/2003	9/18/2013
158	NORMANS LIQUORS	97900051	Norman's Liquors (5200 Clark Road 485824)	0097-01-0003	0.75	CA	2000	2,000	11/30/2000	11/30/2020
159	Foxfire Golf Course of Sarasota	00049854	Red Hawk - Foxfire Golf Club(515908)	0264-09-0036	287.00	GC/SFH	2005	375,000	2/11/2004	2/11/2014
161	Founders Club Development Co, LLC	63312871	9000 Fruitville Road Founders(residential) - #513220	0221-03-0032	300.00	SFH	2004	440,000	3/21/2003	3/21/2023
161	Founders Golf Club, Inc.	63312872	9000 Fruitville Road Founders (golf course) - #513224	0221-03-0032	110.00	GC	2004	308,800	3/21/2003	3/21/2023
162	Publix at Northridge Road	61164019	Publix at Northridge SR Development (512274)	0097-01-0005	12.00	CA	2002	222	11/19/2002	11/19/2022
163	Eagle Trace Subdivision	83973718	Eagle Trace(502898)	0234-09-0013	12	SFH	2003	10,000	12/16/2002	12/16/2002
165	The Preserve at Heron Lake(516746)	00050430	Heron Lake Preserve(516746)	0283-16-0001	32.00	SFH	2005	300000*	8/2/2005	8/2/2015
166	James Shea 7340 Palomino (185660)	07054693	James Shea 7340 Palomino (185660)	0277-01-0151	17.00	SFH	2007	25,000	3/12/2007	3/12/2017
169	Tournament Players Club	201938	Tournament Players Dr. (TPC 611990)	0113-01-0100	180.00	GC	1985	400,000	11/11/1985	Until CCU ceases to operate
176	NAP Bee Ridge LLC	06022475	NAP Bee Ridge LLC (547342)	0257-01-0004	?		2009	25,000	3/6/2009	3/6/2019
104A	Stoneybrook Estates Community Association, Inc.	20020686	Preymore Stoneybrook(612582)	0133-09-0040	10.00	CA	1992	34,500	6/22/1992	6/22/2022
other	Botanica at Palmer Ranch	20033479	Palmer Ranch Parkway Ext. (Botanica 629386)	0116-01-0003	5.00	MF	1994	under other agrmt.		
other	Lennar Homes, Inc.	99900050	6500 Honore Avenue (Hamptons 2")(626666)		2.00	CA	1998	under other agrmt.		
other	Palmer Ranch Enterprises, Inc. & Golden Eagle Service	20021830	T/R Hanging Moss Lane(139286)	0121-16-0001	108.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	Palmer Ranch Enterprises, Inc. & Golden Eagle Service	20021833	T/R Meadow Rush Loop(611216)	0121-09-0020	50.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	Palmer Ranch Enterprises, Inc. & Golden Eagle Service	20063324	T/R Park Shore Lane(612558)	0122-09-0001	133.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	Palmer Ranch Enterprises, Inc. & Golden Eagle Service	20063161	T/R Sweetmeadow NE(612562)	0122-01-0017	82.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
ID	Customer	Meter #	Alternate Name	Parcel ID	Acres/homes	Type of Use	Yr of Connection	Maximum GPD on Agreement	Date of Agreement	Date of Next Renewal

other	Palmer Ranch Enterprises, Inc. & Golden Eagle Service	20063160	T/R Sweetmeadow NW(612560)	0122-01-0049	63.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	Palmer Ranch Enterprises, Inc. & Golden Eagle Service	20021832	T/R Timber Chase Way(138494)	0121-16-0010	43.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	Palmer Ranch Master Property Owner's Association	932354	Prestancia South(614040)	0113-01-0100	20.00	CA	1992	under other agrmt.		
other	Sarasota County	94566143	7462 Featherstone Test Meter(626772)	0116-02-0029	1.00	SFH	1995	under other agrmt.		
other	SERENADE ON PALMER RANCH CONDO	20083082	Northridge Savoy(631484)	0097-15-0042	15.00	MF	1995	under other agrmt.		
other	TURTLE ROCK COMM ASSOC INC	20063325	T/R Sabal Lake NW(626930)	0116-10-0017	73.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	TURTLE ROCK COMM ASSOC INC	20021831	T/R Deerbrook Circle(626926)	0121-08-0019	59.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	TURTLE ROCK COMM ASSOC INC	20021834	T/R Nice Way Reuse(626934)	0116-16-0001	66.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	TURTLE ROCK COMM ASSOC INC	20021837	T/R Sabal Lake NE(626928)	0116-09-0001	34.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
other	TURTLE ROCK COMM ASSOC INC	20071214	T/R Sweetmeadow Circle Reuse #8(626932)	0121-08-0048	42.00	SFH	1994	under other agrmt.	6/9/1994	6/9/2014
	Arvida Oaks II, Ltd. (assigned to Oaks 2000, L.C.)	00960213	Oaks Golf Courses (MacEwen Drive 150554)	0142-01-0002	230	GC	1988	500,000	8/2/1988	Until CCU ceases to provide sewer
	DORMAN, TERRY	97900001		0096-13-0003						
	Lowes Marcobay Construction(550072)	090S4574	Lowes Marcobay Construction(550072)	0132-02-0001	2.00	CA	2011		4/9/2012	4/9/2022
	Manor Care of Boynton Beach, Inc.	61164018	Manor Care - 5111 Palmer Ran. Pkwy.(628888)	0116-01-0002	4.00	CA	1997	100,000		
	NORTH HAMPTONS COMM ASSOC	B4993633	North Hamptons(511740)	0098-15-0031	56	SFH	2003			
	Palmer Management, Inc.	99528063	Honore 1(628862)	0097-15-0042	1.00	M	1998	5,000		
	Palmer Management, Inc.	99528061	Honore 2(628864)	0098-15-0031	1.00	M	1998	5,000		
	Palmer Management, Inc.	61164022	Honore 3(628866)	0115-07-0009	1.00	M	1998	5,000		
	Palmer Ranch Enterprises, Inc. & Golden Eagle Service	9437214	T/R Clubhouse(612556)	0121-16-0004	1.00	M	1994	262,500		
	Palmer Ranch Master Association, Inc.	20012074	Honore #4	0116-01-0003	1.00	M	2001	25,000		
	Palmer Ranch Master Association, Inc.	20012075	Honore #5	0121-16-0004	1.00	M	2001	25,000		
	Palmer Ranch Master Homeowner's Association	20013900								
	Palmer Ranch Master Homeowner's Association	61164017								
	Palmer Ranch Master Homeowner's Association	20072833		0133-01-0036						
	Palmer Ranch Master Homeowner's Association	61164021		0124-15-0002						
153	Plantation Golf & Country Club	00201041	Panther Golf Course(494464)	0442-04-0001	240.00	GC	2001	300,000	10/4/2001	10/4/2021
	Pool Water Products	99900046	6500 Sawyer Loop Road(613176)	0098-03-0006	1.00	CA	1996	5,000		
	Potter Park c/o Sarasota County Parks & Rec. Dept.	90013952	8587 Potter Park Drive(627208)	0124-15-0002	3.50	P	1998	50,000		
	PRESTANCIA COMM ASSOC INC	910818								
	Sarasota County Fire Dept	09054595	Sarasota County FD - 9102 Bloomfield(547798)	0136-00-1019			2010			
	Sarasota County Fire Dept	09054596	Sarasota County FD - 9102 Bloomfield(547798)	0136-00-1020			2010			
	Sarasota County Parks & Recreation Dept.	00200311	17th St. Soccer Fields(481472)	0040-06-0002	5.00	P	2000	15,000		
	Stoneybrook Golf & Country Club of Sarasota, Inc	20020687		0134-04-0001						
	Stoneybrook Golf & Country Club of Sarasota, Inc.	94566144	Stoneybrook Reuse Sign(612904)	0134-05-0002		CA	1992	1,000		
	Turtle Rock Blvd.	20021835	Turtle Rock Blvd.(140118)	0116-07-0045		CA	1994			
	Tuscano Sarasota National	07052C87	Tuscano Sarasota National 24351 Spartina (543702)	0462-00-1000	700.00	GC/SFH	2007	2,000,000	10/10/2006	10/10/2026
	USPS	94566147		0098-04-0009					9/21/1995	9/21/2015
	VINYARDS SILVEROAKS HOA	20020684	5100 Cantabria Crest(632242)	0136-12-0037	20.00	SFH	1998	45,000		
	Taylor Woodrow Homes Limited		The Highlands			GC		370,000	8/31/1987	8/31/2086
	Taylor Woodrow Homes Limited		Hammock Place Reservior						2/4/1992	2/4/2091
	Valencia Management Limited Partnership		Valencia at Prestancia		2.34			17,000	5/25/1995	5/25/2015
	Sunrise Golf Club		Sunrise GC		110			250,000	4/12/1995	4/12/2015
	Laurel Oak									7/25/1989

Abbreviations

GC Golf Course
CA Common Area
SFH Single Family Home
M Median
P Park
MF Multi Family Home

APPENDIX G

LANDAP 2010 RESULTS

2011 Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 5250 *Acres*

- (•) Wet-Weather Storage
- ( ) Wet-Weather Discharge

Calculate

"----------Output----------"	
Required Storage	**229.56** *MG*
Required Days of Storage	**34.15**
Year of 10-yr Return Period	**1971**
Annual Avg. Daily Flow (AADF)	**0.05** *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
( ) Constant	*MGD*	(•) Constant	0.7 *in/wk*	(•) Constant	0.2
(•) Monthly		( ) Monthly		( ) Monthly	
JAN	6.44	JAN		JAN	
FEB	6.43	FEB		FEB	
MAR	6.98	MAR		MAR	
APR	7.19	APR		APR	
MAY	6.70	MAY		MAY	
JUN	7.63	JUN		JUN	
JUL	6.64	JUL		JUL	
AUG	7.41	AUG		AUG	
SEP	6.93	SEP		SEP	
OCT	5.45	OCT		OCT	
NOV	5.93	NOV		NOV	
DEC	6.95	DEC		DEC	
			1.000		
Average Flow	6.72 *MGD*	**Average HSC**	0.70 *in/wk*	**Average SRO Coeff**	0.20

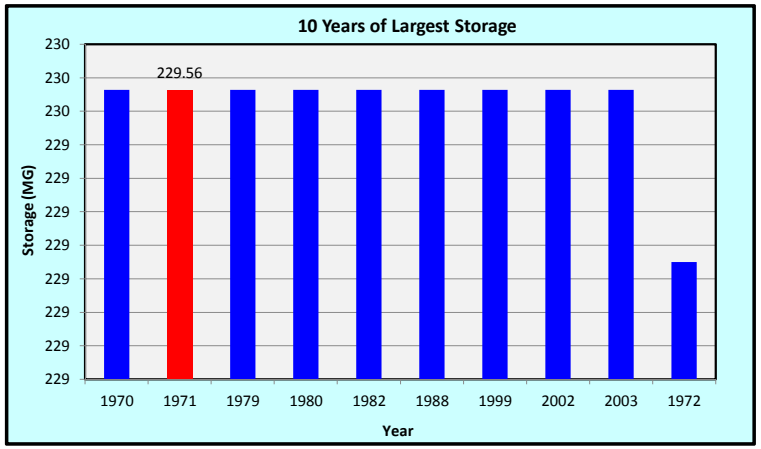
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1970	229.56	34.15	52.2
2	12.00	1971	229.56	34.15	59.8
3	8.00	1979	229.56	34.15	66.9
4	6.00	1980	229.56	34.15	58.5
5	4.80	1982	229.56	34.15	76.7
6	4.00	1988	229.56	34.15	62.1
7	3.43	1999	229.56	34.15	59.9
8	3.00	2002	229.56	34.15	59.5
9	2.67	2003	229.56	34.15	79.0
10	2.40	1972	229.05	34.07	54.4
11	2.18	1976	229.05	34.07	49.5
12	2.00	1987	216.52	32.21	69.9
13	1.85	1998	216.52	32.21	76.5
14	1.71	1983	215.32	32.03	80.4
15	1.60	1977	207.95	30.93	57.4
16	1.50	1985	207.95	30.93	44.0
17	1.41	1973	205.71	30.60	61.2
18	1.33	1984	205.71	30.60	51.8
19	1.26	2000	200.52	29.83	45.2
20	1.20	1990	184.58	27.45	45.6
21	1.14	1989	83.69	12.45	45.9

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2015 Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 5502 *Acres*

◉ Wet-Weather Storage
○ Wet-Weather Discharge

Calculate

"----------Output----------"

Required Storage	262.92 *MG*
Required Days of Storage	34.15
Year of 10-yr Return Period	1980
Annual Avg. Daily Flow (AADF)	0.05 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
○ Constant	1.7 *MGD*	◉ Constant	0.7 *in/wk*	◉ Constant	0.2
◉ Monthly		○ Monthly		○ Monthly	
JAN	7.37	JAN	1.00	JAN	0.10
FEB	7.36	FEB	1.00	FEB	0.10
MAR	8.00	MAR	1.00	MAR	0.10
APR	8.24	APR	2.00	APR	0.10
MAY	7.68	MAY	1.00	MAY	0.20
JUN	8.74	JUN	1.00	JUN	0.30
JUL	7.60	JUL	1.00	JUL	0.30
AUG	8.48	AUG	2.00	AUG	0.30
SEP	7.94	SEP	1.00	SEP	0.20
OCT	6.24	OCT	1.00	OCT	0.10
NOV	6.79	NOV	2.00	NOV	0.10
DEC	7.96	DEC	1.00	DEC	0.10
			1.000		
Average Flow	7.70 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

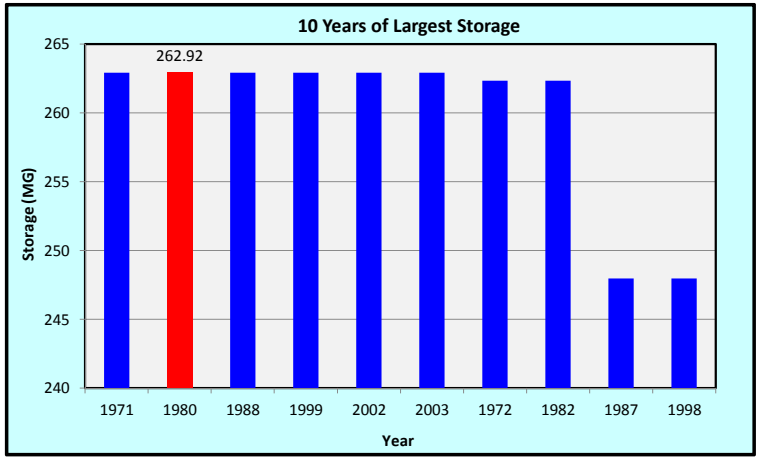
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1971	262.92	34.15	59.8
2	12.00	1980	262.92	34.15	58.5
3	8.00	1988	262.92	34.15	62.1
4	6.00	1999	262.92	34.15	59.9
5	4.80	2002	262.92	34.15	59.5
6	4.00	2003	262.92	34.15	79.0
7	3.43	1972	262.34	34.07	54.4
8	3.00	1982	262.34	34.07	76.7
9	2.67	1987	247.99	32.21	69.9
10	2.40	1998	247.99	32.21	76.5
11	2.18	1979	238.17	30.93	66.9
12	2.00	1973	235.61	30.60	61.2
13	1.85	1984	235.61	30.60	51.8
14	1.71	1983	165.57	21.50	80.4
15	1.60	1970	104.19	13.53	52.2
16	1.50	1977	72.95	9.47	57.4

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2020 Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 6084 *Acres*

◉ Wet-Weather Storage
○ Wet-Weather Discharge

Calculate

"----------Output----------"

Required Storage	286.83 *MG*
Required Days of Storage	34.15
Year of 10-yr Return Period	1980
Annual Avg. Daily Flow (AADF)	0.05 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
○ Constant	*MGD*	◉ Constant	0.7 *in/wk*	◉ Constant	0.2
◉ Monthly		○ Monthly		○ Monthly	
JAN	8.04	JAN		JAN	
FEB	8.03	FEB		FEB	
MAR	8.73	MAR		MAR	
APR	8.99	APR		APR	
MAY	8.38	MAY		MAY	
JUN	9.54	JUN		JUN	
JUL	8.29	JUL		JUL	
AUG	9.25	AUG		AUG	
SEP	8.66	SEP		SEP	
OCT	6.80	OCT		OCT	
NOV	7.41	NOV		NOV	
DEC	8.68	DEC		DEC	
			1.000		
Average Flow	8.40 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

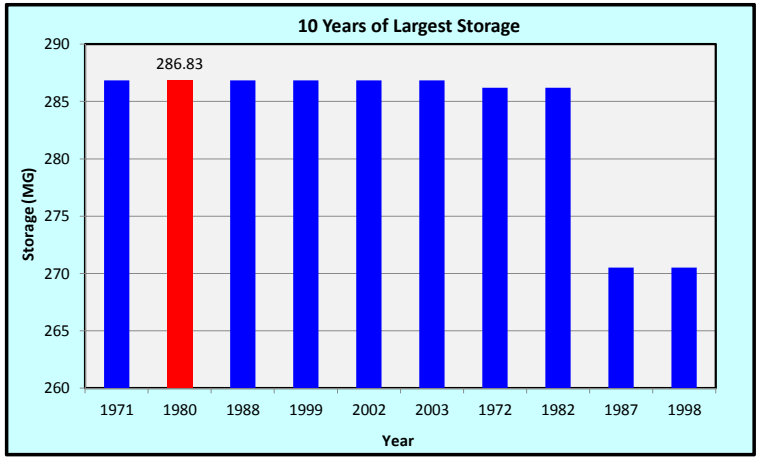
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1971	286.83	34.15	59.8
2	12.00	1980	286.83	34.15	58.5
3	8.00	1988	286.83	34.15	62.1
4	6.00	1999	286.83	34.15	59.9
5	4.80	2002	286.83	34.15	59.5
6	4.00	2003	286.83	34.15	79.0
7	3.43	1972	286.18	34.07	54.4
8	3.00	1982	286.18	34.07	76.7
9	2.67	1987	270.53	32.21	69.9
10	2.40	1998	270.53	32.21	76.5
11	2.18	1979	259.82	30.93	66.9
12	2.00	1973	257.02	30.60	61.2
13	1.85	1984	257.02	30.60	51.8
14	1.71	1983	179.89	21.42	80.4
15	1.60	1970	110.78	13.19	52.2
16	1.50	1977	76.58	9.12	57.4

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2025 Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 7047 *Acres*

◉ Wet-Weather Storage
○ Wet-Weather Discharge

Calculate

"----------Output----------"

Required Storage	300.49	*MG*
Required Days of Storage	34.15	
Year of 10-yr Return Period	1980	
Annual Avg. Daily Flow (AADF)	0.05	*in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
○ Constant	*MGD*	◉ Constant	0.7 *in/wk*	◉ Constant	0.2
◉ Monthly		○ Monthly		○ Monthly	
JAN	8.43	JAN		JAN	
FEB	8.41	FEB		FEB	
MAR	9.14	MAR		MAR	
APR	9.42	APR		APR	
MAY	8.77	MAY		MAY	
JUN	9.99	JUN		JUN	
JUL	8.69	JUL		JUL	
AUG	9.69	AUG		AUG	
SEP	9.07	SEP		SEP	
OCT	7.13	OCT		OCT	
NOV	7.76	NOV		NOV	
DEC	9.09	DEC		DEC	
			1.000		
Average Flow	8.80 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

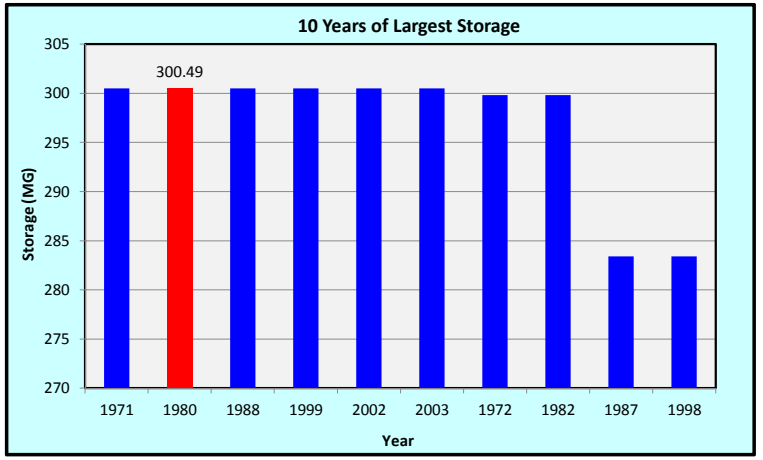
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1971	300.49	34.15	59.8
2	12.00	1980	300.49	34.15	58.5
3	8.00	1988	300.49	34.15	62.1
4	6.00	1999	300.49	34.15	59.9
5	4.80	2002	300.49	34.15	59.5
6	4.00	2003	300.49	34.15	79.0
7	3.43	1972	299.81	34.07	54.4
8	3.00	1982	299.81	34.07	76.7
9	2.67	1987	283.41	32.21	69.9
10	2.40	1998	283.41	32.21	76.5
11	2.18	1979	272.19	30.93	66.9
12	2.00	1973	269.26	30.60	61.2
13	1.85	1984	269.26	30.60	51.8
14	1.71	1983	183.29	20.83	80.4
15	1.60	1970	95.80	10.89	52.2
16	1.50	1977	59.14	6.72	57.4

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2030 Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 8242 *Acres*

◉ Wet-Weather Storage
○ Wet-Weather Discharge

Calculate

"----------Output----------"

Required Storage	317.56 *MG*
Required Days of Storage	34.15
Year of 10-yr Return Period	1980
Annual Avg. Daily Flow (AADF)	0.04 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
○ Constant	*MGD*	◉ Constant	0.7 *in/wk*	◉ Constant	0.2
◉ Monthly		○ Monthly		○ Monthly	
JAN	8.91	JAN		JAN	
FEB	8.89	FEB		FEB	
MAR	9.66	MAR		MAR	
APR	9.95	APR		APR	
MAY	9.27	MAY		MAY	
JUN	10.56	JUN		JUN	
JUL	9.18	JUL		JUL	
AUG	10.24	AUG		AUG	
SEP	9.59	SEP		SEP	
OCT	7.53	OCT		OCT	
NOV	8.20	NOV		NOV	
DEC	9.61	DEC		DEC	
			1.000		
Average Flow	9.30 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

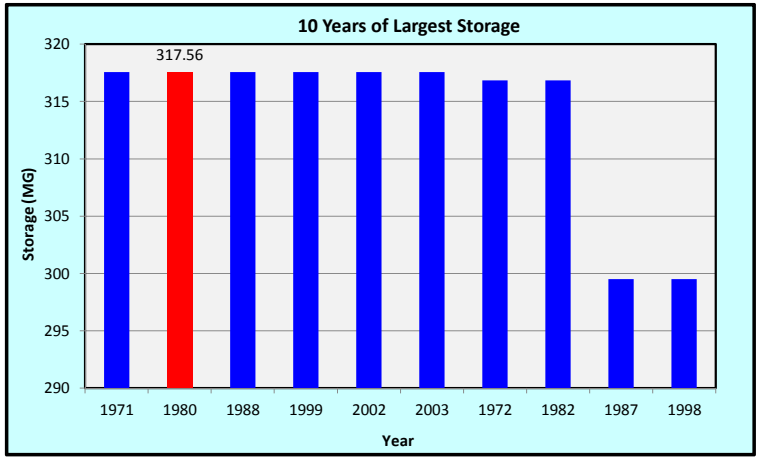
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1971	317.56	34.15	59.8
2	12.00	1980	317.56	34.15	58.5
3	8.00	1988	317.56	34.15	62.1
4	6.00	1999	317.56	34.15	59.9
5	4.80	2002	317.56	34.15	59.5
6	4.00	2003	317.56	34.15	79.0
7	3.43	1972	316.85	34.07	54.4
8	3.00	1982	316.85	34.07	76.7
9	2.67	1987	299.51	32.21	69.9
10	2.40	1998	299.51	32.21	76.5
11	2.18	1979	287.66	30.93	66.9
12	2.00	1973	284.56	30.60	61.2
13	1.85	1984	284.56	30.60	51.8
14	1.71	1983	187.60	20.17	80.4
15	1.60	1970	77.33	8.31	52.2
16	1.50	1977	37.61	4.04	57.4

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2032 Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 9510 *Acres*

◉ Wet-Weather Storage
○ Wet-Weather Discharge

Calculate

"----------Output----------"

Required Storage	320.97	*MG*
Required Days of Storage	34.15	
Year of 10-yr Return Period	1971	
Annual Avg. Daily Flow (AADF)	0.04	*in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
○ Constant	*MGD*	◉ Constant	0.7 *in/wk*	◉ Constant	0.2
◉ Monthly		○ Monthly		○ Monthly	
JAN	9.00	JAN		JAN	
FEB	8.98	FEB		FEB	
MAR	9.77	MAR		MAR	
APR	10.06	APR		APR	
MAY	9.37	MAY		MAY	
JUN	10.68	JUN		JUN	
JUL	9.28	JUL		JUL	
AUG	10.35	AUG		AUG	
SEP	9.69	SEP		SEP	
OCT	7.61	OCT		OCT	
NOV	8.29	NOV		NOV	
DEC	9.71	DEC		DEC	
			1.000		
Average Flow	9.40 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

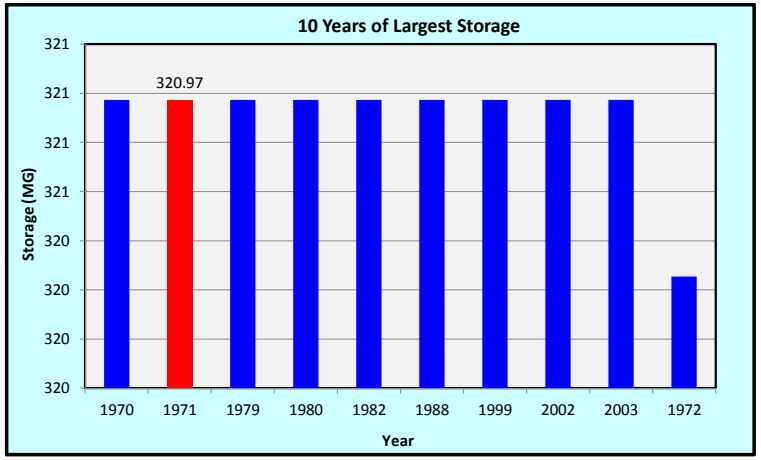
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1970	320.97	34.15	52.2
2	12.00	1971	320.97	34.15	59.8
3	8.00	1979	320.97	34.15	66.9
4	6.00	1980	320.97	34.15	58.5
5	4.80	1982	320.97	34.15	76.7
6	4.00	1988	320.97	34.15	62.1
7	3.43	1999	320.97	34.15	59.9
8	3.00	2002	320.97	34.15	59.5
9	2.67	2003	320.97	34.15	79.0
10	2.40	1972	320.25	34.07	54.4
11	2.18	1976	320.25	34.07	49.5
12	2.00	1987	302.74	32.21	69.9
13	1.85	1998	302.74	32.21	76.5
14	1.71	1983	301.06	32.03	80.4
15	1.60	1977	290.75	30.93	57.4
16	1.50	1985	290.75	30.93	44.0
17	1.41	1973	287.62	30.60	61.2
18	1.33	1984	287.62	30.60	51.8
19	1.26	2000	267.82	28.49	45.2
20	1.20	1990	248.78	26.47	45.6
21	1.14	1989	63.37	6.74	45.9

The years listed above are limited to those with non-zero Storage/Discharge values.



2011 Maximum Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 4545 *Acres*

(•) Wet-Weather Storage
( ) Wet-Weather Discharge

Calculate

"----------Output----------"

Required Storage	295.98	*MG*
Required Days of Storage	33.57	
Year of 10-yr Return Period	1976	
Annual Avg. Daily Flow (AADF)	0.07	*in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
( ) Constant	*MGD*	(•) Constant	0.7 *in/wk*	(•) Constant	0.2
(•) Monthly		( ) Monthly		( ) Monthly	
JAN	8.14	JAN		JAN	
FEB	8.89	FEB		FEB	
MAR	9.31	MAR		MAR	
APR	9.39	APR		APR	
MAY	8.50	MAY		MAY	
JUN	7.85	JUN		JUN	
JUL	8.34	JUL		JUL	
AUG	9.53	AUG		AUG	
SEP	9.87	SEP		SEP	
OCT	8.57	OCT		OCT	
NOV	8.58	NOV		NOV	
DEC	8.82	DEC		DEC	
			1.000		
Average Flow	8.82 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

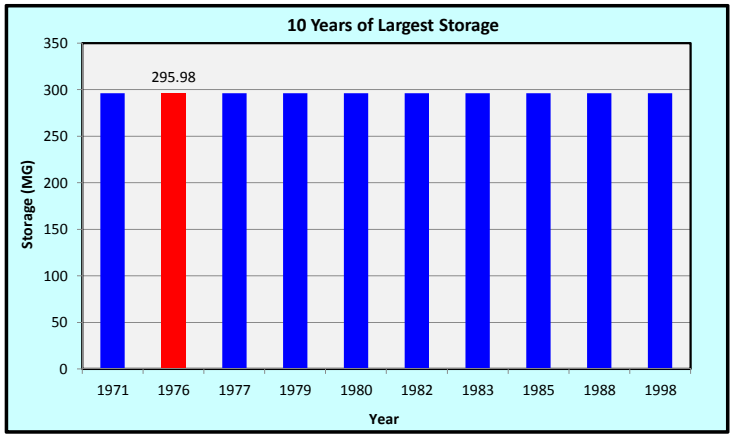
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1971	295.98	33.57	59.8
2	12.00	1976	295.98	33.57	49.5
3	8.00	1977	295.98	33.57	57.4
4	6.00	1979	295.98	33.57	66.9
5	4.80	1980	295.98	33.57	58.5
6	4.00	1982	295.98	33.57	76.7
7	3.43	1983	295.98	33.57	80.4
8	3.00	1985	295.98	33.57	44.0
9	2.67	1988	295.98	33.57	62.1
10	2.40	1998	295.98	33.57	76.5
11	2.18	2003	295.98	33.57	79.0
12	2.00	1970	295.31	33.50	52.2
13	1.85	1999	295.31	33.50	59.9
14	1.71	2002	295.31	33.50	59.5
15	1.60	1987	288.58	32.74	69.9
16	1.50	1973	258.54	29.33	61.2
17	1.41	1984	258.54	29.33	51.8
18	1.33	1990	239.64	27.18	45.6
19	1.26	1972	235.44	26.71	54.4
20	1.20	2000	209.92	23.81	45.2
21	1.14	1989	149.41	16.95	45.9
22	1.09	1996	19.89	2.26	45.5
23	1.04	1986	7.83	0.89	44.1

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2015 Maximum Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 5898 *Acres*

- (•) Wet-Weather Storage
- ( ) Wet-Weather Discharge

Calculate

"----------Output----------"	
Required Storage	404.78 *MG*
Required Days of Storage	35.39
Year of 10-yr Return Period	1998
Annual Avg. Daily Flow (AADF)	0.07 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

	Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
	( ) Constant	1.7 *MGD*	(•) Constant	0.7 *in/wk*	(•) Constant	0.2
	(•) Monthly		( ) Monthly		( ) Monthly	
JAN		11.83		1.00		0.10
FEB		11.97		1.00		0.10
MAR		13.06		1.00		0.10
APR		12.93		2.00		0.10
MAY		11.05		1.00		0.20
JUN		10.51		1.00		0.30
JUL		11.32		1.00		0.30
AUG		13.00		2.00		0.30
SEP		11.00		1.00		0.20
OCT		10.05		1.00		0.10
NOV		10.37		2.00		0.10
DEC		10.17		1.00		0.10
				1.000		
Average Flow		11.44 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

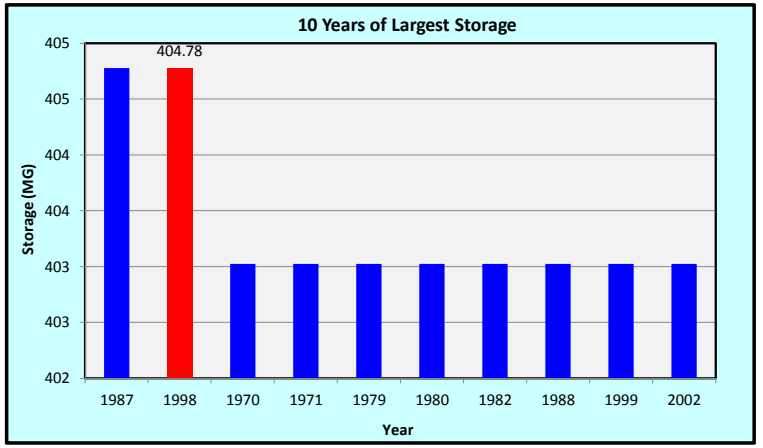
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1987	404.78	35.39	69.9
2	12.00	1998	404.78	35.39	76.5
3	8.00	1970	403.02	35.24	52.2
4	6.00	1971	403.02	35.24	59.8
5	4.80	1979	403.02	35.24	66.9
6	4.00	1980	403.02	35.24	58.5
7	3.43	1982	403.02	35.24	76.7
8	3.00	1988	403.02	35.24	62.1
9	2.67	1999	403.02	35.24	59.9
10	2.40	2002	403.02	35.24	59.5
11	2.18	2003	403.02	35.24	79.0
12	2.00	1983	397.30	34.73	80.4
13	1.85	1973	366.76	32.07	61.2
14	1.71	1984	350.96	30.68	51.8
15	1.60	1976	329.95	28.85	49.5
16	1.50	1977	329.95	28.85	57.4
17	1.41	1985	329.95	28.85	44.0
18	1.33	1990	326.45	28.54	45.6
19	1.26	1972	315.17	27.55	54.4
20	1.20	2000	282.08	24.66	45.2
21	1.14	1989	209.43	18.31	45.9
22	1.09	1996	56.31	4.92	45.5

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2020 Maximum Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 6487 *Acres*

- (•) Wet-Weather Storage
- ( ) Wet-Weather Discharge

Calculate

"----------Output----------"	
Required Storage	445.16 *MG*
Required Days of Storage	35.38
Year of 10-yr Return Period	1998
Annual Avg. Daily Flow (AADF)	0.07 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
( ) Constant	*MGD*	(•) Constant	0.7 *in/wk*	(•) Constant	0.2
(•) Monthly		( ) Monthly		( ) Monthly	
JAN	13.01	JAN		JAN	
FEB	13.17	FEB		FEB	
MAR	14.36	MAR		MAR	
APR	14.22	APR		APR	
MAY	12.16	MAY		MAY	
JUN	11.56	JUN		JUN	
JUL	12.45	JUL		JUL	
AUG	14.3	AUG		AUG	
SEP	12.1	SEP		SEP	
OCT	11.05	OCT		OCT	
NOV	11.41	NOV		NOV	
DEC	11.19	DEC		DEC	
			1.000		
Average Flow	12.58 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

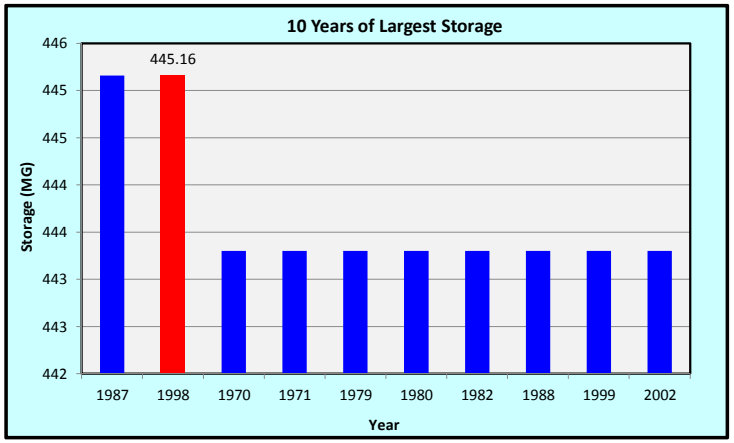
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1987	445.16	35.38	69.9
2	12.00	1998	445.16	35.38	76.5
3	8.00	1970	443.30	35.23	52.2
4	6.00	1971	443.30	35.23	59.8
5	4.80	1979	443.30	35.23	66.9
6	4.00	1980	443.30	35.23	58.5
7	3.43	1982	443.30	35.23	76.7
8	3.00	1988	443.30	35.23	62.1
9	2.67	1999	443.30	35.23	59.9
10	2.40	2002	443.30	35.23	59.5
11	2.18	2003	443.30	35.23	79.0
12	2.00	1983	436.93	34.73	80.4
13	1.85	1973	403.31	32.06	61.2
14	1.71	1984	385.95	30.68	51.8
15	1.60	1976	363.00	28.85	49.5
16	1.50	1977	363.00	28.85	57.4
17	1.41	1985	363.00	28.85	44.0
18	1.33	1990	358.99	28.53	45.6
19	1.26	1972	346.80	27.56	54.4
20	1.20	2000	310.40	24.67	45.2
21	1.14	1989	230.28	18.30	45.9
22	1.09	1996	61.90	4.92	45.5

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2025 Maximum Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 7077 *Acres*

- (•) Wet-Weather Storage
- ( ) Wet-Weather Discharge

Calculate

"----------Output----------"	
Required Storage	485.77 *MG*
Required Days of Storage	35.39
Year of 10-yr Return Period	1998
Annual Avg. Daily Flow (AADF)	0.07 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
( ) Constant	*MGD*	(•) Constant	0.7 *in/wk*	(•) Constant	0.2
(•) Monthly		( ) Monthly		( ) Monthly	
JAN	14.2	JAN		JAN	
FEB	14.37	FEB		FEB	
MAR	15.67	MAR		MAR	
APR	15.51	APR		APR	
MAY	13.27	MAY		MAY	
JUN	12.61	JUN		JUN	
JUL	13.59	JUL		JUL	
AUG	15.6	AUG		AUG	
SEP	13.2	SEP		SEP	
OCT	12.05	OCT		OCT	
NOV	12.44	NOV		NOV	
DEC	12.2	DEC		DEC	
			1.000		
Average Flow	13.73 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

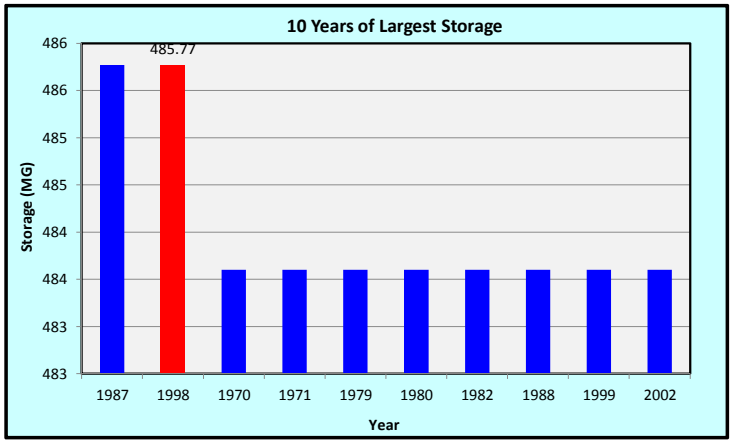
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1987	485.77	35.39	69.9
2	12.00	1998	485.77	35.39	76.5
3	8.00	1970	483.60	35.23	52.2
4	6.00	1971	483.60	35.23	59.8
5	4.80	1979	483.60	35.23	66.9
6	4.00	1980	483.60	35.23	58.5
7	3.43	1982	483.60	35.23	76.7
8	3.00	1988	483.60	35.23	62.1
9	2.67	1999	483.60	35.23	59.9
10	2.40	2002	483.60	35.23	59.5
11	2.18	2003	483.60	35.23	79.0
12	2.00	1983	476.79	34.74	80.4
13	1.85	1973	440.20	32.07	61.2
14	1.71	1984	421.29	30.69	51.8
15	1.60	1976	396.00	28.85	49.5
16	1.50	1977	396.00	28.85	57.4
17	1.41	1985	396.00	28.85	44.0
18	1.33	1990	391.88	28.55	45.6
19	1.26	1972	378.30	27.56	54.4
20	1.20	2000	338.59	24.67	45.2
21	1.14	1989	251.47	18.32	45.9
22	1.09	1996	67.65	4.93	45.5

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2030 Maximum Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 7667 *Acres*

- (•) Wet-Weather Storage
- ( ) Wet-Weather Discharge

Calculate

"----------Output----------"	
Required Storage	526.21 *MG*
Required Days of Storage	35.39
Year of 10-yr Return Period	1998
Annual Avg. Daily Flow (AADF)	0.07 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
( ) Constant	*MGD*	(•) Constant	0.7 *in/wk*	(•) Constant	0.2
(•) Monthly		( ) Monthly		( ) Monthly	
JAN	15.38	JAN		JAN	
FEB	15.57	FEB		FEB	
MAR	16.97	MAR		MAR	
APR	16.81	APR		APR	
MAY	14.37	MAY		MAY	
JUN	13.66	JUN		JUN	
JUL	14.72	JUL		JUL	
AUG	16.90	AUG		AUG	
SEP	14.30	SEP		SEP	
OCT	13.06	OCT		OCT	
NOV	13.48	NOV		NOV	
DEC	13.22	DEC		DEC	
			1.000		
Average Flow	14.87 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

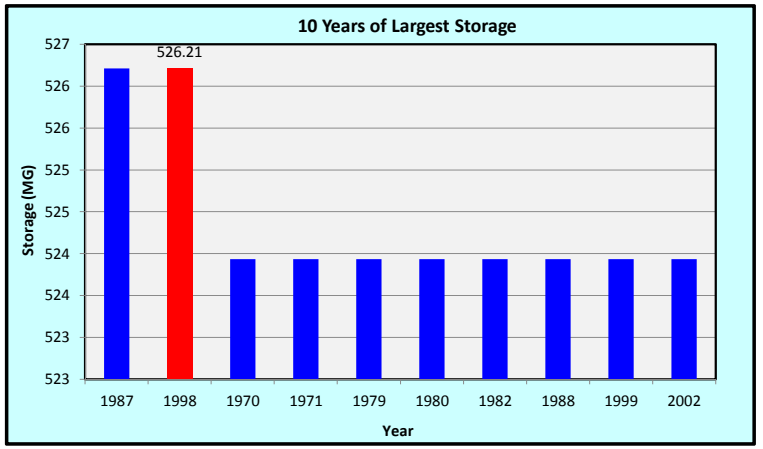
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1987	526.21	35.39	69.9
2	12.00	1998	526.21	35.39	76.5
3	8.00	1970	523.93	35.24	52.2
4	6.00	1971	523.93	35.24	59.8
5	4.80	1979	523.93	35.24	66.9
6	4.00	1980	523.93	35.24	58.5
7	3.43	1982	523.93	35.24	76.7
8	3.00	1988	523.93	35.24	62.1
9	2.67	1999	523.93	35.24	59.9
10	2.40	2002	523.93	35.24	59.5
11	2.18	2003	523.93	35.24	79.0
12	2.00	1983	516.49	34.73	80.4
13	1.85	1973	476.79	32.07	61.2
14	1.71	1984	456.25	30.68	51.8
15	1.60	1976	428.94	28.85	49.5
16	1.50	1977	428.94	28.85	57.4
17	1.41	1985	428.94	28.85	44.0
18	1.33	1990	424.39	28.54	45.6
19	1.26	1972	409.73	27.55	54.4
20	1.20	2000	366.71	24.66	45.2
21	1.14	1989	272.27	18.31	45.9
22	1.09	1996	73.23	4.92	45.5

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2032 Maximum Wet Weather Storage Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 7903 *Acres*

- (•) Wet-Weather Storage
- ( ) Wet-Weather Discharge

Calculate

"----------Output----------"	
Required Storage	542.50 *MG*
Required Days of Storage	35.39
Year of 10-yr Return Period	1998
Annual Avg. Daily Flow (AADF)	0.07 *in/day*

Minimum required storage based on 10-year return period

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
( ) Constant	*MGD*	(•) Constant	0.7 *in/wk*	(•) Constant	0.2
(•) Monthly		( ) Monthly		( ) Monthly	
JAN	15.85	JAN		JAN	
FEB	16.05	FEB		FEB	
MAR	17.5	MAR		MAR	
APR	17.32	APR		APR	
MAY	14.81	MAY		MAY	
JUN	14.08	JUN		JUN	
JUL	15.17	JUL		JUL	
AUG	17.42	AUG		AUG	
SEP	14.74	SEP		SEP	
OCT	13.46	OCT		OCT	
NOV	13.9	NOV		NOV	
DEC	13.63	DEC		DEC	
			1.000		
Average Flow	15.33 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

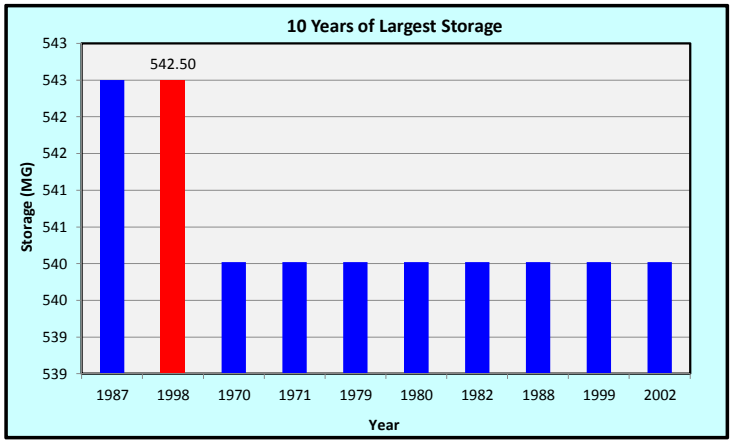
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Storage (MG)	Storage Days	RAIN
1	24.00	1987	542.50	35.39	69.9
2	12.00	1998	542.50	35.39	76.5
3	8.00	1970	540.02	35.23	52.2
4	6.00	1971	540.02	35.23	59.8
5	4.80	1979	540.02	35.23	66.9
6	4.00	1980	540.02	35.23	58.5
7	3.43	1982	540.02	35.23	76.7
8	3.00	1988	540.02	35.23	62.1
9	2.67	1999	540.02	35.23	59.9
10	2.40	2002	540.02	35.23	59.5
11	2.18	2003	540.02	35.23	79.0
12	2.00	1983	532.47	34.74	80.4
13	1.85	1973	491.35	32.06	61.2
14	1.71	1984	470.27	30.68	51.8
15	1.60	1976	442.20	28.85	49.5
16	1.50	1977	442.20	28.85	57.4
17	1.41	1985	442.20	28.85	44.0
18	1.33	1990	437.43	28.54	45.6
19	1.26	1972	422.40	27.56	54.4
20	1.20	2000	378.06	24.67	45.2
21	1.14	1989	280.62	18.31	45.9
22	1.09	1996	75.58	4.93	45.5

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2011 Disposal Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 5250 *Acres*

○ Wet-Weather Storage
◉ Wet-Weather Discharge

Calculate

Input Storage: 320 *MG*

"----------Output----------"

MG

Annual Avg. Daily Flow (AADF): 0.06 *in/day*

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

	Hydraulic Loading Rate (MGD)	Hydrologic Site Capacity (in/wk)	Runoff Coefficient
	○ Constant [ ] *MGD* ◉ Monthly	◉ Constant 0.7 *in/wk* ○ Monthly	◉ Constant 0.2 ○ Monthly
JAN	8.14	1.00	0.10
FEB	8.89	1.00	0.10
MAR	9.31	1.00	0.10
APR	9.39	2.00	0.10
MAY	8.50	1.00	0.20
JUN	7.85	1.00	0.30
JUL	8.34	1.00	0.30
AUG	9.53	2.00	0.30
SEP	9.87	1.00	0.20
OCT	8.57	1.00	0.10
NOV	8.58	2.00	0.10
DEC	8.82	1.00	0.10
		1.000	
Average Flow	8.82 *MGD*	Average HSC 0.70 *in/wk*	Average SRO Coeff 0.20

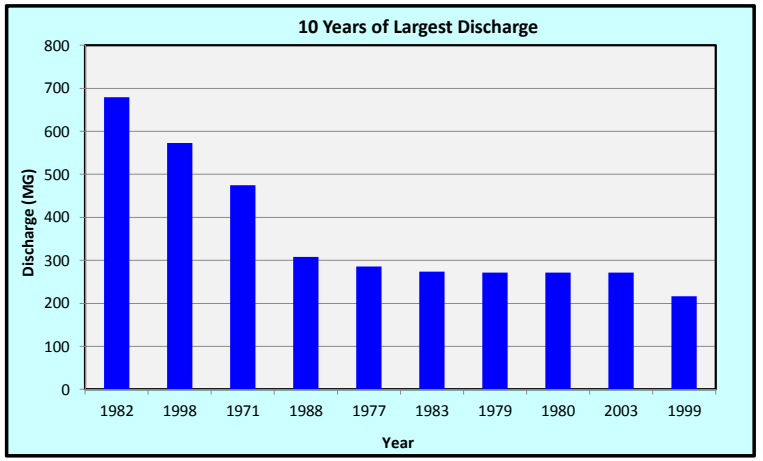
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Discharge (MG)	Discharge Days	RAIN
1	24.00	1982	679.11	77.04	76.7
2	12.00	1998	572.70	64.97	76.5
3	8.00	1971	474.47	53.82	59.8
4	6.00	1988	308.22	34.96	62.1
5	4.80	1977	285.30	32.36	57.4
6	4.00	1983	273.39	31.01	80.4
7	3.43	1979	271.29	30.77	66.9
8	3.00	1980	271.29	30.77	58.5
9	2.67	2003	271.29	30.77	79.0
10	2.40	1999	216.80	24.59	59.9
11	2.18	1985	139.56	15.83	44.0
12	2.00	1987	124.69	14.14	69.9
13	1.85	1973	6.42	0.73	61.2

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2015 Disposal Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 5502 *Acres*

○ Wet-Weather Storage
◉ Wet-Weather Discharge

Calculate

Input Storage: 320 *MG*

"----------Output----------" *MG*

Annual Avg. Daily Flow (AADF): 0.08 *in/day*

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

	Hydraulic Loading Rate (MGD)	Hydrologic Site Capacity (in/wk)	Runoff Coefficient
	○ Constant ◉ Monthly	◉ Constant ○ Monthly	◉ Constant ○ Monthly
	MGD	in/wk	
JAN	11.83	1.00	0.10
FEB	11.97	1.00	0.10
MAR	13.06	1.00	0.10
APR	12.93	2.00	0.10
MAY	11.05	1.00	0.20
JUN	10.51	1.00	0.30
JUL	11.32	1.00	0.30
AUG	13.00	2.00	0.30
SEP	11.00	1.00	0.20
OCT	10.05	1.00	0.10
NOV	10.37	2.00	0.10
DEC	10.17	1.00	0.10
		1.000	
Average Flow	11.44 MGD	Average HSC: 0.70 in/wk	Average SRO Coeff: 0.20

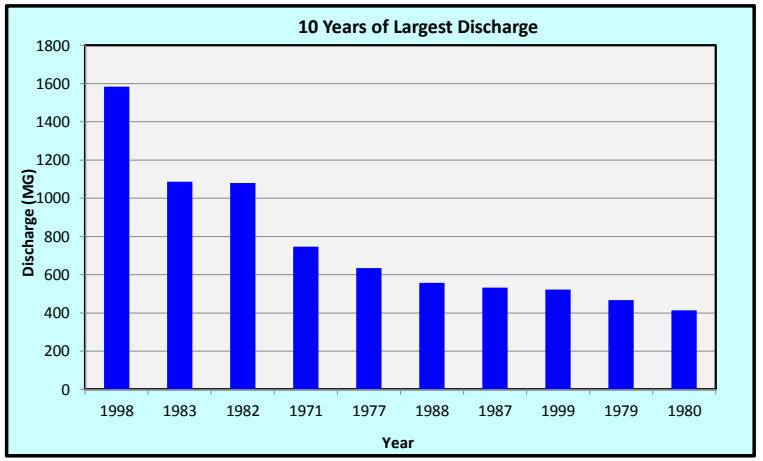
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Discharge (MG)	Discharge Days	RAIN
1	24.00	1998	1584.27	138.51	76.5
2	12.00	1983	1085.54	94.91	80.4
3	8.00	1982	1079.11	94.34	76.7
4	6.00	1971	747.22	65.33	59.8
5	4.80	1977	634.12	55.44	57.4
6	4.00	1988	557.27	48.72	62.1
7	3.43	1987	532.44	46.55	69.9
8	3.00	1999	521.73	45.61	59.9
9	2.67	1979	467.02	40.83	66.9
10	2.40	1980	412.97	36.11	58.5
11	2.18	2003	412.97	36.11	79.0
12	2.00	1973	390.85	34.17	61.2
13	1.85	1985	274.72	24.02	44.0
14	1.71	2000	95.18	8.32	45.2
15	1.60	2002	92.69	8.10	59.5
16	1.50	1984	90.13	7.88	51.8
17	1.41	1970	83.02	7.26	52.2
18	1.33	1990	53.43	4.67	45.6
19	1.26	1976	9.95	0.87	49.5

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2020 Disposal Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 6084 *Acres*

○ Wet-Weather Storage
◉ Wet-Weather Discharge

Calculate

Input Storage: 320 *MG*

"----------Output----------"

MG

Annual Avg. Daily Flow (AADF): 0.08 *in/day*

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

	Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
	○ Constant / ◉ Monthly	*MGD*	◉ Constant / ○ Monthly	*in/wk*	◉ Constant / ○ Monthly	
				0.7		0.2
JAN		13.01	JAN	1.00	JAN	0.10
FEB		13.17	FEB	1.00	FEB	0.10
MAR		14.36	MAR	1.00	MAR	0.10
APR		14.22	APR	2.00	APR	0.10
MAY		12.16	MAY	1.00	MAY	0.20
JUN		11.56	JUN	1.00	JUN	0.30
JUL		12.45	JUL	1.00	JUL	0.30
AUG		14.30	AUG	2.00	AUG	0.30
SEP		12.10	SEP	1.00	SEP	0.20
OCT		11.05	OCT	1.00	OCT	0.10
NOV		11.41	NOV	2.00	NOV	0.10
DEC		11.19	DEC	1.00	DEC	0.10
				1.000		
Average Flow		12.58 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

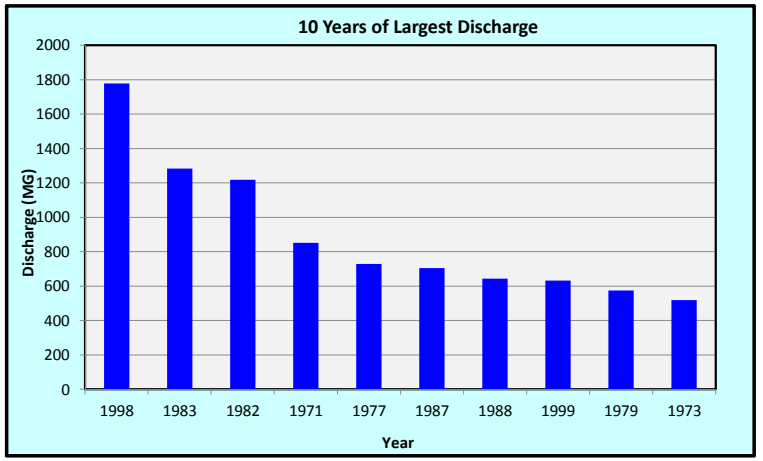
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Discharge (MG)	Discharge Days	RAIN
1	24.00	1998	1777.37	141.27	76.5
2	12.00	1983	1283.58	102.02	80.4
3	8.00	1982	1219.02	96.89	76.7
4	6.00	1971	850.97	67.64	59.8
5	4.80	1977	728.36	57.89	57.4
6	4.00	1987	705.10	56.04	69.9
7	3.43	1988	643.13	51.12	62.1
8	3.00	1999	632.80	50.29	59.9
9	2.67	1979	574.94	45.70	66.9
10	2.40	1973	518.53	41.21	61.2
11	2.18	2003	512.96	40.77	79.0
12	2.00	1980	486.27	38.65	58.5
13	1.85	1985	332.94	26.46	44.0
14	1.71	2002	163.27	12.98	59.5
15	1.60	2000	162.69	12.93	45.2
16	1.50	1984	128.04	10.18	51.8
17	1.41	1970	123.33	9.80	52.2
18	1.33	1990	84.48	6.71	45.6
19	1.26	1976	69.64	5.53	49.5
20	1.20	1972	26.69	2.12	54.4

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2025 Disposal Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 7047 *Acres*

○ Wet-Weather Storage
◉ Wet-Weather Discharge

Calculate

Input Storage: 320 *MG*

"----------Output----------"

MG

Annual Avg. Daily Flow (AADF): 0.07 *in/day*

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

	Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
	○ Constant / ◉ Monthly	1.7 *MGD*	◉ Constant / ○ Monthly	0.7 *in/wk*	◉ Constant / ○ Monthly	0.2
JAN		14.20		1.00		0.10
FEB		14.37		1.00		0.10
MAR		15.67		1.00		0.10
APR		15.51		2.00		0.10
MAY		13.27		1.00		0.20
JUN		12.61		1.00		0.30
JUL		13.59		1.00		0.30
AUG		15.60		2.00		0.30
SEP		13.20		1.00		0.20
OCT		12.05		1.00		0.10
NOV		12.44		2.00		0.10
DEC		12.20		1.00		0.10
				1.000		
	Average Flow	13.73 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

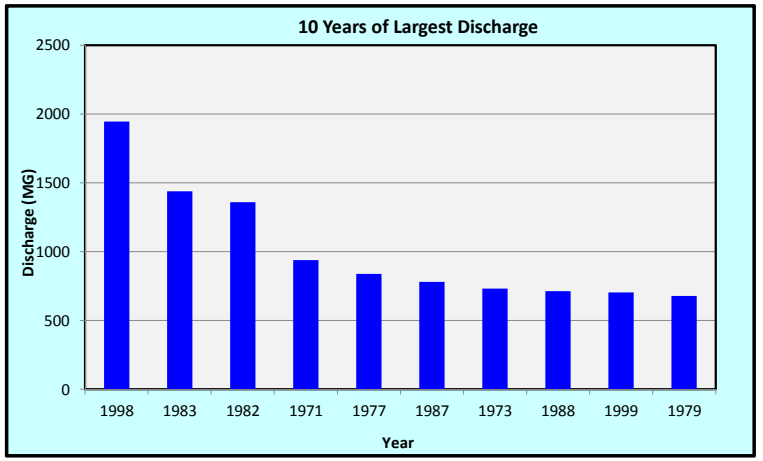
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Discharge (MG)	Discharge Days	RAIN
1	24.00	1998	1945.61	141.75	76.5
2	12.00	1983	1440.09	104.92	80.4
3	8.00	1982	1358.93	99.01	76.7
4	6.00	1971	939.23	68.43	59.8
5	4.80	1977	838.55	61.09	57.4
6	4.00	1987	781.50	56.94	69.9
7	3.43	1973	731.97	53.33	61.2
8	3.00	1988	714.23	52.04	62.1
9	2.67	1999	703.64	51.26	59.9
10	2.40	1979	679.69	49.52	66.9
11	2.18	2003	617.78	45.01	79.0
12	2.00	1980	559.57	40.77	58.5
13	1.85	1985	381.29	27.78	44.0
14	1.71	2002	221.93	16.17	59.5
15	1.60	2000	182.80	13.32	45.2
16	1.50	1970	163.63	11.92	52.2
17	1.41	1984	141.39	10.30	51.8
18	1.33	1976	134.15	9.77	49.5
19	1.26	1990	72.75	5.30	45.6
20	1.20	1972	58.21	4.24	54.4

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2030 Disposal Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 8242 *Acres*

○ Wet-Weather Storage
◉ Wet-Weather Discharge

Calculate

Input Storage: 320 *MG*

"----------Output----------"

MG

Annual Avg. Daily Flow (AADF): 0.07 *in/day*

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

	Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
	○ Constant / ◉ Monthly	1.7 *MGD*	◉ Constant / ○ Monthly	0.7 *in/wk*	◉ Constant / ○ Monthly	0.2
JAN		15.38		1.00		0.10
FEB		15.57		1.00		0.10
MAR		16.97		1.00		0.10
APR		16.81		2.00		0.10
MAY		14.37		1.00		0.20
JUN		13.66		1.00		0.30
JUL		14.72		1.00		0.30
AUG		16.90		2.00		0.30
SEP		14.30		1.00		0.20
OCT		13.06		1.00		0.10
NOV		13.48		2.00		0.10
DEC		13.22		1.00		0.10
				1.000		
	Average Flow	14.87 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

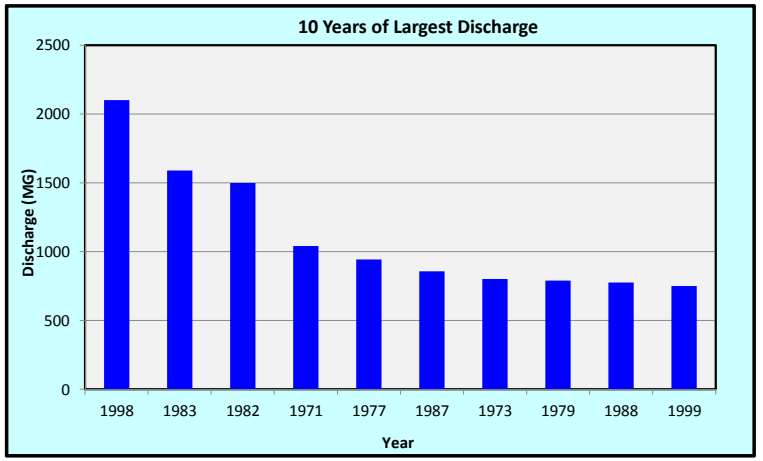
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Discharge (MG)	Discharge Days	RAIN
1	24.00	1998	2101.60	141.34	76.5
2	12.00	1983	1590.86	106.99	80.4
3	8.00	1982	1498.85	100.80	76.7
4	6.00	1971	1040.41	69.97	59.8
5	4.80	1977	943.66	63.46	57.4
6	4.00	1987	857.22	57.65	69.9
7	3.43	1973	802.75	53.99	61.2
8	3.00	1979	789.66	53.11	66.9
9	2.67	1988	776.35	52.21	62.1
10	2.40	1999	749.98	50.44	59.9
11	2.18	2003	722.59	48.60	79.0
12	2.00	1980	632.87	42.56	58.5
13	1.85	1985	423.63	28.49	44.0
14	1.71	2002	293.76	19.76	59.5
15	1.60	1970	203.93	13.71	52.2
16	1.50	1976	198.66	13.36	49.5
17	1.41	2000	174.05	11.71	45.2
18	1.33	1984	139.80	9.40	51.8
19	1.26	1990	102.69	6.91	45.6
20	1.20	1972	89.73	6.03	54.4

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



2032 Disposal Requirements

LandAp2010 v1.0

Select Station: MYAKKA RIVER SP (86065)

Crop Coefficient: Warm Season Grass (South FL)

Wetted Area: 9510 *Acres*

○ Wet-Weather Storage
◉ Wet-Weather Discharge

Calculate

Input Storage: 320 *MG*

"----------Output----------"

MG

Annual Avg. Daily Flow (AADF): 0.06 *in/day*

Detailed Results in New Sheet | Nitrogen Balance in New Sheet | Clear Results

	Hydraulic Loading Rate (MGD)		Hydrologic Site Capacity (in/wk)		Runoff Coefficient	
	○ Constant	1.7 *MGD*	◉ Constant	0.7 *in/wk*	◉ Constant	0.2
	◉ Monthly		○ Monthly		○ Monthly	
JAN		15.85		1.00		0.10
FEB		16.05		1.00		0.10
MAR		17.50		1.00		0.10
APR		17.32		2.00		0.10
MAY		14.81		1.00		0.20
JUN		14.08		1.00		0.30
JUL		15.17		1.00		0.30
AUG		17.42		2.00		0.30
SEP		14.74		1.00		0.20
OCT		13.46		1.00		0.10
NOV		13.90		2.00		0.10
DEC		13.63		1.00		0.10
				1.000		
	Average Flow	15.33 *MGD*	Average HSC	0.70 *in/wk*	Average SRO Coeff	0.20

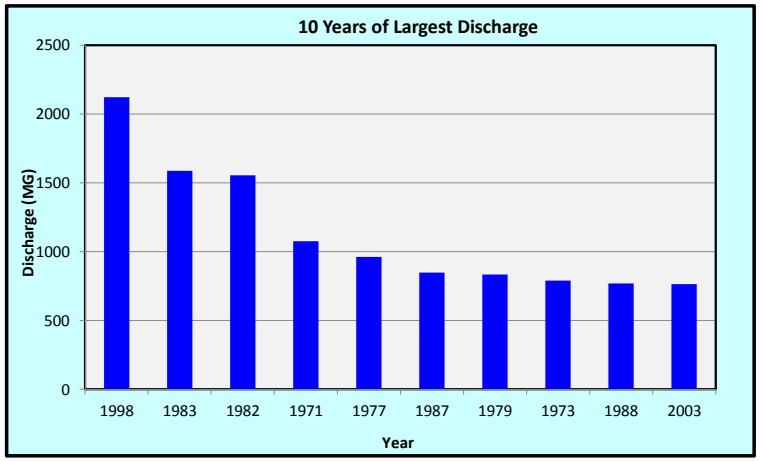
This sheet contains the main inputs and outputs of LandAp2010
Site-specific values for all parameters should be input by the user

- Input Fields
- Output Fields
- Cells containing comments

RANKED DATA

RANK	RETURN PERIOD	YEAR	Discharge (MG)	Discharge Days	RAIN
1	24.00	1998	2122.29	138.47	76.5
2	12.00	1983	1588.59	103.65	80.4
3	8.00	1982	1554.81	101.44	76.7
4	6.00	1971	1076.12	70.21	59.8
5	4.80	1977	962.69	62.81	57.4
6	4.00	1987	847.99	55.33	69.9
7	3.43	1979	833.65	54.39	66.9
8	3.00	1973	791.21	51.62	61.2
9	2.67	1988	770.60	50.28	62.1
10	2.40	2003	764.52	49.88	79.0
11	2.18	1999	685.10	44.70	59.9
12	2.00	1980	662.19	43.20	58.5
13	1.85	1985	420.10	27.41	44.0
14	1.71	2002	322.49	21.04	59.5
15	1.60	1976	224.47	14.65	49.5
16	1.50	1970	220.05	14.36	52.2
17	1.41	1984	150.29	9.81	51.8
18	1.33	1990	111.45	7.27	45.6
19	1.26	1972	102.33	6.68	54.4
20	1.20	2000	72.28	4.72	45.2

The years listed above are limited to those with non-zero Storage/Discharge values.
For detailed information press Detailed Result Button.



APPENDIX H

MODEL ELEMENT IDS

Sarasota County, FL
Reclaimed Water System
Model Element IDs

0 1,000 2,000 4,000 6,000 8,000 Feet

1 inch = 2,000 feet

Existing Pipes

36-inch, 30-inch, 24-inch, 20-inch, 18-inch, 16-inch, 14-inch, 12-inch, 10-inch, 8-inch, 6-inch, 4-inch

Future Pipes

24-inch, 20-inch, 16-inch, 12-inch, 10-inch, 8-inch, 6-inch

Nodes

PSV

Pumps

Tanks

Reclaimed Water Storage Ponds

To Venice Eastside WRF

Sarasota County

McKIM&CREED

S:\1038\004791-GIS\91b-Map Doc\Appendix - Model Elements.mxd; 1/14/2013 bwhite

APPENDIX I

PUMP CURVES

Bee Ridge Effluent Pump Station 1

Company: McKim & Creed, Samantha Jones
Name: Sarasota County Pump
Date: 7/30/2012

Bee Ridge Effluent Pump Station 1
Pump 1-3

Layne/Verti-Line
Pentair Water

Pump:

Size: 13CM (3 stage)

Type: Vertical Turbine
Synch speed: 1800 rpm

Speed: 1770 rpm
Dia: 10 in

Curve:

Impeller:

Specific Speeds:

Ns: ---
Nss: ---

Dimensions:

Suction: 10 in
Discharge: --- in

Vertical Turbine:

Bowl size: 12.63 in
Max lateral: --- in
Thrust K factor: 15.2 lb/ft

Pump Limits:

Temperature: 150 °F
Pressure: 400 psi g
Sphere size: 1 in

Power: --- hp
Eye area: 25.5 in²

Search Criteria:

Flow: 1600 US gpm

Head: 190 ft

Fluid:

Water
Density: 62.37 lb/ft³
Viscosity: 1.105 cP

Temperature: 60 °F
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a

NPSHa: --- ft

Motor:

Standard: NEMA
Enclosure: TEFC

Size: 100 hp
Speed: 1800
Frame: 405T

Sizing criteria: Max Power on Design Curve

---- Data Point ----

Flow:	1600 US gpm
Head:	194 ft
Eff:	82.3%
Power:	95.4 hp
NPSHr:	15.4 ft

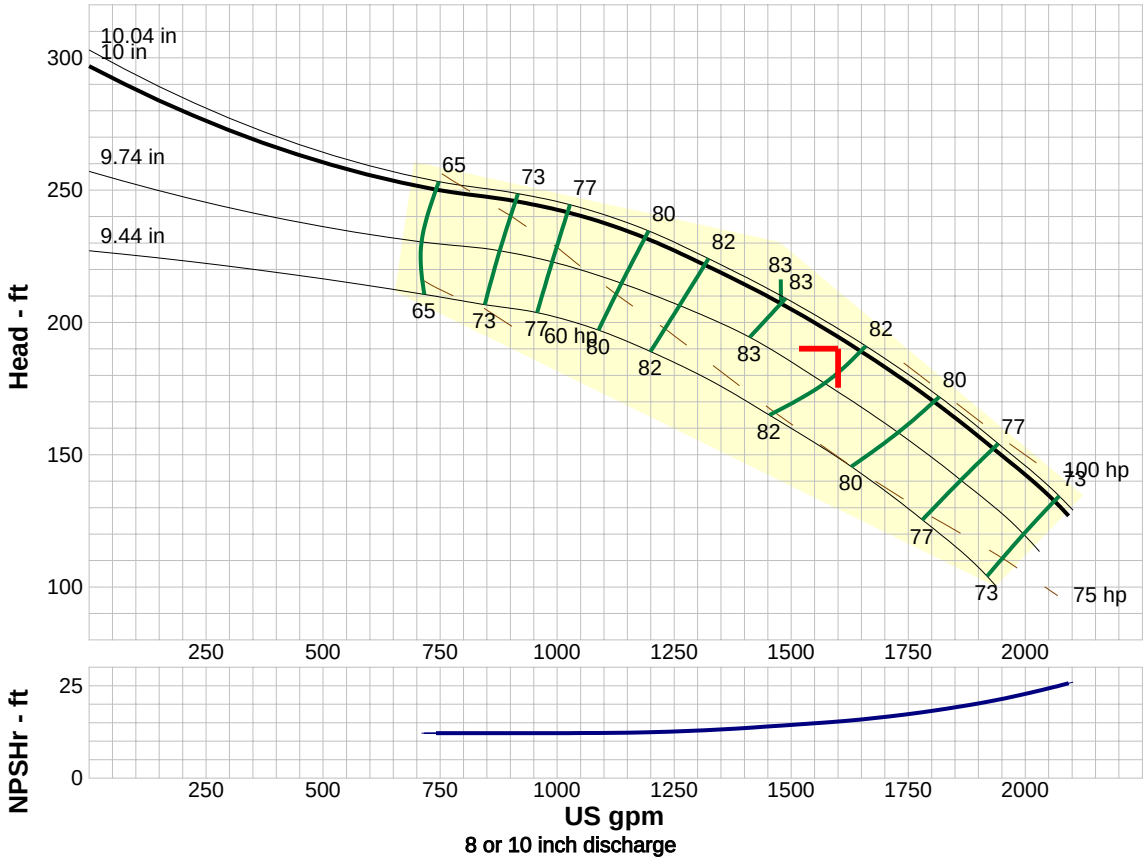
---- Design Curve ----

Shutoff head:	297 ft
Shutoff dP:	129 psi
Min flow:	--- US gpm
BEP:	83% @ 1478 US gpm

NOL power:
97.1 hp @ 1805 US gpm

-- Max Curve --

Max power:
98.7 hp @ 1816 US gpm



Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
1920	1770	154	77.3	96.7	20.7
1600	1770	194	82.3	95.4	15.4
1280	1770	225	81.5	89.2	12.8
960	1770	244	74.8	79.2	12.2
640	1770	---	---	---	---

Selected from catalog: Layne-Vertiline.60 Vers: 1

Company: McKim & Creed, Samantha Jones
Name: Sarasota County Effluent Pump
Date: 6/28/2012

Bee Ridge Effluent Pump Station 1
Pump 4

Layne/Verti-Line
Pentair Water

Pump:

Size: 10TLC (6 stage)

Type: Vertical Turbine
Synch speed: 1800 rpm

Speed: 1750 rpm
Dia: 7.875 in

Curve:

Impeller:

Specific Speeds:

Ns: ---
Nss: ---

Dimensions:

Suction: 8 in
Discharge: --- in

Vertical Turbine:

Bowl size: 9.88 in
Max lateral: --- in
Thrust K factor: 6 lb/ft

Pump Limits:

Temperature: 150 °F
Pressure: 450 psi g
Sphere size: 0.63 in

Power: --- hp
Eye area: 16.53 in²

Search Criteria:

Flow: 800 US gpm

Head: 190 ft

Fluid:

Water
Density: 62.37 lb/ft³
Viscosity: 1.105 cP

Temperature: 60 °F
Vapor pressure: 0.2563 psi a
Atm pressure: 14.7 psi a

NPSHa: --- ft

Motor:

Standard: NEMA
Enclosure: TEFC

Size: 50 hp
Speed: 1800
Frame: 326T

Sizing criteria: Max Power on Design Curve

---- Data Point ----

Flow:	800 US gpm
Head:	194 ft
Eff:	82.2%
Power:	47.8 hp
NPSHr:	11.9 ft

---- Design Curve ----

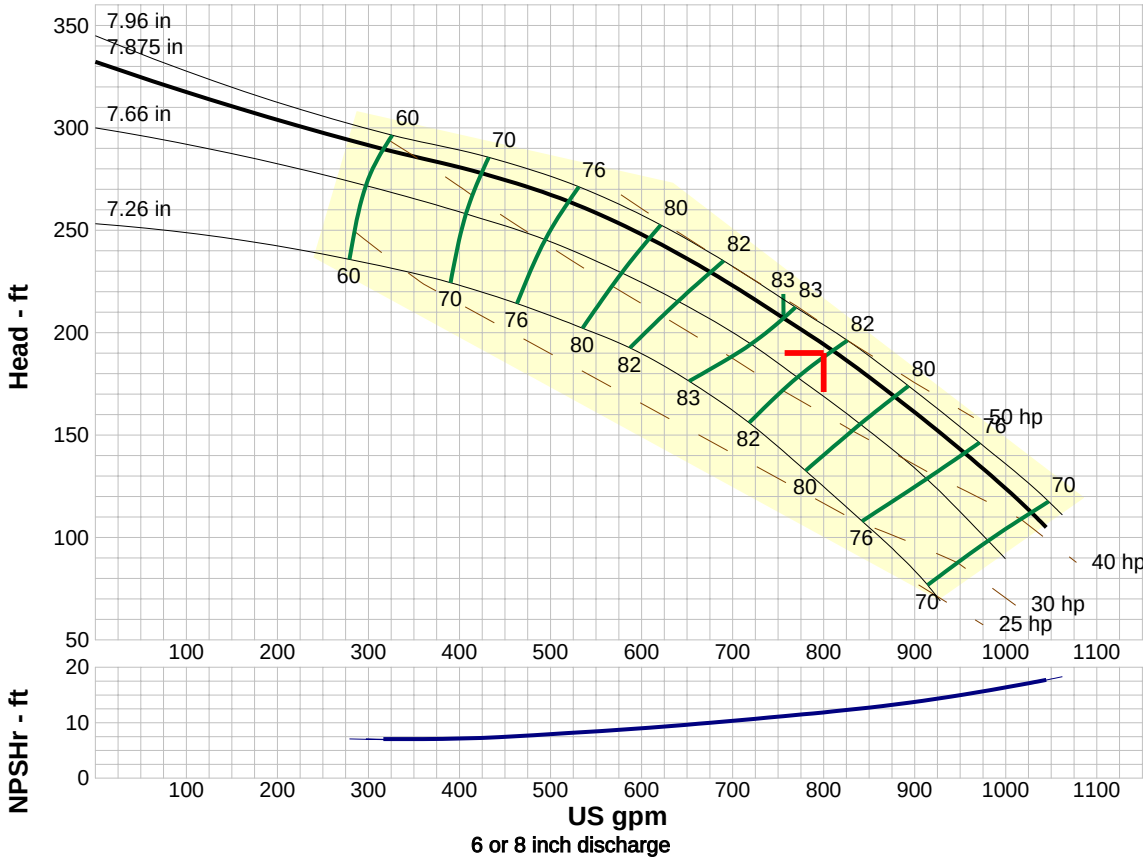
Shutoff head:	332 ft
Shutoff dP:	144 psi
Min flow:	--- US gpm

BEP: 83% @ 755 US gpm

NOL power:
47.8 hp @ 676 US gpm

-- Max Curve --

Max power:
50 hp @ 690 US gpm

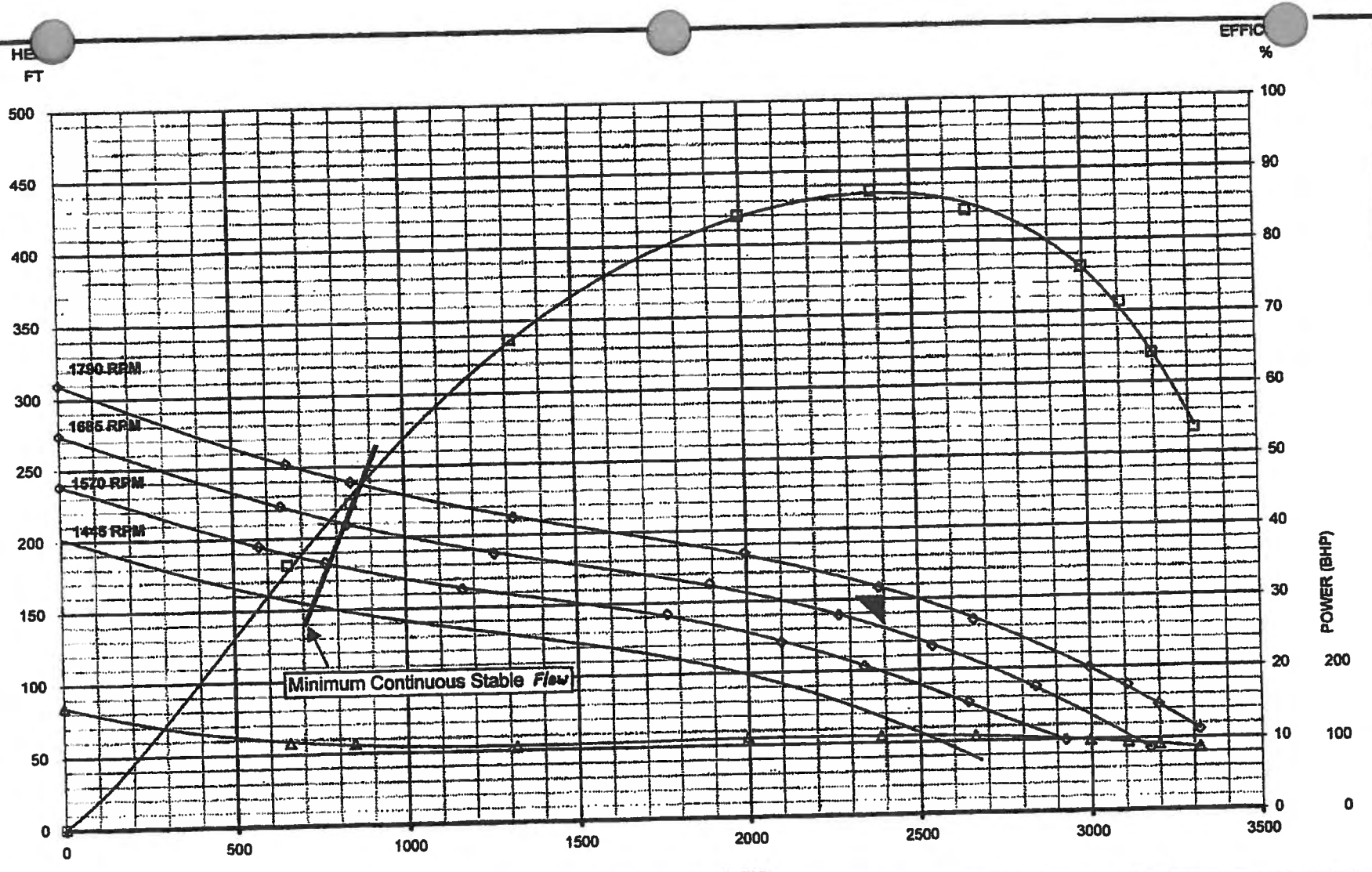


Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
960	1750	139	75.6	44.7	15.3
800	1750	194	82.2	47.8	11.9
640	1750	238	80.9	47.6	9.52
480	1750	270	73.5	44.4	7.78
320	1750	289	60.3	38.8	7.08

Selected from catalog: Layne-Vertiline.60 Vers: 1

Bee Ridge Pump Station 2



0304MS002341-1 SERIAL NO.	S2341-1 ORDER NO.	14ENL MODEL	3 STAGES	VTP TEST LOOP	PUMP TYPE OF TEST	JOB TEST MOTOR	16 MAG FLOW METER	10/01/03 DATE TESTED	1WAS CURVE NO

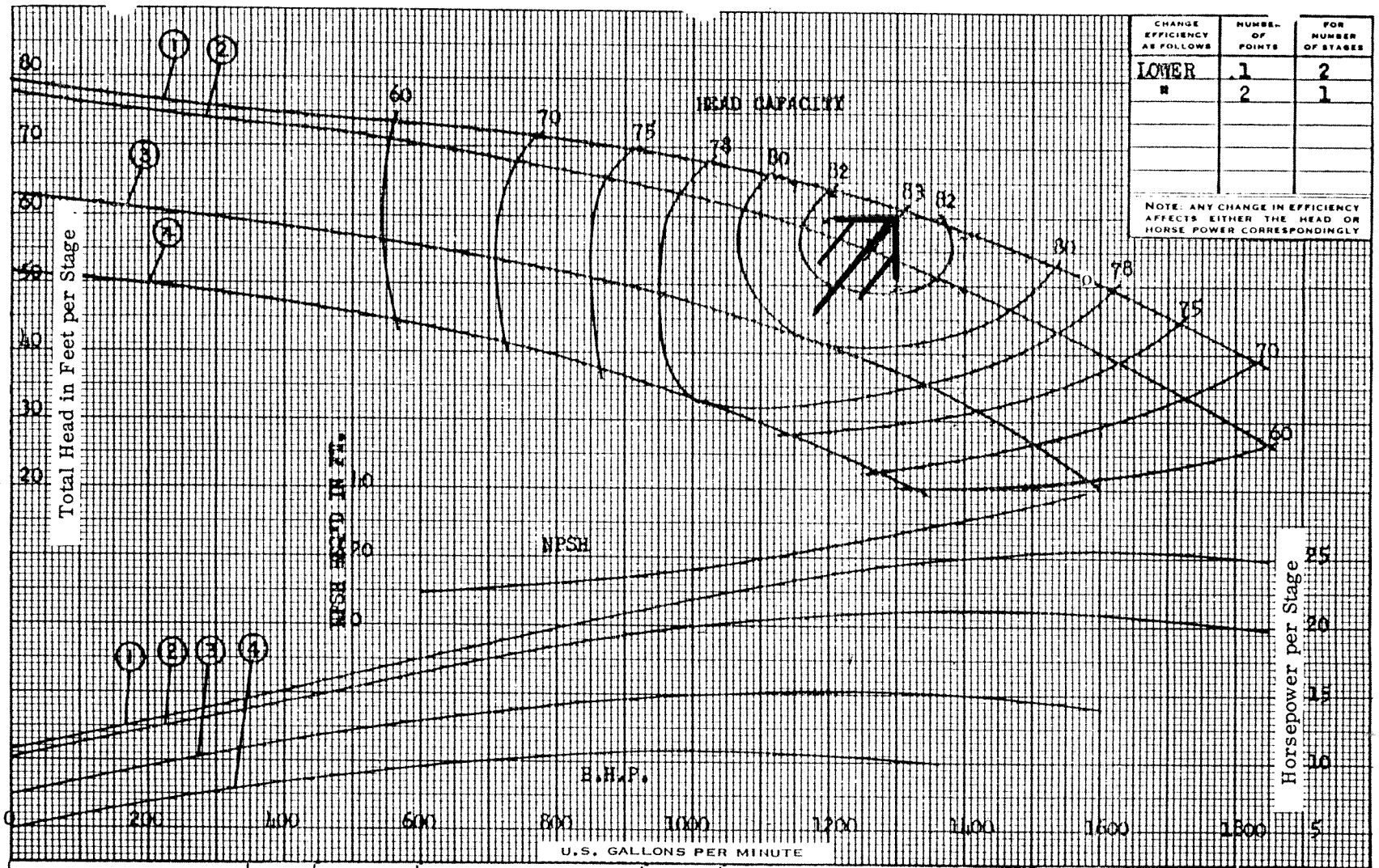
CASING DATA	IMPELLER DATA		CONDITIONS OF SERVICE		
CAST IRON MATERIAL	BRONZE MATERIAL	1A FINISH	2400 GPM FLOW	152.93 FT HEAD	I CERTIFY THAT WITHIN THE ACCURACY OF THE TEST INSTRUMENTATION, THIS TEST REPRESENTS THE PERFORMANCE OF 0304MS002341-1
LINED FINISH	10.25 DIAMETER		1 SG	1790 RPM SPEED	
N/A TONGUE	.13 X 1.50 TIP			81 TEMP. (F)	FLOWSERVE

Bee Ridge Pump Station 2
Pumps 5-8

Central County Effluent Pump Station

Peerless Pumps

Central County Effluent Pumps 2-3



CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES
LOWER	1	2
"	2	1

NOTE: ANY CHANGE IN EFFICIENCY AFFECTS EITHER THE HEAD OR HORSE POWER CORRESPONDINGLY

HYDRAULIC PERFORMANCE WARRANTY

Guaranteed at designated point only, and contingent on:

Proper flow to pump suction
Proper submergence
Fluid free of gas, air & abrasives
Proper lateral setting of impeller

CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
1	2624331	8 7/8"	40385
2	2624331	8 11/16"	35492
3	2624331	8 3/16"	
4	2624331	7 11/16"	

Customer Southern Controls
Sarasota, FL
Item Sarasota W.W.T.P. Pump # 3
Peerless Ref. No: TI 43262

Laboratory Performance BOWL T84506-E

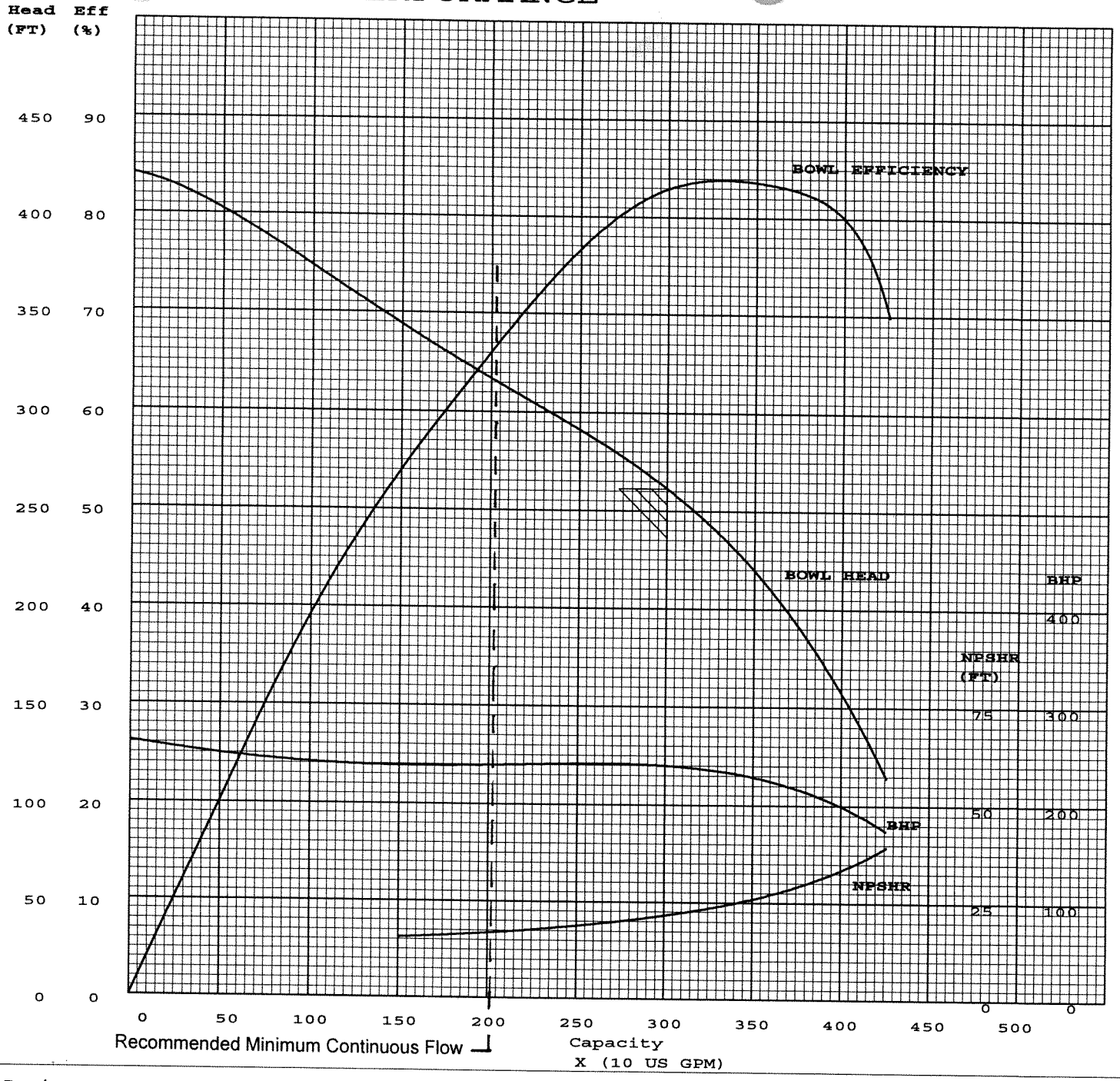
SIZE 12 MB | RPM 1760 | CURVE 2842487

PUMP DESCRIPTION: Driver 100 HP, 1800 RPM, 230/460/3/60 ; Head U.S. Elec., WP-i, N.R.R., 1-1/2" T.D.C. 8 X 8 X 16-1/2 ; Column 14 ft. of 8" X 1-1/2" S.S.

GUARANTEED PERFORMANCE: BOWL ☐ FIELD ☐ Capacity 1300 gpm; Head 240 ft; Eff 80 %; BHP 98.73

10-74

PUMP PERFORMANCE



INGERSOLL-DRESSER PUMP

This pump is guaranteed to deliver:

US GPM : 3000
TDH : 260 (FT)
RPM : 1780
Efficiency: 82%

Driver: Electric Motor

This curve shows the expected heads and efficiencies at other capacities, but this additional data is only approximate and is not guaranteed.

Central County Effluent Pumps 4-5

Project: CENTRAL COUNTY WRF
Service: EFFLUENT REUSE PUMP

Model No. 15HH340-4
Order No. S000639

Date: 05MAY98
E-PS000639A

APPENDIX J

HYDARULIC MODEL RESULTS – EXISTING CONDITIONS
MAXIMUM MONTH AVERAGE DAILY FLOW

Existing Conditions - Max Month Averge Daily Flow

Pipe Report

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1200	951.07	J-726	PSCC1_5	12	130	-3,848.25	10.92	0.031	0.38
P-183	272.49	PSCC1_4	J-726	12	130	3,840.28	10.89	0.092	1.38
P-226	1,464.16	PSBR1_3	J-165	10	130	2,502.16	10.22	0.494	9.87
P-227	1,779.58	PSBR1_2	J-165	10	130	2,502.16	10.22	0.494	9.87
P-230	2,201.99	PSBR1_1	J-165	10	130	2,502.16	10.22	0.494	9.87
P-356	21.45	J-124	LOPSV-2	6	130	796.2	9.03	0.049	1.02
P-357	43.12	LOPSV-2	LOSP-2	6	130	796.17	9.03	0.049	2.09
P-165	68.09	J-137	J-34	6	130	-588.48	6.68	0.035	2.35
P-304	37.87	J-137	PPSV-1	6	130	581.82	6.6	0.027	1.03
P-305	97.33	PPSV-1	PSP-1	6	130	581.82	6.6	0.027	2.64
P-43	30.71	J-216	J-220	8	130	974.39	6.22	0.017	0.54
P-327	523.1	ISPSV-1	J-220	8	130	-974.39	6.22	0.017	9.11
P-263	35.52	ISPSV-1	ISSP-1	8	130	974.39	6.22	0.017	0.63
P-1199	289.64	J-726	J-143	24	130	7,688.54	5.45	0.004	0.01
P-1193	352.68	J-51	J-738	24	130	-7,688.53	5.45	0.004	0.12
P-1194	163.62	J-738	J-143	24	130	-7,688.53	5.45	0.004	0.05
P-294	56.41	J-107	GCPSV-1	6	130	473.94	5.38	0.019	1.04
P-295	55.68	GCPSV-1	GCSP-1	6	130	473.93	5.38	0.019	1.04
P-1215	422.93	J-731	J-21	10	130	1,314.74	5.37	0.011	4.5
P-296	104.66	J-108	MCPSV-1	6	130	473.25	5.37	0.019	1.95
P-297	100.11	MCPSV-1	MCSP-1	6	130	473.25	5.37	0.019	1.86
P-1219	644.26	BRGST_1	J-151	24	130	7,506.48	5.32	0.004	0.54
P-234	334.31	J-165	J-166	24	130	7,506.47	5.32	0.008	0.06
P-235	596.22	J-166	J-142	24	130	7,506.47	5.32	0.004	1.45
P-59	444.73	J-18	J-51	24	130	-7,059.75	5.01	0.003	1.44
P-68	116.16	J-19	J-29	14	130	2,397.06	5	0.008	0.89
P-358	1,490.15	J-11	J-263	6	130	439	4.98	0.016	24.06
P-359	539.78	J-263	J-264	6	130	439	4.98	0.016	8.72
P-361	1,280.99	J-265	J-266	6	130	439	4.98	0.016	20.68
P-362	123.53	J-266	SBPSV-1	6	130	439	4.98	0.016	2
P-363	41.24	SBPSV-1	SBSP-1	6	130	439	4.98	0.016	0.66
P-69	1,155.67	J-29	J-30	14	130	2,341.21	4.88	0.006	6.68
P-74	551.63	J-44	J-30	14	130	-2,327.93	4.85	0.006	3.34
P-89	399.84	J-42	J-64	14	130	-2,304.88	4.8	0.006	2.55
P-90	513.67	J-64	J-44	14	130	-2,304.88	4.8	0.006	3.14
P-254	456.47	J-54	J-733	18	130	3,665.87	4.62	0.006	2.89
P-255	1,527.60	J-733	J-19	18	130	3,665.87	4.62	0.005	7.07
P-81	402.26	J-55	J-42	14	130	-2,180.80	4.55	0.007	2.81
P-82	588.71	J-56	J-55	14	130	-2,180.80	4.55	0.006	3.27
P-83	468.62	J-57	J-56	14	130	-2,180.80	4.55	0.005	2.38
P-151	1,726.42	J-131	J-132	12	130	-1,594.75	4.52	0.006	10.45
P-154	142.66	J-109	J-132	12	130	1,594.75	4.52	0.007	1.02
P-292	54.7	J-131	HOPSV-1	12	130	1,594.75	4.52	0.006	0.33
P-293	74.18	HOPSV-1	HOSP-1	12	130	1,594.73	4.52	0.006	0.45
P-257	167.37	J-179	J-57	14	130	-2,167.56	4.52	0.006	1
P-256	311.22	J-40	J-179	14	130	-2,166.08	4.51	0.006	1.72
P-245	2,111.17	J-21	J-174	14	130	2,145.38	4.47	0.005	10.63
P-253	52.79	J-174	J-177	14	130	2,145.38	4.47	0.01	0.51
P-1	14.14	J-217	J-218	8	130	699.8	4.47	0.009	0.13
P-3	14.91	J-218	J-219	8	130	699.8	4.47	0.009	0.14
P-45	138.37	J-221	J-222	8	130	-699.8	4.47	0.009	1.3
P-6	447.81	J-224	J-225	8	130	699.8	4.47	0.009	4.22
P-4	670.05	J-225	J-222	8	130	699.8	4.47	0.009	6.32
P-2	704.17	J-215	J-224	8	130	699.8	4.47	0.009	6.64
P-9	729.35	J-221	J-217	8	130	699.8	4.47	0.009	6.87
P-310	185.44	J-219	J-241	8	130	699.8	4.47	0.009	1.74
P-311	18.71	J-241	VWPSV-2	8	130	699.8	4.47	0.009	0.18
P-312	38.51	VWPSV-2	VWSP-2	8	130	699.8	4.47	0.009	0.37
P-1218	4,386.88	J-731	J-732	12	130	-1,448.02	4.11	0.005	22.07
P-46	1,295.61	J-3	J-4	10	130	-999.84	4.08	0.006	8.33
P-247	973.78	J-2	J-176	10	130	-999.84	4.08	0.007	7.22
P-248	3,626.88	J-176	J-3	10	130	-999.84	4.08	0.006	23.56

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-285	79.98	J-2	J-238	10	130	999.84	4.08	0.006	0.49
P-286	30.42	J-238	OPSV-1	10	130	999.84	4.08	0.006	0.18
P-287	38.15	OPSV-1	OSP-1	10	130	999.84	4.08	0.006	0.23
P-60	1,550.39	J-51	J-20	8	130	628.79	4.01	0.008	12.23
P-210	2,114.21	J-31	J-153	8	130	628.79	4.01	0.008	16.61
P-249	806.4	J-20	J-175	8	130	628.79	4.01	0.008	6.38
P-250	688.1	J-175	J-31	8	130	628.79	4.01	0.008	5.47
P-39	24.18	J-185	J-181	8	130	-616.05	3.93	0.007	0.18
P-288	73.85	J-185	FCPSV-1	8	130	616.05	3.93	0.007	0.55
P-289	41.95	FCPSV-1	FCSP-1	8	130	616.04	3.93	0.007	0.31
P-211	170.62	J-153	J-32	8	130	606.82	3.87	0.009	1.48
P-57	2,677.39	J-16	J-17	14	130	-1,814.44	3.78	0.004	10.1
P-70	831.31	J-34	J-32	8	130	-588.48	3.76	0.008	6.35
P-106	778.84	J-79	J-16	14	130	-1,788.73	3.73	0.004	2.86
P-149	4,739.39	J-128	J-129	16	130	2,333.57	3.72	0.003	14.53
P-187	2,076.69	J-145	J-144	16	130	2,291.68	3.66	0.003	6.18
P-188	828.32	J-146	J-145	16	130	2,291.68	3.66	0.003	2.73
P-189	1,453.61	J-147	J-146	16	130	2,291.68	3.66	0.003	4.36
P-190	2,810.26	J-148	J-147	16	130	2,291.68	3.66	0.003	8.4
P-191	1,287.71	J-149	J-148	16	130	2,291.68	3.66	0.003	4.09
P-193	3,742.59	J-129	J-150	16	130	2,291.68	3.66	0.003	11.3
P-1308	726.81	J-150	J-808	16	130	2,291.68	3.66	0.003	2.42
P-1309	5,281.23	J-808	J-149	16	130	2,291.68	3.66	0.003	15.62
P-1216	179.99	J-18	J-732	24	130	5,113.90	3.63	0.002	0.32
P-156	1,787.53	J-109	J-110	16	130	-2,267.83	3.62	0.003	5.16
P-67	200.38	J-28	J-19	12	130	-1,268.81	3.6	0.005	0.99
P-40	24.58	J-184	J-182	8	130	-548.23	3.5	0.006	0.15
P-290	70.81	J-184	FCPSV-2	8	130	548.23	3.5	0.006	0.43
P-291	43.16	FCPSV-2	FCSP-2	8	130	548.22	3.5	0.006	0.26
P-1206	432.67	CCSP_1	J-728	30	130	7,688.54	3.49	0.001	0.26
P-262	186.06	J-177	J-227	14	130	1,674.19	3.49	0.003	0.58
P-243	893.43	J-27	J-173	12	130	-1,222.46	3.47	0.004	3.28
P-244	310.73	J-173	J-28	12	130	-1,222.46	3.47	0.004	1.14
P-308	208.82	J-240	ETPSV-1	6	130	297.14	3.37	0.008	1.64
P-309	298.49	ETPSV-1	ETSP-1	6	130	297.14	3.37	0.008	2.34
P-65	502.5	J-25	J-26	12	130	-1,175.91	3.34	0.004	1.78
P-66	289.68	J-26	J-27	12	130	-1,175.91	3.34	0.004	1.11
P-20	72.16	J-188	J-189	12	130	-1,164.28	3.3	0.003	0.24
P-16	108.53	J-183	J-190	12	130	-1,164.28	3.3	0.003	0.37
P-38	155.92	J-191	J-192	12	130	-1,164.28	3.3	0.003	0.52
P-21	192.69	J-194	J-195	12	130	1,164.28	3.3	0.003	0.65
P-18	216.08	J-189	J-197	12	130	-1,164.28	3.3	0.003	0.73
P-23	311.08	J-199	J-186	12	130	1,164.28	3.3	0.003	1.04
P-19	253.49	J-200	J-195	12	130	-1,164.28	3.3	0.003	0.85
P-11	531	J-112	J-201	12	130	1,164.28	3.3	0.003	1.78
P-44	330.04	J-203	J-191	12	130	-1,164.28	3.3	0.003	1.11
P-15	345.41	J-186	J-194	12	130	1,164.28	3.3	0.003	1.16
P-22	408.96	J-190	J-188	12	130	-1,164.28	3.3	0.003	1.37
P-28	410.57	J-180	J-203	12	130	-1,164.28	3.3	0.003	1.38
P-17	457.74	J-197	J-200	12	130	-1,164.28	3.3	0.003	1.54
P-42	804.25	J-196	J-199	12	130	1,164.28	3.3	0.003	2.7
P-14	1,196.46	J-206	J-196	12	130	1,164.28	3.3	0.003	4.02
P-12	999.9	J-201	J-207	12	130	1,164.28	3.3	0.003	3.36
P-10	1,000.05	J-207	J-206	12	130	1,164.28	3.3	0.003	3.36
P-27	1,435.94	J-192	J-183	12	130	-1,164.28	3.3	0.003	4.82
P-142	476.56	J-122	J-124	10	130	796.2	3.25	0.004	1.98
P-279	997.12	J-236	J-47	6	130	-282.52	3.21	0.007	7.28
P-278	598.94	J-49	J-236	6	130	-282.52	3.21	0.007	4.44
P-155	2,594.59	J-167	J-239	24	130	4,457.71	3.16	0.001	3.58
P-236	633.3	J-142	J-167	24	130	4,457.71	3.16	0.001	0.93
P-264	966.82	J-229	J-40	12	130	-1,107.29	3.14	0.003	3.17
P-133	1,059.21	J-110	J-111	20	130	-3,048.76	3.11	0.002	1.84
P-64	312.25	J-24	J-25	12	130	-1,096.91	3.11	0.003	1.08
P-79	531.25	J-52	J-261	12	130	-1,091.32	3.1	0.003	1.62

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-351	559.16	J-261	J-8	12	130	-1,091.32	3.1	0.003	1.7
P-265	95.1	J-229	J-230	8	130	483.21	3.08	0.005	0.45
P-266	3,644.71	J-230	J-231	8	130	483.21	3.08	0.005	17.31
P-267	59.34	J-231	VWPSV-1	8	130	483.21	3.08	0.005	0.28
P-268	51.79	VWPSV-1	VWSP-1	8	130	483.21	3.08	0.005	0.25
P-146	521.98	J-127	J-126	20	130	-2,996.29	3.06	0.002	1.01
P-1277	956.21	J-126	J-790	20	130	-2,996.29	3.06	0.002	1.61
P-1278	1,578.80	J-790	J-112	20	130	-2,996.29	3.06	0.002	2.61
P-131	1,599.68	J-105	J-107	8	130	473.94	3.03	0.005	7.56
P-132	1,406.22	J-106	J-108	8	130	473.25	3.02	0.005	6.57
P-306	1,005.45	J-239	J-112	24	130	4,160.57	2.95	0.002	1.56
P-53	214.18	J-8	J-12	14	130	-1,397.48	2.91	0.002	0.49
P-63	1,741.70	J-23	J-24	12	130	-1,024.70	2.91	0.003	4.7
P-167	1,662.86	J-7	J-52	12	130	-1,018.68	2.89	0.003	4.46
P-360	3,184.93	J-264	J-265	6	130	254.46	2.89	0.006	18.73
P-84	1,825.02	J-40	J-59	12	130	1,002.42	2.84	0.003	4.7
P-240	975.11	J-170	J-59	12	130	-1,002.42	2.84	0.003	2.48
P-47	599.47	J-4	J-5	12	130	-999.84	2.84	0.003	1.56
P-48	1,209.24	J-5	J-6	12	130	-999.84	2.84	0.003	3.14
P-49	474.23	J-6	J-7	12	130	-999.84	2.84	0.003	1.23
P-105	1,305.86	J-15	J-79	14	130	-1,359.36	2.83	0.002	2.88
P-349	1,467.47	J-212	J-260	12	130	974.39	2.76	0.002	3.54
P-350	2,160.20	J-260	J-213	12	130	974.39	2.76	0.002	5.22
P-41	307.75	J-213	J-216	12	130	974.39	2.76	0.002	0.74
P-147	72.15	J-127	J-123	20	130	2,691.79	2.75	0.003	0.19
P-56	223.23	J-14	J-15	14	130	-1,302.99	2.72	0.002	0.45
P-8	134.08	J-223	J-212	16	130	1,674.19	2.67	0.002	0.22
P-7	659.91	J-227	J-223	16	130	1,674.19	2.67	0.002	1.07
P-271	32.31	J-232	J-233	4	130	102.71	2.62	0.008	0.25
P-272	2,121.00	J-233	J-234	4	130	102.71	2.62	0.008	16.75
P-273	21.62	J-234	HLPSV-1	4	130	102.71	2.62	0.008	0.17
P-274	29.89	HLPSV-1	HLSP-1	4	130	102.71	2.62	0.008	0.24
P-1217	146.49	J-732	J-54	24	130	3,665.87	2.6	0.001	0.14
P-54	1,738.66	J-12	J-13	14	130	-1,239.29	2.58	0.002	3.23
P-55	65.77	J-13	J-14	14	130	-1,239.29	2.58	0.002	0.12
P-61	729.69	J-21	J-22	12	130	-910.48	2.58	0.002	1.61
P-62	361.87	J-22	J-23	12	130	-910.48	2.58	0.002	0.77
P-162	392.38	J-48	J-136	6	130	-221.35	2.51	0.005	1.86
P-163	366.44	J-136	J-49	6	130	-221.35	2.51	0.005	1.7
P-148	1,292.98	J-123	J-128	20	130	2,333.57	2.38	0.001	1.39
P-143	95.64	J-122	J-125	8	130	-358.22	2.29	0.003	0.28
P-144	2,438.59	J-125	J-123	8	130	-358.22	2.29	0.003	6.8
P-343	64.15	J-257	J-170	12	130	-805.17	2.28	0.002	0.11
P-342	28.61	J-254	J-257	12	130	-805.17	2.28	0.002	0.05
P-238	343.12	J-41	J-169	12	130	805.17	2.28	0.002	0.58
P-239	447.17	J-169	J-168	12	130	805.17	2.28	0.002	0.76
P-246	2,693.65	J-168	J-47	12	130	805.17	2.28	0.002	4.57
P-340	589.31	J-41	J-254	12	130	-805.17	2.28	0.002	1
P-347	803.79	J-110	J-259	12	130	780.94	2.22	0.002	1.42
P-348	4,855.17	J-259	J-113	12	130	780.94	2.22	0.002	7.91
P-137	42.67	J-114	J-117	8	130	342.96	2.19	0.003	0.11
P-180	421.55	J-111	J-142	24	130	-3,048.76	2.16	0.001	0.34
P-364	3,068.88	J-265	J-267	6	130	-184.53	2.09	0.003	9.95
P-365	2,706.19	J-267	J-264	6	130	-184.53	2.09	0.003	8.78
P-261	2,497.54	J-208	J-209	8	130	310.98	1.98	0.002	5.25
P-275	2,204.05	J-209	J-235	8	130	310.98	1.98	0.002	4.63
P-276	23.31	J-235	RHPSV-1	8	130	310.98	1.98	0.002	0.05
P-277	26.82	RHPSV-1	RHSP-1	8	130	310.98	1.98	0.002	0.06
P-78	1,361.94	J-52	J-53	4	130	72.64	1.85	0.004	5.66
P-98	280.06	J-71	J-72	4	130	72.31	1.85	0.004	1.17
P-77	64.47	J-24	J-50	4	130	72.21	1.84	0.004	0.26
P-52	8.47	J-10	J-11	10	130	439.44	1.8	0.003	0.02
P-145	4,387.31	J-120	J-122	10	130	437.98	1.79	0.001	5.99
P-225	1,205.16	J-151	PSBR1_3	24	130	2,502.16	1.77	0.005	0.1

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-228	1,299.18	J-151	PSBR1_2	24	130	2,502.16	1.77	0.005	0.1
P-229	1,536.28	J-151	PSBR1_1	24	130	2,502.16	1.77	0.005	0.1
P-345	2,098.11	J-65	J-258	12	130	-624.07	1.77	0.001	2.29
P-346	1,154.15	J-258	J-229	12	130	-624.07	1.77	0.001	1.29
P-97	1,398.19	J-71	J-68	10	130	-429.36	1.75	0.001	1.85
P-107	2,070.99	J-79	J-68	10	130	429.36	1.75	0.001	2.8
P-13	333.56	J-193	J-181	12	130	616.05	1.75	0.001	0.35
P-26	218.74	J-198	J-193	12	130	616.05	1.75	0.001	0.23
P-30	324.44	J-202	J-198	12	130	616.05	1.75	0.001	0.33
P-24	352.8	J-180	J-202	12	130	616.05	1.75	0.001	0.36
P-1204	892.8	J-728	PSCC1_5	30	130	3,848.25	1.75	0	0
P-205	192.23	J-728	PSCC1_4	30	130	3,840.28	1.74	0	0.01
P-32	336.55	J-182	J-204	12	130	-548.23	1.56	0.001	0.28
P-31	406.78	J-187	J-205	12	130	-548.23	1.56	0.001	0.34
P-29	647.53	J-205	J-180	12	130	-548.23	1.56	0.001	0.54
P-25	738.09	J-204	J-187	12	130	-548.23	1.56	0.001	0.61
P-108	1,130.73	J-47	J-80	12	130	522.65	1.48	0.001	0.86
P-96	1,202.96	J-70	J-71	10	130	-357.05	1.46	0.001	1.13
P-138	772.38	J-117	J-118	8	130	225.76	1.44	0.001	0.92
P-300	47.87	J-118	BTPSV-1	8	130	225.76	1.44	0.001	0.06
P-301	78.27	BTPSV-1	BTSP-1	8	130	225.75	1.44	0.001	0.09
P-109	242.19	J-80	J-81	12	130	496.55	1.41	0.001	0.19
P-134	1,555.47	J-113	J-114	10	130	342.96	1.4	0.001	1.37
P-58	1,103.77	J-17	J-18	24	130	-1,945.85	1.38	0	0.33
P-333	1,954.77	J-81	J-249	12	130	482.74	1.37	0.001	1.38
P-334	1,891.03	J-249	J-161	12	130	482.74	1.37	0.001	1.33
P-313	1,846.15	J-156	J-242	6	130	119.26	1.35	0.001	2.67
P-314	116.41	J-242	GPSV-1	6	130	119.26	1.35	0.001	0.17
P-315	172.31	GPSV-1	GSP-1	6	130	119.24	1.35	0.001	0.25
P-72	586.36	J-38	J-39	12	130	-471.75	1.34	0.001	0.38
P-91	1,202.37	J-39	J-65	12	130	-471.75	1.34	0.001	0.8
P-124	1,358.86	J-99	J-38	12	130	-471.75	1.34	0.001	0.89
P-251	109.32	J-37	J-737	12	130	-471.75	1.34	0.001	0.09
P-252	2,116.11	J-737	J-99	12	130	-471.75	1.34	0.001	1.36
P-120	3,859.88	J-91	J-95	12	130	-471.74	1.34	0.001	2.47
P-121	650.24	J-95	J-96	12	130	-471.74	1.34	0.001	0.43
P-122	577.3	J-96	J-97	12	130	-471.74	1.34	0.001	0.37
P-123	2,144.31	J-97	J-98	12	130	-471.74	1.34	0.001	1.38
P-125	311.32	J-100	J-37	12	130	-471.74	1.34	0.001	0.2
P-126	974.36	J-100	J-101	12	130	471.74	1.34	0.001	0.64
P-185	1,473.78	J-98	J-101	12	130	-471.74	1.34	0.001	0.94
P-116	2,452.64	J-87	J-92	12	130	-471.74	1.34	0.001	1.57
P-117	1,875.31	J-92	J-91	12	130	-471.74	1.34	0.001	1.19
P-50	329.06	J-8	J-9	10	130	306.16	1.25	0.001	0.24
P-51	2,653.52	J-9	J-10	10	130	306.16	1.25	0.001	1.83
P-140	1,892.91	J-120	J-113	12	130	-437.98	1.24	0.001	1.07
P-5	5.07	J-212	J-215	16	130	699.8	1.12	0	0
P-157	4,087.00	J-134	J-109	16	130	-673.07	1.07	0	1.26
P-158	468.82	J-106	J-134	16	130	-673.07	1.07	0	0.14
P-100	904.66	J-73	J-74	8	130	165.62	1.06	0.001	0.6
P-101	523.68	J-74	J-76	8	130	165.62	1.06	0.001	0.35
P-102	38.46	J-76	J-75	8	130	165.62	1.06	0.001	0.02
P-113	2,045.62	J-87	J-88	16	130	643.5	1.03	0	0.58
P-307	120.44	J-239	J-240	12	130	297.14	0.84	0	0.03
P-73	187.68	J-42	J-43	8	130	124.09	0.79	0	0.08
P-92	558.01	J-66	J-67	10	130	-191.43	0.78	0	0.17
P-93	638.25	J-67	J-70	10	130	-191.43	0.78	0	0.18
P-110	1,498.14	J-82	J-83	16	130	482.74	0.77	0	0.25
P-111	1,954.51	J-83	J-86	16	130	482.74	0.77	0	0.33
P-112	515.94	J-86	J-84	16	130	482.74	0.77	0	0.09
P-171	2,231.73	J-161	J-82	16	130	482.74	0.77	0	0.39
P-259	2,224.12	J-84	J-208	16	130	482.74	0.77	0	0.37
P-215	638.09	J-158	J-156	8	130	119.26	0.76	0	0.23
P-216	1,566.97	J-159	J-160	8	130	119.26	0.76	0	0.56

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-217	1,867.61	J-160	J-158	8	130	119.26	0.76	0	0.66
P-139	3,669.81	J-117	J-119	8	130	117.2	0.75	0	1.29
P-302	53.72	J-119	BTPSV-2	8	130	117.2	0.75	0	0.02
P-303	95.48	BTPSV-2	BTSP-2	8	130	117.19	0.75	0	0.03
P-94	1,304.48	J-12	J-69	10	130	-171.85	0.7	0	0.31
P-95	1,058.34	J-69	J-66	10	130	-171.85	0.7	0	0.26
P-269	2,486.36	J-88	J-232	16	130	438.05	0.7	0	0.35
P-326	156.22	J-102	J-245	6	130	61.22	0.69	0	0.07
P-99	1,841.51	J-70	J-73	10	130	165.62	0.68	0	0.41
P-1214	898.24	J-10	J-731	10	130	-133.28	0.54	0	0.13
P-114	3,674.33	J-85	J-89	16	130	335.34	0.54	0	0.31
P-115	5,227.25	J-89	J-90	16	130	335.34	0.54	0	0.44
P-127	1,764.05	J-102	J-103	16	130	-335.34	0.54	0	0.15
P-128	1,839.15	J-90	J-104	16	130	335.34	0.54	0	0.16
P-129	692.91	J-104	J-103	16	130	335.34	0.54	0	0.06
P-270	3,305.62	J-232	J-85	16	130	335.34	0.54	0	0.28
P-1211	207.3	J-162	J-159	10	130	119.26	0.49	0	0.02
P-130	2,067.68	J-102	J-105	16	130	274.12	0.44	0	0.12
P-159	3,071.10	J-135	J-106	16	130	-199.82	0.32	0	0.1
P-160	4,463.50	J-105	J-135	16	130	-199.82	0.32	0	0.14
P-260	127.96	J-208	J-87	16	130	171.76	0.27	0	0
P-299	123.96	SGCPSV-1	SGCSP-1	8	130	42.02	0.27	0	0.01
P-161	2,592.91	J-129	J-130	8	130	41.89	0.27	0	0.13
P-298	93.32	J-130	SGCPSV-1	8	130	41.89	0.27	0	0
P-213	1,433.37	J-154	J-155	16	130	119.26	0.19	0	0.02
P-214	5,780.24	J-157	J-154	16	130	119.26	0.19	0	0.07
P-220	1,786.32	J-162	J-164	16	130	-119.26	0.19	0	0.02
P-221	4,995.77	J-164	J-155	16	130	-119.26	0.19	0	0.06
P-231	4,275.38	J-144	J-157	16	130	119.26	0.19	0	0.05
P-1281	362.61	J-35	J-792	4	130	4.76	0.12	0	0.01
P-1282	383.64	J-792	J-36	4	130	4.76	0.12	0	0.01
P-152	2,069.83	J-33	J-133	6	130	6.66	0.08	0	0.01
P-153	990.5	J-133	J-58	6	130	6.66	0.08	0	0.01
P-164	1,640.28	J-33	J-137	6	130	-6.66	0.08	0	0.01
P-328	674.83	J-60	J-246	4	130	-2.88	0.07	0	0.01
P-329	1,209.86	J-246	J-61	4	130	-2.88	0.07	0	0.01
P-1283	1,607.52	J-62	J-793	6	130	4.76	0.05	0	0.01
P-1284	544.62	J-793	J-35	6	130	4.76	0.05	0	0
P-330	269.3	J-178	J-247	4	130	-2.08	0.05	0	0
P-331	416.49	J-247	J-36	4	130	-2.08	0.05	0	0
P-85	749.21	J-61	J-48	6	130	-2.88	0.03	0	0
P-86	6,000.17	J-17	J-62	8	130	4.76	0.03	0	0.01
P-319	1,109.24	J-1	J-2	4	130	0	0	0	0
P-170	252.08	J-140	J-37	12	130	0	0	0	0
P-335	5.26	J-243	J-250	4	130	0	0	0	0
P-1213	1,253.76	J-730	J-243	4	130	0	0	0	0
P-336	624.12	J-250	J-244	4	130	0	0	0	0
P-317	37.26	J-244	PSV-22	4	130	0	0	0	0
P-318	25.78	PSV-22	R-28	4	130	0	0	0	0
P-194	151.38	J-736	J-735	12	130	0	0	0	0
P-280	146.6	J-236	J-237	6	130	0	0	0	0
P-281	25.68	J-237	PUBPSV-1	6	130	0	0	0	0
P-282	44.06	PUBPSV-1	PUBSP-1	6	130	0	0	0	0
P-195	211.47	J-735	J-140	12	130	0	0	0	0
P-320	68.45	J-1	PSV-23	6	130	0	0	0	0
P-321	90.63	PSV-23	R-29	6	130	0	0	0	0
P-355	91.08	LOPSV-1	LOSP-1	6	130	0	0	0	0
P-354	47.09	J-121	LOPSV-1	6	130	0	0	0	0
P-186	137.84	J-139	J-736	12	130	0	0	0	0
P-118	475.85	J-91	J-93	8	130	0	0	0	0
P-119	243.2	J-93	J-94	8	130	0	0	0	0
P-283	72.21	J-94	SPSV-1	8	130	0	0	0	0
P-284	100.14	SPSV-1	SSP-1	8	130	0	0	0	0
P-141	810.88	J-120	J-121	8	130	0	0	0	0

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1212	643.57	J-159	J-730	6	130	0	0	0	0
P-337	486.84	J-80	J-251	6	130	0	0	0	0
P-353	1,524.61	PSBR2_8	J-141	10	130	0	0	0	0
P-176	1,228.09	PSBR2_7	J-141	10	130	0	0	0	0
P-177	921.43	PSBR2_6	J-141	10	130	0	0	0	0
P-178	966.38	PSBR2_5	J-141	10	130	0	0	0	0
P-1209	1,063.19	PSBR1_4	J-141	10	130	0	0	0	0
P-212	100.81	J-138	J-153	6	130	0	0	0	0
P-233	240.82	J-141	J-165	24	130	0	0	0	0
P-182	250.63	PSCC1_3	J-725	12	130	0	0	0	0
P-1197	948.37	PSCC1_2	J-725	12	130	0	0	0	0
P-168	438.2	J-139	PSPXN1_1	12	130	0	0	0	0
P-169	498.67	J-139	PSPXN1_2	12	130	0	0	0	0
P-197	178.47	J-799	PXNSP_1	12	130	0	0	0	0
P-200	565.78	PXNSP_1	PSPXN1_1	12	130	0	0	0	0
P-203	1,042.98	PXNSP_1	PSPXN1_2	12	130	0	0	0	0
P-204	1,755.42	PXNSP_1	PSPXN1_3	12	130	0	0	0	0
P-198	936.11	PSPXN1_3	J-139	12	130	0	0	0	0
P-341	164.94	J-254	J-255	6	130	0	0	0	0
P-103	77.45	J-76	J-77	6	130	0	0	0	0
P-339	40.2	J-251	J-253	6	130	0	0	0	0
P-338	36.81	J-251	J-252	6	130	0	0	0	0
P-344	107.66	J-256	J-257	6	130	0	0	0	0
P-1198	198.2	J-725	J-143	24	130	0	0	0	0
P-33	2.73	J-213	J-214	8	130	0	0	0	0
P-37	2.02	J-210	J-211	8	130	0	0	0	0
P-352	922.95	J-262	PSBR2_8	16	130	0	0	0	0
P-172	913.75	J-262	PSBR2_7	16	130	0	0	0	0
P-173	995.15	J-262	PSBR2_6	16	130	0	0	0	0
P-175	1,112.74	J-262	PSBR2_5	16	130	0	0	0	0
P-34	536.6	J-214	J-226	8	130	0	0	0	0
P-36	2,113.49	J-228	J-210	8	130	0	0	0	0
P-35	1,264.25	J-226	J-228	8	130	0	0	0	0
P-1205	386.69	CCSP_1	J-727	30	130	0	0	0	0
P-104	77	J-75	J-78	8	130	0	0	0	0
P-258	887.66	BRSP_1	J-262	48	130	0	0	0	0
P-174	1,089.14	J-151	PSBR1_4	24	130	0	0	0	0
P-1202	900.45	J-727	PSCC1_2	30	130	0	0	0	0
P-206	189.64	J-727	PSCC1_3	30	130	0	0	0	0
P-1289	4,590.53	J-732	J-796	16	130	0	0	0	0
P-1290	1,095.48	J-796	J-797	16	130	0	0	0	0
P-135	317.98	J-114	J-116	8	130	0	0	0	0
P-332	92.54	J-44	J-248	4	130	0	0	0	0
P-75	1,180.73	J-41	J-45	6	130	0	0	0	0
P-242	220.81	J-49	J-172	4	130	0	0	0	0
P-1279	1,267.27	J-61	J-791	4	130	0	0	0	0
P-241	201.76	J-48	J-171	4	130	0	0	0	0
P-76	2,043.41	J-45	J-46	6	130	0	0	0	0
P-136	167.85	J-116	J-115	6	130	0	0	0	0
P-1280	806.63	J-791	J-63	4	130	0	0	0	0
P-196	608.42	J-799	J-140	12	130	0	0	0	0

Existing Conditions - Max Month Averge Daily Flow

Junction Report

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-151	29	0	39.46	4.5
J-799	16	0	34	7.8
J-262	1	0	31	13
J-728	20.94	0	54.74	14.6
J-727	20.41	0	55	15
J-242	26.73	0	90.89	27.7
J-159	27.44	0	95.01	29.2
J-155	26.51	0	95.12	29.7
J-730	25.28	0	95.01	30.2
J-162	24.03	0	95.03	30.7
J-164	23.6	0	95.06	30.9
J-156	21.29	0	93.56	31.3
J-243	22.61	0	95.01	31.3
J-250	22.6	0	95.01	31.3
J-160	21.8	0	94.45	31.4
J-154	22.32	0	95.13	31.5
J-158	20.36	0	93.79	31.8
J-244	21.35	0	95.01	31.9
J-157	18.24	0	95.2	33.3
J-146	14.72	0	104.17	38.7
J-144	4.8	2,172.42	95.26	39.1
J-147	14.1	0	108.53	40.8
J-145	6.69	0	101.44	41
J-148	21.08	0	116.93	41.4
J-185	37.95	0	139.24	43.8
J-184	34.77	0	138.77	45
J-181	34.9	0	139.42	45.2
J-182	34.28	0	138.92	45.2
J-193	34.65	0	139.76	45.5
J-198	33.85	0	139.99	45.9
J-202	34.11	0	140.33	45.9
J-187	33.26	0	139.81	46.1
J-204	32.37	0	139.2	46.2
J-149	14.05	0	121.01	46.3
J-180	33.49	0	140.69	46.4
J-205	32.91	0	140.15	46.4
J-203	34.35	0	142.07	46.6
J-192	34.52	0	143.7	47.2
J-191	33.99	0	143.18	47.2
J-266	18.71	0	134.13	49.9
J-808	21.12	0	136.64	50
J-150	22.09	0	139.06	50.6
J-234	35.33	0	153.29	51
J-183	30.46	0	148.53	51.1
J-130	31.79	0	150.22	51.2
J-190	30.1	0	148.89	51.4
J-188	29.66	0	150.27	52.2
J-189	29.58	0	150.51	52.3
J-197	29.09	0	151.24	52.8
J-200	28.8	0	152.77	53.6
J-131	33.44	0	158.96	54.3
J-195	27.96	0	153.62	54.3
J-122	33.32	0	159.19	54.4
J-194	28.28	0	154.27	54.5
J-129	24.31	0	150.36	54.5
J-124	31.09	0	157.21	54.5
J-108	36.05	0	162.46	54.7
J-186	28.59	0	155.43	54.8
J-125	32.63	0	159.47	54.8
J-235	33.51	0	161.35	55.3
J-199	28.19	0	156.48	55.5
J-116	36.01	0	164.88	55.7

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-118	34.4	0	163.85	56
J-196	28.36	0	159.18	56.6
J-114	33.98	0	164.88	56.6
J-117	32.94	0	164.77	57
J-120	32.49	0	165.18	57.4
J-209	32.9	0	165.98	57.5
J-128	31.73	0	164.89	57.6
J-121	31.97	0	165.18	57.6
J-48	27	218.47	161.12	58
J-208	36.99	0	171.22	58
J-84	37.29	0	171.59	58.1
J-106	34.67	0	169.03	58.1
J-86	37.19	0	171.68	58.2
J-107	26.45	0	161.23	58.3
J-63	26	0	161.12	58.4
J-115	29.68	0	164.88	58.5
J-171	25.66	0	161.12	58.6
J-85	34.51	0	170.01	58.6
J-123	30.74	0	166.28	58.6
J-127	30.92	304.5	166.47	58.6
J-87	35.65	0	171.22	58.6
J-791	25.43	0	161.12	58.7
J-136	26.93	0	162.98	58.8
J-88	34.22	205.45	170.64	59
J-61	24.52	0	161.12	59.1
J-233	33.44	0	170.04	59.1
J-49	28.08	61.17	164.69	59.1
J-206	26.48	0	163.19	59.1
J-135	32.19	0	168.93	59.1
J-119	26.71	0	163.48	59.1
J-134	31.71	0	169.17	59.4
J-109	32.63	0	170.42	59.6
J-1	17.79	0	155.59	59.6
J-246	23.2	0	161.11	59.6
J-113	28.29	0	166.25	59.7
J-238	16.85	0	155.1	59.8
J-265	16.2	0	154.81	59.9
J-60	22.46	2.88	161.1	60
J-172	25.97	0	164.69	60
J-237	30.34	0	169.12	60
J-83	33.2	0	172.01	60
J-161	33.45	0	172.65	60.2
J-82	32.62	0	172.26	60.4
J-232	30.64	0	170.29	60.4
J-132	28.83	0	169.4	60.8
J-2	14.87	0	155.59	60.9
J-126	26.6	0	167.48	60.9
J-207	25.64	0	166.55	60.9
J-249	33.06	0	173.98	60.9
J-236	27.79	0	169.12	61.1
J-89	27.26	0	169.71	61.6
J-81	32.73	13.81	175.35	61.7
J-790	26.07	0	169.09	61.8
J-241	18.54	0	161.59	61.9
J-259	30.94	0	174.16	61.9
J-176	19.56	0	162.81	61.9
J-219	19.72	0	163.33	62.1
J-218	19.75	0	163.47	62.2
J-245	25.03	61.22	168.84	62.2
J-102	25.03	0	168.91	62.2
J-201	26.04	0	169.91	62.2
J-92	28.88	0	172.79	62.2
J-217	19.65	0	163.6	62.2
J-105	24.61	0	168.79	62.3

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-110	31.18	0	175.58	62.4
J-80	31	26.11	175.54	62.5
J-252	30.93	0	175.54	62.5
J-253	30.42	0	175.54	62.8
J-251	30.16	0	175.54	62.9
J-103	23.53	0	169.05	62.9
J-104	23.52	0	169.11	63
J-240	27.19	0	173.22	63.1
J-735	34	0	180.4	63.3
J-736	34	0	180.4	63.3
J-112	25.2	0	171.7	63.4
J-47	29.73	0	176.4	63.4
J-231	22.91	0	169.72	63.5
J-93	26.85	0	173.98	63.6
J-90	21.45	0	169.27	63.9
J-239	25.33	0	173.25	64
J-111	29.24	0	177.42	64.1
J-267	15.81	0	164.76	64.4
J-142	28.15	0	177.76	64.7
J-140	30.19	0	180.4	65
J-167	26.56	0	176.83	65
J-141	29	0	179.28	65
J-165	29	0	179.28	65
J-37	29.68	0	180.4	65.2
J-91	23.12	0	173.98	65.2
J-166	28.21	0	179.21	65.3
J-94	21.62	0	173.98	65.9
J-221	18.03	0	170.48	65.9
J-222	18.08	0	171.78	66.5
J-95	21.19	0	176.45	67.1
J-220	22.6	0	178.92	67.6
J-264	16.7	0	173.54	67.8
J-96	19.64	0	176.87	68
J-216	21.74	0	179.46	68.2
J-97	19.5	0	177.24	68.2
J-98	20.74	0	178.62	68.3
J-58	21.2	6.66	179.38	68.4
J-225	19.76	0	178.1	68.5
J-226	21.8	0	180.2	68.5
J-168	22.18	0	180.97	68.7
J-214	21.27	0	180.2	68.7
J-213	21.26	0	180.2	68.7
J-33	20.14	0	179.4	68.9
J-169	22.36	0	181.73	68.9
J-41	22.7	0	182.31	69
J-137	19.38	0	179.41	69.2
J-46	22.21	0	182.31	69.2
J-737	20.38	0	180.49	69.2
J-139	20.1	0	180.4	69.3
J-254	22.85	0	183.31	69.4
J-255	22.85	0	183.31	69.4
J-256	22.86	0	183.36	69.4
J-257	22.86	0	183.36	69.4
J-170	22.87	197.25	183.47	69.4
J-100	19.54	0	180.2	69.5
J-133	18.58	0	179.39	69.5
J-101	18.5	0	179.56	69.6
J-34	20.66	0	181.77	69.7
J-228	17.89	0	180.2	70.2
J-99	19.5	0	181.85	70.2
J-45	19.9	0	182.31	70.2
J-39	19.92	0	183.12	70.6
J-224	18.59	0	182.32	70.8
J-65	20.03	152.33	183.91	70.9

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-38	18.72	0	182.74	70.9
J-210	15.99	0	180.2	71
J-263	17.92	0	182.26	71.1
J-211	15.84	0	180.2	71.1
J-59	21.21	0	185.95	71.2
J-258	21.17	0	186.2	71.4
J-230	21.94	0	187.04	71.4
J-229	21.79	0	187.49	71.7
J-260	19.66	0	185.42	71.7
J-32	19.4	18.35	188.12	73
J-40	21.81	56.37	190.66	73
J-227	21.2	0	190.25	73.1
J-215	18.58	0	188.96	73.7
J-212	18.4	0	188.96	73.8
J-138	18.98	0	189.6	73.8
J-153	18.84	21.96	189.6	73.8
J-3	14.88	0	186.37	74.2
J-223	17.5	0	189.18	74.2
J-179	20.64	1.49	192.37	74.3
J-177	18.8	471.19	190.83	74.4
J-57	21.19	13.23	193.37	74.5
J-174	18.55	0	191.34	74.7
J-56	20.75	0	195.74	75.7
J-55	20.6	0	199.02	77.2
J-43	22.88	124.09	201.75	77.3
J-42	21.15	0	201.83	78.1
J-5	14.44	0	196.26	78.6
J-64	21.87	0	204.38	78.9
J-21	18.56	79.84	201.97	79.3
J-22	19.63	0	203.58	79.5
J-4	9.98	0	194.7	79.9
J-23	19.61	114.22	204.35	79.9
J-248	21	0	207.52	80.7
J-44	20.88	23.04	207.52	80.7
J-31	19.42	0	206.22	80.8
J-6	11.59	0	199.39	81.2
J-7	12.66	18.84	200.63	81.3
J-731	18.07	0	206.47	81.5
J-50	20.02	72.21	208.79	81.6
J-25	21.24	79.01	210.13	81.7
J-24	20.11	0	209.05	81.7
J-53	10.48	72.64	199.43	81.7
J-11	17.32	0.45	206.32	81.7
J-10	17.01	0	206.34	81.9
J-30	21.5	13.28	210.86	81.9
J-26	21.74	0	211.91	82.2
J-52	13.98	0	205.09	82.6
J-27	21.43	46.54	213.02	82.9
J-9	15.9	0	208.17	83.1
J-175	19.2	0	211.69	83.2
J-70	16.77	0	209.81	83.5
J-8	15.17	0	208.41	83.6
J-78	14.83	0	208.43	83.7
J-77	14.81	0	208.45	83.7
J-67	15.9	0	209.63	83.8
J-261	12.94	0	206.71	83.8
J-15	18.54	56.37	212.7	84
J-72	15.38	72.31	209.77	84.1
J-75	13.98	165.62	208.43	84.1
J-76	13.93	0	208.45	84.1
J-79	21.05	0	215.58	84.1
J-66	14.57	19.57	209.46	84.3
J-71	15.96	0	210.94	84.3
J-16	23.23	25.71	218.44	84.4

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-173	20.89	0	216.31	84.5
J-28	21.96	46.35	217.45	84.5
J-74	13.12	0	208.8	84.6
J-14	16.34	63.7	212.24	84.7
J-12	12.81	13.67	208.89	84.8
J-73	13.2	0	209.4	84.8
J-68	16.57	0	212.78	84.9
J-69	12.63	0	209.2	85
J-29	20.72	55.86	217.54	85.1
J-19	21.5	0	218.44	85.2
J-13	13.89	0	212.12	85.7
J-20	19.44	0	218.08	85.9
J-17	23.76	126.65	228.54	88.6
J-62	23.06	0	228.53	88.9
J-793	22.16	0	228.52	89.2
J-796	22.04	0	228.54	89.3
J-35	21.85	0	228.52	89.4
J-797	21.86	0	228.54	89.4
J-792	20.07	0	228.51	90.1
J-178	20.02	2.08	228.5	90.2
J-247	19.3	0	228.5	90.5
J-738	20.41	0	230.42	90.8
J-36	18.19	2.68	228.5	90.9
J-725	20	0	230.47	91
J-726	20	0	230.48	91
J-733	14.5	0	225.51	91.2
J-732	17.33	0	228.54	91.3
J-54	17.14	0	228.4	91.4
J-18	17.57	0	228.86	91.4
J-143	18.2	0	230.47	91.8
J-51	17	0	230.3	92.2

Existing Conditions - Max Month Averge Daily Flow

Pump Report

Label	Elevation (ft)	Pump Definition	Status (Initial)	Flow (gal/min)	Pressure (Discharge) (psi)
PSCC1_5	29	PSCC1_4-5	On	3,848.25	87.3
PSCC1_4	29	PSCC1_4-5	On	3,840.28	87.7
PSBR1_3	29	PSBR1_1-3	On	2,502.16	69.3
PSBR1_2	29	PSBR1_1-3	On	2,502.16	69.3
PSBR1_1	29	PSBR1_1-3	On	2,502.16	69.3
PSCC1_2	29	PSCC1_2-3	Off	0	87.1
PSCC1_3	29	PSCC1_2-3	Off	0	87.1
PSPXN1_1	34	PSCC1_2-3	Off	0	63.3
PSPXN1_2	34	PSCC1_2-3	Off	0	63.3
PSBR2_7	29	PSBR2_5-8	Off	0	65
PSBR2_6	29	PSBR2_5-8	Off	0	65
PSBR2_5	29	PSBR2_5-8	Off	0	65
PSBR1_4	29	PSBR1_4	Off	0	65
PSPXN1_3	34	PSCC1_2-3	Off	0	63.3
PSBR2_8	29	PSBR2_5-8	Off	0	65

Existing Conditions - Max Month Averge Daily Flow

Reservior Report

Label	Elevation (ft)	Flow (In net) (gal/min)*	Notes
BRSP_1	31	0	Bee Ridge WRF seasonal pond
BTSP-1	38.61	225.75	Bent Tree Golf Course 1
BTSP-2	26.71	117.19	Bent Tree Golf Course 2
CCSP_1	55	-7,688.53	Central County WRF pond (19.6 MG)
ETSP-1	26.28	297.14	Eagle Trace
FCSP-1	36.63	616.04	Founder's Golf Club
FCSP-2	36.28	548.22	Founder's Club Development
GCSP-1	25.75	473.93	Gator Creek Golf Course
GSP-1	23.35	119.24	Longmeadow (No Meter No.)
HLSP-1	34.87	102.71	Preserve at Heron Lake
HOSP-1	33.44	1,594.73	Heritage Oaks
ISSP-1	21.5	974.39	Isles of Sarasota
LOSP-1	32	0.00	Laurel Oaks GC Pond
LOSP-2	31	796.17	Laurel Oaks GC Pond
MCSP-1	35.33	473.25	Misty Creek
OSP-1	18.16	999.84	Oaks Golf Course
PSP-1	18.51	581.82	Prestancia
PUBSP-1	27.41	0	Publix
PXNSP_1	34	0	36 MG Parcel X north pond
R-28	22.5	0	Miss Sarasota Softball
R-29	17.68	0	Oaks I (not in use)
RHSP-1	33.8	310.98	Foxfire Golf Club
SBSP-1	18.5	439	Stoneybrook GC Pond
SGCSP-1	31.97	42.02	Sarasota Golf Course
SSP-1	24.6	0	Serenoa
VWSP-1	21.13	483.21	Village Walk
VWSP-2	17.72	699.8	Village Walk

*Negative is withdrawl and positive is filling

Existing Conditions - Max Month Averge Daily Flow

Pressure Sustaining Valve Report

Label	Elevation (ft)	Diameter (Valve) (in)	Upstream Pressure (psi)	Pressure Setting (psi)	Flow (gal/min)	Headloss (ft)	Notes	Status (Initial)
HOPSV-1	31.44	6	55	55	1,594.73	124.74	Heritage Oaks	Active
OPSV-1	16.16	6	60	60	999.84	136.52	Oaks Golf Course	Active
ISPSV-1	19.5	6	65	65	974.39	147.69	Isles of Sarasota	Active
LOPSV-2	29	6	55	55	796.17	123.1	Laurel Oaks GC	Active
VWPSV-2	15.72	6	63	63	699.8	143.32	Village Walk	Active
FCPSV-1	34.63	6	45	45	616.04	101.75	Founder's Golf Club	Active
PPSV-1	16.51	6	70	70	581.82	157.23	Prestancia	Active
FCPSV-2	34.28	6	45	45	548.22	101.8	Founder's Club Development	Active
VWPSV-1	19.13	6	65	65	483.21	148.07	Village Walk	Active
GCPSV-1	23.75	6	59	59	473.93	133.39	Gator Creek Golf Course	Active
MCPSV-1	33.33	6	55	55	473.25	123.33	Misty Creek	Active
SBPSV-1	16.5	6	50	50	439	112.96	Stoneybrook GC	Active
RHPSV-1	31.8	6	56	56	310.98	127.44	Foxfire Golf Club	Active
ETPSV-1	24.28	2	63.7	55	297.14	142.97	Eagle Trace	Active
BTPSV-1	36.61	6	55	55	225.75	125.1	Bent Tree Golf Course 1	Active
GPSV-1	21.35	6	30	30	119.24	67.13	Longmeadow (No Meter No.)	Active
BTPSV-2	24.71	6	60	60	117.19	136.72	Bent Tree Golf Course 2	Active
HLPSV-1	32.87	4	52	52	102.71	118.01	Preserve at Heron Lake	Active
SGCPSV-1	29.97	6	52	52	42.02	118.24	Sarasota Golf Course	Active
PUBPSV-1	25.41	6	62.1	64	0	0	Publix	Active
SPSV-1	22.6	6	65.5	68	0	0	Serenoa	Active
PSV-22	20.5	4	32.2	55	0	0	Miss Sarasota Softball	Closed
PSV-23	15.68	6	60.5	55	0	0	Oaks I (not in use)	Closed
LOPSV-1	30	6	58.5	52	0	0	Laurel Oaks GC	Closed

APPENDIX K

HYDARULIC MODEL RESULTS – 2032 MAXIMUM MONTH AVERAGE DAILY FLOW WITHOUT DEFICIENCY IMPROVEMENTS

2032 Max Month Average Daily Flow - without Deficiency Improvements

Pipe Report

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1200	951.07	J-726	PSCC1_5	12	130	-3,991.01	11.32	0.033	0.4
P-183	272.49	PSCC1_4	J-726	12	130	3,982.44	11.3	0.099	1.48
P-226	1,464.16	PSBR1_3	J-165	10	130	2,574.65	10.52	0.522	10.45
P-227	1,779.58	PSBR1_2	J-165	10	130	2,574.65	10.52	0.522	10.45
P-230	2,201.99	PSBR1_1	J-165	10	130	2,574.65	10.52	0.522	10.45
P-1215	422.93	J-731	J-21	10	130	1,559.54	6.37	0.015	6.19
P-1199	289.64	J-726	J-143	24	130	7,973.44	5.65	0.004	0.01
P-1193	352.68	J-51	J-738	24	130	-7,973.44	5.65	0.004	0.13
P-1194	163.62	J-738	J-143	24	130	-7,973.44	5.65	0.004	0.05
P-356	21.45	J-124	LOPSV-2	6	130	484.74	5.5	0.019	0.41
P-357	43.12	LOPSV-2	LOSP-2	6	130	484.69	5.5	0.019	0.83
P-1219	644.26	BRGST_1	J-151	24	130	7,723.95	5.48	0.004	0.57
P-234	334.31	J-165	J-166	24	130	7,723.95	5.48	0.008	0.07
P-235	596.22	J-166	J-142	24	130	7,723.95	5.48	0.004	1.53
P-59	444.73	J-18	J-51	24	130	-7,471.95	5.3	0.004	1.6
P-68	116.16	J-19	J-29	14	130	2,527.06	5.27	0.009	0.99
P-165	68.09	J-137	J-34	6	130	-461.18	5.23	0.022	1.49
P-304	37.87	J-137	PPSV-1	6	130	454.53	5.16	0.017	0.65
P-305	97.33	PPSV-1	PSP-1	6	130	454.45	5.16	0.017	1.67
P-69	1,155.67	J-29	J-30	14	130	2,471.21	5.15	0.006	7.39
P-74	551.63	J-44	J-30	14	130	-2,457.93	5.12	0.007	3.7
P-245	2,111.17	J-21	J-174	14	130	2,452.86	5.11	0.006	13.63
P-253	52.79	J-174	J-177	14	130	2,452.86	5.11	0.012	0.66
P-89	399.84	J-42	J-64	14	130	-2,434.88	5.07	0.007	2.83
P-90	513.67	J-64	J-44	14	130	-2,434.88	5.07	0.007	3.48
P-254	456.47	J-54	J-733	18	130	3,858.55	4.86	0.007	3.19
P-255	1,527.60	J-733	J-19	18	130	3,858.55	4.86	0.005	7.79
P-81	402.26	J-55	J-42	14	130	-2,310.80	4.82	0.008	3.14
P-82	588.71	J-56	J-55	14	130	-2,310.80	4.82	0.006	3.65
P-83	468.62	J-57	J-56	14	130	-2,310.80	4.82	0.006	2.65
P-257	167.37	J-179	J-57	14	130	-2,297.56	4.79	0.007	1.11
P-256	311.22	J-40	J-179	14	130	-2,296.08	4.79	0.006	1.91
P-349	1,467.47	J-212	J-260	12	130	1,550.69	4.4	0.006	8.38
P-350	2,160.20	J-260	J-213	12	130	1,550.69	4.4	0.006	12.34
P-41	307.75	J-213	J-216	12	130	1,536.39	4.36	0.006	1.73
P-149	4,739.39	J-128	J-129	16	130	2,677.75	4.27	0.004	18.76
P-189	1,453.61	J-147	J-146	16	130	2,677.75	4.27	0.004	5.82
P-190	2,810.26	J-148	J-147	16	130	2,677.75	4.27	0.004	11.21
P-191	1,222.79	J-149	J-148	16	130	2,677.75	4.27	0.004	5.21
P-193	3,742.59	J-129	J-150	16	130	2,677.75	4.27	0.004	15.09
P-1308	726.81	J-150	J-808	16	130	2,677.75	4.27	0.004	3.24
P-1309	5,346.07	J-808	J-149	16	130	2,677.75	4.27	0.004	21.11
P-358	1,490.15	J-11	J-263	6	130	373.41	4.24	0.012	17.83
P-359	539.78	J-263	J-264	6	130	373.41	4.24	0.012	6.46
P-361	1,280.99	J-265	J-266	6	130	373.41	4.24	0.012	15.33
P-362	123.53	J-266	SBPSV-1	6	130	373.41	4.24	0.012	1.48
P-363	41.24	SBPSV-1	SBSP-1	6	130	373.36	4.24	0.012	0.49
P-1218	4,386.88	J-731	J-732	12	130	-1,487.88	4.22	0.005	23.21
P-188	828.32	J-146	J-145	16	130	2,636.68	4.21	0.004	3.55
P-156	1,787.53	J-109	J-110	16	130	-2,633.46	4.2	0.004	6.8
P-187	2,101.78	J-145	J-144	16	130	2,627.16	4.19	0.004	8.05
P-262	186.06	J-177	J-227	14	130	1,981.68	4.13	0.004	0.79
P-1216	179.99	J-18	J-732	24	130	5,559.02	3.94	0.002	0.37
P-67	200.38	J-28	J-19	12	130	-1,331.49	3.78	0.005	1.08
P-57	2,677.39	J-16	J-17	14	130	-1,765.02	3.68	0.004	9.59
P-279	997.12	J-236	J-47	6	130	-323.36	3.67	0.009	9.35
P-278	598.94	J-49	J-236	6	130	-323.36	3.67	0.01	5.7
P-243	893.43	J-27	J-173	12	130	-1,285.14	3.65	0.004	3.6
P-244	310.73	J-173	J-28	12	130	-1,285.14	3.65	0.004	1.25
P-106	778.84	J-79	J-16	14	130	-1,739.31	3.63	0.003	2.72
P-1206	432.67	CCSP_1	J-728	30	130	7,973.44	3.62	0.001	0.27
P-11	531.00	J-112	J-201	12	130	1,255.40	3.56	0.004	2.05

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-65	502.50	J-25	J-26	12	130	-1,238.59	3.51	0.004	1.96
P-66	289.68	J-26	J-27	12	130	-1,238.59	3.51	0.004	1.23
P-84	1,825.02	J-40	J-59	12	130	1,207.84	3.43	0.004	6.64
P-240	975.11	J-170	J-59	12	130	-1,207.84	3.43	0.004	3.51
P-46	1,295.61	J-3	J-4	10	130	-811.07	3.31	0.004	5.64
P-247	973.78	J-2	J-176	10	130	-811.07	3.31	0.005	4.88
P-248	3,626.88	J-176	J-3	10	130	-811.07	3.31	0.004	15.97
P-285	79.98	J-2	J-238	10	130	811.07	3.31	0.004	0.33
P-286	30.42	J-238	OPSV-1	10	130	811.07	3.31	0.004	0.13
P-287	38.15	OPSV-1	OSP-1	10	130	810.94	3.31	0.004	0.16
P-64	312.25	J-24	J-25	12	130	-1,159.59	3.29	0.004	1.19
P-308	208.82	J-240	ETPSV-1	6	130	288.67	3.28	0.007	1.55
P-309	298.49	ETPSV-1	ETSP-1	6	130	288.67	3.28	0.007	2.21
P-155	2,594.59	J-167	J-239	24	130	4,615.69	3.27	0.001	3.82
P-236	633.30	J-142	J-167	24	130	4,615.69	3.27	0.002	0.99
P-60	1,550.39	J-51	J-20	8	130	501.49	3.2	0.005	8.04
P-210	2,114.21	J-31	J-153	8	130	501.49	3.2	0.005	10.92
P-249	806.4	J-20	J-175	8	130	501.49	3.2	0.005	4.2
P-250	688.10	J-175	J-31	8	130	501.49	3.2	0.005	3.6
P-157	4,087.00	J-134	J-109	16	130	-2,000.37	3.19	0.002	9.48
P-133	1,059.21	J-110	J-111	20	130	-3,108.26	3.17	0.002	1.91
P-8	134.08	J-223	J-212	16	130	1,981.68	3.16	0.002	0.3
P-7	659.91	J-227	J-223	16	130	1,981.68	3.16	0.002	1.46
P-1278	1,578.80	J-790	J-112	20	130	-3,065.77	3.13	0.002	2.72
P-1277	956.21	J-126	J-790	20	130	-3,054.71	3.12	0.002	1.67
P-146	521.98	J-127	J-126	20	130	-3,049.14	3.11	0.002	1.05
P-63	1,741.70	J-23	J-24	12	130	-1,087.38	3.08	0.003	5.25
P-306	1,005.45	J-239	J-112	24	130	4,327.02	3.07	0.002	1.68
P-211	170.62	J-153	J-32	8	130	479.53	3.06	0.006	0.95
P-163	366.44	J-136	J-49	6	130	-262.19	2.98	0.006	2.33
P-162	392.38	J-48	J-136	6	130	-259.70	2.95	0.006	2.5
P-70	831.31	J-34	J-32	8	130	-461.18	2.94	0.005	4.03
P-264	966.82	J-229	J-40	12	130	-1,031.87	2.93	0.003	2.78
P-345	2,098.11	J-65	J-258	12	130	-1,031.87	2.93	0.003	5.82
P-346	1,154.15	J-258	J-229	12	130	-1,031.87	2.93	0.003	3.28
P-12	999.90	J-201	J-207	12	130	1,017.54	2.89	0.003	2.62
P-343	64.15	J-257	J-170	12	130	-1,010.59	2.87	0.003	0.17
P-238	343.12	J-41	J-169	12	130	1,010.59	2.87	0.003	0.89
P-239	447.17	J-169	J-168	12	130	1,010.59	2.87	0.003	1.16
P-246	2,693.65	J-168	J-47	12	130	1,010.59	2.87	0.003	6.96
P-340	589.31	J-41	J-254	12	130	-1,010.59	2.87	0.003	1.52
P-342	28.61	J-254	J-257	12	130	-1,010.59	2.87	0.003	0.07
P-10	1,000.05	J-207	J-206	12	130	999.29	2.83	0.003	2.53
P-53	214.18	J-8	J-12	14	130	-1,348.06	2.81	0.002	0.45
P-261	2,497.54	J-208	J-209	8	130	439.87	2.81	0.004	9.97
P-275	2,204.05	J-209	J-235	8	130	439.87	2.81	0.004	8.8
P-147	72.15	J-127	J-123	20	130	2,744.63	2.8	0.003	0.2
P-20	72.16	J-188	J-189	12	130	-980.97	2.78	0.002	0.18
P-16	108.53	J-183	J-190	12	130	-980.97	2.78	0.002	0.27
P-38	155.92	J-191	J-192	12	130	-980.97	2.78	0.002	0.38
P-21	192.69	J-194	J-195	12	130	980.97	2.78	0.002	0.47
P-18	216.08	J-189	J-197	12	130	-980.97	2.78	0.002	0.53
P-23	311.08	J-199	J-186	12	130	980.97	2.78	0.002	0.76
P-19	253.49	J-200	J-195	12	130	-980.97	2.78	0.002	0.62
P-44	330.04	J-203	J-191	12	130	-980.97	2.78	0.002	0.81
P-15	345.41	J-186	J-194	12	130	980.97	2.78	0.002	0.84
P-22	408.96	J-190	J-188	12	130	-980.97	2.78	0.002	1
P-28	410.57	J-180	J-203	12	130	-980.97	2.78	0.002	1.01
P-17	457.74	J-197	J-200	12	130	-980.97	2.78	0.002	1.12
P-42	804.25	J-196	J-199	12	130	980.97	2.78	0.002	1.97
P-14	1,196.46	J-206	J-196	12	130	980.97	2.78	0.002	2.93
P-27	1,435.94	J-192	J-183	12	130	-980.97	2.78	0.002	3.51
P-61	729.69	J-21	J-22	12	130	-973.16	2.76	0.003	1.83
P-62	361.87	J-22	J-23	12	130	-973.16	2.76	0.002	0.87

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-105	1,305.86	J-15	J-79	14	130	-1,320.51	2.75	0.002	2.73
P-1217	146.49	J-732	J-54	24	130	3,858.55	2.74	0.001	0.15
P-148	1,292.98	J-123	J-128	20	130	2,677.75	2.73	0.001	1.79
P-40	24.58	J-184	J-182	8	130	-415.49	2.65	0.004	0.09
P-290	70.81	J-184	FCPSV-2	8	130	415.49	2.65	0.004	0.25
P-291	43.16	FCPSV-2	FCSP-2	8	130	415.48	2.65	0.004	0.15
P-56	223.23	J-14	J-15	14	130	-1,264.13	2.63	0.002	0.43
P-79	531.25	J-52	J-261	12	130	-902.55	2.56	0.002	1.14
P-351	559.16	J-261	J-8	12	130	-902.55	2.56	0.002	1.19
P-54	1,738.66	J-12	J-13	14	130	-1,200.43	2.5	0.002	3.04
P-55	65.77	J-13	J-14	14	130	-1,200.43	2.5	0.002	0.12
P-91	1,202.37	J-39	J-65	12	130	-879.55	2.5	0.002	2.53
P-360	3,184.93	J-264	J-265	6	130	216.44	2.46	0.004	13.88
P-167	1,662.86	J-7	J-52	12	130	-829.91	2.35	0.002	3.05
P-47	599.47	J-4	J-5	12	130	-811.07	2.3	0.002	1.05
P-48	1,209.24	J-5	J-6	12	130	-811.07	2.3	0.002	2.13
P-49	474.23	J-6	J-7	12	130	-811.07	2.3	0.002	0.83
P-180	421.55	J-111	J-142	24	130	-3,108.26	2.2	0.001	0.36
P-1236	919.70	J-90	J-753	6	130	178.96	2.03	0.003	2.82
P-142	476.56	J-122	J-124	10	130	484.74	1.98	0.002	0.79
P-108	1,130.73	J-47	J-80	12	130	685.17	1.94	0.001	1.42
P-72	586.36	J-38	J-39	12	130	-679.22	1.93	0.001	0.75
P-124	1,358.86	J-99	J-38	12	130	-679.22	1.93	0.001	1.75
P-251	109.32	J-37	J-737	12	130	-679.22	1.93	0.002	0.18
P-252	2,116.11	J-737	J-99	12	130	-679.22	1.93	0.001	2.67
P-123	2,144.31	J-97	J-98	12	130	-679.22	1.93	0.001	2.71
P-125	311.32	J-100	J-37	12	130	-679.22	1.93	0.001	0.39
P-126	974.36	J-100	J-101	12	130	679.22	1.93	0.001	1.26
P-185	1,473.78	J-98	J-101	12	130	-679.22	1.93	0.001	1.85
P-109	242.19	J-80	J-81	12	130	659.06	1.87	0.001	0.32
P-39	24.18	J-185	J-181	8	130	-290.59	1.85	0.002	0.04
P-288	73.85	J-185	FCPSV-1	8	130	290.59	1.85	0.002	0.14
P-289	41.95	FCPSV-1	FCSP-1	8	130	290.57	1.85	0.002	0.08
P-78	1,361.94	J-52	J-53	4	130	72.64	1.85	0.004	5.66
P-98	280.06	J-71	J-72	4	130	72.31	1.85	0.004	1.17
P-77	64.47	J-24	J-50	4	130	72.21	1.84	0.004	0.26
P-333	1,954.77	J-81	J-249	12	130	645.25	1.83	0.001	2.36
P-334	1,891.03	J-249	J-161	12	130	645.25	1.83	0.001	2.29
P-225	1,205.16	J-151	PSBR1_3	24	130	2,574.65	1.83	0.005	0.1
P-228	1,299.18	J-151	PSBR1_2	24	130	2,574.65	1.83	0.005	0.1
P-229	1,536.28	J-151	PSBR1_1	24	130	2,574.65	1.83	0.005	0.1
P-50	329.06	J-8	J-9	10	130	445.51	1.82	0.001	0.47
P-51	2,653.52	J-9	J-10	10	130	445.51	1.82	0.001	3.67
P-1204	892.80	J-728	PSCC1_5	30	130	3,991.01	1.81	0	0
P-205	192.23	J-728	PSCC1_4	30	130	3,982.44	1.81	0	0.01
P-151	1,726.42	J-131	J-132	12	130	-633.09	1.8	0.001	1.89
P-154	142.66	J-109	J-132	12	130	633.09	1.8	0.001	0.18
P-292	54.70	J-131	HOPSV-1	12	130	633.09	1.8	0.001	0.06
P-293	74.18	HOPSV-1	HOSP-1	12	130	633.05	1.8	0.001	0.08
P-158	468.82	J-106	J-134	16	130	-1,121.09	1.79	0.001	0.36
P-159	3,071.10	J-135	J-106	16	130	-1,121.09	1.79	0.001	2.41
P-160	4,463.50	J-105	J-135	16	130	-1,121.09	1.79	0.001	3.52
P-130	2,067.68	J-102	J-105	16	130	-1,121.09	1.79	0.001	1.66
P-364	3,068.88	J-265	J-267	6	130	-156.96	1.78	0.002	7.38
P-365	2,706.19	J-267	J-264	6	130	-156.96	1.78	0.002	6.5
P-97	1,398.19	J-71	J-68	10	130	-418.81	1.71	0.001	1.76
P-107	2,070.99	J-79	J-68	10	130	418.81	1.71	0.001	2.67
P-145	4,387.31	J-120	J-122	10	130	417.86	1.71	0.001	5.49
P-127	1,764.05	J-102	J-103	16	130	1,059.87	1.69	0.001	1.24
P-128	1,839.15	J-90	J-104	16	130	-1,059.87	1.69	0.001	1.32
P-129	692.91	J-104	J-103	16	130	-1,059.87	1.69	0.001	0.5
P-1211	207.30	J-162	J-159	10	130	405.99	1.66	0.001	0.24
P-26	218.74	J-198	J-193	12	130	565.48	1.6	0.001	0.19
P-30	324.44	J-202	J-198	12	130	565.48	1.6	0.001	0.29

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-24	352.80	J-180	J-202	12	130	565.48	1.6	0.001	0.31
P-1237	3,026.84	J-216	J-754	20	130	1,536.38	1.57	0	1.41
P-1269	7,432.31	J-781	J-785	10	130	376.09	1.54	0.001	7.48
P-52	8.47	J-10	J-11	10	130	373.85	1.53	0.002	0.02
P-1232	1,860.92	J-749	J-750	8	130	238.57	1.52	0.001	2.39
P-1265	3,247.70	J-756	J-781	12	130	501.98	1.42	0.001	2.3
P-96	1,202.96	J-70	J-71	10	130	-346.5	1.42	0.001	1.07
P-1238	3,090.59	J-754	J-755	20	130	1,354.18	1.38	0	1.14
P-1222	2,301.79	J-159	J-740	10	130	338.53	1.38	0.001	1.91
P-1223	1,975.95	J-740	J-741	10	130	338.53	1.38	0.001	1.64
P-1224	3,031.77	J-741	J-742	10	130	338.53	1.38	0.001	2.51
P-1234	8,560.09	J-742	J-752	10	130	338.53	1.38	0.001	7.09
P-115	5,227.25	J-89	J-90	16	130	-864.18	1.38	0	2.53
P-58	1,103.77	J-17	J-18	24	130	-1,912.93	1.36	0	0.32
P-347	803.79	J-110	J-259	12	130	474.81	1.35	0.001	0.56
P-348	4,855.17	J-259	J-113	12	130	474.81	1.35	0.001	3.15
P-1239	8,409.87	J-755	J-756	20	130	1,276.96	1.3	0	2.78
P-312	38.51	VWPSV-2	VWSP-2	8	130	198.25	1.27	0.001	0.04
P-1	14.14	J-217	J-218	8	130	197.58	1.26	0.001	0.01
P-3	14.91	J-218	J-219	8	130	197.58	1.26	0.001	0.01
P-45	138.37	J-221	J-222	8	130	-197.58	1.26	0.001	0.13
P-6	447.81	J-224	J-225	8	130	197.58	1.26	0.001	0.41
P-4	670.05	J-225	J-222	8	130	197.58	1.26	0.001	0.61
P-2	704.17	J-215	J-224	8	130	197.58	1.26	0.001	0.64
P-9	729.35	J-221	J-217	8	130	197.58	1.26	0.001	0.66
P-310	185.44	J-219	J-241	8	130	197.58	1.26	0.001	0.17
P-311	18.71	J-241	VWPSV-2	8	130	197.58	1.26	0.001	0.02
P-140	1,892.91	J-120	J-113	12	130	-417.86	1.19	0.001	0.98
P-32	336.55	J-182	J-204	12	130	-415.49	1.18	0	0.17
P-31	406.78	J-187	J-205	12	130	-415.49	1.18	0	0.2
P-29	647.53	J-205	J-180	12	130	-415.49	1.18	0	0.32
P-25	738.09	J-204	J-187	12	130	-415.49	1.18	0	0.37
P-1233	2,513.52	J-750	J-751	8	130	177.19	1.13	0.001	1.86
P-1261	1,504.01	J-777	J-89	20	130	-1,084.81	1.11	0	0.37
P-100	904.66	J-73	J-74	8	130	165.62	1.06	0.001	0.6
P-101	523.68	J-74	J-76	8	130	165.62	1.06	0.001	0.35
P-102	38.46	J-76	J-75	8	130	165.62	1.06	0.001	0.02
P-1260	1,928.18	J-776	J-777	20	130	-1,027.71	1.05	0	0.43
P-120	3,859.88	J-91	J-95	12	130	-366.44	1.04	0	1.54
P-121	650.24	J-95	J-96	12	130	-366.44	1.04	0	0.27
P-122	577.30	J-96	J-97	12	130	-366.44	1.04	0	0.23
P-117	1,875.31	J-92	J-91	12	130	-366.43	1.04	0	0.75
P-1259	2,423.65	J-775	J-776	20	130	-1,015.60	1.04	0	0.53
P-110	1,498.14	J-82	J-83	16	130	635.04	1.01	0	0.41
P-111	1,954.51	J-83	J-86	16	130	635.04	1.01	0	0.55
P-112	515.94	J-86	J-84	16	130	635.04	1.01	0	0.15
P-171	2,231.73	J-161	J-82	16	130	635.04	1.01	0	0.65
P-1270	2,234.69	J-785	J-782	10	130	246.76	1.01	0	1.03
P-116	2,452.64	J-87	J-92	12	130	-345.82	0.98	0	0.88
P-259	2,224.12	J-84	J-208	16	130	609.97	0.97	0	0.57
P-1258	3,093.95	J-774	J-775	20	130	-815.06	0.83	0	0.45
P-13	333.56	J-193	J-181	12	130	290.59	0.82	0	0.09
P-113	2,045.62	J-87	J-88	16	130	515.93	0.82	0	0.38
P-307	120.44	J-239	J-240	12	130	288.67	0.82	0	0.03
P-1267	1,229.68	J-782	J-783	10	130	196.06	0.8	0	0.37
P-73	187.68	J-42	J-43	8	130	124.09	0.79	0	0.08
P-1229	573.92	J-193	J-747	12	130	274.89	0.78	0	0.13
P-1230	1,096.27	J-747	J-748	12	130	274.89	0.78	0	0.25
P-1231	2,215.11	J-748	J-749	12	130	274.89	0.78	0	0.51
P-1240	1,478.77	J-756	J-757	20	130	763.31	0.78	0	0.19
P-329	1,209.86	J-246	J-61	4	130	-29.89	0.76	0.001	0.98
P-1241	1,610.13	J-757	J-758	20	130	727.69	0.74	0	0.19
P-92	558.01	J-66	J-67	10	130	-180.88	0.74	0	0.15
P-93	638.25	J-67	J-70	10	130	-180.88	0.74	0	0.17

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-214	5,780.24	J-157	J-154	16	130	454.74	0.73	0	0.84
P-231	4,251.35	J-144	J-157	16	130	454.74	0.73	0	0.62
P-213	1,424.58	J-154	J-155	16	130	444.5	0.71	0	0.2
P-326	156.22	J-102	J-245	6	130	61.22	0.69	0	0.07
P-328	674.83	J-60	J-246	4	130	-26.81	0.68	0.001	0.45
P-99	1,841.51	J-70	J-73	10	130	165.62	0.68	0	0.41
P-94	1,304.48	J-12	J-69	10	130	-161.30	0.66	0	0.28
P-95	1,058.34	J-69	J-66	10	130	-161.30	0.66	0	0.23
P-220	1,786.32	J-162	J-164	16	130	-405.99	0.65	0	0.21
P-221	4,995.77	J-164	J-155	16	130	-405.99	0.65	0	0.59
P-1250	2,634.99	J-758	J-767	20	130	534.63	0.55	0	0.17
P-1257	3,191.85	J-773	J-774	20	130	-531.24	0.54	0	0.21
P-1235	177.79	J-752	J-743	10	130	125.71	0.51	0	0.02
P-269	2,486.36	J-88	J-232	16	130	310.48	0.5	0	0.18
P-85	749.21	J-61	J-48	6	130	-41.23	0.47	0	0.15
P-270	3,305.62	J-232	J-85	16	130	286.56	0.46	0	0.21
P-216	1,566.97	J-159	J-160	8	130	67.46	0.43	0	0.19
P-217	1,867.61	J-160	J-158	8	130	67.46	0.43	0	0.23
P-143	95.64	J-122	J-125	8	130	-66.88	0.43	0	0.01
P-144	2,438.59	J-125	J-123	8	130	-66.88	0.43	0	0.3
P-114	3,674.33	J-85	J-89	16	130	264.82	0.42	0	0.2
P-137	42.67	J-114	J-117	8	130	56.95	0.36	0	0
P-139	3,669.81	J-117	J-119	8	130	56.43	0.36	0	0.33
P-302	53.72	J-119	BTPSV-2	8	130	56.43	0.36	0	0
P-303	95.48	BTPSV-2	BTSP-2	8	130	56.38	0.36	0	0.01
P-1262	8,129.51	J-774	J-778	10	130	83.75	0.34	0	0.51
P-1263	1,106.42	J-778	J-779	10	130	83.75	0.34	0	0.07
P-1264	2,102.91	J-779	J-780	10	130	83.75	0.34	0	0.13
P-1251	928.79	J-767	J-768	20	130	334.28	0.34	0	0.03
P-1256	5,162.45	J-772	J-773	20	130	-333.42	0.34	0	0.14
P-1289	4,590.53	J-732	J-796	16	130	212.59	0.34	0	0.16
P-5	5.07	J-212	J-215	16	130	197.58	0.32	0	0
P-1252	4,070.09	J-768	J-769	20	130	307.41	0.31	0	0.1
P-1214	898.24	J-10	J-731	10	130	71.66	0.29	0	0.04
P-260	127.96	J-208	J-87	16	130	170.10	0.27	0	0
P-1268	324.09	J-783	J-784	10	130	60.52	0.25	0	0.01
P-1283	1,607.52	J-62	J-793	6	130	21.25	0.24	0	0.1
P-1281	362.61	J-35	J-792	4	130	9.12	0.23	0	0.03
P-134	1,555.47	J-113	J-114	10	130	56.95	0.23	0	0.05
P-1290	1,095.48	J-796	J-797	16	130	139.05	0.22	0	0.02
P-1271	2,752.22	J-758	J-786	8	130	32.04	0.2	0	0.09
P-1282	383.64	J-792	J-36	4	130	7.98	0.2	0	0.03
P-1279	1,267.27	J-61	J-791	4	130	7.89	0.2	0	0.09
P-1284	544.62	J-793	J-35	6	130	14.59	0.17	0	0.02
P-1242	5,497.77	J-758	J-759	20	130	161.02	0.16	0	0.04
P-1280	806.63	J-791	J-63	4	130	5.85	0.15	0	0.03
P-1255	2,582.81	J-771	J-772	20	130	-134.05	0.14	0	0.01
P-86	6,000.17	J-17	J-62	8	130	21.25	0.14	0	0.09
P-1253	2,562.28	J-769	J-770	20	130	104.56	0.11	0	0.01
P-1276	4,405.22	J-788	J-789	8	130	-14.33	0.09	0	0.03
P-33	2.73	J-213	J-214	8	130	14.3	0.09	0	0
P-34	536.60	J-214	J-226	8	130	14.30	0.09	0	0
P-35	1,264.25	J-226	J-228	8	130	14.30	0.09	0	0.01
P-36	2,113.49	J-228	J-210	8	130	14.30	0.09	0	0.01
P-1243	5,251.59	J-759	J-760	20	130	77.08	0.08	0	0.01
P-1244	1,677.81	J-760	J-761	20	130	77.08	0.08	0	0
P-152	2,069.83	J-33	J-133	6	130	6.66	0.08	0	0.01
P-153	990.50	J-133	J-58	6	130	6.66	0.08	0	0.01
P-164	1,640.28	J-33	J-137	6	130	-6.66	0.08	0	0.01
P-1245	495.59	J-761	J-762	20	130	67.86	0.07	0	0
P-1274	666.95	J-762	J-789	20	130	66.71	0.07	0	0
P-1275	1,130.15	J-789	J-763	20	130	52.38	0.05	0	0
P-330	269.30	J-178	J-247	4	130	-2.08	0.05	0	0
P-331	416.49	J-247	J-36	4	130	-2.08	0.05	0	0

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1273	1,099.77	J-787	J-788	8	130	-5.03	0.03	0	0
P-1247	1,512.30	J-763	J-764	20	130	25.18	0.03	0	0
P-1254	2,126.46	J-770	J-771	20	130	23.43	0.02	0	0
P-1272	1,010.64	J-786	J-787	8	130	-1.86	0.01	0	0
P-301	78.27	BTPSV-1	BTSP-1	8	130	0.57	0	0	0
P-138	772.38	J-117	J-118	8	130	0.52	0	0	0
P-300	47.87	J-118	BTPSV-1	8	130	0.52	0	0	0
P-319	1,109.24	J-1	J-2	4	130	0.00	0	0	0
P-274	29.89	HLPSV-1	HLSP-1	4	130	0.00	0	0	0
P-272	2,121.00	J-233	J-234	4	130	0.00	0	0	0
P-273	21.62	J-234	HLPSV-1	4	130	0	0	0	0
P-271	32.31	J-232	J-233	4	130	0	0	0	0
P-321	90.63	PSV-23	R-29	6	130	0.00	0	0	0
P-320	68.45	J-1	PSV-23	6	130	0.00	0	0	0
P-170	252.08	J-140	J-37	12	130	0.00	0	0	0
P-355	91.08	LOPSV-1	LOSP-1	6	130	0.00	0	0	0
P-354	47.09	J-121	LOPSV-1	6	130	0.00	0	0	0
P-294	56.41	J-107	GCPSV-1	6	130	0.00	0	0	0
P-295	55.68	GCPSV-1	GCSP-1	6	130	0.00	0	0	0
P-296	104.66	J-108	MCPSV-1	6	130	0.00	0	0	0
P-297	100.11	MCPSV-1	MCSP-1	6	130	0.00	0	0	0
P-281	25.68	J-237	PUBPSV-1	6	130	0.00	0	0	0
P-282	44.06	PUBPSV-1	PUBSP-1	6	130	0.00	0	0	0
P-194	151.38	J-736	J-735	12	130	0.00	0	0	0
P-280	146.6	J-236	J-237	6	130	0	0	0	0
P-195	211.47	J-735	J-140	12	130	0.00	0	0	0
P-186	137.84	J-139	J-736	12	130	0	0	0	0
P-318	25.78	PSV-22	R-28	4	130	0.00	0	0	0
P-335	26.29	J-243	J-250	4	130	0.00	0	0	0
P-317	37.42	J-244	PSV-22	4	130	0.00	0	0	0
P-336	624.42	J-250	J-244	4	130	0.00	0	0	0
P-1213	1,279.38	J-730	J-243	4	130	0	0	0	0
P-265	95.10	J-229	J-230	8	130	0	0	0	0
P-266	3,644.71	J-230	J-231	8	130	0	0	0	0
P-268	51.79	VWPSV-1	VWSP-1	8	130	0	0	0	0
P-267	59.34	J-231	VWPSV-1	8	130	0.00	0	0	0
P-141	810.88	J-120	J-121	8	130	0.00	0	0	0
P-327	523.10	ISPSV-1	J-220	8	130	0.00	0	0	0
P-43	30.71	J-216	J-220	8	130	0.00	0	0	0
P-263	35.52	ISPSV-1	ISSP-1	8	130	0	0	0	0
P-131	1,599.68	J-105	J-107	8	130	0	0	0	0
P-119	243.20	J-93	J-94	8	130	0.00	0	0	0
P-283	72.21	J-94	SPSV-1	8	130	0.00	0	0	0
P-284	100.14	SPSV-1	SSP-1	8	130	0.00	0	0	0
P-118	475.85	J-91	J-93	8	130	0.00	0	0	0
P-132	1,406.22	J-106	J-108	8	130	0.00	0	0	0
P-242	220.81	J-49	J-172	4	130	0.00	0	0	0
P-332	92.54	J-44	J-248	4	130	0	0	0	0
P-299	123.96	SGCPSV-1	SGCSP-1	8	130	0	0	0	0
P-298	93.32	J-130	SGCPSV-1	8	130	0.00	0	0	0
P-161	2,592.91	J-129	J-130	8	130	0.00	0	0	0
P-176	1,228.09	PSBR2_7	J-141	10	130	0	0	0	0
P-177	921.43	PSBR2_6	J-141	10	130	0	0	0	0
P-178	966.38	PSBR2_5	J-141	10	130	0	0	0	0
P-353	1,524.61	PSBR2_8	J-141	10	130	0	0	0	0
P-1209	1,063.19	PSBR1_4	J-141	10	130	0	0	0	0
P-277	26.82	RHPSV-1	RHSP-1	8	130	0.00	0	0	0
P-182	250.63	PSCC1_3	J-725	12	130	0	0	0	0
P-1197	948.37	PSCC1_2	J-725	12	130	0	0	0	0
P-276	23.31	J-235	RHPSV-1	8	130	0	0	0	0
P-233	240.82	J-141	J-165	24	130	0	0	0	0
P-1212	643.57	J-159	J-730	6	130	0	0	0	0
P-314	116.41	J-242	GPSV-1	6	130	0.00	0	0	0
P-313	1,846.15	J-156	J-242	6	130	0.00	0	0	0

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-315	172.31	GPSV-1	GSP-1	6	130	0.00	0	0	0
P-200	565.78	PXNSP_1	PSPXN1_1	12	130	0.00	0	0	0
P-203	1,042.98	PXNSP_1	PSPXN1_2	12	130	0.00	0	0	0
P-204	1,755.42	PXNSP_1	PSPXN1_3	12	130	0.00	0	0	0
P-197	178.47	J-799	PXNSP_1	12	130	0	0	0	0
P-344	107.66	J-256	J-257	6	130	0	0	0	0
P-168	438.20	J-139	PSPXN1_1	12	130	0	0	0	0
P-169	498.67	J-139	PSPXN1_2	12	130	0	0	0	0
P-212	100.81	J-138	J-153	6	130	0.00	0	0	0
P-198	936.11	PSPXN1_3	J-139	12	130	0	0	0	0
P-215	638.09	J-158	J-156	8	130	0	0	0	0
P-1198	198.20	J-725	J-143	24	130	0.00	0	0	0
P-37	2.02	J-210	J-211	8	130	0	0	0	0
P-352	922.95	J-262	PSBR2_8	16	130	0	0	0	0
P-172	913.75	J-262	PSBR2_7	16	130	0	0	0	0
P-173	995.15	J-262	PSBR2_6	16	130	0	0	0	0
P-175	1,112.74	J-262	PSBR2_5	16	130	0	0	0	0
P-1205	386.69	CCSP_1	J-727	30	130	0	0	0	0
P-104	77.00	J-75	J-78	8	130	0	0	0	0
P-258	887.66	BRSP_1	J-262	48	130	0	0	0	0
P-174	1,089.14	J-151	PSBR1_4	24	130	0	0	0	0
P-1202	900.45	J-727	PSCC1_2	30	130	0	0	0	0
P-206	189.64	J-727	PSCC1_3	30	130	0	0	0	0
P-1305	260.02	J-150	J-806	16	130	0	0	0	0
P-1248	4,034.36	J-764	J-765	20	130	0.00	0	0	0
P-1306	355.76	J-806	PMP-42	16	130	0.00	0	0	0
P-1307	365.97	PMP-42	J-807	16	130	0.00	0	0	0
P-338	36.81	J-251	J-252	6	130	0.00	0	0	0
P-1310	249.42	J-807	J-808	16	130	0.00	0	0	0
P-339	40.20	J-251	J-253	6	130	0.00	0	0	0
P-341	164.94	J-254	J-255	6	130	0.00	0	0	0
P-135	317.98	J-114	J-116	8	130	0	0	0	0
P-75	1,180.73	J-41	J-45	6	130	0.00	0	0	0
P-241	201.76	J-48	J-171	4	130	0.00	0	0	0
P-103	77.45	J-76	J-77	6	130	0.00	0	0	0
P-136	167.85	J-116	J-115	6	130	0	0	0	0
P-337	486.84	J-80	J-251	6	130	0	0	0	0
P-76	2,043.41	J-45	J-46	6	130	0	0	0	0
P-196	608.42	J-799	J-140	12	130	0	0	0	0
P-1291	663.4	J-165	R-36	90	130	0	0	0	0

2032 Max Month Average Daily Flow - without Deficiency Improvements

Junction Report

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-151	29	0	39.43	4.5
J-799	16	0	34	7.8
J-752	23.69	212.82	48.02	10.5
J-742	28.68	0	55.11	11.4
J-741	29.73	0	57.62	12.1
J-743	19.65	125.71	47.99	12.3
J-740	30.43	0	59.26	12.5
J-262	1	0	31	13
J-159	27.44	0	61.17	14.6
J-728	20.94	0	54.73	14.6
J-242	26.73	0	60.74	14.7
J-727	20.41	0	55	15
J-155	26.51	38.51	62.21	15.4
J-730	25.28	0	61.17	15.5
J-162	24.03	0	61.41	16.2
J-164	23.6	0	61.62	16.4
J-243	22.61	0	61.17	16.7
J-250	22.6	0	61.17	16.7
J-160	21.8	0	60.98	16.9
J-156	21.29	0	60.74	17.1
J-244	21.35	0	61.17	17.2
J-154	22.32	10.24	62.41	17.3
J-158	20.36	67.46	60.74	17.5
J-157	18.24	0	63.24	19.5
J-144	4.8	2,172.42	63.86	25.5
J-146	14.72	41.07	75.47	26.3
J-145	6.69	9.52	71.91	28.2
J-147	14.1	0	81.29	29.1
J-148	21.08	0	92.5	30.9
J-149	14.05	0	97.71	36.2
J-235	33.51	439.87	119.93	37.4
J-751	41.11	177.19	133.8	40.1
J-209	32.9	0	128.73	41.4
J-807	22	0	118.82	41.9
J-808	21.12	0	118.82	42.2
J-784	26.25	60.52	125.08	42.7
J-750	36.31	61.38	135.66	43
J-150	22.09	0	122.06	43.2
J-806	22	0	122.06	43.3
J-48	27	218.47	127.53	43.5
J-185	37.95	0	138.83	43.6
J-63	26	5.85	127.26	43.8
J-208	36.99	0	138.7	44
J-791	25.43	2.04	127.29	44
J-171	25.66	0	127.53	44
J-84	37.29	25.07	139.27	44.1
J-86	37.19	0	139.41	44.2
J-234	35.33	0	138.13	44.5
J-61	24.52	3.45	127.38	44.5
J-87	35.65	0	138.7	44.6
J-136	26.93	2.49	130.03	44.6
J-246	23.2	3.08	126.39	44.6
J-85	34.51	21.74	137.92	44.7
J-60	22.46	26.81	125.94	44.7
J-184	34.77	0	138.6	44.9
J-181	34.9	0	138.87	45
J-88	34.22	205.45	138.31	45
J-49	28.08	61.17	132.36	45.1
J-193	34.65	0	138.96	45.1
J-182	34.28	0	138.69	45.1
J-749	33.47	36.32	138.06	45.2
J-233	33.44	0	138.13	45.3

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-202	34.11	0	139.44	45.5
J-130	31.79	0	137.15	45.6
J-747	33.32	0	138.82	45.6
J-187	33.26	0	139.22	45.8
J-180	33.49	0	139.75	46
J-172	25.97	0	132.36	46
J-203	34.35	0	140.75	46
J-204	32.37	0	138.85	46
J-205	32.91	0	139.42	46.1
J-83	33.2	0	139.96	46.2
J-748	31.29	0	138.57	46.4
J-192	34.52	0	141.94	46.5
J-232	30.64	23.92	138.13	46.5
J-191	33.99	0	141.56	46.5
J-161	33.45	10.21	141.02	46.5
J-237	30.34	0	138.06	46.6
J-82	32.62	0	140.37	46.6
J-783	15.04	135.54	125.09	47.6
J-249	33.06	0	143.31	47.7
J-236	27.79	0	138.06	47.7
J-89	27.26	44.18	137.72	47.8
J-92	28.88	20.61	139.58	47.9
J-780	23.82	83.75	135.25	48.2
J-777	25.08	57.1	137.35	48.6
J-776	24.4	12.11	136.93	48.7
J-129	24.31	0	137.15	48.8
J-81	32.73	13.81	145.67	48.8
J-775	23.2	200.54	136.4	49
J-93	26.85	0	140.32	49.1
J-735	34	0	148.56	49.5
J-736	34	0	148.56	49.5
J-779	20.71	0	135.38	49.6
J-108	36.05	0	150.91	49.7
J-266	18.71	0	133.61	49.7
J-753	22.45	178.96	137.44	49.7
J-80	31	26.11	145.99	49.7
J-183	30.46	0	145.45	49.7
J-252	30.93	0	145.99	49.8
J-253	30.42	0	145.99	50
J-190	30.1	0	145.72	50
J-251	30.16	0	145.99	50.1
J-773	19.79	197.82	135.75	50.1
J-774	19.83	200.07	135.96	50.2
J-106	34.67	0	150.91	50.3
J-782	9.22	50.7	125.46	50.3
J-135	32.19	0	148.5	50.3
J-789	19.5	0	135.84	50.3
J-761	19.07	9.22	135.84	50.5
J-188	29.66	0	146.72	50.6
J-762	18.67	1.15	135.84	50.7
J-91	23.12	0	140.32	50.7
J-778	18.17	0	135.45	50.7
J-189	29.58	0	146.9	50.7
J-47	29.73	2.06	147.41	50.9
J-104	23.52	0	141.57	51.1
J-785	8.38	129.33	126.49	51.1
J-772	17.48	199.37	135.6	51.1
J-245	25.03	61.22	143.26	51.1
J-102	25.03	0	143.32	51.2
J-197	29.09	0	147.43	51.2
J-140	30.19	0	148.56	51.2
J-107	26.45	0	144.98	51.3
J-103	23.53	0	142.08	51.3
J-94	21.62	0	140.32	51.3

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-90	21.45	16.73	140.26	51.4
J-770	16.72	81.13	135.59	51.4
J-37	29.68	0	148.56	51.4
J-771	16.65	157.49	135.59	51.4
J-220	22.6	0	141.61	51.5
J-781	14.83	125.89	133.98	51.5
J-769	16.21	202.85	135.6	51.6
J-134	31.71	879.28	151.27	51.7
J-760	16.12	0	135.85	51.8
J-200	28.8	0	148.55	51.8
J-216	21.74	0	141.61	51.8
J-768	15.72	26.87	135.7	51.9
J-105	24.61	0	144.98	52.1
J-757	15.55	35.62	136.08	52.1
J-95	21.19	0	141.87	52.2
J-758	15.2	0	135.9	52.2
J-767	14.63	200.35	135.72	52.4
J-786	14.62	33.9	135.81	52.4
J-195	27.96	0	149.16	52.4
J-194	28.28	0	149.64	52.5
J-226	21.8	0	143.34	52.6
J-186	28.59	0	150.48	52.7
J-756	14.28	11.67	136.27	52.8
J-214	21.27	0	143.34	52.8
J-213	21.26	0	143.34	52.8
J-765	13.66	0	135.84	52.8
J-96	19.64	0	142.13	53
J-759	13.23	83.94	135.86	53
J-97	19.5	312.78	142.37	53.1
J-763	12.94	27.2	135.84	53.1
J-764	12.9	25.18	135.84	53.2
J-199	28.19	0	151.24	53.2
J-122	33.32	0	157.38	53.7
J-128	31.73	0	155.91	53.7
J-754	15.93	182.2	140.2	53.7
J-755	14.78	77.22	139.06	53.7
J-98	20.74	0	145.08	53.8
J-788	11.22	9.3	135.81	53.9
J-125	32.63	0	157.4	54
J-196	28.36	0	153.21	54
J-787	10.74	3.17	135.81	54.1
J-131	33.44	0	158.69	54.2
J-228	17.89	0	143.33	54.2
J-124	31.09	0	156.59	54.3
J-123	30.74	0	157.7	54.9
J-127	30.92	304.5	157.9	54.9
J-210	15.99	14.3	143.31	55.1
J-211	15.84	0	143.31	55.1
J-116	36.01	0	163.8	55.3
J-109	32.63	0	160.75	55.4
J-737	20.38	0	148.75	55.5
J-101	18.5	0	146.92	55.5
J-139	20.1	0	148.56	55.6
J-100	19.54	0	148.18	55.6
J-118	34.4	0	163.8	56
J-206	26.48	18.32	156.13	56.1
J-114	33.98	0	163.8	56.1
J-120	32.49	0	162.87	56.4
J-117	32.94	0	163.8	56.6
J-121	31.97	0.00	162.87	56.6
J-132	28.83	0	160.57	57
J-99	19.5	0	151.42	57
J-168	22.18	0	154.38	57.2
J-126	26.6	5.57	158.94	57.2

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-265	16.2	0	148.94	57.4
J-207	25.64	18.25	158.66	57.5
J-169	22.36	0	155.53	57.6
J-41	22.7	0	156.42	57.8
J-39	19.92	200.33	153.92	57.9
J-115	29.68	0	163.8	58
J-46	22.21	0	156.42	58
J-38	18.72	0	153.17	58.1
J-790	26.07	11.06	160.61	58.2
J-254	22.85	0	157.94	58.4
J-255	22.85	0	157.94	58.4
J-256	22.86	0	158.01	58.4
J-257	22.86	0	158.01	58.4
J-201	26.04	237.86	161.28	58.5
J-170	22.87	197.25	158.18	58.5
J-113	28.29	0	163.85	58.6
J-260	19.66	0	155.68	58.8
J-259	30.94	0	167	58.8
J-110	31.18	0	167.56	59
J-65	20.03	152.33	156.45	59
J-45	19.9	0	156.42	59
J-119	26.71	0	163.46	59.1
J-1	17.79	0	155.37	59.5
J-240	27.19	0	164.98	59.6
J-112	25.2	5.85	163.33	59.7
J-238	16.85	0	155.04	59.8
J-239	25.33	0	165.01	60.4
J-111	29.24	0	169.46	60.6
J-59	21.21	0	161.69	60.7
J-267	15.81	0	156.31	60.8
J-2	14.87	0	155.37	60.8
J-176	19.56	0	160.25	60.8
J-258	21.17	0	162.27	61
J-142	28.15	0	169.82	61.3
J-218	19.75	0	161.6	61.3
J-219	19.72	0	161.59	61.4
J-217	19.65	0	161.62	61.4
J-167	26.56	0	168.83	61.5
J-141	29	0	171.41	61.6
J-165	29	0	171.41	61.6
J-231	22.91	0	165.55	61.7
J-241	18.54	0	161.42	61.8
J-166	28.21	0	171.35	61.9
J-225	19.76	0	163.01	61.9
J-230	21.94	0	165.55	62.1
J-229	21.79	0	165.55	62.2
J-221	18.03	0	162.28	62.4
J-222	18.08	0	162.4	62.4
J-227	21.2	0	165.81	62.5
J-224	18.59	0	163.42	62.6
J-215	18.58	0	164.06	62.9
J-212	18.4	233.41	164.06	63
J-264	16.7	0	162.82	63.2
J-40	21.81	56.37	168.33	63.4
J-223	17.5	0	164.35	63.5
J-177	18.8	471.19	166.6	63.9
J-174	18.55	0	167.26	64.3
J-179	20.64	1.49	170.24	64.7
J-57	21.19	13.23	171.35	64.9
J-263	17.92	0	169.28	65.5
J-56	20.75	0	174	66.3
J-55	20.6	0	177.64	67.9
J-58	21.2	6.66	179	68.2
J-43	22.88	124.09	180.71	68.2

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-33	20.14	0	179.02	68.7
J-42	21.15	0	180.78	69
J-137	19.38	0	179.03	69
J-34	20.66	0	180.52	69.1
J-133	18.58	0	179.01	69.4
J-3	14.88	0	176.22	69.8
J-64	21.87	0	183.61	69.9
J-21	18.56	79.84	180.89	70.2
J-22	19.63	0	182.72	70.5
J-23	19.61	114.22	183.59	70.9
J-32	19.4	18.35	184.55	71.4
J-248	21	0	187.09	71.8
J-44	20.88	23.04	187.09	71.9
J-138	18.98	0	185.51	72
J-153	18.84	21.96	185.51	72.1
J-5	14.44	0	182.91	72.9
J-50	20.02	72.21	188.57	72.9
J-24	20.11	0	188.84	73
J-25	21.24	79.01	190.03	73
J-731	18.07	0	187.08	73.1
J-30	21.5	13.28	190.78	73.2
J-11	17.32	0.45	187.1	73.4
J-10	17.01	0	187.12	73.6
J-26	21.74	0	191.99	73.6
J-27	21.43	46.54	193.22	74.3
J-4	9.98	0	181.86	74.3
J-53	10.48	72.64	183.27	74.7
J-7	12.66	18.84	185.88	74.9
J-6	11.59	0	185.04	75
J-9	15.9	0	190.79	75.6
J-52	13.98	0	188.93	75.7
J-70	16.77	0	192.54	76
J-173	20.89	0	196.82	76.1
J-8	15.17	0	191.26	76.1
J-28	21.96	46.35	198.07	76.2
J-78	14.83	0	191.16	76.2
J-77	14.81	0	191.18	76.3
J-67	15.9	0	192.37	76.3
J-15	18.54	56.37	195.31	76.4
J-79	21.05	0	198.04	76.5
J-31	19.42	0	196.43	76.5
J-72	15.38	72.31	192.44	76.6
J-261	12.94	0	190.07	76.6
J-75	13.98	165.62	191.16	76.6
J-76	13.93	0	191.18	76.6
J-29	20.72	55.86	198.17	76.7
J-16	23.23	25.71	200.75	76.8
J-71	15.96	0	193.6	76.8
J-66	14.57	19.57	192.22	76.8
J-19	21.5	0	199.16	76.8
J-74	13.12	0	191.53	77.1
J-14	16.34	63.7	194.88	77.2
J-68	16.57	0	195.37	77.3
J-12	12.81	13.67	191.72	77.4
J-73	13.2	0	192.13	77.4
J-69	12.63	0	191.99	77.6
J-175	19.2	0	200.02	78.2
J-13	13.89	0	194.76	78.2
J-20	19.44	0	204.22	79.9
J-17	23.76	126.65	210.34	80.7
J-62	23.06	0	210.25	80.9
J-793	22.16	6.66	210.16	81.3
J-796	22.04	73.54	210.12	81.3
J-797	21.86	139.05	210.11	81.4

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-35	21.85	5.47	210.14	81.4
J-792	20.07	1.14	210.11	82.2
J-178	20.02	2.08	210.08	82.2
J-247	19.3	0	210.08	82.5
J-36	18.19	5.9	210.08	83
J-738	20.41	0	212.39	83
J-725	20	0	212.44	83.2
J-733	14.5	0	206.94	83.2
J-726	20	0	212.45	83.2
J-732	17.33	0	210.29	83.4
J-54	17.14	0	210.13	83.5
J-18	17.57	0	210.66	83.5
J-143	18.2	0	212.44	84
J-51	17	0	212.26	84.4

2032 Max Month Average Daily Flow - without Deficiency Improvements

Pump Report

Label	Elevation (ft)	Pump Definition	Status (Initial)	Flow (gal/min)	Pressure (Discharge) (psi)
PSCC1_5	29	PSCC1_4-5	On	3,991.01	79.5
PSCC1_4	29	PSCC1_4-5	On	3,982.44	80
PSBR1_3	29	PSBR1_1-3	On	2,574.65	66.1
PSBR1_2	29	PSBR1_1-3	On	2,574.65	66.1
PSBR1_1	29	PSBR1_1-3	On	2,574.65	66.1
PSCC1_2	29	PSCC1_2-3	Off	0.00	79.3
PSCC1_3	29	PSCC1_2-3	Off	0.00	79.3
PSPXN1_1	34	PSCC1_2-3	Off	0.00	49.5
PSPXN1_2	34	PSCC1_2-3	Off	0	49.5
PSBR2_7	29	PSBR2_5-8	Off	0	61.6
PSBR2_6	29	PSBR2_5-8	Off	0	61.6
PSBR2_5	29	PSBR2_5-8	Off	0	61.6
PSBR1_4	29	PSBR1_4	Off	0	61.6
PSPXN1_3	34	PSCC1_2-3	Off	0	49.5
PSBR2_8	29	PSBR2_5-8	Off	0	61.6
PMP-42	22	Proposed BPS	Off	0	41.9

2032 Max Month Average Daily Flow - without Deficiency Improvements

Reservior Report

Label	Elevation (ft)	Flow (gal/min)*	Notes
BRSP_1	31	0.00	Bee Ridge WRF seasonal pond
BTSP-1	38.61	0.57	Bent Tree Golf Course 1
BTSP-2	26.71	56.38	Bent Tree Golf Course 2
CCSP_1	55	-7,973.44	Central County WRF pond (19.6 MG)
ETSP-1	26.28	288.67	Eagle Trace
FCSP-1	36.63	290.57	Founder's Golf Club
FCSP-2	36.28	415.48	Founder's Club Development
GCSP-1	25.75	0	Gator Creek Golf Course
GSP-1	23.35	0	Longmeadow (No Meter No.)
HLSP-1	34.87	0.00	Preserve at Heron Lake
HOSP-1	33.44	633.05	Heritage Oaks
ISSP-1	21.5	0	Isles of Sarasota
LOSP-1	32	0.00	Laurel Oaks GC Pond
LOSP-2	31	484.69	Laurel Oaks GC Pond
MCSP-1	35.33	0	Misty Creek
OSP-1	18.16	810.94	Oaks Golf Course
PSP-1	18.51	454.45	Prestancia
PUBSP-1	27.41	0	Publix
PXNSP_1	34	0	36 MG Parcel X north pond
R-28	22.5	0	Miss Sarasota Softball
R-29	17.68	0	Oaks I (not in use)
R-36	237	0	
RHSP-1	33.8	0	Foxfire Golf Club
SBSP-1	18.5	373.36	Stoneybrook GC Pond
SGCSP-1	31.97	0	Sarasota Golf Course
SSP-1	24.6	0	Serenoa
VWSP-1	21.13	0	Village Walk
VWSP-2	17.72	198.25	Village Walk

*Negative is withdraw and positive is filling.

2032 Max Month Average Daily Flow - without Deficiency Improvements

Pressure Sustaining Valve Report

Label	Elevation (ft)	Diameter (Valve) (in)	Upstream Pressure (psi)	Pressure Setting (psi)	Flow (gal/min)	Headloss (ft)	Notes	Status (Initial)
OPSV-1	16.16	6	60	60	810.94	136.59	Oaks Golf Course	Active
HOPSV-1	31.44	6	55	55	633.05	125.11	Heritage Oaks	Active
LOPSV-2	29	6	55	55	484.69	124.35	Laurel Oaks GC	Active
PPSV-1	16.51	6	70	70	454.45	158.2	Prestancia	Active
FCPSV-2	34.28	6	45	45	415.48	101.91	Founder's Club Development	Active
SBPSV-1	16.5	6	50	50	373.36	113.13	Stoneybrook GC	Active
FCPSV-1	34.63	6	45	45	290.57	101.98	Founder's Golf Club	Active
ETPSV-1	24.28	2	60.2	55	288.67	134.93	Eagle Trace	Active
VWPSV-2	15.72	6	63	63	198.25	143.65	Village Walk	Active
BTPSV-2	24.71	6	60	60	56.38	136.74	Bent Tree Golf Course 2	Active
BTPSV-1	36.61	6	55	55	0.57	125.19	Bent Tree Golf Course 1	Active
ISPSV-1	19.5	6	52.8	65	0	0	Isles of Sarasota	Active
VWPSV-1	19.13	6	63.3	65	0	0	Village Walk	Active
HLPSV-1	32.87	4	45.5	52	0	0	Preserve at Heron Lake	Active
RHPSV-1	31.8	6	38.1	56	0	0	Foxfire Golf Club	Active
PUBPSV-1	25.41	6	48.7	64	0	0	Publix	Active
SPSV-1	22.6	6	50.9	68	0	0	Serenoa	Active
GCPSV-1	23.75	6	52.4	59	0	0	Gator Creek Golf Course	Active
MCPSV-1	33.33	6	50.8	55	0	0	Misty Creek	Active
SGCPSV-1	29.97	6	46.3	52	0	0	Sarasota Golf Course	Active
GPSV-1	21.35	6	17	45	0	0	Longmeadow (No Meter No.)	Active
PSV-22	20.5	4	17.6	55	0	0	Miss Sarasota Softball	Closed
PSV-23	15.68	6	60.4	55	0	0	Oaks I (not in use)	Closed
LOPSV-1	30	6	57.5	52	0	0	Laurel Oaks GC	Closed

APPENDIX L

HYDRAULIC MODEL RESULTS – BUILD-OUT AVERAGE ANNUAL DAILY FLOW WITHOUT DEFICIENCY IMPROVEMENTS

Build-Out Average Annual Daily Flow - without Deficiency Improvements

Pipe Report

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1215	422.93	J-731	J-21	10	130	2,792.76	11.41	0.043	18.27
P-1200	951.07	J-726	PSCC1_5	12	130	-3,996.57	11.34	0.033	0.4
P-183	272.49	PSCC1_4	J-726	12	130	3,987.98	11.31	0.099	1.49
P-226	1,464.16	PSBR1_3	J-165	10	130	2,592.70	10.59	0.53	10.59
P-227	1,779.58	PSBR1_2	J-165	10	130	2,592.70	10.59	0.53	10.59
P-230	2,201.99	PSBR1_1	J-165	10	130	2,592.70	10.59	0.53	10.59
P-349	1,467.47	J-212	J-260	12	130	3,645.25	10.34	0.028	40.8
P-350	2,160.20	J-260	J-213	12	130	3,645.25	10.34	0.028	60.07
P-41	307.75	J-213	J-216	12	130	3,607.53	10.23	0.027	8.4
P-245	2,111.17	J-21	J-174	14	130	4,270.40	8.9	0.018	38.13
P-253	52.79	J-174	J-177	14	130	4,270.40	8.9	0.036	1.92
P-68	116.16	J-19	J-29	14	130	4,201.99	8.76	0.022	2.58
P-69	1,155.67	J-29	J-30	14	130	4,146.13	8.64	0.017	19.26
P-74	551.63	J-44	J-30	14	130	-4,132.85	8.61	0.018	9.72
P-89	399.84	J-42	J-64	14	130	-4,109.81	8.57	0.019	7.52
P-90	513.67	J-64	J-44	14	130	-4,109.81	8.57	0.018	9.22
P-81	402.26	J-55	J-42	14	130	-3,985.73	8.31	0.022	8.82
P-82	588.71	J-56	J-55	14	130	-3,985.73	8.31	0.017	10.09
P-83	468.62	J-57	J-56	14	130	-3,985.73	8.31	0.015	7.26
P-257	167.37	J-179	J-57	14	130	-3,972.49	8.28	0.019	3.1
P-256	311.22	J-40	J-179	14	130	-3,971.00	8.28	0.017	5.32
P-1193	352.68	J-51	J-738	24	130	-11,635.41	8.25	0.008	0.26
P-1194	163.62	J-738	J-143	24	130	-11,635.41	8.25	0.008	0.11
P-262	186.06	J-177	J-227	14	130	3,799.21	7.92	0.014	2.64
P-59	444.73	J-18	J-51	24	130	-11,140.91	7.9	0.008	3.35
P-313	1,846.15	J-156	J-242	6	130	695.18	7.89	0.038	69.83
P-314	116.41	J-242	GPSV-1	6	130	695.18	7.89	0.038	4.39
P-315	172.31	GPSV-1	GSP-1	6	130	694.97	7.89	0.038	6.5
P-254	456.47	J-54	J-733	18	130	6,117.79	7.71	0.017	7.69
P-255	1,527.60	J-733	J-19	18	130	6,117.79	7.71	0.012	18.49
P-1211	207.3	J-162	J-159	10	130	1,723.33	7.04	0.017	3.49
P-156	1,787.53	J-109	J-110	16	130	-4,104.17	6.55	0.009	15.49
P-157	4,087.00	J-134	J-109	16	130	-4,104.17	6.55	0.009	36
P-1219	644.26	BRGST_1	J-151	24	130	8,759.67	6.21	0.005	0.72
P-234	334.31	J-165	J-166	24	130	8,759.67	6.21	0.011	0.09
P-235	596.22	J-166	J-142	24	130	8,759.67	6.21	0.005	1.93
P-84	1,825.02	J-40	J-59	12	130	2,188.66	6.21	0.011	20
P-240	975.11	J-170	J-59	12	130	-2,188.66	6.21	0.011	10.54
P-1218	4,386.88	J-731	J-732	12	130	-2,186.93	6.2	0.011	47.36
P-8	134.08	J-223	J-212	16	130	3,799.21	6.06	0.007	0.99
P-7	659.91	J-227	J-223	16	130	3,799.21	6.06	0.007	4.88
P-1216	179.99	J-18	J-732	24	130	8,437.58	5.98	0.004	0.81
P-158	468.82	J-106	J-134	16	130	-3,554.62	5.67	0.007	3.07
P-159	3,071.10	J-135	J-106	16	130	-3,554.62	5.67	0.007	20.5
P-160	4,463.50	J-105	J-135	16	130	-3,554.62	5.67	0.007	29.95
P-130	2,067.68	J-102	J-105	16	130	-3,554.62	5.67	0.007	14.14
P-1199	289.64	J-726	J-143	24	130	7,984.55	5.66	0.004	0.01
P-343	64.15	J-257	J-170	12	130	-1,991.41	5.65	0.009	0.58
P-340	589.31	J-41	J-254	12	130	-1,991.41	5.65	0.009	5.35
P-342	28.61	J-254	J-257	12	130	-1,991.41	5.65	0.009	0.26
P-127	1,764.05	J-102	J-103	16	130	3,493.40	5.57	0.006	11.36
P-128	1,839.15	J-90	J-104	16	130	-3,493.40	5.57	0.007	12.08
P-129	692.91	J-104	J-103	16	130	-3,493.40	5.57	0.007	4.63
P-67	200.38	J-28	J-19	12	130	-1,915.80	5.43	0.011	2.15
P-1236	919.70	J-90	J-753	6	130	471.94	5.36	0.018	16.98
P-243	893.43	J-27	J-173	12	130	-1,869.45	5.3	0.008	7.21
P-244	310.73	J-173	J-28	12	130	-1,869.45	5.3	0.008	2.51
P-57	2,677.39	J-16	J-17	14	130	-2,528.43	5.27	0.007	18.71
P-1197	948.37	PSCC1_2	J-725	12	130	1,825.50	5.18	0.026	0.3
P-182	250.63	PSCC1_3	J-725	12	130	1,825.35	5.18	0.022	0.32
P-65	502.5	J-25	J-26	12	130	-1,822.90	5.17	0.008	4.01
P-66	289.68	J-26	J-27	12	130	-1,822.90	5.17	0.009	2.53

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-165	68.09	J-137	J-34	6	130	-454.19	5.15	0.021	1.45
P-357	43.12	LOPSV-2	LOSP-2	6	130	447.58	5.08	0.016	0.69
P-304	37.87	J-137	PPSV-1	6	130	447.53	5.08	0.017	0.64
P-305	97.33	PPSV-1	PSP-1	6	130	447.45	5.08	0.017	1.62
P-238	343.12	J-41	J-169	12	130	1,773.12	5.03	0.007	2.51
P-239	447.17	J-169	J-168	12	130	1,773.12	5.03	0.007	3.27
P-246	2,693.65	J-168	J-47	12	130	1,773.12	5.03	0.007	19.72
P-356	21.45	J-124	LOPSV-2	6	130	442.70	5.02	0.016	0.34
P-64	312.25	J-24	J-25	12	130	-1,743.90	4.95	0.008	2.56
P-264	966.82	J-229	J-40	12	130	-1,725.98	4.9	0.007	7.24
P-345	2,098.11	J-65	J-258	12	130	-1,725.98	4.9	0.007	15.12
P-346	1,154.15	J-258	J-229	12	130	-1,725.98	4.9	0.007	8.54
P-115	5,227.25	J-89	J-90	16	130	-2,977.35	4.75	0.005	25.14
P-63	1,741.70	J-23	J-24	12	130	-1,671.69	4.74	0.007	11.65
P-216	1,566.97	J-159	J-160	8	130	739.60	4.72	0.01	16.37
P-217	1,867.61	J-160	J-158	8	130	739.60	4.72	0.01	19.52
P-11	531	J-112	J-201	12	130	1,644.93	4.67	0.006	3.38
P-133	1,059.21	J-110	J-111	20	130	-4,479.22	4.57	0.004	3.76
P-278	598.94	J-49	J-236	6	130	-401.16	4.55	0.014	8.51
P-279	997.12	J-236	J-47	6	130	-401.16	4.55	0.014	13.95
P-91	1,202.37	J-39	J-65	12	130	-1,573.65	4.46	0.006	7.48
P-215	638.09	J-158	J-156	8	130	695.18	4.44	0.009	5.94
P-61	729.69	J-21	J-22	12	130	-1,557.47	4.42	0.006	4.38
P-62	361.87	J-22	J-23	12	130	-1,557.47	4.42	0.006	2.08
P-1217	146.49	J-732	J-54	24	130	6,117.79	4.34	0.002	0.36
P-1261	1,504.01	J-777	J-89	20	130	-4,062.92	4.15	0.003	4.25
P-72	586.36	J-38	J-39	12	130	-1,448.45	4.11	0.005	3.07
P-124	1,358.86	J-99	J-38	12	130	-1,448.45	4.11	0.005	7.15
P-251	109.32	J-37	J-737	12	130	-1,448.45	4.11	0.007	0.77
P-252	2,116.11	J-737	J-99	12	130	-1,448.45	4.11	0.005	10.87
P-123	2,144.31	J-97	J-98	12	130	-1,448.44	4.11	0.005	11.03
P-125	311.32	J-100	J-37	12	130	-1,448.44	4.11	0.005	1.57
P-126	974.36	J-100	J-101	12	130	1,448.44	4.11	0.005	5.13
P-185	1,473.78	J-98	J-101	12	130	-1,448.44	4.11	0.005	7.52
P-106	778.84	J-79	J-16	14	130	-1,970.02	4.11	0.004	3.42
P-1232	1,860.92	J-749	J-750	8	130	629.16	4.02	0.008	14.41
P-1209	1,063.19	PSBR1_4	J-141	10	130	981.56	4.01	0.077	1.53
P-1260	1,928.18	J-776	J-777	20	130	-3,912.34	4	0.003	5.08
P-1259	2,423.65	J-775	J-776	20	130	-3,880.40	3.96	0.003	6.29
P-108	1,130.73	J-47	J-80	12	130	1,366.54	3.88	0.005	5.11
P-163	366.44	J-136	J-49	6	130	-339.99	3.86	0.01	3.77
P-109	242.19	J-80	J-81	12	130	1,340.43	3.8	0.005	1.19
P-162	392.38	J-48	J-136	6	130	-333.43	3.78	0.01	3.98
P-333	1,954.77	J-81	J-249	12	130	1,326.63	3.76	0.005	9.04
P-334	1,891.03	J-249	J-161	12	130	1,326.63	3.76	0.005	8.77
P-1237	3,026.84	J-216	J-754	20	130	3,607.53	3.68	0.002	6.86
P-1206	432.67	CCSP_1	J-728	30	130	7,984.55	3.62	0.001	0.27
P-50	329.06	J-8	J-9	10	130	875.23	3.58	0.005	1.66
P-51	2,653.52	J-9	J-10	10	130	875.23	3.58	0.005	12.82
P-1258	3,093.95	J-774	J-775	20	130	-3,351.54	3.42	0.002	6.12
P-53	214.18	J-8	J-12	14	130	-1,578.77	3.29	0.003	0.61
P-308	208.82	J-240	ETPSV-1	6	130	286.69	3.25	0.007	1.53
P-309	298.49	ETPSV-1	ETSP-1	6	130	286.69	3.25	0.007	2.19
P-1238	3,090.59	J-754	J-755	20	130	3,127.04	3.19	0.002	5.37
P-180	421.55	J-111	J-142	24	130	-4,479.22	3.18	0.002	0.7
P-60	1,550.39	J-51	J-20	8	130	494.50	3.16	0.005	7.83
P-210	2,114.21	J-31	J-153	8	130	494.50	3.16	0.005	10.64
P-249	806.4	J-20	J-175	8	130	494.50	3.16	0.005	4.09
P-250	688.1	J-175	J-31	8	130	494.50	3.16	0.005	3.5
P-105	1,305.86	J-15	J-79	14	130	-1,502.18	3.13	0.003	3.47
P-358	1,490.15	J-11	J-263	6	130	268.95	3.05	0.007	9.71
P-359	539.78	J-263	J-264	6	130	268.95	3.05	0.007	3.52
P-361	1,280.99	J-265	J-266	6	130	268.95	3.05	0.007	8.35
P-362	123.53	J-266	SBPSV-1	6	130	268.95	3.05	0.007	0.81

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-363	41.24	SBPSV-1	SBSP-1	6	130	268.89	3.05	0.007	0.27
P-155	2,594.59	J-167	J-239	24	130	4,280.45	3.04	0.001	3.32
P-236	633.30	J-142	J-167	24	130	4,280.45	3.04	0.001	0.86
P-211	170.62	J-153	J-32	8	130	472.53	3.02	0.005	0.93
P-56	223.23	J-14	J-15	14	130	-1,445.80	3.01	0.002	0.55
P-1239	8,409.87	J-755	J-756	20	130	2,923.39	2.99	0.002	12.91
P-1233	2,513.52	J-750	J-751	8	130	467.28	2.98	0.004	11.22
P-1305	260.02	J-150	J-806	16	130	1,851.94	2.96	0.002	0.51
P-1306	355.76	J-806	PMP-42	16	130	1,851.94	2.96	0.002	0.7
P-1307	365.97	PMP-42	J-807	16	130	1,851.94	2.96	0.002	0.72
P-1310	249.42	J-807	J-808	16	130	1,851.94	2.96	0.002	0.49
P-149	4,739.39	J-128	J-129	16	130	1,851.94	2.96	0.002	9.46
P-189	1,453.61	J-147	J-146	16	130	1,851.94	2.96	0.002	2.94
P-190	2,810.26	J-148	J-147	16	130	1,851.94	2.96	0.002	5.65
P-191	1,287.71	J-149	J-148	16	130	1,851.94	2.96	0.002	2.75
P-193	3,742.59	J-129	J-150	16	130	1,851.94	2.96	0.002	7.61
P-1309	5,281.23	J-808	J-149	16	130	1,851.94	2.96	0.002	10.52
P-188	828.32	J-146	J-145	16	130	1,826.27	2.91	0.002	1.79
P-70	831.31	J-34	J-32	8	130	-454.19	2.9	0.005	3.92
P-12	999.90	J-201	J-207	12	130	1,017.67	2.89	0.003	2.62
P-54	1,738.66	J-12	J-13	14	130	-1,382.10	2.88	0.002	3.96
P-55	65.77	J-13	J-14	14	130	-1,382.10	2.88	0.002	0.15
P-187	2,076.69	J-145	J-144	16	130	1,801.17	2.87	0.002	3.95
P-214	5,780.24	J-157	J-154	16	130	1,801.17	2.87	0.002	10.73
P-231	4,275.38	J-144	J-157	16	130	1,801.17	2.87	0.002	7.94
P-306	1,005.45	J-239	J-112	24	130	3,993.77	2.83	0.001	1.44
P-213	1,433.37	J-154	J-155	16	130	1,747.40	2.79	0.002	2.51
P-10	1,000.05	J-207	J-206	12	130	969.54	2.75	0.002	2.39
P-220	1,786.32	J-162	J-164	16	130	-1,723.33	2.75	0.002	3.05
P-221	4,995.77	J-164	J-155	16	130	-1,723.33	2.75	0.002	8.54
P-1257	3,191.85	J-773	J-774	20	130	-2,603.09	2.66	0.001	3.95
P-20	72.16	J-188	J-189	12	130	-921.24	2.61	0.002	0.16
P-16	108.53	J-183	J-190	12	130	-921.24	2.61	0.002	0.24
P-38	155.92	J-191	J-192	12	130	-921.24	2.61	0.002	0.34
P-21	192.69	J-194	J-195	12	130	921.24	2.61	0.002	0.42
P-18	216.08	J-189	J-197	12	130	-921.24	2.61	0.002	0.47
P-23	311.08	J-199	J-186	12	130	921.24	2.61	0.002	0.68
P-19	253.49	J-200	J-195	12	130	-921.24	2.61	0.002	0.55
P-44	330.04	J-203	J-191	12	130	-921.24	2.61	0.002	0.72
P-15	345.41	J-186	J-194	12	130	921.24	2.61	0.002	0.75
P-22	408.96	J-190	J-188	12	130	-921.24	2.61	0.002	0.89
P-28	410.57	J-180	J-203	12	130	-921.24	2.61	0.002	0.89
P-17	457.74	J-197	J-200	12	130	-921.24	2.61	0.002	1
P-42	804.25	J-196	J-199	12	130	921.24	2.61	0.002	1.75
P-14	1,196.46	J-206	J-196	12	130	921.24	2.61	0.002	2.6
P-27	1,435.94	J-192	J-183	12	130	-921.24	2.61	0.002	3.13
P-1198	198.20	J-725	J-143	24	130	3,650.86	2.59	0.015	0.06
P-46	1,295.61	J-3	J-4	10	130	-612.05	2.5	0.003	3.35
P-247	973.78	J-2	J-176	10	130	-612.05	2.5	0.003	2.88
P-248	3,626.88	J-176	J-3	10	130	-612.05	2.5	0.003	9.46
P-285	79.98	J-2	J-238	10	130	612.05	2.5	0.002	0.2
P-286	30.42	J-238	OPSV-1	10	130	612.05	2.5	0.002	0.07
P-287	38.15	OPSV-1	OSP-1	10	130	611.9	2.5	0.002	0.09
P-1214	898.24	J-10	J-731	10	130	605.84	2.47	0.002	2.22
P-113	2,045.62	J-87	J-88	16	130	1,527.93	2.44	0.001	2.88
P-1278	1,578.80	J-790	J-112	20	130	-2,333.40	2.38	0.001	1.64
P-1277	956.21	J-126	J-790	20	130	-2,304.24	2.35	0.001	0.99
P-146	521.98	J-127	J-126	20	130	-2,289.56	2.34	0.001	0.61
P-1256	5,162.45	J-772	J-773	20	130	-2,081.41	2.13	0.001	4.22
P-269	2,486.36	J-88	J-232	16	130	1,322.48	2.11	0.001	2.71
P-110	1,498.14	J-82	J-83	16	130	1,299.71	2.07	0.001	1.57
P-111	1,954.51	J-83	J-86	16	130	1,299.71	2.07	0.001	2.07
P-112	515.94	J-86	J-84	16	130	1,299.71	2.07	0.001	0.56
P-171	2,231.73	J-161	J-82	16	130	1,299.71	2.07	0.001	2.47

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1265	3,247.70	J-756	J-781	20	130	2,027.82	2.07	0.001	2.53
P-26	218.74	J-198	J-193	12	130	724.93	2.06	0.001	0.31
P-30	324.44	J-202	J-198	12	130	724.93	2.06	0.001	0.45
P-24	352.80	J-180	J-202	12	130	724.93	2.06	0.001	0.49
P-1229	573.92	J-193	J-747	12	130	724.93	2.06	0.001	0.8
P-1230	1,096.27	J-747	J-748	12	130	724.93	2.06	0.001	1.53
P-1231	2,215.11	J-748	J-749	12	130	724.93	2.06	0.001	3.09
P-147	72.15	J-127	J-123	20	130	1,985.06	2.03	0.001	0.11
P-270	3,305.62	J-232	J-85	16	130	1,259.41	2.01	0.001	3.26
P-79	531.25	J-52	J-261	12	130	-703.53	2	0.001	0.72
P-351	559.16	J-261	J-8	12	130	-703.53	2	0.001	0.75
P-259	2,224.12	J-84	J-208	16	130	1,233.59	1.97	0.001	2.09
P-114	3,674.33	J-85	J-89	16	130	1,202.08	1.92	0.001	3.26
P-58	1,103.77	J-17	J-18	24	130	-2,703.33	1.92	0.001	0.6
P-97	1,398.19	J-71	J-68	10	130	-467.84	1.91	0.002	2.17
P-107	2,070.99	J-79	J-68	10	130	467.84	1.91	0.002	3.28
P-329	1,209.86	J-246	J-61	4	130	-74.12	1.89	0.004	5.31
P-148	1,292.98	J-123	J-128	20	130	1,851.94	1.89	0.001	0.9
P-78	1,361.94	J-52	J-53	4	130	72.64	1.85	0.004	5.66
P-98	280.06	J-71	J-72	4	130	72.31	1.85	0.004	1.17
P-77	64.47	J-24	J-50	4	130	72.21	1.84	0.004	0.26
P-225	1,205.16	J-151	PSBR1_3	24	130	2,592.70	1.84	0.005	0.1
P-228	1,299.18	J-151	PSBR1_2	24	130	2,592.70	1.84	0.005	0.1
P-229	1,536.28	J-151	PSBR1_1	24	130	2,592.70	1.84	0.005	0.1
P-1204	892.80	J-728	PSCC1_5	30	130	3,996.57	1.81	0	0
P-205	192.23	J-728	PSCC1_4	30	130	3,987.98	1.81	0	0.01
P-142	476.56	J-122	J-124	10	130	442.70	1.81	0.001	0.67
P-167	1,662.86	J-7	J-52	12	130	-630.90	1.79	0.001	1.84
P-117	1,875.31	J-92	J-91	12	130	-623.60	1.77	0.001	2
P-120	3,859.88	J-91	J-95	12	130	-623.60	1.77	0.001	4.14
P-121	650.24	J-95	J-96	12	130	-623.60	1.77	0.001	0.71
P-122	577.30	J-96	J-97	12	130	-623.60	1.77	0.001	0.63
P-360	3,184.93	J-264	J-265	6	130	155.89	1.77	0.002	7.56
P-261	2,497.54	J-208	J-209	8	130	274.92	1.75	0.002	4.17
P-275	2,204.05	J-209	J-235	8	130	274.92	1.75	0.002	3.68
P-47	599.47	J-4	J-5	12	130	-612.05	1.74	0.001	0.63
P-48	1,209.24	J-5	J-6	12	130	-612.05	1.74	0.001	1.26
P-49	474.23	J-6	J-7	12	130	-612.05	1.74	0.001	0.5
P-1269	7,432.31	J-781	J-785	20	130	1,695.82	1.73	0.001	4.16
P-328	674.83	J-60	J-246	4	130	-66.00	1.68	0.004	2.42
P-1205	386.69	CCSP_1	J-727	30	130	3,650.86	1.66	0	0.06
P-96	1,202.96	J-70	J-71	10	130	-395.53	1.62	0.001	1.36
P-116	2,452.64	J-87	J-92	12	130	-569.26	1.61	0.001	2.22
P-1255	2,582.81	J-771	J-772	20	130	-1,555.65	1.59	0	1.23
P-260	127.96	J-208	J-87	16	130	958.67	1.53	0.001	0.1
P-1270	2,234.69	J-785	J-782	16	130	903.87	1.44	0.001	1.16
P-85	749.21	J-61	J-48	6	130	-114.97	1.3	0.001	1.01
P-364	3,068.88	J-265	J-267	6	130	-113.05	1.28	0.001	4.02
P-365	2,706.19	J-267	J-264	6	130	-113.05	1.28	0.001	3.54
P-145	4,387.31	J-120	J-122	10	130	309.58	1.26	0.001	3.14
P-40	24.58	J-184	J-182	8	130	-196.31	1.25	0.001	0.02
P-290	70.81	J-184	FCPSV-2	8	130	196.31	1.25	0.001	0.06
P-291	43.16	FCPSV-2	FCSP-2	8	130	194.48	1.24	0.001	0.04
P-1254	2,126.46	J-770	J-771	20	130	-1,140.33	1.16	0	0.57
P-52	8.47	J-10	J-11	10	130	269.39	1.1	0.001	0.01
P-347	803.79	J-110	J-259	12	130	375.04	1.06	0	0.36
P-100	904.66	J-73	J-74	8	130	165.62	1.06	0.001	0.6
P-101	523.68	J-74	J-76	8	130	165.62	1.06	0.001	0.35
P-102	38.46	J-76	J-75	8	130	165.62	1.06	0.001	0.02
P-1253	2,562.28	J-769	J-770	20	130	-926.37	0.95	0	0.47
P-92	558.01	J-66	J-67	10	130	-229.91	0.94	0	0.23
P-93	638.25	J-67	J-70	10	130	-229.91	0.94	0	0.26
P-348	4,855.17	J-259	J-113	12	130	325.75	0.92	0	1.56
P-1262	8,129.51	J-774	J-778	10	130	220.85	0.9	0	3.05

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1263	1,106.42	J-778	J-779	10	130	220.85	0.9	0	0.42
P-1264	2,102.91	J-779	J-780	10	130	220.85	0.9	0	0.79
P-1240	1,478.77	J-756	J-757	20	130	864.79	0.88	0	0.24
P-140	1,892.91	J-120	J-113	12	130	-309.59	0.88	0	0.56
P-1222	2,301.79	J-159	J-740	10	130	211.58	0.86	0	0.8
P-1223	1,975.95	J-740	J-741	10	130	211.58	0.86	0	0.69
P-1224	3,031.77	J-741	J-742	10	130	211.58	0.86	0	1.05
P-1234	8,560.09	J-742	J-752	10	130	211.58	0.86	0	2.97
P-94	1,304.48	J-12	J-69	10	130	-210.33	0.86	0	0.45
P-95	1,058.34	J-69	J-66	10	130	-210.33	0.86	0	0.37
P-143	95.64	J-122	J-125	8	130	-133.11	0.85	0	0.04
P-144	2,438.59	J-125	J-123	8	130	-133.11	0.85	0	1.08
P-1202	900.45	J-727	PSCC1_2	30	130	1,825.50	0.83	0	0
P-206	189.64	J-727	PSCC1_3	30	130	1,825.35	0.83	0	0
P-1267	1,229.68	J-782	J-783	16	130	517.01	0.82	0	0.23
P-307	120.44	J-239	J-240	12	130	286.69	0.81	0	0.03
P-73	187.68	J-42	J-43	8	130	124.09	0.79	0	0.08
P-1241	1,610.13	J-757	J-758	20	130	770.85	0.79	0	0.21
P-174	1,089.14	J-151	PSBR1_4	24	130	981.56	0.7	0.001	0.01
P-233	240.82	J-141	J-165	24	130	981.56	0.7	0	0.01
P-326	156.22	J-102	J-245	6	130	61.22	0.69	0	0.07
P-99	1,841.51	J-70	J-73	10	130	165.62	0.68	0	0.41
P-1271	2,752.22	J-758	J-786	8	130	89.07	0.57	0	0.57
P-32	336.55	J-182	J-204	12	130	-196.31	0.56	0	0.04
P-31	406.78	J-187	J-205	12	130	-196.31	0.56	0	0.05
P-29	647.53	J-205	J-180	12	130	-196.31	0.56	0	0.08
P-25	738.09	J-204	J-187	12	130	-196.31	0.56	0	0.09
P-1283	1,607.52	J-62	J-793	6	130	48.24	0.55	0	0.44
P-1279	1,267.27	J-61	J-791	4	130	20.80	0.53	0	0.52
P-1242	5,497.77	J-758	J-759	20	130	474.00	0.48	0	0.29
P-1281	362.61	J-35	J-792	4	130	16.26	0.42	0	0.09
P-1252	4,070.09	J-768	J-769	20	130	-391.43	0.4	0	0.15
P-1280	806.63	J-791	J-63	4	130	15.42	0.39	0	0.19
P-1284	544.62	J-793	J-35	6	130	30.68	0.35	0	0.07
P-1282	383.64	J-792	J-36	4	130	13.26	0.34	0	0.07
P-1251	928.79	J-767	J-768	20	130	-320.56	0.33	0	0.02
P-1235	154.52	J-752	J-743	10	130	78.57	0.32	0	0.01
P-86	6,000.17	J-17	J-62	8	130	48.24	0.31	0	0.41
P-1243	5,251.59	J-759	J-760	20	130	252.63	0.26	0	0.09
P-1244	1,677.81	J-760	J-761	20	130	252.63	0.26	0	0.03
P-1268	324.09	J-783	J-784	16	130	159.59	0.25	0	0.01
P-33	2.73	J-213	J-214	8	130	37.71	0.24	0	0
P-34	536.60	J-214	J-226	8	130	37.71	0.24	0	0.02
P-35	1,264.25	J-226	J-228	8	130	37.71	0.24	0	0.05
P-36	2,113.49	J-228	J-210	8	130	37.71	0.24	0	0.09
P-1245	495.59	J-761	J-762	20	130	228.33	0.23	0	0.01
P-1274	666.95	J-762	J-789	20	130	225.3	0.23	0	0.01
P-1250	2,634.99	J-758	J-767	20	130	207.79	0.21	0	0.03
P-1276	4,405.22	J-788	J-789	8	130	-33.23	0.21	0	0.15
P-1289	4,590.53	J-732	J-796	16	130	132.87	0.21	0	0.07
P-1275	1,130.15	J-789	J-763	20	130	138.13	0.14	0	0.01
P-1290	1,095.48	J-796	J-797	16	130	86.91	0.14	0	0.01
P-152	2,069.83	J-33	J-133	6	130	6.66	0.08	0	0.01
P-153	990.50	J-133	J-58	6	130	6.66	0.08	0	0.01
P-164	1,640.28	J-33	J-137	6	130	-6.66	0.08	0	0.01
P-1247	1,512.30	J-763	J-764	20	130	66.41	0.07	0	0
P-1273	1,099.77	J-787	J-788	8	130	-8.70	0.06	0	0
P-330	269.30	J-178	J-247	4	130	-2.08	0.05	0	0
P-331	416.49	J-247	J-36	4	130	-2.08	0.05	0	0
P-6	447.81	J-224	J-225	8	130	8.08	0.05	0	0
P-2	704.17	J-215	J-224	8	130	8.08	0.05	0	0
P-5	5.07	J-212	J-215	16	130	8.08	0.01	0	0
P-1272	1,010.64	J-786	J-787	8	130	-0.34	0	0	0
P-335	5.26	J-243	J-250	4	130	0	0	0	0

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1213	1,253.76	J-730	J-243	4	130	0	0	0	0
P-336	624.42	J-250	J-244	4	130	0	0	0	0
P-317	37.42	J-244	PSV-22	4	130	0	0	0	0
P-318	25.78	PSV-22	R-28	4	130	0	0	0	0
P-319	1,109.24	J-1	J-2	4	130	0	0	0	0
P-1212	643.57	J-159	J-730	6	130	0.00	0	0	0
P-137	42.67	J-114	J-117	8	130	0.00	0	0	0
P-320	68.45	J-1	PSV-23	6	130	0.00	0	0	0
P-321	90.63	PSV-23	R-29	6	130	0.00	0	0	0
P-355	91.08	LOPSV-1	LOSP-1	6	130	0.00	0	0	0
P-354	47.09	J-121	LOPSV-1	6	130	0	0	0	0
P-134	1,555.47	J-113	J-114	10	130	0	0	0	0
P-274	29.89	HLPSV-1	HLSP-1	4	130	0.00	0	0	0
P-272	2,121.00	J-233	J-234	4	130	0.00	0	0	0
P-273	21.62	J-234	HLPSV-1	4	130	0.00	0	0	0
P-271	32.31	J-232	J-233	4	130	0.00	0	0	0
P-302	53.72	J-119	BTPSV-2	8	130	0.00	0	0	0
P-139	3,669.81	J-117	J-119	8	130	0.00	0	0	0
P-303	95.48	BTPSV-2	BTSP-2	8	130	0.00	0	0	0
P-297	100.11	MCPSV-1	MCSP-1	6	130	0.00	0	0	0
P-296	104.66	J-108	MCPSV-1	6	130	0.00	0	0	0
P-141	810.88	J-120	J-121	8	130	0.00	0	0	0
P-138	772.38	J-117	J-118	8	130	0.00	0	0	0
P-300	47.87	J-118	BTPSV-1	8	130	0.00	0	0	0
P-301	78.27	BTPSV-1	BTSP-1	8	130	0	0	0	0
P-298	93.32	J-130	SGCPSV-1	8	130	0.00	0	0	0
P-161	2,592.91	J-129	J-130	8	130	0	0	0	0
P-299	123.96	SGCPSV-1	SGCSP-1	8	130	0.00	0	0	0
P-289	41.95	FCPSV-1	FCSP-1	8	130	0.00	0	0	0
P-288	73.85	J-185	FCPSV-1	8	130	0.00	0	0	0
P-39	24.18	J-185	J-181	8	130	0.00	0	0	0
P-1	14.14	J-217	J-218	8	130	0	0	0	0
P-3	14.91	J-218	J-219	8	130	0	0	0	0
P-353	1,524.61	PSBR2_8	J-141	10	130	0	0	0	0
P-310	185.44	J-219	J-241	8	130	0	0	0	0
P-176	1,228.09	PSBR2_7	J-141	10	130	0.00	0	0	0
P-177	921.43	PSBR2_6	J-141	10	130	0.00	0	0	0
P-178	966.38	PSBR2_5	J-141	10	130	0.00	0	0	0
P-312	38.51	VWPSV-2	VWSP-2	8	130	0.00	0	0	0
P-9	729.35	J-221	J-217	8	130	0	0	0	0
P-45	138.37	J-221	J-222	8	130	0	0	0	0
P-4	670.05	J-225	J-222	8	130	0.00	0	0	0
P-132	1,406.22	J-106	J-108	8	130	0.00	0	0	0
P-311	18.71	J-241	VWPSV-2	8	130	0.00	0	0	0
P-212	100.81	J-138	J-153	6	130	0.00	0	0	0
P-266	3,644.71	J-230	J-231	8	130	0.00	0	0	0
P-265	95.1	J-229	J-230	8	130	0.00	0	0	0
P-268	51.79	VWPSV-1	VWSP-1	8	130	0	0	0	0
P-267	59.34	J-231	VWPSV-1	8	130	0	0	0	0
P-294	56.41	J-107	GCPSV-1	6	130	0.00	0	0	0
P-295	55.68	GCPSV-1	GCSP-1	6	130	0.00	0	0	0
P-154	142.66	J-109	J-132	12	130	0	0	0	0
P-151	1,726.42	J-131	J-132	12	130	0	0	0	0
P-293	74.18	HOPSV-1	HOSP-1	12	130	0	0	0	0
P-13	333.56	J-193	J-181	12	130	0	0	0	0
P-292	54.7	J-131	HOPSV-1	12	130	0	0	0	0
P-263	35.52	ISPSV-1	ISSP-1	8	130	0.00	0	0	0
P-276	23.31	J-235	RHPSV-1	8	130	0	0	0	0
P-104	77.00	J-75	J-78	8	130	0	0	0	0
P-327	523.10	ISPSV-1	J-220	8	130	0	0	0	0
P-43	30.71	J-216	J-220	8	130	0	0	0	0
P-172	913.75	J-262	PSBR2_7	16	130	0	0	0	0
P-173	995.15	J-262	PSBR2_6	16	130	0.00	0	0	0
P-175	1,112.74	J-262	PSBR2_5	16	130	0.00	0	0	0

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-352	922.95	J-262	PSBR2_8	16	130	0.00	0	0	0
P-131	1,599.68	J-105	J-107	8	130	0.00	0	0	0
P-277	26.82	RHPSV-1	RHSP-1	8	130	0.00	0	0	0
P-344	107.66	J-256	J-257	6	130	0.00	0	0	0
P-337	486.84	J-80	J-251	6	130	0	0	0	0
P-284	100.14	SPSV-1	SSP-1	8	130	0	0	0	0
P-119	243.20	J-93	J-94	8	130	0	0	0	0
P-118	475.85	J-91	J-93	8	130	0	0	0	0
P-283	72.21	J-94	SPSV-1	8	130	0.00	0	0	0
P-280	146.6	J-236	J-237	6	130	0	0	0	0
P-258	887.66	BRSP_1	J-262	48	130	0	0	0	0
P-170	252.08	J-140	J-37	12	130	0.00	0	0	0
P-194	151.38	J-736	J-735	12	130	0	0	0	0
P-281	25.68	J-237	PUBPSV-1	6	130	0	0	0	0
P-195	211.47	J-735	J-140	12	130	0	0	0	0
P-339	40.2	J-251	J-253	6	130	0	0	0	0
P-338	36.81	J-251	J-252	6	130	0	0	0	0
P-241	201.76	J-48	J-171	4	130	0	0	0	0
P-1292	109.21	J-110	J-800	20	130	0	0	0	0
P-186	137.84	J-139	J-736	12	130	0	0	0	0
P-37	2.02	J-210	J-211	8	130	0	0	0	0
P-200	565.78	PXNSP_1	PSPXN1_1	12	130	0	0	0	0
P-203	1,042.98	PXNSP_1	PSPXN1_2	12	130	0	0	0	0
P-204	1,755.42	PXNSP_1	PSPXN1_3	12	130	0	0	0	0
P-1248	4,024.90	J-764	J-765	20	130	0.00	0	0	0
P-198	936.11	PSPXN1_3	J-139	12	130	0.00	0	0	0
P-135	317.98	J-114	J-116	8	130	0.00	0	0	0
P-197	178.47	J-799	PXNSP_1	12	130	0.00	0	0	0
P-282	44.06	PUBPSV-1	PUBSP-1	6	130	0.00	0	0	0
P-168	438.20	J-139	PSPXN1_1	12	130	0.00	0	0	0
P-169	498.67	J-139	PSPXN1_2	12	130	0.00	0	0	0
P-136	167.85	J-116	J-115	6	130	0	0	0	0
P-341	164.94	J-254	J-255	6	130	0.00	0	0	0
P-242	220.81	J-49	J-172	4	130	0.00	0	0	0
P-332	92.54	J-44	J-248	4	130	0.00	0	0	0
P-103	77.45	J-76	J-77	6	130	0	0	0	0
P-75	1,180.73	J-41	J-45	6	130	0	0	0	0
P-76	2,043.41	J-45	J-46	6	130	0	0	0	0
P-196	608.42	J-799	J-140	12	130	0	0	0	0
P-1291	663.4	J-165	R-36	90	130	0	0	0	0
P-1308	726.81	J-150	J-808	16	130	0	0	0	0

Build-Out Average Annual Daily Flow - without Deficiency Improvements

Junction Report

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-784	26.25	159.59	-49.47	-32.7
J-783	15.04	357.42	-49.47	-27.9
J-789	19.5	53.94	-42.26	-26.7
J-761	19.07	24.3	-42.24	-26.5
J-762	18.67	3.02	-42.25	-26.3
J-780	23.82	220.85	-35.51	-25.7
J-781	14.83	332	-43.92	-25.4
J-782	9.22	386.86	-49.24	-25.3
J-760	16.12	0	-42.21	-25.2
J-770	16.72	213.96	-41.22	-25.1
J-769	16.21	534.94	-41.69	-25
J-768	15.72	70.87	-41.84	-24.9
J-771	16.65	415.32	-40.65	-24.8
J-757	15.55	93.94	-41.63	-24.7
J-758	15.2	0	-41.84	-24.7
J-786	14.62	89.41	-42.41	-24.7
J-772	17.48	525.76	-39.42	-24.6
J-767	14.63	528.35	-41.87	-24.4
J-785	8.38	791.95	-48.08	-24.4
J-765	13.66	0	-42.26	-24.2
J-756	14.28	30.77	-41.39	-24.1
J-779	20.71	0	-34.71	-24
J-759	13.23	221.37	-42.13	-23.9
J-763	12.94	71.72	-42.26	-23.9
J-764	12.9	66.41	-42.26	-23.9
J-773	19.79	521.68	-35.2	-23.8
J-788	11.22	24.53	-42.4	-23.2
J-787	10.74	8.36	-42.41	-23
J-778	18.17	0	-34.3	-22.7
J-774	19.83	527.6	-31.24	-22.1
J-775	23.2	528.86	-25.13	-20.9
J-755	14.78	203.65	-28.48	-18.7
J-776	24.4	31.94	-18.84	-18.7
J-85	34.51	57.33	-6.25	-17.6
J-754	15.93	480.49	-23.11	-16.9
J-777	25.08	150.58	-13.76	-16.8
J-220	22.6	0	-16.25	-16.8
J-235	33.51	274.92	-5.17	-16.7
J-234	35.33	0	-3	-16.6
J-216	21.74	0	-16.25	-16.4
J-89	27.26	116.51	-9.52	-15.9
J-233	33.44	0	-3	-15.8
J-88	34.22	205.45	-0.29	-14.9
J-209	32.9	0	-1.48	-14.9
J-208	36.99	0	2.69	-14.8
J-232	30.64	63.07	-3	-14.5
J-87	35.65	0	2.59	-14.3
J-84	37.29	66.12	4.78	-14.1
J-86	37.19	0	5.34	-13.8
J-226	21.8	0	-7.87	-12.8
J-214	21.27	0	-7.84	-12.6
J-213	21.26	0	-7.84	-12.6
J-60	22.46	66	-3.4	-11.2
J-228	17.89	0	-7.92	-11.2
J-83	33.2	0	7.4	-11.2
J-246	23.2	8.12	-0.99	-10.5
J-92	28.88	54.34	4.81	-10.4
J-210	15.99	37.71	-8.01	-10.4
J-211	15.84	0	-8.01	-10.3
J-753	22.45	471.94	-1.37	-10.3
J-82	32.62	0	8.97	-10.2
J-63	26	15.42	3.61	-9.7

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-161	33.45	26.92	11.44	-9.5
J-48	27	218.47	5.33	-9.4
J-791	25.43	5.37	3.8	-9.4
J-171	25.66	0	5.33	-8.8
J-61	24.52	20.04	4.32	-8.7
J-93	26.85	0	6.81	-8.7
J-136	26.93	6.56	9.31	-7.6
J-91	23.12	0	6.81	-7.1
J-49	28.08	61.17	13.08	-6.5
J-94	21.62	0	6.81	-6.4
J-172	25.97	0	13.08	-5.6
J-249	33.06	0	20.21	-5.6
J-95	21.19	0	10.95	-4.4
J-237	30.34	0	21.6	-3.8
J-96	19.64	0	11.67	-3.4
J-97	19.5	824.84	12.29	-3.1
J-236	27.79	0	21.6	-2.7
J-90	21.45	44.11	15.62	-2.5
J-81	32.73	13.81	29.25	-1.5
J-80	31	26.11	30.44	-0.2
J-252	30.93	0	30.44	-0.2
J-253	30.42	0	30.44	0
J-251	30.16	0	30.44	0.1
J-98	20.74	0	23.33	1.1
J-735	34	0	37.55	1.5
J-736	34	0	37.55	1.5
J-104	23.52	0	27.69	1.8
J-47	29.73	5.42	35.55	2.5
J-140	30.19	0	37.55	3.2
J-37	29.68	0	37.55	3.4
J-103	23.53	0	32.32	3.8
J-151	29	0	39.28	4.4
J-101	18.5	0	30.85	5.3
J-100	19.54	0	35.98	7.1
J-139	20.1	0	37.55	7.5
J-737	20.38	0	38.32	7.8
J-799	16	0	34	7.8
J-245	25.03	61.22	43.62	8
J-102	25.03	0	43.68	8.1
J-99	19.5	0	49.19	12.8
J-262	1	0	31	13
J-107	26.45	0	57.83	13.6
J-260	19.66	0	52.23	14.1
J-168	22.18	0	55.27	14.3
J-105	24.61	0	57.83	14.4
J-728	20.94	0	54.73	14.6
J-727	20.41	0	54.94	14.9
J-169	22.36	0	58.54	15.6
J-38	18.72	0	56.34	16.3
J-41	22.7	218.29	61.05	16.6
J-46	22.21	0	61.05	16.8
J-39	19.92	125.21	59.41	17.1
J-45	19.9	0	61.05	17.8
J-254	22.85	0	66.4	18.8
J-255	22.85	0	66.4	18.8
J-256	22.86	0	66.66	18.9
J-257	22.86	0	66.66	18.9
J-170	22.87	197.25	67.25	19.2
J-65	20.03	152.33	66.88	20.3
J-135	32.19	0	87.78	24
J-59	21.21	0	77.79	24.5
J-258	21.17	0	82	26.3
J-751	41.11	467.28	106.38	28.2
J-231	22.91	0	90.54	29.2

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-242	26.73	0	95.11	29.6
J-230	21.94	0	90.54	29.7
J-229	21.79	0	90.54	29.7
J-108	36.05	0	108.28	31.2
J-225	19.76	8.08	93.03	31.7
J-218	19.75	0	93.03	31.7
J-219	19.72	0	93.03	31.7
J-217	19.65	0	93.03	31.7
J-106	34.67	0	108.28	31.8
J-224	18.59	0	93.03	32.2
J-215	18.58	0	93.03	32.2
J-241	18.54	0	93.03	32.2
J-212	18.4	145.88	93.03	32.3
J-222	18.08	0	93.03	32.4
J-221	18.03	0	93.03	32.4
J-40	21.81	56.37	97.78	32.9
J-223	17.5	0	94.02	33.1
J-227	21.2	0.00	98.9	33.6
J-134	31.71	549.55	111.34	34.4
J-750	36.31	161.87	117.6	35.2
J-179	20.64	1.49	103.1	35.7
J-177	18.8	471.19	101.54	35.8
J-174	18.55	0	103.45	36.7
J-57	21.19	13.23	106.2	36.8
J-56	20.75	0	113.46	40.1
J-749	33.47	95.77	132.01	42.6
J-185	37.95	0	137.44	43
J-181	34.9	0	137.44	44.3
J-193	34.65	0	137.44	44.4
J-55	20.6	0	123.55	44.5
J-747	33.32	0	136.64	44.7
J-184	34.77	0	138.4	44.8
J-748	31.29	0	135.11	44.9
J-198	33.85	0	137.75	44.9
J-202	34.11	0	138.2	45
J-182	34.28	0	138.43	45
J-180	33.49	0	138.69	45.5
J-203	34.35	0	139.59	45.5
J-187	33.26	0	138.56	45.5
J-205	32.91	0	138.61	45.7
J-204	32.37	0	138.47	45.9
J-192	34.52	0	140.64	45.9
J-191	33.99	0	140.31	46
J-43	22.88	124.09	132.29	47.3
J-42	21.15	0	132.37	48.1
J-183	30.46	0	143.77	49
J-131	33.44	0	147.34	49.3
J-190	30.1	0	144.01	49.3
J-266	18.71	0	132.93	49.4
J-109	32.63	0	147.34	49.6
J-188	29.66	0	144.9	49.8
J-189	29.58	0	145.06	49.9
J-130	31.79	0	147.96	50.2
J-197	29.09	0	145.53	50.3
J-200	28.8	0	146.52	50.9
J-806	22	0	139.85	51
J-64	21.87	0	139.89	51
J-150	22.09	0	140.36	51.1
J-132	28.83	0	147.34	51.2
J-195	27.96	0	147.07	51.5
J-194	28.28	0	147.49	51.6
J-186	28.59	0	148.25	51.7
J-199	28.19	0	148.92	52.2
J-196	28.36	0	150.67	52.9

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-21	18.56	79.84	141.58	53.2
J-129	24.31	0	147.96	53.5
J-122	33.32	0	157.2	53.6
J-125	32.63	0	157.24	53.9
J-116	36.01	0	160.9	54
J-265	16.2	0	141.28	54.1
J-124	31.09	0	156.53	54.2
J-128	31.73	0	157.43	54.4
J-22	19.63	0	145.96	54.6
J-118	34.4	0	160.9	54.7
J-206	26.48	48.3	153.28	54.8
J-114	33.98	0	160.9	54.9
J-127	30.92	304.5	158.43	55.1
J-123	30.74	0	158.33	55.2
J-120	32.49	0	160.34	55.3
J-117	32.94	0	160.9	55.3
J-248	21	0	149.11	55.4
J-44	20.88	23.04	149.11	55.5
J-121	31.97	0	160.34	55.5
J-23	19.61	114.22	148.04	55.5
J-267	15.81	0	145.3	56
J-207	25.64	48.13	155.67	56.2
J-115	29.68	0	160.9	56.7
J-259	30.94	49.29	162.47	56.9
J-110	31.18	0	162.83	56.9
J-264	16.7	0	148.84	57.1
J-201	26.04	627.26	158.29	57.2
J-126	26.6	14.68	159.04	57.3
J-113	28.29	16.16	160.9	57.3
J-790	26.07	29.16	160.03	57.9
J-119	26.71	0	160.9	58
J-263	17.92	0	152.36	58.1
J-240	27.19	0	163.08	58.8
J-112	25.2	15.43	161.67	59
J-30	21.5	13.28	158.83	59.4
J-111	29.24	0	166.59	59.4
J-1	17.79	0	155.18	59.4
J-239	25.33	0	163.11	59.6
J-238	16.85	0	154.99	59.7
J-176	19.56	0	158.06	59.9
J-142	28.15	0	167.3	60.2
J-50	20.02	72.21	159.43	60.3
J-24	20.11	0	159.69	60.4
J-167	26.56	0	166.44	60.5
J-165	29	0	169.31	60.7
J-2	14.87	0	155.18	60.7
J-141	29	0	169.32	60.7
J-166	28.21	0	169.22	61
J-25	21.24	79.01	162.26	61
J-731	18.07	0	159.85	61.3
J-156	21.29	0	164.94	62.1
J-26	21.74	0	166.27	62.5
J-11	17.32	0.45	162.07	62.6
J-10	17.01	0	162.07	62.7
J-27	21.43	46.54	168.8	63.7
J-158	20.36	44.42	170.88	65.1
J-3	14.88	0	167.52	66
J-173	20.89	0	176.01	67.1
J-28	21.96	46.35	178.52	67.7
J-5	14.44	0	171.49	67.9
J-29	20.72	55.86	178.09	68.1
J-58	21.2	6.66	178.98	68.2
J-33	20.14	0	179	68.7
J-53	10.48	72.64	169.42	68.7

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-9	15.9	0	174.89	68.8
J-19	21.5	0	180.67	68.8
J-137	19.38	0	179.02	69
J-34	20.66	0	180.46	69.1
J-133	18.58	0	178.99	69.4
J-7	12.66	18.84	173.25	69.4
J-4	9.98	0	170.87	69.6
J-52	13.98	0	175.09	69.7
J-6	11.59	0	172.75	69.7
J-8	15.17	0	176.55	69.8
J-70	16.77	0	178.48	69.9
J-78	14.83	0	177.1	70.2
J-77	14.81	0	177.13	70.2
J-67	15.9	0	178.22	70.2
J-800	0	0	162.83	70.4
J-261	12.94	0	175.8	70.4
J-75	13.98	165.62	177.1	70.5
J-76	13.93	0	177.13	70.6
J-15	18.54	56.37	181.82	70.6
J-72	15.38	72.31	178.68	70.6
J-66	14.57	19.57	177.99	70.7
J-71	15.96	0	179.84	70.9
J-79	21.05	0	185.29	71
J-74	13.12	0	177.47	71.1
J-12	12.81	13.67	177.16	71.1
J-73	13.2	0	178.07	71.3
J-14	16.34	63.7	181.27	71.3
J-32	19.4	18.35	184.38	71.3
J-69	12.63	0	177.62	71.3
J-68	16.57	0	182.01	71.5
J-16	23.23	558.42	188.71	71.6
J-138	18.98	0	185.31	71.9
J-153	18.84	21.96	185.31	72
J-13	13.89	0	181.12	72.3
J-160	21.8	0	190.4	72.9
J-740	30.43	0	205.97	75.9
J-742	28.68	0	204.23	75.9
J-741	29.73	0	205.29	75.9
J-31	19.42	0	195.95	76.3
J-752	23.69	133.01	201.26	76.8
J-159	27.44	772.14	206.77	77.5
J-175	19.2	0	199.45	77.9
J-730	25.28	0	206.77	78.5
J-743	19.65	78.57	201.25	78.5
J-17	23.76	126.65	207.42	79.4
J-62	23.06	0	207.01	79.5
J-20	19.44	0	203.54	79.6
J-243	22.61	0	206.77	79.6
J-250	22.6	0	206.77	79.6
J-793	22.16	17.57	206.57	79.7
J-35	21.85	14.42	206.51	79.9
J-733	14.5	0	199.16	79.9
J-796	22.04	45.96	207.14	80
J-797	21.86	86.91	207.14	80.1
J-244	21.35	0	206.77	80.2
J-162	24.03	0	210.26	80.5
J-178	20.02	2.08	206.34	80.6
J-792	20.07	3	206.41	80.6
J-247	19.3	0	206.34	80.9
J-36	18.19	11.17	206.35	81.4
J-54	17.14	0	206.85	82
J-164	23.6	0	213.32	82
J-732	17.33	0	207.21	82.1
J-18	17.57	0	208.02	82.4

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-738	20.41	0	211.63	82.7
J-726	20	0	211.75	82.9
J-725	20	0	211.79	82.9
J-143	18.2	0	211.74	83.7
J-51	17	0	211.37	84.1
J-155	26.51	24.07	221.86	84.5
J-154	22.32	53.77	224.38	87.4
J-157	18.24	0	235.11	93.8
J-146	14.72	25.67	248.78	101.2
J-148	21.08	0	257.37	102.2
J-147	14.1	0	251.72	102.8
J-144	4.8	0	243.04	103
J-145	6.69	25.1	246.99	103.9
J-149	14.05	0	260.12	106.4
J-807	22	0	271.13	107.7
J-808	21.12	0	270.64	107.9

Build-Out Average Annual Daily Flow - without Deficiency Improvements

Pump Report

Label	Elevation (ft)	Pump Definition	Status (Initial)	Flow (gal/min)	Pressure (Discharge) (psi)
PSCC1_5	29	PSCC1_4-5	On	3,996.57	79.2
PSCC1_4	29	PSCC1_4-5	On	3,987.98	79.7
PSBR1_3	29	PSBR1_1-3	On	2,592.70	65.3
PSBR1_2	29	PSBR1_1-3	On	2,592.70	65.3
PSBR1_1	29	PSBR1_1-3	On	2,592.70	65.3
PMP-42	22	Proposed BPS	On	1,851.94	108
PSCC1_2	29	PSCC1_2-3	On	1,825.50	79.2
PSCC1_3	29	PSCC1_2-3	On	1,825.35	79.2
PSBR1_4	29	PSBR1_4	On	981.56	61.3
PSPXN1_1	34	PSCC1_2-3	Off	0	1.5
PSPXN1_2	34	PSCC1_2-3	Off	0	1.5
PSBR2_7	29	PSBR2_5-8	Off	0	60.7
PSBR2_6	29	PSBR2_5-8	Off	0	60.7
PSBR2_5	29	PSBR2_5-8	Off	0	60.7
PSPXN1_3	34	PSCC1_2-3	Off	0	1.5
PSBR2_8	29	PSBR2_5-8	Off	0	60.7

Build-Out Average Annual Daily Flow - without Deficiency Improvements

Reservior Report

Label	Elevation (ft)	Flow (gal/min)*	Notes
BRSP_1	31	0	Bee Ridge WRF seasonal pond
BTSP-1	38.61	0.00	Bent Tree Golf Course 1
BTSP-2	26.71	0	Bent Tree Golf Course 2
CCSP_1	55	-11,635.41	Central County WRF pond (19.6 MG)
ETSP-1	26.28	286.69	Eagle Trace
FCSP-1	36.63	0	Founder's Golf Club
FCSP-2	36.28	194.48	Founder's Club Development
GCSP-1	25.75	0	Gator Creek Golf Course
GSP-1	23.35	694.97	Longmeadow (No Meter No.)
HLSP-1	34.87	0.00	Preserve at Heron Lake
HOSP-1	33.44	0	Heritage Oaks
ISSP-1	21.5	0	Isles of Sarasota
LOSP-1	32	0.00	Laurel Oaks GC Pond
LOSP-2	31	447.58	Laurel Oaks GC Pond
MCSP-1	35.33	0	Misty Creek
OSP-1	18.16	611.9	Oaks Golf Course
PSP-1	18.51	447.45	Prestancia
PUBSP-1	27.41	0	Publix
PXNSP_1	34	0	36 MG Parcel X north pond
R-28	22.5	0	Miss Sarasota Softball
R-29	17.68	0	Oaks I (not in use)
R-36	237	0	
RHSP-1	33.8	0	Foxfire Golf Club
SBSP-1	18.5	268.89	Stoneybrook GC Pond
SGCSP-1	31.97	0	Sarasota Golf Course
SSP-1	24.6	0	Serenoa
VWSP-1	21.13	0	Village Walk
VWSP-2	17.72	0	Village Walk

*Negative is withdraw and positive is filling.

Build-Out Average Annual Daily Flow - without Deficiency Improvements

Pressure Sustaining Valve Report

Label	Elevation (ft)	Diameter (Valve) (in)	Upstream Pressure (psi)	Pressure Setting (psi)	Flow (gal/min)	Headloss (ft)	Notes	Status (Initial)
GPSV-1	21.35	6	30	30	694.97	60.87	Longmeadow (No Meter No.)	Active
OPSV-1	16.16	6	60	60	611.9	136.66	Oaks Golf Course	Active
LOPSV-2	29	6	55	55	447.58	124.5	Laurel Oaks GC	Active
PPSV-1	16.51	6	70	70	447.45	158.25	Prestancia	Active
ETPSV-1	24.28	2	59.4	55	286.69	133.09	Eagle Trace	Active
SBPSV-1	16.5	6	50	50	268.89	113.36	Stoneybrook GC	Active
FCPSV-2	34.28	6	45	45	194.48	102.02	Founder's Club Development	Active
ISPSV-1	19.5	6	-15.5	65	0	0	Isles of Sarasota	Active
VWPSV-1	19.13	6	30.9	65	0	0	Village Walk	Active
HLPSV-1	32.87	4	-15.5	52	0	0	Preserve at Heron Lake	Active
RHPSV-1	31.8	6	-16	56	0.00	0	Foxfire Golf Club	Active
PUBPSV-1	25.41	6	-1.6	64	0	0	Publix	Active
SPSV-1	22.6	6	-6.8	68	0	0	Serenoa	Active
FCPSV-1	34.63	6	44.5	45	0	0	Founder's Golf Club	Active
HOPSV-1	31.44	6	50.1	55	0	0	Heritage Oaks	Active
GCPSV-1	23.75	6	14.7	59	0	0	Gator Creek Golf Course	Active
MCPSV-1	33.33	6	32.4	55	0	0	Misty Creek	Active
SGCPSV-1	29.97	6	51	52	0	0	Sarasota Golf Course	Active
BTPSV-1	36.61	6	53.7	55	0	0	Bent Tree Golf Course 1	Active
BTPSV-2	24.71	6	58.9	60	0	0	Bent Tree Golf Course 2	Active
VWPSV-2	15.72	6	33.4	63	0	0	Village Walk	Active
PSV-22	20.5	4	80.5	55	0	0	Miss Sarasota Softball	Closed
PSV-23	15.68	6	60.3	55	0	0	Oaks I (not in use)	Closed
LOPSV-1	30	6	56.4	52	0	0	Laurel Oaks GC	Closed

APPENDIX M

HYDRAULIC MODEL RESULTS – 2032 MAXIMUM MONTH AVERAGE DAILY FLOW WITH DEFICIENCY IMPROVEMENTS

2032 Max Month Average Daily Flow - with Deficiency Improvements

Pipe Report

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1200	951.07	J-726	PSCC1_5	12	130	-3,991.64	11.32	0.033	0.4
P-183	272.49	PSCC1_4	J-726	12	130	3,983.07	11.3	0.099	1.48
P-226	1,464.16	PSBR1_3	J-165	10	130	2,584.35	10.56	0.526	10.53
P-227	1,779.58	PSBR1_2	J-165	10	130	2,584.35	10.56	0.526	10.53
P-230	2,201.99	PSBR1_1	J-165	10	130	2,584.35	10.56	0.526	10.53
P-1215	422.93	J-731	J-21	10	130	1,560.25	6.37	0.015	6.19
P-1199	289.64	J-726	J-143	24	130	7,974.71	5.66	0.004	0.01
P-1193	352.68	J-51	J-738	24	130	-7,974.71	5.66	0.004	0.13
P-1194	163.62	J-738	J-143	24	130	-7,974.71	5.66	0.004	0.05
P-1219	644.26	BRGST_1	J-151	24	130	7,753.05	5.5	0.004	0.58
P-234	334.31	J-165	J-166	24	130	7,753.04	5.5	0.009	0.07
P-235	596.22	J-166	J-142	24	130	7,753.04	5.5	0.004	1.54
P-59	444.73	J-18	J-51	24	130	-7,473.84	5.3	0.004	1.6
P-68	116.16	J-19	J-29	14	130	2,529.69	5.27	0.009	0.99
P-165	68.09	J-137	J-34	6	130	-460.55	5.23	0.022	1.48
P-69	1,155.67	J-29	J-30	14	130	2,473.83	5.16	0.006	7.4
P-304	37.87	J-137	PPSV-1	6	130	453.90	5.15	0.017	0.65
P-305	97.33	PPSV-1	PSP-1	6	130	453.82	5.15	0.017	1.66
P-74	551.63	J-44	J-30	14	130	-2,460.55	5.13	0.007	3.7
P-245	2,111.17	J-21	J-174	14	130	2,453.29	5.11	0.006	13.63
P-253	52.79	J-174	J-177	14	130	2,453.29	5.11	0.012	0.66
P-89	399.84	J-42	J-64	14	130	-2,437.50	5.08	0.007	2.83
P-90	513.67	J-64	J-44	14	130	-2,437.50	5.08	0.007	3.48
P-149	4,739.39	J-128	J-129	16	130	3,065.76	4.89	0.005	24.11
P-1305	260.02	J-150	J-806	16	130	3,065.76	4.89	0.005	1.29
P-1306	355.76	J-806	PMP-42	16	130	3,065.76	4.89	0.005	1.77
P-1307	365.97	PMP-42	J-807	16	130	3,065.76	4.89	0.005	1.82
P-1310	249.42	J-807	J-808	16	130	3,065.76	4.89	0.005	1.24
P-189	1,453.61	J-147	J-146	16	130	3,065.76	4.89	0.005	7.49
P-190	2,810.26	J-148	J-147	16	130	3,065.76	4.89	0.005	14.41
P-191	1,287.71	J-149	J-148	16	130	3,065.76	4.89	0.005	7.03
P-193	3,742.59	J-129	J-150	16	130	3,065.76	4.89	0.005	19.4
P-1309	5,281.23	J-808	J-149	16	130	3,065.76	4.89	0.005	26.81
P-254	456.47	J-54	J-733	18	130	3,860.89	4.87	0.007	3.19
P-255	1,527.60	J-733	J-19	18	130	3,860.89	4.87	0.005	7.8
P-188	828.32	J-146	J-145	16	130	3,024.69	4.83	0.006	4.59
P-81	402.26	J-55	J-42	14	130	-2,313.42	4.82	0.008	3.15
P-82	588.71	J-56	J-55	14	130	-2,313.42	4.82	0.006	3.66
P-83	468.62	J-57	J-56	14	130	-2,313.42	4.82	0.006	2.65
P-187	2,076.69	J-145	J-144	16	130	3,015.17	4.81	0.005	10.28
P-257	167.37	J-179	J-57	14	130	-2,300.19	4.79	0.007	1.11
P-256	311.22	J-40	J-179	14	130	-2,298.70	4.79	0.006	1.92
P-349	1,467.47	J-212	J-260	12	130	1,554.82	4.41	0.006	8.42
P-350	2,160.20	J-260	J-213	12	130	1,554.82	4.41	0.006	12.4
P-313	1,846.15	J-156	J-242	6	130	388.01	4.4	0.013	23.71
P-314	116.41	J-242	GPSV-1	6	130	388.01	4.4	0.013	1.49
P-315	172.31	GPSV-1	GSP-1	6	130	388.00	4.4	0.013	2.21
P-41	307.75	J-213	J-216	12	130	1,540.52	4.37	0.006	1.74
P-358	1,490.15	J-11	J-263	6	130	373.11	4.23	0.012	17.8
P-359	539.78	J-263	J-264	6	130	373.11	4.23	0.012	6.45
P-361	1,280.99	J-265	J-266	6	130	373.11	4.23	0.012	15.3
P-362	123.53	J-266	SBPSV-1	6	130	373.11	4.23	0.012	1.48
P-363	41.24	SBPSV-1	SBSP-1	6	130	373.06	4.23	0.012	0.49
P-1218	4,386.88	J-731	J-732	12	130	-1,487.86	4.22	0.005	23.21
P-262	186.06	J-177	J-227	14	130	1,982.11	4.13	0.004	0.79
P-156	1,787.53	J-109	J-110	16	130	-2,545.09	4.06	0.004	6.39
P-1216	179.99	J-18	J-732	24	130	5,561.33	3.94	0.002	0.37
P-67	200.38	J-28	J-19	12	130	-1,331.20	3.78	0.005	1.08
P-57	2,677.39	J-16	J-17	14	130	-1,764.60	3.68	0.004	9.59
P-279	997.12	J-236	J-47	6	130	-323.36	3.67	0.009	9.35
P-278	598.94	J-49	J-236	6	130	-323.36	3.67	0.01	5.7
P-243	893.43	J-27	J-173	12	130	-1,284.85	3.64	0.004	3.6

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-244	310.73	J-173	J-28	12	130	-1,284.85	3.64	0.004	1.25
P-106	778.84	J-79	J-16	14	130	-1,738.89	3.62	0.003	2.71
P-1206	432.67	CCSP_1	J-728	30	130	7,974.71	3.62	0.001	0.27
P-65	502.5	J-25	J-26	12	130	-1,238.31	3.51	0.004	1.96
P-66	289.68	J-26	J-27	12	130	-1,238.31	3.51	0.004	1.23
P-11	531.00	J-112	J-201	12	130	1,222.69	3.47	0.004	1.95
P-84	1,825.02	J-40	J-59	12	130	1,209.31	3.43	0.004	6.66
P-240	975.11	J-170	J-59	12	130	-1,209.31	3.43	0.004	3.51
P-155	2,594.59	J-167	J-239	24	130	4,770.15	3.38	0.002	4.06
P-236	633.30	J-142	J-167	24	130	4,770.15	3.38	0.002	1.05
P-356	21.45	J-124	LOPSV-2	6	130	296.89	3.37	0.008	0.16
P-357	43.12	LOPSV-2	LOSP-2	6	130	296.45	3.36	0.008	0.34
P-1278	1,578.80	J-790	J-112	20	130	-3,254.37	3.32	0.002	3.04
P-1277	956.21	J-126	J-790	20	130	-3,243.31	3.31	0.002	1.86
P-46	1,295.61	J-3	J-4	10	130	-810.20	3.31	0.004	5.63
P-247	973.78	J-2	J-176	10	130	-810.20	3.31	0.005	4.87
P-248	3,626.88	J-176	J-3	10	130	-810.20	3.31	0.004	15.94
P-285	79.98	J-2	J-238	10	130	810.20	3.31	0.004	0.33
P-286	30.42	J-238	OPSV-1	10	130	810.20	3.31	0.004	0.13
P-287	38.15	OPSV-1	OSP-1	10	130	810.06	3.31	0.004	0.16
P-146	521.98	J-127	J-126	20	130	-3,237.74	3.31	0.002	1.17
P-64	312.25	J-24	J-25	12	130	-1,159.30	3.29	0.004	1.19
P-308	208.82	J-240	ETPSV-1	6	130	287.24	3.26	0.007	1.54
P-309	298.49	ETPSV-1	ETSP-1	6	130	287.24	3.26	0.007	2.19
P-1211	207.3	J-162	J-159	10	130	794.00	3.24	0.004	0.83
P-60	1,550.39	J-51	J-20	8	130	500.86	3.2	0.005	8.02
P-210	2,114.21	J-31	J-153	8	130	500.86	3.2	0.005	10.9
P-249	806.40	J-20	J-175	8	130	500.86	3.2	0.005	4.19
P-250	688.1	J-175	J-31	8	130	500.86	3.2	0.005	3.59
P-157	4,087.00	J-134	J-109	16	130	-1,993.61	3.18	0.002	9.42
P-306	1,005.45	J-239	J-112	24	130	4,482.91	3.18	0.002	1.79
P-8	134.08	J-223	J-212	16	130	1,982.11	3.16	0.002	0.3
P-7	659.91	J-227	J-223	16	130	1,982.11	3.16	0.002	1.46
P-148	1,292.98	J-123	J-128	20	130	3,065.76	3.13	0.002	2.3
P-63	1,741.70	J-23	J-24	12	130	-1,087.10	3.08	0.003	5.25
P-211	170.62	J-153	J-32	8	130	478.90	3.06	0.006	0.95
P-133	1,059.21	J-110	J-111	20	130	-2,982.89	3.05	0.002	1.77
P-147	72.15	J-127	J-123	20	130	2,933.24	3	0.003	0.22
P-163	366.44	J-136	J-49	6	130	-262.19	2.98	0.006	2.33
P-162	392.38	J-48	J-136	6	130	-259.70	2.95	0.006	2.5
P-70	831.31	J-34	J-32	8	130	-460.55	2.94	0.005	4.02
P-264	966.82	J-229	J-40	12	130	-1,033.02	2.93	0.003	2.78
P-345	2,098.11	J-65	J-258	12	130	-1,033.02	2.93	0.003	5.83
P-346	1,154.15	J-258	J-229	12	130	-1,033.02	2.93	0.003	3.29
P-216	1,566.97	J-159	J-160	8	130	455.47	2.91	0.004	6.67
P-217	1,867.61	J-160	J-158	8	130	455.47	2.91	0.004	7.95
P-342	28.61	J-254	J-257	12	130	-1,012.06	2.87	0.003	0.08
P-343	64.15	J-257	J-170	12	130	-1,012.06	2.87	0.003	0.17
P-238	343.12	J-41	J-169	12	130	1,012.06	2.87	0.003	0.89
P-239	447.17	J-169	J-168	12	130	1,012.06	2.87	0.003	1.16
P-246	2,693.65	J-168	J-47	12	130	1,012.06	2.87	0.003	6.98
P-340	589.31	J-41	J-254	12	130	-1,012.06	2.87	0.003	1.53
P-53	214.18	J-8	J-12	14	130	-1,347.64	2.81	0.002	0.45
P-261	2,497.54	J-208	J-209	8	130	439.87	2.81	0.004	9.97
P-275	2,204.05	J-209	J-235	8	130	439.87	2.81	0.004	8.8
P-12	999.90	J-201	J-207	12	130	984.83	2.79	0.002	2.46
P-61	729.69	J-21	J-22	12	130	-972.88	2.76	0.003	1.83
P-62	361.87	J-22	J-23	12	130	-972.88	2.76	0.002	0.87
P-105	1,305.86	J-15	J-79	14	130	-1,320.17	2.75	0.002	2.73
P-10	1,000.05	J-207	J-206	12	130	966.58	2.74	0.002	2.38
P-1217	146.49	J-732	J-54	24	130	3,860.89	2.74	0.001	0.15
P-20	72.16	J-188	J-189	12	130	-948.26	2.69	0.002	0.17
P-16	108.53	J-183	J-190	12	130	-948.26	2.69	0.002	0.25

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-38	155.92	J-191	J-192	12	130	-948.26	2.69	0.002	0.36
P-21	192.69	J-194	J-195	12	130	948.26	2.69	0.002	0.44
P-18	216.08	J-189	J-197	12	130	-948.26	2.69	0.002	0.5
P-23	311.08	J-199	J-186	12	130	948.26	2.69	0.002	0.71
P-19	253.49	J-200	J-195	12	130	-948.26	2.69	0.002	0.58
P-44	330.04	J-203	J-191	12	130	-948.26	2.69	0.002	0.76
P-15	345.41	J-186	J-194	12	130	948.26	2.69	0.002	0.79
P-22	408.96	J-190	J-188	12	130	-948.26	2.69	0.002	0.94
P-28	410.57	J-180	J-203	12	130	-948.26	2.69	0.002	0.94
P-17	457.74	J-197	J-200	12	130	-948.26	2.69	0.002	1.05
P-42	804.25	J-196	J-199	12	130	948.26	2.69	0.002	1.85
P-14	1,196.46	J-206	J-196	12	130	948.26	2.69	0.002	2.75
P-27	1,435.94	J-192	J-183	12	130	-948.26	2.69	0.002	3.3
P-56	223.23	J-14	J-15	14	130	-1,263.80	2.63	0.002	0.43
P-40	24.58	J-184	J-182	8	130	-402.25	2.57	0.003	0.08
P-290	70.81	J-184	FCPSV-2	8	130	402.25	2.57	0.003	0.24
P-291	43.16	FCPSV-2	FCSP-2	8	130	402.22	2.57	0.003	0.15
P-79	531.25	J-52	J-261	12	130	-901.68	2.56	0.002	1.14
P-351	559.16	J-261	J-8	12	130	-901.68	2.56	0.002	1.19
P-54	1,738.66	J-12	J-13	14	130	-1,200.10	2.5	0.002	3.04
P-55	65.77	J-13	J-14	14	130	-1,200.10	2.5	0.002	0.12
P-91	1,202.37	J-39	J-65	12	130	-880.70	2.5	0.002	2.54
P-215	638.09	J-158	J-156	8	130	388.01	2.48	0.003	2.02
P-360	3,184.93	J-264	J-265	6	130	216.27	2.45	0.004	13.86
P-167	1,662.86	J-7	J-52	12	130	-829.05	2.35	0.002	3.05
P-47	599.47	J-4	J-5	12	130	-810.20	2.3	0.002	1.05
P-48	1,209.24	J-5	J-6	12	130	-810.20	2.3	0.002	2.13
P-49	474.23	J-6	J-7	12	130	-810.2	2.3	0.002	0.83
P-180	421.55	J-111	J-142	24	130	-2,982.89	2.12	0.001	0.33
P-1236	919.70	J-90	J-753	6	130	178.96	2.03	0.003	2.82
P-108	1,130.73	J-47	J-80	12	130	686.64	1.95	0.001	1.43
P-72	586.36	J-38	J-39	12	130	-680.37	1.93	0.001	0.75
P-124	1,358.86	J-99	J-38	12	130	-680.37	1.93	0.001	1.76
P-251	109.32	J-37	J-737	12	130	-680.37	1.93	0.002	0.18
P-252	2,116.11	J-737	J-99	12	130	-680.37	1.93	0.001	2.68
P-123	2,144.31	J-97	J-98	12	130	-680.37	1.93	0.001	2.72
P-125	311.32	J-100	J-37	12	130	-680.37	1.93	0.001	0.39
P-126	974.36	J-100	J-101	12	130	680.37	1.93	0.001	1.26
P-185	1,473.78	J-98	J-101	12	130	-680.37	1.93	0.001	1.85
P-109	242.19	J-80	J-81	12	130	660.53	1.87	0.001	0.32
P-78	1,361.94	J-52	J-53	4	130	72.64	1.85	0.004	5.66
P-98	280.06	J-71	J-72	4	130	72.31	1.85	0.004	1.17
P-77	64.47	J-24	J-50	4	130	72.21	1.84	0.004	0.26
P-333	1,954.77	J-81	J-249	12	130	646.72	1.83	0.001	2.37
P-334	1,891.03	J-249	J-161	12	130	646.72	1.83	0.001	2.3
P-225	1,205.16	J-151	PSBR1_3	24	130	2,584.35	1.83	0.005	0.1
P-228	1,299.18	J-151	PSBR1_2	24	130	2,584.35	1.83	0.005	0.1
P-229	1,536.28	J-151	PSBR1_1	24	130	2,584.35	1.83	0.005	0.1
P-50	329.06	J-8	J-9	10	130	445.96	1.82	0.001	0.47
P-51	2,653.52	J-9	J-10	10	130	445.96	1.82	0.001	3.68
P-1204	892.80	J-728	PSCC1_5	30	130	3,991.64	1.81	0	0
P-205	192.23	J-728	PSCC1_4	30	130	3,983.07	1.81	0	0.01
P-364	3,068.88	J-265	J-267	6	130	-156.84	1.78	0.002	7.37
P-365	2,706.19	J-267	J-264	6	130	-156.84	1.78	0.002	6.49
P-158	468.82	J-106	J-134	16	130	-1,114.33	1.78	0.001	0.36
P-159	3,071.10	J-135	J-106	16	130	-1,114.33	1.78	0.001	2.38
P-160	4,463.50	J-105	J-135	16	130	-1,114.33	1.78	0.001	3.48
P-130	2,067.68	J-102	J-105	16	130	-1,114.33	1.78	0.001	1.64
P-145	4,387.31	J-120	J-122	10	130	429.42	1.75	0.001	5.77
P-39	24.18	J-185	J-181	8	130	-271.12	1.73	0.002	0.04
P-288	73.85	J-185	FCPSV-1	8	130	271.12	1.73	0.002	0.12
P-289	41.95	FCPSV-1	FCSP-1	8	130	271.07	1.73	0.002	0.07
P-97	1,398.19	J-71	J-68	10	130	-418.72	1.71	0.001	1.76
P-107	2,070.99	J-79	J-68	10	130	418.72	1.71	0.001	2.67
P-127	1,764.05	J-102	J-103	16	130	1,053.11	1.68	0.001	1.23

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-128	1,839.15	J-90	J-104	16	130	-1,053.11	1.68	0.001	1.3
P-129	692.91	J-104	J-103	16	130	-1,053.11	1.68	0.001	0.5
P-1237	3,026.84	J-216	J-754	20	130	1,540.52	1.57	0	1.41
P-151	1,726.42	J-131	J-132	12	130	-551.48	1.56	0.001	1.46
P-154	142.66	J-109	J-132	12	130	551.48	1.56	0.001	0.14
P-292	54.7	J-131	HOPSV-1	12	130	551.48	1.56	0.001	0.05
P-293	74.18	HOPSV-1	HOSP-1	12	130	551.23	1.56	0.001	0.06
P-26	218.74	J-198	J-193	12	130	546.01	1.55	0.001	0.18
P-30	324.44	J-202	J-198	12	130	546.01	1.55	0.001	0.27
P-24	352.80	J-180	J-202	12	130	546.01	1.55	0.001	0.29
P-1269	7,432.31	J-781	J-785	10	130	376.09	1.54	0.001	7.48
P-52	8.47	J-10	J-11	10	130	373.56	1.53	0.002	0.02
P-1232	1,860.92	J-749	J-750	8	130	238.57	1.52	0.001	2.39
P-1265	3,247.70	J-756	J-781	12	130	501.98	1.42	0.001	2.3
P-96	1,202.96	J-70	J-71	10	130	-346.41	1.42	0.001	1.06
P-1238	3,090.59	J-754	J-755	20	130	1,358.32	1.39	0	1.15
P-1222	2,301.79	J-159	J-740	10	130	338.53	1.38	0.001	1.91
P-1223	1,975.95	J-740	J-741	10	130	338.53	1.38	0.001	1.64
P-1224	3,031.77	J-741	J-742	10	130	338.53	1.38	0.001	2.51
P-1234	8,560.09	J-742	J-752	10	130	338.53	1.38	0.001	7.09
P-115	5,227.25	J-89	J-90	16	130	-857.42	1.37	0	2.5
P-58	1,103.77	J-17	J-18	24	130	-1,912.51	1.36	0	0.32
P-214	5,780.24	J-157	J-154	16	130	842.75	1.34	0	2.63
P-231	4,275.38	J-144	J-157	16	130	842.75	1.34	0	1.94
P-213	1,433.37	J-154	J-155	16	130	832.51	1.33	0	0.64
P-1239	8,409.87	J-755	J-756	20	130	1,281.10	1.31	0	2.8
P-220	1,786.32	J-162	J-164	16	130	-794.00	1.27	0	0.73
P-221	4,995.77	J-164	J-155	16	130	-794.00	1.27	0	2.03
P-312	38.51	VWPSV-2	VWSP-2	8	130	194.59	1.24	0.001	0.03
P-347	803.79	J-110	J-259	12	130	437.80	1.24	0.001	0.48
P-348	4,855.17	J-259	J-113	12	130	437.80	1.24	0.001	2.71
P-1	14.14	J-217	J-218	8	130	193.88	1.24	0.001	0.01
P-3	14.91	J-218	J-219	8	130	193.88	1.24	0.001	0.01
P-45	138.37	J-221	J-222	8	130	-193.88	1.24	0.001	0.12
P-6	447.81	J-224	J-225	8	130	193.88	1.24	0.001	0.39
P-4	670.05	J-225	J-222	8	130	193.88	1.24	0.001	0.59
P-2	704.17	J-215	J-224	8	130	193.88	1.24	0.001	0.62
P-9	729.35	J-221	J-217	8	130	193.88	1.24	0.001	0.64
P-310	185.44	J-219	J-241	8	130	193.88	1.24	0.001	0.16
P-311	18.71	J-241	VWPSV-2	8	130	193.88	1.24	0.001	0.02
P-140	1,892.91	J-120	J-113	12	130	-429.42	1.22	0.001	1.03
P-142	476.56	J-122	J-124	10	130	296.89	1.21	0.001	0.32
P-32	336.55	J-182	J-204	12	130	-402.25	1.14	0	0.16
P-31	406.78	J-187	J-205	12	130	-402.25	1.14	0	0.19
P-29	647.53	J-205	J-180	12	130	-402.25	1.14	0	0.3
P-25	738.09	J-204	J-187	12	130	-402.25	1.14	0	0.35
P-1233	2,513.52	J-750	J-751	8	130	177.19	1.13	0.001	1.86
P-1261	1,504.01	J-777	J-89	20	130	-1,080.68	1.1	0	0.37
P-100	904.66	J-73	J-74	8	130	165.62	1.06	0.001	0.6
P-101	523.68	J-74	J-76	8	130	165.62	1.06	0.001	0.35
P-102	38.46	J-76	J-75	8	130	165.62	1.06	0.001	0.02
P-1260	1,928.18	J-776	J-777	20	130	-1,023.58	1.05	0	0.42
P-120	3,859.88	J-91	J-95	12	130	-367.59	1.04	0	1.55
P-121	650.24	J-95	J-96	12	130	-367.59	1.04	0	0.27
P-122	577.30	J-96	J-97	12	130	-367.59	1.04	0	0.24
P-117	1,875.31	J-92	J-91	12	130	-367.59	1.04	0	0.75
P-1259	2,423.65	J-775	J-776	20	130	-1,011.47	1.03	0	0.52
P-110	1,498.14	J-82	J-83	16	130	636.51	1.02	0	0.42
P-111	1,954.51	J-83	J-86	16	130	636.51	1.02	0	0.55
P-112	515.94	J-86	J-84	16	130	636.51	1.02	0	0.15
P-171	2,231.73	J-161	J-82	16	130	636.51	1.02	0	0.65
P-1270	2,234.69	J-785	J-782	10	130	246.76	1.01	0	1.03
P-116	2,452.64	J-87	J-92	12	130	-346.98	0.98	0	0.89
P-259	2,224.12	J-84	J-208	16	130	611.44	0.98	0	0.57

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-143	95.64	J-122	J-125	8	130	132.53	0.85	0	0.04
P-144	2,438.59	J-125	J-123	8	130	132.53	0.85	0	1.08
P-1258	3,093.95	J-774	J-775	20	130	-810.93	0.83	0	0.44
P-113	2,045.62	J-87	J-88	16	130	518.55	0.83	0	0.39
P-307	120.44	J-239	J-240	12	130	287.24	0.81	0	0.03
P-1267	1,229.68	J-782	J-783	10	130	196.06	0.8	0	0.37
P-73	187.68	J-42	J-43	8	130	124.09	0.79	0	0.08
P-1240	1,478.77	J-756	J-757	20	130	767.45	0.78	0	0.19
P-1229	573.92	J-193	J-747	12	130	274.89	0.78	0	0.13
P-1230	1,096.27	J-747	J-748	12	130	274.89	0.78	0	0.25
P-1231	2,215.11	J-748	J-749	12	130	274.89	0.78	0	0.51
P-13	333.56	J-193	J-181	12	130	271.12	0.77	0	0.08
P-329	1,209.86	J-246	J-61	4	130	-29.89	0.76	0.001	0.98
P-1241	1,610.13	J-757	J-758	20	130	731.83	0.75	0	0.19
P-92	558.01	J-66	J-67	10	130	-180.78	0.74	0	0.15
P-93	638.25	J-67	J-70	10	130	-180.78	0.74	0	0.17
P-326	156.22	J-102	J-245	6	130	61.22	0.69	0	0.07
P-328	674.83	J-60	J-246	4	130	-26.81	0.68	0.001	0.45
P-99	1,841.51	J-70	J-73	10	130	165.62	0.68	0	0.41
P-94	1,304.48	J-12	J-69	10	130	-161.21	0.66	0	0.28
P-95	1,058.34	J-69	J-66	10	130	-161.21	0.66	0	0.23
P-1250	2,634.99	J-758	J-767	20	130	538.77	0.55	0	0.18
P-1257	3,184.33	J-773	J-774	20	130	-527.11	0.54	0	0.2
P-1235	154.52	J-752	J-743	10	130	125.71	0.51	0	0.02
P-269	2,486.36	J-88	J-232	16	130	313.1	0.5	0	0.19
P-85	749.21	J-61	J-48	6	130	-41.23	0.47	0	0.15
P-270	3,305.62	J-232	J-85	16	130	289.18	0.46	0	0.21
P-114	3,674.33	J-85	J-89	16	130	267.44	0.43	0	0.2
P-1251	928.79	J-767	J-768	20	130	338.42	0.35	0	0.03
P-1262	8,129.51	J-774	J-778	10	130	83.75	0.34	0	0.51
P-1263	1,106.42	J-778	J-779	10	130	83.75	0.34	0	0.07
P-1264	2,102.91	J-779	J-780	10	130	83.75	0.34	0	0.13
P-1289	4,590.53	J-732	J-796	16	130	212.59	0.34	0	0.16
P-1256	5,162.45	J-772	J-773	20	130	-329.29	0.34	0	0.14
P-1252	4,070.09	J-768	J-769	20	130	311.55	0.32	0	0.1
P-5	5.07	J-212	J-215	16	130	193.88	0.31	0	0
P-1214	898.24	J-10	J-731	10	130	72.40	0.3	0	0.04
P-260	127.96	J-208	J-87	16	130	171.57	0.27	0	0
P-1268	324.09	J-783	J-784	10	130	60.52	0.25	0	0.01
P-1283	1,607.52	J-62	J-793	6	130	21.25	0.24	0	0.1
P-1281	362.61	J-35	J-792	4	130	9.12	0.23	0	0.03
P-1290	1,095.48	J-796	J-797	16	130	139.05	0.22	0	0.02
P-1271	2,752.22	J-758	J-786	8	130	32.04	0.2	0	0.09
P-1282	383.64	J-792	J-36	4	130	7.98	0.2	0	0.03
P-1279	1,267.27	J-61	J-791	4	130	7.89	0.2	0	0.09
P-1284	544.62	J-793	J-35	6	130	14.59	0.17	0	0.02
P-1242	5,497.77	J-758	J-759	20	130	161.02	0.16	0	0.04
P-1280	806.63	J-791	J-63	4	130	5.85	0.15	0	0.03
P-86	6,000.17	J-17	J-62	8	130	21.25	0.14	0	0.09
P-1255	2,582.81	J-771	J-772	20	130	-129.92	0.13	0	0.01
P-1253	2,562.28	J-769	J-770	20	130	108.7	0.11	0	0.01
P-1276	4,405.22	J-788	J-789	8	130	-14.33	0.09	0	0.03
P-33	2.73	J-213	J-214	8	130	14.30	0.09	0	0
P-34	536.60	J-214	J-226	8	130	14.30	0.09	0	0
P-35	1,264.25	J-226	J-228	8	130	14.3	0.09	0	0.01
P-36	2,113.49	J-228	J-210	8	130	14.30	0.09	0	0.01
P-1243	5,251.59	J-759	J-760	20	130	77.08	0.08	0	0.01
P-1244	1,677.81	J-760	J-761	20	130	77.08	0.08	0	0
P-152	2,069.83	J-33	J-133	6	130	6.66	0.08	0	0.01
P-153	990.50	J-133	J-58	6	130	6.66	0.08	0	0.01
P-164	1,640.28	J-33	J-137	6	130	-6.66	0.08	0	0.01
P-1245	495.59	J-761	J-762	20	130	67.86	0.07	0	0
P-1274	666.95	J-762	J-789	20	130	66.71	0.07	0	0
P-303	95.48	BTPSV-2	BTSP-2	8	130	9.16	0.06	0	0

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-137	42.67	J-114	J-117	8	130	8.38	0.05	0	0
P-139	3,669.81	J-117	J-119	8	130	8.38	0.05	0	0.01
P-302	53.72	J-119	BTPSV-2	8	130	8.38	0.05	0	0
P-1275	1,130.15	J-789	J-763	20	130	52.38	0.05	0	0
P-330	269.30	J-178	J-247	4	130	-2.08	0.05	0	0
P-331	416.49	J-247	J-36	4	130	-2.08	0.05	0	0
P-134	1,555.47	J-113	J-114	10	130	8.38	0.03	0	0
P-1273	1,099.77	J-787	J-788	8	130	-5.03	0.03	0	0
P-1254	2,126.46	J-770	J-771	20	130	27.57	0.03	0	0
P-1247	1,512.30	J-763	J-764	20	130	25.18	0.03	0	0
P-1272	1,010.64	J-786	J-787	8	130	-1.86	0.01	0	0
P-319	1,109.24	J-1	J-2	4	130	0	0	0	0
P-1213	1,253.76	J-730	J-243	4	130	0.00	0	0	0
P-335	5.26	J-243	J-250	4	130	0.00	0	0	0
P-336	624.12	J-250	J-244	4	130	0.00	0	0	0
P-317	37.26	J-244	PSV-22	4	130	0.00	0	0	0
P-318	25.78	PSV-22	R-28	4	130	0.00	0	0	0
P-271	32.31	J-232	J-233	4	130	0.00	0	0	0
P-272	2,121.00	J-233	J-234	4	130	0.00	0	0	0
P-273	21.62	J-234	HLPSV-1	4	130	0.00	0	0	0
P-274	29.89	HLPSV-1	HLSP-1	4	130	0.00	0	0	0
P-321	90.63	PSV-23	R-29	6	130	0.00	0	0	0
P-320	68.45	J-1	PSV-23	6	130	0.00	0	0	0
P-355	91.08	LOPSV-1	LOSP-1	6	130	0.00	0	0	0
P-354	47.09	J-121	LOPSV-1	6	130	0	0	0	0
P-170	252.08	J-140	J-37	12	130	0.00	0	0	0
P-294	56.41	J-107	GCPSV-1	6	130	0	0	0	0
P-295	55.68	GCPSV-1	GCSP-1	6	130	0.00	0	0	0
P-297	100.11	MCPSV-1	MCSP-1	6	130	0.00	0	0	0
P-296	104.66	J-108	MCPSV-1	6	130	0.00	0	0	0
P-281	25.68	J-237	PUBPSV-1	6	130	0.00	0	0	0
P-282	44.06	PUBPSV-1	PUBSP-1	6	130	0	0	0	0
P-280	146.60	J-236	J-237	6	130	0	0	0	0
P-1212	643.57	J-159	J-730	6	130	0	0	0	0
P-195	211.47	J-735	J-140	12	130	0	0	0	0
P-194	151.38	J-736	J-735	12	130	0.00	0	0	0
P-186	137.84	J-139	J-736	12	130	0.00	0	0	0
P-265	95.10	J-229	J-230	8	130	0.00	0	0	0
P-266	3,644.71	J-230	J-231	8	130	0.00	0	0	0
P-268	51.79	VWPSV-1	VWSP-1	8	130	0	0	0	0
P-267	59.34	J-231	VWPSV-1	8	130	0	0	0	0
P-141	810.88	J-120	J-121	8	130	0.00	0	0	0
P-301	78.27	BTPSV-1	BTSP-1	8	130	0.00	0	0	0
P-300	47.87	J-118	BTPSV-1	8	130	0.00	0	0	0
P-138	772.38	J-117	J-118	8	130	0.00	0	0	0
P-263	35.52	ISPSV-1	ISSP-1	8	130	0.00	0	0	0
P-327	523.1	ISPSV-1	J-220	8	130	0.00	0	0	0
P-131	1,599.68	J-105	J-107	8	130	0	0	0	0
P-43	30.71	J-216	J-220	8	130	0	0	0	0
P-284	100.14	SPSV-1	SSP-1	8	130	0.00	0	0	0
P-132	1,406.22	J-106	J-108	8	130	0.00	0	0	0
P-118	475.85	J-91	J-93	8	130	0	0	0	0
P-119	243.20	J-93	J-94	8	130	0	0	0	0
P-283	72.21	J-94	SPSV-1	8	130	0	0	0	0
P-241	201.76	J-48	J-171	4	130	0	0	0	0
P-242	220.81	J-49	J-172	4	130	0	0	0	0
P-161	2,592.91	J-129	J-130	8	130	0.00	0	0	0
P-298	93.32	J-130	SGCPSV-1	8	130	0	0	0	0
P-299	123.96	SGCPSV-1	SGCSP-1	8	130	0	0	0	0
P-176	1,228.09	PSBR2_7	J-141	10	130	0	0	0	0
P-177	921.43	PSBR2_6	J-141	10	130	0	0	0	0
P-178	966.38	PSBR2_5	J-141	10	130	0	0	0	0
P-182	250.63	PSCC1_3	J-725	12	130	0.00	0	0	0
P-1197	948.37	PSCC1_2	J-725	12	130	0.00	0	0	0

Label	Length (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-353	1,524.61	PSBR2_8	J-141	10	130	0.00	0	0	0
P-277	26.82	RHPSV-1	RHSP-1	8	130	0.00	0	0	0
P-276	23.31	J-235	RHPSV-1	8	130	0.00	0	0	0
P-1209	1,063.19	PSBR1_4	J-141	10	130	0.00	0	0	0
P-233	240.82	J-141	J-165	24	130	0	0	0	0
P-200	565.78	PXNSP_1	PSPXN1_1	12	130	0	0	0	0
P-203	1,042.98	PXNSP_1	PSPXN1_2	12	130	0	0	0	0
P-204	1,755.42	PXNSP_1	PSPXN1_3	12	130	0	0	0	0
P-197	178.47	J-799	PXNSP_1	12	130	0.00	0	0	0
P-168	438.2	J-139	PSPXN1_1	12	130	0	0	0	0
P-169	498.67	J-139	PSPXN1_2	12	130	0	0	0	0
P-341	164.94	J-254	J-255	6	130	0.00	0	0	0
P-104	77.00	J-75	J-78	8	130	0	0	0	0
P-1198	198.20	J-725	J-143	24	130	0	0	0	0
P-37	2.02	J-210	J-211	8	130	0	0	0	0
P-198	936.11	PSPXN1_3	J-139	12	130	0	0	0	0
P-352	922.95	J-262	PSBR2_8	16	130	0	0	0	0
P-172	913.75	J-262	PSBR2_7	16	130	0	0	0	0
P-173	995.15	J-262	PSBR2_6	16	130	0	0	0	0
P-175	1,112.74	J-262	PSBR2_5	16	130	0	0	0	0
P-212	100.81	J-138	J-153	6	130	0	0	0	0
P-1205	386.69	CCSP_1	J-727	30	130	0	0	0	0
P-174	1,089.14	J-151	PSBR1_4	24	130	0	0	0	0
P-258	887.66	BRSP_1	J-262	48	130	0	0	0	0
P-206	189.64	J-727	PSCC1_3	30	130	0.00	0	0	0
P-1202	900.45	J-727	PSCC1_2	30	130	0.00	0	0	0
P-1248	4,063.72	J-764	J-765	20	130	0.00	0	0	0
P-337	486.84	J-80	J-251	6	130	0.00	0	0	0
P-339	40.20	J-251	J-253	6	130	0.00	0	0	0
P-338	36.81	J-251	J-252	6	130	0.00	0	0	0
P-103	77.45	J-76	J-77	6	130	0.00	0	0	0
P-135	317.98	J-114	J-116	8	130	0	0	0	0
P-344	107.66	J-256	J-257	6	130	0.00	0	0	0
P-136	167.85	J-116	J-115	6	130	0.00	0	0	0
P-332	92.54	J-44	J-248	4	130	0.00	0	0	0
P-75	1,180.73	J-41	J-45	6	130	0	0	0	0
P-76	2,043.41	J-45	J-46	6	130	0	0	0	0
P-196	608.42	J-799	J-140	12	130	0	0	0	0
P-1291	663.4	J-165	R-36	90	130	0	0	0	0
P-1308	726.81	J-150	J-808	16	130	0	0	0	0

2032 Max Month Average Daily Flow - with Deficiency Improvements

Junction Report

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-151	29	0	39.42	4.5
J-799	16	0	34	7.8
J-262	1	0	31	13
J-728	20.94	0	54.73	14.6
J-727	20.41	0	55	15
J-242	26.73	0	92.21	28.3
J-235	33.51	439.87	119.69	37.3
J-806	22	0	108.44	37.4
J-150	22.09	0	109.73	37.9
J-751	41.11	177.19	133.77	40.1
J-156	21.29	0	115.93	40.9
J-209	32.9	0	128.48	41.3
J-752	23.69	212.82	119.42	41.4
J-130	31.79	0	129.13	42.1
J-158	20.36	67.46	117.95	42.2
J-742	28.68	0	126.51	42.3
J-784	26.25	60.52	124.85	42.6
J-741	29.73	0	129.03	42.9
J-750	36.31	61.38	135.63	43
J-743	19.65	125.71	119.4	43.1
J-740	30.43	0	130.66	43.3
J-48	27	218.47	127.32	43.4
J-185	37.95	0	138.81	43.6
J-63	26	5.85	127.05	43.7
J-208	36.99	0.00	138.45	43.9
J-791	25.43	2.04	127.08	44
J-171	25.66	0	127.32	44
J-84	37.29	25.07	139.02	44
J-86	37.19	0	139.17	44.1
J-234	35.33	0	137.88	44.3
J-61	24.52	3.45	127.17	44.4
J-87	35.65	0	138.45	44.5
J-136	26.93	2.49	129.82	44.5
J-246	23.2	3.08	126.18	44.5
J-85	34.51	21.74	137.66	44.6
J-60	22.46	26.81	125.73	44.7
J-184	34.77	0	138.58	44.9
J-88	34.22	205.45	138.06	44.9
J-181	34.9	0	138.85	45
J-49	28.08	61.17	132.15	45
J-160	21.8	0	125.9	45
J-193	34.65	0	138.92	45.1
J-182	34.28	0	138.67	45.1
J-233	33.44	0	137.88	45.2
J-749	33.47	36.32	138.02	45.2
J-129	24.31	0	129.13	45.3
J-159	27.44	0	132.57	45.5
J-198	33.85	0	139.11	45.5
J-202	34.11	0	139.37	45.5
J-747	33.32	0	138.79	45.6
J-187	33.26	0	139.17	45.8
J-180	33.49	0	139.67	45.9
J-172	25.97	0	132.15	45.9
J-203	34.35	0	140.61	46
J-205	32.91	0	139.36	46
J-204	32.37	0	138.82	46
J-83	33.2	0	139.72	46.1
J-192	34.52	0	141.73	46.4
J-232	30.64	23.92	137.88	46.4
J-748	31.29	0	138.54	46.4
J-730	25.28	0	132.57	46.4
J-161	33.45	10.21	140.79	46.4

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-191	33.99	0	141.37	46.4
J-237	30.34	0	137.85	46.5
J-82	32.62	0	140.13	46.5
J-162	24.03	0	133.4	47.3
J-155	26.51	38.51	136.16	47.4
J-783	15.04	135.54	124.86	47.5
J-243	22.61	0	132.57	47.6
J-250	22.6	0	132.57	47.6
J-249	33.06	0	143.09	47.6
J-236	27.79	0	137.85	47.6
J-89	27.26	44.18	137.46	47.7
J-92	28.88	20.61	139.34	47.8
J-164	23.6	0	134.13	47.8
J-780	23.82	83.75	135	48.1
J-244	21.35	0	132.57	48.1
J-777	25.08	57.1	137.1	48.4
J-776	24.4	12.11	136.67	48.6
J-81	32.73	13.81	145.46	48.7
J-775	23.2	200.54	136.15	48.8
J-93	26.85	0	140.09	49
J-735	34	0	148.36	49.5
J-736	34	0	148.36	49.5
J-779	20.71	0	135.13	49.5
J-108	36.05	0	150.49	49.5
J-154	22.32	10.24	136.8	49.5
J-183	30.46	0	145.02	49.5
J-753	22.45	178.96	137.14	49.6
J-80	31	26.11	145.78	49.6
J-252	30.93	0	145.78	49.7
J-266	18.71	0	133.61	49.7
J-190	30.1	0	145.27	49.8
J-253	30.42	0	145.78	49.9
J-251	30.16	0	145.78	50
J-773	19.79	197.82	135.51	50
J-106	34.67	0	150.49	50.1
J-774	19.83	200.07	135.71	50.1
J-135	32.19	0	148.11	50.1
J-782	9.22	50.7	125.23	50.2
J-789	19.5	0	135.61	50.2
J-761	19.07	9.22	135.61	50.4
J-188	29.66	0	146.21	50.4
J-189	29.58	0	146.38	50.5
J-762	18.67	1.15	135.61	50.6
J-91	23.12	0	140.09	50.6
J-778	18.17	0	135.2	50.6
J-47	29.73	2.06	147.2	50.8
J-104	23.52	0	141.26	50.9
J-197	29.09	0	146.88	50.9
J-785	8.38	129.33	126.26	51
J-772	17.48	199.37	135.37	51
J-245	25.03	61.22	142.92	51
J-102	25.03	0	142.99	51
J-140	30.19	0	148.36	51.1
J-107	26.45	0	144.63	51.1
J-103	23.53	0	141.76	51.1
J-94	21.62	0	140.09	51.2
J-90	21.45	16.73	139.96	51.2
J-770	16.72	81.13	135.35	51.3
J-37	29.68	0	148.36	51.3
J-771	16.65	157.49	135.35	51.3
J-220	22.6	0	141.41	51.4
J-781	14.83	125.89	133.75	51.4
J-200	28.8	0	147.93	51.5
J-134	31.71	879.28	150.85	51.5

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-769	16.21	202.85	135.36	51.5
J-760	16.12	0	135.62	51.7
J-216	21.74	0	141.41	51.7
J-768	15.72	26.87	135.46	51.8
J-105	24.61	0	144.63	51.9
J-757	15.55	35.62	135.85	52
J-95	21.19	0	141.64	52.1
J-758	15.2	0	135.66	52.1
J-195	27.96	0	148.51	52.1
J-194	28.28	0	148.95	52.2
J-767	14.63	200.35	135.49	52.3
J-786	14.62	33.9	135.58	52.3
J-186	28.59	0	149.74	52.4
J-157	18.24	0	139.43	52.4
J-226	21.8	0	143.14	52.5
J-128	31.73	0	153.25	52.5
J-756	14.28	11.67	136.05	52.7
J-214	21.27	0.00	143.15	52.7
J-213	21.26	0	143.15	52.7
J-765	13.66	0	135.61	52.7
J-199	28.19	0	150.46	52.9
J-96	19.64	0	141.91	52.9
J-759	13.23	83.94	135.63	52.9
J-97	19.5	312.78	142.14	53
J-763	12.94	27.2	135.61	53
J-764	12.9	25.18	135.61	53.1
J-122	33.32	0	156.67	53.3
J-196	28.36	0	152.31	53.6
J-125	32.63	0	156.63	53.6
J-754	15.93	182.2	139.99	53.7
J-755	14.78	77.22	138.85	53.7
J-98	20.74	0	144.86	53.7
J-788	11.22	9.3	135.58	53.8
J-123	30.74	0	155.55	54
J-787	10.74	3.17	135.58	54
J-127	30.92	304.5	155.77	54
J-131	33.44	0	158.67	54.2
J-228	17.89	0	143.13	54.2
J-124	31.09	0	156.35	54.2
J-210	15.99	14.3	143.12	55
J-211	15.84	0	143.12	55
J-116	36.01	0	163.47	55.1
J-109	32.63	0	160.27	55.2
J-737	20.38	0	148.54	55.4
J-101	18.5	0	146.71	55.4
J-139	20.1	0	148.36	55.5
J-100	19.54	0	147.97	55.5
J-206	26.48	18.32	155.05	55.6
J-118	34.4	0	163.47	55.8
J-114	33.98	0	163.47	56
J-120	32.49	0	162.44	56.2
J-126	26.6	5.57	156.94	56.4
J-121	31.97	0	162.44	56.4
J-117	32.94	0	163.47	56.4
J-132	28.83	0	160.13	56.8
J-99	19.5	0	151.22	57
J-207	25.64	18.25	157.43	57
J-168	22.18	0	154.19	57.1
J-265	16.2	0	148.91	57.4
J-790	26.07	11.06	158.81	57.4
J-169	22.36	0.00	155.34	57.5
J-41	22.7	0	156.23	57.7
J-115	29.68	0	163.47	57.9
J-39	19.92	200.33	153.73	57.9

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-201	26.04	237.86	159.9	57.9
J-46	22.21	0	156.23	58
J-38	18.72	0	152.98	58.1
J-254	22.85	0	157.76	58.3
J-255	22.85	0	157.76	58.3
J-256	22.86	0	157.83	58.4
J-257	22.86	0	157.83	58.4
J-170	22.87	197.25	158	58.4
J-113	28.29	0	163.47	58.5
J-259	30.94	0	166.18	58.5
J-110	31.18	0	166.66	58.6
J-260	19.66	0	155.54	58.8
J-65	20.03	152.33	156.27	58.9
J-45	19.9	0	156.23	59
J-240	27.19	0	163.61	59
J-144	4.8	2,172.42	141.37	59.1
J-112	25.2	5.85	161.85	59.1
J-119	26.71	0	163.46	59.1
J-1	17.79	0	155.37	59.5
J-238	16.85	0	155.04	59.8
J-239	25.33	0	163.64	59.8
J-111	29.24	0	168.43	60.2
J-59	21.21	0	161.51	60.7
J-267	15.81	0	156.28	60.7
J-2	14.87	0	155.37	60.8
J-142	28.15	0	168.75	60.8
J-176	19.56	0	160.24	60.8
J-258	21.17	0	162.1	60.9
J-167	26.56	0	167.7	61
J-141	29	0	170.36	61.1
J-165	29	0	170.36	61.1
J-146	14.72	41.07	156.25	61.2
J-218	19.75	0	161.6	61.3
J-219	19.72	0	161.58	61.3
J-217	19.65	0	161.61	61.4
J-166	28.21	0	170.29	61.4
J-231	22.91	0	165.39	61.6
J-241	18.54	0	161.42	61.8
J-225	19.76	0	162.96	61.9
J-230	21.94	0	165.39	62
J-229	21.79	0	165.39	62.1
J-221	18.03	0	162.25	62.4
J-222	18.08	0	162.37	62.4
J-227	21.2	0	165.72	62.5
J-224	18.59	0	163.35	62.6
J-145	6.69	9.52	151.65	62.7
J-215	18.58	0	163.96	62.9
J-212	18.4	233.41	163.96	62.9
J-264	16.7	0	162.77	63.2
J-40	21.81	56.37	168.17	63.3
J-223	17.5	0	164.26	63.5
J-177	18.8	471.19	166.51	63.9
J-174	18.55	0	167.17	64.3
J-179	20.64	1.49	170.09	64.6
J-147	14.1	0	163.73	64.7
J-57	21.19	13.23	171.2	64.9
J-263	17.92	0	169.22	65.4
J-56	20.75	0	173.85	66.2
J-55	20.6	0	177.51	67.9
J-148	21.08	0	178.15	67.9
J-43	22.88	124.09	180.58	68.2
J-58	21.2	6.66	179	68.2
J-33	20.14	0	179.02	68.7
J-42	21.15	0	180.65	69

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-137	19.38	0	179.03	69
J-34	20.66	0	180.52	69.1
J-133	18.58	0	179.01	69.4
J-3	14.88	0	176.17	69.7
J-64	21.87	0	183.49	69.9
J-21	18.56	79.84	180.81	70.2
J-22	19.63	0	182.63	70.5
J-23	19.61	114.22	183.5	70.9
J-32	19.4	18.35	184.54	71.4
J-248	21	0	186.97	71.8
J-44	20.88	23.04	186.97	71.8
J-138	18.98	0	185.49	72
J-153	18.84	21.96	185.49	72.1
J-5	14.44	0	182.86	72.8
J-50	20.02	72.21	188.48	72.8
J-24	20.11	0	188.75	72.9
J-25	21.24	79.01	189.94	73
J-731	18.07	0	187	73.1
J-30	21.5	13.28	190.67	73.2
J-11	17.32	0.45	187.02	73.4
J-10	17.01	0	187.04	73.5
J-26	21.74	0	191.9	73.6
J-149	14.05	0	185.18	74
J-27	21.43	46.54	193.13	74.2
J-4	9.98	0	181.81	74.3
J-53	10.48	72.64	183.2	74.7
J-7	12.66	18.84	185.82	74.9
J-6	11.59	0	184.98	75
J-9	15.9	0	190.72	75.6
J-52	13.98	0	188.86	75.6
J-70	16.77	0	192.46	76
J-173	20.89	0	196.73	76
J-28	21.96	46.35	197.98	76.1
J-8	15.17	0	191.19	76.1
J-78	14.83	0	191.08	76.2
J-77	14.81	0	191.11	76.2
J-67	15.9	0	192.3	76.3
J-15	18.54	56.37	195.23	76.4
J-79	21.05	0	197.96	76.5
J-31	19.42	0	196.39	76.5
J-72	15.38	72.31	192.36	76.5
J-261	12.94	0	190	76.6
J-75	13.98	165.62	191.08	76.6
J-76	13.93	0	191.11	76.6
J-29	20.72	55.86	198.07	76.7
J-16	23.23	25.71	200.67	76.7
J-19	21.5	0	199.06	76.8
J-71	15.96	0	193.53	76.8
J-66	14.57	19.57	192.15	76.8
J-74	13.12	0	191.46	77.1
J-14	16.34	63.7	194.8	77.2
J-68	16.57	0	195.29	77.3
J-12	12.81	13.67	191.65	77.3
J-73	13.2	0	192.05	77.3
J-69	12.63	0	191.92	77.5
J-175	19.2	0	199.97	78.2
J-13	13.89	0	194.69	78.2
J-20	19.44	0	204.16	79.9
J-17	23.76	126.65	210.26	80.6
J-62	23.06	0	210.17	80.9
J-793	22.16	6.66	210.08	81.3
J-796	22.04	73.54	210.04	81.3
J-797	21.86	139.05	210.03	81.4
J-35	21.85	5.47	210.06	81.4

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-792	20.07	1.14	210.03	82.1
J-178	20.02	2.08	210	82.2
J-247	19.3	0	210	82.5
J-808	21.12	0	211.99	82.5
J-807	22	0	213.22	82.7
J-36	18.19	5.9	210	82.9
J-738	20.41	0	212.31	83
J-733	14.5	0	206.86	83.2
J-725	20	0	212.36	83.2
J-726	20	0	212.37	83.2
J-732	17.33	0	210.21	83.4
J-54	17.14	0	210.05	83.4
J-18	17.57	0	210.58	83.5
J-143	18.2	0	212.36	84
J-51	17	0	212.18	84.4

2032 Max Month Average Daily Flow - with Deficiency Improvements

Pump Report

Label	Elevation (ft)	Pump Definition	Status (Initial)	Flow (gal/min)	Pressure (Discharge) (psi)
PSCC1_5	29	PSCC1_4-5	On	3,991.64	79.5
PSCC1_4	29	PSCC1_4-5	On	3,983.07	79.9
PMP-42	22	Proposed BPS	On	3,065.76	83.5
PSBR1_3	29	PSBR1_1-3	On	2,584.35	65.7
PSBR1_2	29	PSBR1_1-3	On	2,584.35	65.7
PSBR1_1	29	PSBR1_1-3	On	2,584.35	65.7
PSCC1_2	29	PSCC1_2-3	Off	0.00	79.3
PSCC1_3	29	PSCC1_2-3	Off	0.00	79.3
PSPXN1_1	34	PSCC1_2-3	Off	0	49.5
PSPXN1_2	34	PSCC1_2-3	Off	0	49.5
PSBR2_7	29	PSBR2_5-8	Off	0	61.1
PSBR2_6	29	PSBR2_5-8	Off	0	61.1
PSBR2_5	29	PSBR2_5-8	Off	0	61.1
PSBR1_4	29	PSBR1_4	Off	0	61.1
PSPXN1_3	34	PSCC1_2-3	Off	0	49.5
PSBR2_8	29	PSBR2_5-8	Off	0	61.1

2032 Max Month Average Daily Flow - with Deficiency Improvements

Reservior Report

Label	Elevation (ft)	Flow (gal/min)*	Notes
BRSP_1	31	0.00	Bee Ridge WRF seasonal pond
BTSP-1	38.61	0.00	Bent Tree Golf Course 1
BTSP-2	26.71	9.16	Bent Tree Golf Course 2
CCSP_1	55	-7,974.71	Central County WRF pond (19.6 MG)
ETSP-1	26.28	287.24	Eagle Trace
FCSP-1	36.63	271.07	Founder's Golf Club
FCSP-2	36.28	402.22	Founder's Club Development
GCSP-1	25.75	0	Gator Creek Golf Course
GSP-1	23.35	388	Longmeadow (No Meter No.)
HLSP-1	34.87	0.00	Preserve at Heron Lake
HOSP-1	33.44	551.23	Heritage Oaks
ISSP-1	21.5	0	Isles of Sarasota
LOSP-1	32	0.00	Laurel Oaks GC Pond
LOSP-2	31	296.45	Laurel Oaks GC Pond
MCSP-1	35.33	0	Misty Creek
OSP-1	18.16	810.06	Oaks Golf Course
PSP-1	18.51	453.82	Prestancia
PUBSP-1	27.41	0	Publix
PXNSP_1	34	0	36 MG Parcel X north pond
R-28	22.5	0	Miss Sarasota Softball
R-29	17.68	0	Oaks I (not in use)
R-36	237	0	
RHSP-1	33.8	0	Foxfire Golf Club
SBSP-1	18.5	373.06	Stoneybrook GC Pond
SGCSP-1	31.97	0	Sarasota Golf Course
SSP-1	24.6	0	Serenoa
VWSP-1	21.13	0	Village Walk
VWSP-2	17.72	194.59	Village Walk

*Negative is withdraw and positive is filling.

2032 Max Month Average Daily Flow - with Deficiency Improvements

Pressure Sustaining Valve Report

Label	Elevation (ft)	Diameter (Valve) (in)	Upstream Pressure (psi)	Pressure Setting (psi)	Flow (gal/min)	Headloss (ft)	Notes	Status (Initial)
OPSV-1	16.16	6	60	60	810.06	136.59	Oaks Golf Course	Active
HOPSV-1	31.44	6	55	55	551.23	125.12	Heritage Oaks	Active
PPSV-1	16.51	6	70	70	453.82	158.21	Prestancia	Active
FCPSV-2	34.28	6	45	45	402.22	101.92	Founder's Club Development	Active
GPSV-1	21.35	6	30	30	388	65.17	Longmeadow (No Meter No.)	Active
SBPSV-1	16.5	6	50	50	373.06	113.14	Stoneybrook GC	Active
LOPSV-2	29	6	55	55	296.45	124.85	Laurel Oaks GC	Active
ETPSV-1	24.28	2	59.6	55	287.24	133.6	Eagle Trace	Active
FCPSV-1	34.63	6	45	45	271.07	101.99	Founder's Golf Club	Active
VWPSV-2	15.72	6	63	63	194.59	143.65	Village Walk	Active
BTPSV-2	24.71	6	60	60	9.16	136.75	Bent Tree Golf Course 2	Active
ISPSV-1	19.5	6	52.7	65	0	0	Isles of Sarasota	Active
VWPSV-1	19.13	6	63.2	65	0	0	Village Walk	Active
HLPSV-1	32.87	4	45.4	52	0	0	Preserve at Heron Lake	Active
RHPSV-1	31.8	6	38	56	0	0	Foxfire Golf Club	Active
PUBPSV-1	25.41	6	48.6	64	0	0	Publix	Active
SPSV-1	22.6	6	50.8	68	0	0	Serenoa	Active
GCPSV-1	23.75	6	52.3	59	0	0	Gator Creek Golf Course	Active
MCPSV-1	33.33	6	50.7	55	0	0	Misty Creek	Active
SGCPSV-1	29.97	6	42.9	52	0	0	Sarasota Golf Course	Active
BTPSV-1	36.61	6	54.9	55	0	0	Bent Tree Golf Course 1	Active
PSV-22	20.5	4	48.5	55	0	0	Miss Sarasota Softball	Closed
PSV-23	15.68	6	60.4	55	0	0	Oaks I (not in use)	Closed
LOPSV-1	30	6	57.3	52	0	0	Laurel Oaks GC	Closed

APPENDIX N

HYDARULIC MODEL RESULTS – BUILD-OUT AVERAGE ANNUAL DAILY FLOW WITH DEFICIENCY IMPROVEMENTS

Build-Out Average Annual Daily Flow - with Deficiency Improvements

Pipe Report

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1200	951.07	J-726	PSCC1_5	12	130	-3,838.53	10.89	0.031	0.38
P-226	1,464.16	PSBR1_3	J-165	10	130	2,664.33	10.88	0.559	11.18
P-227	1,779.58	PSBR1_2	J-165	10	130	2,664.33	10.88	0.559	11.18
P-230	2,201.99	PSBR1_1	J-165	10	130	2,664.33	10.88	0.559	11.18
P-183	272.49	PSCC1_4	J-726	12	130	3,830.59	10.87	0.092	1.37
P-1193	352.68	J-51	J-738	24	130	-11,110.32	7.88	0.007	0.24
P-1194	163.62	J-738	J-143	24	130	-11,110.32	7.88	0.007	0.1
P-315	172.31	GPSV-1	GSP-1	6	130	679.85	7.71	0.036	6.24
P-313	1,846.15	J-156	J-242	6	130	679.65	7.71	0.036	66.96
P-314	116.41	J-242	GPSV-1	6	130	679.65	7.71	0.036	4.21
P-59	444.73	J-18	J-51	24	130	-10,474.74	7.43	0.007	2.99
P-1218	4,386.88	J-731	J-732	12	130	-2,498.66	7.09	0.014	60.62
P-1211	207.30	J-162	J-159	10	130	1,707.80	6.98	0.017	3.44
P-165	68.09	J-137	J-34	6	130	-595.27	6.75	0.035	2.4
P-305	97.33	PPSV-1	PSP-1	6	130	589.28	6.69	0.028	2.7
P-304	37.87	J-137	PPSV-1	6	130	588.62	6.68	0.028	1.06
P-1219	644.26	BRGST_1	J-151	24	130	8,996.93	6.38	0.005	0.76
P-234	334.31	J-165	J-166	24	130	8,996.93	6.38	0.011	0.09
P-235	596.22	J-166	J-142	24	130	8,996.93	6.38	0.005	2.03
P-254	456.47	J-54	J-733	18	130	4,844.73	6.11	0.011	4.93
P-255	1,527.60	J-733	J-19	18	130	4,844.73	6.11	0.008	11.93
P-68	116.16	J-19	J-29	14	130	2,825.43	5.89	0.011	1.22
P-57	2,677.39	J-16	J-17	14	130	-2,823.59	5.88	0.009	22.97
P-69	1,155.67	J-29	J-30	14	130	2,769.57	5.77	0.008	9.12
P-74	551.63	J-44	J-30	14	130	-2,756.29	5.74	0.008	4.57
P-67	200.38	J-28	J-19	12	130	-2,019.29	5.73	0.012	2.37
P-89	399.84	J-42	J-64	14	130	-2,733.25	5.7	0.009	3.51
P-90	513.67	J-64	J-44	14	130	-2,733.25	5.7	0.008	4.31
P-243	893.43	J-27	J-173	12	130	-1,972.94	5.6	0.009	7.97
P-244	310.73	J-173	J-28	12	130	-1,972.94	5.6	0.009	2.77
P-65	502.5	J-25	J-26	12	130	-1,926.40	5.46	0.009	4.45
P-66	289.68	J-26	J-27	12	130	-1,926.40	5.46	0.01	2.8
P-1199	289.64	J-726	J-143	24	130	7,669.12	5.44	0.004	0.01
P-81	402.26	J-55	J-42	14	130	-2,609.16	5.44	0.01	3.95
P-82	588.71	J-56	J-55	14	130	-2,609.16	5.44	0.008	4.58
P-83	468.62	J-57	J-56	14	130	-2,609.16	5.44	0.007	3.31
P-257	167.37	J-179	J-57	14	130	-2,595.93	5.41	0.008	1.4
P-256	311.22	J-40	J-179	14	130	-2,594.44	5.41	0.008	2.4
P-1236	919.70	J-90	J-753	6	130	471.94	5.36	0.018	16.98
P-1216	179.99	J-18	J-732	24	130	7,476.25	5.3	0.004	0.65
P-133	1,059.21	J-110	J-111	20	130	-5,143.00	5.25	0.005	4.86
P-64	312.25	J-24	J-25	12	130	-1,847.39	5.24	0.009	2.86
P-63	1,741.70	J-23	J-24	12	130	-1,775.18	5.04	0.007	13.02
P-1197	948.37	PSCC1_2	J-725	12	130	1,720.67	4.88	0.023	0.26
P-182	250.63	PSCC1_3	J-725	12	130	1,720.53	4.88	0.019	0.29
P-106	778.84	J-79	J-16	14	130	-2,265.18	4.72	0.006	4.44
P-61	729.69	J-21	J-22	12	130	-1,660.97	4.71	0.007	4.93
P-62	361.87	J-22	J-23	12	130	-1,660.97	4.71	0.006	2.35
P-216	1,566.97	J-159	J-160	8	130	724.07	4.62	0.01	15.74
P-217	1,867.61	J-160	J-158	8	130	724.07	4.62	0.01	18.76
P-279	997.12	J-236	J-47	6	130	-401.16	4.55	0.014	13.95
P-278	598.94	J-49	J-236	6	130	-401.16	4.55	0.014	8.51
P-215	638.09	J-158	J-156	8	130	679.65	4.34	0.009	5.7
P-1237	3,026.84	J-216	J-754	20	130	4,114.63	4.2	0.003	8.75
P-11	531.00	J-112	J-201	12	130	1,478.57	4.19	0.005	2.78
P-1209	1,063.19	PSBR1_4	J-141	10	130	1,003.93	4.1	0.08	1.6
P-50	329.06	J-8	J-9	10	130	1,003.45	4.1	0.007	2.14
P-51	2,653.52	J-9	J-10	10	130	1,003.45	4.1	0.006	16.51
P-84	1,825.02	J-40	J-59	12	130	1,438.27	4.08	0.005	9.18
P-240	975.11	J-170	J-59	12	130	-1,438.27	4.08	0.005	4.84
P-60	1,550.39	J-51	J-20	8	130	635.58	4.06	0.008	12.47
P-210	2,114.21	J-31	J-153	8	130	635.58	4.06	0.008	16.95

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-249	806.40	J-20	J-175	8	130	635.58	4.06	0.008	6.51
P-250	688.1	J-175	J-31	8	130	635.58	4.06	0.008	5.58
P-211	170.62	J-153	J-32	8	130	613.62	3.92	0.009	1.51
P-53	214.18	J-8	J-12	14	130	-1,873.93	3.91	0.004	0.84
P-163	366.44	J-136	J-49	6	130	-339.99	3.86	0.01	3.77
P-70	831.31	J-34	J-32	8	130	-595.27	3.8	0.008	6.49
P-162	392.38	J-48	J-136	6	130	-333.43	3.78	0.01	3.98
P-1238	3,090.59	J-754	J-755	20	130	3,634.14	3.71	0.002	7.1
P-180	421.55	J-111	J-142	24	130	-5,143.00	3.65	0.002	0.91
P-1292	109.21	J-110	J-800	20	130	3,568.04	3.64	0.002	0.24
P-1261	1,504.01	J-777	J-89	20	130	-3,555.82	3.63	0.002	3.32
P-105	1,305.86	J-15	J-79	14	130	-1,735.29	3.62	0.003	4.53
P-342	28.61	J-254	J-257	12	130	-1,241.02	3.52	0.004	0.11
P-343	64.15	J-257	J-170	12	130	-1,241.02	3.52	0.004	0.24
P-340	589.31	J-41	J-254	12	130	-1,241.02	3.52	0.004	2.23
P-1239	8,409.87	J-755	J-756	20	130	3,430.49	3.5	0.002	17.36
P-56	223.23	J-14	J-15	14	130	-1,678.92	3.5	0.003	0.73
P-1206	432.67	CCSP_1	J-728	30	130	7,669.12	3.48	0.001	0.25
P-1260	1,928.18	J-776	J-777	20	130	-3,405.24	3.48	0.002	3.93
P-363	41.24	SBPSV-1	SBSP-1	6	130	305.73	3.47	0.008	0.34
P-358	1,490.15	J-11	J-263	6	130	305.30	3.46	0.008	12.28
P-359	539.78	J-263	J-264	6	130	305.30	3.46	0.008	4.45
P-361	1,280.99	J-265	J-266	6	130	305.30	3.46	0.008	10.56
P-362	123.53	J-266	SBPSV-1	6	130	305.30	3.46	0.008	1.02
P-1259	2,423.65	J-775	J-776	20	130	-3,373.30	3.44	0.002	4.85
P-1217	146.49	J-732	J-54	24	130	4,844.73	3.44	0.002	0.24
P-54	1,738.66	J-12	J-13	14	130	-1,615.22	3.37	0.003	5.28
P-55	65.77	J-13	J-14	14	130	-1,615.22	3.37	0.003	0.2
P-1311	8,412.83	J-731	J-216	20	130	3,226.88	3.3	0.002	15.51
P-245	2,111.17	J-21	J-174	14	130	1,550.61	3.23	0.003	5.82
P-253	52.79	J-174	J-177	14	130	1,550.61	3.23	0.005	0.27
P-287	38.15	OPSV-1	OSP-1	10	130	780.06	3.19	0.004	0.15
P-46	1,295.61	J-3	J-4	10	130	-778.99	3.18	0.004	5.24
P-247	973.78	J-2	J-176	10	130	-778.99	3.18	0.005	4.52
P-248	3,626.88	J-176	J-3	10	130	-778.99	3.18	0.004	14.81
P-285	79.98	J-2	J-238	10	130	778.99	3.18	0.004	0.31
P-286	30.42	J-238	OPSV-1	10	130	778.99	3.18	0.004	0.12
P-308	208.82	J-240	ETPSV-1	6	130	279.07	3.17	0.007	1.46
P-309	298.49	ETPSV-1	ETSP-1	6	130	279.07	3.17	0.007	2.08
P-264	966.82	J-229	J-40	12	130	-1,099.81	3.12	0.003	3.13
P-345	2,098.11	J-65	J-258	12	130	-1,099.81	3.12	0.003	6.55
P-346	1,154.15	J-258	J-229	12	130	-1,099.81	3.12	0.003	3.69
P-1305	260.02	J-150	J-806	16	130	1,836.41	2.93	0.002	0.5
P-1306	355.76	J-806	PMP-42	16	130	1,836.41	2.93	0.002	0.68
P-1307	365.97	PMP-42	J-807	16	130	1,836.41	2.93	0.002	0.7
P-1310	249.42	J-807	J-808	16	130	1,836.41	2.93	0.002	0.48
P-149	4,739.39	J-128	J-129	16	130	1,836.41	2.93	0.002	9.32
P-189	1,453.61	J-147	J-146	16	130	1,836.41	2.93	0.002	2.89
P-190	2,810.26	J-148	J-147	16	130	1,836.41	2.93	0.002	5.57
P-191	1,287.71	J-149	J-148	16	130	1,836.41	2.93	0.002	2.7
P-193	3,742.59	J-129	J-150	16	130	1,836.41	2.93	0.002	7.49
P-1309	5,281.23	J-808	J-149	16	130	1,836.41	2.93	0.002	10.36
P-1258	3,093.95	J-774	J-775	20	130	-2,844.45	2.9	0.001	4.51
P-238	343.12	J-41	J-169	12	130	1,022.73	2.9	0.003	0.91
P-239	447.17	J-169	J-168	12	130	1,022.73	2.9	0.003	1.18
P-246	2,693.65	J-168	J-47	12	130	1,022.73	2.9	0.003	7.12
P-188	828.32	J-146	J-145	16	130	1,810.74	2.89	0.002	1.76
P-1214	898.24	J-10	J-731	10	130	697.71	2.85	0.003	2.89
P-187	2,076.69	J-145	J-144	16	130	1,785.64	2.85	0.002	3.89
P-214	5,780.24	J-157	J-154	16	130	1,785.64	2.85	0.002	10.56
P-231	4,275.38	J-144	J-157	16	130	1,785.64	2.85	0.002	7.81
P-213	1,433.37	J-154	J-155	16	130	1,731.87	2.76	0.002	2.47
P-155	2,594.59	J-167	J-239	24	130	3,853.93	2.73	0.001	2.73
P-236	633.30	J-142	J-167	24	130	3,853.93	2.73	0.001	0.71

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-220	1,786.32	J-162	J-164	16	130	-1,707.80	2.73	0.002	3
P-221	4,995.77	J-164	J-155	16	130	-1,707.80	2.73	0.002	8.4
P-91	1,202.37	J-39	J-65	12	130	-947.48	2.69	0.002	2.91
P-349	1,467.47	J-212	J-260	12	130	925.46	2.63	0.002	3.22
P-350	2,160.20	J-260	J-213	12	130	925.46	2.63	0.002	4.74
P-1232	1,860.92	J-749	J-750	10	130	629.16	2.57	0.003	4.86
P-306	1,005.45	J-239	J-112	24	130	3,574.86	2.54	0.001	1.17
P-1293	15,037.37	J-800	J-89	24	130	3,568.04	2.53	0.001	13.74
P-41	307.75	J-213	J-216	12	130	887.75	2.52	0.002	0.63
P-79	531.25	J-52	J-261	12	130	-870.47	2.47	0.002	1.06
P-351	559.16	J-261	J-8	12	130	-870.47	2.47	0.002	1.12
P-1198	198.20	J-725	J-143	24	130	3,441.20	2.44	0.014	0.05
P-12	999.90	J-201	J-207	12	130	851.31	2.41	0.002	1.88
P-72	586.36	J-38	J-39	12	130	-822.28	2.33	0.002	1.07
P-124	1,358.86	J-99	J-38	12	130	-822.28	2.33	0.002	2.5
P-251	109.32	J-37	J-737	12	130	-822.28	2.33	0.002	0.26
P-252	2,116.11	J-737	J-99	12	130	-822.28	2.33	0.002	3.8
P-123	2,144.31	J-97	J-98	12	130	-822.27	2.33	0.002	3.86
P-125	311.32	J-100	J-37	12	130	-822.27	2.33	0.002	0.55
P-126	974.36	J-100	J-101	12	130	822.27	2.33	0.002	1.79
P-185	1,473.78	J-98	J-101	12	130	-822.27	2.33	0.002	2.63
P-10	1,000.05	J-207	J-206	12	130	803.17	2.28	0.002	1.69
P-167	1,662.86	J-7	J-52	12	130	-797.84	2.26	0.002	2.84
P-262	186.06	J-177	J-227	14	130	1,079.43	2.25	0.001	0.26
P-156	1,787.53	J-109	J-110	16	130	-1,405.60	2.24	0.001	2.12
P-157	4,087.00	J-134	J-109	16	130	-1,405.60	2.24	0.001	4.93
P-47	599.47	J-4	J-5	12	130	-778.99	2.21	0.002	0.98
P-48	1,209.24	J-5	J-6	12	130	-778.99	2.21	0.002	1.98
P-49	474.23	J-6	J-7	12	130	-778.99	2.21	0.002	0.77
P-97	1,398.19	J-71	J-68	10	130	-529.88	2.16	0.002	2.73
P-107	2,070.99	J-79	J-68	10	130	529.88	2.16	0.002	4.13
P-20	72.16	J-188	J-189	12	130	-754.87	2.14	0.002	0.11
P-16	108.53	J-183	J-190	12	130	-754.87	2.14	0.002	0.16
P-38	155.92	J-191	J-192	12	130	-754.87	2.14	0.002	0.23
P-21	192.69	J-194	J-195	12	130	754.87	2.14	0.002	0.29
P-18	216.08	J-189	J-197	12	130	-754.87	2.14	0.002	0.33
P-23	311.08	J-199	J-186	12	130	754.87	2.14	0.002	0.47
P-19	253.49	J-200	J-195	12	130	-754.87	2.14	0.002	0.38
P-44	330.04	J-203	J-191	12	130	-754.87	2.14	0.002	0.5
P-15	345.41	J-186	J-194	12	130	754.87	2.14	0.002	0.52
P-22	408.96	J-190	J-188	12	130	-754.87	2.14	0.002	0.62
P-28	410.57	J-180	J-203	12	130	-754.87	2.14	0.002	0.62
P-17	457.74	J-197	J-200	12	130	-754.87	2.14	0.002	0.69
P-42	804.25	J-196	J-199	12	130	754.87	2.14	0.002	1.21
P-14	1,196.46	J-206	J-196	12	130	754.87	2.14	0.002	1.8
P-27	1,435.94	J-192	J-183	12	130	-754.87	2.14	0.002	2.16
P-1257	3,191.85	J-773	J-774	20	130	-2,096.00	2.14	0.001	2.65
P-58	1,103.77	J-17	J-18	24	130	-2,998.49	2.13	0.001	0.73
P-1278	1,578.80	J-790	J-112	20	130	-2,080.86	2.13	0.001	1.33
P-1277	956.21	J-126	J-790	20	130	-2,051.69	2.1	0.001	0.8
P-146	521.98	J-127	J-126	20	130	-2,037.01	2.08	0.001	0.49
P-1265	3,247.70	J-756	J-781	20	130	2,027.82	2.07	0.001	2.53
P-26	218.74	J-198	J-193	12	130	724.93	2.06	0.001	0.31
P-30	324.44	J-202	J-198	12	130	724.93	2.06	0.001	0.45
P-24	352.80	J-180	J-202	12	130	724.93	2.06	0.001	0.49
P-1229	573.92	J-193	J-747	12	130	724.93	2.06	0.001	0.8
P-1230	1,096.27	J-747	J-748	12	130	724.93	2.06	0.001	1.53
P-1231	2,215.11	J-748	J-749	12	130	724.93	2.06	0.001	3.09
P-360	3,184.93	J-264	J-265	6	130	176.97	2.01	0.003	9.56
P-1233	2,513.52	J-750	J-751	10	130	467.28	1.91	0.002	3.78
P-329	1,209.86	J-246	J-61	4	130	-74.12	1.89	0.004	5.31
P-225	1,205.16	J-151	PSBR1_3	24	130	2,664.33	1.89	0.005	0.11
P-228	1,299.18	J-151	PSBR1_2	24	130	2,664.33	1.89	0.005	0.11
P-229	1,536.28	J-151	PSBR1_1	24	130	2,664.33	1.89	0.005	0.11

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-148	1,292.98	J-123	J-128	20	130	1,836.41	1.88	0.001	0.89
P-96	1,202.96	J-70	J-71	10	130	-457.57	1.87	0.001	1.78
P-78	1,361.94	J-52	J-53	4	130	72.64	1.85	0.004	5.66
P-98	280.06	J-71	J-72	4	130	72.31	1.85	0.004	1.17
P-77	64.47	J-24	J-50	4	130	72.21	1.84	0.004	0.26
P-147	72.15	J-127	J-123	20	130	1,732.51	1.77	0.001	0.08
P-261	2,497.54	J-208	J-209	8	130	274.92	1.75	0.002	4.17
P-275	2,204.05	J-209	J-235	8	130	274.92	1.75	0.002	3.68
P-108	1,130.73	J-47	J-80	12	130	616.15	1.75	0.001	1.17
P-1204	892.80	J-728	PSCC1_5	30	130	3,838.53	1.74	0	0
P-205	192.23	J-728	PSCC1_4	30	130	3,830.59	1.74	0	0.01
P-1269	7,432.31	J-781	J-785	20	130	1,695.82	1.73	0.001	4.16
P-8	134.08	J-223	J-212	16	130	1,079.43	1.72	0.001	0.1
P-7	659.91	J-227	J-223	16	130	1,079.43	1.72	0.001	0.47
P-328	674.83	J-60	J-246	4	130	-66.00	1.68	0.004	2.42
P-109	242.19	J-80	J-81	12	130	590.04	1.67	0.001	0.26
P-333	1,954.77	J-81	J-249	12	130	576.23	1.63	0.001	1.91
P-334	1,891.03	J-249	J-161	12	130	576.23	1.63	0.001	1.85
P-1256	5,162.45	J-772	J-773	20	130	-1,574.32	1.61	0	2.52
P-1205	386.69	CCSP_1	J-727	30	130	3,441.20	1.56	0	0.06
P-364	3,068.88	J-265	J-267	6	130	-128.33	1.46	0.002	5.08
P-365	2,706.19	J-267	J-264	6	130	-128.33	1.46	0.002	4.48
P-1270	2,234.69	J-785	J-782	16	130	903.87	1.44	0.001	1.16
P-1240	1,478.77	J-756	J-757	20	130	1,371.89	1.4	0	0.56
P-158	468.82	J-106	J-134	16	130	-856.05	1.37	0	0.22
P-159	3,071.10	J-135	J-106	16	130	-856.05	1.37	0	1.46
P-160	4,463.50	J-105	J-135	16	130	-856.05	1.37	0	2.13
P-130	2,067.68	J-102	J-105	16	130	-856.05	1.37	0	1
P-1241	1,610.13	J-757	J-758	20	130	1,277.95	1.31	0	0.53
P-85	749.21	J-61	J-48	6	130	-114.97	1.3	0.001	1.01
P-127	1,764.05	J-102	J-103	16	130	794.82	1.27	0	0.73
P-128	1,839.15	J-90	J-104	16	130	-794.82	1.27	0	0.77
P-129	692.91	J-104	J-103	16	130	-794.82	1.27	0	0.3
P-52	8.47	J-10	J-11	10	130	305.75	1.25	0.001	0.01
P-92	558.01	J-66	J-67	10	130	-291.95	1.19	0.001	0.36
P-93	638.25	J-67	J-70	10	130	-291.95	1.19	0.001	0.4
P-94	1,304.48	J-12	J-69	10	130	-272.37	1.11	0.001	0.73
P-95	1,058.34	J-69	J-66	10	130	-272.37	1.11	0.001	0.6
P-1255	2,582.81	J-771	J-772	20	130	-1,048.55	1.07	0	0.59
P-102	38.46	J-76	J-75	8	130	165.62	1.06	0.001	0.02
P-100	904.66	J-73	J-74	8	130	165.62	1.06	0.001	0.6
P-101	523.68	J-74	J-76	8	130	165.62	1.06	0.001	0.35
P-1262	8,129.51	J-774	J-778	10	130	220.85	0.9	0	3.05
P-1263	1,106.42	J-778	J-779	10	130	220.85	0.9	0	0.42
P-1264	2,102.91	J-779	J-780	10	130	220.85	0.9	0	0.79
P-110	1,498.14	J-82	J-83	16	130	549.32	0.88	0	0.32
P-111	1,954.51	J-83	J-86	16	130	549.32	0.88	0	0.42
P-112	515.94	J-86	J-84	16	130	549.32	0.88	0	0.11
P-171	2,231.73	J-161	J-82	16	130	549.32	0.88	0	0.5
P-1222	2,301.79	J-159	J-740	10	130	211.58	0.86	0	0.8
P-1223	1,975.95	J-740	J-741	10	130	211.58	0.86	0	0.69
P-1224	3,031.77	J-741	J-742	10	130	211.58	0.86	0	1.05
P-1234	8,560.09	J-742	J-752	10	130	211.58	0.86	0	2.97
P-1267	1,229.68	J-782	J-783	16	130	517.01	0.82	0	0.23
P-73	187.68	J-42	J-43	8	130	124.09	0.79	0	0.08
P-307	120.44	J-239	J-240	12	130	279.07	0.79	0	0.03
P-1202	900.45	J-727	PSCC1_2	30	130	1,720.67	0.78	0	0
P-206	189.64	J-727	PSCC1_3	30	130	1,720.53	0.78	0	0
P-259	2,224.12	J-84	J-208	16	130	483.20	0.77	0	0.37
P-1250	2,634.99	J-758	J-767	20	130	714.89	0.73	0	0.3
P-174	1,089.14	J-151	PSBR1_4	24	130	1,003.93	0.71	0.001	0.02
P-233	240.82	J-141	J-165	24	130	1,003.92	0.71	0	0.01
P-326	156.22	J-102	J-245	6	130	61.22	0.69	0	0.07
P-99	1,841.51	J-70	J-73	10	130	165.62	0.68	0	0.41

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-143	95.64	J-122	J-125	8	130	103.9	0.66	0	0.03
P-144	2,438.59	J-125	J-123	8	130	103.90	0.66	0	0.68
P-1254	2,126.46	J-770	J-771	20	130	-633.23	0.65	0	0.19
P-1271	2,752.22	J-758	J-786	8	130	89.07	0.57	0	0.57
P-1283	1,607.52	J-62	J-793	6	130	48.24	0.55	0	0.44
P-1279	1,267.27	J-61	J-791	4	130	20.80	0.53	0	0.52
P-1242	5,497.77	J-758	J-759	20	130	474.00	0.48	0	0.29
P-347	803.79	J-110	J-259	12	130	169.36	0.48	0	0.08
P-115	5,227.25	J-89	J-90	16	130	-278.77	0.44	0	0.31
P-1253	2,562.28	J-769	J-770	20	130	-419.27	0.43	0	0.11
P-145	4,387.31	J-120	J-122	10	130	103.9	0.42	0	0.41
P-1281	362.61	J-35	J-792	4	130	16.26	0.42	0	0.09
P-1280	806.63	J-791	J-63	4	130	15.42	0.39	0	0.19
P-1284	544.62	J-793	J-35	6	130	30.68	0.35	0	0.07
P-348	4,855.17	J-259	J-113	12	130	120.07	0.34	0	0.25
P-1282	383.64	J-792	J-36	4	130	13.26	0.34	0	0.07
P-260	127.96	J-208	J-87	16	130	208.28	0.33	0	0.01
P-1235	154.52	J-752	J-743	10	130	78.57	0.32	0	0.01
P-86	6,000.17	J-17	J-62	8	130	48.24	0.31	0	0.41
P-140	1,892.91	J-120	J-113	12	130	-103.9	0.29	0	0.07
P-114	3,674.33	J-85	J-89	16	130	-174.49	0.28	0	0.09
P-1243	5,251.59	J-759	J-760	20	130	252.63	0.26	0	0.09
P-1244	1,677.81	J-760	J-761	20	130	252.63	0.26	0	0.03
P-1268	324.09	J-783	J-784	16	130	159.59	0.25	0	0.01
P-113	2,045.62	J-87	J-88	16	130	151.36	0.24	0	0.04
P-33	2.73	J-213	J-214	8	130	37.71	0.24	0	0
P-34	536.6	J-214	J-226	8	130	37.71	0.24	0	0.02
P-35	1,264.25	J-226	J-228	8	130	37.71	0.24	0	0.05
P-36	2,113.49	J-228	J-210	8	130	37.71	0.24	0	0.09
P-1245	495.59	J-761	J-762	20	130	228.33	0.23	0	0.01
P-1274	666.95	J-762	J-789	20	130	225.30	0.23	0	0.01
P-1276	4,405.22	J-788	J-789	8	130	-33.23	0.21	0	0.15
P-1289	4,590.53	J-732	J-796	16	130	132.87	0.21	0	0.07
P-291	43.16	FCPSV-2	FCSP-2	8	130	32.13	0.21	0	0
P-40	24.58	J-184	J-182	8	130	-29.94	0.19	0	0
P-290	70.81	J-184	FCPSV-2	8	130	29.94	0.19	0	0
P-1251	928.79	J-767	J-768	20	130	186.54	0.19	0	0.01
P-270	3,305.62	J-232	J-85	16	130	-117.16	0.19	0	0.04
P-116	2,452.64	J-87	J-92	12	130	56.91	0.16	0	0.03
P-1275	1,130.15	J-789	J-763	20	130	138.13	0.14	0	0.01
P-1290	1,095.48	J-796	J-797	16	130	86.91	0.14	0	0.01
P-1215	422.93	J-731	J-21	10	130	-30.52	0.12	0	0
P-1252	4,070.09	J-768	J-769	20	130	115.67	0.12	0	0.02
P-269	2,486.36	J-88	J-232	16	130	-54.08	0.09	0	0.01
P-32	336.55	J-182	J-204	12	130	-29.94	0.08	0	0
P-31	406.78	J-187	J-205	12	130	-29.94	0.08	0	0
P-29	647.53	J-205	J-180	12	130	-29.94	0.08	0	0
P-25	738.09	J-204	J-187	12	130	-29.94	0.08	0	0
P-152	2,069.83	J-33	J-133	6	130	6.66	0.08	0	0.01
P-153	990.50	J-133	J-58	6	130	6.66	0.08	0	0.01
P-164	1,640.28	J-33	J-137	6	130	-6.66	0.08	0	0.01
P-1247	1,512.30	J-763	J-764	20	130	66.41	0.07	0	0
P-1273	1,099.77	J-787	J-788	8	130	-8.70	0.06	0	0
P-330	269.30	J-178	J-247	4	130	-2.08	0.05	0	0
P-331	416.49	J-247	J-36	4	130	-2.08	0.05	0	0
P-6	447.81	J-224	J-225	8	130	8.08	0.05	0	0
P-2	704.17	J-215	J-224	8	130	8.08	0.05	0	0
P-5	5.07	J-212	J-215	16	130	8.08	0.01	0	0
P-117	1,875.31	J-92	J-91	12	130	2.57	0.01	0	0
P-120	3,859.88	J-91	J-95	12	130	2.57	0.01	0	0
P-121	650.24	J-95	J-96	12	130	2.57	0.01	0	0
P-122	577.30	J-96	J-97	12	130	2.57	0.01	0	0
P-1272	1,010.64	J-786	J-787	8	130	-0.34	0	0	0
P-1213	1,253.76	J-730	J-243	4	130	0	0	0	0

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-335	5.26	J-243	J-250	4	130	0	0	0	0
P-336	624.42	J-250	J-244	4	130	0	0	0	0
P-317	37.42	J-244	PSV-22	4	130	0	0	0	0
P-318	25.78	PSV-22	R-28	4	130	0	0	0	0
P-319	1,109.24	J-1	J-2	4	130	0	0	0	0
P-273	21.62	J-234	HLPSV-1	4	130	0.00	0	0	0
P-274	29.89	HLPSV-1	HLSP-1	4	130	0.00	0	0	0
P-272	2,121.00	J-233	J-234	4	130	0.00	0	0	0
P-271	32.31	J-232	J-233	4	130	0.00	0	0	0
P-1212	643.57	J-159	J-730	6	130	0.00	0	0	0
P-321	90.63	PSV-23	R-29	6	130	0	0	0	0
P-320	68.45	J-1	PSV-23	6	130	0	0	0	0
P-170	252.08	J-140	J-37	12	130	0.00	0	0	0
P-137	42.67	J-114	J-117	8	130	0.00	0	0	0
P-356	21.45	J-124	LOPSV-2	6	130	0.00	0	0	0
P-357	43.12	LOPSV-2	LOSP-2	6	130	0.00	0	0	0
P-355	91.08	LOPSV-1	LOSP-1	6	130	0.00	0	0	0
P-354	47.09	J-121	LOPSV-1	6	130	0.00	0	0	0
P-295	55.68	GCPSV-1	GCSP-1	6	130	0.00	0	0	0
P-294	56.41	J-107	GCPSV-1	6	130	0.00	0	0	0
P-297	100.11	MCPSV-1	MCSP-1	6	130	0.00	0	0	0
P-296	104.66	J-108	MCPSV-1	6	130	0.00	0	0	0
P-195	211.47	J-735	J-140	12	130	0.00	0	0	0
P-280	146.6	J-236	J-237	6	130	0.00	0	0	0
P-281	25.68	J-237	PUBPSV-1	6	130	0	0	0	0
P-282	44.06	PUBPSV-1	PUBSP-1	6	130	0.00	0	0	0
P-194	151.38	J-736	J-735	12	130	0	0	0	0
P-1	14.14	J-217	J-218	8	130	0.00	0	0	0
P-186	137.84	J-139	J-736	12	130	0.00	0	0	0
P-9	729.35	J-221	J-217	8	130	0.00	0	0	0
P-4	670.05	J-225	J-222	8	130	0.00	0	0	0
P-45	138.37	J-221	J-222	8	130	0	0	0	0
P-134	1,555.47	J-113	J-114	10	130	0	0	0	0
P-268	51.79	VWPSV-1	VWSP-1	8	130	0	0	0	0
P-267	59.34	J-231	VWPSV-1	8	130	0	0	0	0
P-266	3,644.71	J-230	J-231	8	130	0.00	0	0	0.01
P-265	95.10	J-229	J-230	8	130	0.00	0	0	0
P-312	38.51	VWPSV-2	VWSP-2	8	130	0.00	0	0	0
P-311	18.71	J-241	VWPSV-2	8	130	0.00	0	0	0
P-310	185.44	J-219	J-241	8	130	0	0	0	0
P-3	14.91	J-218	J-219	8	130	0	0	0	0
P-327	523.10	ISPSV-1	J-220	8	130	0.00	0	0	0
P-263	35.52	ISPSV-1	ISSP-1	8	130	0.00	0	0	0
P-43	30.71	J-216	J-220	8	130	0.00	0	0	0
P-139	3,669.81	J-117	J-119	8	130	0.00	0	0	0
P-303	95.48	BTPSV-2	BTSP-2	8	130	0.00	0	0	0
P-302	53.72	J-119	BTPSV-2	8	130	0.00	0	0	0
P-141	810.88	J-120	J-121	8	130	0	0	0	0
P-131	1,599.68	J-105	J-107	8	130	0	0	0	0
P-284	100.14	SPSV-1	SSP-1	8	130	0.00	0	0	0
P-301	78.27	BTPSV-1	BTSP-1	8	130	0.00	0	0	0
P-119	243.20	J-93	J-94	8	130	0	0	0	0
P-118	475.85	J-91	J-93	8	130	0	0	0	0
P-283	72.21	J-94	SPSV-1	8	130	0	0	0	0
P-300	47.87	J-118	BTPSV-1	8	130	0	0	0	0
P-138	772.38	J-117	J-118	8	130	0	0	0	0
P-132	1,406.22	J-106	J-108	8	130	0.00	0	0	0
P-298	93.32	J-130	SGCPSV-1	8	130	0	0	0	0
P-161	2,592.91	J-129	J-130	8	130	0	0	0	0
P-299	123.96	SGCPSV-1	SGCSP-1	8	130	0	0	0	0
P-39	24.18	J-185	J-181	8	130	0	0	0	0
P-288	73.85	J-185	FCPSV-1	8	130	0	0	0	0
P-289	41.95	FCPSV-1	FCSP-1	8	130	0.00	0	0	0
P-277	26.82	RHPSV-1	RHSP-1	8	130	0.00	0	0	0

Label	Length(ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gal/min)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-353	1,524.61	PSBR2_8	J-141	10	130	0.00	0	0	0
P-276	23.31	J-235	RHPSV-1	8	130	0.00	0	0	0
P-176	1,228.09	PSBR2_7	J-141	10	130	0.00	0	0	0
P-177	921.43	PSBR2_6	J-141	10	130	0.00	0	0	0
P-178	966.38	PSBR2_5	J-141	10	130	0	0	0	0
P-142	476.56	J-122	J-124	10	130	0	0	0	0
P-200	565.78	PXNSP_1	PSPXN1_1	12	130	0	0	0	0
P-203	1,042.98	PXNSP_1	PSPXN1_2	12	130	0	0	0	0
P-204	1,755.42	PXNSP_1	PSPXN1_3	12	130	0.00	0	0	0
P-197	178.47	J-799	PXNSP_1	12	130	0	0	0	0
P-168	438.20	J-139	PSPXN1_1	12	130	0	0	0	0
P-169	498.67	J-139	PSPXN1_2	12	130	0.00	0	0	0
P-293	74.18	HOPSV-1	HOSP-1	12	130	0	0	0	0
P-341	164.94	J-254	J-255	6	130	0	0	0	0
P-198	936.11	PSPXN1_3	J-139	12	130	0	0	0	0
P-292	54.7	J-131	HOPSV-1	12	130	0	0	0	0
P-13	333.56	J-193	J-181	12	130	0	0	0	0
P-104	77	J-75	J-78	8	130	0	0	0	0
P-151	1,726.42	J-131	J-132	12	130	0	0	0	0
P-154	142.66	J-109	J-132	12	130	0	0	0	0
P-172	913.75	J-262	PSBR2_7	16	130	0	0	0	0
P-173	995.15	J-262	PSBR2_6	16	130	0	0	0	0
P-175	1,112.74	J-262	PSBR2_5	16	130	0	0	0	0
P-352	922.95	J-262	PSBR2_8	16	130	0	0	0	0
P-37	2.02	J-210	J-211	8	130	0.00	0	0	0
P-212	100.81	J-138	J-153	6	130	0.00	0	0	0
P-258	887.66	BRSP_1	J-262	48	130	0.00	0	0	0
P-1248	4,024.90	J-764	J-765	20	130	0.00	0	0	0
P-337	486.84	J-80	J-251	6	130	0.00	0	0	0
P-103	77.45	J-76	J-77	6	130	0.00	0	0	0
P-339	40.20	J-251	J-253	6	130	0.00	0	0	0
P-338	36.81	J-251	J-252	6	130	0	0	0	0
P-135	317.98	J-114	J-116	8	130	0.00	0	0	0
P-332	92.54	J-44	J-248	4	130	0.00	0	0	0
P-136	167.85	J-116	J-115	6	130	0.00	0	0	0
P-75	1,180.73	J-41	J-45	6	130	0	0	0	0
P-344	107.66	J-256	J-257	6	130	0	0	0	0
P-242	220.81	J-49	J-172	4	130	0	0	0	0
P-241	201.76	J-48	J-171	4	130	0	0	0	0
P-76	2,043.41	J-45	J-46	6	130	0	0	0	0
P-196	608.42	J-799	J-140	12	130	0	0	0	0
P-1291	663.4	J-165	R-36	90	130	0	0	0	0
P-1308	726.81	J-150	J-808	16	130	0	0	0	0

Build-Out Average Annual Daily Flow - with Deficiency Improvements

Junction Report

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-151	29	0	39.24	4.4
J-799	16	0	34	7.8
J-262	1	0	31	13
J-728	20.94	0	54.75	14.6
J-727	20.41	0	54.94	14.9
J-242	26.73	0	94.93	29.5
J-751	41.11	467.28	123.03	35.4
J-784	26.25	159.59	110.31	36.4
J-60	22.46	66	107.5	36.8
J-246	23.2	8.12	109.92	37.5
J-63	26	15.42	114.51	38.3
J-48	27	218.47	116.24	38.6
J-791	25.43	5.37	114.7	38.6
J-750	36.31	161.87	126.81	39.1
J-171	25.66	0	116.24	39.2
J-61	24.52	20.04	115.22	39.2
J-136	26.93	6.56	120.22	40.3
J-780	23.82	220.85	118.77	41.1
J-783	15.04	357.42	110.32	41.2
J-49	28.08	61.17	123.99	41.5
J-789	19.5	53.94	116.88	42.1
J-761	19.07	24.3	116.89	42.3
J-172	25.97	0	123.99	42.4
J-235	33.51	274.92	131.69	42.5
J-749	33.47	95.77	131.67	42.5
J-762	18.67	3.02	116.89	42.5
J-779	20.71	0	119.56	42.7
J-185	37.95	0	137.1	42.9
J-770	16.72	213.96	117.08	43.4
J-772	17.48	525.76	117.87	43.4
J-753	22.45	471.94	122.97	43.5
J-773	19.79	521.68	120.39	43.5
J-771	16.65	415.32	117.28	43.5
J-769	16.21	534.94	116.98	43.6
J-760	16.12	0	116.92	43.6
J-781	14.83	332	115.86	43.7
J-768	15.72	70.87	116.99	43.8
J-782	9.22	386.86	110.54	43.8
J-778	18.17	0	119.98	44
J-758	15.2	0	117.3	44.2
J-786	14.62	89.41	116.73	44.2
J-237	30.34	0	132.5	44.2
J-181	34.9	0	137.1	44.2
J-757	15.55	93.94	117.83	44.2
J-767	14.63	528.35	117	44.3
J-193	34.65	0	137.1	44.3
J-209	32.9	0	135.38	44.3
J-208	36.99	0	139.55	44.4
J-84	37.29	66.12	139.92	44.4
J-86	37.19	0	140.03	44.5
J-747	33.32	0	136.3	44.5
J-774	19.83	527.6	123.03	44.6
J-765	13.66	0	116.87	44.6
J-785	8.38	791.95	111.7	44.7
J-748	31.29	0	134.77	44.7
J-198	33.85	0	137.41	44.8
J-184	34.77	0	138.34	44.8
J-202	34.11	0	137.86	44.9
J-759	13.23	221.37	117.01	44.9
J-87	35.65	0	139.54	44.9
J-763	12.94	71.72	116.87	44.9
J-764	12.9	66.41	116.87	45

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-182	34.28	0	138.34	45
J-756	14.28	30.77	118.39	45
J-234	35.33	0	139.51	45.1
J-775	23.2	528.86	127.55	45.1
J-203	34.35	0	138.97	45.2
J-236	27.79	0	132.5	45.3
J-180	33.49	0	138.35	45.3
J-85	34.51	57.33	139.55	45.4
J-187	33.26	0	138.35	45.4
J-192	34.52	0	139.7	45.5
J-88	34.22	205.45	139.51	45.5
J-205	32.91	0	138.35	45.6
J-191	33.99	0	139.47	45.6
J-788	11.22	24.53	116.73	45.6
J-204	32.37	0	138.34	45.8
J-787	10.74	8.36	116.73	45.8
J-233	33.44	0	139.51	45.9
J-83	33.2	0	140.45	46.4
J-161	33.45	26.92	141.26	46.6
J-776	24.4	31.94	132.4	46.7
J-82	32.62	0	140.76	46.8
J-232	30.64	63.07	139.51	47.1
J-249	33.06	0	143.11	47.6
J-130	31.79	0	141.89	47.6
J-108	36.05	0	146.35	47.7
J-92	28.88	54.34	139.51	47.8
J-777	25.08	150.58	136.33	48.1
J-183	30.46	0	141.86	48.2
J-106	34.67	0	146.35	48.3
J-806	22	0	133.9	48.4
J-190	30.1	0	142.03	48.4
J-81	32.73	13.81	145.03	48.6
J-150	22.09	0	134.4	48.6
J-89	27.26	116.51	139.64	48.6
J-93	26.85	0	139.51	48.7
J-135	32.19	0	144.89	48.7
J-188	29.66	0	142.64	48.9
J-189	29.58	0	142.75	48.9
J-197	29.09	0	143.08	49.3
J-80	31	26.11	145.28	49.4
J-735	34	0	148.35	49.4
J-736	34	0	148.35	49.4
J-252	30.93	0	145.28	49.4
J-266	18.71	0	133.15	49.5
J-134	31.71	549.55	146.57	49.7
J-253	30.42	0	145.28	49.7
J-200	28.8	0	143.77	49.7
J-251	30.16	0	145.28	49.8
J-194	28.28	0	144.44	50.2
J-195	27.96	0	144.15	50.2
J-107	26.45	0	142.76	50.3
J-186	28.59	0	144.96	50.3
J-91	23.12	0	139.51	50.3
J-245	25.03	61.22	141.69	50.4
J-102	25.03	0	141.75	50.5
J-47	29.73	5.42	146.45	50.5
J-104	23.52	0	140.73	50.7
J-199	28.19	0	145.43	50.7
J-116	36.01	0	153.29	50.7
J-103	23.53	0	141.02	50.8
J-129	24.31	0	141.89	50.8
J-94	21.62	0	139.51	51
J-131	33.44	0	151.5	51.1
J-105	24.61	0	142.76	51.1

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-140	30.19	0	148.35	51.1
J-196	28.36	0	146.64	51.1
J-95	21.19	0	139.51	51.2
J-90	21.45	44.11	139.95	51.2
J-37	29.68	0	148.35	51.3
J-109	32.63	0	151.5	51.4
J-118	34.4	0	153.29	51.4
J-114	33.98	0	153.29	51.6
J-128	31.73	0	151.2	51.7
J-122	33.32	0	152.8	51.7
J-96	19.64	0	139.51	51.8
J-97	19.5	824.84	139.51	51.9
J-125	32.63	0	152.78	52
J-117	32.94	0	153.29	52
J-120	32.49	0	153.22	52.2
J-755	14.78	203.65	135.75	52.3
J-121	31.97	0	153.22	52.4
J-127	30.92	304.50	152.17	52.4
J-123	30.74	0	152.09	52.5
J-124	31.09	0	152.8	52.6
J-206	26.48	48.3	148.44	52.7
J-110	31.18	0	153.62	52.9
J-259	30.94	49.29	153.54	53
J-98	20.74	0	143.37	53
J-132	28.83	0	151.5	53
J-115	29.68	0	153.29	53.5
J-207	25.64	48.13	150.13	53.8
J-113	28.29	16.16	153.29	54.1
J-201	26.04	627.26	152.01	54.5
J-126	26.6	14.68	152.66	54.5
J-119	26.71	0	153.29	54.7
J-754	15.93	480.49	142.85	54.9
J-790	26.07	29.16	153.46	55.1
J-265	16.2	0	143.7	55.1
J-101	18.5	0	146.01	55.1
J-737	20.38	0	148.61	55.4
J-139	20.1	0	148.35	55.5
J-100	19.54	0	147.8	55.5
J-240	27.19	0	155.93	55.7
J-220	22.6	0	151.6	55.8
J-111	29.24	0	158.48	55.9
J-112	25.2	15.43	154.79	56
J-216	21.74	0	151.6	56.2
J-226	21.8	0	152.21	56.4
J-239	25.33	0	155.96	56.5
J-214	21.27	0	152.23	56.6
J-213	21.26	0	152.23	56.6
J-142	28.15	0	159.4	56.8
J-168	22.18	0	153.57	56.8
J-167	26.56	0	158.69	57.1
J-169	22.36	0	154.75	57.2
J-165	29	0	161.51	57.3
J-141	29	0	161.52	57.3
J-99	19.5	0	152.42	57.5
J-41	22.7	218.29	155.66	57.5
J-267	15.81	0	148.78	57.5
J-166	28.21	0	161.42	57.6
J-46	22.21	0	155.66	57.7
J-228	17.89	0	152.15	58.1
J-254	22.85	0	157.89	58.4
J-255	22.85	0	157.89	58.4
J-256	22.86	0	158	58.4
J-257	22.86	0	158	58.4
J-170	22.87	197.25	158.24	58.5

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-45	19.9	0	155.66	58.7
J-39	19.92	125.21	155.98	58.8
J-210	15.99	37.71	152.06	58.8
J-38	18.72	0	154.91	58.9
J-211	15.84	0	152.06	58.9
J-264	16.7	0	153.26	59.1
J-260	19.66	0	156.97	59.4
J-1	17.79	0	155.34	59.5
J-238	16.85	0	155.03	59.8
J-65	20.03	152.33	158.89	60
J-227	21.2	0	160.76	60.4
J-263	17.92	0	157.71	60.4
J-176	19.56	0	159.86	60.7
J-225	19.76	8.08	160.19	60.7
J-218	19.75	0	160.19	60.7
J-2	14.87	0	155.34	60.7
J-219	19.72	0	160.19	60.7
J-217	19.65	0	160.19	60.8
J-156	21.29	0	161.9	60.8
J-224	18.59	0	160.19	61.2
J-215	18.58	0	160.19	61.2
J-241	18.54	0	160.19	61.3
J-212	18.4	145.88	160.19	61.3
J-59	21.21	0	163.08	61.4
J-222	18.08	0	160.19	61.5
J-221	18.03	0	160.19	61.5
J-177	18.8	471.19	161.02	61.5
J-174	18.55	0	161.29	61.7
J-223	17.5	0	160.29	61.7
J-258	21.17	0	165.44	62.4
J-231	22.91	0	169.12	63.2
J-230	21.94	0	169.13	63.7
J-158	20.36	44.42	167.6	63.7
J-229	21.79	0	169.13	63.7
J-21	18.56	79.84	167.11	64.2
J-731	18.07	0	167.11	64.5
J-40	21.81	56.37	172.26	65.1
J-22	19.63	0	172.04	65.9
J-11	17.32	0.45	169.99	66
J-10	17.01	0	170	66.2
J-800	0	0	153.38	66.3
J-179	20.64	1.49	174.66	66.6
J-23	19.61	114.22	174.39	66.9
J-57	21.19	13.23	176.06	67
J-58	21.2	6.66	179.4	68.4
J-56	20.75	0	179.37	68.6
J-33	20.14	0	179.42	68.9
J-3	14.88	0	174.67	69.1
J-137	19.38	0	179.44	69.2
J-133	18.58	0	179.41	69.5
J-34	20.66	0	181.84	69.7
J-55	20.6	0	183.95	70.6
J-160	21.8	0	186.36	71.2
J-43	22.88	124.09	187.82	71.3
J-5	14.44	0	180.89	72
J-42	21.15	0	187.9	72.1
J-50	20.02	72.21	187.15	72.3
J-24	20.11	0	187.42	72.3
J-32	19.4	18.35	188.33	73.1
J-25	21.24	79.01	190.27	73.1
J-64	21.87	0	191.41	73.3
J-4	9.98	0	179.91	73.5
J-53	10.48	72.64	180.81	73.7
J-9	15.9	0	186.51	73.8

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-138	18.98	0	189.85	73.9
J-740	30.43	0	201.3	73.9
J-742	28.68	0	199.57	73.9
J-741	29.73	0	200.62	73.9
J-7	12.66	18.84	183.64	73.9
J-153	18.84	21.96	189.85	73.9
J-6	11.59	0	182.86	74.1
J-52	13.98	0	186.48	74.6
J-752	23.69	133.01	196.6	74.8
J-26	21.74	0	194.72	74.8
J-8	15.17	0	188.65	75
J-261	12.94	0	187.54	75.5
J-159	27.44	772.14	202.1	75.5
J-248	21	0	195.72	75.6
J-70	16.77	0	191.59	75.6
J-44	20.88	23.04	195.72	75.6
J-67	15.9	0	191.19	75.8
J-78	14.83	0	190.21	75.8
J-77	14.81	0	190.24	75.9
J-27	21.43	46.54	197.52	76.1
J-75	13.98	165.62	190.21	76.2
J-66	14.57	19.57	190.83	76.2
J-76	13.93	0	190.24	76.2
J-12	12.81	13.67	189.49	76.4
J-730	25.28	0	202.1	76.5
J-72	15.38	72.31	192.21	76.5
J-743	19.65	78.57	196.59	76.5
J-15	18.54	56.37	195.71	76.6
J-71	15.96	0	193.38	76.7
J-74	13.12	0	190.59	76.7
J-69	12.63	0	190.22	76.8
J-73	13.2	0	191.18	77
J-14	16.34	63.7	194.98	77.2
J-30	21.5	13.28	200.29	77.3
J-79	21.05	0	200.24	77.5
J-243	22.61	0	202.1	77.6
J-250	22.6	0	202.1	77.6
J-68	16.57	0	196.1	77.6
J-244	21.35	0	202.1	78.2
J-13	13.89	0	194.78	78.2
J-16	23.23	558.42	204.68	78.5
J-162	24.03	0	205.54	78.5
J-173	20.89	0	205.49	79.8
J-164	23.6	0	208.54	80
J-28	21.96	46.35	208.26	80.6
J-31	19.42	0	206.8	81
J-29	20.72	55.86	209.42	81.6
J-19	21.5	0	210.64	81.8
J-155	26.51	24.07	216.95	82.4
J-175	19.2	0	212.38	83.5
J-154	22.32	53.77	219.42	85.2
J-20	19.44	0	218.89	86.3
J-17	23.76	126.65	227.65	88.2
J-62	23.06	0	227.24	88.3
J-793	22.16	17.57	226.8	88.5
J-35	21.85	14.42	226.74	88.6
J-796	22.04	45.96	227.66	88.9
J-797	21.86	86.91	227.65	89
J-178	20.02	2.08	226.57	89.3
J-792	20.07	3	226.64	89.3
J-247	19.3	0	226.57	89.6
J-733	14.5	0	222.57	90
J-36	18.19	11.17	226.57	90.1
J-54	17.14	0	227.5	91

Label	Elevation (ft)	Demand (gal/min)	Hydraulic Grade (ft)	Pressure (psi)
J-732	17.33	0	227.73	91
J-18	17.57	0	228.38	91.2
J-738	20.41	0	231.6	91.3
J-726	20	0	231.71	91.6
J-157	18.24	0	229.98	91.6
J-725	20	0	231.75	91.6
J-143	18.2	0	231.7	92.3
J-51	17	0	231.36	92.7
J-146	14.72	25.67	243.43	98.9
J-148	21.08	0	251.89	99.8
J-147	14.1	0	246.32	100.4
J-144	4.8	0	237.79	100.8
J-145	6.69	25.1	241.67	101.6
J-149	14.05	0	254.6	104
J-807	22	0	265.43	105.3
J-808	21.12	0	264.96	105.4

Build-Out Average Annual Daily Flow - with Deficiency Improvements

Pump Report

Label	Elevation (ft)	Pump Definition	Status (Initial)	Flow (gal/min)	Pressure (Discharge) (psi)
PSCC1_5	29	PSCC1_4-5	On	3,838.53	87.8
PSCC1_4	29	PSCC1_4-5	On	3,830.59	88.3
PSBR1_3	29	PSBR1_1-3	On	2,664.33	62.1
PSBR1_2	29	PSBR1_1-3	On	2,664.33	62.1
PSBR1_1	29	PSBR1_1-3	On	2,664.33	62.1
PMP-42	22	Proposed BPS	On	1,836.41	105.6
PSCC1_2	29	PSCC1_2-3	On	1,720.67	87.8
PSCC1_3	29	PSCC1_2-3	On	1,720.53	87.8
PSBR1_4	29	PSBR1_4	On	1,003.93	58
PSPXN1_1	34	PSCC1_2-3	Off	0	49.4
PSPXN1_2	34	PSCC1_2-3	Off	0	49.4
PSBR2_7	29	PSBR2_5-8	Off	0	57.3
PSBR2_6	29	PSBR2_5-8	Off	0	57.3
PSBR2_5	29	PSBR2_5-8	Off	0	57.3
PSPXN1_3	34	PSCC1_2-3	Off	0	49.4
PSBR2_8	29	PSBR2_5-8	Off	0	57.3

Build-Out Average Annual Daily Flow - with Deficiency Improvements

Reservior Report

Label	Elevation (ft)	Flow (gal/min)*	Notes
BRSP_1	31	0	Bee Ridge WRF seasonal pond
BTSP-1	38.61	0.00	Bent Tree Golf Course 1
BTSP-2	26.71	0	Bent Tree Golf Course 2
CCSP_1	55	-11,110.32	Central County WRF pond (19.6 MG)
ETSP-1	26.28	279.07	Eagle Trace
FCSP-1	36.63	0	Founder's Golf Club
FCSP-2	36.28	32.13	Founder's Club Development
GCSP-1	25.75	0	Gator Creek Golf Course
GSP-1	23.35	679.85	Longmeadow (No Meter No.)
HLSP-1	34.87	0.00	Preserve at Heron Lake
HOSP-1	33.44	0	Heritage Oaks
ISSP-1	21.5	0	Isles of Sarasota
LOSP-1	32	0.00	Laurel Oaks GC Pond
LOSP-2	31	0	Laurel Oaks GC Pond
MCSP-1	35.33	0	Misty Creek
OSP-1	18.16	780.06	Oaks Golf Course
PSP-1	18.51	589.28	Prestancia
PUBSP-1	27.41	0	Publix
PXNSP_1	34	0	36 MG Parcel X north pond
R-28	22.5	0	Miss Sarasota Softball
R-29	17.68	0	Oaks I (not in use)
RHSP-1	33.8	0	Foxfire Golf Club
SBSP-1	18.5	305.73	Stoneybrook GC Pond
SGCSP-1	31.97	0	Sarasota Golf Course
SSP-1	24.6	0	Serenoa
VWSP-1	21.13	0	Village Walk
VWSP-2	17.72	0	Village Walk

*Negative is withdrawl and positive is filling.

Build-Out Average Annual Daily Flow - with Deficiency Improvements

Pressure Sustaining Valve Report

Label	Elevation (ft)	Diameter (Valve) (in)	Upstream Pressure (psi)	Pressure Setting (psi)	Flow (gal/min)	Headloss (ft)	Notes	Status (Initial)
OPSV-1	16.16	6	60	60	780.06	136.6	Oaks Golf Course	Active
GPSV-1	21.35	6	30	30	679.85	61.13	Longmeadow (No Meter No.)	Active
PPSV-1	16.51	6	70	70	589.28	157.17	Prestancia	Active
SBPSV-1	16.5	6	50	50	305.73	113.29	Stoneybrook GC	Active
ETPSV-1	24.28	2	56.3	55	279.07	126.11	Eagle Trace	Active
FCPSV-2	34.28	6	45	45	32.13	102.06	Founder's Club Development	Active
ISPSV-1	19.5	6	57.1	65	0.00	0	Isles of Sarasota	Active
VWPSV-1	19.13	6	64.9	65	0	0	Village Walk	Active
HLPSV-1	32.87	4	46.1	52	0	0	Preserve at Heron Lake	Active
RHPSV-1	31.8	6	43.2	56	0	0	Foxfire Golf Club	Active
PUBPSV-1	25.41	6	46.3	64	0.00	0	Publix	Active
SPSV-1	22.6	6	50.6	68	0	0	Serenoa	Active
FCPSV-1	34.63	6	44.3	45	0	0	Founder's Golf Club	Active
HOPSV-1	31.44	6	51.9	55	0	0	Heritage Oaks	Active
GCPSV-1	23.75	6	51.5	59	0	0	Gator Creek Golf Course	Active
MCPSV-1	33.33	6	48.9	55	0	0	Misty Creek	Active
SGCPSV-1	29.97	6	48.4	52	0	0	Sarasota Golf Course	Active
BTPSV-1	36.61	6	50.5	55	0	0	Bent Tree Golf Course 1	Active
BTPSV-2	24.71	6	55.6	60	0	0	Bent Tree Golf Course 2	Active
VWPSV-2	15.72	6	62.5	63	0	0	Village Walk	Active
PSV-22	20.5	4	78.5	55	0	0	Miss Sarasota Softball	Closed
PSV-23	15.68	6	60.4	55	0	0	Oaks I (not in use)	Closed
LOPSV-1	30	6	53.3	52	0	0	Laurel Oaks GC	Closed
LOPSV-2	29	6	53.5	55	0	0	Laurel Oaks GC	Active

Sarasota County

Sarasota County
Reclaimed Water Master Plan

May 2013

Prepared By:

McKIM&CREED

378 Interstate Court
Sarasota, FL 34240
P: (941) 379-3404
F: (941) 379-3530
www.mckimcreed.com