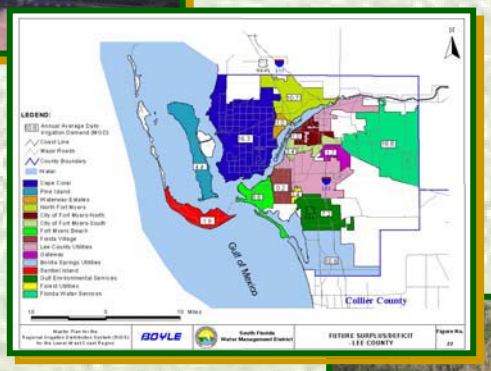
Feasibility Study for the Regional Irrigation Distribution System (RIDS) Sub-Region 3 For the Lower West Coast Region Project C-12368

South Florida Water Management District



December 2004

BOYLE

Master Plan for the
Regional Irrigation Distribution System (RIDS)
Sub-Region 3
For the Lower West Coast Region
Project C-12368

South Florida Water Management District
(SFWMD)

December 2004

TABLE OF CONTENTS

Page No.

List of Tables ii

List of Figures iv

List of Attachments vi

Section 1 - Executive Summary 1

Section 2 – Introduction 3

Section 3 - Study Area Definition 4

Section 4 - Facilities Inventory 7

Section 5 - Urban Irrigation Water Demands 13

Section 6 - Potential Urban Irrigation Water Sources 21

Section 7 - Supply and Demand Analysis 23

Section 8 – Design Alternatives 38

Section 9 - Cost Analysis 62

Section 10 –Institutional Framework 65

Section 11 - Funding Sources and Options 66

Section 12 - Assessment of Current Policies, Procedures, and Regulations 77

Section 13 - Benefits and Incentives 83

Section 14 – Preferred Alternative 84

Section 15 –Recommended Implementation Strategy 91

Section 16 – Design Standards 93

Section 17 – Proposed Projects Description & Existing Infrastructure 96

Section 18 – Proposed Infrastructure 109

Section 19 –General Civil Requirements 122

Section 20—Conclusion and Recommendations 126

LIST OF TABLES

Page No.

Table 1 – Service Area Summary 6

Table 2 – Reuse and Disposal Summary Current 9

Table 3 – Major Current Irrigation Users and Irrigation Demand.....10

Table 4 – Potential Major Irrigation Users and Irrigation Demand.....11

Table 5 – Population Projections 13

Table 6 –1-in-10 Year Drought Rainfall Values (inches).....15

Table 7 – Irrigable Acreage - Current.....16

Table 8 – Irrigable Acreage - Future.....16

Table 9 –Actual Reclaimed Water Use - Current 17

Table 10 –Maximum Potential Demand - Current 17

Table 11 – Demand Analysis – Year 2020 20

Table 12 – Reclaimed Water Supply - Current.....22

Table 13 – Projected Reclaimed Water Supply – Year 2020 22

Table 14 – Projected Surplus/Deficit – Year 2020 23

Table 15 – Summary of USGS and SFWMD Stream Flow Data.....26

Table 16 – Summary of Potential Surface Water ASR Systems 27

Table 17 – Contributions from ASR Projects 27

Table 18 – Projected 2020 Considering ASR Benefit 29

Table 19 – Summary of Ranked Potential Surface Water & Reclaimed Water ASR System Surplus/Deficit 37

Table 20 – Subregional Supply Alternatives Summary.....38

Table 21 – Potential ASR System Geology.....40

Table 22 – Surface Water System Average Water Quality 49

LIST OF TABLES
(continued)

Page No.

Table 23 – Primary Drinking Water Standards.....50

Table 24 – Subregional Alternative Cost Summary 64

Table 25 – RIDS Priority Projects 71

Table 26 – Funding Examples 72

Table 27 – Alternative Water Supply (AWS) Identified Projects 73

Table 28 – Proposed Funding Schedule.....76

Table 29 – Benefits and Incentives.....83

Table 30 – Subregional Alternatives Capacity 84

Table 31 – Project Unit Cost.....90

Table 32– Project and Criteria Evaluation.....90

Table 33 – Project Implementation Strategy 92

Table 34 – Proposed Subregional Project Summary 96

Table 35 – Horizontal Well Pump Characteristics 118

Table 36 – Injection Pump Characteristics 119

Table 37 – Recovery Well Pump 120

Table 38 – Subregional Alternative Summary.....126

LIST OF FIGURES

Page No.

Figure 1 – Study Area 5

Figure 2 – Future Wastewater Service Areas 8

Figure 3 –Reclaimed Water Transmission Lines.....14

Figure 4 – Current Reclaimed Water Demand 18

Figure 5 – Future Reclaimed Water Demand 19

Figure 6 – Project Deficit.....6

Figure 7 – Project Deficit Considering ASR Benefit.....28

Figure 8 – Potential Surface Water & Reclaimed Water ASR Sites 31

Figure 9 – Depth of Penetration of Inventoried Wells.....32

Figure 10 – WWTP, ASR Systems & Upper Florida Permitted Wells 34

Figure 11 – Existing & Proposed Reuse Sites in Study Area 36

Figure 12 – Alternative Projects 39

Figure 13 – Horizontal Well for Intake System Type I 42

Figure 14 – Shallow Vertical Wells Alignment for Intake System Type II 43

Figure 15 – Open Trench with Screen Covering for Intake System Type III.....44

Figure 16 –Infiltration Gallery and Sand Filter Pack Material for Intake System Type IV 45

Figure 17 –Conceptual Surface Water ASR System for Ten Mile Canal.....46

Figure 18 – ASR Well Pad.....47

Figure 19 – Illustration of Construction Details for ASR Well 48

Figure 20 – Conceptual Reclaimed Water ASR System for Fiesta Village/Fort Myers Beach 54

Figure 21 – Conceptual Reclaimed Water ASR System for Fort Myers Central/Lehigh Acres/ Gateway 55

Figure 22 – Conceptual Reclaimed Water ASR System for Gateway/Lehigh Acres.....56

Figure 23 – Conceptual Reclaimed Water ASR System for Lehigh Acres 57

LIST OF FIGURES
(continued)

Page No.

Figure 24 – Conceptual Reclaimed Water ASR System for Three Oaks 58

Figure 25 – Conceptual Reclaimed Water ASR System for Fiesta Village 59

Figure 26 – Conceptual Reclaimed Water ASR System for Fort Myers Beach 60

Figure 27 – Conceptual Reclaimed Water ASR System for Fort Myers South 61

Figure 28– Alternative Projects Index Sheet 85

Figure 29 – Ten Mile Canal Water and Fiesta Village Reclaimed Water ASR Project 98

Figure 30 –Fiesta Village/Fort Myers Beach Reclaimed Water ASR Project.....99

Figure 31 – Fort Myers Central Reclaimed Water ASR Project 100

Figure 32 – Gateway Reclaimed Water ASR Project.....101

Figure 33 – Lehigh Acres Reclaimed Water ASR Project 102

Figure 34 – Three Oaks Reclaimed Water ASR Project.....103

Figure 35 – Fort Myers Beach Reclaimed Water ASR Project 104

Figure 36 – Fort Myers South Reclaimed Water ASR Project.....105

Figure 37 – City of Fort Myers Reclaimed water System Expansion 106

Figure 38 – Corkscrew Rd. to Williams Rd. Interconnect.....107

Figure 39 – Typical Surface Water ASR System Process Flow Layout Schematic.....110

Figure 40 – Typical Surface Water ASR System Layout.....111

Figure 41 – Typical Horizontal Well Withdrawal Pumping Station 112

Figure 42 – Typical ASR Well Layout.....113

Figure 43 – Typical Horizontal Well Cross-Section Installation Method A 114

Figure 44 – Typical Horizontal Well Cross-Section Installation Method B 115

Figure 45 – Typical Reclaimed Water ASR System Process Flow Schematic 116

LIST OF ATTACHMENTS

Attachment A – The B-C Methodology

Attachment B – The B-C Models Results

Attachment C – Summary of Inventoried Well Data

Attachment D – Hydrostratigraphy Assessment of Inventoried Wells

Attachment E – Horizontal Well Pump – Sample Curves

Attachment F – Injection Well Station – Sample Curves

Attachment G – Recovery Pump – Sample Curves

Attachment H – Public Statement on Ultraviolet (UV) Light for Treatment of Public Water Supplies

EXECUTIVE SUMMARY

The Regional Irrigation and Distribution System (RIDS) project was one of the recommendations identified in the District's *Lower West Coast Water Supply Plan* (Water Supply Plan) completed in April 2000. The Water Supply Plan recommended the RIDS to evaluate the "feasibility of constructing regional irrigation water distribution system(s) and other options to meet the growing urban irrigation demands of this area". Accordingly, the objective of the RIDS Feasibility Study is to develop the preliminary design information for a regional, interconnected irrigation system that enables the maximum use of non-potable water to meet all or a portion of the projected year (2020) urban irrigation demand.

The RIDS Master Plan was completed in 2002. The Master Plan study area comprised the coastal area (western portion) of the Lower West Coast Region. It included the service areas of the Cities of Cape Coral, Fort Myers, and Naples, and the franchise areas for Lee County Utilities, Collier County Utilities, Florida Water Services, Gulf Environmental Services, and Bonita Springs Utilities.

Because of the scope and complexity of the issues involved, historic development patterns, and the fact that the few centralized irrigation systems which currently exist in the area are controlled by separate entities, the RIDS Feasibility Study recommends taking a subregional approach, with the ultimate goal of creating a regional integrated network. This paper addresses Subregion 3, which covers the City of Fort Myers and Lee County service areas. Although the area has been progressive in developing alternative supply sources including reclaimed water, these sources will not be adequate to meet future demands. Also, because utilities in this sub-region have their own discrete infrastructure, there has been no optimization of the resource on a regional basis.

To determine the amount of water from alternative sources that will be necessary for future urban irrigation water, an evaluation of water demands was performed. The demand analysis was determined on a temporal basis. The current average demand for this subregion is approximately 51 MGD. Urban irrigation demand for the Year 2020 was projected at 109.3 MGD. Currently, the stakeholder utilities provide 21 MGD of reclaimed water.

Alternative sources of supply were determined to address the urban irrigation demands. Additional allocations from resources that are currently stretched, such as groundwater, will be minimized. Therefore, an inventory of potential sources of supply was conducted and prioritized to address future irrigation water needs in the study area. These potential sources of supply are:

- Reclaimed wastewater from municipal wastewater treatment plants
- Water recovered during the dry season from reclaimed water aquifer storage and recovery (ASR) systems recharged during the wet season
- Surface water from streams, rivers, abandoned borrow pits, and canal systems having salinity control structures
- Water recovered during the dry season from surface water ASR systems recharged during the wet season

These sources provided a total future flow of 66.9 MGD to offset potable water demands and future groundwater withdrawals.

In order to develop a preliminary cost estimate associated with the projects, various potential projects were analyzed on a subregional basis. The estimates consider the financing of initial capital costs, including assumptions about potential grant funding, and annual operations and maintenance expenses. These costs are then divided by the expected production of irrigation water resources for the identified projects to determine the unit cost of the irrigation water resources for each subregion. In order to calculate the cost per gallon, it was assumed that the total annual production of each project would be approximately equal to 180 days of production based on the project capacity measured on an average daily basis. The unit costs for the development of the irrigation water resources as identified herein range from $0.78 to $3.60 per one thousand gallons depending on the project.

It was determined that the preferred alternative is eligible for several different funding options including:

- EPA Grants - $2M/Year
- District Grants - $1M/Year
- Governor's Program Grants - $500K/Year
- SRF Loan - Balance of Capital

It was determined through consensus that individual interlocal agreements on a project-by-project basis, rather than focusing on the RIDS projects as a whole (i.e., Authority or regional utility), would be utilized as an institutional framework.

Implementation of the RIDS will require additional phases to design, finance and construct the improvements. Assuming Phase 1 included the Master Plan and Phase 2 includes the Feasibility Study, subsequent phases include the following:

- **Phase 3 Engineering Design –** Includes design, permitting and bidding of projects.
- **Phase 4 Construction –** Construction and startup of projects

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INTRODUCTION

The objective of the Master Plan for the Regional Irrigation Distribution System (RIDS) for the Lower West Coast Region is to develop a program to supply enough water to meet the projected (year 2020) urban irrigation demand for future growth in Lee and Collier counties. Although the area has been progressive in developing alternative supply sources including reclaimed water, these sources will not be adequate to meet future demands. Also, because many of the utilities in the service area have their own discrete infrastructure, there has been no optimization of the resource on a regional basis. Therefore, it was determined by the South Florida Water Management District (District) that a master plan was required to evaluate these needs.

The RIDS project was one of the recommendations identified in the District's *Lower West Coast Water Supply Plan* (Water Supply Plan) completed in April 2000. The Water Supply Plan recommended the RIDS to evaluate the "feasibility of constructing regional irrigation water distribution system(s) and other options to meet the growing urban irrigation demands of this area".

A series of memoranda were submitted throughout the course of the study in order to ensure that all utilities, local government agencies, project team members, the District and other stakeholders were aware of and involved in the progress of the project.

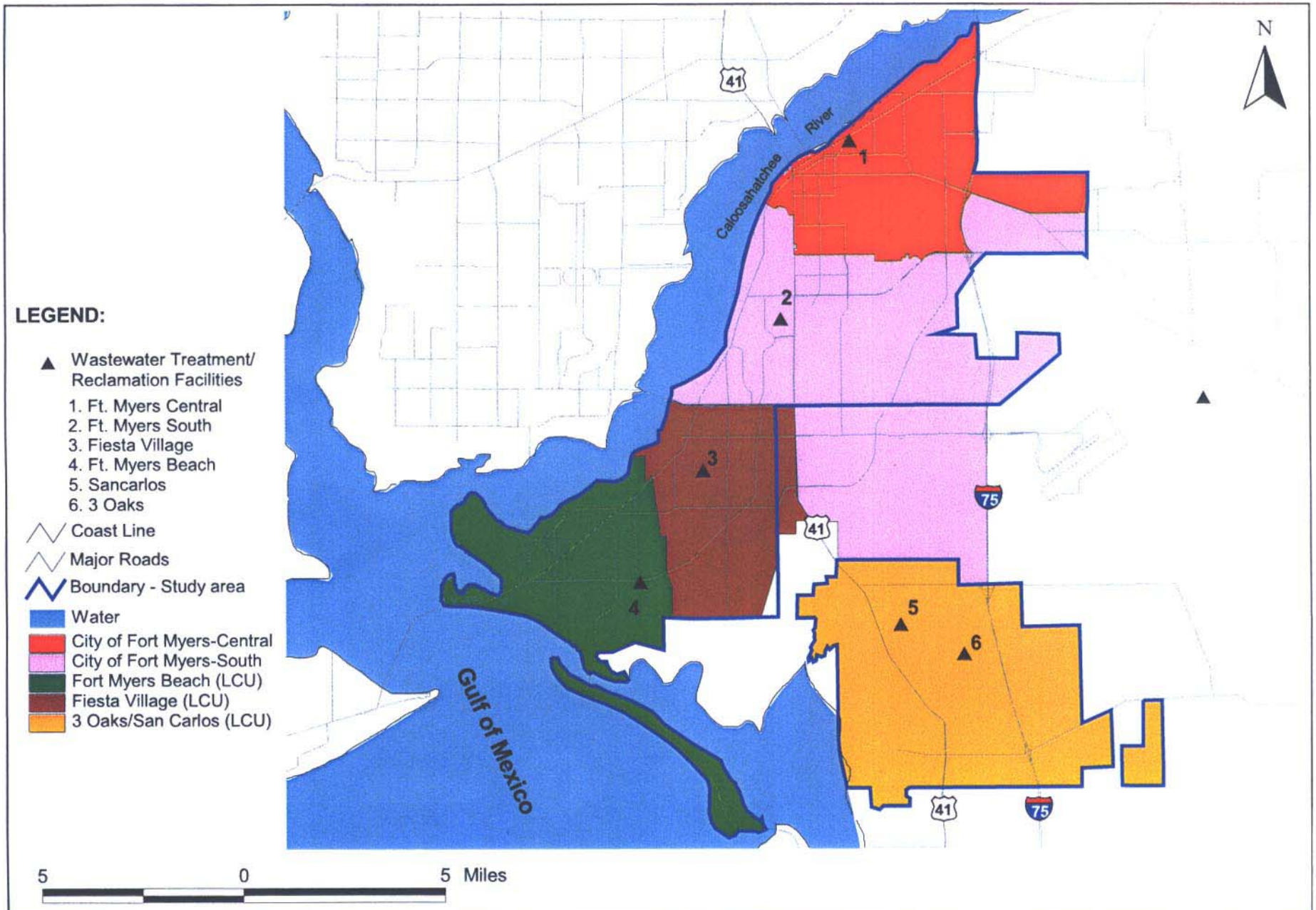
STUDY AREA DEFINITION

The study area comprises the coastal area (western portion) of the Lee County Utilities / Fort Myers Utilities service areas. The study area is presented in Figure 1. Land use is primarily residential and commercial.

The RIDS Sub-Region 3 study area was developed from the following sources:

- Master plans
- Comprehensive land use plans
- Future growth areas (large developments)

The limits follow the year 2020 projected service areas for the City of Ft Myers and the Lee County Utilities Wastewater service areas. There are approximately 144,531 acres in the study area of this sub-region, of which approximately 81,859 acres are currently served by one of these Utilities. It is expected that by the year 2020, the entire population within the study area will be served. This is summarized in Table 1. Figure 1 shows the study area and existing service areas. Figure 2 identifies the projected year 2020 service areas.



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	SUBREGION 3 - STUDY AREA	Figure 1

Table 1
Service Area Summary

Facility Name	Stakeholder	Service Area Acreage	Permitted Capacity (MGD)	Annual Average Daily Flow (MGD)	Maximum Monthly Flow (MGD)	Minimum Monthly Flow (MGD)
Fiesta Village	LCU	9,781	5.0	2.2	2.8	1.8
Ft. Myers Beach	LCU	12,954	6.0	3.0	3.8	2.3
Ft. Myers Central	FMU	13,212	11.0	6.3	12.3	4.4
Ft. Myers South	FMU	19,069	12.0	6.7	11.5	4.9
Three Oaks	LCU	22,363	1.5	1.3	1.6	1.1
Gateway	LCU	4,480	0.5	0.4	0.4	0.3
Lehigh Acres	FGUA	62,672	2.1	1.2	2.4	0.6
Total		**144,531**	**38.1**	**21.1**	**34.7**	**15.5**

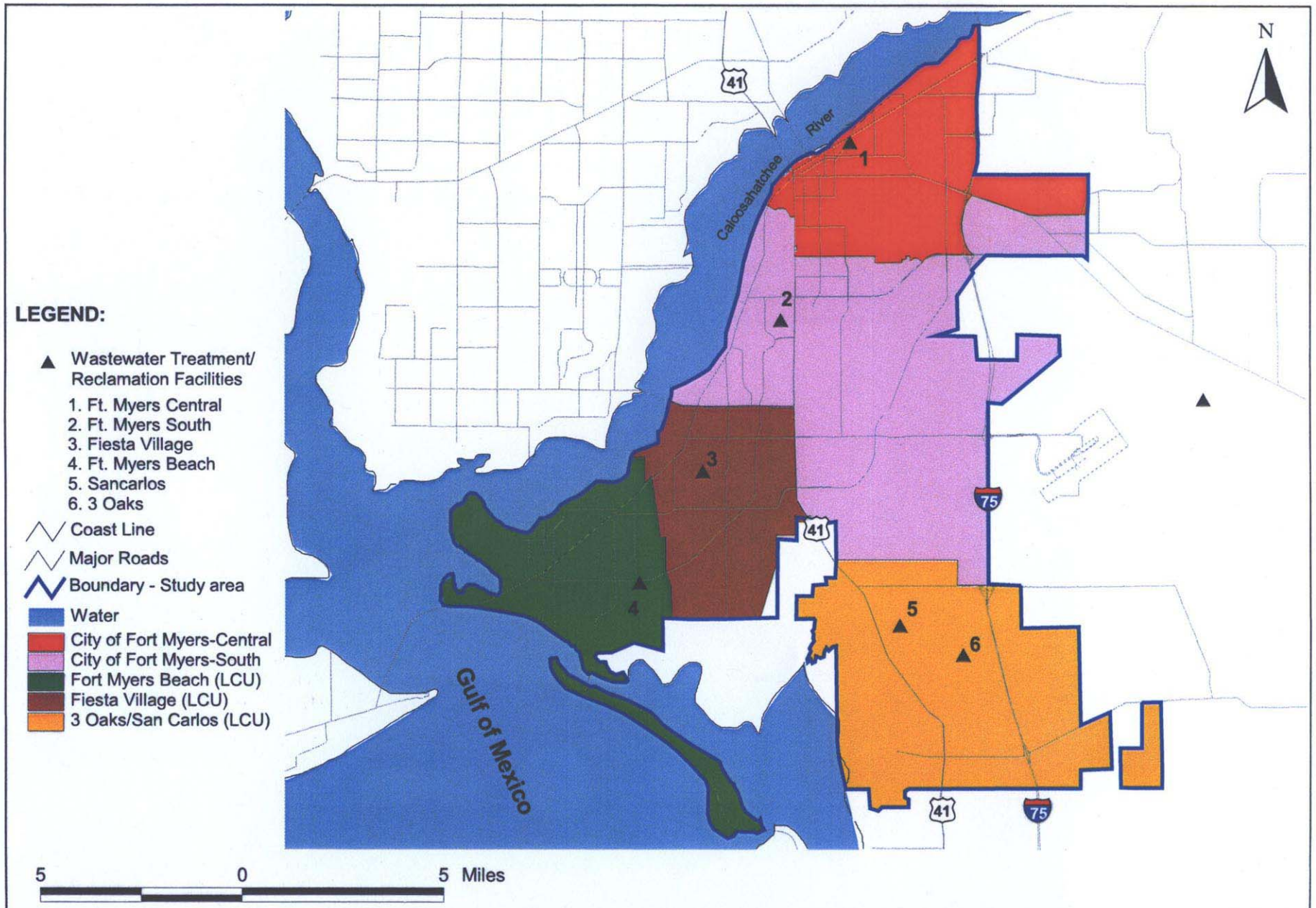
LCU= Lee County Utilities
FMU= Fort Myers Utilities
FMU/LCU Lee County Utilities/Fort Myers Utilities
FGUA=Florida Governmental Utility Authority

FACILITIES INVENTORY

Existing and future, year 2000 and year 2020, respectively, wastewater treatment/reclamation facilities and associated infrastructure within the study area were inventoried. The purpose of the inventory was to:

- Identify existing treatment facilities and infrastructure
- Identify reclaimed water transmission infrastructure
- Determine current wastewater flows
- Determine existing reuse and disposal mechanisms and how much reclaimed water/effluent is distributed to each

Flows were generated from Monthly Operating Reports (MORs) submitted for each facility to FDEP in accordance with their permits and from monitoring data provided by the facilities. Flow data included correlate with year 2000 population projections.



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	SUBREGION 3 - FUTURE WASTEWATER SERVICE AREAS	Figure 2

Wastewater Treatment/Reclamation Facilities

There are five wastewater treatment plants/reclamation facilities of significance in the study area. Effluent from the wastewater treatment/reclamation facilities is reused for urban irrigation, commercial uses, and groundwater recharge, or disposed of via surface water. Table 2 presents recent reuse and disposal information from the facilities.

Table 2
Reuse and Disposal Summary – Current

Facility Name	Disposal Method	AADF (MGD)	Max. Monthly Flow (MGD)	Min. Monthly Flow (MGD)
Fiesta Village Plant Capacity = 5 MGD	Reuse	0.90	1.33	0.19
	Surface Water	1.39	2.66	0.69
Ft. Myers Beach Plant Capacity = 6 MGD	Reuse	2.40	3.61	1.15
	Percolation Ponds	0.5	0.5	0.5
	Deep Well Injection	0.32	1.18	0
Three Oaks Plant Capacity = 1.5 MGD	Reuse	1.3	1.6	1.1
Ft. Myers Central Plant Capacity = 11 MGD	Reuse	0.70	0.8	0.44
	Surface Water	5.65	11.66	0
Ft. Myers South Plant Capacity = 12 MGD	Surface Water	7.37	12.26	5.75
Gateway Plant Cap. = 0.5 MGD	Reuse	0.30	0.41	0.31
Lehigh Acres Plant Cap. = 2.1 MGD	Reuse	1.2	2.4	0.6
Total MGD	Reuse	6.8	10.1	3.8
	Surface Water/Percolation	14.9	27.1	6.9
	Deep Well Injection	0.3	1.2	0.00

A list of potential end users for the RIDS has been determined based on information received from the local governments to determine future infrastructure needs. Attachment A shows existing and proposed users graphically. This will include existing and planned new golf courses, large green space areas, and future large planned residential developments. Table 3 presents the list of existing reclaimed water users (excluding quantity for percolation) and Table 4 presents potential major irrigation users. Current reclaimed water use is 6.8 MGD. The current facility locations are shown in Figures 2 and 3.

Table 3
Major Current Irrigation Users and Irrigation Demand

	Existing User	Reuse Demand (MGD)
Three Oaks	Vines Country Club	0.50
Source: GUS permit, page 3	Pelican Sound Golf Course	0.50
	West Bay Club Golf Course	0.35
	Villages of Country Creek Golf Course	0.15
	Subtotal	**1.50**
Fiesta Village	The Landings	0.25
Source: 2002-3 data	Crown Colony GC	0.50
	Cypress Lake CC/HS/Manor	0.59
	Myerlee CC/Condos	0.53
	Riverside at Landing, Rutenberg Park , DOT Interc, Laguna Lakes Res.	0.28
	Subtotal	**2.15**
Ft. Myers Beach	Gulf Harbour	0.69
Source: 2002-3 data	County Percolation Ponds	0.55
	Lexington	0.61
	Kelly Greens	0.41
	Health Park	0.22
	Bayside Estates	0.19
	Summerlin Ridge	0.13
	Shell Point Golf Club	0.07
	Shell Point Woodlands	0.02
	Shell Point Village	0.11
	McGregor Park Condos	0.09
	Small Users	0.17
	Subtotal	**3.25**
Ft. Myers Central/South	Lee County Resource Recovery Facility	0.46
Source: Effluent Resource Planning Report, March 2001 Table 2-1	Red Sox Minor League Facility	0.13
	City Nursery	0.02
	City of Ft Myers WTP	0.02
	Buckingham Community Bank	0.06
	Subtotal	**0.69**
Gateway	Residential	
	Subtotal	
Lehigh Acres	Lehigh Acres North	
	Mirror Lakes	
	Subtotal	
Total Reuse Demand =		**7.59**

*denotes users that average less than 100,000 gpd

Table 4
Potential Major Irrigation Users and Irrigation Demand

	Potential User	Reuse Demand (MGD)
Three Oaks	Stoneybrook	1.05
Source: GUS permit, page 3	Grande Oaks	0.72
	FGCU	0.2
	Miromar Lakes	0.5
	Subtotal	**2.47**
Fiesta Village	Village of Sevel Lakes	0.60
Source: Reuse Feasibility Study, Sept 02	Edison Community College	0.06
	Myerlee Gardens Home Owners	0.03
	Mariner Building	0.03
	University of South Florida	0.03
	Caloosa Yacht and Racquet Club	0.03
	Golf View Country Club	0.27
	Parker Lakes Developments	0.03
	Caloosa Palms	0.07
	Subtotal	**1.15**
Ft. Myers Beach	Pottinger's Nursery	0.02
Source: Plan Update for Reuse Service Area, June 03	Lee County Property (South of Kelley Rd.)	0.02
	Watercase Corporation	0.02
	Peppertree Points	0.10
	Cypress Cove Health Park	0.12
	Health Park Undeveloped Land	0.30
	Asbury	0.10
	Sanibel Beach Place	0.03
	Small Users	0.01
	Subtotal	**0.71**
Ft. Myers Central/South	Heritage Palms Golf Course	0.47
Source: Effluent Resource Planning Report, March 2001 Table 2-2	Heritage Palms	0.77
	Eastwood Golf Course	0.56
	Ft. Myers Country Club	0.37
	Centennial Park	0.03
	Omni Development	0.42
	Windkler Road Ext.	0.01
	Ft. Myers Cemetery	0.03
	Little League Ballfield	0.01
	Minor Irrigation Users	0.43
	Red Sox Main Field	0.04
	Jack Parker Corp.	0.35
	Jack Parker Corp. Golf Course	0.47
	Sun City Golf Courses	0.70
	Sun City	1.05
	Colonial Golf & Country Club Golf Course	0.29
	Colonial Golf & Country Club Residential	0.57
	Gateway Development	0.84
	Subtotal	**7.41**
Gateway	Residential	
	Subtotal	
Lehigh Acres	Lehigh Acres North	
	Mirror Lakes	
	Subtotal	
Total Potential Reuse Demand =		**9.46**

*NI denotes no information

Reclaimed Water Transmission Facilities

Existing reclaimed water transmission facilities were identified. The focus was primarily on larger pipelines; therefore, distribution systems and smaller lines may not be shown on the maps. Figure 3 presents the existing reclaimed water transmission facilities.

URBAN IRRIGATION WATER DEMANDS

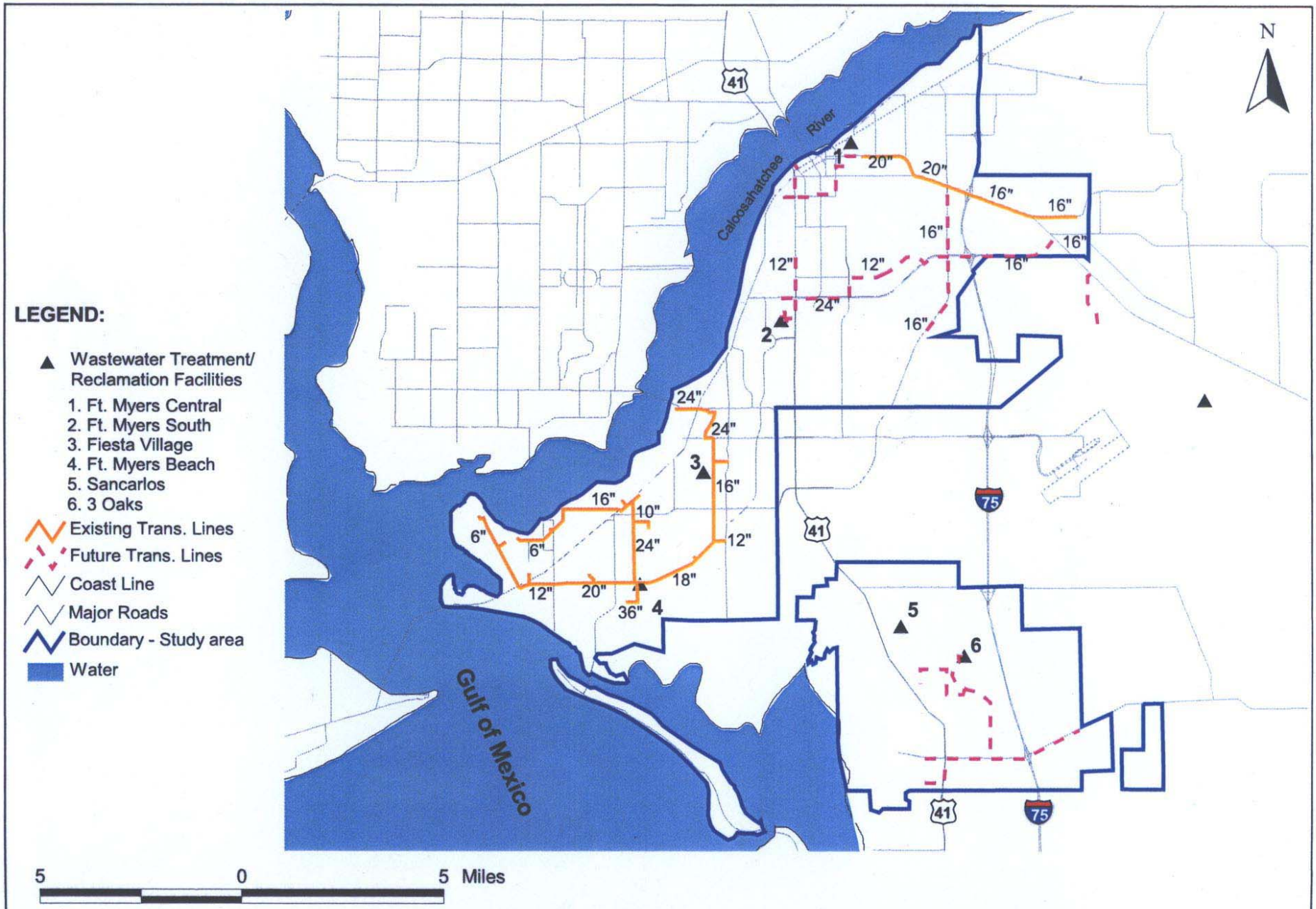
In order to determine the amount of water that will be necessary for future urban irrigation, an evaluation of service area water demands was performed. Significant increases in urban irrigation demands are projected through 2020. In some areas, those sources will not be sufficient to support these future demands. In addition, the seasonality of demands and potential supplies limits the use of some sources. There is 100 percent utilization of reclaimed water supplies in some portions of this project area during the dry months, while there is a surplus during the wet season. It was determined that additional sources of water do exist in the study area to meet a portion of the projected irrigation demands, mainly from surface water and reclaimed water expansions. Storage will be an integral component of this project to span the gap between the seasonal variability of wet weather surpluses and dry season deficits.

Population Projections

First, permanent population projections for each service area were developed from a variety of sources including franchise or utility-supplied data. The majority is based on permanent population and does not reflect seasonal variability. Most of the population projections extended through 2020, but for those that did not, a linear regression was performed using the available data. Table 5 presents an estimate of the current and future population projections and the source of information for each service area.

Table 5
Population Projections

Facility/Service Area	Current Serviced Population 2000	Projected Serviced Population 2020	Source
Lee County Utilities			
Fiesta Village	22,200	39,291	Current determined from monthly flows assuming 100 gpcd, future determined using update to Water Supply Master Plan (2000)
Ft Myers Beach	34,538	48,030	Lee County Planning Community Web Map
Three Oaks	13,484	33,140	Current from the Lee County Planning Community Map, future from the Lower West Coast Water Supply Plan
Gateway	3,020	10,585	Lee County Planning Community Web Map
Lehigh Acres	22,382	91,734	Lee County Planning Community Web Map-utilizing EDUs (from '99 WWTP Permit Modification and Reuse Engineering Report) to determine the population served
Sub-Total	*95,624*	*222,780*	
Ft Myers Utilities			
Ft Myers Central	26,530	36,893	Lee County Planning Community Web Map, taking service area acreage into account
Ft Myers South	47,780	55,764	Lee County Planning Community Web Map, taking service area acreage into account
Sub-Total	*74,310*	*92,657*	
Total	**169,934**	**315,437**	



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	SUBREGION 3 - RECLAIMED WATER TRANSMISSION LINES	Figure 3

Urban Irrigation Water Demands

The urban irrigation water demands were developed using both actual demand data and the modified Blaney-Criddle (B-C) model as provided by the District. The B-C methodology is explained in Attachment B. Rainfall values in inches per month were generated for the 1-in-10 year drought event, meaning there is a probability of such a drought occurring once every ten years. These values are shown in Table 6.

The following input variables were used to determine the B-C urban irrigation water demands:

- Rainfall Station: Ft Myers
- Irrigation System: Sprinkler
- Crop: Turf Grass
- Irrigable Acreage: Calculated for each service area
- Soil Type: Lee, 0.8 (based on Figures C-8 and C-4 from the Management of Water Use Permitting Information Manual, Vol. III).

Table 6
1-in-10 Year Drought Rainfall Values (inches)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Lee County	1.3	1.7	0.3	0.7	2.9	7.2	6.8	7.4	8.0	2.4	1.2	1.3	41.2

The irrigable acreage for each service area was estimated based on two main components: developed (residential and to a lesser extent, commercial) areas and open space areas (typically golf courses). Open space areas were determined from utility-supplied data, where possible, and were projected using historical golf course acreages from the Lower West Coast Water Supply Plan (2000), when other information could not be found. Based on experience in Cape Coral and other reuse systems, a factor of 0.075 irrigable acres per capita was used for the developed areas. The results indicated the total irrigable acreage for each service area. On a percentage basis, this amounted to an irrigable acreage per total acreage of approximately 15 to 20 percent, depending on the service area. This is a realistic percentage for a mixed-use area that has a higher residential coverage, but also includes non-developable coverage, which does not require any significant irrigation needs such as wetlands, surface water, and retail/commercial areas. Tables 7 and 8 present the irrigable acreage used to determine the service area irrigation demands.

Table 7
Irrigable Acreage – Current

Facility Inventory	Total Acreage	Developed Irrigable Acreage	Open Space Irrigable Acreage	Total Irrigable Acreage
Fiesta Village	9,781	1,665	272	1,937
Ft Myers Beach	12,954	3,338	360	3,748
Three Oaks	22,363	1,011	625	1,636
Gateway	6,905	227	191	418
Ft Myers Central	13,212	1,990	368	2,357
Ft Myers South	19,069	3,584	537	4,120
Lehigh Acres	*62,672*	*1,679*	*1750*	*3,429*
Total	**146,956**	**13,494**	**4,103**	**17,645**

Table 8
Irrigable Acreage – Future

Facility Inventory	Total Acreage	Developed Irrigable Acreage	Open Space Irrigable Acreage	Total Irrigable Acreage
Fiesta Village	9,781	2,947	272	3,219
Ft Myers Beach	12,954	4,711	360	5,072
Three Oaks	22,363	2,486	625	3,111
Gateway	15,942	794	414	1,208
Ft Myers Central	13,212	2,767	368	3,135
Ft Myers South	31,302	4,182	810	4,992
Lehigh Acres	62,672	6,880	1,750	8,630
Total	**168,226**	**24,767**	**4,599**	**29,367**

It was determined that the B-C method alone does not realistically predict the irrigation demand, especially in terms of a normal temporal distribution in southwest Florida. With heavy local rainfall and an elevated water table, the demand for irrigation water typically decreases during the wet season months. The temporal distribution of the monthly irrigation requirements generated by the B-C model contradict these facts. For this reason, an alternative method was developed for determining irrigation demands for this project. Reuse factors (ratio of monthly reuse demand to annual average reuse demand) were determined for each service area using the flow data supplied by each franchise. For certain service areas that did not show an appropriate distribution, factors from another representative service area were used. These factors were then applied to the annual supplemental irrigation volume supplied by the B-C model as summarized in the table above to create future demand projections. The reuse factors are included in the methodology for Attachment B.

The demand analysis was determined on a temporal basis for each service area. Table 9 presents actual monthly demands for the service area. Figures 4 and 5 present the demands geographically. In Table 9 the current average demand for the study area is approximately 6.8 MGD. Table 10 shows the maximum potential demand based on current irrigable acreages as determined by the Blaney-Criddle model. Table 11 shows the 2020 demand based on the corresponding demands for the future service areas. Taking into consideration the anticipated growth in the region, this estimate appears to be reasonable.

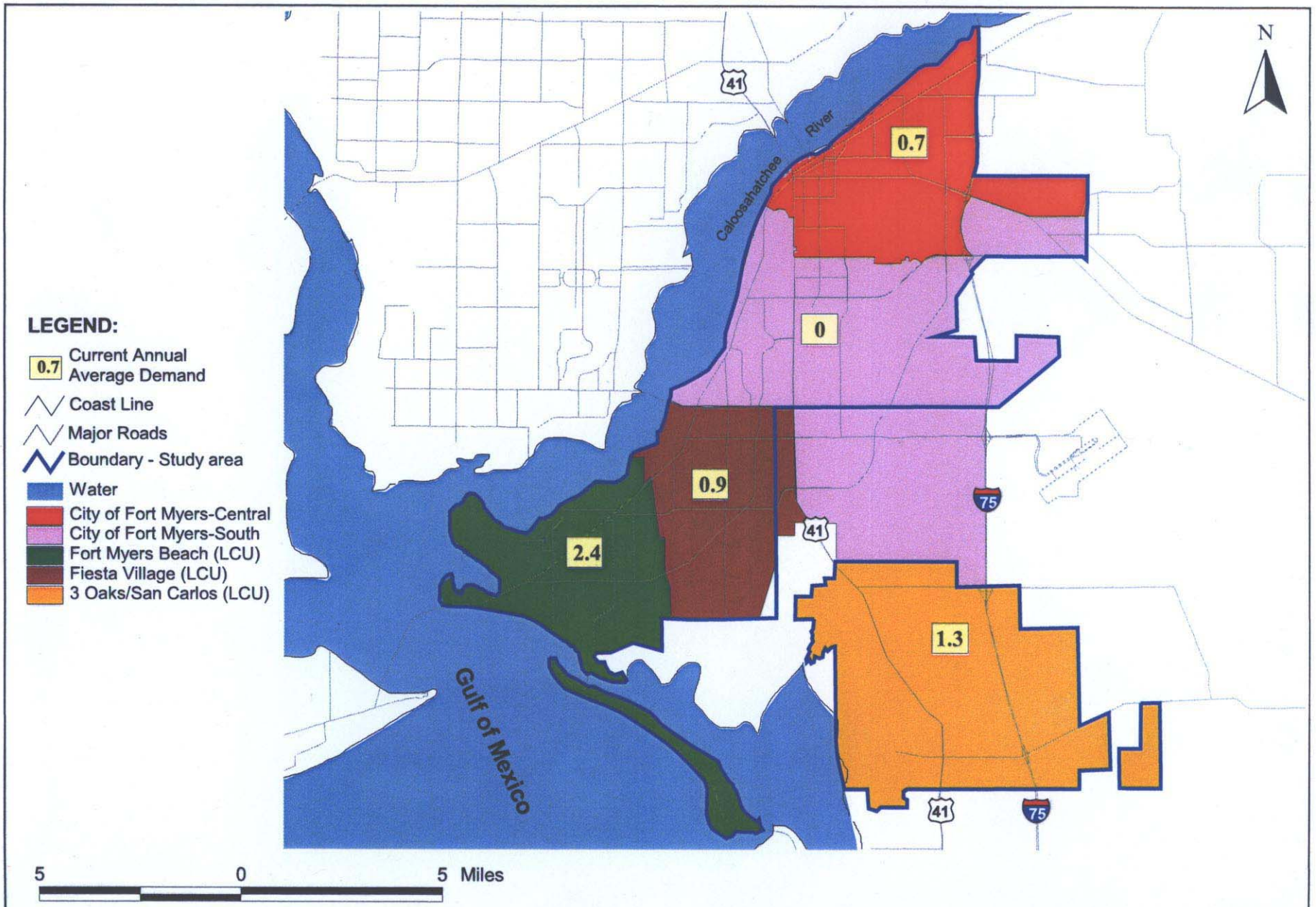
Table 9
Actual Reclaimed Water Use – Current

Facility	Actual Reclaimed System Demand* (MGD)												Annual Average (MGD)	Annual Total (MGY)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec		
Fiesta Village[a]	1.0	1.3	1.1	1.2	1.2	0.6	0.4	0.4	0.2	0.9	1.3	1.0	0.9	321.5
Ft. Myers Beach[a]	2.1	1.9	3.6	3.6	2.8	2.1	2.0	2.0	1.2	2.6	2.8	2.1	2.4	874.8
Ft. Myers Central[b]	0.6	0.7	0.8	0.8	0.8	0.7	0.7	0.7	0.6	0.7	0.7	0.6	0.7	250.6
Ft. Myers South[b]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Three Oaks[c]	1.3	1.1	1.1	1.1	1.1	0.7	1.4	1.6	1.4	1.7	1.8	1.7	1.3	490.0
Gateway	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	109.5
Lehigh Acres	0.9	0.8	0.8	0.8	0.6	0.8	1.1	1.7	2.4	2.0	1.2	1.2	1.2	435.0
Total	**6.3**	**5.9**	**7.7**	**7.7**	**6.8**	**5.2**	**6.0**	**6.6**	**6.1**	**8.2**	**8.1**	**7.0**	**6.8**	**2,481.4**

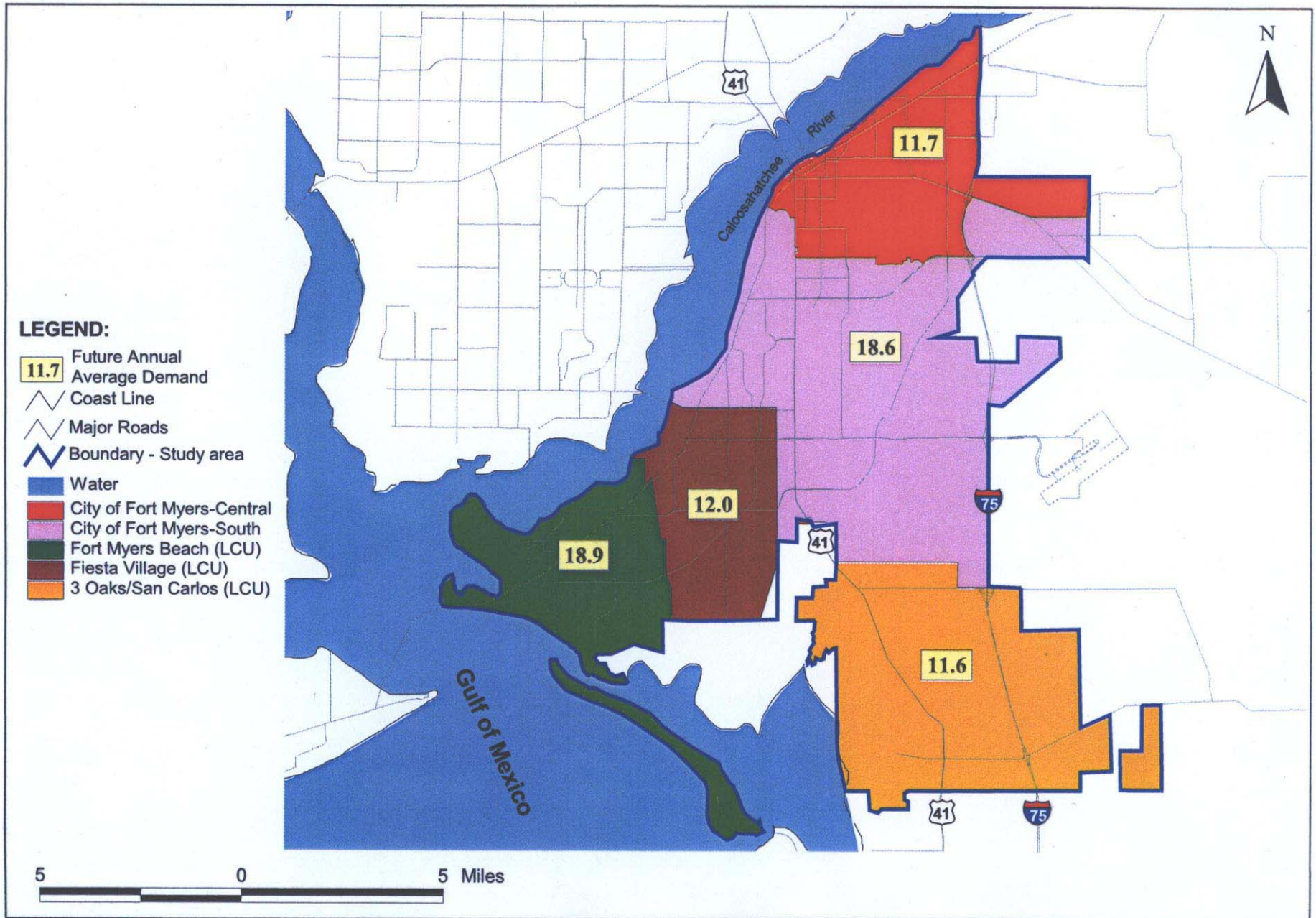
*"Reclaimed System" is defined as all water that is conveyed in the reclaimed infrastructure, including surface water, reclaimed water, and groundwater
a. 2000 data
b. This data displays 2000 data from Oct. - Dec. and 2001 flows for Jan. - Sept.
c. This data was taken from the 2003 Monthly Operating Reports, submitted to the DEP

Table 10
Maximum Potential Demand – Current

Facility	Current Maximum Potential Demand (MGD)												Annual Average (MGD)	Annual Total (MGY)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Fiesta Village	6.8	6.9	9.5	9.6	8.4	6.3	5.9	5.8	4.2	7.6	8.6	6.9	7.2	2,633
Ft. Myers Beach	13.2	13.3	18.4	18.6	16.2	12.3	11.4	11.2	8.2	14.7	16.6	13.4	14.0	5,095
Ft. Myers Central	8.3	8.4	11.6	11.7	10.2	7.7	7.2	7.1	5.1	9.3	10.4	8.4	8.8	3,205
Ft. Myers South	14.5	14.7	20.2	20.4	17.8	13.5	12.5	12.4	9.0	16.2	18.3	14.7	15.3	5,601
Three Oaks	5.8	5.8	8.0	8.1	7.1	5.4	5.0	4.9	3.6	6.4	7.3	5.8	6.1	2,224
Total	**48.6**	**49.1**	**67.7**	**68.4**	**59.6**	**45.1**	**42.0**	**41.4**	**30.0**	**54.2**	**61.1**	**49.2**	**51.4**	**18,758.6**



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	SUBREGION 3 - CURRENT DEMAND	Figure 4



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	SUBREGION 3 - FUTURE DEMAND	Figure 5

Table 11
Demand Analysis – Year 2020

Facility	Normalized Modified Blaney-Criddle Demand (MGD)												Annual Average	Annual Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	(MGD)	(MGY)
Fiesta Village	11.7	12.4	14.6	14.8	13.7	10.7	9.8	9.7	7.9	12.5	14.1	12.0	11.98	4,373.9
Ft. Myers Beach	18.5	19.5	23.0	23.3	21.5	16.8	15.5	15.3	12.5	19.6	22.1	18.9	18.88	6,891.5
Ft. Myers Central	11.4	12.1	14.2	14.4	13.3	10.4	9.6	9.4	7.7	12.1	13.7	11.7	11.67	4,259.4
Ft. Myers South	18.2	19.2	22.6	22.9	21.2	16.6	15.2	15.0	12.3	19.3	21.8	18.6	18.59	6,783.7
Three Oaks	11.3	12.0	14.1	14.3	13.2	10.3	9.5	9.4	7.7	12.0	13.6	11.6	11.58	4,226.7
Gateway	4.4	4.7	5.5	5.5	5.1	4.0	3.7	3.6	3.0	4.7	5.3	4.5	4.50	1,641.4
Lehigh Acres	31.5	33.3	39.1	39.6	36.7	28.6	26.3	26.0	21.3	33.4	37.7	32.2	32.13	11,726.4
Total	**107.1**	**113.1**	**133.0**	**134.7**	**124.7**	**97.5**	**89.6**	**88.4**	**72.5**	**113.6**	**128.2**	**109.5**	**109.3**	**39,896.0**

* These figures represent calculated values for the year 2020, based on a normalized version of a modified Blaney-Criddle Method.

The demands estimated above were larger than predicted by the Water Supply Plan. It is clear a variety of alternative sources will be necessary to satisfy these projected irrigation demands and to minimize impacts to other stretched resources, such as groundwater.

POTENTIAL URBAN IRRIGATION WATER SOURCES

An evaluation of potential sources of supply was conducted to address future irrigation water needs in the Fort Myers/Lee County sub-region. These potential sources of supply are:

- Reclaimed water from municipal wastewater treatment plants
- Water recovered during the dry season from reclaimed water aquifer storage and recovery (ASR) systems recharged during the wet season
- Surface water from streams, rivers, and canal systems having salinity control structures
- Water recovered during the dry season from surface water ASR systems recharged during the wet season
- Groundwater from irrigation supply wells

Reclaimed Water

It was assumed that reclaimed water supply was equivalent to the projected influent wastewater flow. The assumption was also made that the entire population within each service area was connected. While this is not the case, this is a goal that the implementation of the RIDS will help to achieve. The supplies were calculated by taking the current wastewater flows, dividing by the current service area population and multiplying by the projected 2020 population. This allowed the temporal variability to be accounted for in the future projections. Table 12 shows the existing monthly Water Reclamation Facility flows. Table 13 displays the projected (Year 2020) Water Reclamation Facility flows.

Table 12
Existing Monthly Average Wastewater Flow

Facility	Monthly Flows (MGD)												Average	Annual Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	(MGD)	(MGY)
Fiesta Village [a]	2.3	2.4	2.3	2.1	1.8	1.9	2.2	2.3	2.8	2.3	2.1	2.0	2.2	808.9
Ft. Myers Beach [a]	3.3	3.8	3.8	3.2	2.3	2.5	2.6	2.7	3.1	2.7	3.1	2.9	3.0	1,099.8
Ft. Myers Central [b]	4.4	4.9	5.1	5.2	4.9	5.5	7.6	9.0	12.3	7.1	5.3	4.8	6.3	2,314.1
Ft. Myers South [b]	5.5	5.5	5.8	5.7	4.9	5.4	7.8	9.6	11.5	7.0	5.8	5.5	6.7	2,437.3
Three Oaks [c]	1.3	1.1	1.1	1.1	1.1	0.7	1.4	1.6	1.4	1.7	1.3	1.3	1.3	459.0
Gateway [a]	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	109.5
Lehigh Acres [d]	0.9	0.8	0.8	0.8	0.6	0.8	1.1	1.7	2.4	2.0	1.2	1.2	1.2	435.0
Total	**18.0**	**18.7**	**19.4**	**18.5**	**16.0**	**17.0**	**23.1**	**27.2**	**33.9**	**23.2**	**19.0**	**16.8**	20.9	7,627.0

a. 2000 data
b. This data displays 2000 data from Oct. - Dec. and 2001 flows for Jan. - Sept.
c. This data was taken from Monthly Operating Reports submitted to the Dept. of Environmental Protection (Jan - Sept '01, Oct - Dec '00)

Table 13
Projected Reclaimed Water Supply – Year 2020

Facility	Monthly Flows (MGD)												Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	(MGD)
Fiesta Village	4.0	4.3	4.1	3.8	3.3	3.3	3.9	4.1	5.0	4.1	3.7	3.6	3.9
Ft. Myers Beach	4.5	5.3	5.3	4.5	3.2	3.5	3.6	3.7	4.4	3.8	4.3	4.1	4.2
Ft. Myers Central	6.2	6.8	7.1	7.3	6.9	7.6	10.6	12.4	17.1	9.9	7.3	6.6	8.8
Ft. Myers South	6.4	6.4	6.8	6.7	5.7	6.3	9.2	11.2	13.4	8.2	6.7	6.4	7.8
Three Oaks	3.3	2.6	2.8	2.6	2.7	1.7	3.6	3.9	3.4	4.2	3.1	3.1	3.1
Gateway	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Lehigh Acres	3.7	3.3	3.3	3.3	2.5	3.3	4.5	7.0	9.8	8.2	4.9	4.9	4.9
Total	**29.2**	**29.7**	**30.5**	**29.2**	**25.3**	**26.7**	**36.3**	**43.4**	**54.2**	**39.4**	**31.2**	**29.8**	**33.7**

SUPPLY AND DEMAND ANALYSIS

To determine the alternative water sources required to meet projected irrigation demands, future urban irrigation supply was compared to projected demand. The demands presented above in Tables 10 to 12 were compared to the existing and projected supplies, including reclaimed water and surface and reclaimed water ASR.

Projected Surplus / Deficit

Table 14 shows the differential between reclaimed water supply and projected demand in the year 2020 under 1 in 10 year drought conditions. Figure 6 displays this data geographically.

Table 14
Projected Surplus / Deficit – Year 2020

	Monthly Surplus/Deficit (MGD)												Annual Average	Annual Total
Facility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	**(MGD)**	**(MGY)**
Fiesta Village	-9.9	-13.0	-11.4	-11.9	-12.5	-5.5	-1.5	-0.8	2.5	-8.2	-14.4	-10.6	-8.1	-2955.0
Ft. Myers Beach	-11.9	-9.3	-22.9	-23.9	-19.1	-12.9	-12.3	-12.1	-4.7	-16.6	-18.1	-12.1	-14.7	-5350.1
Ft. Myers Central	-4.7	-4.4	-5.6	-6.3	-6.4	-3.8	-1.0	1.1	6.4	-1.7	-3.7	-4.1	-2.8	-1040.1
Ft. Myers South	-10.9	-11.5	-13.5	-14.9	-15.4	-11.9	-9.2	-6.9	-3.6	-10.2	-10.8	-10.6	-10.8	-3937.1
Three Oaks	-7.8	-8.7	-8.6	-8.4	-8.1	-9.7	-7.9	-7.8	-8.6	-8.0	-9.1	-9.1	-8.5	-3098.0
Gateway	-4.2	-5.4	-4.8	-4.8	-4.9	-2.3	-1.0	-0.8	0.1	-3.6	-5.7	-4.3	-3.5	-1262.4
Lehigh Acres	-33.6	-42.9	-38.3	-38.8	-39.8	-20.4	-9.9	-6.1	3.0	-24.8	-43.6	-33.0	-27.3	-9977.8
Total	**-82.8**	**-95.1**	**-105.1**	**-109.1**	**-106.1**	**-66.4**	**-42.9**	**-33.4**	**-5.0**	**-73.1**	**-105.5**	**-83.7**	**(75.7)**	**(27,620.5)**

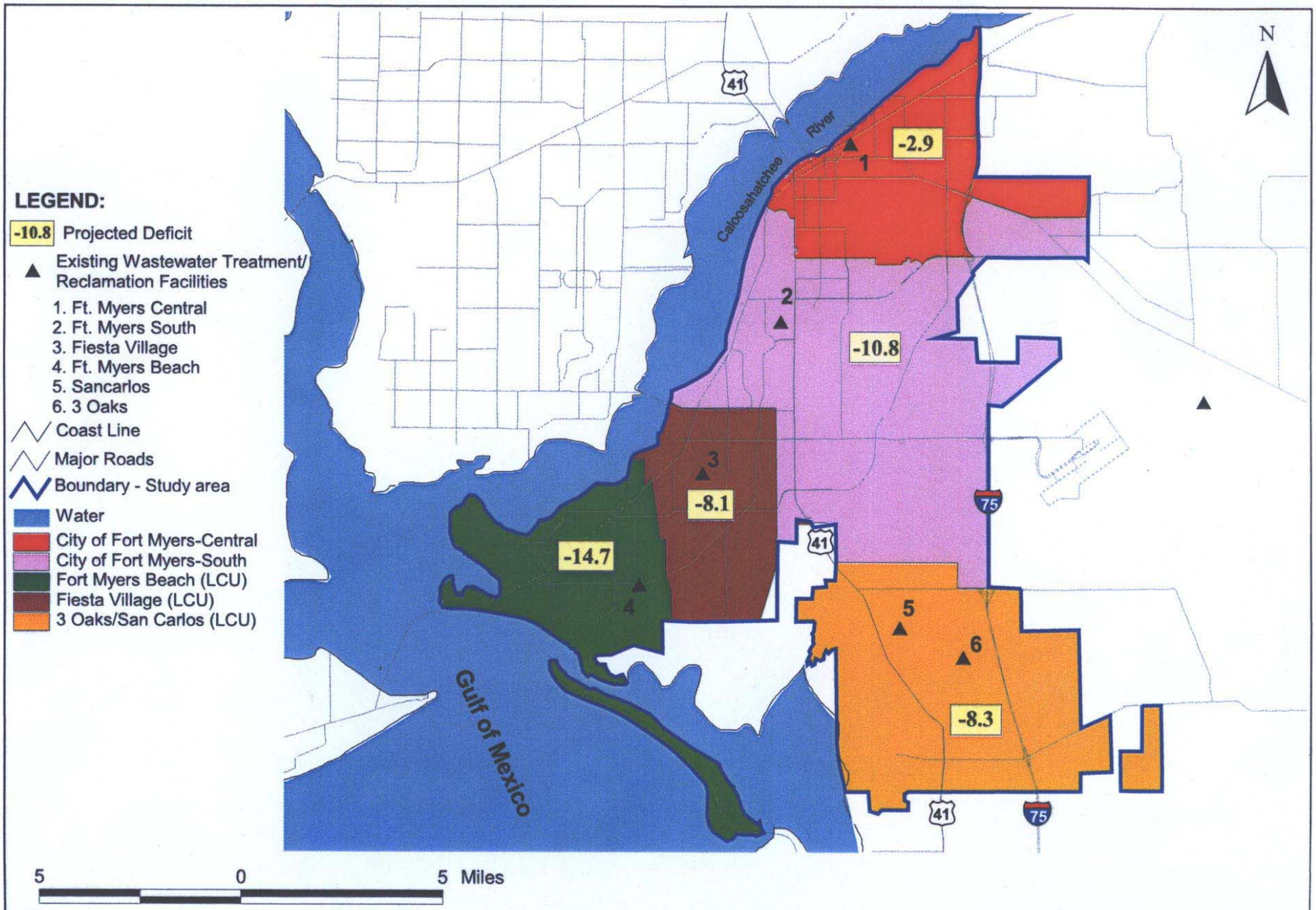
Reclaimed Water ASR Systems

Reclaimed water ASR is becoming more accepted with established regulations for obtaining the necessary permits throughout Florida. There are several reclaimed water ASR systems currently permitted and in some stage of startup and testing. Because of its ability to store large volumes, reclaimed water ASR is considered the best method for optimizing wet-season reclaimed water surpluses, thus balancing storage needs.

To estimate the dry season recovery rate from reclaimed water ASR systems, it was assumed the entire wet season wastewater flow would be injected into the ASR storage zone. This wet season 'recharge' period would last approximately 120 days during the months of July, August, September and October. As discussed in the Phase I report, there is a lag of approximately one month between when high rainfall starts in the wet season to when flow rates in streams increases significantly. Therefore, while the wet season as determined by rainfall extends from June through September; the wet season as determined by stream flows occurs from July through October. The 2020 projected annual average daily flow from July to October as shown in Table 13 is 43.3 MGD. The estimated year 2020 mean dry season reclaimed water ASR recovery rate for the study area is therefore 33.9 MGD.

Recovery was assumed to occur during the six months of the dry season (December through May) at an efficiency of 75% reflecting an estimated loss of 25% of the injected water to diffusion and dispersion with native groundwater in the storage zone. This is based on recovery criteria of a maximum of 250 mg/l dissolved chloride concentration. With a 75% recovery volume and a recovery period of 60 days longer than the injection period, the net result is an estimated dry season 'recovery' rate equal to 50% of the mean wet season 'injection' rate.

As discussed in the Phase I report, the Upper Floridan Aquifer (UFA), which contains brackish native groundwater, would be used as the storage aquifer. It is possible that the SFWMD would permit recovery to a dissolved chloride concentration of 350 mg/l. This would result in higher recovery efficiency and a slight reduction in the number of ASR wells that would be needed. Furthermore, reclaimed water would be recovered directly into the reclaimed water distribution system, but additional disinfection may be required. Treatment will be discussed later on this report.



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	SUBREGION 3 - PROJECTED DEFICIT	Figure 6

Surface Water

Table 15 is an inventory of seven streams, rivers and canals in the study area. Flow for the seven surface water bodies is measured and recorded by either the United States Geological Survey (USGS) or the District. These are the only streams in the study area for which flows are measured. They were selected for flow measurement by governmental agencies because they have the highest flows in the study area. All but two of the surface water bodies inventoried have salinity control structures. Therefore, these water bodies could be used as dry season sources of supply if flow rates are sufficient. Available period of record flow data were tabulated and analyzed for the surface water bodies.

Table 15
Summary of USGS and SFWMD Stream Flow Data

Water Body	Gauge Location	Period of Record	Mean Wet Season Flow (MGD)	Mean Dry Season Flow (MGD)	1-in10 Year Dry Season Flow (MGD)	Utility Service Area	Comments
Caloosahatchee River	S-79	1954-2000	1550	769	20	Lee County Utilities	1971-96
Telegraph Creek*	Telegraph Creek Lane	1997	163	1	0	Lee County Utilities	WRS, 1998
Ten Mile Canal	1.05 miles north of Alico Rd	1990-98	119	12	3	LCU/ City of FM	
Estero River*	1 mile east of US 41	1989-2000	18	2		LCU	
Six Mile Cypress	Near Ten Mile Canal	1992-2000	38	2	0	LCU/ City of Ft. Myers	
Whiskey Creek	Whisky Creek Drive	1995-2000	14	3	1	City of Ft. Myers	
Orange River	Buckingham Road	1984-99				FGUA	Stage data only

* No Salinity Control Structure

Similar to the ASR system, in the analyses of the surface water flow data for this study, the wet season is considered to be July through October, and the dry season is considered to be the six-month period from December through May. The months of November and June are considered transitional and were not integrated into the analyses.

Surface Water ASR Systems

In order to provide drought condition reliability for surface water sources of supply and also to provide a more efficient use of some of the surface water bodies which have mean dry season flows of less than 20 MGD, surface water ASR systems would need to be constructed. A minimum wet season flow of 20 MGD, with a diversion rate of 20% to a surface water ASR system, was utilized to determine sites for potential surface water ASR systems.

Telegraph Creek was not included due to the fact that only one year of partial flow data is available for that stream. Six Mile Cypress was not included because it is tributary to Ten Mile Canal.

The storage aquifer for the potential surface water ASR systems was again (as in the case of reclaimed water ASR systems) assumed to be the Upper Floridan aquifer. A minimum distance of two miles from existing and permitted future municipal reverse osmosis (RO) supply wells and potable water ASR systems was used in the site selection process. The location selected for the surface water ASR system is adjacent to a control structure.

The water would be recovered at an estimated efficiency of 75% during the dry season (December through May). Using the criterion of a minimum wet season flow of 20 MGD one potential surface water ASR system was identified in the study area, in the Ft Myers utility service area.

Table 16
Summary of Potential Surface Water ASR Systems

Irrigation Supply Source	Pumping Station Location	Mean Wet Season Flow[1] (MGD)	Mean Wet Season Diversion Rate[2] (MGD)	Mean Dry Season Recovery Rate[3] (MGD)
Ten Mile Canal	1.05 miles north of Alico Road	119	23.8	12
TOTAL		119	23.8	12

[1] Mean measured flow during the months of July through October.
[2] Estimated as 20% of the mean wet season flow.
[3] Based on 75% recovery efficiency for 180 days during the dry season months of December through May.

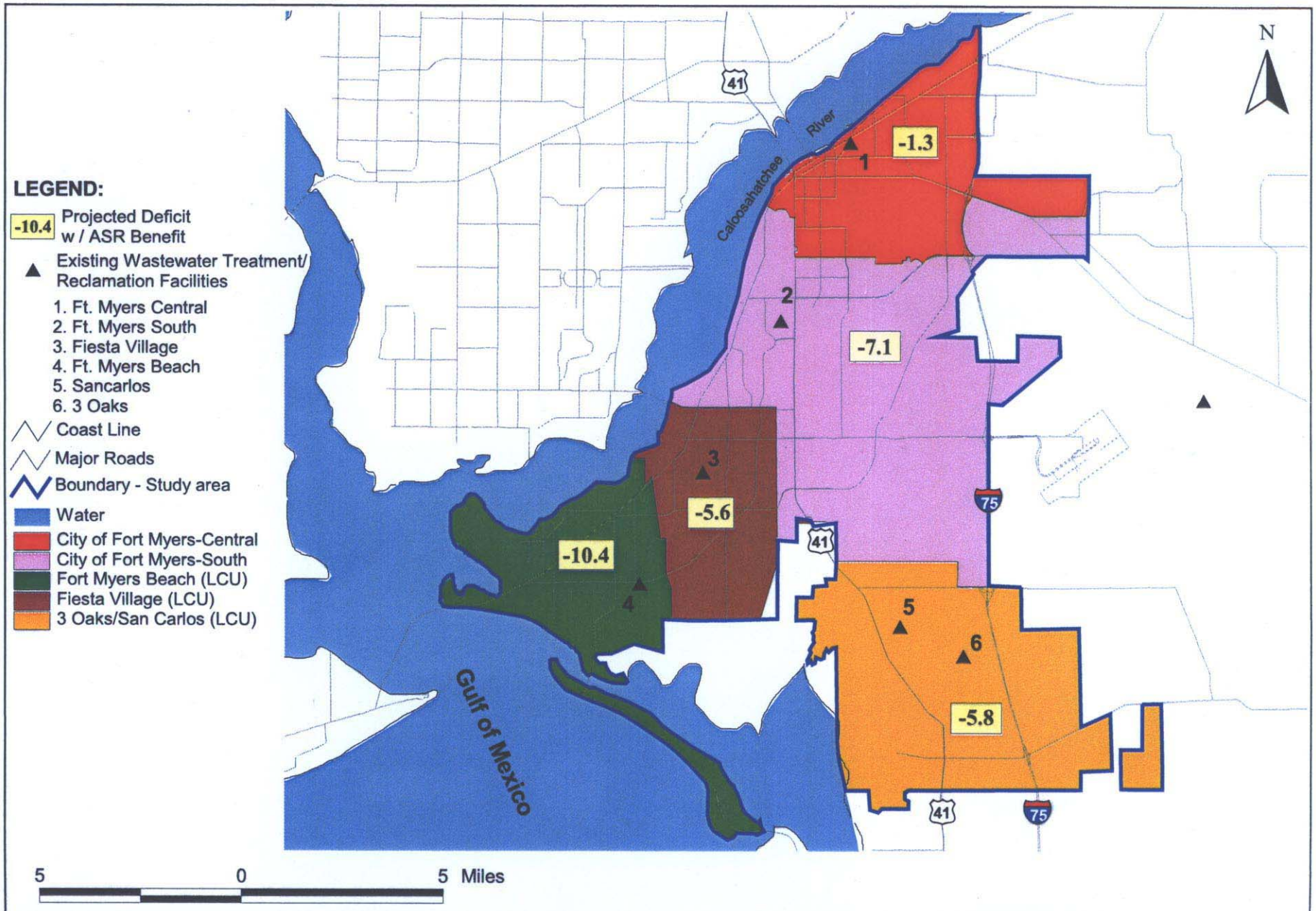
Summary of Contributions from ASR Projects

Contributions from ASR projects are as shown below in Table 17. The projected 2020 surplus / deficit considering the ASR benefit is shown in Table 18 and geographically on Figure 7.

Table 17
Contributions from ASR Project

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Reclaimed Water ASR	33.9	33.9	33.9	0.0	0.0	0.0	0.0	0.0	0.0	33.9	33.9	33.9
Surface Water ASR	12.0	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	12.0	12.0
Total ASR	**45.9**	**45.9**	**45.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**45.9**	**45.9**	**45.9**

1. ASR contribution is applied proportionately in accordance with the pre ASR reclaimed water deficit.



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	SUBREGION 3 - PROJECTED DEFICIT CONSIDERING ASR BENEFIT	Figure 7

Table 18
Projected 2020 Surplus / Deficit Considering ASR Benefit

	Monthly Surplus/Deficit (MGD)												Annual Average	Annual Total
Facility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	**(MGD)**	**(MGY)**
Fiesta Village	-9.9	-13.0	-11.4	-11.9	-12.5	-5.5	-1.5	-0.8	2.5	-8.2	-14.4	-10.6	-8.1	(2,955)
Ft. Myers Beach	-11.9	-9.3	-22.9	-23.9	-19.1	-12.9	-12.3	-12.1	-4.7	-16.6	-18.1	-12.1	-14.7	(5,350)
Ft. Myers Central	-4.7	-4.4	-5.6	-6.3	-6.4	-3.8	-1.0	1.1	6.4	-1.7	-3.7	-4.1	-2.8	(1,040)
Ft. Myers South	-10.9	-11.5	-13.5	-14.9	-15.4	-11.9	-9.2	-6.9	-3.6	-10.2	-10.8	-10.6	-10.8	(3,937)
Three Oaks	-7.8	-8.7	-8.6	-8.4	-8.1	-9.7	-7.9	-7.8	-8.6	-8.0	-9.1	-9.1	-8.5	(3,098)
Gateway	-4.2	-5.4	-4.8	-4.8	-4.9	-2.3	-1.0	-0.8	0.1	-3.6	-5.7	-4.3	-3.5	(1,262)
Lehigh Acres	-33.6	-42.9	-38.3	-38.8	-39.8	-20.4	-9.9	-6.1	3.0	-24.8	-43.6	-33.0	-27.3	(9,978)
Subtotal	**-82.8**	**-95.1**	**-105.1**	**-109.1**	**-106.1**	**-66.4**	**-42.9**	**-33.4**	**-5.0**	**-73.1**	**-105.5**	**-83.7**	**(75.7)**	**(27,620)**
Other Sources of Supply	12.0	12.0	12.0	-	-	-	-	-	-	12.0	12.0	12.0	6.0	2,190
NEW Subtotal	**(70.8)**	**(83.1)**	**(93.1)**	**(109.1)**	**(106.1)**	**(66.4)**	**(42.9)**	**(33.4)**	**(5.0)**	**(61.1)**	**(93.5)**	**(71.7)**	**(69.7)**	**(25,430)**

*These figures represent calculated values for the expected irrigation water deficit in the year 2020.

Groundwater

The future use of vertical wells withdrawing from freshwater aquifers, constructed by municipalities, to provide supplemental water for irrigation purposes will likely be discouraged by the District. However, it may be feasible in the future to use horizontal wells located in road rights-of-way to draw from the water-table aquifer to provide supplemental irrigation during the dry system. In addition, horizontal wells constructed at select golf courses and other locations could be utilized as an injection water source for Floridan aquifer ASR wells. This would serve to more efficiently utilize a resource that would otherwise be pumped from wet areas and stormwater systems and ultimately be discharged to tidal water bodies during the wet season.

Because the year 2020 supplemental irrigation water needs can be partially met within the study area by interconnects between utilities, reclaimed water ASR systems, dry season surface water withdrawals from selected surface water bodies, and surface water ASR systems, a more detailed evaluation of groundwater sources of supply is not provided as part of this study.

STORAGE AND DISTRIBUTION OPTIONS

Storage is the most critical part of the RIDS to optimize current sources (reclaimed water) and to balance supply and demand, especially for supplemental sources such as surface water.

The potential locations of seven possible reclaimed water and one surface water ASR systems are shown on Figure 8 and quantified in Table 19. A minimum distance of two miles from existing and permitted future municipal reverse osmosis (RO) supply wells and potable water ASR systems was used in the site selection process. In addition, a semi-regional approach for reclaimed water ASR systems was utilized in order to maximize the recharge capacity of such systems while also providing some flexibility in siting.

Data Collection

The data used in this investigation comes from several sources, including Water Resource Solutions (WRS) in-house database; South Florida Water Management District; Florida Geological Survey; Florida Department of Environmental Protection; Bureau of Geology; consultant reports; and publications.

Because of its extensive use in coastal areas of the region, the study did not consider the Mid-Hawthorn aquifer system (MHA) as a potential ASR storage interval, but rather focused on the Upper Floridan Aquifer System (UFAS), starting from the Lower Hawthorn Aquifer (LHA) down through the Ocala aquifer. Data from existing ASR wells, existing reverse osmosis (RO) wells, and other available wells which provide some information about the UFAS were evaluated and used to delineate locations for potential surface water and reclaimed water ASR systems.

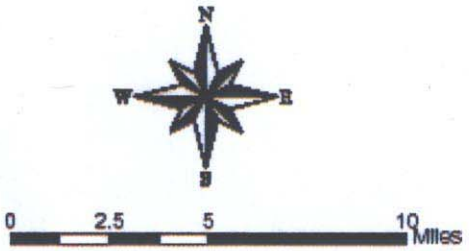
A total of 414 deep wells were inventoried in the area (Attachment C). A map showing depth of penetration of the inventoried wells is provided as Figure 9. Wells with either lithological or geophysical log information were reviewed to delineate the hydrostratigraphy of the area. A hydrostratigraphic database is provided as Attachment D. As shown, information for 144 wells was obtained from the recently completed SFWMD "Lower West Coast Potentiometric Mapping Project" (Water Resource Solutions, 2003).

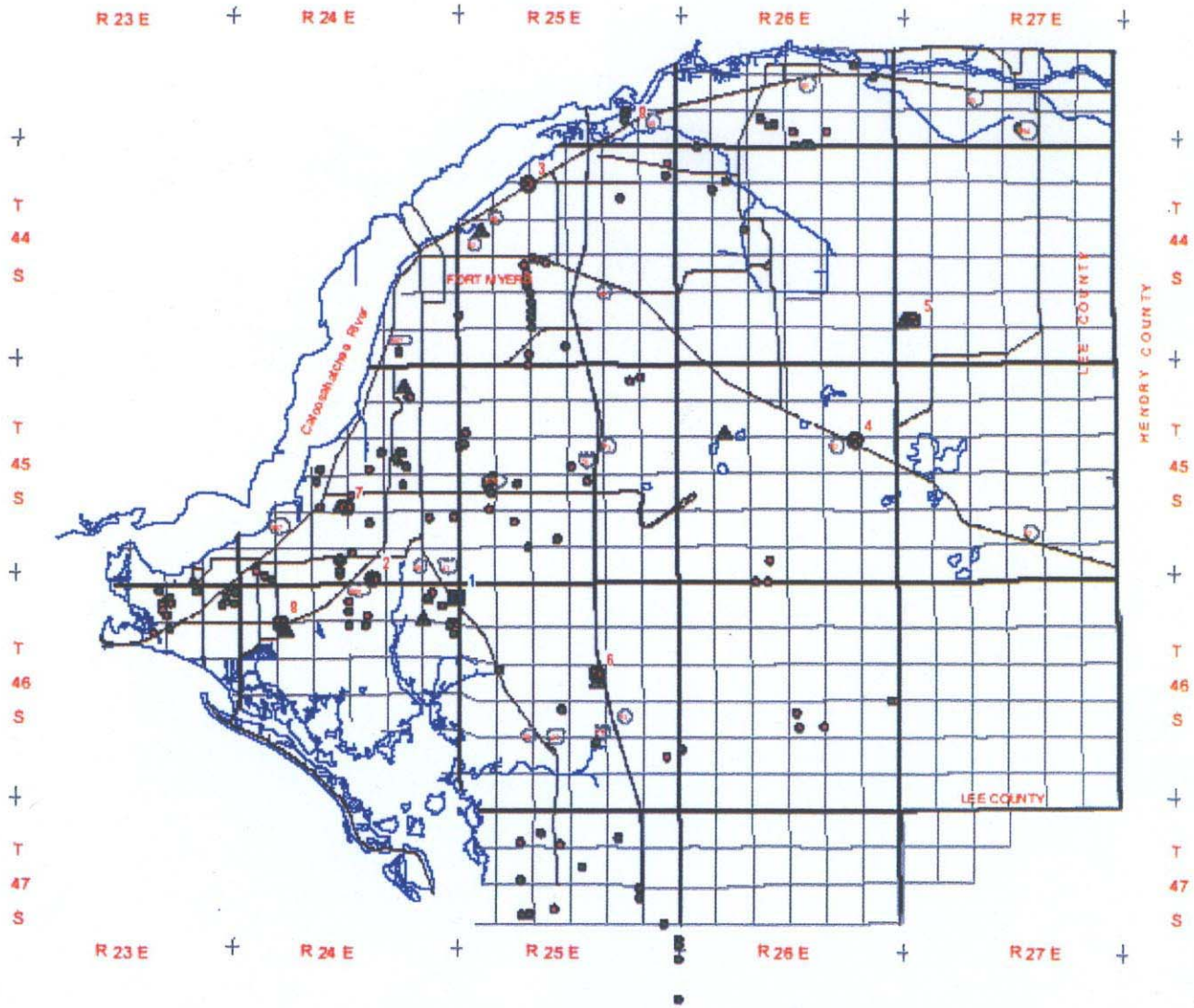
Existing ASR Systems

Two existing UFAS ASR systems in the area were inventoried as shown in Figure 8. The Lee County Olga potable water ASR System, located in the Olga area, uses one existing ASR well completed in the Suwannee Aquifer, with the ASR storage interval between 920 and 860 feet below land surface (BLS).

The City of Fort Myers' Winkler Avenue potable water ASR System is located south of the Caloosahatchee River in the City of Fort Myers. It consists of one ASR well completed in the LHA (520 – 645 feet BLS).

There are five ASR wells located at the Corkscrew water treatment plant (corner of Alico Road and Corkscrew Road)



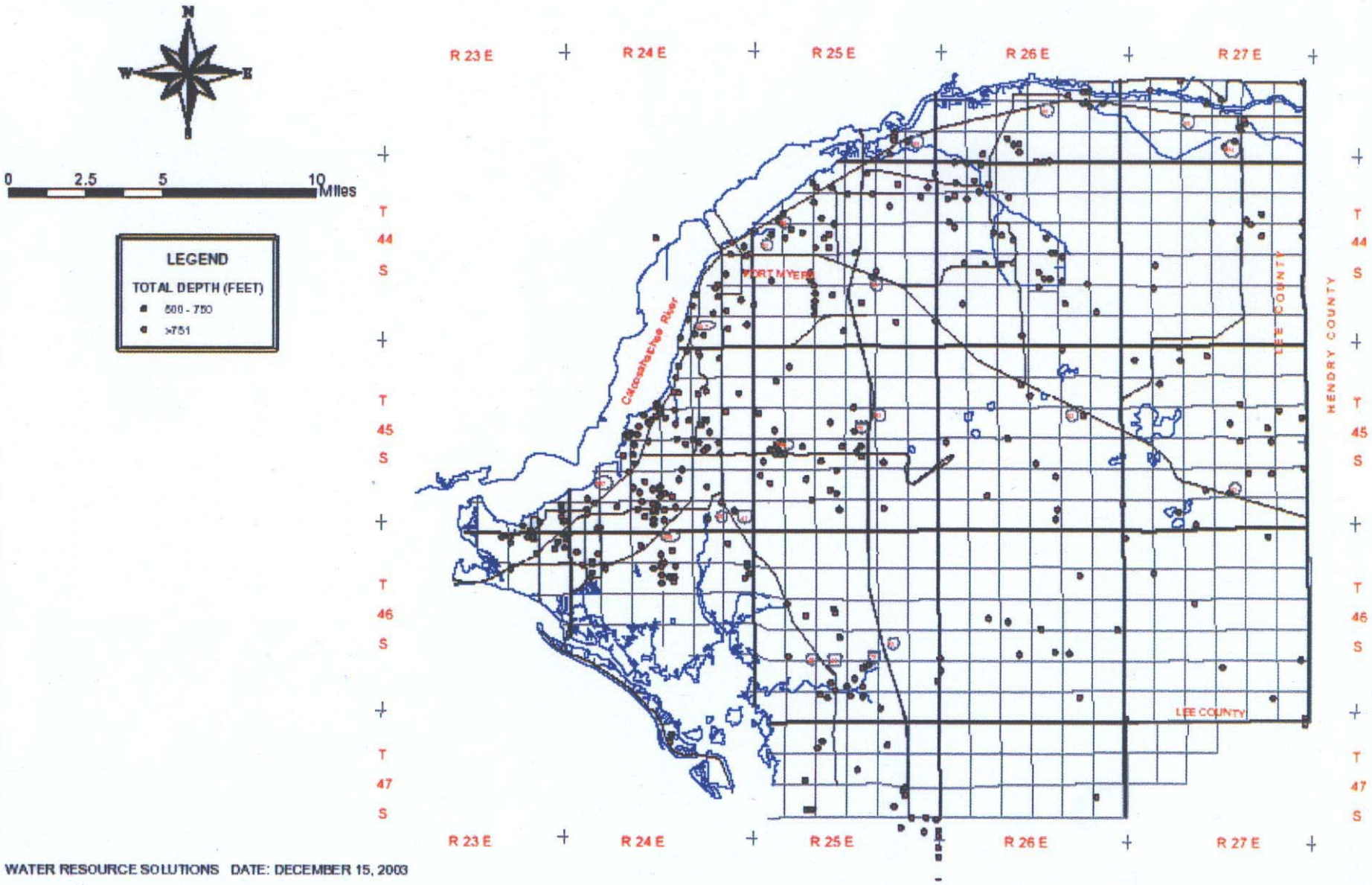


LEGEND

- POTENTIAL RECLAIMED WATER ASR SITE
- POTENTIAL SURFACE WATER ASR SITE
- WASTE WATER TREATMENT PLANT
- UPPER FLORIDA EXISTING PERMITTED WELL
- UPPER FLORIDA PERMITTED PROPOSED WELL

WATER RESOURCE SOLUTIONS DATE: DECEMBER 15, 2003

Regional Irrigation Distribution System (RIDS) Feasibility Study For the Lower West Coast Region	BOYLE	South Florida Water Management District	Potential Surface Water and Reclaimed Water ASR Sites	Figure 8



WATER RESOURCE SOLUTIONS DATE: DECEMBER 15, 2003

Regional Irrigation Distribution System (RIDS) Feasibility Study For the Lower West Coast Region	BOYLE	South Florida Water Management District	Depth of Penetration of Inventoried Wells	Figure 9

Planned ASR Systems

At this time, there are four additional ASR wells planned for Olga WTP. However, it is very likely that additional potable water ASR systems will be constructed in the Fort Myers / Lee County subregion in the future. Potential sites include areas proximal to existing water treatment plants, which do not have existing ASR systems. These include the City of Fort Myers WTP, the LCU Green Meadows and Pinewoods WTP's, and the planned new Lehigh Acres WTP.

Existing RO Systems

One existing UFAS RO system was inventoried in the area. Two other systems, under permitting and construction, are also included, as shown on Figure 10. The City of Fort Myers RO wellfield is located in the northeastern portion of the City of Fort Myers as shown on Figure 10. It consists of seven existing production wells completed in the LHA / UFA (445 – 837 feet BLS) and five proposed permitted wells.

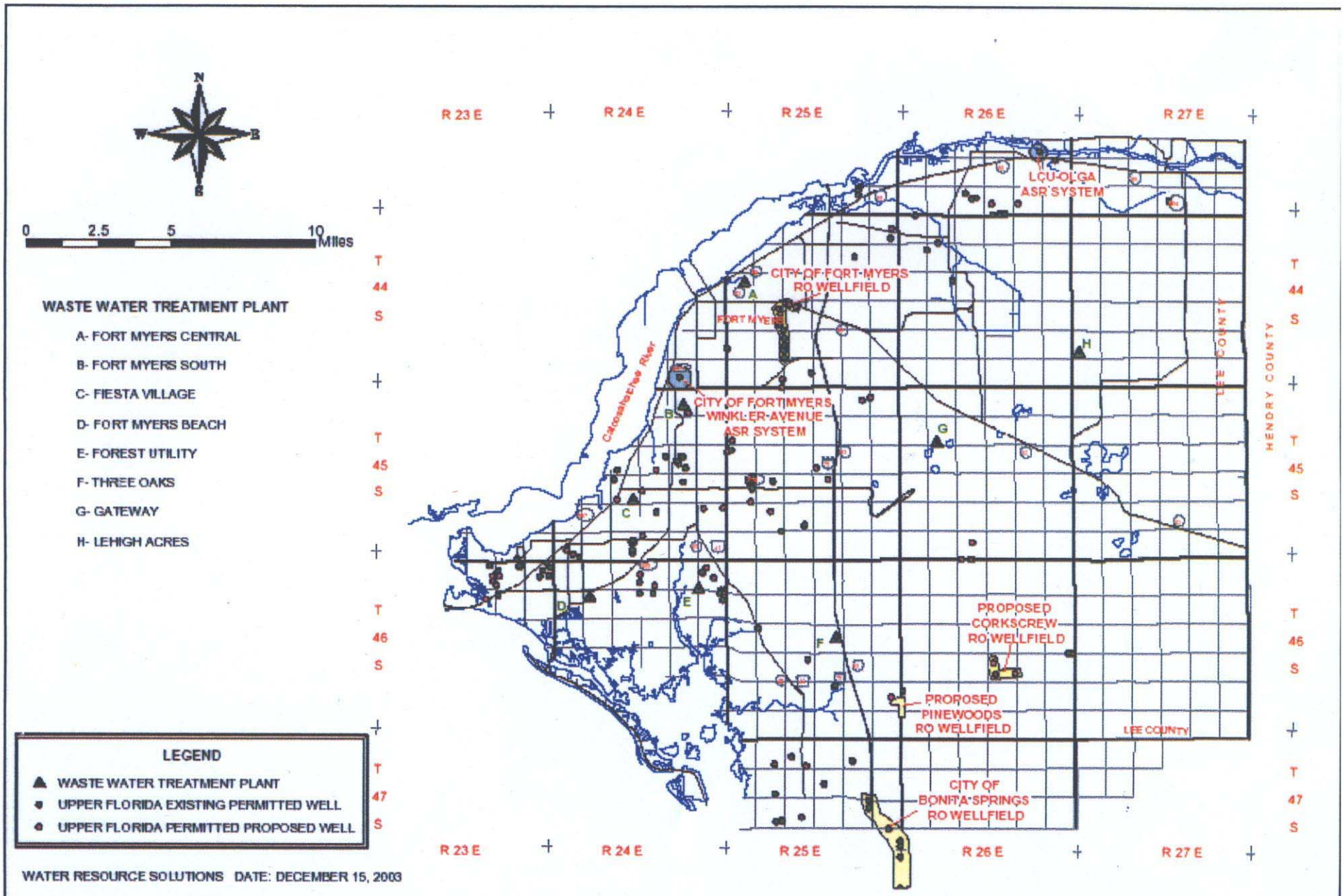
The Lee County Utilities Pinewoods RO wellfield is under permitting at this time. It will consist of four wells completed in the LHA (550-700 feet below land surface).

The Lee County Utilities RO Corkscrew wellfield is under construction at this time. It will consist of three wells completed in the Lower Hawthorn aquifer.

Potential Surface Water ASR Systems.

Based on the RIDS Phase I evaluation of surface water flows and the present detailed subsurface evaluation, one potential surface water ASR system has been identified. A map showing the location of potential surface water ASR system is provided as Figure 8. Details for this site are provided on Table 19. This potential site is:

- Ten Mile Canal.



WATER RESOURCE SOLUTIONS DATE: DECEMBER 15, 2003

Regional Irrigation Distribution System (RIDS) Feasibility Study For the Lower West Coast Region	BOYLE	South Florida Water Management District	WWTP, ASR Systems, and Upper Florida Permitted Wells	Figure 10

Potential Reclaimed Water ASR Systems.

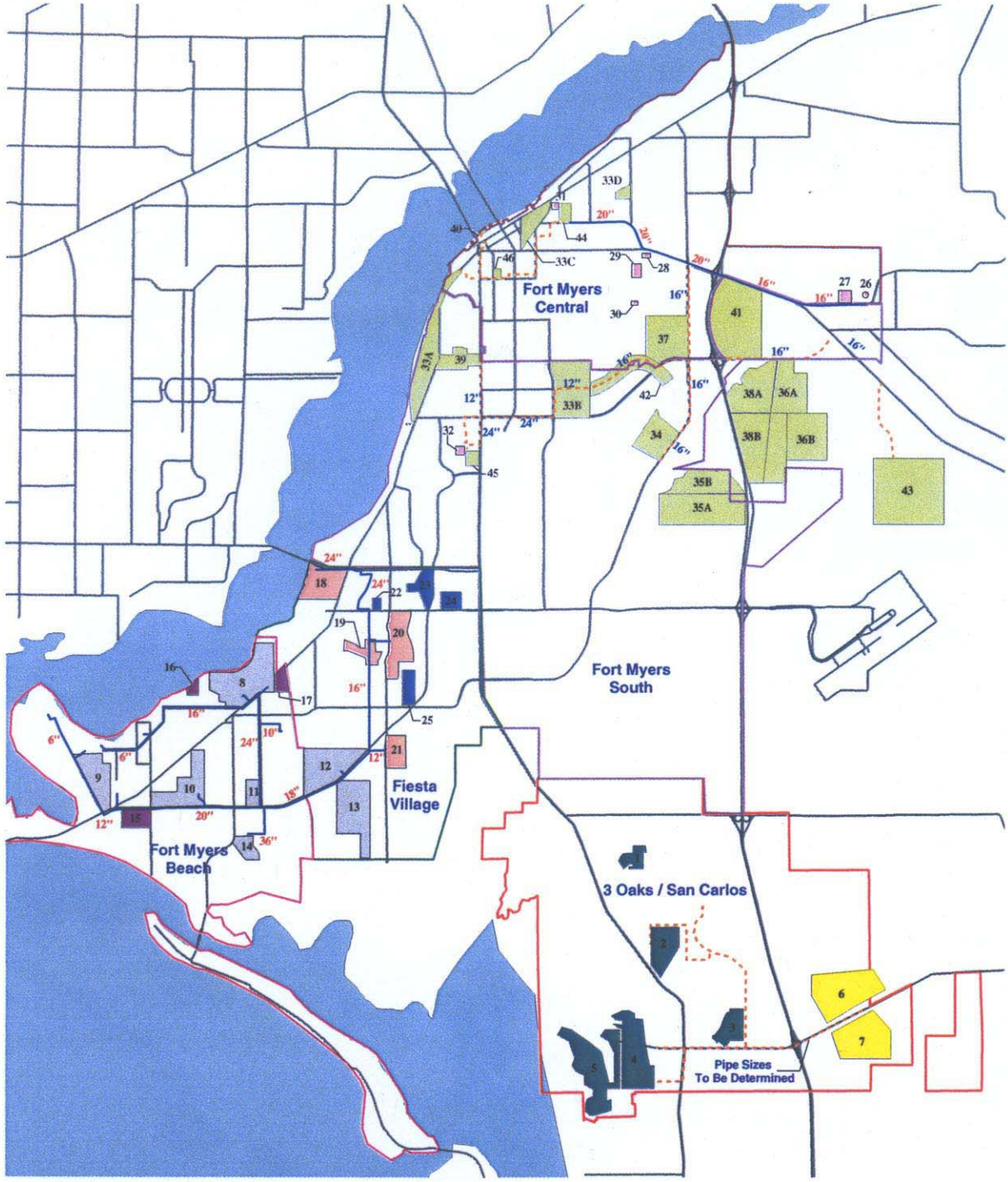
Integrating the hydrostratigraphic information with the capacities of the planned and existing infrastructure for the reclaimed water facilities in the subregion, 8 potential reclaimed water ASR systems were identified. Details on these sites including the potential location for these systems are provided on Table 20. The recovery capacity was determined based on the RIDS phase I average daily wastewater flows for year 2020. These potential reclaimed water ASR systems are:

- Fiesta Village / Fort Myers Beach
- Fort Myers Central
- Gateway
- Lehigh Acres
- Three Oaks
- Fiesta Village
- Fort Myers Beach
- Fort Myers South

If the WWTP does not meet the treatment requirements for irrigation described in the F.A.C.-62-610.466, upgrading of the facilities or additional treatment will be necessary prior to recharge in to the ASR wells. Figure 11 shows the existing and proposed reuse sites in the study area.

Ranking of Potential ASR Systems

The nine potential ASR systems were preliminarily ranked, as shown on Table 19 based on their potential to significantly contribute to a RIDS. The ranking considered capacity, proximity to existing infrastructure, common ownership, and potential for success.



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE Engineering Corporation	South Florida Water Management District	SUBREGION 3 - EXISTING AND PROPOSED REUSE SITES IN STUDY AREA	Figure 11

Table 19
Summary of Ranked Potential Surface Water and Reclaimed Water ASR Systems

ASR Site #	Description	Location (QTR S-T-R)	PTD (ft)	Recovery Capacity (MGD)	Ultimate # Wells	Potential Storage Zones	Overall Rank
Surface Water ASR Systems							
1	Ten Mile Canal	SE NE 01-46S-24E	1100	12.0	17	LH I, II; SU I-III	2
Reclaimed Water ASR Systems							
2	Fiesta Village / Fort Myers Beach	SW SE 34-45S-24E	1100	8.1	12	LH I; SU I, II	3
3	Fort Myers Central	NW 30-44S-26E	1100	8.8	13	LH I-III; SUW I-V	1
4	Gateway	NE NE 14-45S-26E	1100	1.0	2	LH I, II; SUW I-IV	5
5	Lehigh Acres	SW 30-44S-27E	1100	4.9	7	LH I, II; SUW I-IV	7
6	Three Oaks	NE 15-46S-25E	1100	3.3	5	LH I; SUW I-III	9
7	Fiesta Village	SE SE 21-45S-24E	1100	3.9	6	LH I, II; SUW I-V	8
8	Fort Myers Beach	NW NW 08-46S-24E	1150	4.2	6	LH I, II; SUW I-III	6
9	Fort Myers South	NW 08-45S-25E	1000	7.8	12	LH I, II; SUW I-III	4

QTR S-T-R = Quarter Section-Township-Range
PTD = Proposed Total Depth
MGD = Million Gallons Per Day
LH = Lower Hawthorn portion of Upper Floridan Aquifer System
SU = Suwannee portion of Upper Floridan Aquifer System
I = Zone I
N.B. Options are not necessarily mutually exclusive.

Interconnections

The interconnects are proposed as follows:

Fiesta Village / Ft. Myers Beach. This interconnect can transport the collective benefit of the ASR system of Fiesta Village (3.9 MGD) and Ft. Myers Beach (4.2 MGD); therefore, it will provide a benefit of 8.1 MGD.

DESIGN ALTERNATIVES

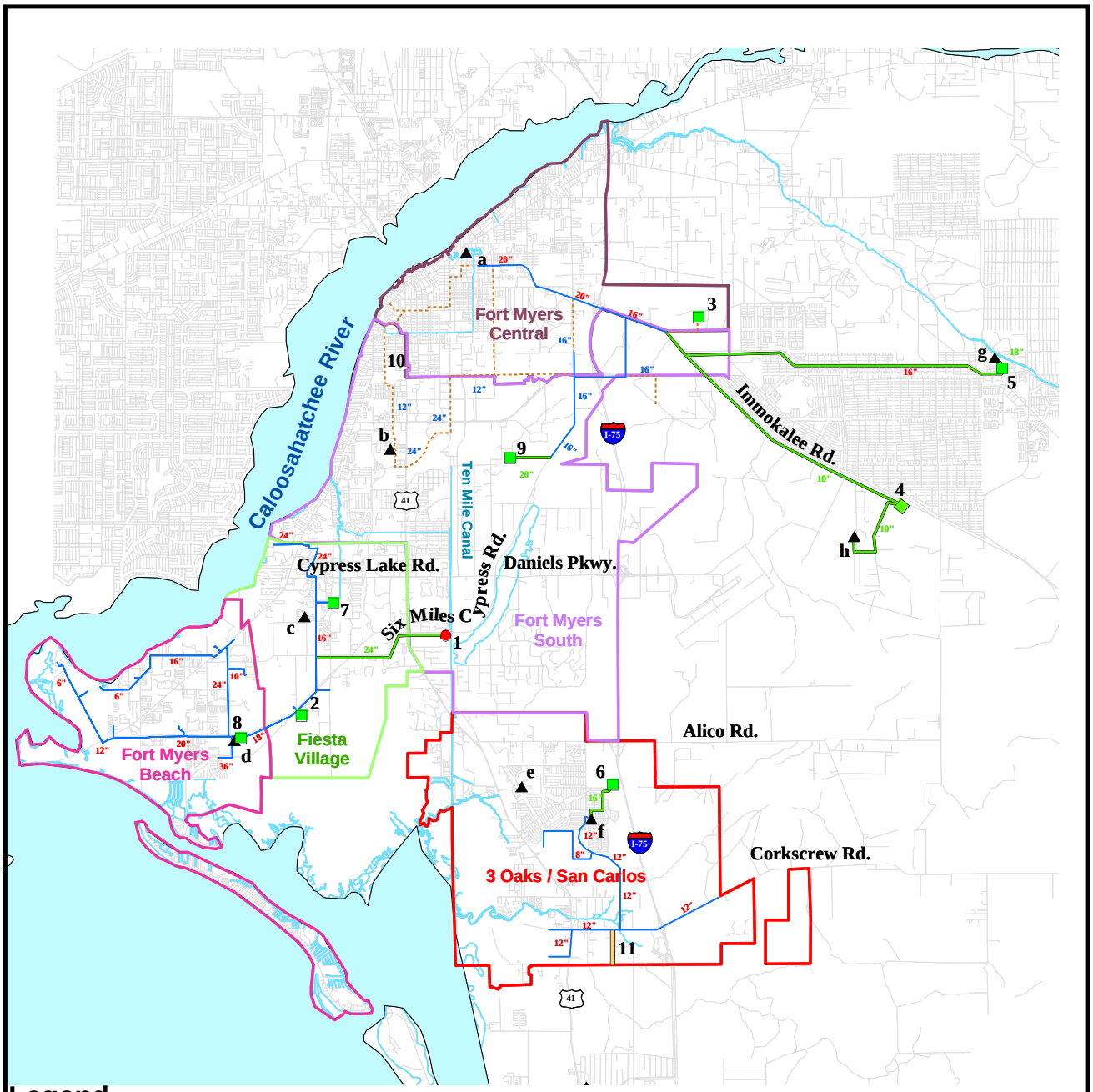
Design alternatives were developed to provide an alternative source of supply of irrigation water and to store it to maximize its use. The design alternatives included:

- Surface water source and ASR storage
- Reclaimed water source and ASR storage
- Interconnects between utilities

All alternatives within the sub-region have been generally located and are shown in Figure 12. Table 20 is a description of the sub-regional alternatives. Together, these options complement the reclaimed/reuse water and may generate up to 46 MGD of additional irrigation water resources for the area, during the dry season. This supply will help to meet the total future estimated annual average demand of 109.3 MGD, as presented in Technical Memorandum No. 1 (Table 12). Each type of supply listed above has particular requirements for infrastructure and treatment as described below.

Table 20
Subregional Supply Alternatives Summary

Project	Supply Type	Benefit or Recovery Capacity (MGD)	No. of Wells
Ten Mile Canal	Surface Water	12.0	17
Fiesta Village / Fort Myers Beach	Reclaimed Water	8.1	12
Fort Myers Central	Reclaimed Water	8.8	13
Gateway	Reclaimed Water	1.0	2
Lehigh Acres	Reclaimed Water	4.9	7
Three Oaks	Reclaimed Water	3.3	5
Fiesta Village	Reclaimed Water	3.9	6
Fort Myers Beach	Reclaimed Water	4.2	6
Fort Myers South	Reclaimed Water	7.8	12
Total		45.9	80



Legend

- **Surface Water ASR Systems**
  1. Ten Mile Canal
- **Reclaimed Water ASR Systems**
  2. Fiesta Village/Fort Myers Beach
  3. Fort Myers Central
  4. Gateway
  5. Lehigh Acres
  6. Three Oaks
  7. Fiesta Village
  8. Fort Myers Beach
  9. Fort Myers South
  10. City of Fort Myers Reclaimed Water System Expansion
  11. Corkscrew Road to Williams Road Interconnect
- **Wastewater Treatment/ Reclamation Facilities**
  a. Fort Myers Central
  b. Fort Myers South
  c. Fiesta Village
  d. Fort Myers Beach
  e. San Carlos
  f. Three Oaks
  g. Lehigh Acres
  h. Gateway
- **Interconnect Locations**
- **Ft myers beach (LCU)**
- **Fiest Village (LCU)**
- **City of Fort Myers - South**
- **City of Fort Myers - Central**
- **3 Oaks/ San Carlos (LCU)**
- **Exist Trans. Lines**
- **Future Trans. Lines**
- **ASR Piping**
- **Major Roads**
- **Major Streams**
- **Gulf**

N

0 1 2 Miles

Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	ALTERNATIVE PROJECTS SUBREGION 3	Figure 12

Surface Water ASR Systems

This type of system focuses on several potential surface water supply sources such as rivers and canal systems (with saline control structures) to be collected and stored in ASR wells for future use during the dry season.

Intake and Well Geology

The conceptual designs presented herein for Sub-region 3 were based on a preliminary, semi-regional scale evaluation of the geology and water resources. This proposed conceptual design for each potential ASR site takes into account the optimum number of wells to be used for the development of the system. In addition, several potential types of intake systems are provided for the surface water ASR systems, and a recommendation of applicable types are made for each system.

The first step in the design for the surface water ASR intake systems was an evaluation of available data regarding the expected shallow site-specific geology for the potential ASR site. This information was obtained from the data compiled for the SFWMD Lower West Coast Potentiometric Mapping Project (WRS, 2003).

From the data compiled, three shallow geology scenarios are possible.

- The first one, which is the most likely for the potential surface water ASR site, represents the site with a thickness of the Holocene – Pleistocene sand greater than 20 feet.
- The second possible shallow geology scenario is present when the Holocene – Pleistocene sand thickness is less than 5 feet and a section of the Tamiami Limestone that could be as deep as 30 feet.
- A third scenario is one where the Holocene-Pleistocene sand section is between 5 and 20 feet thick.

A summary of the Holocene – Pleistocene sand thickness for the potential surface water ASR system is provided as Table 21. It should be noted that the existence of heterogeneity in the shallow sediments within short distances in the area suggests the possibility of changes from a scenario to another.

Table 21
Potential ASR System Geology

ASR SITE #	DESCRIPTION	LOCATION (QTR S-T-R)	HOLOCENE-PLEISTOCENE SAND THICKNESS (FEET)	GEOLOGICAL SCENARIO
1	Ten Mile Canal	SE NE 01-46S-24E	30	1

Four possible types of intake systems were identified, each is applicable for certain shallow geological scenarios.

- Horizontal well (Type I). This type of extraction system is applicable to the first geological scenario and the exact depth and construction details would be based on site-specific conditions, including geology. A cross-sectional view of this type of intake system is provided as Figure 13.

- Shallow vertical well alignment (Type II) completed in the Tamiami Limestone. This system applied to the second geological scenario. The collection wells in this alignment would have to be manifolded together and connected to a centrifugal pumping withdrawal system. A cross-sectional view of this intake system is provided as Figure 14.
- Open trench with screen covering (Type III). This system applies to the second and third geological scenarios. Site-specific geology and the expected extraction volume requirements will determine the trench dimensions. A cross-sectional view of this intake system is provided as Figure 15.
- Trench with infiltration gallery and sand filter pack material (Type IV). This system also applies to the second and third geological scenarios. Site-specific geology and the expected extraction volume requirements will determine the trench dimensions. A cross-sectional view of this intake system is provided as Figure 16.

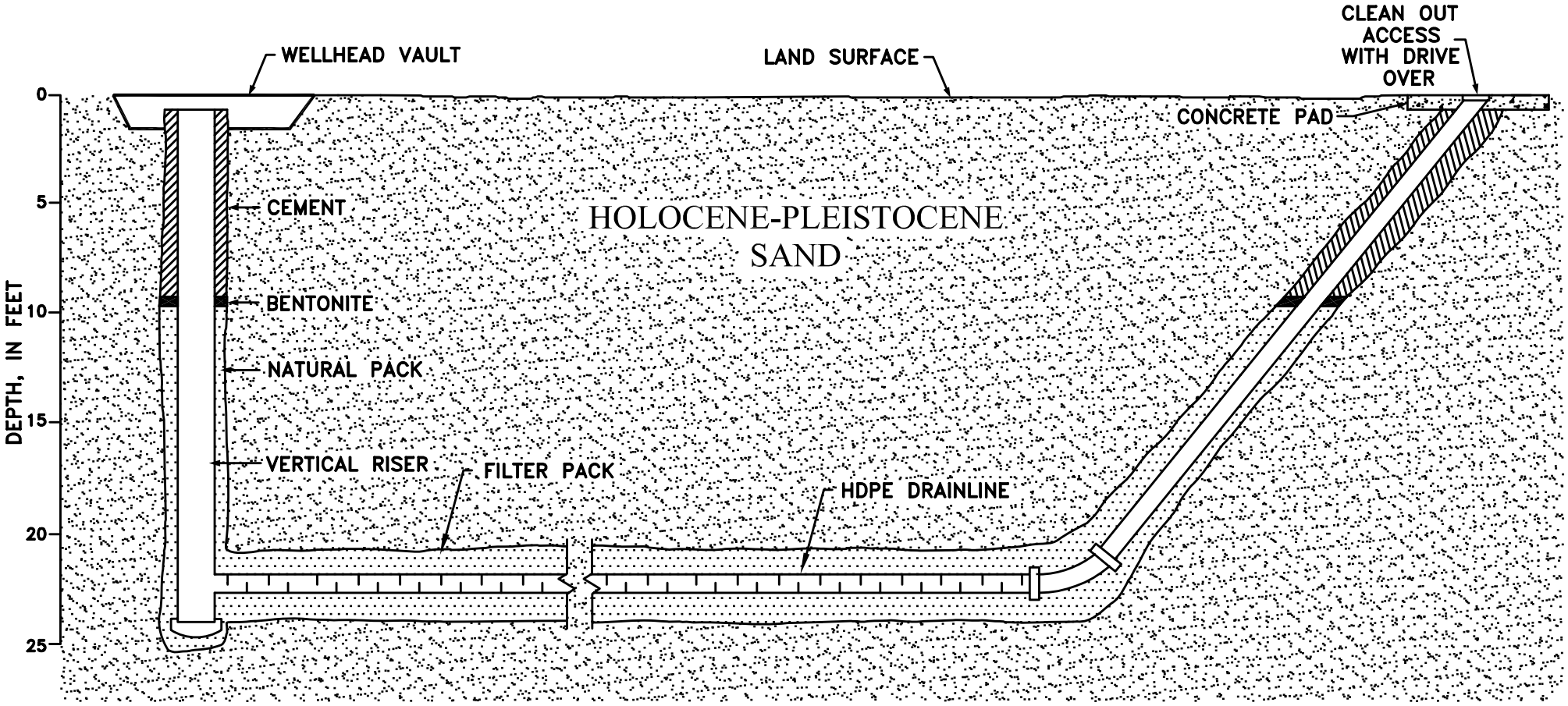
The recommendation to use a particular intake system type, or types, at the surface water ASR site was predicated on achieving the maximum filtration of the surface water prior to injection. Generally, a properly designed intake system can be expected to achieve a three-log cycle removal of pathogens and viruses, and produce a feedwater with a very low turbidity. Additional pretreatment, possibly using ultraviolet radiation may also be required at some sites.

The configurations of the ASR wellfield systems were designed using the information described above and the optimum number of wells for the site. Each proposed configuration seeks to achieve the best distribution of wells to optimize ASR recovery by spacing the wells to reduce mixing between the injected water with the native water. The ASR system configuration for the potential surface water ASR site is provided as Figure 17.

Each ASR well will be constructed with a 16-inch diameter final casing, either of fiberglass or PVC construction, with a discrete open hole interval selected based on test well drilling. A typical ASR wellhead configuration plan view is shown on Figure 18 and a typical ASR subsurface sectional view (prior to installing submersible pump equipment) is shown on Figure 19. A pH adjustment system, utilizing either hydrochloric or carbonic acid, will be needed for each ASR wellfield. The storage capacity for the pH adjustment system chemicals will be dependent upon the number of ASR wells in each ASR wellfield.

Water Quality Background and Requirements

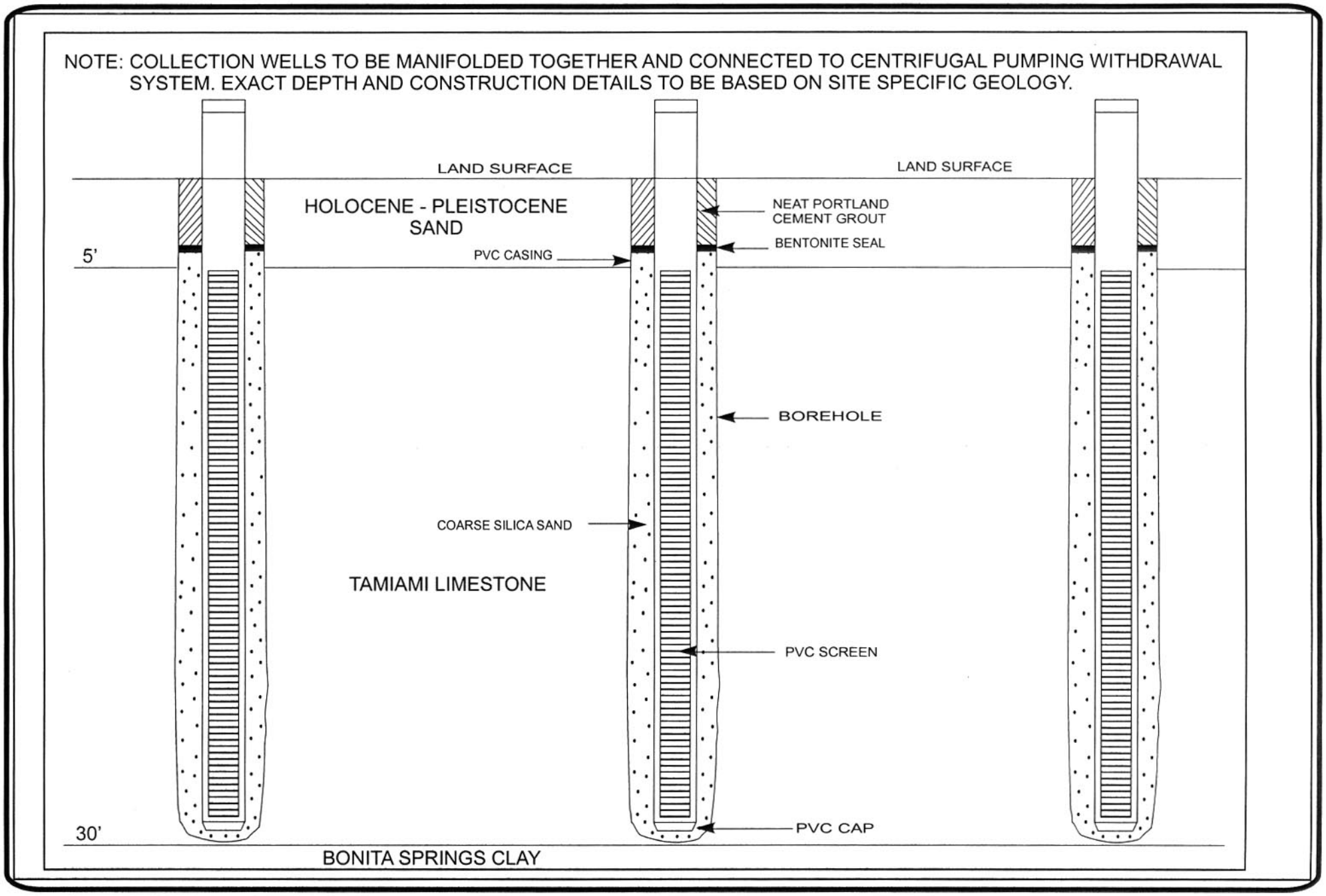
Water Quality, as well as the regulations for ASR wells storage and recovery, also have great importance in the selection of a supply. The current water quality for the proposed surface water supply and ASR storage alternatives (listed on Table 1) is presented in a summary on Table 22. The average water quality data collected is primarily between the years 2003 to 2004. When data was not available for these years, data was extracted from available records of previous years. Specific data for color presented in the table is the average of the recorded data, and not the usual wet season averaged value. This is not a concern due to color being a minor exemption for ASR wells, which has typically been approved by the FDEP.



NOTE: EXACT DEPTH AND CONSTRUCTION DETAILS OF HORIZONTAL WELL SYSTEM TO BE BASED ON SITE-SPECIFIC GEOLOGY

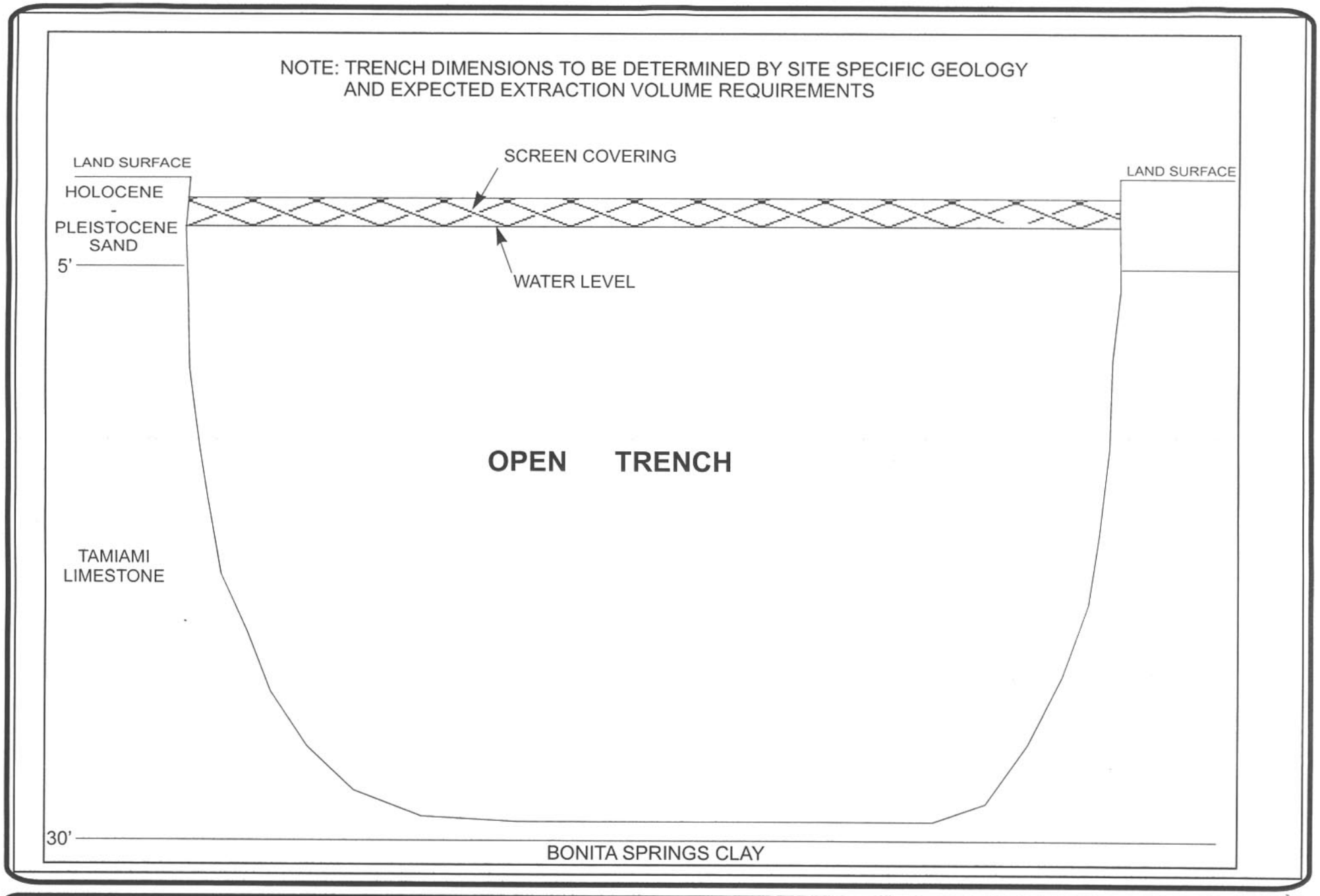
Water Resource Solutions	PROJECT NAME: RIDS PHASE II	DWG. NUMBER: A-014650X1
	PROJECT NUMBER: 01-04650.HO	DATE: 05/11/04

FIGURE 13. CROSS-SECTIONAL VIEW OF HORIZONTAL WELL FOR INTAKE SYSTEM TYPE I.



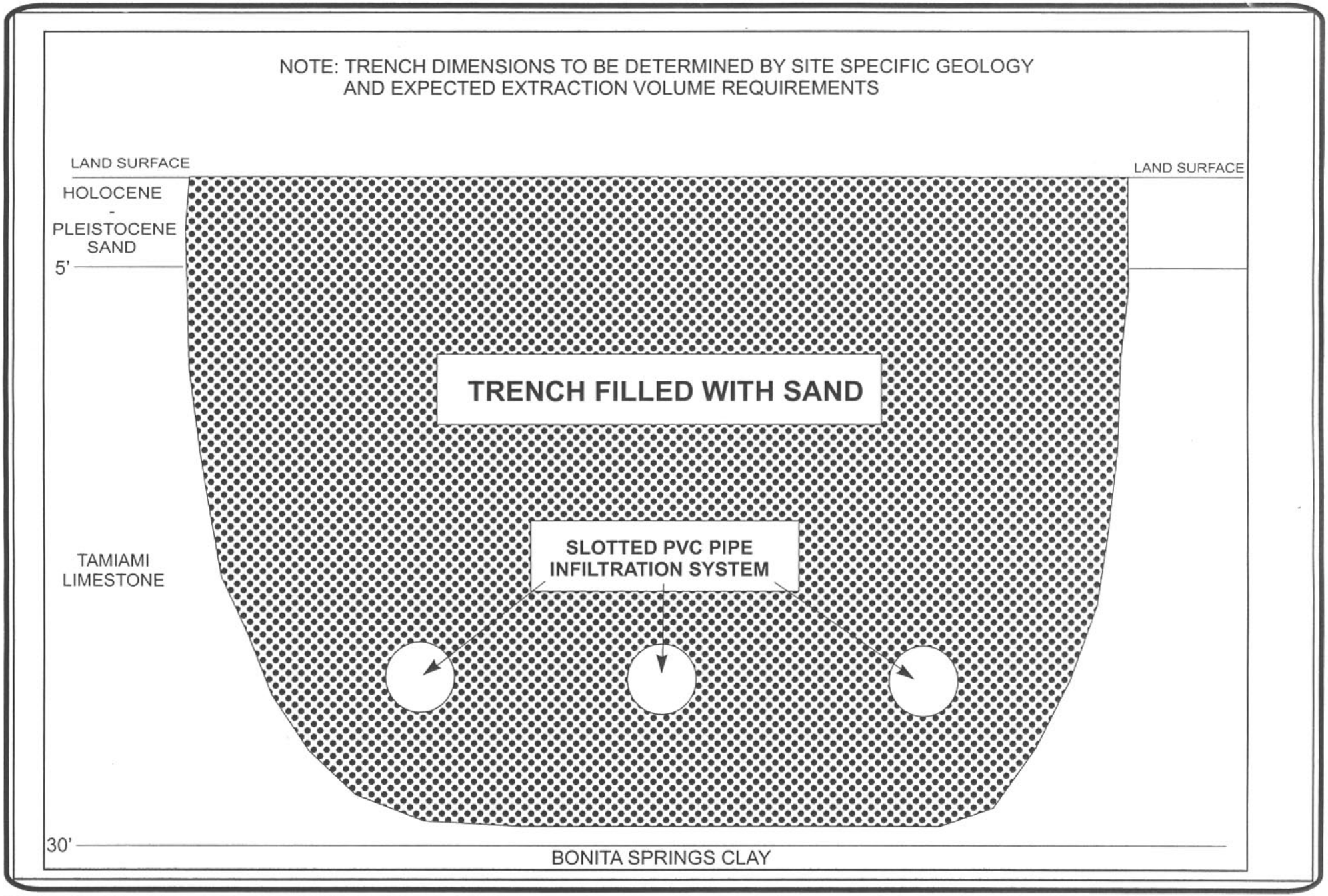
Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/11/04

FIGURE 14- Cross sectional view of shallow vertical wells alignment for intake system Type II.



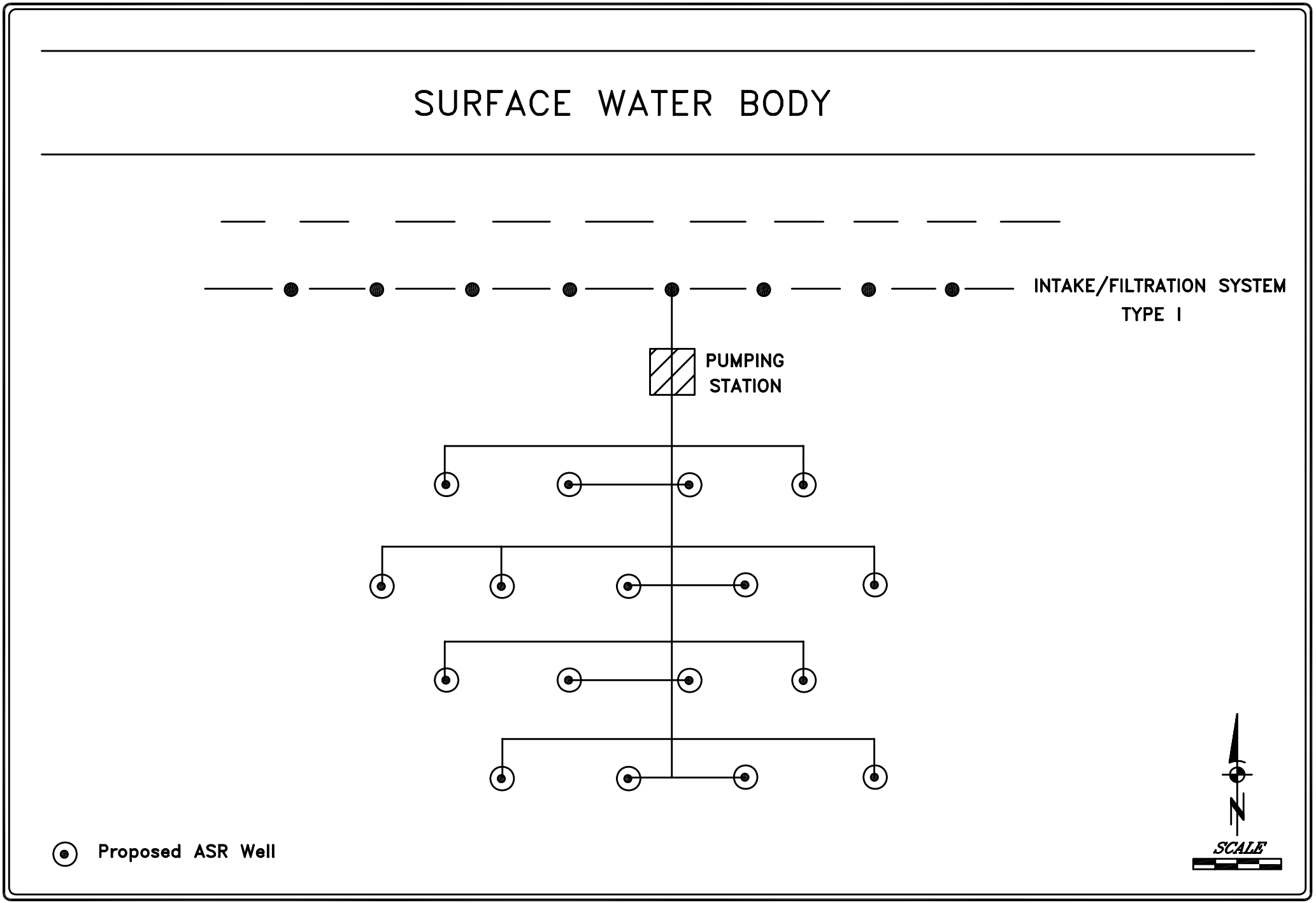
Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/11/04

FIGURE 15- Cross sectional view of open trench with screen covering for intake system Type III.



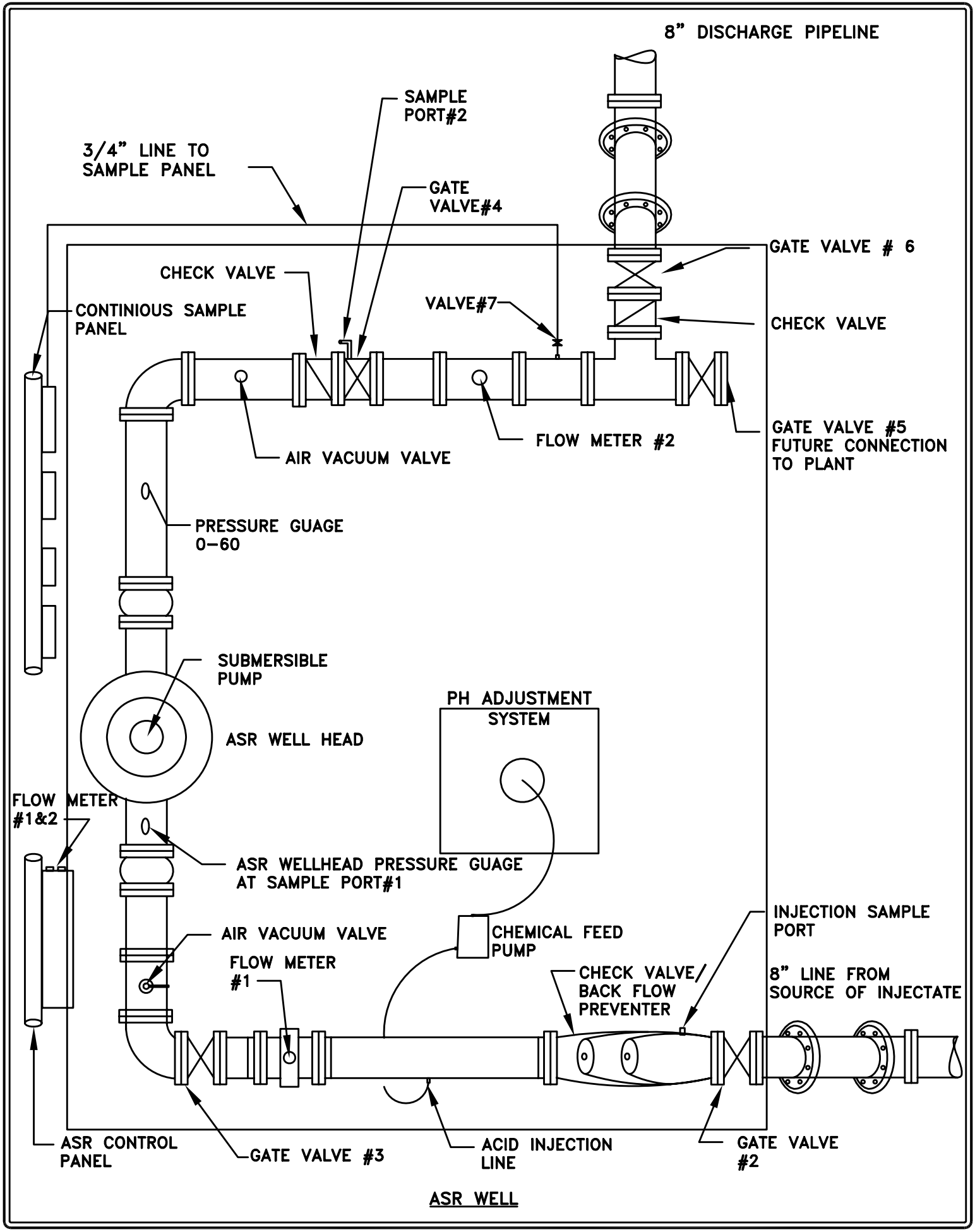
Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/11/04

FIGURE 16 - Cross sectional view of trench with infiltration gallery and sand filter pack material for intake system Type IV.



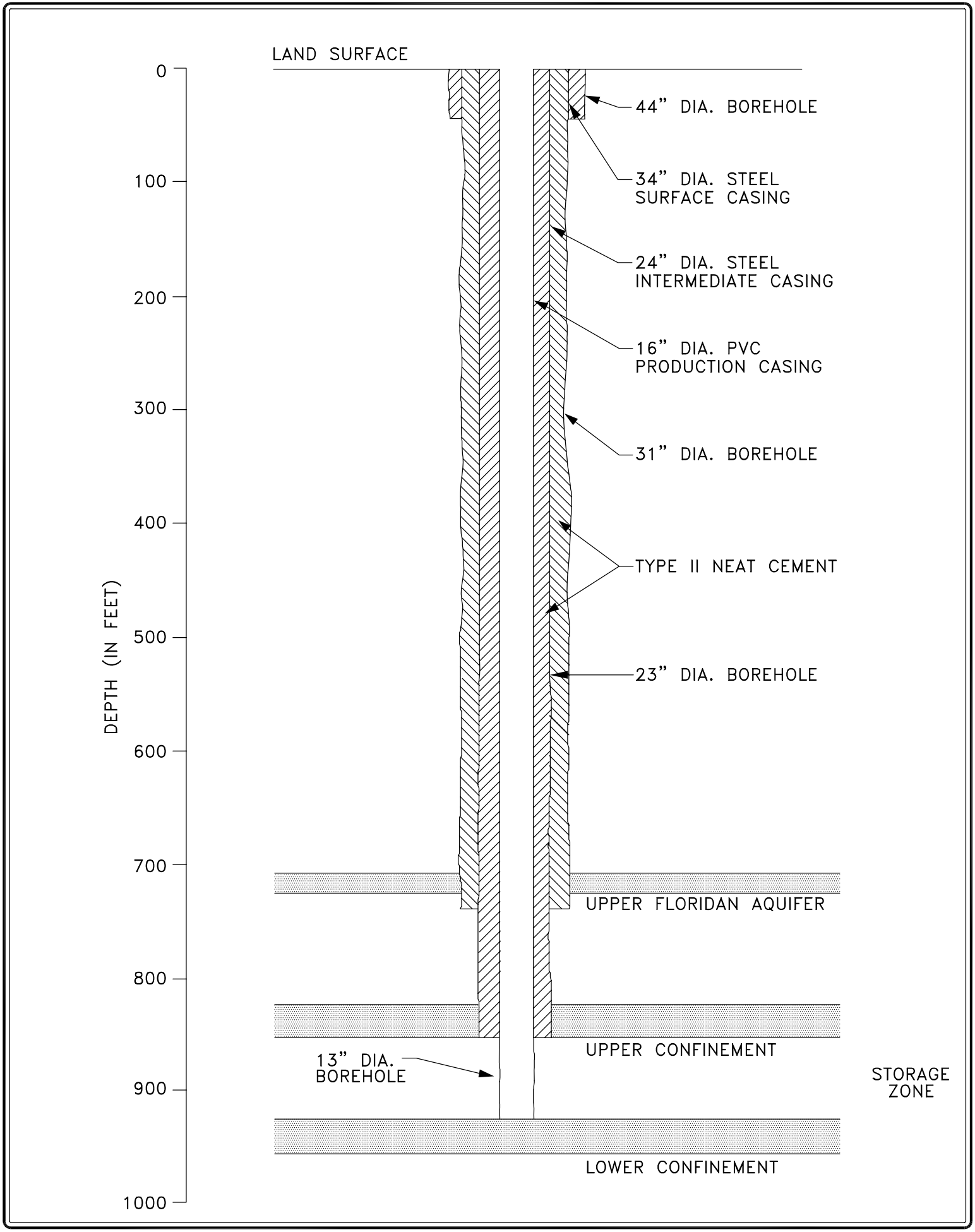
Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/11/04

FIGURE 17- PLAN VIEW OF CONCEPTUAL SURFACE WATER ASR SYSTEM FOR TEN MILE CANAL.



Water Resource Solutions	PROJECT NAME: RIDS PHASE II	DWG. NUMBER: A-014650X6
	PROJECT NUMBER: 01-04650.HO	DATE: 05/11/04

FIGURE 18. PLAN VIEW OF ASR WELL PAD.



Water Resource Solutions	PROJECT NAME: **RIDS PHASE II**	DWG. NUMBER: **A-014650X7**
	PROJECT NUMBER: **01-04650.HO**	DATE: **05/11/04**

FIGURE 19. GENERAL ILLUSTRATION OF CONSTRUCTION DETAILS FOR ASR WELL.

Table 22
Surface Water System Average Water Quality

Parameter	Ten Mile Canal
PH	7.7
Temperature °C	24.4
Color (PtCo)	0.7
TOC (mg/L)	16.5
Turbidity (NTU)	1.7
Alkalinity (mg/L as CaCO3)	186
Hardness (mg/L as CaCO3)	2.8
Calcium (mg/L as CaCO3)	N/a
TDS (mg/L)	N/a
Iron (*u*g/L)	N/a
Chloride (mg/L)	0.9
Sulfate (mg/L)	N/a
Fluoride (Mg/L)	N/a
TSS (mg/L)	2.4

WATER QUALITY REQUIREMENTS

Currently, the surface water to be injected into an ASR well must meet the Primary and Secondary Drinking Water Standards of Treatment (Chapter 62-550 FAC). Table 23 presents the basic water quality parameters to be met by treatment prior to injection. After recovery from the ASR wells the Reuse of Reclaimed Water and Land Application Rule 62-610 FAC dictates the water quality requirements.

Table 23
Primary Drinking Water Standards
(Applicable to ASR Wells)

Parameter			Limit (mg/L)
Inorganics	Arsenic		<10 µg/L MCL
	Fluoride [(1)]		<4 mg/L MCL – Recommended optimum concentration
	Sulfate		<250 mg/L MCL
Organics	Volatile Organic Compounds		Below MCLs at all times.
	Synthetic Organic Compounds		Below MCLs at all times.
Microbials and Turbidity	Disinfection		Surface water – 4-log Virus, 3-log Giardia, 2.5-log Cryptosporidium.
	Turbidity		Surface water - 95th percentile <0.25, always < 3 NTU
Secondary	Color		Maintain Finished Water 15 color units at all times.
Other	Regulated Disinfection-By-Products (DBPs):	THMs / HAAs	Below Stage I (<80 µg/L/ <60 µg/L).
	PH		Maintain Finished Water pH within range needed for corrosion control (approximately 7.6 to 7.9).
	TDS		Below secondary MCL of 500 mg/L.
	Chloride		Below secondary MCL of 250 mg/L.
	Turbidity		<0.3 NTU in Finished Water: Remove colloidal iron.

MCL = Maximum Contaminant Level

[(1)]Fluoride is also a Secondary Parameter

Treatment Proposed

The treatment of surface water systems is highly dependant on raw water quality, but there are systems in operation. The District is preparing to undertake a pilot study to evaluate the use of in-bank filtration of surface water as the primary means of treatment prior to ASR storage for the CERP. This Study assumes the use of in-bank filtration through a variety of media systems, depending on geology, as the treatment system prior to injection. Therefore, the overall system includes in-bank filtration, pumping to the ASR, pH adjustment (acidification), injection, recovery, disinfection, and pumping to the existing reclaimed water system.

This system will provide the necessary water quality for urban irrigation. It is anticipated that this treatment system will provide the following:

- Up to 3-log removal of pathogens,
- Minimal potential for disinfection by-product formation,
- Corrosion control, and
- Well plugging control.

Again, color is not treated to the required level with this type of system, but the FDEP has given exemptions in the past for this parameter.

ASR Recovery Standards

For recovery, the water needs to meet Section 62-610.410 FAC which provides that water for irrigation with public access shall not contain more than 5 mg/L of TSS, as well as meeting the secondary treatment standards and high–level disinfection. It is anticipated that chlorine/chloramines disinfection after recovery is all that I necessary to meet the reclaimed water rule.

Typical System Configuration

A typical surface water ASR system will require a diversion/intake structure (with filtration), pipelines, pumps, pH adjustment (prior to storage), disinfection and the ASR wells, as shown in Figure 16. The pH adjustment system will use either hydrochloric or carbonic acid. The storage capacity for the pH adjustment system chemicals will be dependent upon the number of ASR wells in each ASR wellfield.

Well Configuration

The configuration of the ASR systems was designed using the information described above and the optimum number of wells for each site. Each proposed configuration tried to achieve the best distribution of wells to optimize ASR recovery by concentrating the wells to reduce mixing between the injected water with the native water. The ASR system configurations for each potential alternative site are provided as Figure 17.

A typical ASR wellhead configuration plan view is shown on Figure 18 and a typical ASR subsurface sectional view (prior to installing submersible pump equipment) is shown on Figure 19.

Reclaimed Water Systems

There is a great deal of opportunity to maximize the use of reclaimed water in a RIDS program. The stakeholder utilities have growing reuse programs and plan to continue to expand. In order to offset the disposal of highly treated water during the wet season; ASR storage will be used to store the water during the wet season for use during the dry period of the year.

The configurations of the reclaimed water ASR systems were designed using the optimum number of wells for each site. Each proposed configuration sought to achieve the best distribution of wells to optimize ASR recovery by spacing the wells to reduce mixing between the injected water with the native water. The ASR system configurations for each potential reuse ASR site are provided as Figures 20, 21, 22, 23, 24, 25, 26 and 27.

Each ASR well will be constructed as described above for the surface water ASR system. A typical ASR wellhead configuration plan view is shown on Figure 18 and a typical ASR subsurface sectional view (prior to installing submersible pump equipment) is shown on Figure 19. It is assumed that a reclaimed water pumping station will be available to provide the required injection pressures and rates.

Quantity

As presented previously on TM No. 1, the expected flow from the WWTPs was estimated based on the projected population and wastewater generation factor of 112 gpd/capita. As a result, a total of 13.7 MGD could be use to meet the future reuse demands.

Water Quality Requirements

As is the case with surface water systems, several sections of Chapter 62 of the Florida Administrative Code (FAC) have some control over reuse ASR. The more important sections are 62-610.560 (Ground Water Recharge by Injection) and 62-528.600 (Criteria for Class V Wells).

Section 62-610.560 FAC requires reclaimed water injected into class G-II aquifers (any aquifer containing groundwater quality with a total dissolved solids concentration of less than 10,000 milligrams per liter) with groundwater quality of less than 3,000 milligrams per liter (mg/l) of total dissolved solids (TDS) must meet full treatment and disinfection regulations. These regulation require total suspended solids (TSS) concentrations to be less than 5.0 mg/l before disinfection, filtration for TSS control, total nitrogen less than 10.0 mg/l, Primary and Secondary Drinking Water Standards must be met, total organic carbon (TOC) less than 3.0 mg/l, total organic halogen (TOX) less than 0.2 mg/l, no potable water supply wells drawing from the aquifer within one of the ASR well unless those wells are owned and operated by the ASR well owner.

For aquifers containing groundwater with TDS concentrations greater than 3,000 mg/l but less than 10,000 mg/l, the reclaimed water must meet principal treatment and disinfection requirements. Principal treatment includes (TSS) concentrations to be less than 5.0 mg/l before disinfection, filtration for TSS control, total nitrogen less than 10.0 mg/l Compliance with Secondary Drinking Water Standards and for sodium limitations for the reclaimed water is not required.

Section 62-610.466 FAC requires that water recovered from a reclaimed water ASR well must be treated to high-level disinfection standards before it enters a reuse distribution system. This section also requires an engineering report with the initial permit application, which evaluates any anticipated changes in characteristics of the reclaimed water during injection, storage, and recovery. Further details about all the regulations applicable to these projects are shown below, under Assessment of Current Policies, Procedures, and Regulations.

Interconnects / Transmission Lines

The concept of interconnects between utilities was developed in the Master Plan. These interconnects are the key to providing a system with a regional benefit, not just for the local utility. There are also transmission lines necessary to bring water from supply sources to the existing distribution system. Interconnected systems do have water quality issues due to differing treatment types, disinfection types, piping materials, etc. This will be considered prior to the actual installation of the interconnects so that the utilities can proactively address the issue.

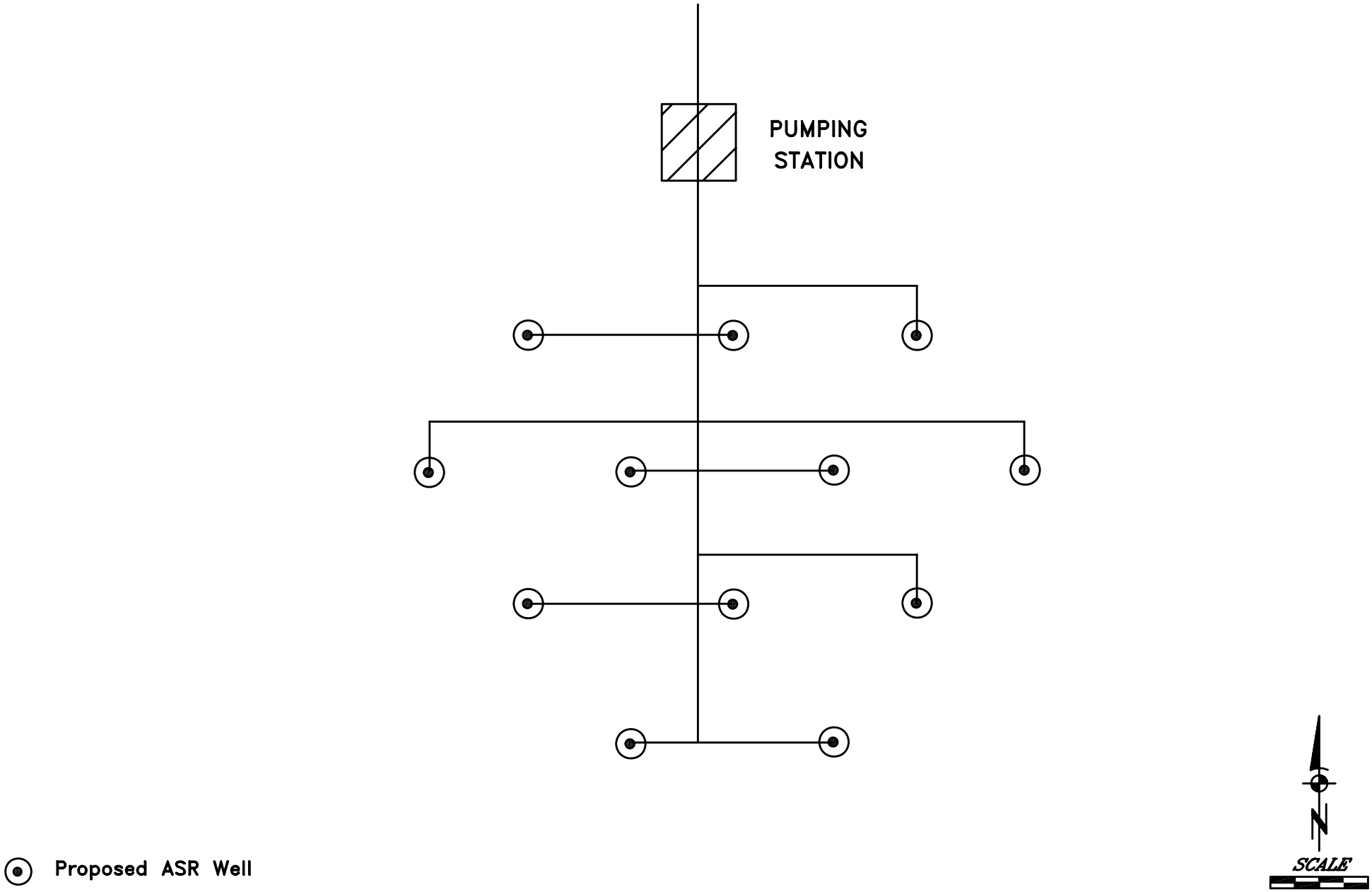
Interconnects / transmission lines were located based on several criteria including:

- Existing reuse transmission system locations
- Geographic proximity between systems
- Potential piping routes or corridors
- Areas of demand
- The conceptual location of and costing for the interconnect included piping, booster pump stations and ASR storage.

Within this Region, there are two interconnects: Fort Myers Central/Gateway/Lehigh, and Ft. Myers Beach/Fiesta Village (shown on **Figure 12**).

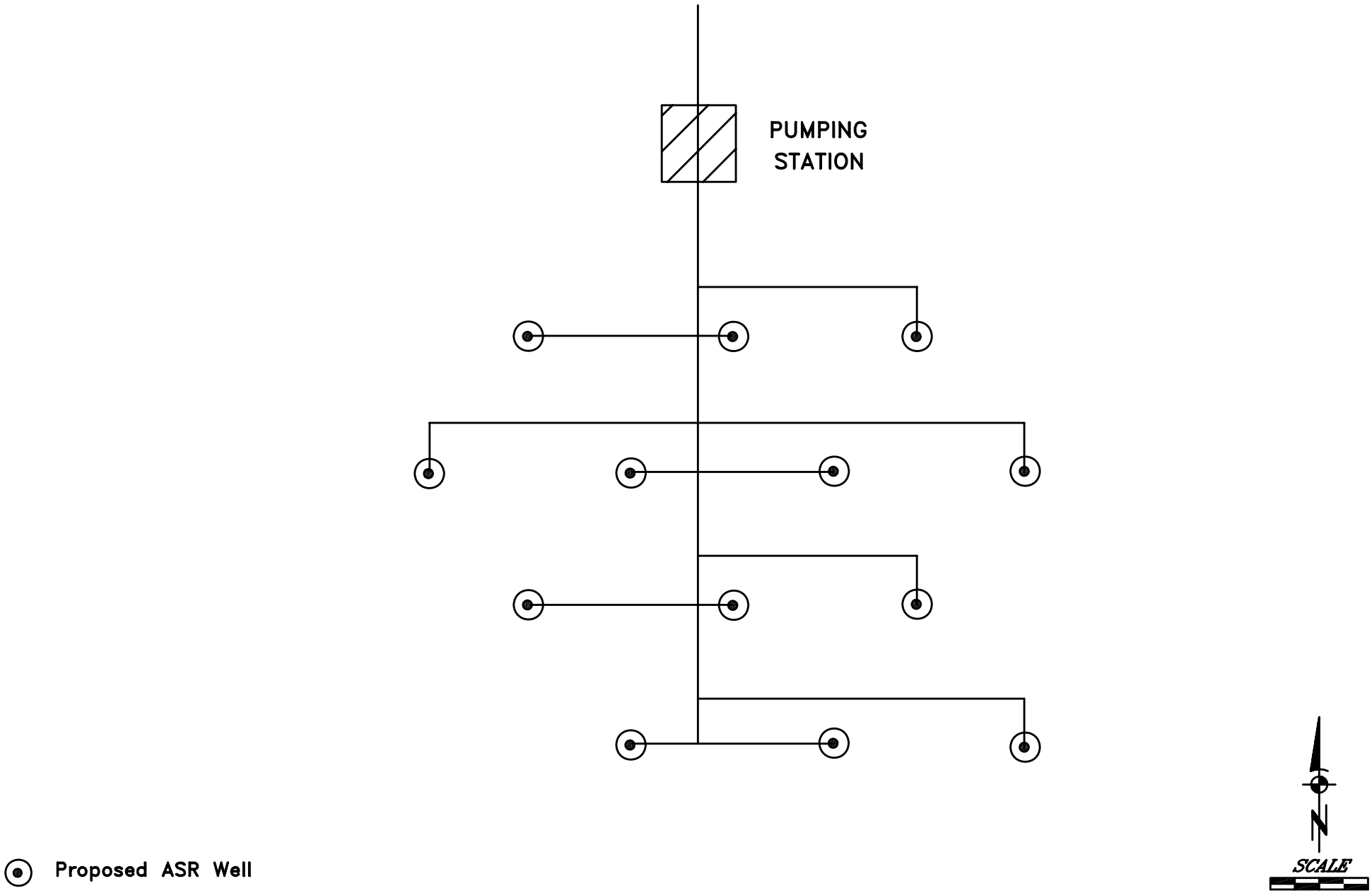
Water Quality Requirements

All water supply sources being injected to an ASR well needs to meet the Primary and Secondary Drinking Water Standards of Treatment (FAC 62-550). For recovery from the ASR, wells supply for irrigation must meet the Reuse of Reclaimed Water and Land Application Rule FAC 62-610, as described in the previous sections.



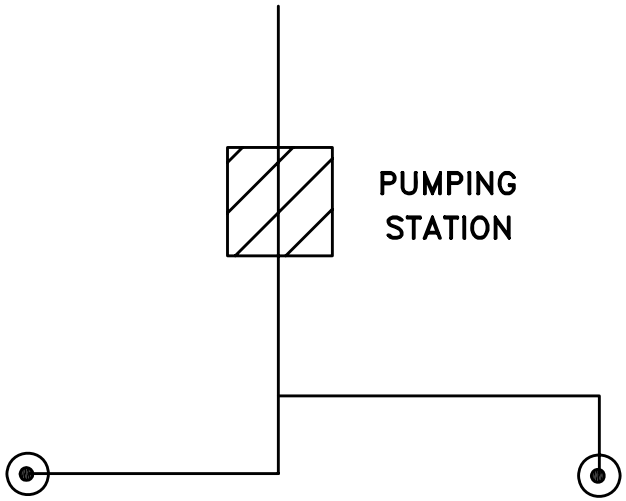
Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/11/04

FIGURE 20– PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR FIESTA VILLAGE / FORT MYERS BEACH

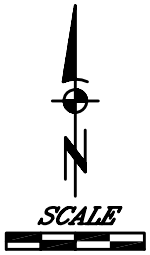


Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/11/04

FIGURE 21- PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR FORT MYERS CENTRAL

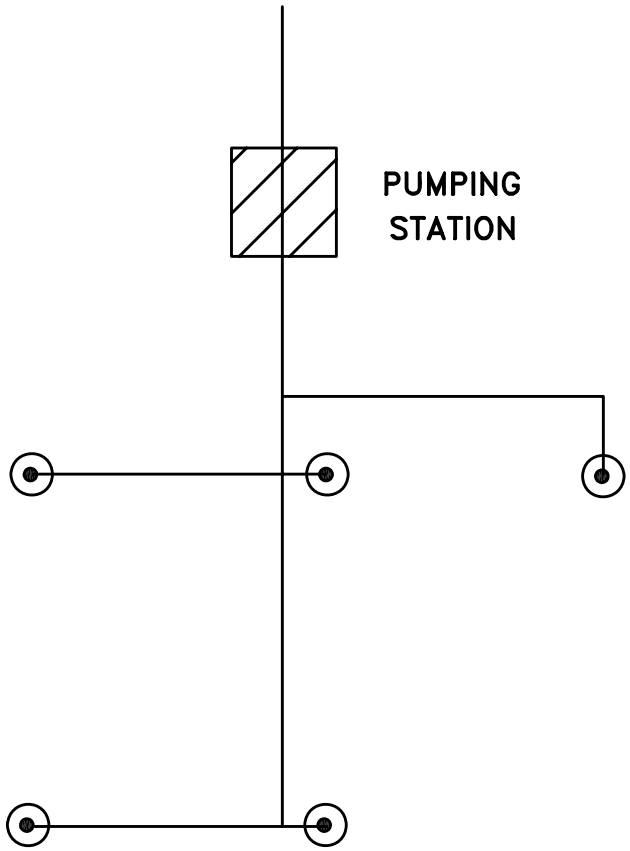


Proposed ASR Well

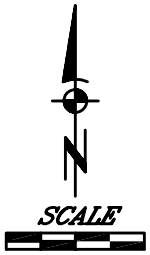


Water Resource Solutions	PROJECT NAME: RIDS PHASE II
	PROJECT NUMBER: 01-04650.HO DATE: 5/12/04

FIGURE 22– PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR GATEWAY

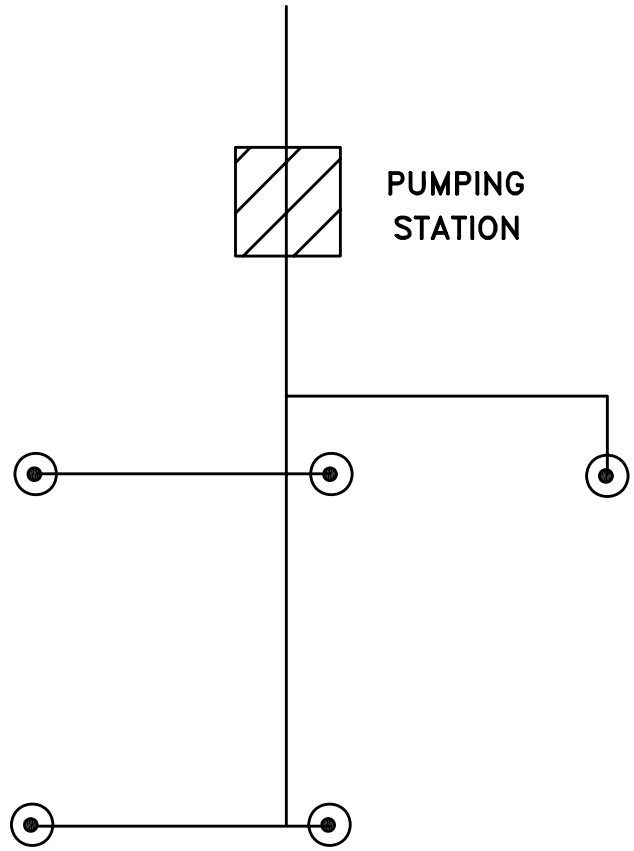


Proposed ASR Well

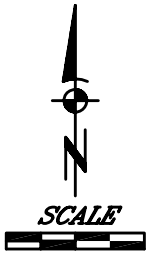


Water Resource Solutions	PROJECT NAME: RIDS PHASE II
	PROJECT NUMBER: 01-04650.HO DATE: 5/12/04

FIGURE 23– PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR LEHIGH ACRES

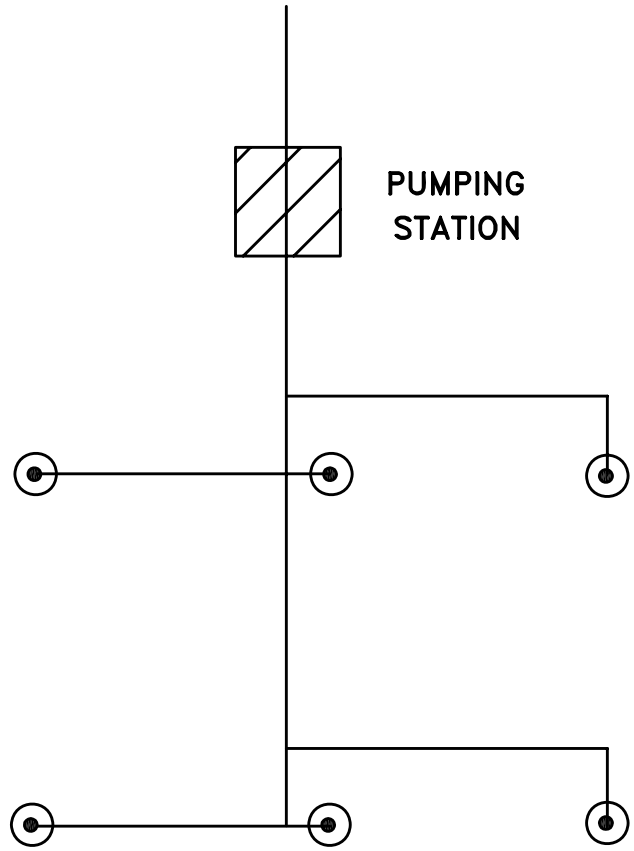


Proposed ASR Well

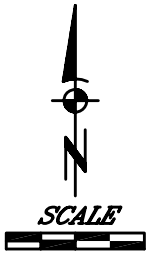


Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/12/04

FIGURE 24– PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR THREE OAKS

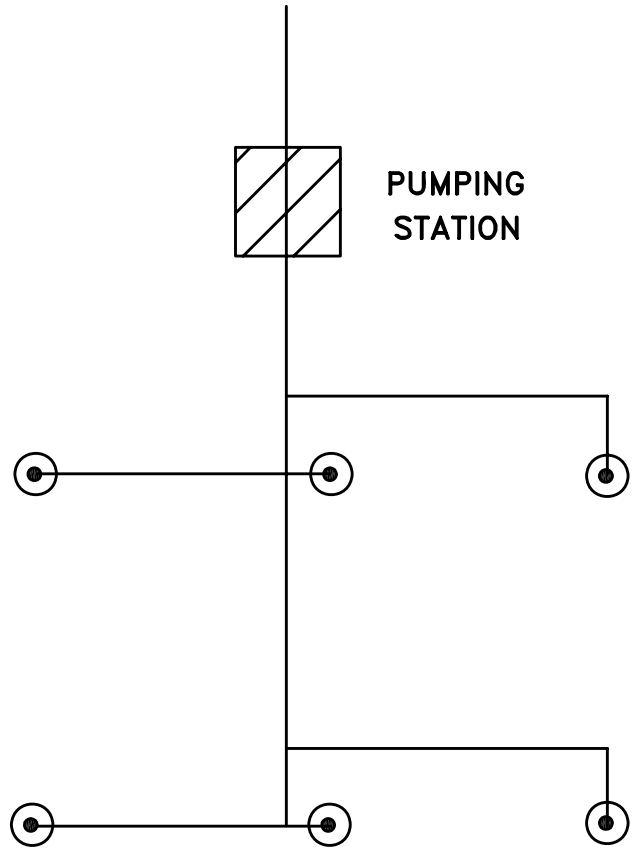


Proposed ASR Well

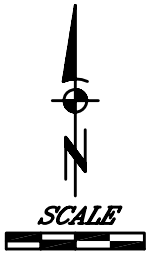


Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/12/04

FIGURE 25– PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR FIESTA VILLAGE

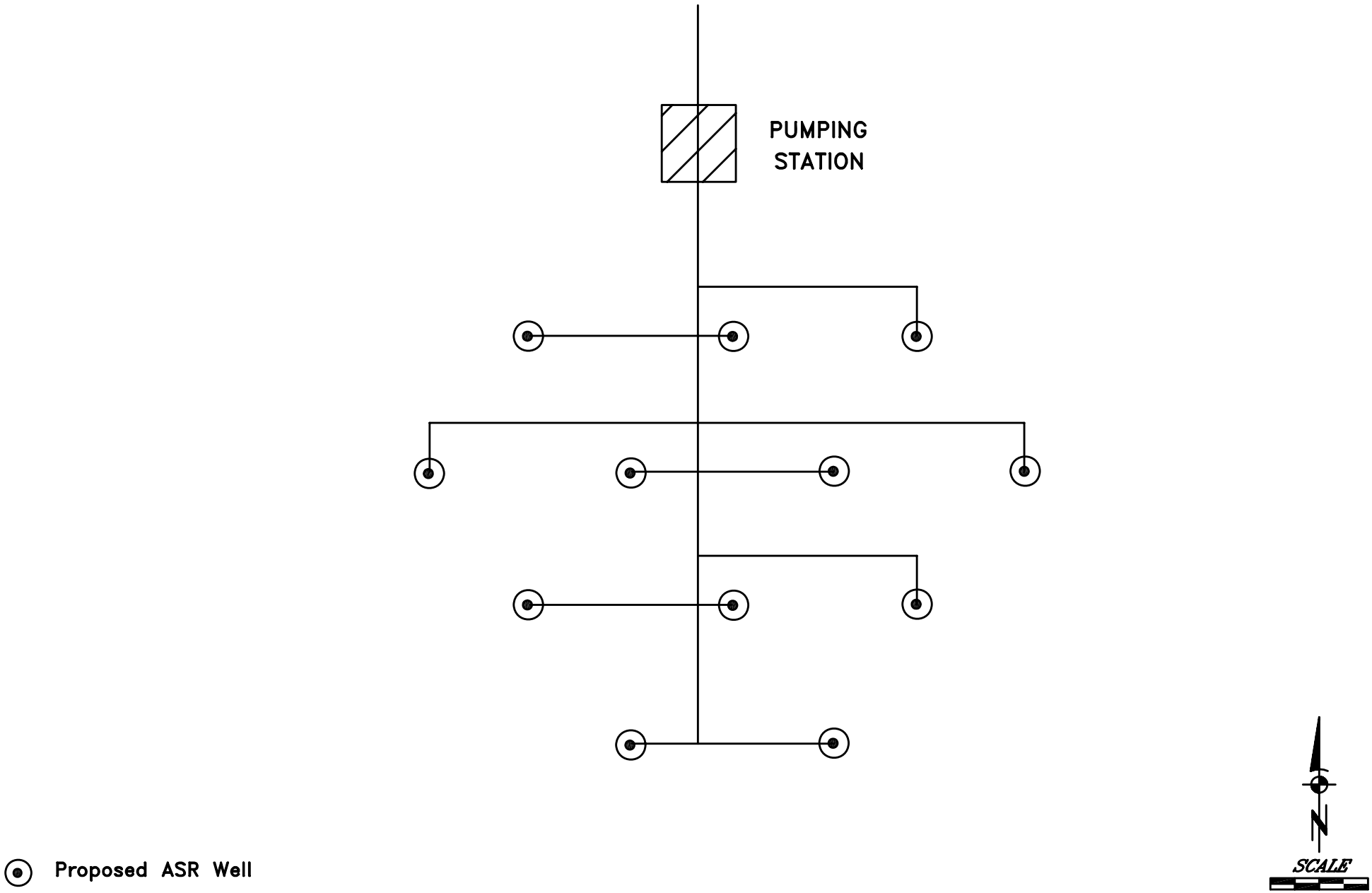


Proposed ASR Well



Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/12/04

FIGURE 26– PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR FORT MYERS BEACH



Water Resource Solutions	PROJECT NAME: RIDS PHASE II	
	PROJECT NUMBER: 01-04650.HO	DATE: 5/11/04

FIGURE 27– PLAN VIEW OF CONCEPTUAL RECLAIMED WATER ASR SYSTEM FOR FORT MYERS SOUTH

COST ANALYSIS

Preliminary cost estimates for the identified alternatives were developed including capital, operation and maintenance (O&M) costs. The costs consider financing the initial project capital costs, including assumptions about potential funding sources, and annual operations and maintenance expenses. Projected annual costs were divided by the projected annual benefits to obtain unit costs for each alternative. The range of costs was $1.17 to $3.60 per thousand gallons. The average cost for the alternatives is approximately $0.76 per thousand gallons. These costs were based on FDEP's State Revolving Fund (SRF) loan structures and assumed no grant funding. These cost estimates include estimated construction costs for the various wells, pumping stations and pipelines that make up the projects, including engineering and contingencies. The cost summary is included in Table 24.

To estimate the debt service for each project the following assumptions and considerations were used:

- The initial project costs will be financed over a twenty (20) year period at a rate of 3.5%;
- The cost to be financed includes administrative fees equal to two percent (2%) of the initial project capital costs as required by the terms and conditions of the SRF Loan Program;
- The cost to be financed includes funding of a loan repayment reserve equal to three percent (3%) of the initial project capital costs being borrowed as required by the terms and conditions of the SRF Loan Program, and
- The cost to be financed includes thirty-six (36) months of capitalized interest based upon construction funding draws during the assumed project engineering and construction period.
- Total capital costs for each subregion include debt service and an allowance for debt service coverage equal to 25% of the annual debt service.
- The allowance for debt service coverage is based upon the SRF Loan Program's minimum debt service coverage requirement of 15% adjusted upward to also reflect the need for funding capital renewals and replacements that may occur during the term of the loan agreement.

The annual operations and maintenance costs for each alternative included:

- The cost of electricity for pumping;
- General maintenance of the facilities;
- Submersible pump maintenance;
- Adjustment of injection rates and measurement of water quality;
- Weekly water sample procurement for laboratory analysis;
- Semiannual calibration of flowmeters and gauges;
- Preparation of monthly regulatory reports; and
- Cost for chemicals, pretreatment, and filtration prior to injection.

The annual operations and maintenance costs were added to the annual capital-related financing costs to estimate the total costs for each project and subregion. The cost per thousand gallons for each subregion was divided by the total annual production of each alternative to obtain unit costs. It was assumed alternatives would serve provide an irrigation water benefit for only 180 days per year.

It is important to note preexisting deficiencies at the treatment plants considered in this study were not included in the analysis. It was assumed all plants would be providing the appropriate treatment to meet primary and secondary standards.

TABLE 24
Cost Analysis

Name	Type	Number of Wells	Wells	Pumping Station	Intake System Const. Cost	Land Acquisition Cost	Pipelines	Engineering, Administrative and Legal	Estimated Pilot Project Cost	Total	Annual Operations and Maintenance	Estimated Benefit MGD
1. Ten Mile Canal-Pump Station	Surface Water ASR			$ 1,550,000	$1,700,000			$650,000		$ 4,875,000		
1. Ten Mile Canal-Wells		17	$ 9,350,000			$850,000	$25,500	$1,875,100	$ 1,850,000	$ 17,438,250		
1. Ten Mile Canal-Transmission Lines							$1,560,000	$312,000		$ 2,340,000		
1. Ten Mile Canal			$ 9,350,000	$ 1,550,000	$ 1,700,000	$ 850,000	$ 1,585,500	$ 2,837,100	$ 1,850,000	$24,653,250	$504,000	12.0
2. Fiesta Village/Ft.Myers Beach-Pump Station	Reclaimed Water ASR			$ 1,200,000				$240,000		$ 1,800,000		
2. Fiesta Village/Ft.Myers Beach-Well		12	$ 6,600,000			$600,000	$18,000	$1,323,600	$ 1,400,000	$ 12,427,000		
2. Fiesta Village/Ft.Myers Beach -Transmission Lines								$0		$ -		
2. Fiesta Village/Ft.Myers Beach			$ 6,600,000	$ 1,200,000	$ -	$ 600,000	$ 18,000	$ 1,563,600	$ 1,400,000	$14,227,000	$340,200	8.1
3. Fort Myers CentralPump Station	Reclaimed Water ASR			$ 1,700,000				$340,000		$ 2,550,000		
3. Fort Myers Central-Well		13	$ 7,150,000			$650,000	$19,500	$1,433,900	$ 1,400,000	$ 13,316,750		
3. Fort Myers Central- Transmission Lines							$72,000	$14,400		$ 108,000		
3. Fort Myers Central			$ 7,150,000	$ 1,700,000	$ -	$ 650,000	$ 91,500	$ 1,788,300	$ 1,400,000	$15,974,750	$369,600	8.8
4. Gateway-Pump Station	Reclaimed Water ASR			$ 250,000				$50,000		$ 375,000		
4. Gateway-Well		2	$ 1,100,000			$100,000	$3,000	$220,600	$ 1,400,000	$ 3,529,500		
4. Gateway - Transmission Lines							$1,588,280	$317,656		$ 2,382,420		
4. Gateway			$ 1,100,000	$ 250,000	$ -	$ 100,000	$ 1,591,280	$ 588,256	$ 1,400,000	$6,286,920	$42,000	1.0
5. Lehigh Acres-Pump Station	Reclaimed Water ASR			$ 680,000				$136,000		$ 1,020,000		
5. Lehigh Acres-Well		7	$ 3,850,000			$350,000	$10,500	$772,100	$ 1,400,000	$ 7,978,250		
5. Lehigh Acres-Transmission Lines							$2,784,000	$556,800		$ 4,176,000		
5. Lehigh Acres			$ 3,850,000	$ 680,000	$ -	$ 350,000	$ 2,794,500	$ 1,464,900	$ 1,400,000	$13,174,250	$205,800	4.9
6. Three Oaks-Pump Station	Reclaimed Water ASR			$ 600,000				$120,000		$ 900,000		
6. Three Oaks-Well		5	$ 2,750,000			$250,000	$7,500	$551,500	$ 1,400,000	$ 6,198,750		
6. Three Oaks-Transmission Lines							$268,800	$53,760		$ 403,200		
6. Three Oaks			$ 2,750,000	$ 600,000	$ -	$ 250,000	$ 276,300	$ 725,260	$ 1,400,000	$7,501,950	$138,600	3.3
7. Fiesta Village-Pump Station	Reclaimed Water ASR			$ 670,000				$135,800		$ 1,007,250		
7. Fiesta Village-Well			$ 3,300,000			$300,000	$9,000	$666,758	$ 1,400,000	$ 7,094,698		
7. Fiesta Village-Transmission Lines		6					$33,792	$8,558		$ 52,938		
7. Fiesta Village			$ 3,300,000	$ 670,000	$ -	$ 300,000	$ 42,792	$ 811,117	$ 1,400,000	$ 8,154,886	$163,800	3.9
8. Fort Myers Beach-Pump Station	Reclaimed Water ASR			$ 810,000				$163,800		$ 1,217,250		
8. Fort Myers Beach-Well			$ 3,300,000			$300,000	$9,000	$667,603	$ 1,400,000	$ 7,095,754		
8. Fort Myers Beach-Transmission Lines		6					$ 38,016	$9,403		$ 59,274		
8. Fort Myers Beach			$ 3,300,000	$ 810,000	$ -	$ 300,000	$ 47,016	$ 840,806	$ 1,400,000	$ 8,372,278	$176,400	4.2
9. Fort Myers South-Pump Station	Reclaimed Water ASR			$ 1,100,000				$223,600		$ 1,654,500		
9. Fort Myers South-Well		12	$ 6,600,000			$600,000	$18,000	$1,362,240		$ 10,725,300		
9. Fort Myers South-Transmission Lines							$ 211,200	$45,840	$ 1,400,000	$ 2,071,300		
9. Fort Myers South			$ 6,600,000	$ 1,100,000	$ -	$ 600,000	$ 229,200	$ 1,631,680	$ 1,400,000	$14,451,100	$327,600	7.8
10. City of Fort Myers Transmission	Reclaimed Water									$ 17,072,141		16.6
10. City of Fort Myers Reclaimed Transmission			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,072,141	$697,200	16.6
11. Corkscrew Rd. to Williams Rd.	Reclaimed Water						$ 196,800	$39,360		$ 295,200		0.3
11. Corkscrew Rd. to Williams Rd.			$ -	$ -	$ -	$ -	$ 196,800	$ 39,360	$ -	$295,200	$12,600	0.3
TOTAL		80	$ 44,000,000	$ 8,560,000	$ 1,700,000	$ 4,000,000	$ 6,872,888	$ 12,290,379	$ 13,050,000	$ 130,163,725	$ 2,977,800	71

Notes:

Wells: $550,000 per well

Pump Station Cost: Derived from Construct. Cost of Service Water P.S. figure 29-6 from the Pumping Station Handbook.

Intake cost: For the first 5 MGD the cost is $1M. For additional cost greater than 5 MGD the cost is $ 100k per MGD.

Land Acquisition Cost $50,000/well. 500 ft well separation minimum

Pipelines: Well Pipelines: $1500/well. Transmission Lines: $4/diameter per linear feet.

Engineering = 20% of capital cost. Doesn't include the land cost.

Pilot: $1.85M for surface water. $1.4M for reclaimed water.

Total has a contingency of 25%

O & M for Surface ASR= 0.14cents/1000 gals X10 months X 30 days/month

INSTITUTIONAL FRAMEWORK

The decision was made during the Master Plan to utilize interlocal agreements to oversee design, construction, development, funding and operation of systems resulting from the RIDS program. In practice, various types of interlocal agreements have been used to own, operate, and govern regional utility water supply and wastewater treatment projects. These range from the formation of a separate and distinct entity such as a utility authority to arrangements where one party is the prime sponsor with respect to financing and operations and the other regional participants are enjoined through a contractually binding bulk sales agreement or capacity entitlement and cost sharing arrangement.

The advantages of the project-by-project or subregional approach is that individual arrangements can be developed that are flexible in dealing with ownership and operating issues in a way that satisfies all of the jurisdictions involved. This type of institutional approach may ensure more active and better participation among the involved parties. In addition, it is anticipated that the project cost would be lower because there would be very little redundant administrative and operating costs. The utility representatives that are participating in developing the Master Plan strongly favor a project-by-project or subregional approach to the development of irrigation water resources.

FUNDING SOURCES AND OPTIONS

Introduction

As a regional project with far reaching impact, the RIDS program requires concerted efforts by all parties involved for funding. The project stakeholders currently have substantial, ongoing programs to implement water, wastewater and reclaimed water programs; therefore, they have incurred significant debt service. With estimated costs of more than $300 Million, the stakeholders are expecting funding assistance in order to implement the program.

This document will emphasize the steps necessary to get the priority projects funded, and will serve as a guideline for future RIDS efforts.

Critical Issues

- **Program Identity:** As funding is sought for these projects, it is imperative that the program be accurately and consistently identified to image it appropriately. IT should be imaged as an Alternative Water Supply Program with regional benefits. Also, projects within stakeholder Capital Improvement Plans often fail to identify the project as pertaining to RIDS. Projects listed on the District alternative water supply list, the Florida Department of Environmental Protection (FDEP) State Revolving Fund (SRF) Fundable List, and the State and Federal Government budgets should be integrated and identified as RIDS to create an identity for the program.

- **Uniform Approach:** To date, Federal and State funding efforts have been minimal, primarily due to the lack of a uniform approach. Stakeholders and the District must coordinate together to achieve the type of funding support the program requires.

- **Detailed Schedule:** The timing of funding cycles and legislative opportunities must be identified for all parties.

Proposed Resolutions

- An identity for the program must be created. To achieve this, a point person should be identified by the District and given the support required to move the program forward. Identification of the program as a major initiative by the District both in the media and on the website would aid in recognition.

- A unified approach must be taken. A project team or steering committee should be set up consisting of the District point person and a representative from each of the stakeholders. Other members would include the federal and state lobbyists; a representative of the District's funding department, the consulting engineer, and the funding specialist.

- A presentation package is required to assist in the timing and uniformity of the project team's actions. The project team should utilize this document for all discussions and funding requests.

This section lists the available sources of funding for the RIDS program.

Florida Department of Environmental Protection (FDEP) State Revolving Fund Loan Program – Wastewater and Stormwater

The State Revolving Fund Loan Program (SRF) provides low-interest loans for planning, designing, and constructing water pollution control facilities. Federal Capitalization Grants and State match appropriations of 20% have funded the SRF. It is a "revolving" fund because loan repayments are used to make additional loans. By federal law, the SRF is to be operated in perpetuity. The FDEP solicits project information each year. The information is used to establish project priorities for the following annual cycle. Funds are made available for Pre-construction Loans and Construction Loans. The loan terms include a 20-year amortization and low interest rates, which represent a 40% discount off bond rates.

Pre-construction loans are available to all communities and provide up-front disbursements for administrative services, project planning and project design.

Construction loans are also available to all communities and provide for construction costs and technical services during construction.

Approximately $120M/yr is available. The current interest rate is approximately 3.00%.

FDEP State Revolving Fund Loan Program – Drinking Water

The Drinking Water State Revolving Fund (SRF) Program provides low-interest loans for planning, designing, and constructing public water facilities. Federal Capitalization Grants and State match appropriations of 20% have funded the SRF. It is a "revolving" fund because loan repayments are used to make additional loans. By federal law, the SRF is to be operated in perpetuity. The Department solicits project information each year from January 1 to February 15. The information is used to establish the project priority list for the following annual cycle. Funds are made available for Pre-construction Loans to rate-based public water systems, Construction Loans of $75,000 minimum or more, and Pre-construction Grants and Construction Grants to financially disadvantaged communities.

The loan terms include a 20-year (30-year for financially disadvantaged communities) amortization and low interest rates, which represent a 40% discount off bond rates. Small community assistance is available for communities having populations less than 10,000. Each year 15% of the funds are reserved exclusively for their use. In addition, small communities may qualify for loans from the unreserved 85% of the funds.

Approximately $40M/yr is available. The current interest rate is approximately 3.00%.

SFWMD Alternative Water Supply Grant Program

In 1995, the Florida Legislature enacted the Alternative Water Supply Grant Program to increase the potential for the development of alternative water supplies in the state and to help utilities develop cost-effective reclaimed water supplies.

The Program is a cost share program that provides a portion of funding for alternative water supply projects built by local, county, or private water purveyors. To be considered for the program, a project must be consistent with the local government plan and must be located in a Water Resource Caution Area. Funding support is limited to capital or infrastructure costs for alternative water supply systems.

The available funds vary annually as determined during the District's budget process.

SFWMD Water Resource Development Program

Water resource development projects are generally regional in nature and are primarily the responsibility of the District. Each water management district is required to include in its annual budget the amount needed for the fiscal year to implement water resource development projects as prioritized in its regional water supply plans.

The traditional source of funding has been ad valorem taxes. Projects are ranked and prioritized along with projects in all other regional water supply plans during annual District budget preparation and funded, as money is available. Priority considerations for a project include availability of a cost-share partner and if a project makes 'new' water available. Sustainability of the regional system is also an important consideration.

State Funds - The Water Quality Improvement and Water Restoration Grant Program (Section 403.885 F.S.)

Amount of funds available will vary by year. In 2003, no projects were funded. In 2004, $100M worth of projects were funded.

Projects eligible for the funding must address such criteria as resolving violations of state water quality standards, preventing drainage and flood control problems, resolving public health threats and protecting the environment. Financial capability of the local government is also a deciding factor.

The program includes grants covering wastewater, stormwater, surface water restoration and water management projects.

Currently, funds are requested through a Community Budget Issue Request/Special Appropriation Process. The FDEP will review the request and make recommendations as to appropriateness of the project to the program.

Federal Funds – EPA State and Tribal Assistance Grants

The United States Environmental Protection Agency makes funds available for special water supply projects through its State and Tribal Assistance Grant (STAG) program.

The projects must be included in an appropriation bill passed by the Senate and House.

Approximately $2M/yr per project in grant funds is typically available for projects the size of RIDS.

Local Funds – Developer Contributions/Impact Fees/User Fees (Rates)

Revenue derived from the collection of impact fees could be used to fund portions of the project. Additionally, requirements could be placed on developers to provide or construct portions of the system within particular developments reducing the total cost of the distribution system.

Revenue generated through rates is normally used for O&M costs.

Bonds

Issuance of bonds could provide for project funding; however, due to the costs of issuance, interest rates, coverage and other financial considerations, this would be a last resort option.

Funding Strategy

As depicted in Figure 4-1, it is recommended that the base funding for the RIDS project be the FDEP SRF program loans. The low interest rates (approximately 3.00%) and repayment terms (20 years) make them the most attractive form of overall financing.

The SRF program provides for the flexibility to draw funds only when needed and allows for application of grant funds when received. Unlike bond funds, there is no arbitrage or pre-payment penalties.

After this base funding is secured, it is recommended that district, state, and federal grant funds be sought and secured to negate the use of borrowed funds where possible.

A significant increase in the District's Water Management and Planning budget would be required to support further development of the program as well as dedication of revenues to provide grants for construction funding.

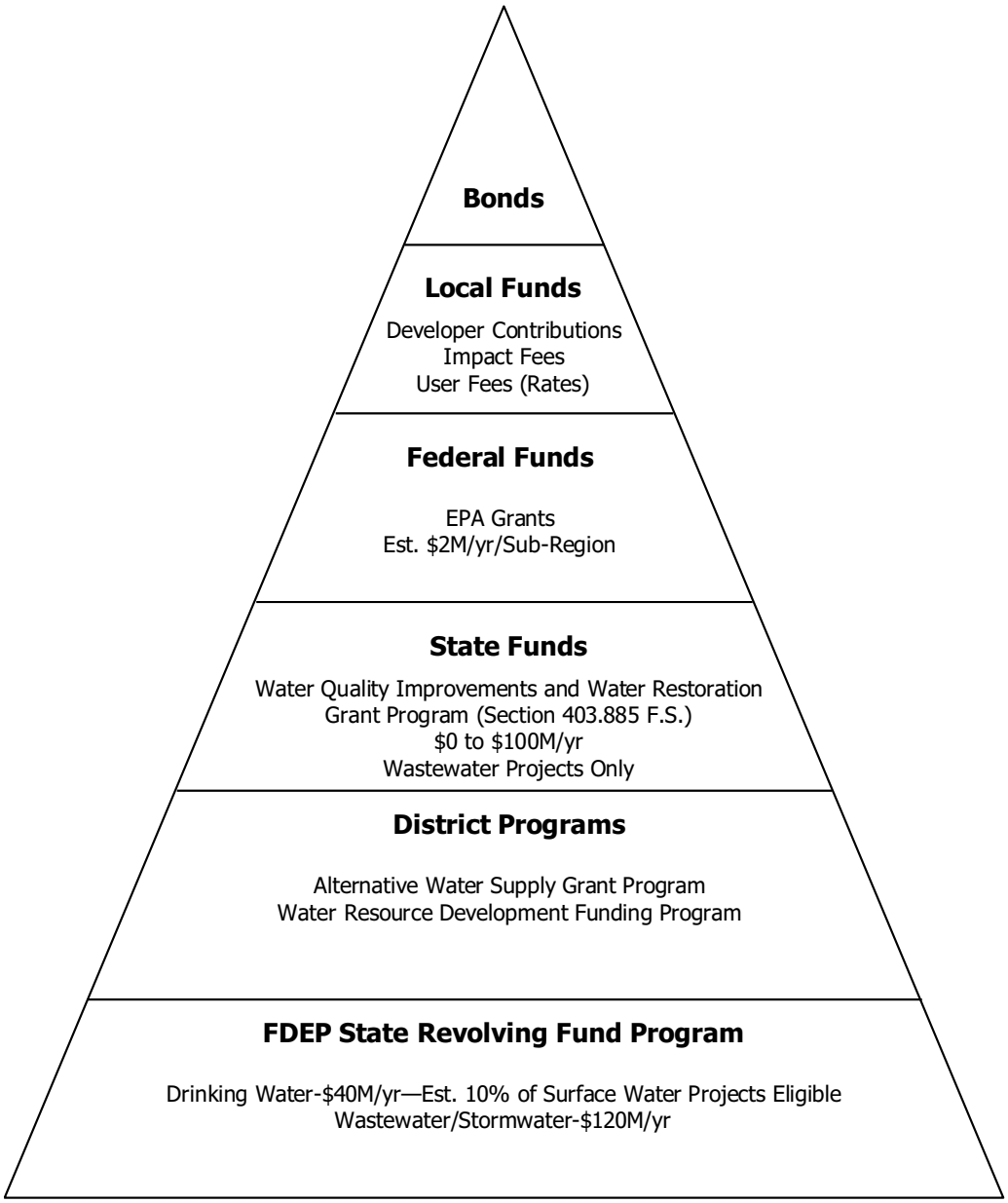
Cash reserves in the form of Developer Contributions and Impact Fees would be considered the third level of funding with bond proceeds considered the least attractive form of funding due to financing costs.

It is assumed that user fees (rates) will pay for Operating and Maintenance costs.

Project Timing and Phasing

It is assumed that the project would be phased to provide system resources based on need. Consideration should also be given to phasing of the service areas as individual areas' economics/demographics may allow them to better "compete" for funding versus other areas or the total project as a whole.

Funding Strategy



Priority Projects

In order to meet the critical issues presented previously, a funding workshop was held with all of the stakeholders and the District. It was determined that "Priority Projects" would be necessary to initiate momentum for the program and to properly image it amongst the legislators, funding agencies regulators. The following table presents a summary of the priority projects as agreed to by the stakeholders and the potential funding sources for them.

Table 25
RIDS Priority Projects

Project Name	Capital Cost	Typical Funding Sources			
		EPA (STAG)	SFWMD	State (CBIR)	SRF
Sub Region 1 (Collier County, Naples and Bonita Springs)					
BSU - Kehl Canal Surface Water ASR	$ 23,000,000	$ 2,300,000	$ 2,300,000	$ 1,150,000	$ 17,250,000
Collier - BSU Interconnect	$ 3,000,000	$ 300,000	$ 300,000	$ 150,000	$ 2,250,000
Collier - BSU Reclaimed Water ASR	$ 20,000,000	$ 2,000,000	$ 2,000,000	$ 1,000,000	$ 15,000,000
Subtotal	$ 46,000,000	$ 4,600,000	$ 4,600,000	$ 2,300,000	$ 34,500,000
Sub Region 2 (Cape Coral, North Ft. Myers and Waterway Estates)					
Cape Coral - Gator Slough Surface Water ASR	$ 27,000,000	$ 2,700,000	$ 2,700,000	$ 1,350,000	$ 20,250,000
Cape Coral - Everest Pkwy Reclaimed Water ASR	$ 22,000,000	$ 2,200,000	$ 2,200,000	$ 1,100,000	$ 16,500,000
Cape Coral - North South Transfer Station Surface Water ASR	$ 19,000,000	$ 1,900,000	$ 1,900,000	$ 950,000	$ 14,250,000
Subtotal	$ 68,000,000	$ 6,800,000	$ 6,800,000	$ 3,400,000	$ 51,000,000
Sub Region 3 (City of Ft. Myers and Lee County)					
Ft Myers - Central WWTP and South WWTP Interconnect	$ 19,500,000	$ 1,950,000	$ 1,950,000	$ 975,000	$ 14,625,000
Ft Myers - Reclaimed Water Pipeline East of I-75	$ 6,500,000	$ 650,000	$ 650,000	$ 325,000	$ 4,875,000
Lee - Ft. Myers Beach/ Ft. Myers Village ASR system	$ 14,000,000	$ 1,400,000	$ 1,400,000	$ 700,000	$ 10,500,000
Subtotal	$ 40,000,000	$ 4,000,000	$ 4,000,000	$ 2,000,000	$ 30,000,000
TOTAL	$ 154,000,000	$ 15,400,000	$ 15,400,000	$ 7,700,000	$ 115,500,000

Notes:
1. Project Costs are from the Boyle Engineering Funding Report for SFWMD, dated 12/14/04.
2. EPA Participation through STAG requests is dependant upon adequate preparation. $2 million per project is typical for projects of similar scope.
3. SFWMD (AWS) participation has typically been maximized at $200,000, and is considered to be included in applicable projects.
4. Future funds availability from EPA, State, and WMD are uncertain. All funding options will be utilized in order to minimize Stakeholder funds required.
5. Initial funding estimates have been broken down as 10% Federal, 10% SFWMD, and 5% State.

Funding Examples

Shown below are project funding examples from other Districts. The dollar amounts shown for Federal, State, and District sources provided to indicate the type of funding that might be available.

Table 26
Funding Examples

Project Name	Project Type	Year	Total Project Cost	Total Federal Funding	Total District Cost	Total Basin Cost	Total Governing Board Cost
Tampa Water Resource Recovery	New Water Sources Initiative	FY 2005	4,392,000	3,642,000	750,000	375,000	375,000
Peace River Option	New Water Sources Initiative	FY 2005	65,989,692	574,000	20,755,155	10,377,578	10,377,577
Manatee Agricultural Reuse Supply (MARS)	New Water Sources Initiative	FY 2005	30,821,940	7,256,000	11,981,145	5,990,660	5,990,485
Hillsborough County Central Reuse System	New Water Sources Initiative	FY 2005	7,000,000		3,294,841	1,584,390	1,710,451
Hillsborough Co Northwest Reuse System Ph 1	New Water Sources Initiative	FY 2005	11,100,000		5,406,232	2,685,232	2,721,000
Peace River Regional Reservoir Expansion	New Water Sources Initiative	FY 2005	29,800,000		14,900,000	7,453,980	7,446,020
Peace River Facility Expansion	New Water Sources Initiative	FY 2005	76,200,000	9,000,000	24,200,000	12,225,000	11,975,000
Largo/Clearwater/Pasco - ASR / Interconnect	Water Supply & Resource Development	FY 2005	10,072,312		4,965,712	2,486,268	2,479,444
Facilitating Agricultural Resource Mgmt Systems	Water Supply & Resource Development	FY 2005	6,453,039		6,353,039	4,295,089	2,057,950
Charlotte Co Regional Reclm Wtr Expansion	Water Supply & Resource Development	FY 2005	5,803,245		2,903,745	1,451,898	1,451,847
Manatee Co FPL / Piney Point MARS Storage	Water Supply & Resource Development	FY 2005	8,000,000		4,000,000	2,000,000	2,000,000
TBRRAP-N, Tampa Reclaimed Wtr Pipeline - Ph I	Water Supply & Resource Development	FY 2005	42,774,874	12,372,750	21,406,098	10,703,440	10,702,658
TBRRAP-N, Tampa Reclaimed Wtr Pipeline - Ph II	Water Supply & Resource Development	FY 2005	42,300,000		21,150,000	10,575,000	10,575,000
Central Sarasota Co Regional Reuse Sys Project	New Water Sources Initiative	FY 2004	4,008,608		2,004,304	1,002,152	1,002,152
North Pinellas Reuse Interconnections	New Water Sources Initiative	FY 2004	3,172,300		1,586,150	793,075	793,075
W. Pasco Infrastructure Improvement-Starkey/N. Pasco	Water Supply & Resource Development	FY 2004	30,000,000		15,000,000	7,500,000	7,500,000
Largo/Clearwater/Pasco - ASR / Interconnect	Water Supply & Resource Development	FY 2004	10,067,144		4,960,544	2,480,894	2,479,650
Facilitating Agricultural Resource Mgmt Systems	Water Supply & Resource Development	FY 2004	3,267,271		3,167,271	2,304,016	863,255
Central Sarasota Reuse	New Water Sources Initiative	FY 2003	4,008,608		2,004,304	1,002,152	1,002,152
NW Reuse Expansion	New Water Sources Initiative	FY 2003	10,884,000		5,442,000	272,100	272,100
Largo/Clearwater/Pasco - ASR / Interconnect	Water Supply & Resource Development	FY 2003	9,564,786		4,708,186	2,353,536	2,354,650
Tampa's Howard Curren WWTP Regional Reclaimed to New Tampa	Water Supply & Resource Development	FY 2003	15,000,000		7,500,000	3,750,000	3,750,000
Tampa's Howard Curren WWTP Regional Reclaimed to Pasco	Water Supply & Resource Development	FY 2003	15,000,000		5,000,500	2,481,000	2,500,000

Below shows various projects identified from this District in its "Alternative Water Supply" (AWS) program, which could hopefully be a source for some of the projects identified in the RIDS Engineering document. The SFWMD Budget for Major Projects includes an additional $21,687,996.

Table 27
Alternative Water Supply (AWS) Identified Projects

Applicant	Project Title	SFWMD Funding	Total Project Cost	% Funded by SFWMD
City of Pahokee	Lake Region Water Treatment Plant Project	$200,000	$499,000	40%
City of South Bay	Lake Region Water Treatment Plant Project	$200,000	$499,000	40%
City of Belle Glade	Lake Region Water Treatment Plant Project	$200,000	$675,000	30%
City of Clewiston*	Lake Region Water Treatment Plant Project	$200,000	$499,000	40%
South Shore Water Association*	Lake Region Water Treatment Plant Project	$200,000	$499,000	40%
Palm Beach County	Century Village Reuse	$200,000	$1,065,000	19%
Town of Manalapan	Floridan Aquifer Wells	$100,000	$842,242	12%
Village of Wellington	Village Park & Water Reclamation Facility #2	$100,000	$672,000	15%
South Central Regional Wastewater Treatment & Disposal Board	Reuse Plant Expansion (phased project)	$100,000	$12,600,000	1%
Jupiter Utilities	RO Treatment Plant Expansion	$100,000	$3,500,000	3%
Jupiter Utilities	Floridan Aquifer Wells	$100,000	$2,742,000	4%
Village of Tequesta	RO Expansion	$100,000	$1,120,000	9%
City of Hollywood*	Reclaimed Water System Expansion	$100,000	$480,000	21%
City of Miami Beach	Normandy Shores Golf Club	$200,000	$935,000	21%
City of North Miami Beach	Nanofiltration Concentrate Treatment	$100,000	$634,000	16%
Miami-Dade Water and Sewer Dept.	Ultra Violet Disinfection – West Wellfield	$200,000	$2,053,000	10%
Miami-Dade Water and Sewer Dept.	Ultra Violet Disinfection – Southwest Wellfield	$100,000	$2,149,000	5%
Florida Keys Aqueduct Authority	Blending ASR Well	$200,000	$1,334,715	15%
City of Fort Myers	Central WWTF Reclaimed Water Extension	$200,000	$3,127,000	6%
City of Fort Myers	RO Expansion	$100,000	$9,800,000	1%
Cape Coral	Reclaimed Water Supplemental Source	$100,000	$998,000	10%
City of Naples	Reclaimed Water System Expansion	$100,000	$13,600,000	1%
Collier County	ASR Expansion	$100,000	$1,260,100	8%
Bonita Springs	San Carlos ASR Wells	$100,000	$974,199	10%
Bonita Springs	New RO Wellfield	$100,000	$2,800,000	4%
Bonita Springs	RO Treatment	$100,000	$24,000,000	0%
Martin County Utilities	North Reclaimed Water System Expansion	$100,000	$570,000	18%
Martin County Utilities	Tropical Farms RO Wellhead	$100,000	$750,000	13%
South Martin Regional Utility	Reclaimed Water System Expansion	$100,000	$540,000	19%
Fort Pierce Utility Authority	Reclaimed Water System	$100,000	$3,150,000	3%
Port St. Lucie Westport Reuse	Westport Reclaimed Water System	$100,000	$1,202,760	8%
City of Kissimmee	Stormwater Reuse	$200,000	$5,200,000	4%
Orange County Utilities Department	Ginn Property Reuse	$100,000	$816,248	12%
City of St. Cloud	Reclaimed Water System Expansion	$100,000	$758,898	13%
Total		$4,500,000	$102,345,162	4%

Shown below is the funding that was obtained for the Manatee County Agricultural Reuse System project.

Manatee County ASR/Reuse Demonstration Program Funding Worksheet

Manatee County ASR/Reuse Demonstration Program
Funding Worksheet

	Total	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	Total
Project Cost	14,824,724	4,295,000	2,632,431	2,632,431	2,632,431	2,632,431	14,824,724
EPA (Original)	4,295,000	2,093,383	1,283,047	918,571	-	-	4,295,000
SWFWMD (Ag. Reuse)	6,740,970	1,670,395	1,267,644	1,267,644	1,267,644	1,267,644	6,740,970
SWFWMD (ASR)	325,000	325,000	-	-	-	-	325,000
Subtotal	11,360,970	4,088,778	2,550,691	2,186,214	1,267,644	1,267,644	11,360,970
Balance of Project Costs	3,463,754	206,222	81,740	446,217	1,364,787	1,364,787	3,463,754
EPA (Amendment)	1,900,000	-	-	446,217	1,364,787	88,996	1,900,000
County Funds (Required)	1,563,754	206,222	81,740	0	0	1,275,791	1,563,754
Subtotal	3,463,754	206,222	81,740	446,217	1,364,787	1,364,787	3,463,754
Grand Total	**14,824,724**	**4,295,000**	**2,632,431**	**2,632,431**	**2,632,431**	**2,632,431**	**14,824,724**

Notes:
1. Project Costs were utilized from the SWFWMD Grant Agreements dated 12/6/94.
2. EPA Participation through the Original Agreement is 48.74% of $8,812,147 up to a maximum of $4,295,000.
3. SWFWMD (Ag. Reuse) participation is 50% of $14,024,724 up to a maximum of $6,740,970.
4. SWMWMD (ASR) participation is 50% of $650,000 (of the $800,000 project) up to a maximum of $325,000.
5. The project EPA Amendment amount is based on discussions with Mario Machado of EPA. Participation is expected to be 95%.
6. Future funds availability from EPA is uncertain. All funds will be utilized in order to minimize County funds required.

Similar results are possible for the RIDS program.

Funding Schedule

A proposed funding schedule is below. This schedule is typical of the annual funding cycles. For State and Federal appropriations, it is imperative that efforts be started now.

The funding consultant is prepared to initiate a CBIR for the District to help get the first funding success with the State and to initiate the entire program.

Specific Recommendations/Summary

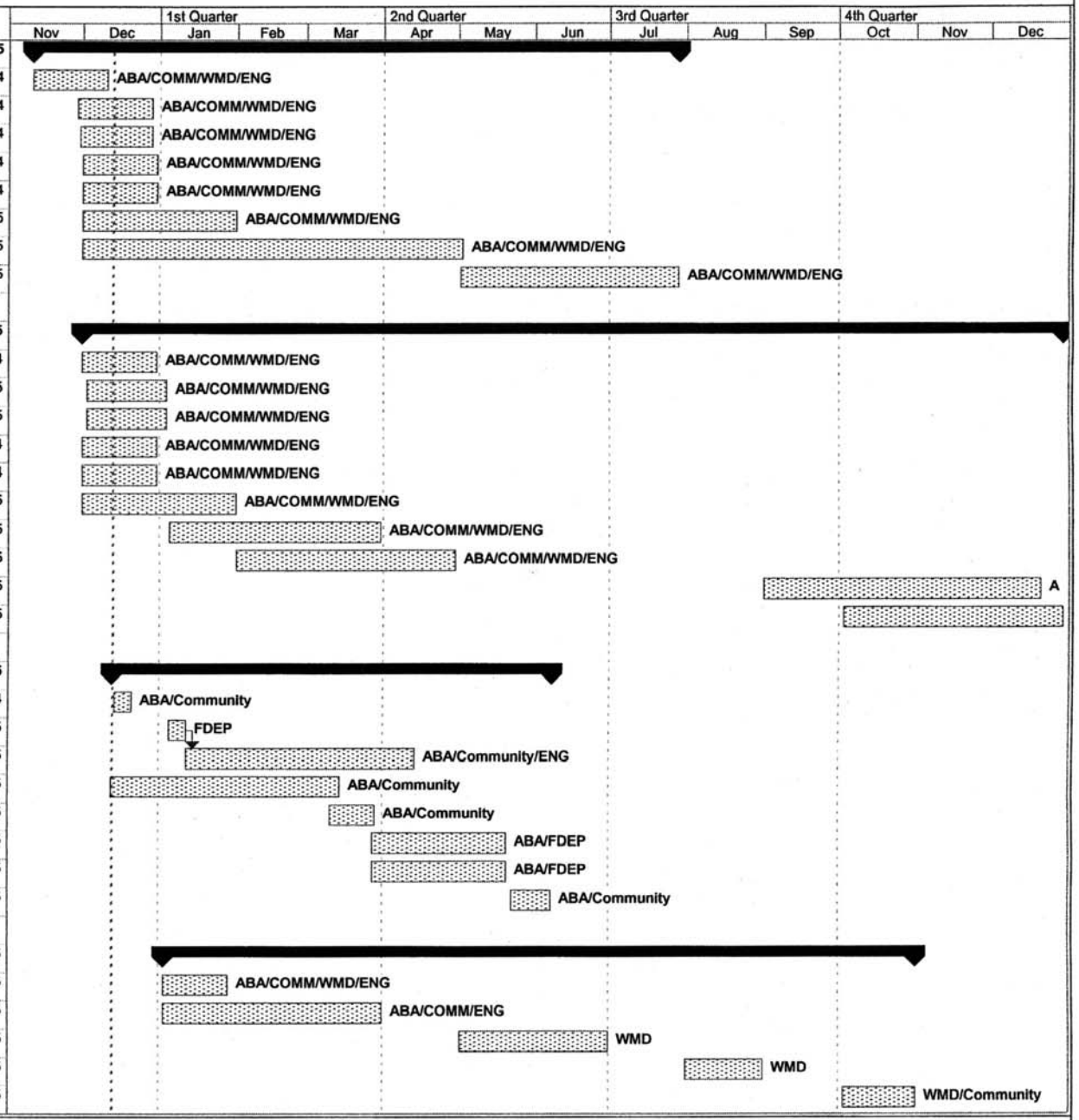
Leadership from the District will ensure success of the RIDS Program. This has been the key to the successes of other District's efforts around the state. The immediate assignment of a high-level person from the District, perhaps a board member, is critical to funding successes.
All stakeholders need direction and support from the District. They need to buy into the funding plan for the program and to be certain their actions are consistent with those of the District in attempts to secure funding.

The process must be identified for all concerned in sufficient detail to allow any party to take advantage of funding opportunities when they arise.

The program must be given a high profile within the District in all actions and publications. This will reinforce the intent to implement the program.
RIDS is a worthwhile program that can address water supply needs in a multi-jurisdictional area for years to come. These issues cannot be ignored by any of the interested parties. With the leadership of the South Florida Water Management District, this program can succeed in addressing these needs.

Table 28

Task Name	Start	Finish
STATE APPROPRIATIONS	**Thu 11/11/04**	**Thu 7/28/05**
Information Document	Thu 11/11/04	Fri 12/10/04
Legislative Discussions	Mon 11/29/04	Tue 12/28/04
Prep Required Documents	Tue 11/30/04	Tue 12/28/04
CBIR Senate	Wed 12/1/04	Thu 12/30/04
CBIR House	Wed 12/1/04	Thu 12/30/04
DEP Review Period	Wed 12/1/04	Mon 1/31/05
Lobby Effort	Wed 12/1/04	Mon 5/2/05
Follow Up	Mon 5/2/05	Thu 7/28/05
FEDERAL APPROPRIATIONS	**Wed 12/1/04**	**Thu 12/29/05**
Information Document	Wed 12/1/04	Thu 12/30/04
Legislative Discussions	Fri 12/3/04	Mon 1/3/05
Prep Required Documents	Fri 12/3/04	Mon 1/3/05
CBIR Senate	Wed 12/1/04	Thu 12/30/04
CBIR House	Wed 12/1/04	Thu 12/30/04
EPA Review Period	Wed 12/1/04	Mon 1/31/05
Lobby Effort 1st Session	Wed 1/5/05	Wed 3/30/05
Follow Up	Tue 2/1/05	Fri 4/29/05
Lobby Effort 2nd Session	Thu 9/1/05	Tue 12/20/05
Follow Up	Mon 10/3/05	Thu 12/29/05
SRF CYCLE	**Mon 12/13/04**	**Tue 6/7/05**
RFI	Tue 12/14/04	Mon 12/20/04
FDEP Hearing	Wed 1/5/05	Tue 1/11/05
Facilities Plan	Wed 1/12/05	Wed 4/13/05
Capital Financing Plan	Mon 12/13/04	Mon 3/14/05
Public/Dedicated Revenue Meeting & Approvals	Fri 3/11/05	Mon 3/28/05
State Environmental Review & Approval Process	Mon 3/28/05	Fri 5/20/05
FFONSI/CEN	Mon 3/28/05	Fri 5/20/05
Site Planning	Mon 5/23/05	Tue 6/7/05
SFWMD FUNDING	**Mon 1/3/05**	**Mon 10/31/05**
Identify Source	Mon 1/3/05	Fri 1/28/05
Request Funding	Mon 1/3/05	Thu 3/31/05
SFWMD Ranks Eligibility	Mon 5/2/05	Thu 6/30/05
District Board Reviews list	Mon 8/1/05	Wed 8/31/05
Agreements Executed	Mon 10/3/05	Mon 10/31/05



Project: Table 28 RIDS Schedule draft
Date: Mon 12/13/04

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

ASSESSMENT OF CURRENT POLICIES, PROCEDURES, AND REGULATIONS

There are numerous regulatory issues that apply to the RIDS program. Emerging policies and regulations are evolving for projects like ASR and surface water withdrawals. The RIDS is on the leading edge of some of these applications, so it is appropriate to assess how specific regulations may affect this initiative.

Surface water ASR is currently being evaluated for the Comprehensive Everglades Restoration Program (CERP). There will ultimately need to be a determination made by FDEP on the water quality criteria for the injection of surface water into ASR wells. The difference between the degree of treatment to meet Primary and Secondary drinking water quality as defined by the Safe Drinking Water Act and incorporated into FAC 62-550, and the minimum criteria for injection wells, is substantial in terms of costs to the overall program. The USEPA has indicated a willingness to allow recharge water that contains Coliform bacteria for the CERP ASR demonstration program. It may not be unreasonable for them to also consider a water quality criterion that slightly exceeds the primary standards for turbidity as long as fundamentally, the turbidity and resulting particles are not a clogging problem for the wells.

Further, there is the need to allow for natural attenuation of bacteria and other microbiota (viruses and protozoa) within the ASR storage zone such that discrepancies between the Safe Drinking Water Act (SDWA) and the EPA underground injection control program requirements are reconciled. With these water quality issues resolved there is great potential for lower technology processes to meet water quality goals within a more reasonable expectation of costs and complexity of the systems.

In this manner, the main criteria would be turbidity and/or particle size consistent with protection of the ASR well and disinfection to meet a Coliform reduction based on daily sampling in which no more than one sample is positive for Total Coliform and no single sample exceeds 4 total Coliforms per 100 mL.

If there is agreement for relaxed treatment requirements for disinfection, wherein the water quality requirements are only to meet a Coliform level of not more than 4 colonies/100mL sample, then the following will suffice:

- A treatment system to meet particulate removals consistent with protecting the injection system (not plugging the well).
- Corrosion control to prevent the injected water causing a corrosive atmosphere to the receiving formation will be sufficient.

However, the concern of disinfecting minimally for Coliforms while preventing Disinfection By-Products remain a concern; therefore, the following methods may be appropriate:

- Bankfiltration systems followed by either a UV disinfection or a low tech solid chemical chlorine/ammonia feed system to provide some limited free chlorine for bacteria and virus inactivation followed by chloramines for further disinfection contact time without a major production of DBPs.
- Slow-sand filtration systems followed by the same level of disinfection as described above (chlorine/ammonia).

The RIDS has assumed the use of bankfiltration systems for source water for ASR in lieu of more costly technologies, such as membranes.

The following is a brief overview of the regulations that will apply to the RIDS projects; it is not intended to be an exhaustive list or comprehensive discussion, but rather to provide a summary of the regulatory environment in which the RIDS will be developed:

Florida Department of Environmental Protection (FDEP) Regulations

Relevant FDEP regulations, as published in the Florida Administrative Code (FAC), were summarized for their relevance to the RIDS project.

Chapter 62-40, FAC – Water Resource Implementation Rule

Chapter 62-40, FAC, contains FDEP policies on water resources in Florida and establishes a cooperative relationship with the Water Management Districts in water resource issues. Under the general water policy provisions, reclaimed water is specifically identified as an integral part of water management programs. FDEP also encourages the use of water of the lowest acceptable quality for the purpose intended. Under the water use guidelines, it is stated that no water use permit shall be granted by the Water Management District unless the applicant demonstrates a reasonable beneficial use for that water.

Chapters 62-520 & 522, FAC – Ground Water

The relevant chapters on the subject of ground water focus on protecting the present and future most beneficial uses of ground waters of the state. To ensure their protection, classifications for ground waters of the State have been established. Appropriate water quality designations are outlined in these chapters.

Chapter 62-520, FAC, contains the minimum criteria for ground water and classification descriptions ranging from G-1 (which has the most stringent regulations), to G-IV (the least stringent). This chapter also includes a list of exemptions for each class of ground water.

Chapter 62-522, FAC, discusses ground water monitoring and permitting. This includes recharging aquifers with surface water and reclaimed water ASR. An allowable zone of discharge is expressed for each classification, and monitoring requirements and exemptions are also discussed.

Chapter 62-528, FAC – Underground Injection Control

The Underground Injection Control Program (UIC) is a delegated federal program authorized under the EPA Safe Drinking Water Act. It is under this program that ASR wells are permitted. All wells included in the RIDS would fall under the Class V category, and would most likely be in Group 7 (Aquifer Storage and Recovery System Wells).

Aquifer Storage and Recovery

As indicated above, FDEP rules contained in Chapter 62, Section 528 of the Florida Administrative Code (FAC), govern the permitting and operation of ASR wells. Subsection 300 is of special interest in the permitting of surface water and reclaimed water ASR wells. This portion of the regulations deals with aquifer exemptions. Such exemptions may be needed for certain injection water quality

parameters, such as color, which do not meet Secondary Drinking Water Standards. Minor exemptions are fairly straightforward for aquifers, which have total dissolved solids (TDS) concentrations between 3,000 and 10,000 milligrams per liter (mg/L).

Well Construction

Regulations regarding construction and testing of ASR wells are contained in FAC Chapter 62, Section 528. In addition to obtaining an FDEP Class V well construction permit, a well construction permit must also be obtained from the agency that permits wells in a particular jurisdiction. In portions of Lee County, it is the Lee County Water Resources Department, which permits small diameter wells. In other parts of Lee County, it is a local government, such as the City of Cape Coral., which permits small diameter wells. However, all of the ASR wells contemplated will have final casing diameters greater than six inches and will therefore be permitted through the SFWMD, as well as the FDEP*Chapter 62-600, FAC – Wastewater Facilities*

Chapter 62-600, FAC, discusses planning for wastewater facilities design and expansion and goes into some detail discussing minimum treatment standards, disinfection, pH, and other design and operational criteria. It also details the required treatment levels for all types of disposal, including discharge to surface waters, reuse and land application, and disposal by underground injection. It is expected this chapter will govern many aspects of the design and construction of RIDS infrastructure.

Chapter 62-604, FAC – Collection Systems and Transmission Facilities

This chapter imparts information on basic design principles that should be upheld, including details on fencing, siting, and special crossings. A requirement for uninterrupted service and a procedural outline for abnormal events are also included in this chapter.

Chapter 62-610, FAC, Part I – Reuse of Reclaimed Water and Land Application

The first part of this rule provides design, operation, and maintenance criteria for land application systems, surface water discharge projects involving reuse for ground water discharge, indirect potable use, or other beneficial purposes. For all new or expanded reuse or land application projects, a preliminary design report must be submitted to FDEP. Any exceptions to this are noted in this rule.

South Florida Water Management District (SFWMD) Regulations

Formed by Florida State Legislature in 1949, the Central and Southern Florida Flood Control District (FCD) resulted from the need to respond to drought and flood conditions in south Florida. The main responsibility of the FCD through 1972 was to act as local sponsor for the U.S. Army Corps of Engineers construction project.

In accordance with South Florida's changing demand for, and perception of, water resources management, the Florida State Legislature enacted the Water Resources Act in 1972. This act divided the state into five regional districts, naming one of them as the South Florida Water Management District (SFWMD). This act (Chapter 373, Florida Statutes) also greatly expanded the previous responsibilities of the FCD. Watersheds and other natural, hydrologic, and geographic features determine the districts' boundaries.

Today, the SFWMD operates and maintains the structures and conveyances built by the FCD. These consist of 1,800 miles of canals and levees, 25 major pumping stations, and about 200 large and 2,000 small water control structures.

The SFWMD spans 16 counties and includes vast areas of agricultural lands, water conservation areas, and areas of rapid urban growth and development.

Consumptive Use Permitting

After construction of a viable ASR pilot project and conducting cycle testing, a water use permit for the established system and any planned expansion must be obtained from the SFWMD. This may be a modification of any existing permit for a particular utility, or a new permit for either an existing utility or for a new subregional entity. The main purpose for obtaining a water use permit for an ASR system is the same as that for obtaining any other water use permit in the State; namely it establishes the prior rights of the permittee to those applicants which may want to use an aquifer in the area in the future.

U.S. Army Corps of Engineers (ACOE)

The ACOE regulatory program includes the review of dredge and fill activities in waters of the United States, construction in navigable waters and the disposal of dredge material in offshore locations. Section 404 of the Clean Water Act requires that permits be received for the deposition of fill in waters or adjacent wetlands of the United States, the construction of revetments, groynes, levees, dams or weirs, and the placement of riprap. Section 10 of the Rivers and Harbors Act of 1899 requires that permits be obtained for activities that affect navigable waters. The ACOE also has Memorandums of Agreement (MOA) with other federal agencies such as the U.S. Fish and Wildlife Service (FWS) and the U.S. Department of Environmental Protection. These agreements allow for the agencies to provide input during the review process on issues such as federally listed wildlife species and wetland impacts associated with the projects under review. In determining whether to issue a permit, the ACOE must also comply with other requirements, including Section 7 of the Endangered Species Act of 1973 (50 CFR Part 402), the National Environmental Policy Act of 1969, the Coastal Zone Management Act, the Fish and Wildlife Coordination Act and other applicable federal laws.

Illustrated below are the possible constraints by federal and state regulations broken down by RIDS alternative.

Regulatory Constraints by Alternative

Source	Regulatory Agency	Constraint
Surface Water	FDEP	Safe Drinking Water Act – Disinfection Byproducts (DBPs), Surface Water Treatment Rules, Primary and Secondary Drinking Water Standards; Permitting and Construction of Public Water System; Regulation of Wells
	SFWMD	Water Use Permit (WUP) Minimum Flows and Levels (MFLs) Reservations
Surface Water ASR	FDEP	Safe Drinking Water Act – Disinfection Byproducts (DBPs), Surface Water Treatment Rules, Primary and Secondary Drinking Water Standards; Permitting and Construction of Public Water System; Regulation of Wells; Underground Injection Control (UIC)
	SFWMD	WUP MFLs Reservations
Reclaimed Water	FDEP	Wastewater Facilities, Collection Systems and Transmission Facilities, Reuse of Reclaimed Water and Land Application
Reclaimed Water ASR	FDEP	Wastewater Facilities, Collection Systems and Transmission Facilities, Reuse of Reclaimed Water and Land Application, Primary and Secondary Drinking Water Standards, Regulation of Wells, UIC
	SFWMD	WUP

Lee County Regulations

Lee County does not have a basin board; therefore, the majority of water rules and regulations are determined by the District, FDEP, or federal rules. However, Lee County is proactive in that both existing and new developments must use reclaimed water for irrigation over potable wherever feasible and within the utility service area.

Lee County Municipal Code, Sec. 10-354 -Reuse Water System

This portion of the Municipal Code states that, wherever feasible, the irrigation of grassed or landscaped areas must be provided for through the use of a second water distribution system supplying treated wastewater effluent or reuse water. All proposed developments should be designed to maximize the use of reclaimed water whether located in the utility service area or from an on-site wastewater treatment facility.

For other information on Lee County regulations, refer to the Lee County Municipal Code, SFWMD, and FDEP regulations.

City of Fort Myers

The City does not have a basin board; therefore, the majority of water rules and regulations are determined by the District, FDEP, or federal rules.

BENEFITS AND INCENTIVES

The benefits of the RIDS program are very positive in terms of additional water sources in a high growth area such as the lower west coast of Florida. Overall, the RIDS optimizes existing reclaimed water supplies, maximizes surface water use, diversifies supply sources, reduces water shortage declarations, offsets potable water usage, reduces disposal volumes, and offsets groundwater withdrawals. Along with these obvious benefits, Table 29 summarizes incentives for this sub-region.

Table 29
Benefits and Incentives

Ft. Myers Central, Ft. Myers South, Gateway, and Lehigh Acres
1. Meet increasing demands
2. Will allow water to be shared between utilities for beneficial reuse
3. Promote reduction of on-site septic systems, increasing reclaimed water supply
4. Allow growth to continue in the region by providing a supplemental supply of irrigation water
5. Reduce reliance on surface water discharge
6. Will allow expansion of reclaimed water systems and infrastructure
7. The region will be able to utilize or store close to 100% of reclaimed water on an annual basis
8. Reduce disposal of effluent to the Caloosahatchee River at the Ft. Myers South and Central WWTPs
9. Interconnect with Gateway will allow effluent from Lehigh to be beneficially reused
Three Oaks, Fiesta Village, and Ft. Myers Beach
1. Meet increasing demands
2. Will allow water to be shared between utilities for beneficial reuse
3. Promote reduction of on-site septic systems, increasing reclaimed water supply
4. Allow growth to continue in the region by providing a supplemental supply of irrigation water
5. Reduce reliance on surface water discharge
6. The region will be able to utilize or store close to 100% of reclaimed water on an annual basis
7. Reduce disposal of effluent from the Ft. Myers Beach WWTP to the deep well injection system
8. Irrigation water would be conveyed to high growth areas near I-75

PREFERRED ALTERNATIVE

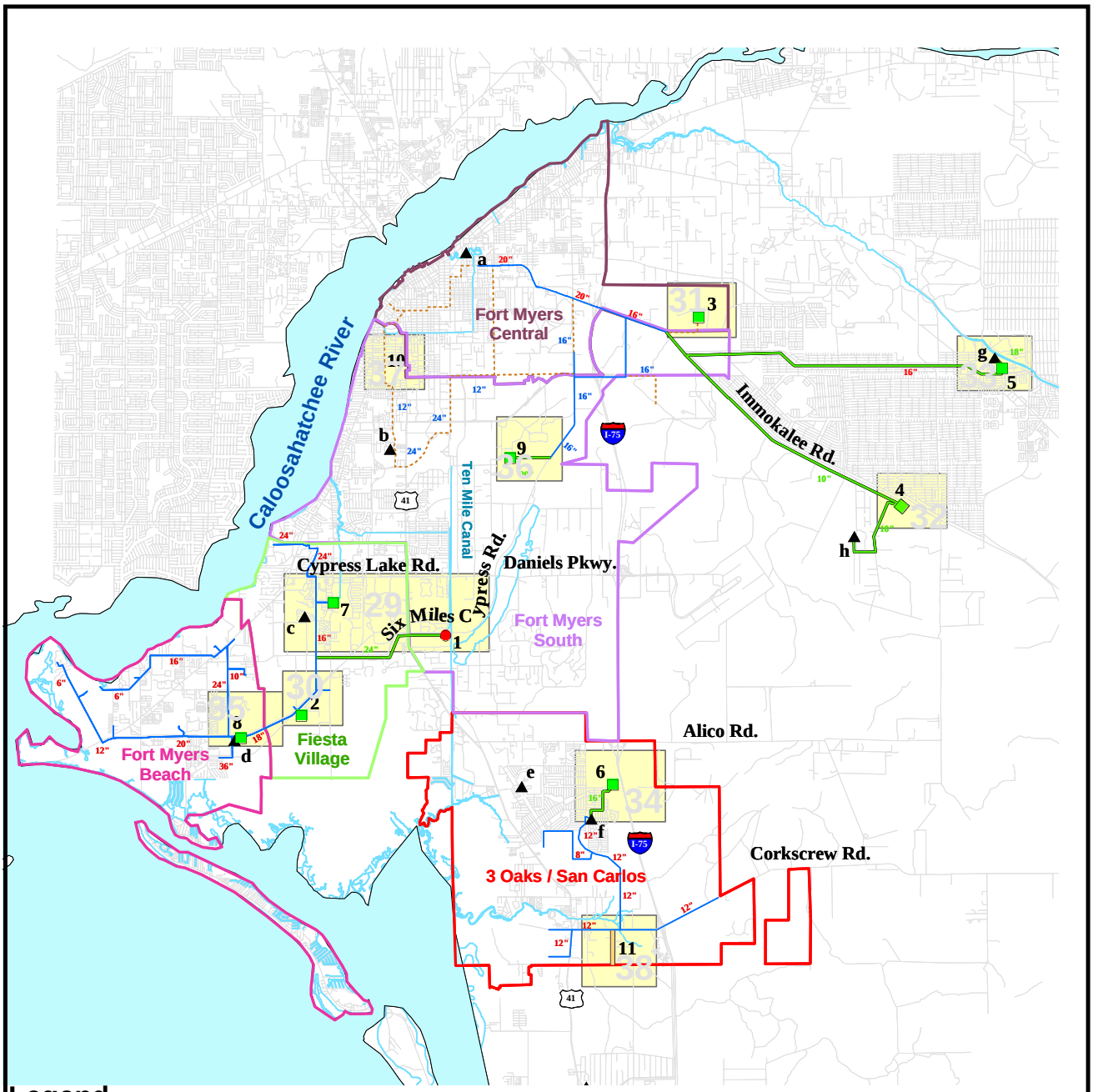
As presented in Table 20 presents the preferred alternative and describes the projects that make up the alternative. The projects include surface water ASR, reclaimed water ASR, and interconnects. Table 30 also presents the supply benefit that each project is estimated to provide.

Table 30
Sub-regional Projects Summary

Project No.	Projects	Benefit or Recovery Capacity (MGD)
1	a. Ten Mile Canal-Pump Station	12
	b. Ten Mile Canal-Wells	
	c. Ten Mile Canal-Transmission Lines	
2	a. Fiesta Village/Fort Myers Beach-Pump Station	8.1
	b. Fiesta Village/Fort Myers Beach-Well	
	c. Fiesta Village/Fort Myers Beach -Transmission Lines	
3	a. Fort Myers Central Pump Station	8.8
	b. Fort Myers Central-Well	
	c. Fort Myers Central- Transmission Lines	
4	a. Gateway-Pump Station	1.0
	b. Gateway-Well	
	c. Gateway - Transmission Lines	
5	a. Lehigh Acres-Pump Station	4.9
	b. Lehigh Acres-Well	
	c. Lehigh Acres-Transmission Lines	
6	a. Three Oaks-Pump Station	3.3
	b. Three Oaks-Well	
	c. Three Oaks-Transmission Lines	
7	a. Fiesta Village-Pump Station	3.9
	b. Fiesta Village-Well	
	c. Fiesta Village-Transmission Lines	
8	a. Fort Myers Beach-Pump Station	4.2
	b. Fort Myers Beach-Well	
	c. Fort Myers Beach-Transmission Lines	
9	a. Fort Myers South-Pump Station	7.8
	b. Fort Myers South-Well	
	c. Fort Myers South-Transmission Lines	
10.	City of Fort Myers Reclaimed Water System Expansion	16.6
11.	Corkscrew Rd. to Williams Rd.	0.3
TOTAL		**45.9***

*Project Nos. 2, 10, and 11 include benefit from other projects.

Figure 1 presents the ASR system locations and interconnect routes.



Legend

- **Surface Water ASR Systems**
  1. Ten Mile Canal
- **Reclaimed Water ASR Systems**
  2. Fiesta Village/Fort Myers Beach
  3. Fort Myers Central
  4. Gateway
  5. Lehigh Acres
  6. Three Oaks
  7. Fiesta Village
  8. Fort Myers Beach
  9. Fort Myers South
  10. City of Fort Myers Reclaimed Water System Expansion
  11. Corkscrew Road to Williams Road Interconnect
- **Wastewater Treatment/ Reclamation Facilities**
  a. Fort Myers Central
  b. Fort Myers South
  c. Fiesta Village
  d. Fort Myers Beach
  e. San Carlos
  f. Three Oaks
  g. Lehigh Acres
  h. Gateway
- **Interconnect Locations**
- **Ft myers beach (LCU)**
- **Fiest Village (LCU)**
- **City of Fort Myers - South**
- **City of Fort Myers - Central**
- **3 Oaks/ San Carlos (LCU)**
- **Exist Trans. Lines**
- **Future Trans. Lines**
- **ASR Piping**
- **Major Roads**
- **Major Streams**
- **Gulf**
- **Figure No.**

N

0 1 2 Miles

Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	ALTERNATIVE PROJECTS INDEX SHEET SUBREGION 3	Figure 28

PREFERRED ALTERNATIVE

In order to better allocate funds for the alternative supply projects presented in TM 2, the projects were divided into major elements. Each of the projects shown in Table 30 were evaluated to best meet the supply needs of this sub-region and to determine the feasibility of its implementation using the criteria described below:

- Capacity Benefit
- Permittability
- Proximity to Existing Infrastructure
- Unit Cost
- Participation Interest
- Funding Ability
- Consistency with Master Plan

These selection criteria are scored between 1 and 5, with the higher score resulting in a higher priority for implementation. The prioritized projects will then be used in the implementation strategy.

Capacity Benefit

This criterion evaluates the amount of supplemental water (benefit) that each project will provide to offset total potable water/groundwater use for urban irrigation. Table 30 summarizes the benefit per project. The benefit is estimated in million of gallons per day. The capacity benefit scoring was based on the range of supply provided as shown below:

- 1 MGD to 3 MGD = 1
- Greater than 3 MGD to 5 MGD = 2
- Greater than 5 MGD to 7 MGD = 3
- Greater than 7 MGD to 10 MGD = 4
- Greater than 10 MGD = 5

Permittability

All of the projects included in the recommended alternative are permittable and there are several precedents for each in the region and throughout the State. Some projects, such as interconnects are much easier to permit than others, which is reflected in the scoring.

- Interconnects, pump stations and transmission mains = 5
- Intake and ASR Well projects = 3

Proximity to Existing Infrastructure

There is an extensive network of existing infrastructure throughout the sub-region that will provide a means of transmission from the new sources of supply to the areas of need. Some projects are close to the existing transmission system, making implementation more economical. For example, a transmission system within 1,000 feet would result in a 5. Larger distances will result in lower scores.

Unit Cost

A unit cost was calculated for each of the projects, as shown in Table 31. The unit cost includes the construction of the project, engineering, pilot testing and operation and maintenance (O&M). Currently, the proposed technology for surface water ASR includes bank-filtration, pH adjustment, and chlorine/chloramines disinfection. For reclaimed water ASR projects, no additional improvements are anticipated beyond the current treatment levels.

Cost Includes:

- ASR Wells: $550,000 per well.
- Pump Station Cost was derived from Pumping Station Design, second Edition, Robert Sanks.
- Intake cost: For capacity equal to or less than 5 MGD the cost is $1 million. $100,000 per MGD is added for capacity greater than 5 MGD.
- Land Acquisition: $50,000 per well. It is assumed that the well separation will be a minimum of 500 ft. Final design will attempt to locate wells an infrastructure in existing rights-of-way or easements.
- Pipes: $4 per inch diameter per linear foot.
- Engineering, administration and legal = 20% of capital cost.
- O & M =$ 0.14 /1000 gals X 10 months X 30 days/month
- Contingency of 25%

Shown below is the scoring range of the unit cost based on price ranges for cost of the project per 1000 gallons of benefit (capacity). The final scoring is presented in Table 31.

- Less than $1.00 = 5
- $1.01 to $1.25 = 4
- $1.26 to $1.50 = 3
- $1.51 to $1.75 = 2
- Greater than $1.75 = 1

Table 31
Project Unit Cost

Project No.	Projects	Cost per 1,000 gallons of benefit ($)
1	a. Ten Mile Canal-Pump Station	1.33
	b. Ten Mile Canal-Wells	
	c. Ten Mile Canal-Transmission Lines	
2	a. Fiesta Village/Fort Myers Beach-Pump Station	1.17
	b. Fiesta Village/Fort Myers Beach-Well	
	c. Fiesta Village/Fort Myers Beach -Transmission Lines	
3	a. Fort Myers Central Pump Station	1.20.
	b. Fort Myers Central-Well	
	c. Fort Myers Central- Transmission Lines	
4	a. Gateway-Pump Station	3.60
	b. Gateway-Well	
	c. Gateway - Transmission Lines	
5	a. Lehigh Acres-Pump Station	1.67
	b. Lehigh Acres-Well	
	c. Lehigh Acres-Transmission Lines	
6	a. Three Oaks-Pump Station	1.45
	b. Three Oaks-Well	
	c. Three Oaks-Transmission Lines	
7	a. Fiesta Village-Pump Station	1.35
	b. Fiesta Village-Well	
	c. Fiesta Village-Transmission Lines	
8	a. Fort Myers Beach-Pump Station	1.30
	b. Fort Myers Beach-Well	
	c. Fort Myers Beach-Transmission Lines	
9	a. Fort Myers South-Pump Station	1.22
	b. Fort Myers South-Well	
	c. Fort Myers South-Transmission Lines	
10.	a. City of Fort Myers Reclaimed Transmission	0.78
11.	a. Corkscrew Rd. to Williams Rd.	0.76
Average		**1.19**

Participation Interest

Some of the stakeholders in the RIDS have expressed more interest in individual projects and participated more extensively than others. As this is primarily a voluntary program for the stakeholders, their anticipated participation overall and regarding individual projects, is scored accordingly.

Funding Ability

The projects included in the preferred alternative are fundable through SRF loans and should be eligible for a number of state and federal grants. Funding has been directed towards projects with regional benefits and those that offset potable use and groundwater pumpage, i.e., alternative sources of supply. The availability of state and federal grant programs has been based on legislative and congressional approval; therefore, a funding strategy based on the latest programs will be provided for the preferred alternative in the final report.

Consistency with Master Plan

The stakeholders have developed or are developing master plans to improve and expand their individual system. The development of the RIDS has integrated the plans of the stakeholders. Therefore, this criterion evaluates how each of the projects could be integrated into the planned improvements.

The summary of the criteria scoring is shown in Table 32.

Table 32
Project and Criteria Evaluation

Supply Projects	Capacity Benefit	Permit-Ability	Proximity To Existing Infrastructure	Unit Cost	Participation Interest	Funding Ability	Consistency With Master Plans	Total Points	Priority Ranking
1a. Ten Mile Canal-Pump Station	5	5	2	3	5	5	2	27	5
1b. Ten Mile Canal-Wells	5	3	2	3	5	5	2	25	5
1c. Ten Mile Canal-Transmission Lines	5	5	2	3	5	5	2	27	5
2a. Fiesta Village/Fort Myers Beach-Pump Station	4	5	5	5	5	5	5	34	1
2b. Fiesta Village/Fort Myers Beach-Wells	4	3	5	5	5	5	5	32	1
2c. Fiesta Village/Fort Myers Beach -Transmission Lines	4	5	5	5	5	5	5	34	1
3a. Fort Myers Central Pump Station	4	5	4	5	5	5	5	33	3
3b. Fort Myers Central-Wells	4	3	4	5	5	5	5	31	3
3c. Fort Myers Central- Transmission Lines	4	5	4	5	5	5	5	33	3
4a. Gateway-Wells	1	5	1	1	5	5	3	21	10
4b. Gateway-Pump Station	1	3	1	1	5	5	3	19	10
4c. Gateway - Transmission Lines	1	5	1	1	5	5	3	21	10
5a. Lehigh Acres-Pump Station	2	5	1	2	2	5	1	18	11
5b. Lehigh Acres-Wells	2	3	1	2	2	5	1	16	11
5c. Lehigh Acres-Transmission Lines	2	5	1	2	2	5	1	18	11
6a. Three Oaks-Pump Station	2	5	3	3	4	5	4	26	6
6b. Three Oaks-Wells	2	3	3	3	4	5	4	24	6
6c. Three Oaks-Transmission Lines	2	5	3	3	4	5	4	26	6
7a. Fiesta Village-Pump Station	2	5	4	3	2	5	2	23	9
7b. Fiesta Village-Wells	2	3	4	3	2	5	2	21	9
7c. Fiesta Village-Transmission Lines	2	5	4	3	2	5	2	23	9
8a. Fort Myers Beach-Pump Station	2	5	5	4	2	5	2	25	8
8b. Fort Myers Beach-Wells	2	3	5	4	2	5	2	23	8
8c. Fort Myers Beach-Transmission Lines	2	5	5	4	2	5	2	25	8
9a. Fort Myers South-Pump Station	4	5	3	4	5	5	3	29	4
9b. Fort Myers South-Wells	4	3	3	4	5	5	3	27	4
9c. Fort Myers South-Transmission Lines	4	5	3	4	5	5	3	29	4
10. City of Fort Myers Reclaimed Water Syst. Expansion	5	5	4	5	5	5	5	34	2
11. Corkscrew Rd. to Williams Rd.	1	5	4	5	5	5	5	30	7

RECOMMENDED IMPLEMENTATION STRATEGY

The supply projects presented in Table 33 were prioritized based on the project criteria total score. Then, the implementation strategy for the projects was based on the following:

- Projects are re-grouped to keep them together logically.
- Coordination with the City of Fort Myers' and Lee County's capital improvement projects for secondary water.
- Transmission and well projects are started first, and then intake and pump station project will follow the second year.
- Funding availability – Assume an approximate maximum funding of $20 million per year
- Implementation horizon ends by 2015
- Regulatory approval
- Design, bidding, construction and testing schedules
    - Two (2) years for interconnects
    - Four (4) years for ASR systems

Table 4 presents the proposed implementation strategy for the projects starting in 2005. The project implementation is started in the order of scoring.

Table 33
Project Implementation Strategy

Name	Est. Implementation Time (Yrs.)	Total Proj. Cost ($M)	Construction Yearly Cost ($M)															
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2a. Fiesta Village/Fort Myers Beach-Pump Station	2	$ 1.80			$ 0.90	$ 0.90												
2b. Fiesta Village/Fort Myers Beach-Wells	4	$ 12.43	$ 2.49	$ 4.35	$ 3.11	$ 2.49												
2c. Fiesta Village/Fort Myers Beach -Transmission Lines [1]	0	$ -				$ -												
10. City of Fort Myers Interconnect	3	$ 17.07		$ 5.80	$ 5.63	$ 5.63												
3a. Fort Myers Central Pump Station	2	$ 2.55						$ 1.28	$ 1.28									
3b. Fort Myers Central-Wells	4	$ 13.32				$ 2.66	$ 4.66	$ 3.33	$ 2.66									
3c. Fort Myers Central- Transmission Lines	1	$ 0.11							$ 0.11									
11. Corkscrew Rd. to Williams Rd.	2	$ 0.30		$ 0.15	$ 0.15													
9a. Fort Myers South-Pump Station	2	$ 1.65							$ 0.83	$ 0.83								
9b. Fort Myers South-Wells	4	$ 10.73					$ 2.15	$ 3.75	$ 2.68	$ 2.15								
9c. Fort Myers South-Transmission Lines	2	$ 2.07							$ 1.04	$ 1.04								
1a. Ten Mile Canal-Pump Station	2	$ 4.88								$ 2.44	$ 2.44							
1b. Ten Mile Canal-Wells	4	$ 17.44						$ 3.49	$ 6.10	$ 4.36	$ 3.49							
1c. Ten Mile Canal-Transmission Lines	2	$ 2.34								$ 1.17	$ 1.17							
6a. Three Oaks-Pump Station	4	$ 0.90									$ 0.45	$0.45						
6b. Three Oaks-Wells	4	$ 6.20							$ 1.24	$ 2.17	$ 1.55	$1.24						
6c. Three Oaks-Transmission Lines	1	$ 0.40										$0.40						
8a. Fort Myers Beach-Pump Station	2	$ 1.22										$0.61	$0.61					
8b. Fort Myers Beach-Wells	4	$ 7.10								$ 1.42	$ 2.48	$1.77	$1.42					
8c. Fort Myers Beach-Transmission Lines	1	$ 0.06											$0.06					
7a. Fiesta Village-Pump Station	2	$ 1.01												$0.50	$0.50			
7b. Fiesta Village-Wells	4	$ 7.09										$1.42	$2.48	$1.77	$1.42			
7c. Fiesta Village-Transmission Lines	1	$ 0.05													$0.05			
4a. Gateway-Wells	4	$ 3.53												$0.88	$0.88	$0.88	$0.88	
4b. Gateway-Pump Station	2	$ 0.38														$0.19	$0.19	
4c. Gateway - Transmission Lines	2	$ 2.38														$1.19	$1.19	
5a. Lehigh Acres-Pump Station	2	$ 1.02															$0.51	$0.51
5b. Lehigh Acres-Wells	4	$ 7.98													$1.60	$1.60	$2.79	$1.99
5c. Lehigh Acres-Transmission Lines	2	$ 4.18															$2.09	$2.09
		$ 130	**$ 2.49**	**$ 10.30**	**$ 9.79**	**$ 11.68**	**$ 6.81**	**$ 11.85**	**$ 15.93**	**$ 15.56**	**$ 11.58**	**$5.89**	**$4.57**	**$3.16**	**$4.45**	**$3.86**	**$7.65**	**$4.59**

DESIGN STANDARDS

The design and implementation of the projects identified as the preferred alternatives will be performed in accordance with industry standards, regulatory requirements and local government standards. This section presents the accepted industry resources and which elements apply to the proposed projects.

American Water Works Association (AWWA)

The following are AWWA standards that will be applicable to the facilities in the proposed projects:

- A97-100 - Groundwater and Wells
- C104, C105, C110, C111, C115, C116, C150, C151, and C153 - Ductile Iron Pipe and Fittings
- C200, C203, C205, C205, C206, C207, C208 - Steel Pipe
- C500, C501, C504, C540 - Valves and Hydrants
- C600s - Disinfection Facilities
- C900s - Plastic Pipe
- C901, C906 - HDPE Pipes

Florida Department Of Environmental Protection (FDEP)

The following are the FDEP regulations (Florida Administrative Code) applicable to the facilities under consideration:

- 62-40 - Water Policy
- 62-520 - Ground Water Classes, Standards, and Exemptions
- 62-521 - Wellhead Protection
- 62-522 - Ground Water Permitting and Monitoring Requirements
- 62-524 - New Potable Water Well Permitting in Delineated Areas
- 62-528 - Underground Injection Control
- 62-531 - Water Well Contractors
- 62-532 - Water Well Permitting and Construction Requirements
- 62-550 - Drinking Water Standards, Monitoring, and Reporting
- 62-600 - Domestic Wastewater Facilities (Reuse requirements)
- 62-610 – Reuse of Reclaimed Water and Land Application
- 62-650 - Water Quality Based Effluent Limitations

Class I reliability, as defined by the US EPA and stated in FDEP's regulations refers to the reliability of mechanical, electrical, and fluid systems. For major equipment items (pumps, blowers, etc.), the capacity and operations should be designed for the maximum design flows with the largest unit out of service.

United States Environmental Protection Agency (US EPA)

The Class V - Underground Injection Control Study, Volume 21-Aquifer Recharge and Aquifer Storage and Recovery Well, September 1999. This document presents best management practices for aquifer storage and recovery (ASR) wells.

Ten States Standards / Recommended Standards for Water Works Great Lakes - Upper Mississippi River Board (2003 Edition)

These standards include design guidelines for:

- Treatment – Part 4
- Pumping Facilities – Part 6
- Finished Water Storage – Part 7
- Distribution System Piping and Appurtenances – Part 8

ASR WELL STANDARDS

Criteria and standards for Class V wells are addressed in Chapter 62-528 FAC. ASR systems are categorized Class V Group 7. For these wells, standards of design and construction are required for any construction permit application. In order to operate the well, it must be demonstrated that the well operation will not adversely affect underground sources of drinking water (USDW). Approval to operate the system by the FDEP will be subject to operating and reporting requirements, such as meeting drinking water standards for the injectate.

ASR from surface water sources are Under Direct Influence (UDI) of surface water, which will require more extensive sampling and monitoring requirements. This needs to be considered from a cost and operations standpoint.

ASR wells are required to be constructed following the standards set forth in Chapter 62-520 FAC, as long as the drinking water standards of 40 CFR Part 142 are met at the point of discharge.

Water Quality

The following are federal rules and programs that regulate ASR well water quality:

- Total Trihalomethane Rule (TTHMs)
- Surface Water Treatment Rule
- Total Coliform Rule
- Interim Enhanced Surface Water Treatment
- Stage 1 Disinfection Byproducts Rule

- Radon Rule
- Ground Water Rule

Siting and Construction

In order to determine the location and spacing of the ASR wells, the following should be considered:

- Proposed storage zone background water quality, permeability, and confinement characteristics
- Background hydrogeology
- Projected withdrawal rates
- Discharge locations for surface water ASR systems
- Nearby users of potential storage zones

Florida has enacted specific regulation requirements for Class V wells that include:

- Calibration of pressure gauges and flow meters every six months
- Monitoring of the storage zone and the next overlying permeate zone
- Monthly and annual reports of injected and recovered water qualities and quantities

Water injected into the ASR wells must meet water quality requirements such as the following:

- Primary and Secondary Drinking Water Quality Standards (Chapter 62-550 FAC)
- Minimum criteria in Rule 62-520.400 of FAC- Ground Water Classes, Standards, and Exemptions/ Minimum Criteria for Ground Water

Operation requirements

Class V wells are required to operate in a manner that does not present a hazard to an USDW and to meet the water quality standards presented in Rule 62-520 FAC. The following operating and maintenance practices are recommended for successful operations of ASR wells:

- Periodic change in operating mode
- Periodic back-flushing to waste during recharge

Monitoring

Only wells with injectate being treated by a permitted drinking water facility in accordance with rules 62-528.615(1)(a)2 FAC do not require monitoring. None of the injectate for the proposed projects in this Sub-Region is expected to originate from a drinking water treatment facility; thus, monitoring requirements will be included in the Class V use permits.

PROPOSED PROJECTS DESCRIPTION AND EXISTING INFRASTRUCTURE

As described on previous technical memoranda, a group of projects for urban irrigation were evaluated and selected to mitigate the irrigation demand. Table 34 shows the list of theses proposed projects and the expected facilities needed. The amount of benefit or recovery will determine the capacity necessary for the pipes and pumps.

Table 34
Proposed Sub-Regional Project Summary

No.	Projects	Benefit or Recovery Capacity (MGD)	No. of ASR Wells	Infrastructure Needed
1	Ten Mile Canal	12.0	17	Intake system, pumping station, ASR wells and chemical treatment system
2	Fiesta Village / Fort Myers Beach	8.1	12	ASR wells, chemical treatment system and pump station
3	Fort Myers Central	8.8	13	ASR wells, chemical treatment system and pump station
4	Gateway	1.0	2	ASR wells, pump station, connection, and chemical treatment.
5	Lehigh Acres	4.9	7	ASR wells, pump station, connection, and chemical treatment.
6	Three Oaks	3.3	5	ASR wells, pump station, connection, and chemical treatment.
7	Fiesta Village	3.9	6	ASR wells, pump station, connection, and chemical treatment.
8	Fort Myers Beach	4.2	6	ASR wells, pump station, connection, and chemical treatment.
9	Fort Myers South	7.8	12	ASR wells, pump station, connection, and chemical treatment.
10.	City of Fort Myers Reclaimed Water System Expansion	16.6	0	Pumping station, storage tanks, and transmission lines.
11.	Corkscrew Rd. to Williams Rd.	0.3	0	Interconnection.
	Total	45.9	80	

The locations of the projects listed above are presented in a series of figures, which are located in Figure 28. The Index figure shows a general map of the Sub-Region 3 projects. This figure serves as an index to locate the figure number where the proposed projects are shown. Proposed locations are based on general locations and do not include land use, survey, property assessment or any other property-specific considerations.

Figure 29 presents Project 1 - Ten Mile Canal and Project 7 - Fiesta Village. They are located west of Highway 41. Project 1 is located near the Ten Mile Canal and will require a transmission line that will convey the supply to the existing pipeline about 3 miles west of the proposed site. Project 7 is located west of Summerlin Rd, east of McGregor Blvd., and south of Cypress Lake Drive. As shown in the

figure an existing pipeline for transmission and distribution of reclaimed water is already built; therefore, it can be used for the purpose of this project.

Figure 30 shows the location of Project 2 - Fiesta Village/Fort Myers Beach. The location of this ASR project is on Summerlin Road, east of the Fort Myers Beach Wastewater Treatment Plant. The project's proposed site has the advantage of being located next to an existing 18-inch transmission line that can be used to convey the recovered water provided by this project.

Figure 31 illustrates the location of Project 3 - Fort Myers Central. The proposed ASR reclaimed water project is located east of Immokalee Road on Buckingham Road. The proposed site was selected near a future reclaimed water transmission line, as shown in the figure.

Figure 32 presents Project 4 - Gateway. This reclaimed water ASR project will be located northeast of the existing Gateway WRF. A 10-inch transmission line is needed between the WRF and the project site and from the project site to the distribution system (approximately 6 miles away).

Figure 33 presents Project 5 - Lehigh Acres. This project is located on Lee Boulevard. The proposed project site is located southeast of the existing Lehigh Acres WRF. A 16-inch pipeline will be required between the WRF and the project site. From the project site, a 16-inch transmission line will convey the supply to the rest of the reclaimed water system approximately 7.5 miles west of the project site.

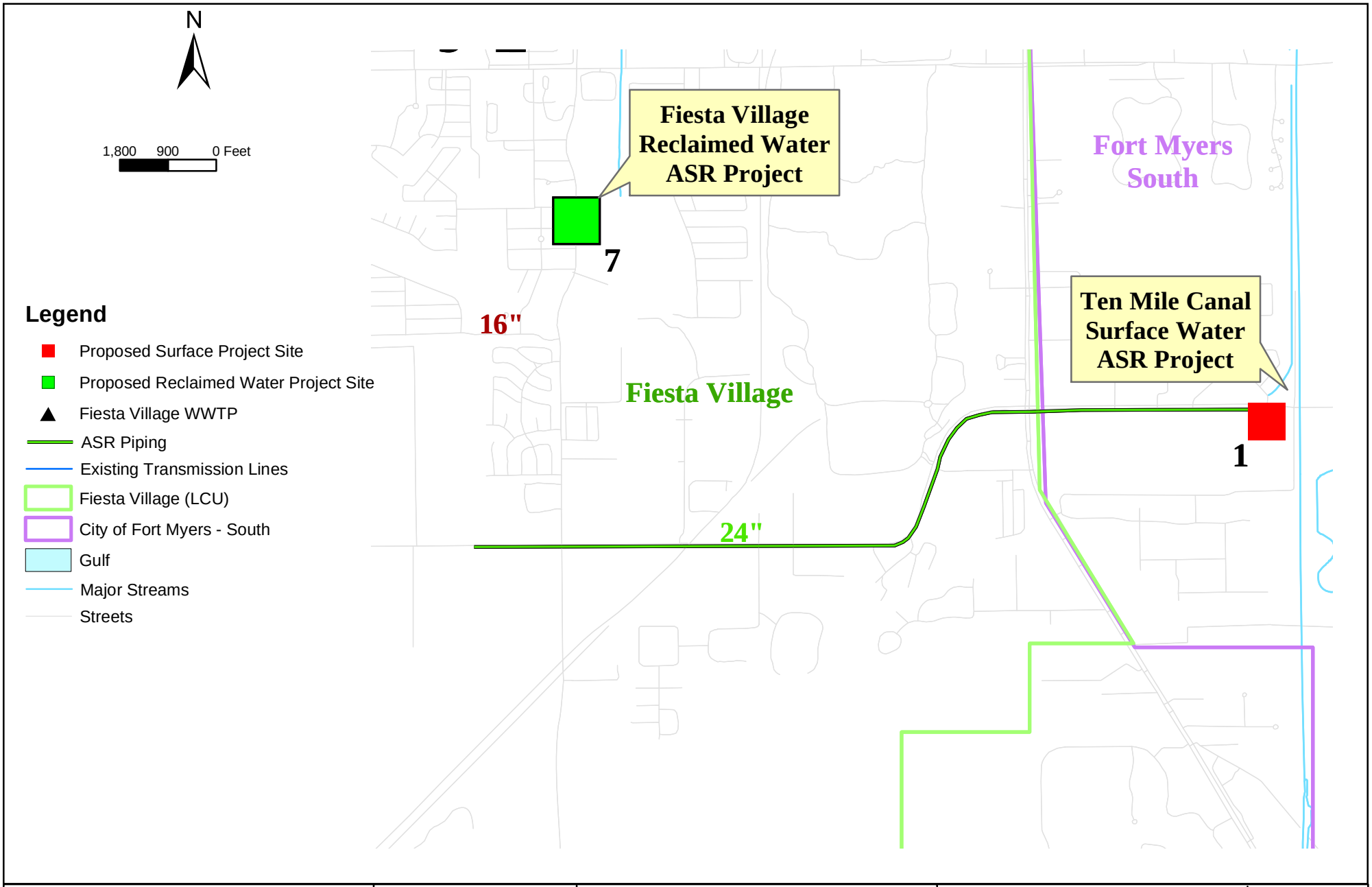
Figure 34 presents Project 6 - Three Oaks. The proposed project site for this reclaimed water project is located west of I-75, and northeast of the existing Three Oaks WRF. The project will require a 16-inch transmission line from the site to the WRF. A recently built distribution system will be used to convey the water supply from the WRF.

Figure 35 shows Project 8 - Fort Myers Beach. The location of this project is on Summerlin Road just east of the existing WRF. The advantage of the proposed site for this project is that there is a pipeline already in place that would distribute the supply obtained from this project.

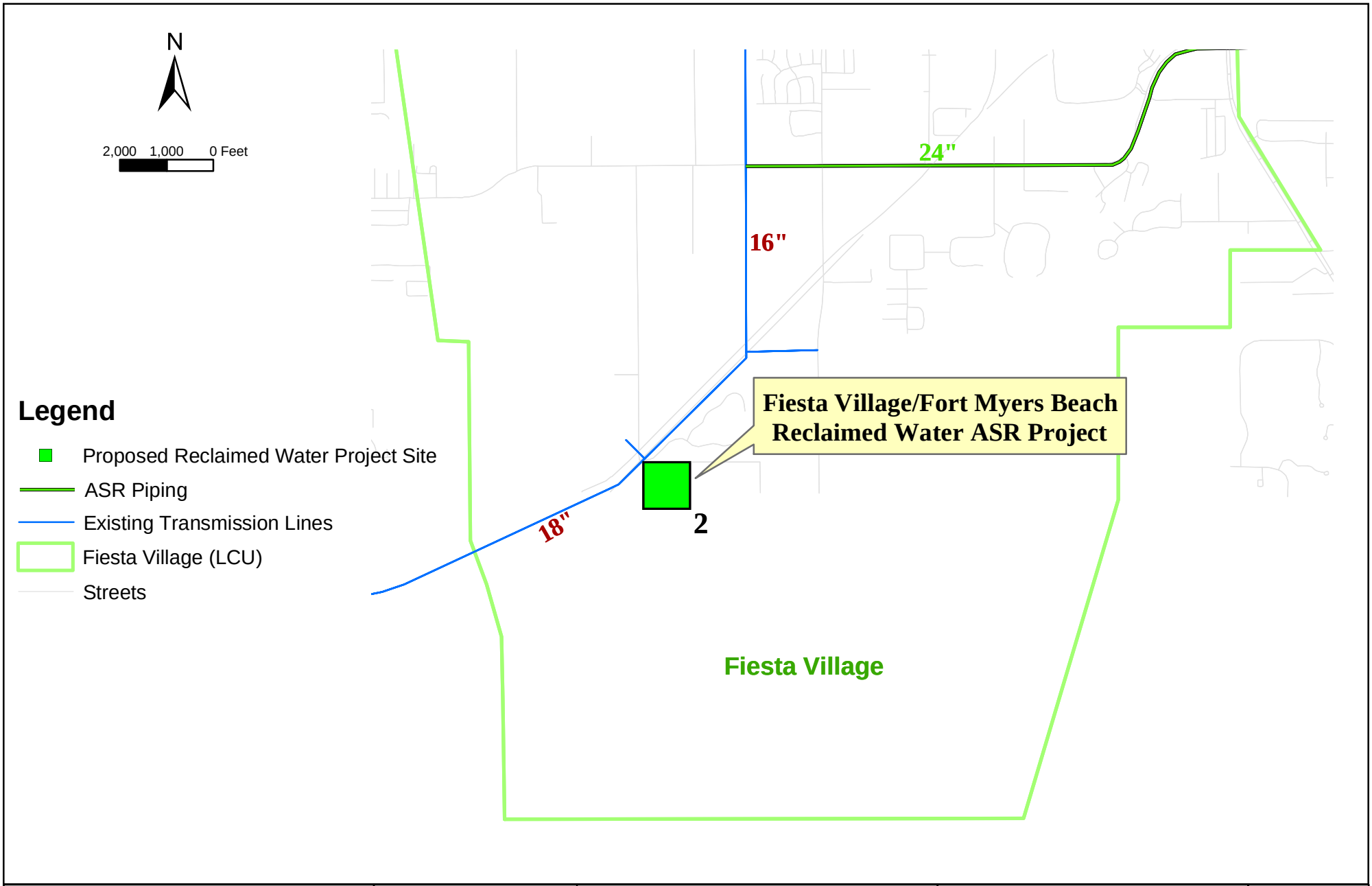
Figure 36 presents the location of Project 9 - Fort Myers South. This reclaimed water project is located approximately 3,300 feet west of Six Mile Cypress Parkway and south of Colonial Blvd. The proposed site for this project is near the existing distribution line on Six Mile Cypress Parkway that would convey the supply provided by this project.

Figure 37 shows Project 10 - City of Fort Myers Reclaimed Water System Expansion. This project includes a series of projects including the Fort Myers Central WWTP and South WWTP interconnect and the Fort Myers Pipeline West of I-75. As shown on figure 1 the project encompasses transmission lines that loop between these two WWTP's to provide a combined supply of reclaimed water of approximately 16.6 MGD.

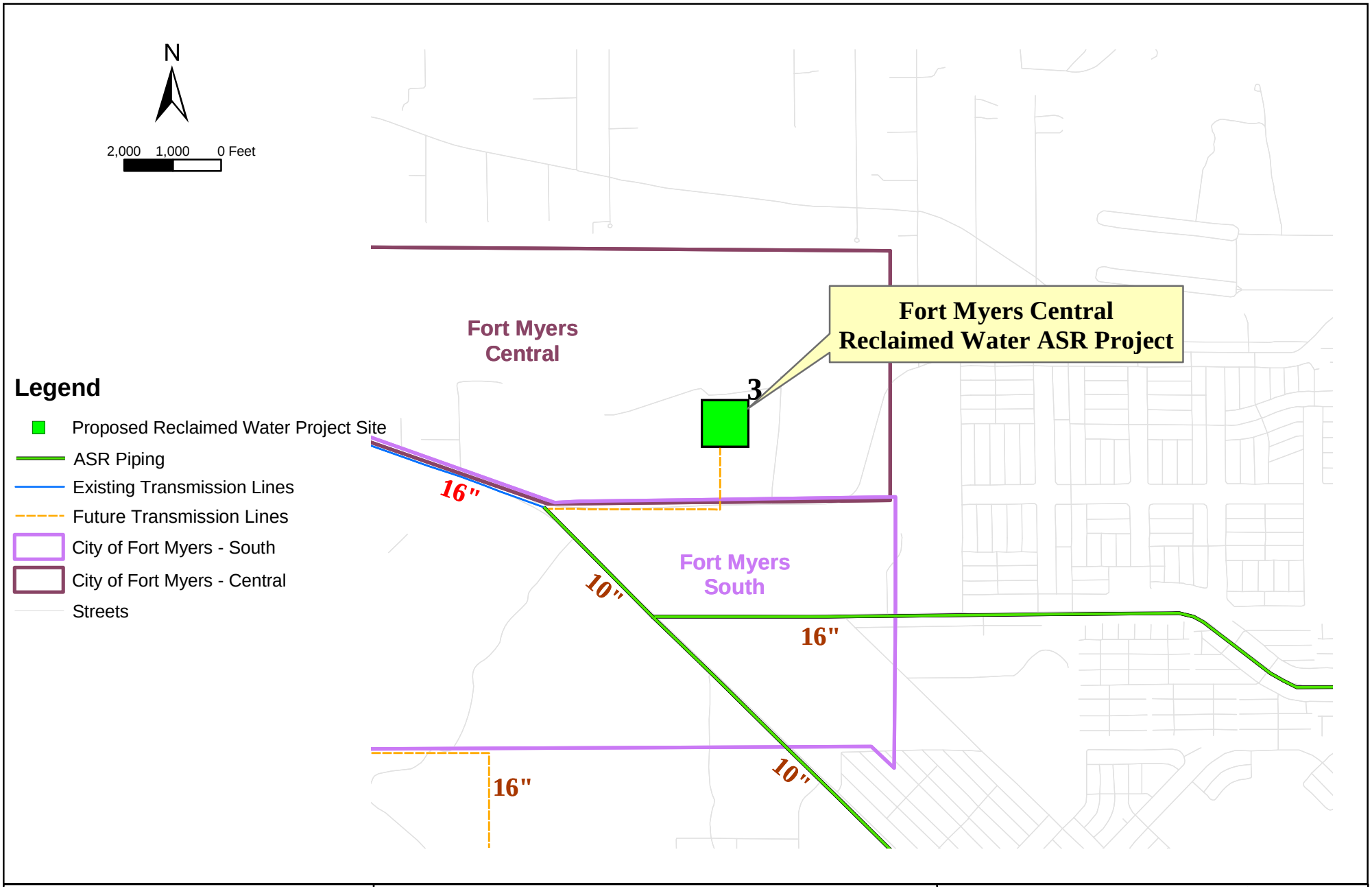
Figure 38 shows Project 11 - Corkscrew Road to Williams Road. This project between Lee County and the City of Bonita Springs will provide approximately 300,000 gallons per day of reclaimed water supply to an existing golf course that could use.



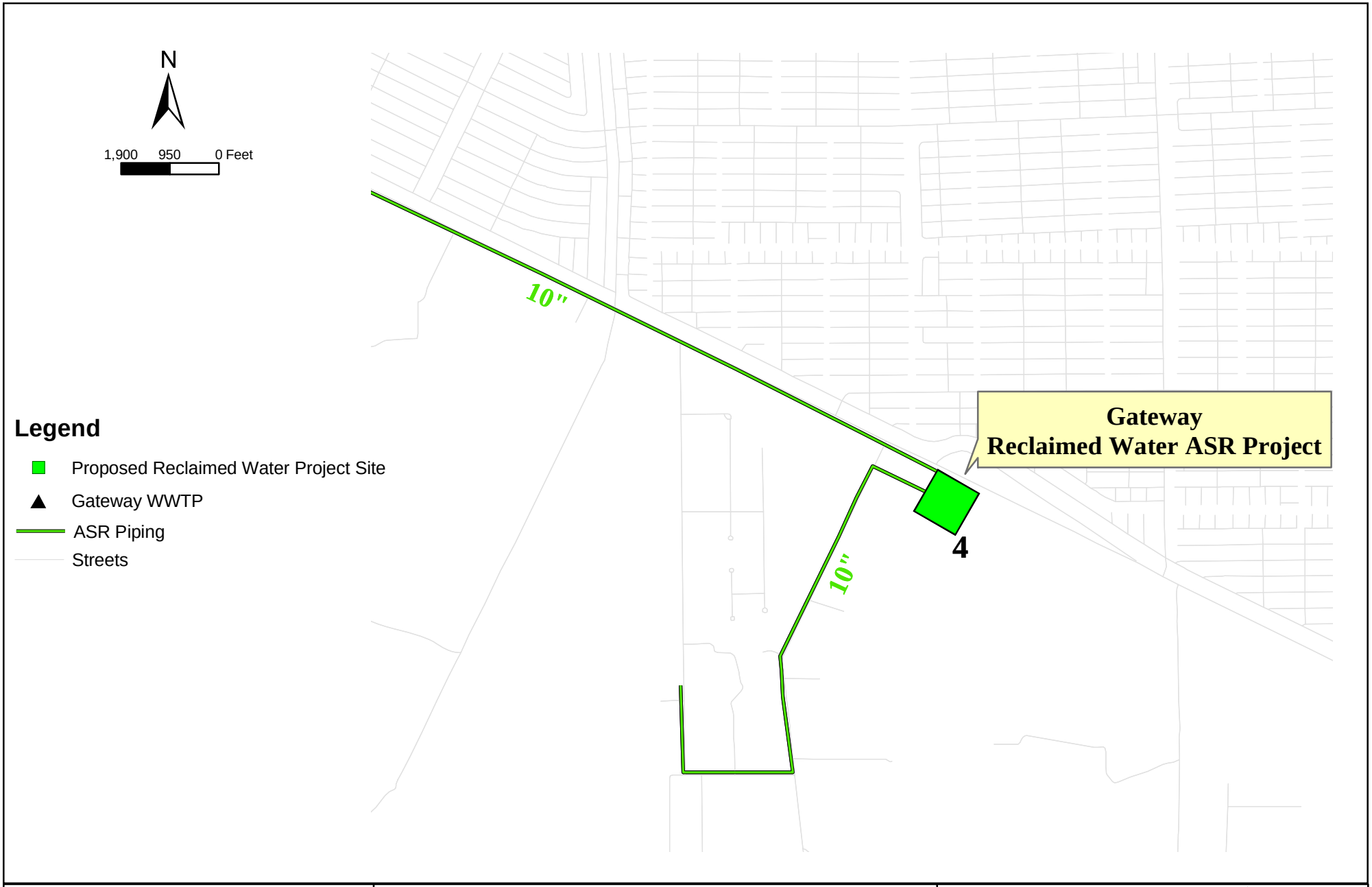
Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	1. Ten Mile Canal Surface Water and 7. Fiesta Village Reclaimed Water ASR System - Subregion 3	Figure 29



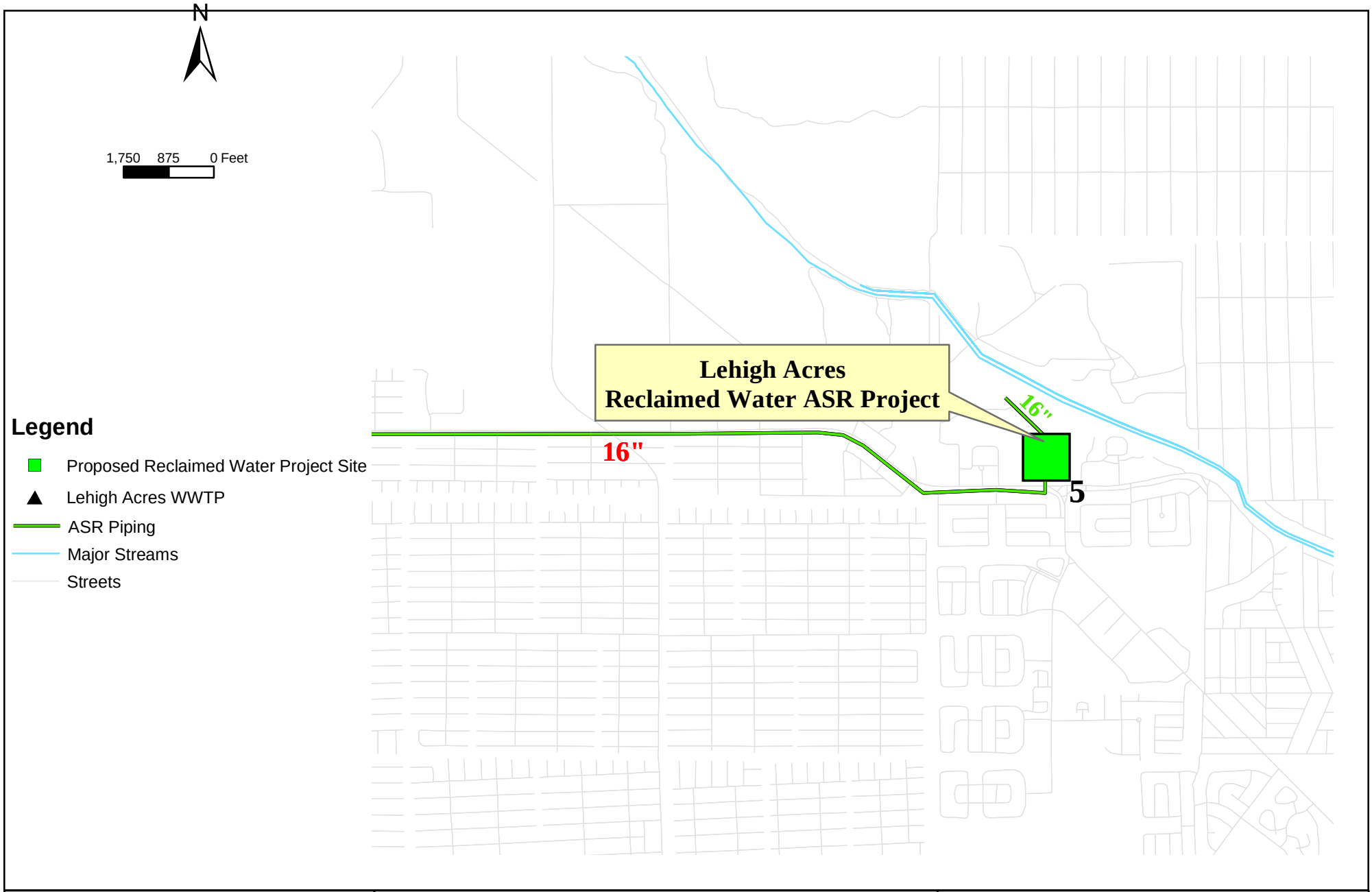
Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	2. Fiesta Village/Fort Myers Beach Reclaimed Water ASR System - Subregion 3	Figure 30



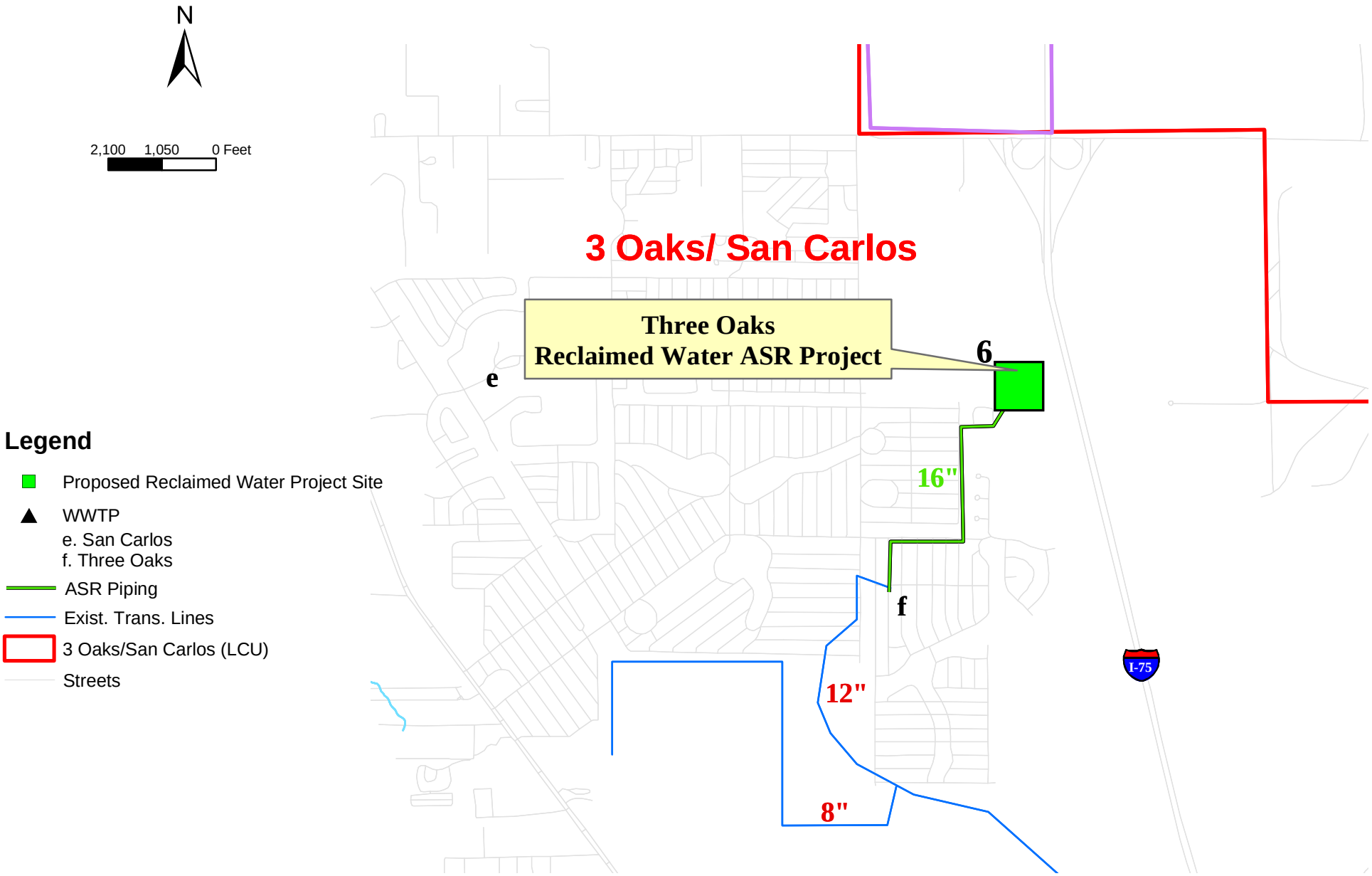
Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	3. Fort Myers Central Reclaimed Water ASR System - Subregion 3	Figure 31



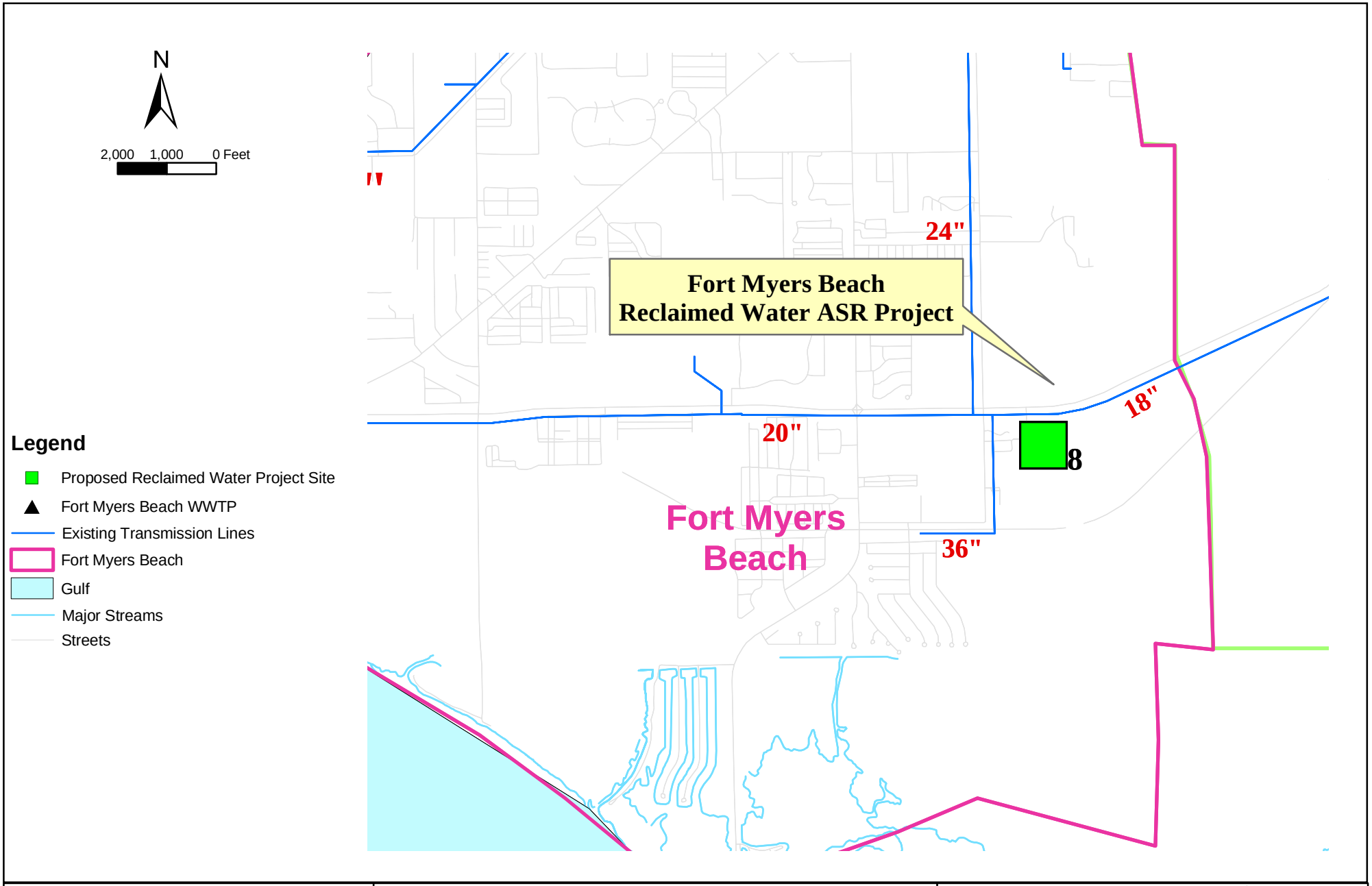
Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	**South Florida Water Management District**	**4. Gateway Reclaimed Water ASR System - Subregion 3**	**Figure 32**



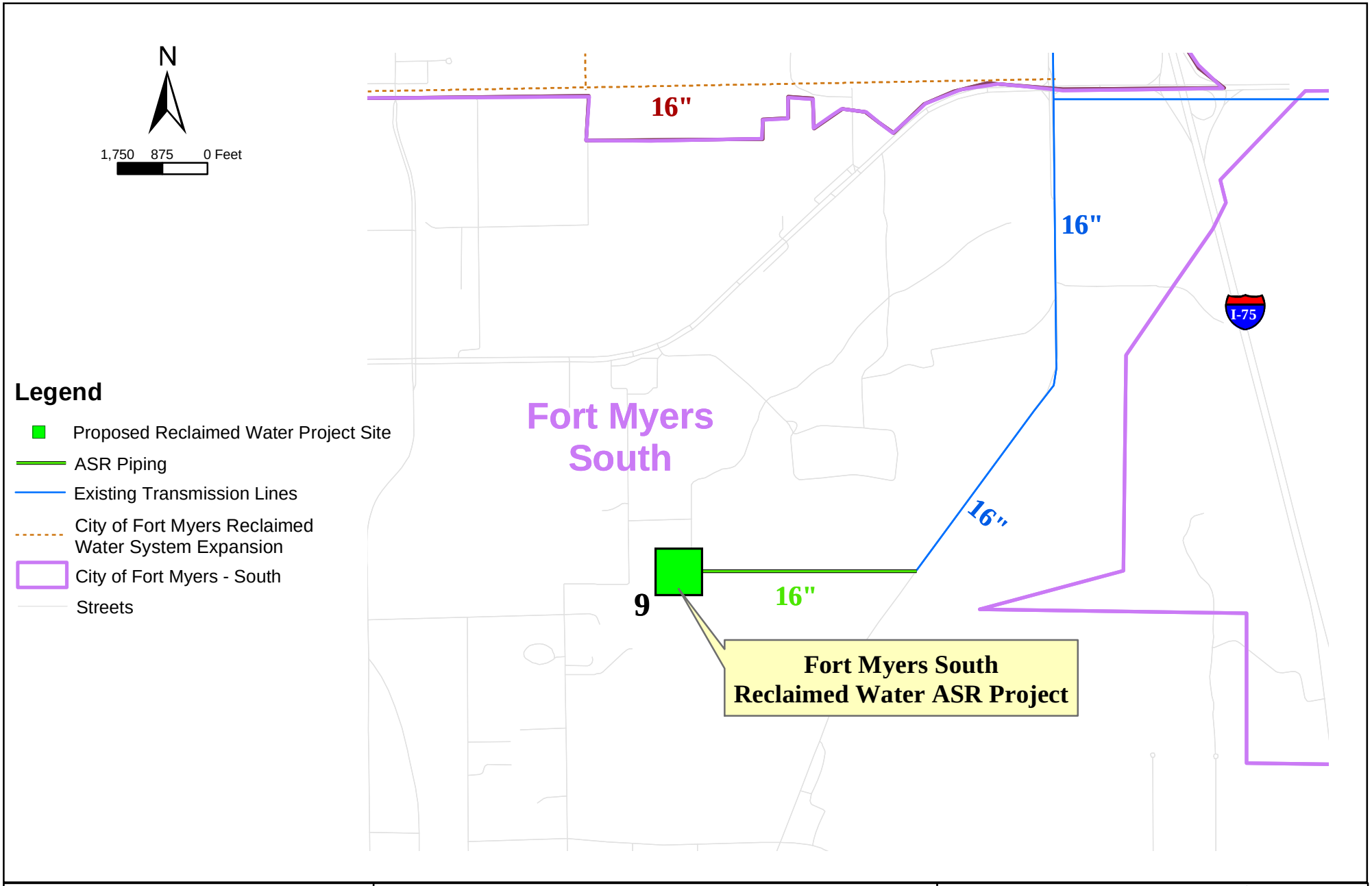
Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	5. Lehigh Acres Reclaimed Water ASR System - Subregion 3	Figure 33



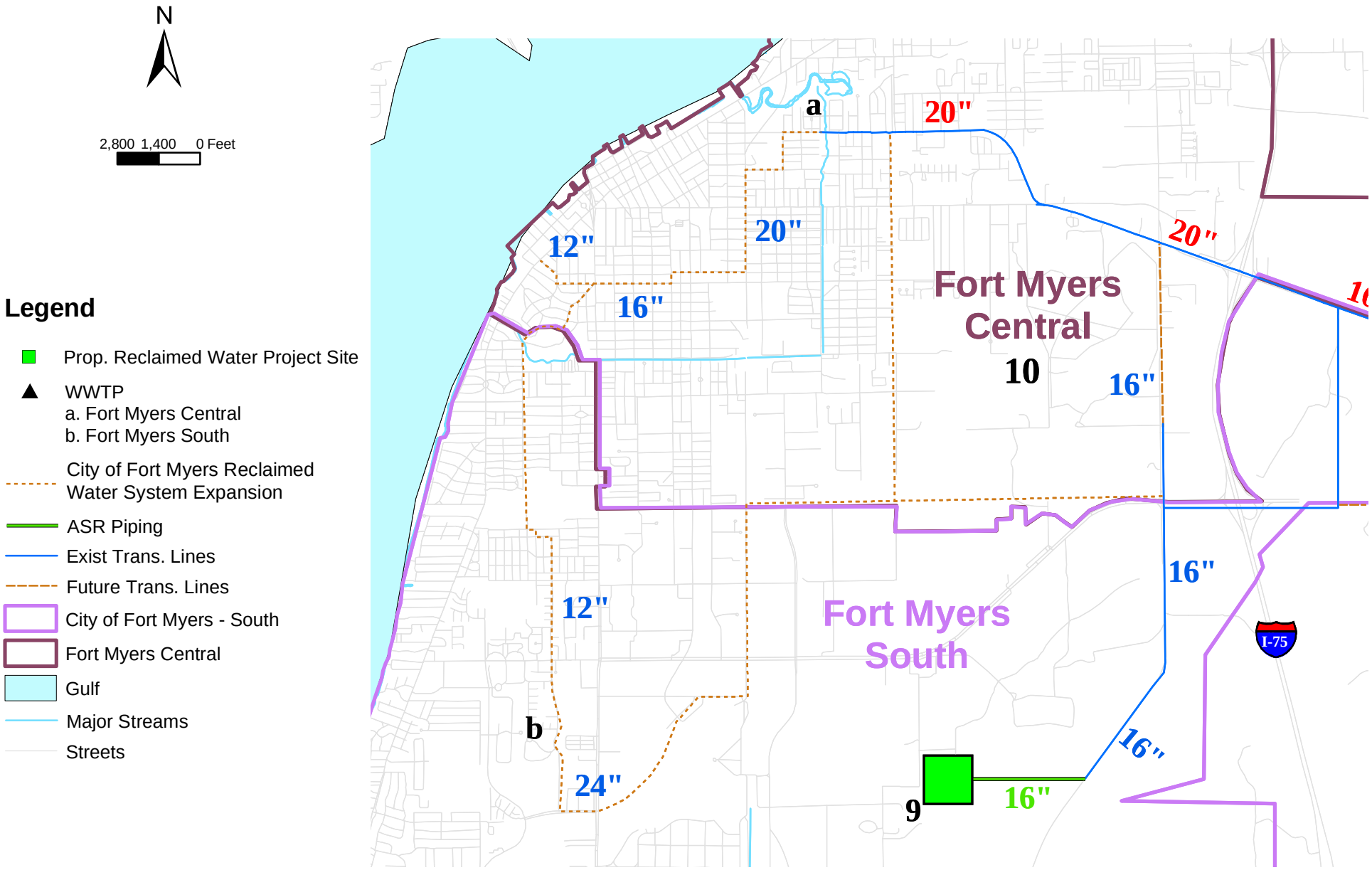
Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	6. Three Oaks Reclaimed Water ASR System - Subregion 3	Figure 34



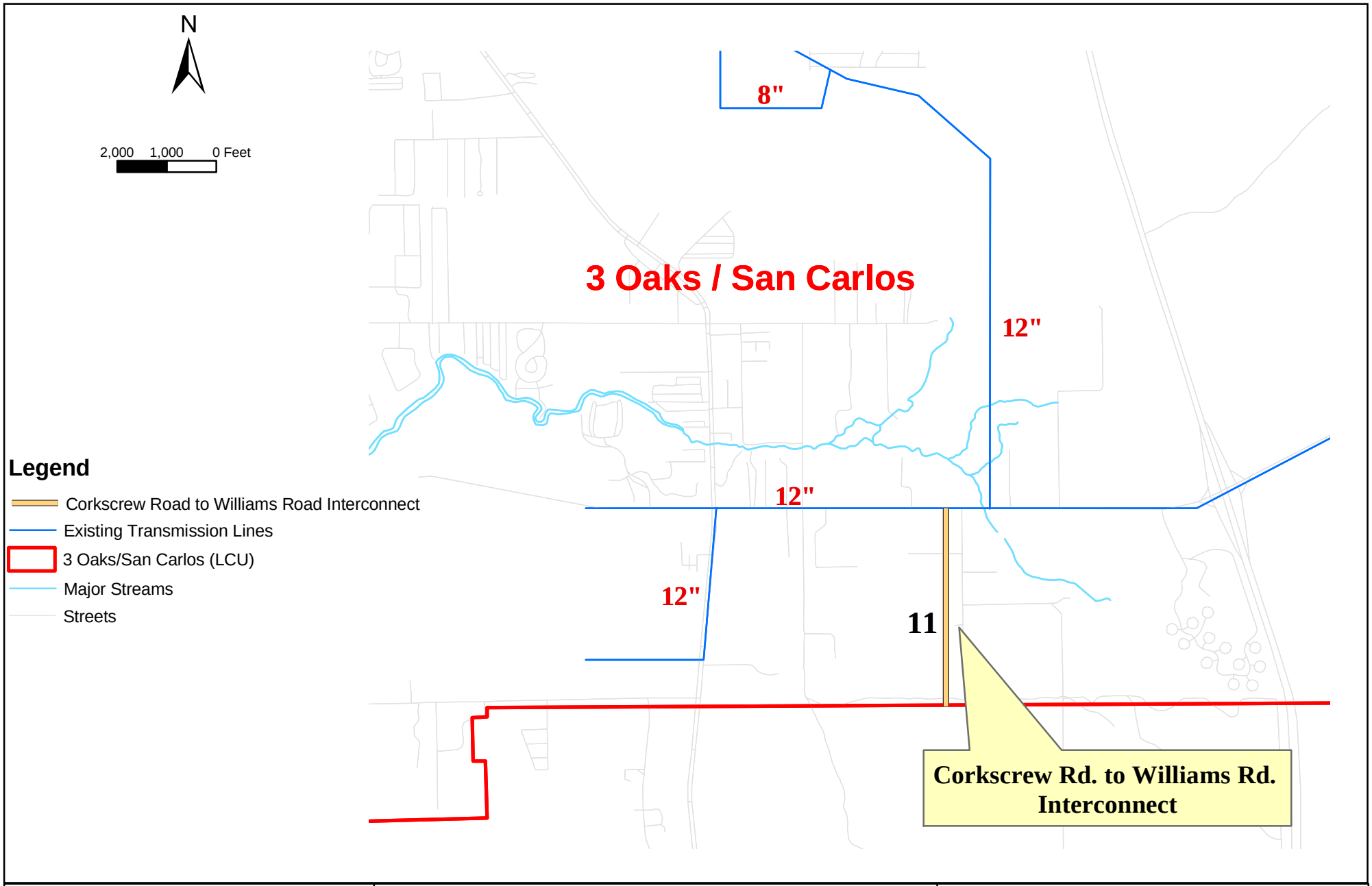
Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	8. Fort Myers Beach Reclaimed Water ASR System - Subregion 3	Figure 35



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	9. Fort Myers South Reclaimed Water ASR System - Subregion 3	Figure 36



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	10. City of Fort Myers Reclaimed Water System Expansion - Subregion 3	Figure 37



Regional Irrigation Distribution System (RIDS) Feasibility Study for the Lower West Coast Region	BOYLE	South Florida Water Management District	11. Corkscrew Rd. to Williams Rd. Interconnect Subregion 3	Figure 38

Existing Infrastructure

Currently Lee County and the City of Fort Myers have existing reclaimed water distribution systems, which is proposed infrastructure. The rest of proposed RIDS projects use the existing infrastructure as much as possible. Figures 28 through 38 include the existing and planned infrastructure near each of the proposed projects.

PROPOSED INFRASTRUCTURE

Surface Water Projects Design Criteria

Surface water ASR projects like Project 1 - Ten Mile Canal, Project 1 typically require the following facilities:

- Horizontal well to provide in-bank filtration,
- Pump stations,
- pH adjustment, and
- Pre- and post- ASR well disinfection.

A typical process flow schematic for these facilities is shown on Figure 39. This figure conceptually presents the horizontal well, which will be constructed near the surface water source. From this point, the pH is adjusted with CO_2 prior to disinfection and injection into the ASR well. Water recovered from the well will then be disinfected before it is sent to the irrigation system.

Figure 40 illustrates how the horizontal wells and injection pumping are located in relation to one another.

Figure 41 presents how the injection well pump station will be configured. A minimum of two pumps will be used at each pump station. Piping size depends on each project's capacity requirement. This figure also shows the anticipated locations of power pole connections, meters, valves, and sample taps.

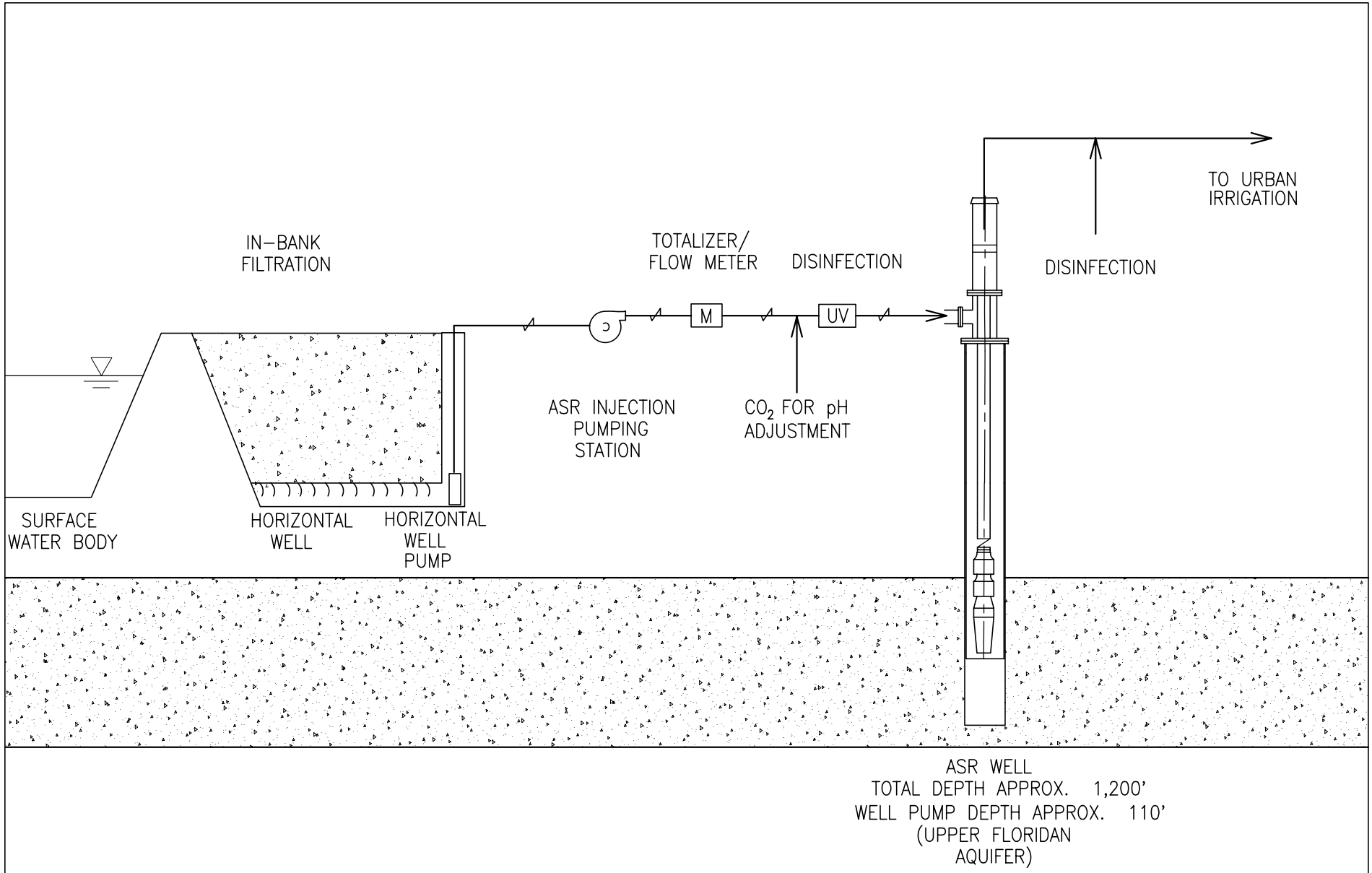
Figure 42 presents the layout of a typical ASR well. Figures 43 and 44 show horizontal well installation methods. The specific method used will depend on subsurface conditions at each project location.

Reclaimed Water Projects Design Criteria

The typical facilities for the reclaimed water ASR projects are similar to the surface water ASR projects, except for the horizontal well and the need for additional disinfection facilities (if the WWTP meets AWT limits). The reclaimed water will be treated effluent from the wastewater treatment plant, which will be injected into the ASR well. Prior to injection, the pH will be adjusted with CO_2 and then disinfected. This system is presented in Figure 45**.**

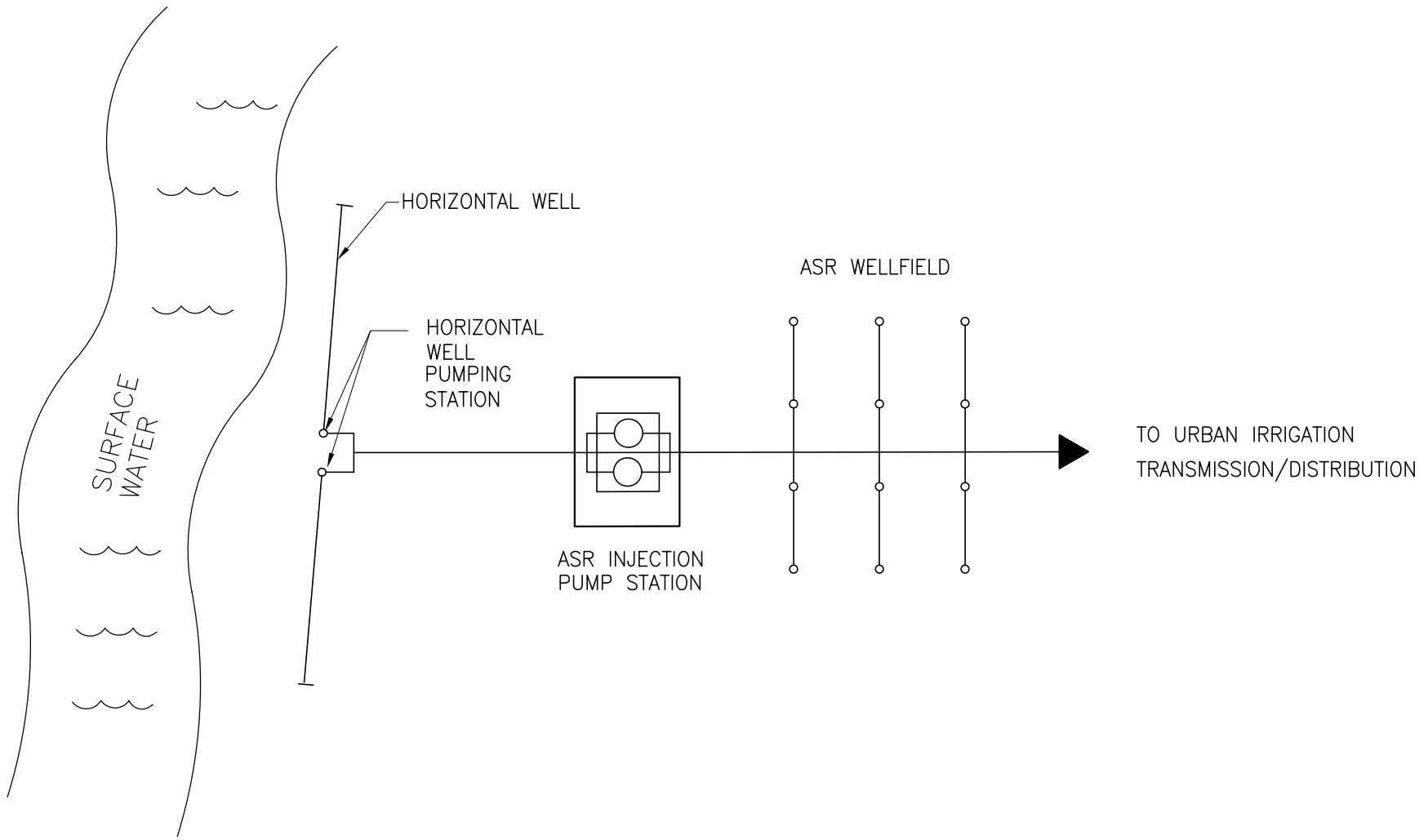
Interconnects

Interconnects can supply supplemental irrigation needs through resources available in either side of the connection. The proposed interconnect project between the City of Bonita Springs and Lee County is shown on Figure 38.

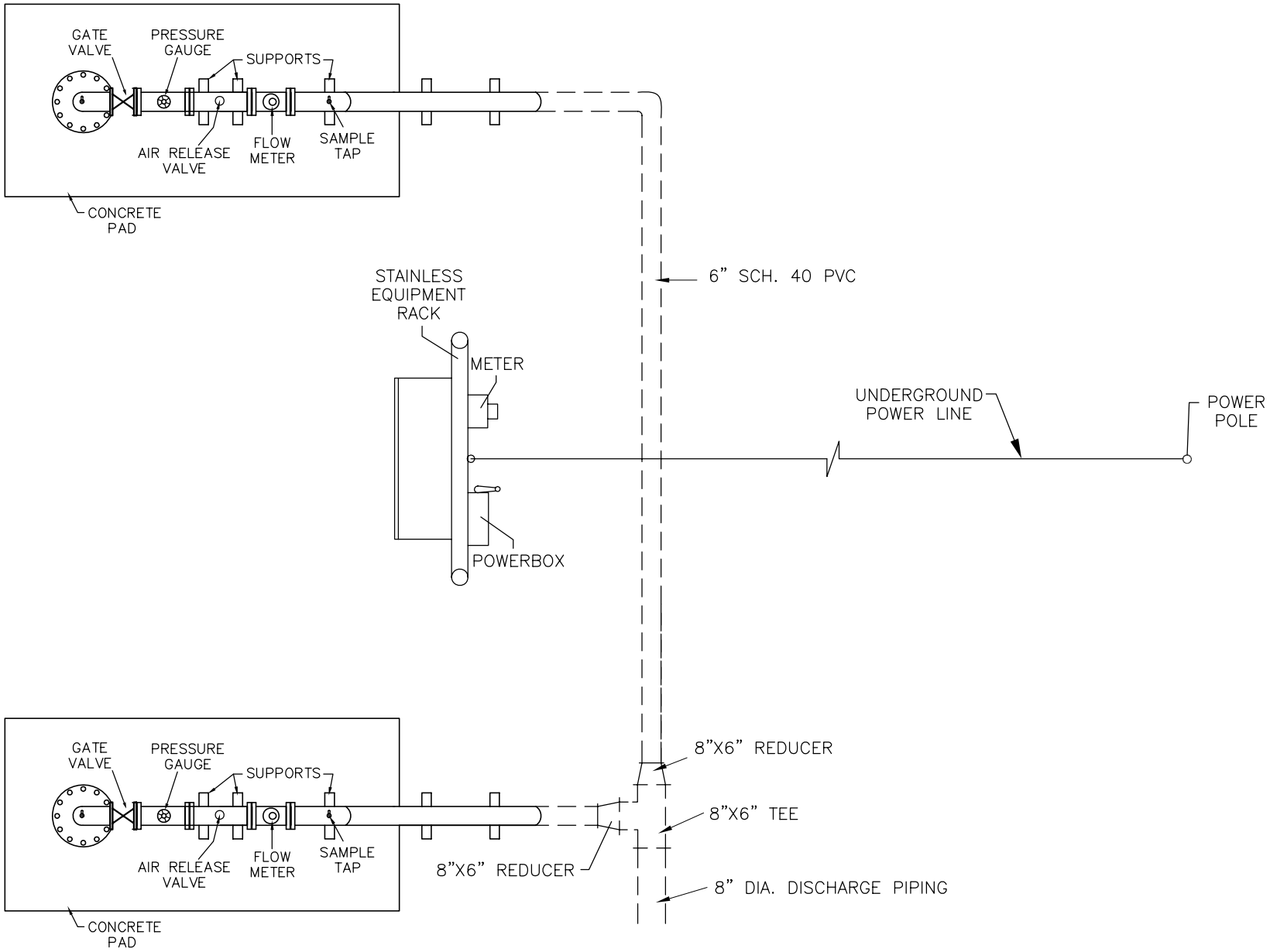


Not to Scale
For Conceptual Purposes Only

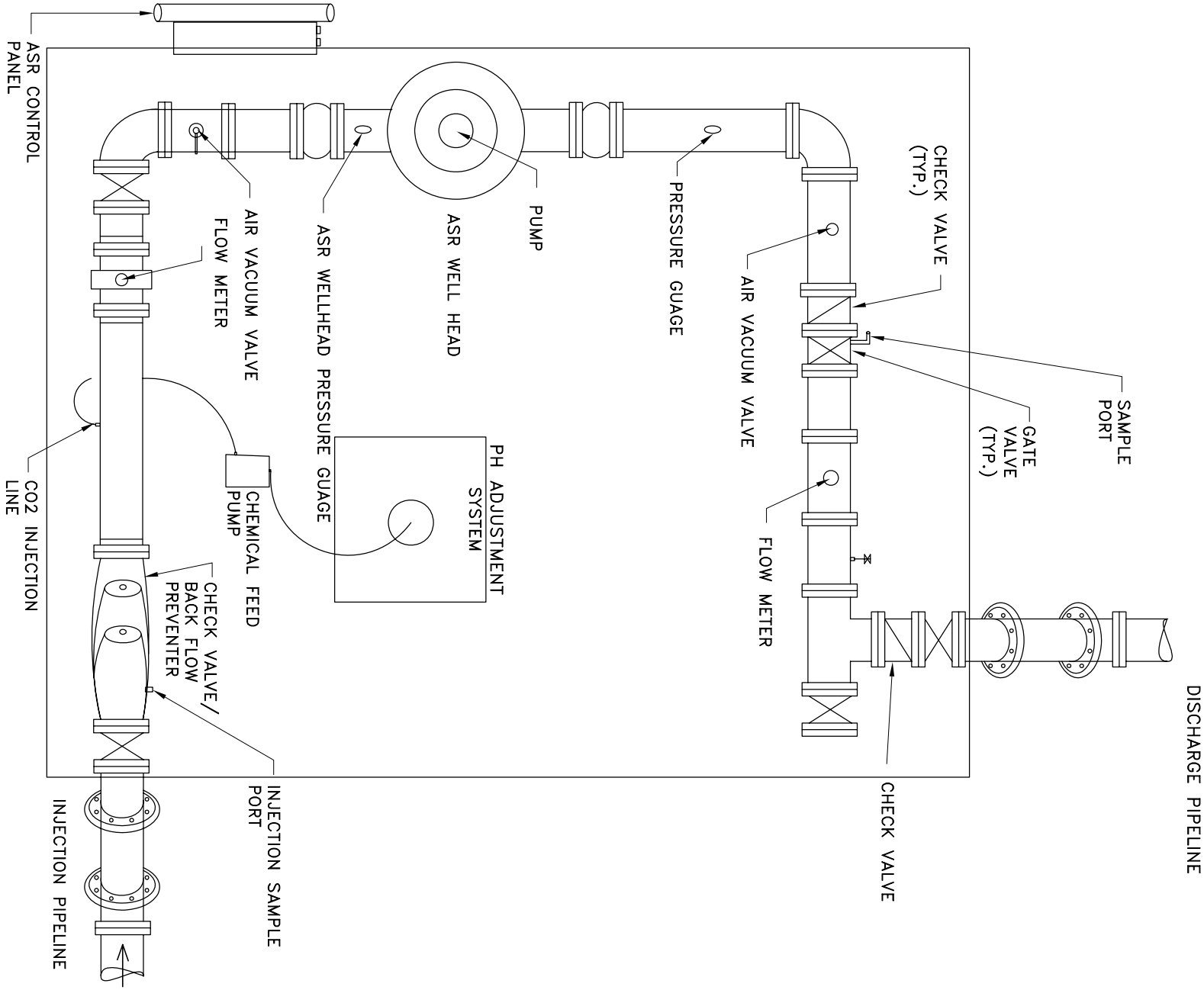
Regional Irrigation Distribution System (RIDS) Feasibility Study	BOYLE	South Florida Water Management District	Typical Surface Water ASR System Process Flow Schematic	Figure 39



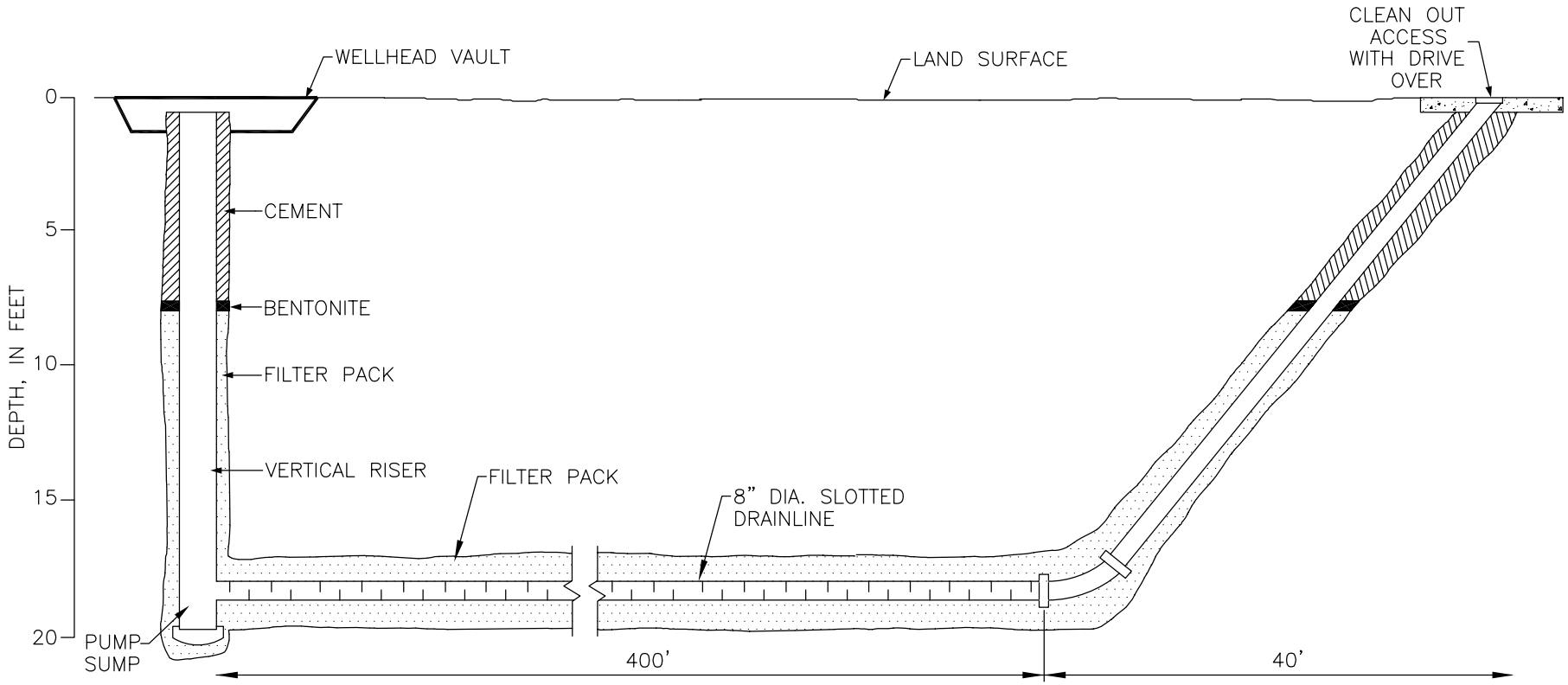
Regional Irrigation Distribution System (RIDS) Feasibility Study	BOYLE	South Florida Water Management District	Typical Surface Water ASR System Layout	Figure 40



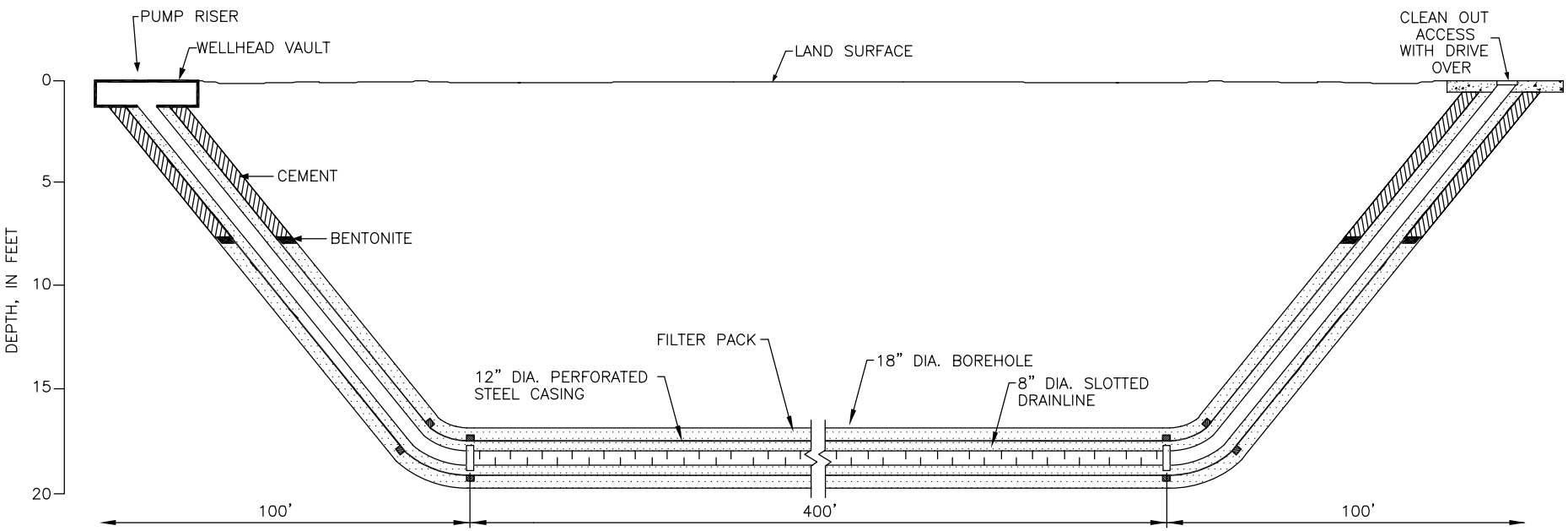
Regional Irrigation Distribution System (RIDS) Feasibility Study	BOYLE	South Florida Water Management District	Typical Horizontal Well Withdrawal Pumping Station	Figure 41



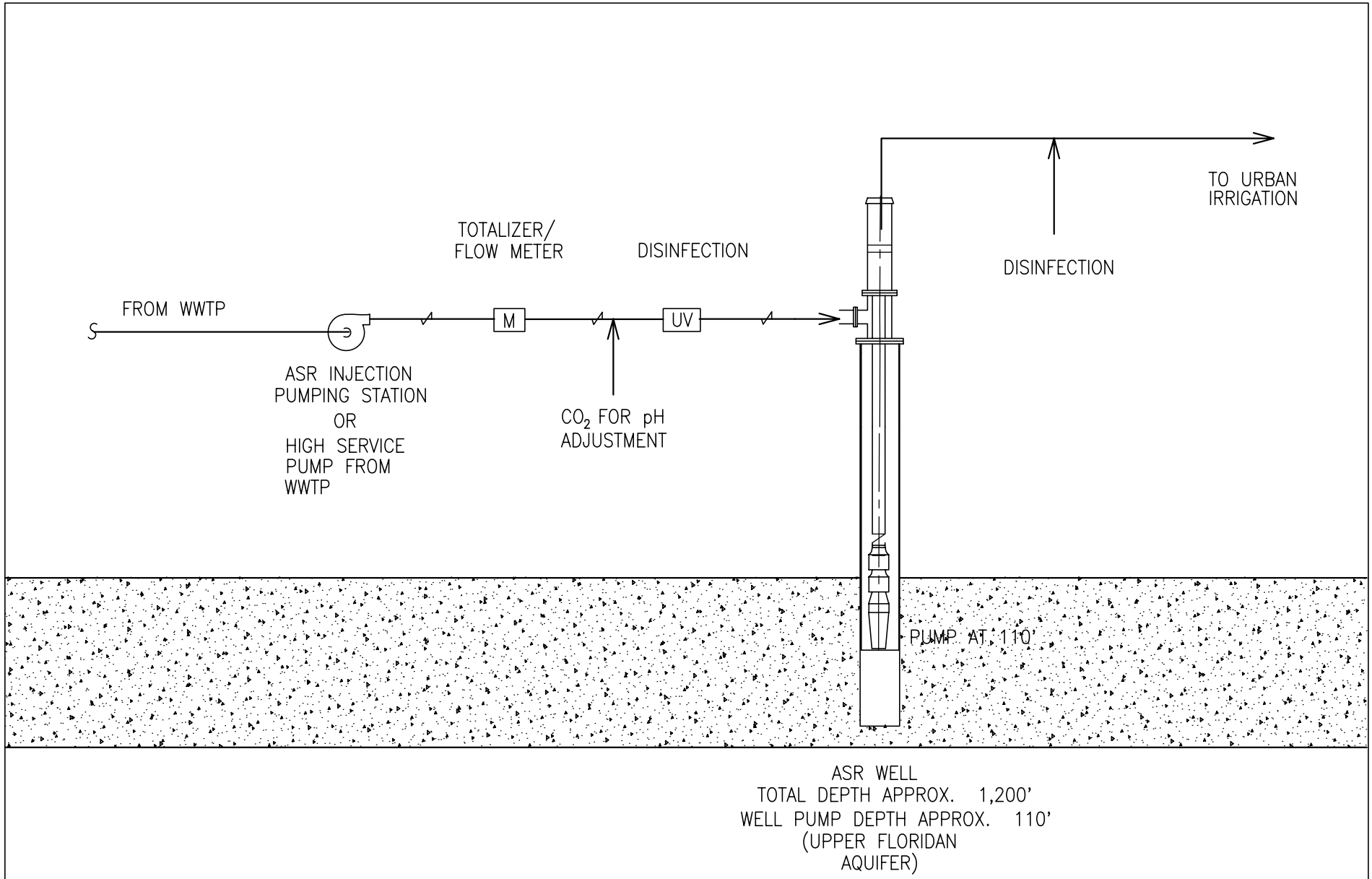
Regional Irrigation Distribution System (RIDS) Feasibility Study	BOYLE	South Florida Water Management District	Typical ASR Well Layout	Figure 42



Regional Irrigation Distribution System (RIDS) Feasibility Study	BOYLE	South Florida Water Management District	Typical Horizontal Well Cross-Section Installation Method A (Directional Drilled)	Figure 43



Regional Irrigation Distribution System (RIDS) Feasibility Study	BOYLE	South Florida Water Management District	Typical Horizontal Well Cross-Section Installation Method B	Figure 44



Not to Scale
For Conceptual Purposes Only

Regional Irrigation Distribution System (RIDS) Feasibility Study	BOYLE	South Florida Water Management District	Typical Reclaimed Water ASR System Process Flow Schematic	Figure 45

PIPELINE DIAMETERS AND MATERIALS

Preliminary piping arrangements for the ASR well system are shown in Figure 41. Piping and valving arrangements allow for isolation, directing of flow for recharge/injection or recovery, flow measurements, and control of recharge and recovery flow rates. Typical piping and valve sizes are presented in Figures 29 through 38.

The pipe materials anticipated for the ASR systems infrastructure will be as follows:

- For Horizontal Wells - slotted high-density polyethylene (HDPE) and Ductile Iron Pipe (DIP)
- For Injection pumping stations - DIP and polyvinyl chloride (PVC)
- For the ASR wells - DIP and PVC

For the recovery pumping stations - PVC and DIP

PUMPS AND TREATMENT EQUIPMENT DESCRIPTIONS

The typical ASR well system will include pumps, pipes, valves, meters, instrumentation, and disinfection equipment. This section includes a preliminary selection of each type of equipment, which will be confirmed during the design phase.

Pumps

For reliability, all pumping systems will be designed for firm capacity, meaning that the capacity is met with the largest pump out of service. For the surface water projects, there will be three types of pumps. As shown in Figure 39, the system includes horizontal well pumps, injection pumps, and recovery pumps. For reclaimed water projects horizontal well pumps are not necessary. In addition, the injection well pumps may not be necessary if it is determined that the WWTP's effluent pumps can be used for this purpose. For the preliminary selection of equipment for this feasibility study, the capacities needed are estimated based on the typical layout and pressure requirements from other ASR wells.

<u>Horizontal well pumps</u>

As shown on Figures 43 and 44 the horizontal wells will require submersible pumps to extract the filtered surface water. Table 35 presents the ASR well projects for surface water sources and the anticipated pump capacities. Pump capacities are based on potential of withdrawal benefit from the source. The depth of the sump will vary depending on subsurface geological conditions of the project site. A typical depth is about one foot below the invert of the pipe, about 20 feet below ground. The total discharge head (TDH) required is calculated based on this depth and approximately 5 feet for minor losses. Thus, the TDH for this type of well will be 25 feet. This type of pump is typically recommended for minimal turbulence and the entrance velocity should not be greater than 3.5 ft/s. The horizontal well layout allows the surface water to be filtered through the shallow soils. The pumps will operate based on a pressure transducer on the slotted high-density polyethylene (HDPE). Sample pump curves are included in Attachment J for the above list of pumps.

Table 35
Horizontal Well Pump Characteristics

No.	Project	Type of ASR Project	Benefit and Pump Capacity (MGD)	Benefit and Pump Capacity (GPM)
1	Ten Mile Canal	Surface Water	12	8,300

Injection Pumps

In some cases, the high service pumps from WWTP reclaimed water systems may be used to inject the effluent into the ASR well. Injection pumps may be necessary for others. In situations in which injection pumps are necessary, vertical turbine pumps will be used. The vertical turbine pumps will be installed in a wet well. TM No. 1 presented an estimate of the depth of each ASR well, but the final depth will be evaluated based on subsurface geological conditions at each site. The TDH for each pump is based on the anticipated pressure of injection plus some headloss. Using an estimated injection pressure of 60 psi, the TDH for these pumps will be 65 psi. The total flow for the surface water ASR systems is the same amount that was withdrawn from the horizontal wells. For the injection pump stations, multiple pumps will be used to assure reliability, using the firm capacity concept for selection. Table 36 presents the list of projects, and the injection pump capacities/characteristics.

Table 36
Injection Pump Characteristics

No.	Project	Type of ASR Project	No. of Wells	Benefit (MGD)	Pump Capacity (GPM)	No. of Pumps	Maximum Well Depth (ft)
1	Ten Mile Canal	Surface Water	17	12.0	8,300	2	1100
2	Fiesta Village / Fort Myers Beach	Reclaimed Water	12	8.1	5,600	2	1100
3	Fort Myers Central	Reclaimed Water	13	8.8	6,111	3	1100
4	Gateway	Reclaimed Water	2	1.0	694	2	1100
5	Lehigh Acres	Reclaimed Water	7	4.9	3,400	3	1100
6	Three Oaks	Reclaimed Water	5	3.3	2,300	2	1100
7	Fiesta Village	Reclaimed Water	6	3.9	2,700	2	1100
8	Fort Myers Beach	Reclaimed Water	6	4.2	2,900	3	1150
9	Fort Myers South	Reclaimed Water	12	7.8	5,400	2	1000

For the injection pumps, sample pump curves are included in Appendix B.

Recovery Pumps

Each well will have its own recovery pump system. For all the projects, the estimated flow for each well will be 0.75 MGD (521 GPM). It is anticipated that pumps for all wells will be located at approximately 110 feet and 10 feet are added for friction losses; therefore, the total TDH will be 120 feet. Table 37 presents the projects and the anticipated characteristics of the pumps. Each pump should be constructed of 316 stainless steel since it will be used to pump water from an aquifer zone, which contains background brackish water quality.

Table 37
Recovery Well Pump

No.	Project	Type of ASR Project	No. of Wells	Benefit (MGD)
1	Ten Mile Canal	Surface Water	17	12.0
2	Fiesta Village / Fort Myers Beach	Reclaimed Water	12	8.1
3	Fort Myers Central / Lehigh Acres / Gateway	Reclaimed Water	13	8.8
4	Gateway / Lehigh Acres	Reclaimed Water	2	1.0
5	Lehigh Acres	Reclaimed Water	7	4.9
6	Three Oaks	Reclaimed Water	5	3.3
7	Fiesta Village	Reclaimed Water	6	3.9
8	Fort Myers Beach	Reclaimed Water	6	4.2
9	Fort Myers South	Reclaimed Water	12	7.8

Attachment K presents pre-selected pump curves that can meet capacity requirements for the horizontal wells, injection and recovery pumps.

Treatment

Ultraviolet Disinfection (UV)

In order to meet the Primary Drinking Water Standards, UV disinfection may be necessary. The need for any treatment and disinfection will be determined based on a pilot study at each site. This type of disinfection is considered operator friendly, as it has no residual; no chemicals to store, minimal contact time, and requires a smaller footprint than other disinfection methods. The recommended UV system will be a closed vessel, medium pressure, and high intensity type system.

According to the Recommended Standards from Water Works (2003 Edition), the Policy Statement on UV Light for treatment of Public Water Supplies states that the UV system shall meet the Class A criteria under ANSI/NSF Standard 55 (See Attachment L).

Chlorine Disinfection

Chlorine disinfection may be considered, but current and emerging disinfection byproduct regulations may result in chlorine not being viable. Chlorine disinfection can be evaluated to develop site-specific information related to microbial inactivation and disinfection by-product formation similar to that done for ozone and UV. In view of the organic content of the project source water, chlorine demand and subsequent disinfection by-product formation will be high. Chloramination may be able to reduce demand and disinfection by-product formation, however significantly greater contact time will be

necessary to achieve disinfection comparable to free chlorine. Because chlorine disinfection has not been tested, it cannot be stated at this time whether or not it is a viable disinfection process. Once the appropriate evaluations have been performed, chlorine disinfection can be compared and contrasted with ozone and UV. If chlorine disinfection is able to meet water quality objectives (and this level varies depending on requirements mandated by EPA or FDEP), this process may have a competitive advantage in that disinfection could be achieved via a solid (tablet type) chemical feed/contact system. Such a system would be relatively simple to maintain and operate.

It is of importance to note that chloramination has been tested on highly colored surface water and found to be suitable for meeting the coliform standard. This procedure was evaluated for disinfection for another ASR project in South Florida that proposed to store highly colored surface water.

CONTROL REQUIREMENTS

The permit will require proper system operation and monitoring. The operation and control of the ASR well system needs to be automatically monitored for the following parameters:

- Pressure at the wellhead during injection
- Pressure at the wellhead during recovery
- Pumping water level during recovery
- Water level
- Flow rates during injection and recovery
- Conductivity during injection and recovery
- Pump motor status (on/off)
- Open/close position of each motor operated valve
- Abnormal conditions alarm (high motor temperature, high/low pressure, high/low flow)

Control panels for the well should be free standing within a NEMA 4X cabinet to include the following:

- Local/Off/Remote switch
- Lock out stop switch
- Indicator light for pump/motor status
- Indicator of monitored hydraulic parameters
- PLC and auxiliary hardware

If remote control of the ASR well is needed, a remote telemetry unit (RTU) can transmit an operator directive or provide information about the selected parameters.

GENERAL CIVIL REQUIREMENTS

Structures

Local codes and requirements - Standard Florida Building Code (Wind Speed = 150 Mile per Hour).

Electrical

Final design also will be performed in coordination and communication with Florida Power & Light Company (FPL). Electrical service will be extended from the existing electrical distribution system that currently serves nearby systems. The electrical power needs will be estimated to include motor horsepower (HP), motor operated valves, lighting, and instrumentation controls. Emergency power will be provided by a back-up generators located either at the treatment plants (for reclaimed water projects) or on-site for surface water projects). Each well will have a control panel. All electrical equipment will have nameplates to identify each item with its respective service or function. The nameplates will include the name of the equipment being served and its associated component number.

The following are the electrical standards and codes that will be used to design and construct the proposed facilities:

- National Electrical Code (NEC)
- American National Standards Institute (ANSI)
- National Electrical Manufacturers Association (NEMA)
- Institute of Electrical and Electronic Engineers (IEEE)
- Insulated Cable Engineers Association (ICEA)
- Occupational Safety and Health Administration (OSHA)
- American Society for Testing Material (ASTM)
- Underwriters' Laboratories, Inc. (UL)
- Local codes and standards

TECHNICAL SPECIFICATIONS

Division 1 – General Requirements

01025	MEASUREMENT AND PAYMENT
01040	CONSTRUCTION COORDINATION
01065	PERMITS AND FEES
01070	GENERAL ABBREVIATIONS
01200	PROJECT MEETINGS
01300	SUBMITTALS
01326	SCHEDULE (CPM)

01370 SCHEDULE OF VALUES

01380 CONSTRUCTION PHOTOGRAPHS

01410 TESTING LABORATORY SERVICES

01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

01600 MATERIAL AND EQUIPMENT

01667 SYSTEM START UP AND TESTING

01700 CONTRACT CLOSEOUT

01730 OPERATION AND MAINTENANCE MANUALS

Division 2 – Site Work

02210 SAND CEMENT RIP-RAP

02221 EXCAVATING, BACKFILLING AND COMPACTION

02232 LIME ROCK BASE

02270 EROSION AND SEDIMENT CONTROL

02486 FINISH GRADING AND GRASS

02822 CHAIN LINK FENCE AND GATES

Division 3 - Concrete

03100 CONCRETE FORMWORK

03201 CONCRETE REINFORCEMENT

03260 CONCRETE JOINTS AND WATERSTOPS

03300 CONCRETE

03345 CONCRETE FINISHING AND CURING

03800 LEAKAGE TESTING OF HYDRAULIC STRUCTURES

Division 5 - Metals

05050 BOLTS, WASHERS, DRILLED ANCHORS, AND EYEBOLTS

05121 MISCELLANEOUS STRUCTURAL STEEL AND ALUMINUM

05515 LADDERS, STAIRS, AND STAIR NOSINGS

05520 HANDRAILS AND SAFETY CHAINS

05530 GRATING, COVER PLATES, AND ACCESS HATCHES

Division 9 - Finishes

09900 PAINTING AND COATING

Division 11 - Equipment

11210 HORIZONTAL END SUCTION CENTRIFUGAL PUMPS
11214 VERTICAL TURBINE PUMPS
11215 VERTICAL TURBINE PUMPS-WATER WELLS
11240 CO_2 FEED SYSTEM
11281 FABRICATED STAINLESS-STEEL SLIDE GATES
11375 ULTRAVIOLET DISINFECTION SYSTEM

Division 13 – Special Construction

13226 UNDERDRAIN AND COLLECTION SYSTEM

Division 15 – Mechanical

15000 PIPING SCHEDULE & GENERAL PIPING REQUIREMENTS
15041 DISINFECTION OF PIPING AND STRUCTURES
15044 PRESSURE TESTING OF PIPING
15056 DUCTILE-IRON PIPE
15064 PVC DISTRIBUTION PIPE (AWWA C900)
15100 MANUAL, CHECK, AND PROCESS VALVES
15108 AIR-RELEASE AND VACUUM-RELIEF VALVES
15121 MISCELLANEOUS PIPE FITTINGS AND ACCESSORIES
15122 FLEXIBLE PIPE COUPLINGS AND EXPANSION JOINTS
15132 PRESSURE GAUGES
15142 WALL PIPES, SEEP RINGS, AND PENETRATIONS
15155 MAGNETIC FLOWMETER
15190 EQUIPMENT, PIPING, DUCT & VALVE IDENTIFICATION

Division 16 - Electrical

16015 ELECTRICAL REFERENCE SYMBOLS
16020 WORK INCLUDED
16025 CODES, FEES, & STANDARDS
16035 ACCEPTANCE TESTING
16040 IDENTIFICATION
16050 SPECIAL REQUIREMENTS
16110 RACEWAYS AND CONDUITS

16120 WIRES AND CABLES

16130 OUTLET BOXES

16134 PANEL BOARDS

16140 WIRING DEVICES

16150 ELECTRIC MOTORS

16160 MOTOR CONTROLS

16170 DISCONNECTS

16180 OVERCURRENT PROTECTIVE DEVICES

16190 SUPPORTING DEVICES

16410 ELECTRIC SERVICE

16450 GROUNDING

16460 TRANSFORMERS

16501 LIGHTING FIXTURES

16709 SURGE SUPPRESSION EQUIPMENT

16850 INSTRUMENTATION, CONTROL AND TELEMETRY SYSTEM

16910 CONTROL PANELS

Reference:

1. Pumping station Design Robert Sanks, Second Edition, 1998.
2. Wastewater Technology Fact Sheet Ultraviolet Disinfection, EPA September 1999.
3. Water Ten State Standards

CONCLUSIONS AND RECOMMENDATIONS

It was concluded in the RIDS Master Plan that developing improvements on a subregional basis would be the most beneficial way to develop alternative water supply to offset potable water demands. Table 37 presents a summary of the selected alternatives for each subregion. **Figure 23** illustrates the RIDS alternative options for the lower west coast study area.

Table 38
Subregional Alternative Summary

Alternatives	Benefit (MGD)	Capital Cost ($)	Unit Cost ($ / 1,000 gal)
Ten Mile Canal	12	24.7	1.33
Fiesta Village/Fort Myers Beach	8.1	14.2	1.17
Fort Myers Central	8.8	16.0	1.2
Gateway	1.0	6.3	3.6
Lehigh Acres	4.9	13.2	1.67
Three Oaks	3.3	7.5	1.45
Fiesta Village	3.9	8.1	1.35
Fort Myers Beach	4.2	8.4	1.30
Fort Myers South	7.8	14.5	1.22
City of Fort Myers Reclaimed	16.6	17.1	0.78
Corkscrew Rd. to Williams Rd.	0.3	6.5	11.81

Implementation of the RIDS will require additional phases to plan, design, finance and construct the improvements. Assuming Phase 1 included the Master Plan, and Phase 2 included the Feasibility Study, subsequent phases include the following:

- **Phase 3 Engineering Design –** Includes design, permitting and bidding of projects.
- **Phase 4 Construction –** Construction and startup of projects.

Project phases will be implemented on a subregional basis as developed in the RIDS Master Plan.

ATTACHMENT A

The Blaney-Cridde (B-C) Methodology

The Blaney-Cridde (B-C) Methodology

The basic B-C formula states that the consumptive use (U) is equal to a seasonal consumptive use factor coefficient (k), times a monthly consumptive use factor (f), therefore U = k*f. F is a function of the mean monthly temperature in degrees Fahrenheit (t) times the monthly percent of daylight hours (p), divided by 100, expressed as f=t*p/100. K is a factor relating the plant water usage for a specific species. K factors are generated under experimental conditions where F and U are measured under tightly controlled conditions. This analysis uses a modified B-C method beginning with a modified k factor. Here, k is equal to a climatic coefficient which is related to the mean air temperature (kt), times a coefficient reflecting the growth stage of the crop (kc) expressed as k=kt*kc. In order to approximate evapotranspiration, the following calculation must first be completed:

$f(m) = (t(m) * p(m))/100$
$kt(m) = (0.0173 * t(m) – 0.314$
$kt\ f(m) = f(m) * kt(m)$
$u(m) = kt\ f\ (m) * kc(m)$

where:
m = month of year
f(m) = monthly evapotranspiration factor
r(m) = average monthly temperature
p(m) = monthly percentage of annual daylight hours
kt(m) = kt
u(m) = monthly evapotranspiration
kc(m) = monthly crop coefficient`

The effective rainfall for crop evapotranspiration is calculated as a function of the 1-in-10 year drought rainfall as:

$Rt(1) = (0.70917 * (Rt(m)^{(0.82416)}) – 0.11556$
$U1(m) = 10^{(0.01226*U(m))}$
$F1 = 0.531747 + (0.295154 * D) – (0.057697 * D^2) + (0.003804 * D^3)$
$Re(m) = Rt1(m) * U1(m) * F1$

where:
Rt1(m) = monthly effective rainfall factor considering 1-in-10 rainfall
Rt(m) = 1-in-10 monthly rainfall
U1(m) = monthly effective rainfall factor considering monthly evapotranspiration
F1 = soil factor
D = net depth of application
Re(m) = monthly effective rainfall

After the monthly evapotranspiration, U(m) and the monthly 1-in-10 effective rainfall, Re(m) has been determined, the monthly supplemental crop requirement, Sup(m) is calculated as:
Sup(m) = U(m) – Re(m) for each month of the year.

Finally, the irrigation quantity needed to supply the supplemental crop requirement Sup(m) is determined by:

$$Q(m) = Sup(m) * Ka * A$$

Where:

Ka = allocation coefficient multiplier for the irrigation system specified

A = irrigated acreage for the crop

Reuse Factors for Temporal Distribution of Blaney-Criddle Supplemental Irrigation Requirements

In order to calculate temporal distribution of supplemental irrigation requirements for wastewater service areas, the values for current reclaimed demand water demand for the areas were totaled for each month and the total for each month was divided by the annual average demand as shown in the table below. The reuse factor was then applied by taking the total annual volume, dividing it by the number of days in the year, multiplying it by the number of days in the month, and then multiplying this value times the reuse factor.

	Actual Reclaimed System Demand* (MGD)											
Facility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Fiesta Village[a]	1.0	1.3	1.1	1.2	1.2	0.6	0.4	0.4	0.2	0.9	1.3	1.0
Ft. Myers Beach[a]	2.1	1.9	3.6	3.6	2.8	2.1	2.0	2.0	1.2	2.6	2.8	2.1
Ft. Myers Central[b]	0.6	0.7	0.8	0.8	0.8	0.7	0.7	0.7	0.6	0.7	0.7	0.6
Ft. Myers South[b]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gulf Environmental Services[c]	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
Total	**4.5**	**4.5**	**6.2**	**6.3**	**5.5**	**4.1**	**3.9**	**3.8**	**2.8**	**5.0**	**5.6**	**4.5**
Reuse Factor	**0.95**	**0.96**	**1.32**	**1.33**	**1.16**	**0.88**	**0.82**	**0.81**	**0.58**	**1.06**	**1.19**	**0.96**

ATTACHMENT B

The B-C Models Results

Fiesta Village - Current

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	1937.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 1937 Acres X 1.33 X 0.02715 MG/AC-IN = 2632.00 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 1937 Acres X 1.33 X 0.02715 MG/AC-IN = 358.11 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Ft. Myers Beach - Current

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	3748.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 3748 Acres X 1.33 X 0.02715 MG/AC-IN = 5092.78 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 3748 Acres X 1.33 X 0.02715 MG/AC-IN = 692.93 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Ft. Myers Central - Current

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	2357.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 2357 Acres X 1.33 X 0.02715 MG/AC-IN = 3202.69 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 2357 Acres X 1.33 X 0.02715 MG/AC-IN = 435.76 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Ft. Myers South - Current

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	4120.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 4120 Acres X 1.33 X 0.02715 MG/AC-IN = 5598.26 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 4120 Acres X 1.33 X 0.02715 MG/AC-IN = 761.71 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Gateway - Current

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	418.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 418 Acres X 1.33 X 0.02715 MG/AC-IN = 567.98 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 418 Acres X 1.33 X 0.02715 MG/AC-IN = 77.28 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Lehigh Acres - Current

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	3429.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 3429 Acres X 1.33 X 0.02715 MG/AC-IN = 4659.33 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 3429 Acres X 1.33 X 0.02715 MG/AC-IN = 633.96 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Fiesta Village - Future

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	3219.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 3219 Acres X 1.33 X 0.02715 MG/AC-IN = 4373.98 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 3219 Acres X 1.33 X 0.02715 MG/AC-IN = 595.13 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Ft. Myers Beach - Future

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	5072.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (Inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (Inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 5072 Acres X 1.33 X 0.02715 MG/AC-IN = 6891.84 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 5072 Acres X 1.33 X 0.02715 MG/AC-IN = 937.71 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Ft. Myers Central - Future

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	3135.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (Inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (Inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (Inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (Inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 3135 Acres X 1.33 X 0.02715 MG/AC-IN = 4259.84 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 3135 Acres X 1.33 X 0.02715 MG/AC-IN = 579.60 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Ft. Myers South - Future

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	4992.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 4992 Acres X 1.33 X 0.02715 MG/AC-IN = 6783.13 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 4992 Acres X 1.33 X 0.02715 MG/AC-IN = 922.92 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Gateway - Future

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	1208.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 1208 Acres X 1.33 X 0.02715 MG/AC-IN = 1641.43 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 1208 Acres X 1.33 X 0.02715 MG/AC-IN = 223.34 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

Lehigh Acres - Future

Calculations Of Irrigation Requirements (1-in-10)

Rainfall Station:	Ft. Myers
Irrigation System:	Sprinkler
Irrigated Acreage:	8630.00
Crop:	Turf Grass
Soil Type:	0.80
Multiplier	1.33
Efficiency	0.75

Calculations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Average Rainfall (inches)	1.90	2.00	1.50	1.90	4.10	9.40	8.70	8.60	8.40	3.50	1.50	1.50	53.00
Evapotranspiration (inches)	1.86	2.14	3.70	5.11	6.83	7.60	8.05	7.72	6.48	4.92	3.07	2.15	59.63
Average Effective Rainfall (inches)	0.88	0.94	0.79	1.06	2.31	4.91	4.71	4.58	4.19	1.81	0.76	0.72	27.66
1-in-10 Effective Rainfall (inches)	0.62	0.81	0.13	0.40	1.71	3.91	3.82	4.03	4.02	1.30	0.62	0.63	22.00
Average Irrigation (inches)	0.98	1.20	2.91	4.05	4.52	2.69	3.34	3.14	2.29	3.11	2.31	1.43	31.97
1-in-10 Irrigation (inches)	1.24	1.33	3.57	4.71	5.12	3.69	4.23	3.69	2.46	3.62	2.45	1.52	37.63

1-in-10 Annual Supplemental Crop Requirement = 37.63 inches

Annual Supplemental Crop Water Use:

37.63 inches X 8630 Acres X 1.33 X 0.02715 MG/AC-IN = 11726.45 MG

1-in-10 Maximum Monthly Supplemental Crop Requirement = 5.12 inches

Maximum Monthly Supplemental Crop Water Use:

5.12 inches X 8630 Acres X 1.33 X 0.02715 MG/AC-IN = 1595.52 MG

Notes:
Evapotranspiration was calculated using a modified Blaney-Criddle method.
Average effective rainfall is the amount that is useful to crops in an average year.
2-in-10 drought rainfall is the rainfall minimum expected with a probability of 2 year in 10.
2-in-10 effective rainfall is the amount that is useful to crops in a 2-in-10 drought rainfall.
Average irrigation is the net amount that should be required for maximum yields during an average year.
2-in-10 irrigation is the net amount that should be required for maximum yields during a 2-in-10 drought year.

ATTACHMENT C

Summary of Inventoried Well Data

Attachment C - Summary of Inventoried Well Data
Fory Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS #	BOG #	FGS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	TD (ft)	CD (ft)	DIS. Cl (mg/l)	COND (umhos/cm)	COMMENTS	AQUIFER	USE	OWNER - WELL NAME	DATA SOURCE
LM-2660						NW NE 35-43S-25E	935								WRS
LM-5395						NE NE 35-43S-25E	800	500			Permit # 36-00595-W	SUW	IND	MANATEE PROTECTION WELL	SFWMD
LM-5396						NW NE 35-43S-25E	800	500			Permit # 36-00595-W	SUW	IND	MANATEE PROTECTION WELL	SFWMD
LM-5397						SW NE 35-43S-25E	800	500			Permit # 36-00595-W	SUW	IND	MANATEE PROTECTION WELL	SFWMD
LM-5900			WA-2043			NW SE 35-43S-25E	515	98			P&A 2/6/89				SFWMD
LM-5465			W-3	L-641		SW NW 36-43S-25E	535								USGS
LM-3429		W-9308				SE SW 23-43S-26E	1250						CORE	HORC CT #1	FGS
LM-5468				L-2530		NE SE 23-43S-26E	620	475	460	2,190		LH			USGS
LM-6615						NE SE 23-43S-26E	945	864					ASR	LEE COUNTY UTILS ASR- OLGA	WRS
LM-5333						NW NE 25-43S-26E	710	400			PERMIT # 36-00030-W	MH/LH	AGR	ROY W. AND KARL A. WIGHTMAN	SFWMD
LM-5864			WA-834			NW NW 25-43S-26E	519	210							SFWMD
LM-4993			WA-77	L-1903		NE NE 26-43S-26E	669	190	413	2,100		MH/LH			SFWMD
LM-4997			WA-81	L-2586		NE NE 26-43S-26E	568								SFWMD
LM-5093			WA-311			NW SE 32-43S-26E	800		1,628	5,450	P&A 4/11/84				SFWMD
LM-5866			WA-693			SE NW 33-43S-26E	612	96			PERMIT # 36-00043-W	SS/MH/LH	AGR	HUNTER RANCH	SFWMD
LM-6974	P-520	W-11508				NE SW 33-43S-26E	11630	3568			P&A 8/15/72	PAL/K	PET TW	R.K. HUGHES'72 #1 N.H. Hunter	WRS
LM-7943					1	NE NW 33-43S-26E	820	160			PERMIT # 36-00043-W	SS/MH/LH	AGR	HUNTER RANCH	SFWMD
LM-7944					3	SE NE 33-43S-26E	875	160			PERMIT # 36-00043-W	SS/MH/LH	AGR	HUNTER RANCH	SFWMD
LM-5865			WA-695			SW SE 34-43S-26E	765	115			PERMIT # 36-00043-W	SS/MH/LH	AGR	HUNTER RANCH	SFWMD
LM-7945					6	SW SE 34-43S-26E	765	160			PERMIT # 36-00043-W	SS/MH/LH	AGR	HUNTER RANCH	SFWMD
LM-7946					4	SE SW 34-43S-26E	890	700			PERMIT # 36-00043-W	UFA	AGR	HUNTER RANCH	SFWMD
LM-5868			WA-147	L-724		NE SE 19-43S-27E	792	128	563	2,628	LM-5016	SS/MH/LH			SFWMD
LM-5271		W-9325				NW NW 21-43S-27E	1050								FGS
LM-2776			WA-135	L-295		SE SW 22-43S-27E	600		222	1,500				ALVA MIDDLE SCHOOL	SFWMD
LM-576				L-629		NE NE 24-43S-27E	576								USGS
LM-4798			WA-33	L-914		SW SW 26-43S-27E	508	120			P&A 9/14/81				SFWMD
LM-5080			WA-289	L-913		NW SW 26-43S-27E	536	320			P&A 3/28/83				SFWMD
LM-7095				L-912		NE SW 26-43S-27E	836	650						SIMMS GROVES	USGS
LM-2086			WA-97	L-916		SE SE 27-43S-27E	536	318			P&A 4/28/82				USGS
LM-4797			WA-32	L-915		SE SE 27-43S-27E	542	131			P&A 9/18/80				SFWMD
LM-4799			WA-34	L-4850		NE NE 28-43S-27E	560	107			P&A 9/17/80				USGS
LM-2079				L-904		SE NE 34-43S-27E	772		670						USGS
LM-5335						NE SW 34-43S-27E	600	580			PERMIT # 36-00042-W	LH	AGR	ADAMS GROVES	SFWMD
LM-5043			WA-216			SE SE 13-44S-24E	687		1,091	3,600	P&A 3/16/83				SFWMD
LM-5047			WA-227	L-123		SE SE 13-44S-24E	858		1,884	5,750	P&A 9/27/82				SFWMD
LM-5879			WA-447			NE SW 13-44S-24E	938	234			P&A 4/4/85				SFWMD
LM-5075			WA-279	L-902		NE SW 15-44S-24E	760	130	748	2,140	P&A 2/10/83	SS/MH/LH			SFWMD
LM-5884			WA-423			SE SE 23-44S-24E	928	322			P&A 9/12/84				SFWMD
LM-5030			WA-188	L-95		NE NE 24-44S-24E	924	170	1,958	6,000	P&A 9/14/82	MH/LH/SU			SFWMD
LM-5102			WA-326			NW SW 24-44S-24E	515				P&A 6/28/83				SFWMD
LM-5887			WA-459	L-436		SE NE 24-44S-24E	964	150			P&A 1/28/85				SFWMD
LM-5888			WA-965	L-2232		NE NW 24-44S-24E	760	165			P&A 4/6/88				SFWMD
LM-5042			WA-215	L-2895		SW NE 25-44S-24E	778	148	522	2,150	P&A 9/21/82	MH/LH			SFWMD
LM-5889			WA-375			SW SW 25-44S-24E	908	150			P&A 6/13/84				SFWMD
LM-5099			WA-321	L-102		SW NW 26-44S-24E	672	152	628	2,950	P&A 6/22/83	SS/MH/LH			SFWMD
LM-5891			WA-405			SW SE 26-44S-24E	1008	242			P&A 6/27/84				SFWMD
LM-5892			WA-384			SE NE 26-44S-24E	693	136			P&A 6/25/84				SFWMD
LM-5894			WA-711			NW NW 26-44S-24E	634	136			P&A 4/24/87				SFWMD
LM-7634				L-470		NE NE 26-44S-24E	843	427	675	2,840		MH/LH/SU		GRESHAM	USGS
LM-5895			WA-986			NW SW 26-44S-24E	860	348							SFWMD
LM-5072			WA-276			SE SE 34-44S-24E	644	130	769	2,340	P&A 1/13/83	SS/MH/LH			SFWMD
LM-5896			WA-597			NE NE 34-44S-24E	500	246			P&A 3/31/86				SFWMD
LM-5897			WA-619			SW NW 35-44S-24E	730	158			P&A 7/14/86				SFWMD
LM-6955						NE SW 35-44S-24E	750	520			Permit # 36-00035-W	LH	ASR	CITY OF FT. MYERS ASR - WINKLER AVE.	FDEP
LM-5898			WA-545			SE NE 36-44S-24E	798	190			P&A 7/29/85				SFWMD
LM-5899			WA-2069			SW NW 36-44S-24E	1150	142			P&A 8/27/89				SFWMD
LM-5900			WA-2043			SE NE 01-44S-25E	515	98			P&A 2/6/89				SFWMD
LM-7605						SE NE 01-44S-25E	797	490	522		PERMIT # 36-01569-W	MH/LH	IRR	OASIS PALMS	SFWMD
LM-5010			WA-129	L-1318		NE SE 02-44S-25E	814	80	1,396	4,760	P&A 5/3/82	SS/MH/LH			SFWMD
LM-3447		W-9330				SW NE 03-44S-25E	1130						TEST	STRAYHORN	FGS

Attachment C - Summary of Inventoried Well Data
Fory Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS #	BOG #	FGS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	TD (ft)	CD (ft)	DIS. Cl (mg/l)	COND (umhos/cm)	COMMENTS	AQUIFER	USE	OWNER - WELL NAME	DATA SOURCE
LM-5017			WA-151	L-1345		NE SE 04-44S-25E	625		620	3,100	P&A 9/15/81				SFWMD
LM-5903			WA-502			SW SW 04-44S-25E	756	136			P&A 5/11/87				SFWMD
LM-5904			WA-603			NE SE 05-44S-25E	635	130			P&A 7/16/88				SFWMD
LM-5012			WA-136	L-773		SE SE 07-44S-25E	740	130	1,120	4,240	P&A 8/25/81	SS/MH/LH			SFWMD
LM-5107			WA-334			SW SW 08-44S-25E	550	120			P&A 8/17/83				SFWMD
LM-4983				L-4867		SE SW 09-44S-25E	505								SFWMD
LM-5906			WA-499			SW SE 09-44S-25E	627	128			P&A 3/14/85				SFWMD
LM-5907			WA-926			SW NW 09-44S-25E	624	138			P&A 1/19/88				SFWMD
LM-5908			WA-366			NW NW 10-44S-25E	700	122			P&A 8/6/84				SFWMD
LM-5910			WA-361			NE NE 11-44S-25E	1040	878			P&A 8/20/84				SFWMD
LM-7947					Well #5	C 11-44S-25E	840	460			PERMIT # 36-04601-W	LH/SUW	LAN	CYPRESS WOODS RV RESORT	SFWMD
LM-5040			WA-205			NW NE 12-44S-25E	890	190	894	3,075	P&A 7/1/82	SS/MH/LH			SFWMD
LM-5911			WA-368			SE SW 15-44S-25E	524	104			P&A 7/24/84				SFWMD
LM-2705			WA-270	L-1394		SE NW 16-44S-25E	886	128	841	3,500	P&A 4/28/83	SS/MH/LH		LM-5069	SFWMD
LM-4987			WA-70	L-1396		SW SW 16-44S-25E	857	126	748	2,900	LM-2706, P&A 4/26/83	SS/MH/LH			SFWMD
LM-4991			WA-72	L-1397		SW SE 16-44S-25E	1003		730	3,050	P&A 9/3/81				SFWMD
LM-5913			WA-470			SW NE 16-44S-25E	765	210			P&A 4/1/85				SFWMD
LM-4793			WA-28	L-191		SE NW 17-44S-25E	596	155			P&A 4/2/80				SFWMD
LM-5049			WA-229			SE NE 17-44S-25E	546	180			P&A 8/3/82				SFWMD
LM-5912			WA-543			SW NW 17-44S-25E	763	132			P&A 8/12/85				SFWMD
LM-5063			WA-260	L-2317		SW NE 18-44S-25E	702	96	905	4,140	P&A 3/3/83	SS/MH/LH			SFWMD
LM-5029			WA-187	L-59		SW SE 19-44S-25E	550				P&A 3/23/82				SFWMD
LM-7197					P-1	SE SE 20-44S-25E	1150	462	680	2,790	Backplugged to 775'	MH/LH/SU	P.S	City of Fort Myers. Permit # 36-00035-W	MI
LM-7628					P-2	NE SE 20-44S-25E	775	465	950	3,990	Permit # 36-00035-W	MH/LH/SU	P.S	City of Fort Myers.	SFWMD
LM-4969			WA-45	L-426		SW SW 21-44S-25E	518	120			P&A 8/30/83			LM-2710	SFWMD
LM-5915			WA-735			NW SW 23-44S-25E	780	153			P&A 5/21/87				SFWMD
LM-4996			WA-80	L-4894		NW SE 27-44S-25E	828	172	1,164	4,300	P&A 3/27/84	SS/MH/LH			SFWMD
LM-483			W-46	L-2292		SW NE 28-44S-25E	616	302	900	3,500		MH/LH	TEST		USGS
LM-7629					P-3	NW NW 28-44S-25E	837	510	910	3,770	Permit # 36-00035-W	LH/SU	P.S	City of Fort Myers.	SFWMD
LM-7630					P-4	SW NW 28-44S-25E	825	510	920	3,180	Permit # 36-00035-W	LH/SU	P.S	City of Fort Myers.	SFWMD
LM-7631					P-5	NW SW 28-44S-25E	832	480	880	3,530	Permit # 36-00035-W	LH/SU	P.S	City of Fort Myers.	SFWMD
LM-7632					P-6	NW SW 28-44S-25E	805	445	780	3,500	Permit # 36-00035-W	MH/LH/SU	P.S	City of Fort Myers.	SFWMD
LM-7633					P-7	SW SW 28-44S-25E	800	445	940	3,640	Permit # 36-00035-W	MH/LH/SU	P.S	City of Fort Myers.	SFWMD
LM-5916			WA-2303			NW SW 30-44S-25E	718	132			PERMIT # 36-01861-W	SS/MH/LH	IRR	Britton Lease Farm	SFWMD
LM-7948					2	SE NE 33-44S-25E	750	400			PERMIT # 36-01614-W	MH/LH	AGR	COLONIAL FARMS	SFWMD
LM-3440		W-9332				NW NE 35-44S-25E	1445						TEST	TRAVERS	FGS
LM-5000			WA-87	L-2197		NE NE 36-44S-25E	604	132	811	3,750	LM-5000, P&A 9/2/81	SS/MH/LH			SFWMD
LM-3446		W-9326				SW SE 05-44S-26E	1430							RUTLEDGE	FGS
LM-4785			WA-19	L-599		NE SW 05-44S-26E	832	95	682	2,750	P&A 9/16/81	SS/MH/LH			SFWMD
LM-4994			WA-78	L-4892		NW NE 05-44S-26E	585	162			P&A 1/28/92				SFWMD
LM-5490				L-652		NW NW 05-44S-26E	598	188							USGS
LM-4967			WA-42	L-3271		NW SE 06-44S-26E	604	96	342	2,300		SS/MH/LH			USGS
LM-5381						NW NE 06-44S-26E	715	480			PERMIT # 36-00284-W	MH/LH	AGR	KINZIE'S NURSERY	SFWMD
LM-4964			WA-35	L-1358		NE NW 07-44S-26E	742	98	755	3,000	P&A 11/30/79	SS/MH/LH			SFWMD
LM-5919			WA-703			SE SW 07-44S-26E	603	142							SFWMD
LM-6983	P-950	W-14093				NW NE 07-44S-26E	11581				P&A 10/31/78		PET TW	REYNOLDS & MASON'78 #7-1 Lehigh Consol	BOG
LM-5325						NW NW 08-44S-26E	700	100			PERMIT # 36-00015-W	SS/MH/LH	LIV	CATTLE RANCH	SFWMD
LM-5326						NW NW 08-44S-26E	700	390			PERMIT # 36-00015-W	MH/LH	LIV	CATTLE RANCH	SFWMD
LM-6984	P-1124	W-15472				NE NW 09-44S-26E	11650	1398			P&A 12/20/83		PET TW	HUGHES ENT'85 #9-2 Clark	BOG
LM-3462		W-15268	LE-028			SE SE 15-44S-26E	770							BUCKINGHAM #1, 1982	WRS
LM-5021			WA-174			NW SW 15-44S-26E	825	128	609	2,400	P&A 5/17/83	SS/MH/LH			SFWMD
LM-5037			WA-201			SE SE 15-44S-26E	650	128	502	1,950	P&A 5/18/83	SS/MH/LH			SFWMD
LM-5920			WA-707			NW SE 16-44S-26E	573	255							SFWMD
LM-6985	P-758	W-12644				SW NW 16-44S-26E	12601	3602			P&A 1/25/75		PET TW	EXXON'75 #16-2 City of Ft. Myers	BOG
LM-7949					1	SE NE 17-44S-26E	600	160			PERMIT # 36-00111-W	SS/MH/LH	AGR	BUCKINGHAM	SFWMD
LM-6986	P-847	W-13345				NW NE 18-44S-26E	11622	3600			P&A 11/16/76		PET TW	EXXON'76 #1 FL State Int. Imp, Tr. Fund	BOG
LM-4787			WA-21	L-4817		SE NE 19-44S-26E	780	195	1,122	3,900	P&A 3/19/80	SS/MH/LH			SFWMD
LM-6987	P-966	W-14307				SW NE 20-44S-26E	11450	3620			P&A 7/17/79		PET TW	EXXON'79 #1 Consol Tomoka	BOG
LM-6988	WGI-111					NW SW 21-44S-26E	3018						PET TW	FL EXPLOR'24 #2 Consol Land Co	BOG
LM-5275	P-850	W-13483		L-6461		SW SE 22-44S-26E	12464	11984			Producing Oil Well		PET TW	EXXON'74 #23-3 Consol Tomoka Land	BOG

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Fory Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS #	BOG #	FGS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	TD (ft)	CD (ft)	DIS. Cl (mg/l)	COND (umhos/cm)	COMMENTS	AQUIFER	USE	OWNER - WELL NAME	DATA SOURCE
LM-5924						SW SE 22-44S-26E	2209	1590					PET TW		BOG
LM-6989	P-712	W-12378				SW SE 22-44S-26E	11630	11630			Producing Oil Well		PET TW	EXXON'74 #22-4 Consol Tomoka Land	FGS
LM-5926	P-858	W-13713				SE SE 23-44S-26E	11834	11834			Producing Oil Well		PET TW	EXXON'77 #23-4 Consol Tomoka Land	BOG
LM-6990	P-959	W-14232				SE SE 23-44S-26E	11852	3618			P&A 4/12/79		PET TW	EXXON'79 #1 Lehigh-Consol-Tomoka	BOG
LM-6991	P-770	W-12841				NW NW 23-44S-26E	11889	3593			P&A 5/22/75		PET TW	EXXON'75 #22-1 Consol Tomoka Land	BOG
LM-3457	P-648	W-11909				SW SW 25-44S-26E	11650	3618			P&A 5/15/73		PET TW	EXXON'73 #25-3 Lehigh Acres Dev	FGS
LM-6992	P-841	W-13270				NW SW 26-44S-26E	11940	11940			Producing Oil Well		PET TW	EXXON'76 #26-2 Consol Tomoka Land	BOG
LM-5925	P-812	W-13010				NE NW 27-44S-26E	11740	3550			P&A 3/31/87		PET TW	EXXON'76 #27-2 Consol Tomoka Land	BOG
LM-6993	P-544	W-11505				NE SE 30-44S-26E	11674				P&A 3/29/72		PET TW	EXXON'72 #1 Lehigh Acres Dev	BOG
LM-5921			WA-364			SE SE 32-44S-26E	530	96			P&A 2/11/85				SFWMD
LM-646				L-659		NE SE 33-44S-26E	1340						TEST		USGS
LM-588				L-625		SE SE 09-44S-27E	540						TEST		USGS
LM-2085			WA-534	L-706		SW SE 11-44S-27E	590	140					TEST		USGS
LM-4784			WA-12	L-2460		SE SE 11-44S-27E	763	115	650	2,900	P&A 5/6/80	SS/MH/LH			SFWMD
LM-4792			WA-27	L-2458		SE SE 12-44S-27E	852	120	413	3,400	P&A 6/23/81	SS/MH/LH			SFWMD
LM-590				L-626		SE SE 13-44S-27E	500	200					TEST		USGS
LM-589			WA-532	L-660		SW NE 14-44S-27E	1260	195							USGS
LM-5922			WA-532			NE NW 14-44S-27E	768	140			P&A 6/6/86				SFWMD
LM-5036			WA-196			NE SE 15-44S-27E	701	110	387	1,850	P&A 5/18/83	SS/MH/LH			SFWMD
LM-6994	P-532	W-11228				SW NW 20-44S-27E	11650				P&A 1/22/72		PET TW	HORC'72 #20-2 Consol Oleum	BOG
LM-6995	P-1014	W-15092	W-LE025			NW NW 29-44S-27E	12548	3610			P&A 12/6/81		PET TW	EXXON'81 #29-3 Consol Tomoka	WRS
LM-7608						SE SE 35-45S-23E	780	376			PERMIT # 36-00073-W	MH/LH	IRR	Florida Investors'91	SFWMD
LM-7641				L-374		35-45S-23E	647		742						USGS
LM-1627			WA-86	L-521		NE NE 36-45S-23E	805	87	1,110	3,500		SS/MH/LH			USGS
LM-1628			WA-85	L-2657		NE SE 36-45S-23E	916	162	771	3,400	LM-1882	SS/MH/LH			SFWMD
LM-1634			WA-43	L-4839		NW SW 36-45S-23E	555	141			P&A 9/19/80				SFWMD
LM-7649				L-1259		NE SE 36-45S-23E	967		780						USGS
LM-7650				L-1260		NE SE 36-45S-23E	900		580						USGS
LM-7653				L-6133		SE NE 36-45S-23E	662	146	697		P&A 4/15/82	SS/MH/LH			USGS
LM-7654			WA-265	L-6136		NE NE 36-45S-23E	720	140	988	3,600	P&A 3/1/83	SS/MH/LH			USGS
LM-7013			WA-60	L-4870		NE NE 02-45S-24E	796	172	1,369	4,500		SS/MH/LH			USGS
LM-7033			WA-62			SE NW 02-45S-24E	849	150	713	3,000	P&A 7/23/81	SS/MH/LH			SFWMD
LM-7664			WA-210			SE NE 02-45S-24E	775	130	751	2,750	P&A 5/24/82	SS/MH/LH			
LM-7014			WA-47	L-4840		NW SE 03-45S-24E	710	130	611	2,400		SS/MH/LH			USGS
LM-7034			WA-98	L-4901		SE SW 03-45S-24E	920	114	902	3,440	P&A 6/22/82	SS/MH/LH			SFWMD
LM-7642			WA-272			NE NE 03-45S-24E	705	140	880	2,310	P&A 1/24/83	SS/MH/LH			SFWMD
LM-7035			WA-594			SE 09-45S-24E	736	156				SS/MH/LH			SFWMD
LM-7639				L-366		09-45S-24E	600		910						USGS
LM-7036			WA-587			10-45S-24E	871	120				SS/MH/LH			SFWMD
LM-7037			WA-588			10-45S-24E	803	302							SFWMD
LM-7637			WA-642	L-5613		SW NE 10-45S-24E	760	750	730	2,180		SUW			USGS
LM-7016				L-1471		SW NW 11-45S-24E	960	735	700	2,700		SUW			USGS
LM-7038			WA-274	L-2438		NW SW 11-45S-24E	860	140	757	2,510	P&A 1/6/83	SS/MH/LH			SFWMD
LM-7017				L-1445		12-45S-24E	740								USGS
LM-7039	P-208	W-3368				NW NW 13-45S-24E	5612				P&A 9/9/54		PET TW	SUNNILAND CONT. CO.'54 #1 Walton	BOG
LM-7616						SE NW 14-45S-24E	600	300			Permit # 36-00693-W	MH/LH	IRR	Forestwood Apartments	SFWMD
LM-7617						SW NE 14-45S-24E	600	320			Permit # 36-00693-W	MH/LH	IRR	Forestwood Apartments	SFWMD
LM-7618						SW SE 14-45S-24E	620	480			Permit # 36-02095-W	MH/LH	IRR	World Plaza 11	SFWMD
LM-7626						NE SW 14-45S-24E	600	320			Permit # 36-02989-W	MH/LH	IRR	Linden Place Professional Center	SFWMD
LM-7041		W-9327				NW NW 15-45S-24E	1360						PET TW	HORC #1 Sanders	FGS
LM-7647				L-967		15-45S-24E	861	119	1,250			SS/MH/LH			USGS
LM-7950					2	SE NE 15-45S-24E	640	260			Permit # 36-03783-W	MH/LH	LAN	Whiskey Creek Medians	SFWMD
LM-1262				L-1719		NE NW 16-45S-24E	600	128	11,400	30,000	P&A 12/5/78	SS/MH/LH			USGS
LM-1264				L-446		SW NE 16-45S-24E	770	166	7,960	21,700	P&A 12/78	SS/MH/LH			USGS
LM-1265				L-968		NE NE 16-45S-24E	790	120	7,700	23,200	P&A 12/78	SS/MH/LH			USGS
LM-1669						SW SW 16-45S-24E	690	630			PERMIT # 36-00138-W	LH	LAN	LANDINGS YATCH GOLF & TENNIS CLUB	SFWMD
LM-7019				L-3261		16-45S-24E	700		7,250	21,300					USGS
LM-7031				L-979		NE SW 16-45S-24E	1350		14,300		P&A 10/70			CALUSA BAY VIEW'69	USGS
LM-7042			WA-57	L-4864		NE NE 16-45S-24E	920	138	720	2,900	P&A 9/23/80	SS/MH/LH			SFWMD
LM-7640				L-367		NE NE 16-45S-24E	1106	120	1,300	3,000	P&A 10/15/69	SS/MH/LH			USGS

Attachment C - Summary of Inventoried Well Data
Fory Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS #	BOG #	FGS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	TD (ft)	CD (ft)	DIS. Cl (mg/l)	COND (umhos/cm)	COMMENTS	AQUIFER	USE	OWNER - WELL NAME	DATA SOURCE
LM-7645				L-820		NW SE 16-45S-24E	600		2,900	10,000					USGS
LM-7646				L-821		NE NE 16-45S-24E	997		720						USGS
LM-7651				L-2355		NE NE 16-45S-24E	600	300	400			MH/LH			USGS
LM-1529				L-966		SE SE 17-45S-24E	686	615	830			LH			WRS
LM-1562				L-3000D		SE SE 17-45S-24E	1200	595	800			LH/SUW	IRR	LITH LOG W-LE018	USGS
LM-1629			WA-46	L-5618		SE SE 17-45S-24E	627	160	4,128	12,600		SS/MH/LH			SFWMD
LM-7652				L-4858		20-45S-24E	800	600	840	3,700	P&A 1981	LH			USGS
LM-1440				L-2115		NW NW 21-45S-24E	614	592	720	2,970	PERMIT # 36-00138-W	LH	LAN	LANDINGS YATCH GOLF & TENNIS CLUB	SFWMD
LM-1630			WA-88			NW NE 21-45S-24E	938	148	731	2,295	P&A 8/10/82	SS/MH/LH			SFWMD
LM-594				L-1179		NW SW 21-45S-24E	693	130	1,200		P&A 6/14/73	SS/MH/LH			USGS
LM-7648				L-1162		SW NW 21-45S-24E	600	129	1,350		P&A 12/22/70	SS/MH/LH			USGS
LM-7044			WA-426			SW SE 22-45S-24E	504	147			P&A 8/15/84				SFWMD
LM-7045			WA-111	L-1715		NE NE 22-45S-24E	901	135	3,679	9,600	P&A 7/1/81	SS/MH/LH			SFWMD
LM-7655			WA-2	L-1728		NW NE 22-45S-24E	630	125	4,359		P&A 4/15/80	SS/MH/LH			SFWMD
LM-3453		W-10739				SE NW 23-45S-24E	930							SEVEN LAKES	FGS
LM-7023			WA-255	L-1157		NE SE 23-45S-24E	740	589	1,174	5,050		LH			SFWMD
LM-7051	P-161	W-3073		L-1084		NW NW 23-45S-24E	12877	150	1,200	3,500	P&A 1/5/83		PET TW	HORC'53 Kirchkoff Tretux #1	BOG
LM-7615						SW NE 23-45S-24E	605	260			Permit # 36-00088-W	MH/LH	IRR	Seven Lakes Golf Course	SFWMD
LM-7669			WA-322	L-1083		NW NW 23-45S-24E	614		669	3,050	P&A 6/21/83				SFWMD
LM-7666			WA-241			SW NW 24-45S-24E	912	150	944	3,775	P&A 1/5/83	SS/MH/LH			SFWMD
LM-7643				L-554		26-45S-24E	750		795						USGS
LM-1902				L-1264		SE SW 27-45S-24E	944	148	495		P&A 7/14/82	SS/MH/LH			USGS
LM-1905			WA-171	L-1263		SW SW 27-45S-24E	959	108	601	2,600	P&A 5/11/82	SS/MH/LH			SFWMD
LM-2606						SW NE 27-45S-24E	600	320	850		PERMIT 36-04405-W	MH/LH	GOL	CYPRESS LAKES COUNTRY CLUB	SFWMD
LM-7002			WA-224	L-1264		SE SW 27-45S-24E	944	148	453	1,900	P&A 3/14/83	SS/MH/LH			SFWMD
LM-1829			WA-222	L-1268		NE NE 28-45S-24E	660	132	857	3,050	P&A 7/8/85	SS/MH/LH	IRR		SFWMD
LM-1895				L-1269		NE SW 28-45S-24E	919		660						USGS
LM-1901				L-1267		NW NW 28-45S-24E	855		560						USGS
LM-1906				L-977		NE SE 28-45S-24E	1042	128	800	2,500		SS/MH/UFA	PET TW		USGS
LM-1908				L-457		NE SE 28-45S-24E	697	170	680			SS/MH/LH			USGS
LM-7665			WA-223			SE SE 28-45S-24E	1080	120	620	2,400		SS/MH/UFA			SFWMD
LM-1631			WA-73	L-4868		NE NE 29-45S-24E	874	125	751	3,200		SS/MH/UFA			USGS
LM-1632			WA-101	L-3267		NE SE 29-45S-24E	870	190	790	3,400		SS/MH/UFA			SFWMD
LM-2235						NE NE 31-45S-24E	880	150	660			SS/MH/UFA	IRR		WRS
LM-7026			WA-2176	L-5696		SW SE 31-45S-24E	905	385	840	3,400	Permit # 36-00052-W	MH/LH/SU	IRR	Black Diamond Potato Farm	USGS
LM-7043			LE-31			SW NE 31-45S-24E	4900						PET TW	HORC'53	FGS
LM-7046			WA-300			NW NE 31-45S-24E	905	110	864	3,450		SS/MH/UFA			SFWMD
LM-7658			WA-153			SW NE 31-45S-24E	831	148	480	2,850	P&A 9/25/81	SS/MH/UFA			SFWMD
LM-7667			WA-301			SW NE 31-45S-24E	888	150	818	3,325		SS/MH/UFA			SFWMD
LM-1633			WA-84	L-357		SW SW 32-45S-24E	759	122	767	3,440		SS/MH/UFA			SFWMD
LM-1909				L-532		NE NE 33-45S-24E	720		625		P&A 7/19/82				USGS
LM-1910				L-534		NE NE 33-45S-24E	1140	170	565			SS/MH/UFA			USGS
LM-1912			WA-185	L-568		SE NW 33-45S-24E	1106	168	1,040	3,750	P&A 6/24/82	SS/MH/UFA			SFWMD
LM-3435		W-9309				SE NW 33-45S-24E	1360						TEST	HORC #1 Broughon	FGS
LM-7610			WA-2167			C SE 33-45S-24E	950				Permit # 36-00054-W		IRR	Black Diamond Potato Farm	SFWMD
LM-7611			WA-2168			SE NE 33-45S-24E	950				Permit # 36-00054-W		IRR	Black Diamond Potato Farm	SFWMD
LM-7612						SW NE 33-45S-24E	804	400			Permit # 36-00054-W		IRR	Black Diamond Potato Farm	SFWMD
LM-7613						NE SE 33-45S-24E	900	400			Permit # 36-00054-W		IRR	Black Diamond Potato Farm	SFWMD
LM-7614						SE NE 33-45S-24E	800	400			Permit # 36-00054-W		IRR	Black Diamond Potato Farm	SFWMD
LM-7659			WA-162			NE NW 33-45S-24E	1108	188	701	2,260	P&A 6/23/82	SS/MH/UFA			SFWMD
LM-1913				L-556		NW SW 34-45S-24E	800	122	821	2,290	P&A 2/24/83	SS/MH/UFA			USGS
LM-7047			WA-448			NW NE 32-45S-24E	596	134			P&A 1/14/85				SFWMD
LM-7052			WA-156	L-6116		SW NW 34-45S-24E	1132	142	680	3,080	P&A 3/15/83	SS/MH/UFA			SFWMD
LM-7053			WA-433			NE NW 34-45S-24E	928	124			P&A 8/27/84				SFWMD
LM-7054			WA-456			NW SE 35-45S-24E	713	140			P&A 1/8/85				SFWMD
LM-7638			WA-226	L-332		NE NE 35-45S-24E	900		880						USGS
LM-6963			WA-363	L-335		SE NW 36-45S-24E	631	148			P&A 8/20/84				SFWMD
LM-7644				L-758		36-45S-24E	600	140	625	1,500	P&A 1978	SS/MH/LH			USGS
LM-7201		W-9355				NW SW 05-45S-25E	1558						TEST	HUMBLE OIL CO. (HORC CI #1)	FGS
LM-867			WA-2055	L-2003		NE NE 07-45S-25E	685	240	1,300	4,650		MH/LH			USGS

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Fory Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS #	BOG #	FGS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	TD (ft)	CD (ft)	DIS. Cl (mg/l)	COND (umhos/cm)	COMMENTS	AQUIFER	USE	OWNER - WELL NAME	DATA SOURCE
LM-3438		W-9328				SE SW 15-45S-25E	1290						TEST	HORC #1 Smith	FGS
LM-732				L-736		NE NW 15-45S-25E	880	152	930	1,600		SS/MH/UFA			USGS
LM-7058			WA-370			16-45S-25E	760	170			P&A 5/4/84				SFWMD
LM-3439		W-9331				NW SE 18-45S-25E	1240						TEST	HORC #1 Travis	FGS
LM-7623						NW NW 18-45S-25E	600	300			Permit # 36-02506-W	MH/LH	IRR	Metropolitan Commercial Park	SFWMD
LM-7060			WA-2152			NE SW 19-45S-25E	825	160			P&A 8/21/89				SFWMD
LM-7061			WA-636			19-45S-25E	840	138			P&A 6/19/86				SFWMD
LM-7069			WA-949			NW SW 19-45S-25E	525	146			P&A 7/5/88				SFWMD
LM-7621						SE NE 19-45S-25E	660	330			Permit # 36-00660-W	MH/LH	IRR	Brookshire Bath & Tennis Club	SFWMD
LM-7624						NE SE 19-45S-25E	660	280			Permit # 36-02846-W	MH/LH	IRR	Daniels Crossing	SFWMD
LM-7951					W1-1	C NE 19-45S-25E	600	300			Permit # 36-02994-W	MH/LH	LAN	BROOKSHIRE VILLAGE I	SFWMD
LM-7952					W2-1	NE NE 19-45S-25E	600	300			Permit # 36-02995-W	MH/LH	LAN	HEATHER RIDGE II OF BROOKSHIRE	SFWMD
LM-450			WA-118	L-2293		SW NW 20-45S-25E	635	330	800	3,110	P&A 3/18/81	MH/LH			SFWMD
LM-7620						SW NE 20-45S-25E	680	248			Permit # 36-00622-W	MH/LH	IRR	Cross Creek Country Club	SFWMD
LM-3437		W-9313				SW SW 21-45S-25E	1205						TEST	HORC #1 Ft. Myers Land Co.	FGS
LM-7062			WA-2044			21-45S-25E	749	115							SFWMD
LM-7656			WA-9	L-4861		SE NE 21-45S-25E	800		966		P&A 7/12/83				SFWMD
LM-7064			LE-26			SE NW 22-45S-25E	748						TEST	L. BETTS	FGS
LM-729			WA-341	L-719		NE SW 22-45S-25E	798	174	838	2,210	P&A 8/28/84	SS/MH/LH			SFWMD
LM-743			WA-333	L-755		SW NE 22-45S-25E	748	133	916	3,060	P&A 8/15/83	SS/MH/LH			SFWMD
LM-7066			WA-454	L-2022		NW SW 23-45S-25E	753	134			P&A 5/19/86				SFWMD
LM-7126			WA-2202			NE SW 28-45S-25E	1302	754							SFWMD
LM-7625						SW SE 28-45S-25E	625	450			Permit # 36-03145-W	MH/LH	IRR	Thomas Property Golf Course	SFWMD
LM-7067	P-685	W-12272				S/2 NE 29-45S-25E	11810				P&A 2/28/74		PET TW	TRIBAL'74 #29-1 Osborne	BOG
LM-7068			WA-760			30-45S-25E	907	128				F-464			SFWMD
LM-7188		W-9329				SW NE 30-45S-25E	1281				W.A. Smith		CORE	Humble Oil & Ref Comp Core Test #1	BOG
LM-7622						NE NE 32-45S-25E	600	295			Permit # 36-1902-W		IRR	Glenn Abey	SFWMD
LM-1841				L-5641		SE NE 33-45S-25E	1410	950	1,060			SU/OCA	TEST		USGS
LM-1842				L-5801		SE NE 33-45S-25E	635	450	1,160	4,380		LH			USGS
LM-3436		W-9310				SW NW 35-45S-25E	1126						TEST	HORC	FGS
LM-7071	P-527	W-11227				NE NE 02-45S-26E	11712	1388			P&A 12/10/71		PET TW	EXXON'71 #2-1 Lehigh Acres Dev.	BOG
LM-7189		W-9357				NE 09-45S-26E	1290				Consololidated Navel Stores		CORE	Humble Oil & Ref Comp Core Test #2	BOG
LM-7072	WGI-112					NW SW 10-45S-26E	2191						TEST	FLORIDA EXPLOR. SYNDICATE'23 #1 Consol.	BOG
LM-7073	P-684	W-12273				C NE 14-45S-26E	11740	3006			P&A 11/21/73		PET TW	TRIBAL'73 #14-1 Lehigh Acres Dev.	BOG
LM-7668			WA-306			NE NW 19-45S-26E	785	166	741	2,060	P&A 7/11/83	SS/MH/LH			SFWMD
LM-7074			WA-2008			21-45S-26E	637	145							SFWMD
LM-3041	P-250	W-4165				SW SW 22-45S-26E	11800	5024			P&A 11/04/56		PET TW	GULF'56 #2 Consol. Naval Stores	BOG
LM-3040	P-160	W-2979	LE-30			NE NE 27-45S-26E	12865	5012			P&A 9/26/53		PET TW	GULF'53 #1 Consol. Naval Stores	BOG
LM-7028	P-930	W-13848				SW SE 29-45S-26E	11827	3864			P&A 2/17/78		PET TW	EXXON'78 #29-4 Sanders	BOG
LM-7029	P-979	W-14348	W-LE023			SE NE 34-45S-26E	11802	3812			P&A 9/18/80		PET TW	NRM'79 #34-1 Chapman	BOG
LM-7049	P-747	W-12611				SE NE 04-45S-27E	12760				P&A 1/20/75		PET TW	EXXON'75 #4-4 Lehigh Acres Dev.	BOG
LM-7055			WA-25	L-1688		NE NE 05-45S-27E	966	125	402	3,300	P&A 7/23/80	SS			SFWMD
LM-7056			WA-13	L-2457		SE NE 05-45S-27E	510	100			P&A 5/5/80				SFWMD
LM-3448		W-9340				SE NW 06-45S-27E	1500		1,200	4,630				HORC #1 Lamb	FGS
LM-7057	P-425	W-10600				C NW 08-45S-27E	11725	3617			P&A 8/15/70		PET TW	EXXON'70 #8-2 Lehigh Consol. Unit	BOG
LM-7070	P-817	W-13348				SE SE 10-45S-27E	11567	3611			P&A 6/17/76		PET TW	EXXON'76 #10-4 Consol. Tomoka	BOG
LM-7063	P-892	W-13714				NW NW 13-45S-27E	11820	3596			P&A 7/31/77, BHL: SW SW 12		PET TW	EXXON'77 #12-3 Lehigh Corp.	BOG
LM-7077	P-1132	W-15560				NE SE 13-45S-27E	12495	12495			BHL: NW NW, Producing Oil Well		PET TW	EXXON'84 #13-5 Consol. Tomoka	BOG
LM-7078	P-407	W-10566				NE SE 14-45S-27E	15710	12754						HORC'69 #1 Lehigh Acres Dev.	FGS
LM-986				L-2311		NW SE 15-45S-27E	625	300					TEST		USGS
LM-7079	P-749	W-12982				NE NE 23-45S-27E	11556	11556			Producing Oil Well		PET TW	EXXON'75 #23-1 CTLC	BOG
LM-7080	P-645					NE NE 24-45S-27E	3640	1325			J&A in Boulder Zone		PET TW	EXXON'73 #24-1 Lehigh Acres Dev.	BOG
LM-7082	P-715	W-12230				NE NE 24-45S-27E	11927				P&A 5/20/74		PET TW	EXXON'73 #24 LEHIGH ACRES	BOG
LM-7083	P-422	W-10478				NE NE 26-45S-27E	11785	2611			P&A 6/24/70		PET TW	EXXON'70 #26-1 Lee Cypress A-1	BOG
LM-7084	P-786	W-12843				NW NW 26-45S-27E	12100	1348			P&A 7/18/75, BHL: NW NE 27		PET TW	EXXON'75 #27-1 Lehigh Consol. Tomoka	WRS
LM-7085	P-744	W-12612				NE NE 26-45S-27E	1780				P&A 06/07/88		PET TW	EXXON'74 #24-3 L.H ACRES	BOG
LM-618				L-618		SW SE 27-45S-27E	600						TEST		USGS
LM-7180			LE-29			NW SE 28-45S-27E	900								FGS
LM-795				L-2061		NW SE 28-45S-27E	885	340	1,150			MH/LH	IRR		USGS
LM-7086						31-45S-27E	11800				Producing Oil Well		PET TW	HUMBLE'70 #1 Lehigh Acres Dev.	BOG

Attachment C - Summary of Inventoried Well Data
Fory Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS #	BOG #	FGS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	TD (ft)	CD (ft)	DIS. Cl (mg/l)	COND (umhos/cm)	COMMENTS	AQUIFER	USE	OWNER - WELL NAME	DATA SOURCE
LM-617				L-619		SE NE 32-45S-27E	530						TEST		USGS
LM-7087	P-1165	W-15756				SE NE 32-45S-27E	11800	3712			P&A 5/19/85		PET TW	EXXON'85 #32-1 Kaplan Trustee	BOG
LM-797			W-LE001	L-2063		SW SE 35-45S-27E	1340	1140	2,000			OCA	IRR		USGS
LM-7953					W-9	NE NE 01-46S-23E	600	280			PERMIT # 36-00455-W	MH/LH	LAN	KELLY GREENS	SFWMD
LM-7954					W-12	NE NE 01-46S-23E	685	300			PERMIT # 36-00455-W	MH/LH	LAN	KELLY GREENS	SFWMD
LM-7955					W-14	NW SE 01-46S-23E	600	300			PERMIT # 36-00455-W	MH/LH	LAN	KELLY GREENS	SFWMD
LM-7956					W-15	SE NE 01-46S-23E	580	300			PERMIT # 36-00455-W	MH/LH	LAN	KELLY GREENS	SFWMD
LM-7957					W-16	SW NE 01-46S-23E	560	300			PERMIT # 36-00455-W	MH/LH	LAN	KELLY GREENS	SFWMD
LM-1635			WA-18	L-3295		NW SE 02-46S-23E	550	130							USGS
LM-6813						NE NE 02-46S-23E	616	132	800		Unused Agr Well	SS/MH/LH		Bayside Apts	WRS
LM-7097			WA-359			NE SE 02-46S-23E	670	130			P&A 8/7/84				SFWMD
LM-7098			WA-950			NW NW 02-46S-23E	955	138			P&A 8/22/88				SFWMD
LM-7608						NE NE 02-46S-23E	780	376			PERMIT # 36-00073-W	MH/LH	AGR	Florida Investors'91/A / W BULB INC	SFWMD
LM-7609						NE NE 02-46S-23E	680	360			PERMIT # 36-04449-W	MH/LH	AGR	Florida Investors'91/A / COLONIAL SHORES	SFWMD
LM-7660			WA-193			NW NW 02-46S-23E	824	164	870	3,150		SS/MH/LH			SFWMD
LM-7958					W1	SW NW 02-46S-23E	620	280			PERMIT # 36-03730-W	MH/LH	LAN	SHELL POINT	SFWMD
LM-7105			WA-133	L-550		SW SW 03-46S-24E	883	140	827	3,830	P&A 6/14/90	SS/MH/LH			SFWMD
LM-7106			WA-460			SW SW 03-46S-24E	904				P&A 1/30/85				SFWMD
LM-7190		W-9316	F-149			NE SW 03-46S-24E	1520				Geraci		CORE	Humble Oil & Ref Comp Core Test #1-A	BOG
LM-7959					Well 2	NE NE 03-46S-23E	640	290			PERMIT # 36-03730-W	MH/LH	LAN	SHELL POINT	SFWMD
LM-7960					Well 3	NW NW 11-46S-23E	580	280			PERMIT # 36-03730-W	MH/LH	LAN	SHELL POINT	SFWMD
LM-7961					WELL 1	SW NW 01-46S-24E	840	350			PERMIT # 36-00857-W	MH/LH	LAN	FAIRWAY WOODS	SFWMD
LM-7108			WA-464	L-562		NE SW 04-46S-24E	863	698	635		P&A 1/15/85	LH/SU			SFWMD
LM-7962					WELL 2	NE SE 04-46S-24E	883	140			PERMIT # 36-00720-W	SS/MH/LH	AGR	RICHARD S SHORE FARM	SFWMD
LM-7111			WA-122	L-5620		NW NW 06-46S-24E	660	194			P&A 3/15/85				SFWMD
LM-7112			WA-434			NE SE 06-46S-24E	983	181			P&A 8/29/84				SFWMD
LM-7661			WA-198	L-4844		SW NE 06-46S-24E	667		947	3,000	P&A 5/05/82				SFWMD
LM-7663			WA-208	L-558		NW SW 06-46S-24E	950	150	2,762	8,000	P&A 5/26/82	SS/MH/UFA			SFWMD
LM-7110			WA-157			NE NE 07-46S-24E	734	130	1,673	6,000	P&A 1/19/82	SS/MH/LH			SFWMD
LM-7113			W-45	L-2529		SW NE 07-46S-24E	545	304							USGS
LM-7114			WA-48	L-4841		NE NE 07-46S-24E	706	155	1,002	3,750	P&A 5/5/82	SS/MH/LH			SFWMD
LM-7657			WA-49	L-4842		SE NE 07-46S-24E	630	132	1,905	7,000	P&A 9/24/81	SS/MH/LH			SFWMD
LM-7662			WA-203			NE NW 07-46S-24E	881	136	1,805	5,500	P&A 5/6/82	SS/MH/UFA			SFWMD
LM-6967						NW NW 08-46S-24E	3036	2370					INJ	FT. MYERS BEACH IW	FDEP
LM-7107			WA-451			NW NE 09-46S-24E	615	142			P&A 5/13/88				SFWMD
LM-7115			WA-132			SE NE 09-46S-24E	758	142	970	4,000	P&A 6/14/90	SS/MH/LH			SFWMD
LM-7116			WA-389			NE SE 09-46S-24E	615	134			P&A 7/10/84				SFWMD
LM-7099			WA-259	L-552		SW NW 10-46S-24E	740	146	863	3,750	P&A 11/16/82	SS/MH/LH			SFWMD
LM-7118			WA-442			NE SW 10-46S-24E	790	120							SFWMD
LM-7119			WA-374			SE NW 10-46S-24E	842	138			P&A 8/26/86				SFWMD
LM-7963					WELL 3	NW NW 10-46S-24E	758	142			PERMIT # 36-00720-W	SS/MH/LH	AGR	RICHARD S SHORE FARM	SFWMD
LM-7964					WELL 4	NE NW 10-46S-24E	790	120			PERMIT # 36-00720-W	SS/MH/LH	AGR	RICHARD S SHORE FARM	SFWMD
LM-3445		W-9320				NW SW 12-46S-24E	1692								FGS
LM-7965					TV-1	NE NE 12-46S-24E	704	310			PERMIT # 36-00882-W	MH/LH	LAN	TERRAVERDE COUNTRY CLUB	SFWMD
LM-7966					TV-2	NE NE 12-46S-24E	655	320			PERMIT # 36-00882-W	MH/LH	LAN	TERRAVERDE COUNTRY CLUB	SFWMD
LM-7967					TV-3	SE NE 12-46S-24E	645	325			PERMIT # 36-00882-W	MH/LH	LAN	TERRAVERDE COUNTRY CLUB	SFWMD
LM-7124			WA-515	L-4875		SW NE 16-46S-25E	759	184			P&A 6/25/85				SFWMD
LM-7125			WA-516	L-4876		SW NE 16-46S-25E	700	167			P&A 6/25/85				SFWMD
LM-7127			WA-931			17-46S-25E	1009	508			P&A 2/16/88				SFWMD
LM-7968					1	NW NW 17-46S-25E	1000	750			PERMIT # 36-00918-W	SUW	LAN	SAN CARLOS INN	SFWMD
LM-7191		W-9317				SW SW 20-46S-25E	1317				B.R. Green		CORE	Humble Oil & Ref Comp Core Test #1	BOG
LM-7969					LHW-1	NE NE 21-46S-25E	600	340			PERMIT # 36-04259-W	MH/LH	LAN	WYNNEWOOD IRRIGATION	SFWMD
LM-623				L-636		NE NE 25-46S-25E	1405						TEST		USGS
LM-7733						NE SE 25-46S-25E	948	580	940		Bckplgd to 646'	LH	TEST	Pinewoods WTP. Exp. Well	WRS
LM-2381			WA-105	L-5608		NE SW 27-46S-25E	828	198	1,195	4,060		SS/MH/UFA			SFWMD
LM-2386			WA-114	L-5615		NW SE 27-46S-25E	750	132	1,023	3,590	P&A 4/5/83	SS/MH/LH			SFWMD
LM-7128			WA-104	L-3001D		SW SW 27-46S-25E	818	181	1,468	4,930	P&A 7/14/82	SS/MH/UFA			SFWMD
LM-7129		LE-01				NW NE 27-46S-25E	814								FGS
LM-7198			LHW-1			NE NE 27-46S-25E	600	320			PERMIT # 36-03911-W	MH/LH	LAN	Test Production Well	SFWMD
LM-763				L-635		SW NE 27-46S-25E	1405						TEST		USGS

Attachment C - Summary of Inventoried Well Data
Fory Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS #	BOG #	FGS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	TD (ft)	CD (ft)	DIS. Cl (mg/l)	COND (umhos/cm)	COMMENTS	AQUIFER	USE	OWNER - WELL NAME	DATA SOURCE
LM-7130			WA-2265			28-46S-25E	820	200			P&A 9/10/90				SFWMD
LM-759			WA-383	L-340		SW SE 28-46S-25E	946	170			P&A 4/17/84		IRR		USGS
LM-3258		W-16523		L-6401		NW NW 33-46S-25E	822							90 #1 Koreshan	FGS
LM-983			W-44	L-2295		NE NW 33-46S-25E	610	300	340	1,890		MH/LH	TEST		USGS
LM-2390			WA-167			SW SE 34-46S-25E	709	175	986	4,000	P&A 3/2/82	SS/MH/LH			SFWMD
LM-2393			WA-386			NW NW 34-46S-25E	809	180	1,195	4,580	P&A 5/16/84	SS/MH/UFA			SFWMD
LM-7132			WA-319			NW SW 35-46S-25E	758	260	1,128	4,058	P&A 6/29/83	SS/MH/LH			SFWMD
LM-7133	P-919	W-13851				W/2 NE 11-46S-26E	11890	3868			P&A 1/7/78		PET TW	R.L. BURNS'78 #11-1 Chapman-Consol Tomoka	BOG
LM-7135			LE-39			SE SW 16-46S-26E	1550							ALICO'82	FGS
LM-3318	P-1068	W-15285		L-6463		NW SE 17-46S-26E	11918	3840			P&A 1/6/83		PET TW	NRM'83 #17-4 Alico (Sancee)	BOG
LM-625			W-19	L-2183		SE NW 21-46S-26E	513						TEST		USGS
LM-626				L-634		SE SE 21-46S-26E	1418	200	920			MH/LH/UFA	TEST		USGS
LM-3982						NE NW 22-46S-26E	719	340			MW-A		ASR	LEE COUNTY UTILS ASR - CORKSCREW	WRS
LM-7138			WA-584	L-2319		NW SE 22-46S-26E	750	414			P&A 6/10/86				SFWMD
LM-7192		W-9356				SW 23-46S-26E	1330				Consol Naval Stores		CORE	Humble oil & Ref Comp Core Test #3	BOG
LM-7970					PW-2	NE NE 24-46S-26E	800	483			PERMIT # 36-04578-W	MH/LH	GOL	CORKSCREW LINKS PROPERTY	SFWMD
LM-7738					LHW-1	SW NW 30-46S-26E	705	360			PERMIT # 36-01871-W	LH	LAN	GRANDE OAK	SFWMD
LM-3317	P-851	W-13449	LE-38	L-6462		NW NE 35-46S-26E	11927	3608			P&A 12/10/76		PET TW	TOTAL LEONARD'76 #35-1 Florida Farms	BOG
LM-7143	P-625					C NE 02-46S-27E	11814	3635			P&A 1/18/73		PET TW	TRIBAL'73 #2-1 Consol. Naval Stores	BOG
LM-7144	P-720	W-12261				SW NW 06-46S-27E	11816	3558			P&A 4/23/74		PET TW	WATSON OIL'74 #6-2 Lee Investment Co.	BOG
LM-688				L-996		NE NE 07-46S-27E	735						TEST		USGS
LM-7146	P-271	W-4839	LE-33A	L-5009		NE NW 16-46S-27E	11898	4308			P&A 12/7/58		PET TW	HORC' 58 #16-2 Consol. Naval Stores	BOG
LM-7147				L-2513		NE NE 25-46S-27E	670	400							USGS
LM-7193		W-9322				NW 27-46S-27E	1260				Lee Land Company		CORE	Humble Oil & Ref Comp Core Test #2	BOG
LM-7194		W-9323				SW SW 31-46S-27E	1200				Lee Land Company		CORE	Humble Oil & Ref Comp Core Test #3	BOG
LM-7195		W-9321				SE SE 36-46S-27E	1020				Lee Land Company		CORE	Humble Oil & Ref Comp Core Test #1	BOG
LM-7148	P-408	W-8745				E/2 NE 35-46S-27E	11960	11960			P&A 9/13/69		PET TW	MOBIL'69 #1 Sanders	BOG
LM-7158				L-1634		SE SW 03-47S-24E	950	740						BEACH GOLF COURSE	USGS
LM-7159				L-1635		SE NW 03-47S-24E	620	360							USGS
LM-7604					LH-1	NE SW 02-47S-25E	775	375			PERMIT # 36-03331-W	MH/LH	GOL	THE BROOKS OF BONITA SPRINGS	SFWMD
LM-786			WA-143	L-1569		SW SW 04-47S-25E	809	294	777	3,900		MH/LH/UFA	IRR		SFWMD
LM-7971					11	NW SW 04-47S-25E	700	360			PERMIT # 36-03130-W	MH/LH	LAN	FOUNTAIN LAKES	SFWMD
LM-7627					22	NW SE 08-47S-25E	640	340			PERMIT # 36-03745-W	MH/LH	GOL	PELICAN COLONY	SFWMD
LM-7972					LH2	NE SW 10-47S-25E	750	400			PERMIT # 36-03331-W	MH/LH	GOL	THE BROOKS OF BONITA SPRINGS	SFWMD
LM-7936					Well 30	SW SE 13-47S-25E	1140	900	1,500	5,800	Backplugged to 1120'	LH/SU	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
LM-7941					TB-2	SW SW 13-47S-25E	1000				P&A		TEST	BSU RO WELLFIELD TB-2	CH2MHILL
LM-6958						NE NE 14-47S-25E	721	659					MONITOR	BSU RO WELLFIELD	FDEP
LM-6959					Well 32	NE NE 14-47S-25E	701	650			Former San Carlos ASR	LH	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
LM-7937					Well 31	NE NE 14-47S-25E	843	660	1,380	5,150		LH	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
LM-7939					ROMW-2	NW SE 14-47S-25E	900	550				LH/SU	MONITOR	BSU RO WELLFIELD MONITOR WELL 2	CH2MHILL
LM-1980						SE SE 17-47S-25E	1306		960				IRR	PELICAN LANDING	WRS
LM-1980A						SE SE 17-47S-25E	660	350	960		PERMIT # 36-00433	MH/LH	IRR	PELICAN LANDING	WRS
LM-2041						SE SE 17-47S-25E	620	360					MONITOR	PELICAN LANDING	WRS
LM-3049						SE 17-47S-25E	660	336			PERMIT # 36-00433	MH/LH	GOL	PELICAN NEST GOLF COURSE	WRS
LM-7942					TB-4	SE NE 23-47S-25E	1010				P&A		TEST	BSU RO WELLFIELD TB-4	CH2MHILL
LM-7935					Well 29	NE NE 24-47S-25E	1063	841	1,150	5,560		LH/SU	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
LM-7938					ROMW-1	SE NW 24-47S-25E	1080					LH/SU	MONITOR	BSU RO WELLFIELD MONITOR WELL 1	CH2MHILL
LM-7940					TB-1	SE NE 25-47S-25E	922				P&A		TEST	BSU RO WELLFIELD TB-1	CH2MHILL
LM-7931					Well 25	NE NE 36-47S-25E	1040	816	1,624	6,300		LH/SU	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
LM-7173		W-9324		L-6413		SW NW 13-47S-26E	1460						TEST		FGS
LM-7932					Well 26	SW SW 19-47S-26E	1063	835	1,650	6,800		LH/SU	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
LM-7933					Well 27	NW SW 19-47S-26E	1200	815			Backplugged to 1080'	LH/SU	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
LM-7934					Well 28	SW NW 19-47S-26E	1101	805	1,200	4,500	Backplugged to 1080'	LH/SU	P.S	Permit 36-04062-W. BSU RO WELLFIELD	CH2MHILL
CO-2695	P-1030	W-14891				NE NE 01-47S-27E	11858	3820			BHL SW NE; P&A 4/9/81		PET TW	NRM'81 #1-1 Audubon Society	BOG

Attachment D - Summary of Tops of Geologic Units in Inventoried Wells
Fort Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS NUMBER	BOG #	[illegible]S #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	FL Planar X83	FL Planar Y83	Datum ft (NGVD)	To[illegible] Depth (ft)	Cased Depth (ft)	Hol/Pleist-Pinec. Ls Thickness	Bonita Springs Top	Ochopee Top	Peace River Top	Arcadia Top	Lower Hawthorn Top	Suwanee Top	Ocala Top	[illegible]n Park Top	DATA SOURCE
LM-2660						NW NE 35-43S-25E	400931	860021	7	935		8	NP	8	26	174	500	650	NDE	NDE	WRS
LM-5465			W-3	L-641		SW NW 36-43S-25E	403194	859300	5	535		45	NP	NP	45	285	NDE	NDE	NDE	NDE	USGS
LM-3429		W-9308				SE SW 23-43S-26E	430720	867220	9	1250		5	NP	5	27	240	540	690	NDE	NDE	FGS
LM-5468				L-2530		NE SE 23-43S-26E	434168	867706	7	620	475	25	NP	NP	25	245	520	NDE	NDE	NDE	USGS
LM-6615						NE SE 23-43S-26E	433352	867710	5	945	864	14	NP	NP	14	262	510	720	NDE	NDE	WRS
LM-4993			WA-77	L-1903		NE NE 26-43S-26E	433797	865991	10	669	190	20	NP	20	54	236	460	622	NDE	NDE	SFWMD
LM-4997			WA-81	L-2586		NE NE 26-43S-26E	433252	865893	10	568		25	NP	25	55	240	510	NDE	NDE	NDE	SFWMD
LM-5271		W-9325				NW NW 21-43S-27E	450048	869846	10	1050		NP	NP	Surf	30	250	520	650	1010	NDE	FGS
LM-2776			WA-135	L-295		SE SW 22-43S-27E	457105	866580	16	600		11	11	25	40	250	NL	NDE	NDE	NDE	SFWMD
LM-576				L-629		NE NE 24-43S-27E	471175	869645	19	576		NP	Surf	10	20	290	NL	NDE	NDE	NDE	USGS
LM-5080			WA-289	L-913		NW SW 26-43S-27E	461258	862521	10	536	320	14	14	25	40	260	450	NDE	NDE	NDE	SFWMD
LM-7095				L-912		NE SW 26-43S-27E	460988	863028	10	836		NP	Surf	10	20	305	488	672	NDE	NDE	FGS
LM-2086			WA-97	L-916		SE SE 27-43S-27E	460527	861313	16	536	318	20	NP	NP	20	280	448	NDE	NDE	NDE	USGS
LM-4799			WA-34	L-4850		NE NE 28-43S-27E	454653	865784	15	560	107	10	NP	10	20	248	470	NDE	NDE	NDE	USGS
LM-2079				L-904		SE NE 34-43S-27E	459430	859501	16	772		20	NP	NP	20	256	505	>772	NDE	NDE	USGS
LM-5879			WA-447			NE SW 13-44S-24E	372961	841723	10	938	234	40	NP	NP	40	175	522	736	NDE	NDE	SFWMD
LM-5884			WA-423			SE SE 23-44S-24E	370643	834469	16	928	322	20	NP	NP	20	195	550	784	NDE	NDE	SFWMD
LM-5030			WA-188	L-95		NE NE 24-44S-24E	375487	839484	13	924	170	40	NP	NP	40	180	540	758	NDE	NDE	SFWMD
LM-5887			WA-459	L-436		SE NE 24-44S-24E	375378	836759	16	964	150	30	NP	NP	30	160	576	745	NDE	NDE	SFWMD
LM-5042			WA-215	L-2895		SW NE 25-44S-24E	374709	831816	17	778	148	50	NP	NP	50	187	522	720	NDE	NDE	SFWMD
LM-5889			WA-375			SW SW 25-44S-24E	372155	829914	16	908	150	40	NP	NP	40	218	584	800	NDE	NDE	SFWMD
LM-5891			WA-405			SW SE 26-44S-24E	369883	829526	11	1008	242	55	NP	NP	55	198	564	773	NDE	NDE	SFWMD
LM-5072			WA-276			SE SE 34-44S-24E	364226	825324	5	644	130	40	NP	NP	40	148	484	NDE	NDE	NDE	SFWMD
LM-5897			WA-619			SW NW 35-44S-24E	366681	825913	7	730	158	50	NP	NP	50	159	495	686	NDE	NDE	SFWMD
LM-6955						NE SW 35-44S-24E	368223	825700	13	645	520	60	NP	NP	60	165	470	NDE	NDE	NDE	FDEP
LM-5010			WA-129	L-1318		NE SE 02-44S-25E	401516	851838	15	814	80	35	NP	35	85	170	525	710	NDE	NDE	SFWMD
LM-3447		W-9330				SW NE 03-44S-25E	396266	853688	17	1130		40	NP	40	90	160	580	840	1110	NDE	FGS
LM-5903			WA-502			SW SW 04-44S-25E	387542	851320	16	756	136	64	NP	NP	64	150	402	652	NDE	NDE	SFWMD
LM-5012			WA-136	L-773		SE SE 07-44S-25E	380972	845506	5	740	130	50	NP	NP	50	132	374	654	NDE	NDE	SFWMD
LM-5908			WA-366			NW NW 10-44S-25E	392887	850074	14	700	122	60	NP	NP	60	186	504	NDE?	NDE	NDE	SFWMD
LM-5910			WA-361			NE NE 11-44S-25E	397151	850149	19	1040	878	50	NP	NP	50	194	597	820	NDE	NDE	SFWMD
LM-5040			WA-205			NW NE 12-44S-25E	405495	849694	17	890	190	64	NP	NP	64	200	566	760	NDE	NDE	SFWMD
LM-5913			WA-470			SW NE 16-44S-25E	389758	843127	20	765	210	38	NP	38	70	160	510	NDE	NDE	NDE	SFWMD
LM-5049			WA-229			SE NE 17-44S-25E	385132	843460	12	546	180	68	NP	NP	68	154	367?	NDE	NDE	NDE	SFWMD
LM-5063			WA-260	L-2317		SW NE 18-44S-25E	379775	842990	11	702	96	58	NP	NP	58	142	407	596	NDE	NDE	SFWMD
LM-7197					P-1	SE SE 20-44S-25E	386532	835373	18	1150	462	30	NP	NP	30	180	450	660	1010?	NDE	SFWMD
LM-4969			WA-45	L-426		SW SW 21-44S-25E	397153	835911	18	518	120	15	NP	15	30	172	456	NDE	NDE	NDE	SFWMD
LM-483			W-46	L-2292		SW NE 28-44S-25E	390327	832723	20	616	302	19	NP	NP	19	197	537	NDE	NDE	NDE	USGS
LM-7629					P-3	NW NW 28-44S-25E	387160	834359	18	837	510	30	NP	NP	30	200	480	700	NDE	NDE	SFWMD
LM-7630					P-4	SW NW 28-44S-25E	387333	832944	18	825	510	30	NP	NP	30	210	470	690	NDE	NDE	SFWMD
LM-7631					P-5	NW SW 28-44S-25E	387324	831631	18	832	480	30	NP	NP	30	180	470	640	NDE	NDE	SFWMD
LM-7632					P-6	NW SW 28-44S-25E	387318	830622	18	805	445	30	NP	NP	30	200	430	650	NDE	NDE	SFWMD
LM-7633					P-7	SW SW 28-44S-25E	387309	829309	18	800	445	30	NP	NP	30	200	450	650	NDE	NDE	SFWMD
LM-3440		W-9332				NW NE 35-44S-25E	401280	828010	20	1445		NP	NP	Surf	30	220	590	780?	1120?	NDE	FGS
LM-5000			WA-87	L-2197		NE NE 36-44S-25E	408089	828272	24	604	132	10	NP	10	44	210	490	NDE	NDE	NDE	SFWMD
LM-3446		W-9326				SW SE 05-44S-26E	417210	851846	12	1430		10	NP	10	40	230	580	770	1200	NDE	FGS
LM-4785			WA-19	L-599		NE SW 05-44S-26E	414674	852467	12	832	95	NP	Surf	NP	30	234	490	697	NDE	NDE	SFWMD
LM-4967			WA-42	L-3271		NW SE 06-44S-26E	411497	852081	11	604	96	20	NP	NP	20	184	420	NDE	NDE	NDE	USGS
LM-4964			WA-35	L-1358		NE NW 07-44S-26E	410120	849363	20	742	98	25	NP	NP	25	190	400	680	NDE	NDE	SFWMD
LM-6984	P-1124	W-15472				NE NW 09-44S-26E	420645	849605	34 DF	11650	1398	30	NP	NP	30	198	500	650	1140	1530	BOG
LM-3462		W-15268	LE-028			SE SE 15-44S-26E	428486	840070	19	770		6	NP	6	21	214	550	732	NDE	NDE	SFWMD
LM-5021			WA-174			NW SW 15-44S-26E	427139	842703	18	825	128	20	NP	20	32	207	590	760	NDE	NDE	SFWMD
LM-4787			WA-21	L-4817		SE NE 19-44S-26E	413049	838239	21	780	195	20	NP	NP	20	190	560	735	NDE	NDE	SFWMD
LM-5275	P-850	W-13483		L-6461		SW SE 22-44S-26E	425835	836652	46 DF	12464	11984	5	NP	29	60	220	645	825	1170	1424	BOG
LM-6989	P-712	W-12378				SW SE 22-44S-26E	427736	835632	23	11630	11630	5	NP	5	60	NL	630	NL	1090	1360	FGS
LM-5926	P-858	W-13713				SE SE 23-44S-26E	434174	834688	25	11834	11834	6	32	36	51	195	560	680	1090	1400	BOG
LM-3457	P-648	W-11909				SW SW 25-44S-26E	435691	829833	26	11650	3618	?	?	?	?	?	630?	750?	1210?	NL	FGS
LM-646				L-659		NE SE 33-44S-26E	422962	825864	26	1340		NP	Surf	10	40	205	578	735	1095	NDE	USGS
LM-588				L-625		SE SE 09-44S-27E	455552	845384	21	540		20	NP	NP	20	225	NDE	NDE	NDE	NDE	USGS
LM-2085			WA-534	L-706		SW SE 11-44S-27E	464088	846858	22	590	140	5	NP	5	28	316	NDE	NDE	NDE	NDE	USGS
LM-4784			WA-12	L-2460		SE SE 11-44S-27E	461542	845759	22	763	115	20	20	30	54	255	448	575	NDE	NDE	SFWMD
LM-4792			WA-27	L-2458		SE SE 12-44S-27E	471158	845513	24	852	120	NL	NL	NL	NL	258	440	585	NDE	NDE	SFWMD

Attachment D - Summary of Tops of Geologic Units in Inventoried Wells
Fort Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

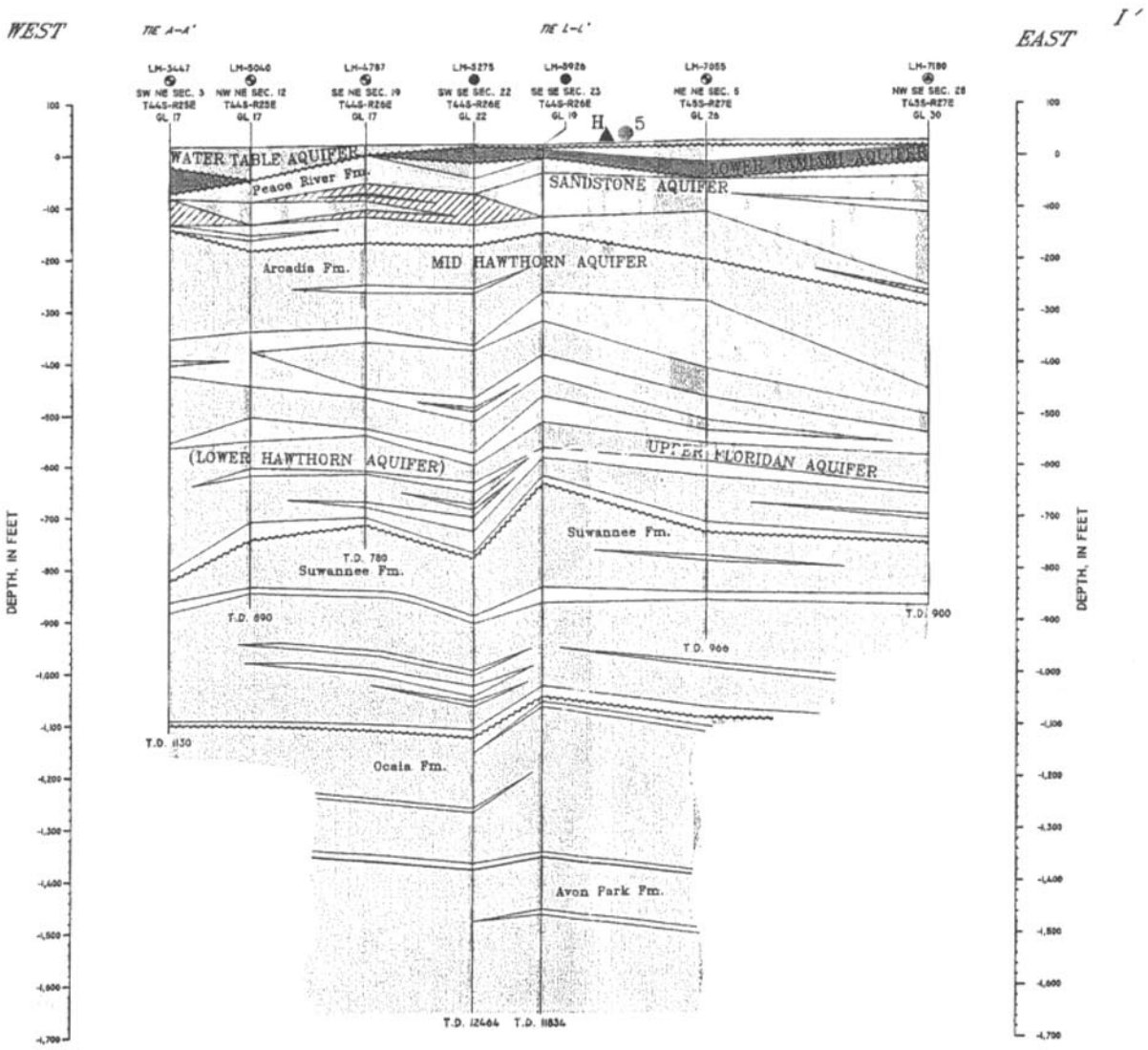
WRS NUMBER	BOG #	GS #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	FL Planar X83	FL Planar Y83	Datum ft (NGVD)	To Depth (ft)	Cased Depth (ft)	Hol/Pleist-Pinec. Ls Thickness	Bonita Springs Top	Ochopee Top	Peace River Top	Arcadia Top	Lower Hawthorn Top	Suwanee Top	Ocala Top	on Park Top	DATA SOURCE
LM-590				L-626		SE SE 13-44S-27E	471148	843191	24	500	200	30	30	NP	47	330	NDE	NDE	NDE	NDE	USGS
LM-589			WA-532	L-660		SW NE 14-44S-27E	464070	843122	24	1260	195	NP	NP	Surf	30	250	420	580	NL	NL	USGS
LM-5036			WA-196			NE SE 15-44S-27E	460438	842432	23	701	110	20?	NP?	20?	50	242	387	493	NDE	NDE	SFWMD
LM-6995	P-1014	W-15092	W-LE025			NW NW 29-44S-27E	445515	834023	46	12548	3610	NP	NP	Surf	30	240	560	680	1030	NL	SFWMD
LM-1628			WA-85	L-2657		NE SE 36-45S-23E	343661	794473	8	916	162	?	?	?	?	145	475	695	NDE	NDE	SFWMD
LM-7034			WA-98	L-4901		SE SW 03-45S-24E	363452	818463	10	920	114	?	?	?	40	206	527	685	NDE	NDE	SFWMD
LM-7016				L-1471		SW NW 11-45S-24E	368611	816105	11	960	735	43	NP	NP	43	115	510	715	NDE	NDE	USGS
LM-7017				L-1445		12-45S-24E	374238	815764	14	740		30	NP	NP	30	135	540	710	NDE	NDE	USGS
LM-7039	P-208	W-3368				NW NW 13-45S-24E	372037	812547	9	5612		30	NP	NP	30	140	540	710	1020	1530	BOG
LM-7041		W-9327				NW NW 15-45S-24E	361587	811509	8	1360		40	NP	NP	40	120	580	?	1200?	NDE	FGS
LM-7019				L-3261		16-45S-24E	358585	810823	6	700		NL	NL	NL	NL	160	470	630?	NDE	NDE	USGS
LM-7031				L-979		NE SW 16-45S-24E	357036	810026	6	1350	114	?	?	?	40	160	470	636	NL	NL	SFWMD
LM-1562				L-3000D		SE SE 17-45S-24E	354754	808528	5	1200	595	?	?	?	38	141	460	630	1060	NDE	WRS
LM-7045			WA-111	L-1715		NE NE 22-45S-24E	365097	807041	7	901	135	30	NP	NP	30	135	540	715	NDE	NDE	SFWMD
LM-3453		W-10739				SE NW 23-45S-24E	368267	805808	3	930		?	?	?	30	135	520	668	NDE	NDE	FGS
LM-7026			WA-2176	L-5696		SW SE 31-45S-24E	349824	792509	5	905	385	50	NP	NP	50	180	590	735	NDE	NDE	USGS
LM-3435		W-9309				SE NW 33-45S-24E	356843	795790	7	1360		50	NP	NP	50	150	520	?	1290?	NDE	FGS
LM-7201		W-9355				NW SW 05-45S-25E	382984	820249	16	1558		70	70	NP	100	190	NL	NL	NL	NL	FGS
LM-867			WA-2055	L-2003		NE NE 07-45S-25E	380698	817841	17	685	240	20	20	NP	40	175	575?	NDE	NDE	NDE	USGS
LM-3438		W-9328				SE SW 15-45S-25E	394082	809273	18	1290		70	NP	NP	70	160	560	750?	1170	NDE	FGS
LM-3439		W-9331				NW SE 18-45S-25E	380370	809361	15	1240		NL	NL	NL	NL	NL	560?	700?	1180	NDE	FGS
LM-3437		W-9313				SW SW 21-45S-25E	388419	804058	17	1205		60	NP	NP	60	150	?	710?	1120	NDE	FGS
LM-7064			LE-26			SE NW 22-45S-25E	394514	805736	21	748		20?	20?	NP?	30?	165	510?	650?	NDE	NDE	FGS
LM-7188		W-9329				SW NE 30-45S-25E	379674	800278	14	1281		40	NP	NP	40	160	560?	710?	NL	NL	BOG
LM-1841				L-5641		SE NE 33-45S-25E	391546	795860	26	1410	950	5	NP	5	30	165	542	689	1110	1360	USGS
LM-3436		W-9310				SW NW 35-45S-25E	399177	796014	21	1126		55	NP	NP	55	180	560?	710	1110	NDE	FGS
LM-7189		W-9357				NE 09-45S-26E	422732	817282	31	1290		NP	NP	Surf	30	230	580	750	NL	NDE	BOG
LM-7072	WGI-112					NW SW 10-45S-26E	424357	815456	27	2191		20	NP	20	30	206	525	677	1137	1495	BOG
LM-3041	P-250	W-4165				SW SW 22-45S-26E	425382	803737	28	11800	5024	40?	NP?	40?	84	270	590	740	1190	1500	BOG
LM-3040	P-160	W-2979	LE-30			NE NE 27-45S-26E	428730	801498	30	12865	5012	NL	NL	NL	NL	NL	NL	740	1170	1500	BOG
LM-7029	P-979	W-14348	W-LE023			SE NE 34-45S-26E	429062	795842	33	11802	3812	NP	NP	Surf	90	335	567	750	1110	NL	SFWMD
LM-7055			WA-25	L-1688		NE NE 05-45S-27E	449912	823904	26	966	125	10	10	42	75	230	585	760	NDE	NDE	SFWMD
LM-3448		W-9340				SE NW 06-45S-27E	442275	821620	28	1500		40?	NP?	40?	80?	?	?	?	1240	NDE?	FGS
LM-7057	P-425	W-10600				C NW 08-45S-27E	446521	817459	30	11725	3617	?	?	?	?	?	520?	750?	1090	1300	BOG
LM-7078	P-407	W-10566				NE SE 14-45S-27E	465098	809999	31	15710		NL	NL	NL	NL	NL	NL	NL	NL	<1400	FGS
LM-618				L-618		SW SE 27-45S-27E	458599	798923	30	600		10	NP	10	40	320	560	NDE	NDE	NDE	USGS
LM-7180			LE-29			NW SE 28-45S-27E	454422	799246	30	900		10	NP	10	40	320	610	780	NDE	NDE	FGS
LM-795				L-2061		NW SE 28-45S-27E	454423	799347	30	885	340	NL	NL	NL	NL	320?	665	815	NDE	NDE	USGS
LM-797			W-LE001	L-2063		SW SE 35-45S-27E	452850	793397	30	1340	1140	40	NP	40	130	390	655	820	<1300	NDE	USGS
LM-7190		W-9316	F-149			NE SW 03-46S-24E	362789	788680	4	1520		40	NP	NP	40	150	560	750	1170	1450	BOG
LM-7113			W-45	L-2529		SW NE 07-46S-24E	348763	784135	6	545	304	46	NP	NP	46	146	465	NDE	NDE	NDE	USGS
LM-6967						NW NW 08-46S-24E	348229	785654	5	3036	2370	40	NP	NP	40	140	585	795	1205	1495	FDEP
LM-3445		W-9320				NW SW 12-46S-24E	375387	783949	7	1692		10	NP	10	20	190	570	740	1140	1340	FGS
LM-7191		W-9317				SW SW 20-46S-25E	382841	770470	10	1317		10	NP	10	60	200	500?	710	1220	NDE	BOG
LM-623				L-636		NE NE 25-46S-25E	408927	770309	19	1405		10	NP	10	35		510	820	1150	NDE	USGS
LM-7733						NE SE 25-46S-25E	408450	766374	17	948	580	13	NP	13	32	280	550	736	NDE	NDE	WRS
LM-2381			WA-105	L-5608		NE SW 27-46S-25E	394270	766662	10	828	198	?	?	?	?	?	560?	823?	NDE	NDE	SFWMD
LM-7128			WA-104	L-3001D		SW SW 27-46S-25E	395626	765340	12	818	181	10?	NP?	10?	20?	176	576		NDE	NDE	SFWMD
LM-7129		LE-01				NW NE 27-46S-25E	395828	768671	15	814		10?	NP?	10?	20?	175	585	>814	NDE	NDE	FGS
LM-7198			LHW-1			NE NE 27-46S-25E	396649	769070	16	600		15	NP	15	21	173	573	NDE	NDE	NDE	SFWMD
LM-763				L-635		SW NE 27-46S-25E	395554	768471	15	1405		10	NP	10	20	160	580	820	1160	NDE	USGS
LM-3258		W-16523		L-6401		NW NW 33-46S-25E	388254	763973	11	822		14	NP	14	19	184	546	>822	NDE	NDE	FGS
LM-983			W-44	L-2295		NE NW 33-46S-25E	389523	763460	16	610	300	11	NP	11	22	200	530	NDE	NDE	NDE	USGS
LM-7135			LE-39			SE SW 16-46S-26E	420506	776502	22	1550		NL	NL	NL	NL	NL	580	790	1160	1465	FGS
LM-3318	P-1068	W-15285		L-6463		NW SE 17-46S-26E	417238	777127	45 (KB)	11918	3840	18	NP	42	60	270	600	800	1170	1470	BOG
LM-625			W-19	L-2183		SE NW 21-46S-26E	422474	770938	19	513		26	NP	26	45	266	NDE	NDE	NDE	NDE	USGS
LM-3982						NE NW 22-46S-26E	426224	775259	22	778	340	21	NP	21	70	336	524	744	NDE	NDE	WRS
LM-7192		W-9356				SW 23-46S-26E	431110	771194	20	1330		40	NP	40	60	290	550	750	1120	NDE	BOG
LM-3317	P-851	W-13449	LE-38	L-6462		NW NE 35-46S-26E	432887	763511	38 (DF)	11927	3608	40	NP	40	70	320	496	690	1036	NL	BOG
LM-7146	P-271	W-4839	LE-33A	L-5009		NE NW 16-46S-27E	452602	779768	44 (DF)	11898	4308	60	NP	60	220	370	565	775	1120	1450	BOG
LM-7193		W-9322				NW 27-46S-27E	457457	768840	30	1260		30	NP	30	130	320	580?	800	1140	NDE	BOG
LM-7194		W-9323				SW SW 31-46S-27E	440869	759935	20	1200		20	NP	20	100	320	580	800	NDE	NDE	BOG

Attachment D - Summary of Tops of Geologic Units in Inventoried Wells
Fort Myers (Central, South, and Beach) / Gateway / Fiesta Village / San Carlos Park / Estero

WRS NUMBER	BOG #	[illegible] #	SFWMD #	USGS #	OTHER #	(QTR QTR S-T-R)	FL Planar X83	FL Planar Y83	Datum ft (NGVD)	Total Depth (ft)	Cased Depth (ft)	Hol/Pleist-Pinec. Ls Thickness	Bonita Springs Top	Ochopee Top	Peace River Top	Arcadia Top	Lower Hawthorn Top	Suwanee Top	Ocala Top	[illegible] Park Top	DATA SOURCE
LM-7195		W-9321				SE SE 36-46S-27E	471599	760193	20	1020		70	NP	70	200	370	640?	810	NDE	NDE	BOG
LM-7158				L-1634		SE SW 03-47S-24E	362468	755764	3	950	740	47	NP	NP	47	184	602	790	NDE	NDE	USGS
LM-786			WA-143	L-1569		SW SW 04-47S-25E	387922	754787	12	809	294	30	30	NP	50	215	505	715	NDE	NDE	SFWMD
LM-7936					Well 30	SW SE 13-47S-25E	406583	742758	14	1140	900	50	50	90	150	340	780	1015	NDE	NDE	CH2MHILL
LM-7941					TB-2	SW SW 13-47S-25E	404126	742671	14	1000		30	30	70	90	270	625	900	NDE	NDE	CH2MHILL
LM-6959					Well 32	NE NE 14-47S-25E	402975	747929	15	701	650	20	20	80	100	230	520	NDE	NDE	NDE	CH2MHILL
LM-7937					Well 31	NE NE 14-47S-25E	402968	746616	15	843	660	25	25	80	100	240	530	NDE	NDE	NDE	CH2MHILL
LM-7939					ROMW-2	NW SE 14-47S-25E	401046	744709	15	900	550	20	20	70	110	210	450	690	NDE	NDE	CH2MHILL
LM-1980						SE SE 17-47S-25E	387155	744160	14	1306		45	45	90	110	200	530	712	1135	NDE	WRS
LM-1980A						SE SE 17-47S-25E	387155	744160	14	660	350	45	45	90	110	200	530	NDE	NDE	NDE	WRS
LM-2041						SE SE 17-47S-25E	386883	744161	15	620	360	36	36	100	110	215	535	NDE	NDE	NDE	WRS
LM-7942					TB-4	SE NE 23-47S-25E	402298	741067	13	1010		20	20	65	90	240	515	800	NDE	NDE	CH2MHILL
LM-7935					Well 29	NE NE 24-47S-25E	408400	742545	16	1063	841	20	20	80	130	450	760	950	NDE	NDE	CH2MHILL
LM-7938					ROMW-1	SE NW 24-47S-25E	406204	740336	14	1080		40	40	70	110	330	710	910	NDE	NDE	CH2MHILL
LM-7940					TB-1	SE NE 25-47S-25E	408817	735979	14	922		30	30	50	100	450	750	NDE	NDE	NDE	CH2MHILL
LM-7931					Well 25	NE NE 36-47S-25E	408792	731840	13	1040	816	40	40	50	110	420	740	930	NDE	NDE	CH2MHILL
LM-7173		W-9324		L-6413		SW NW 13-47S-26E	435798	746432	17	1460		80	80	90	150	280	550	790	1220	NDE	FGS
LM-7932					Well 26	SW SW 19-47S-26E	408735	737595	15	1063	835	35	35	50	120	460	760	930	NDE	NDE	CH2MHILL
LM-7933					Well 27	NW SW 19-47S-26E	408747	739615	16	1200	815	40	40	60	110	475	750	930	NDE	NDE	CH2MHILL
LM-7934					Well 28	SW NW 19-47S-26E	408752	740523	16	1101	805	40	40	60	130	470	735	930	NDE	NDE	CH2MHILL

ATTACHMENT D

Hydrostratigraphy Assessment of Inventoried Wells



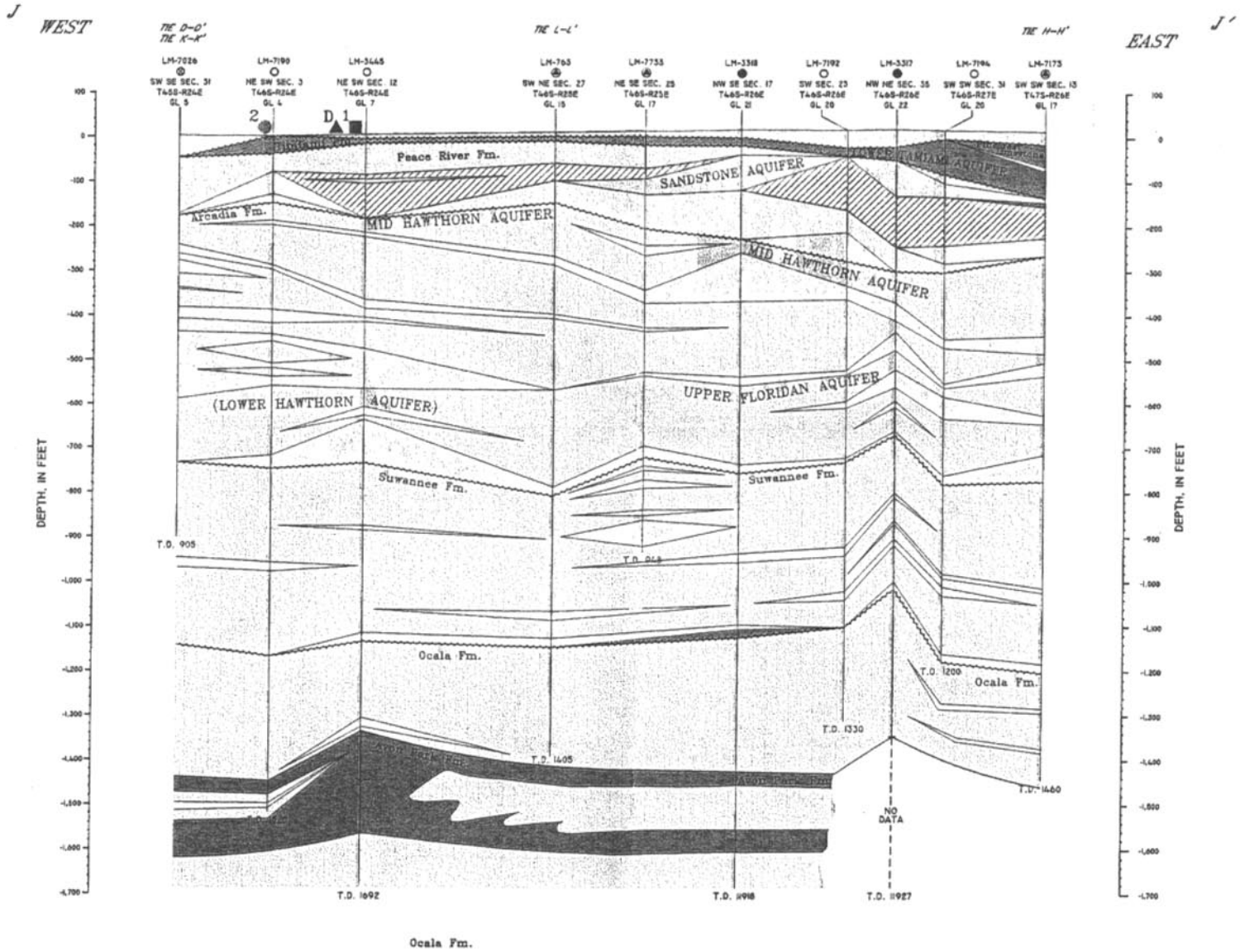
KEY:

- SAND
- SANDSTONE
- LIMESTONE
- CLAY/MARL
- SANDY LIMESTONE
- DOLOMITE
- WASTEWATER TREATMENT/ RECLAMATION FACILITIES
- POTENTIAL RECLAIMED WATER ASR SITES
- UNCONFORMITY
- P & A WELL
- OIL TEST WELL
- TEST WELL

FIGURE 5
CROSS-SECTION I-I'
RIDS-PHASE II PROJECT

0 10000
HORIZONTAL SCALE, IN FEET

100 0
VERTICAL SCALE, IN FEET



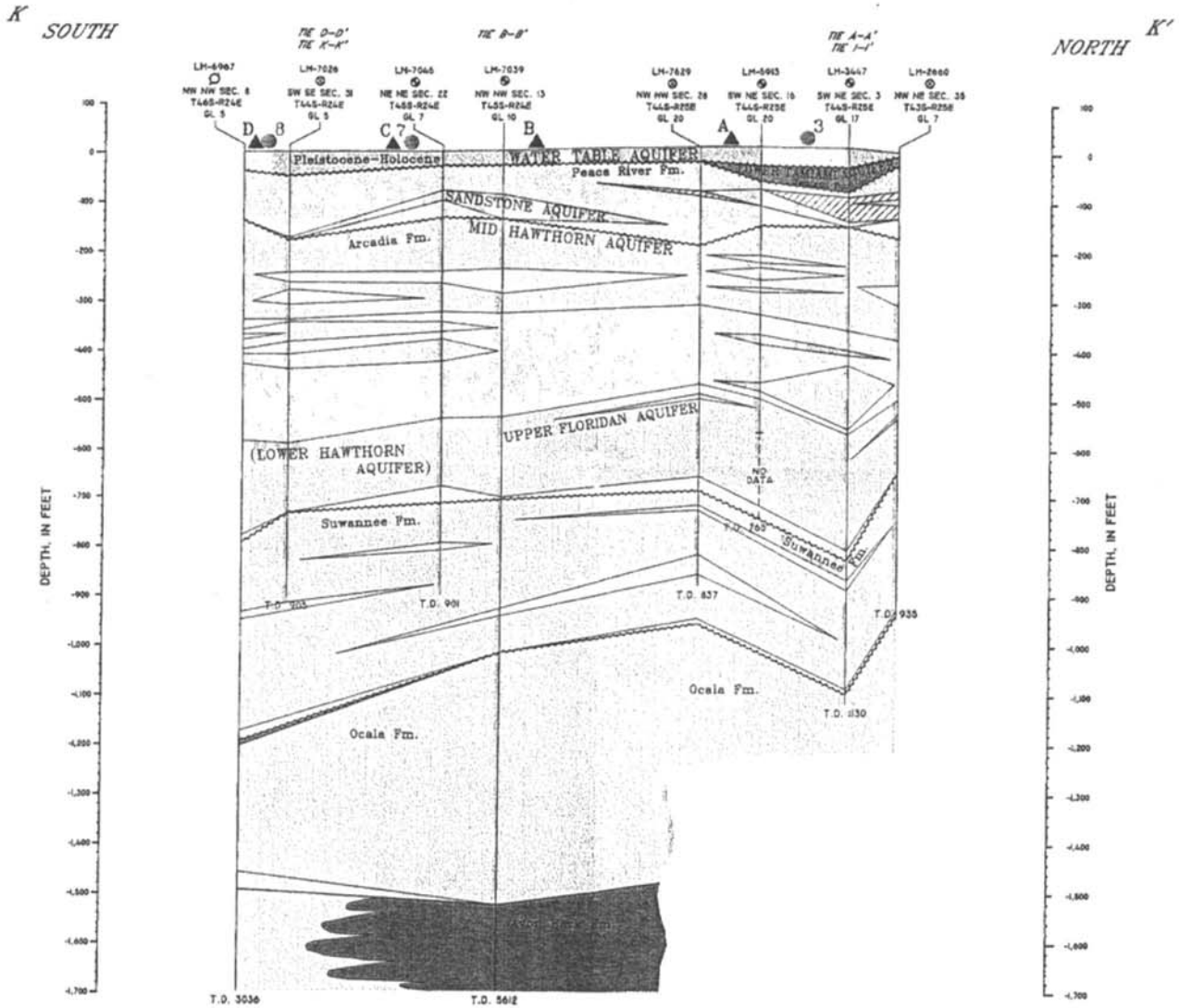
KEY:

- SAND
- SANDSTONE
- LIMESTONE
- CLAY/MARL
- SANDY LIMESTONE
- DOLOMITE
- UNCONFORMITY
- WASTEWATER TREATMENT/ RECLAMATION FACILITIES
- POTENTIAL RECLAIMED WATER ASR SITES
- CANAL PUMP STATION
- P & A WELL
- OIL TEST WELL
- TEST WELL
- SUPPLY WELL

FIGURE 6
CROSS-SECTION J-J'
RIDS-PHASE II PROJECT

VERTICAL SCALE, IN FEET: 0 – 100

HORIZONTAL SCALE, IN FEET: 0 – 10000



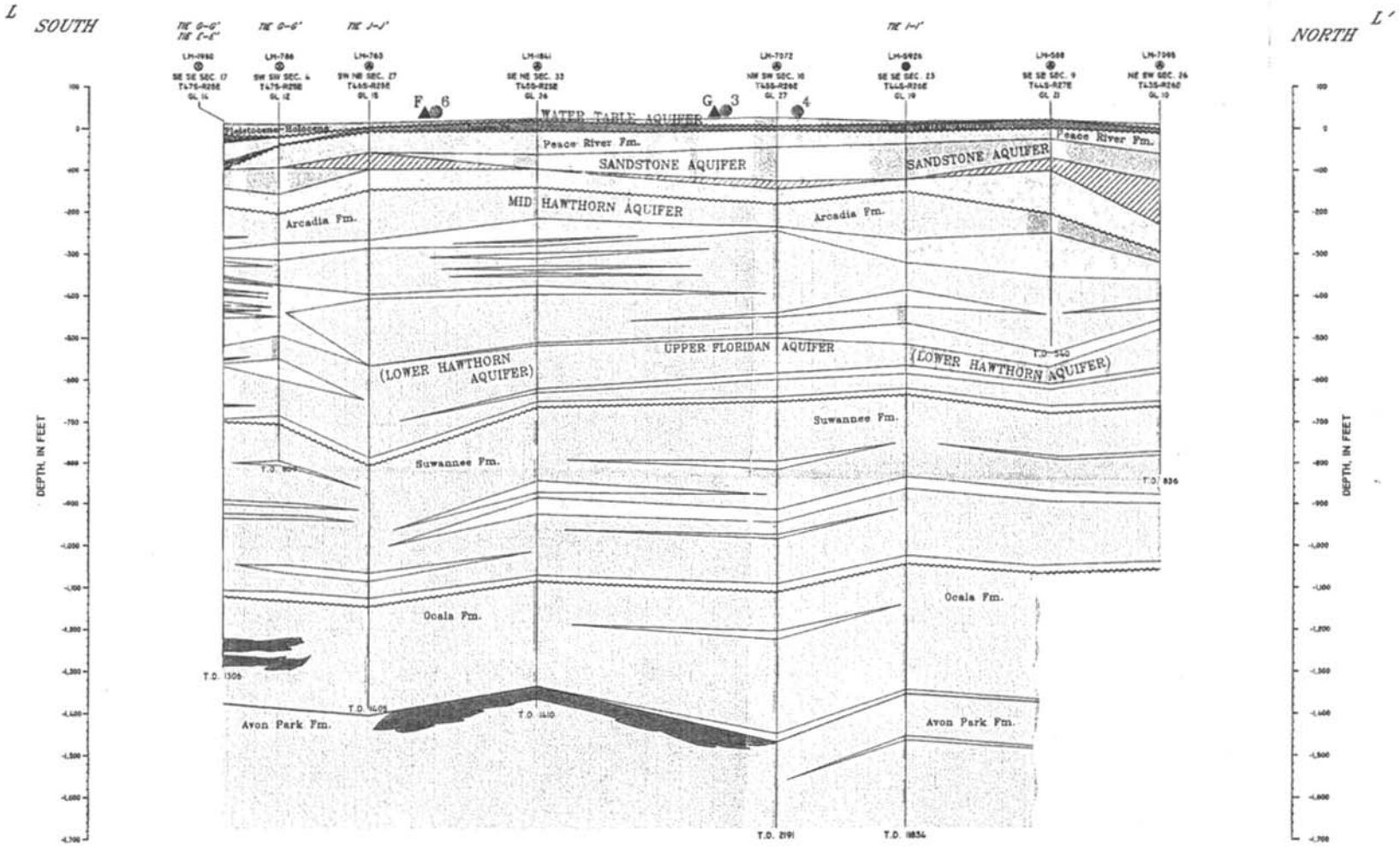
KEY:

- SAND
- SANDSTONE
- LIMESTONE
- CLAY/MARL
- SANDY LIMESTONE
- DOLOMITE
- WASTEWATER TREATMENT/ RECLAMATION FACILITIES
- POTENTIAL RECLAIMED WATER ASR SITES
- UNCONFORMITY
- SUPPLY WELL
- P & A WELL
- INJECTION WELL

FIGURE 7
CROSS-SECTION K-K'
RIDS-PHASE II PROJECT

0 10000
HORIZONTAL SCALE, IN FEET

100 0
VERTICAL SCALE, IN FEET



KEY:

- SAND
- SANDSTONE
- LIMESTONE
- CLAY/MARL
- SANDY LIMESTONE
- DOLOMITE
- WASTEWATER TREATMENT/ RECLAMATION FACILITIES
- POTENTIAL RECLAIMED WATER ASR SITES
- UNCONFORMITY
- SUPPLY WELL
- OIL TEST WELL
- TEST WELL

FIGURE 8
CROSS-SECTION L-L'
RIDS-PHASE II PROJECT

0 10000
HORIZONTAL SCALE, IN FEET

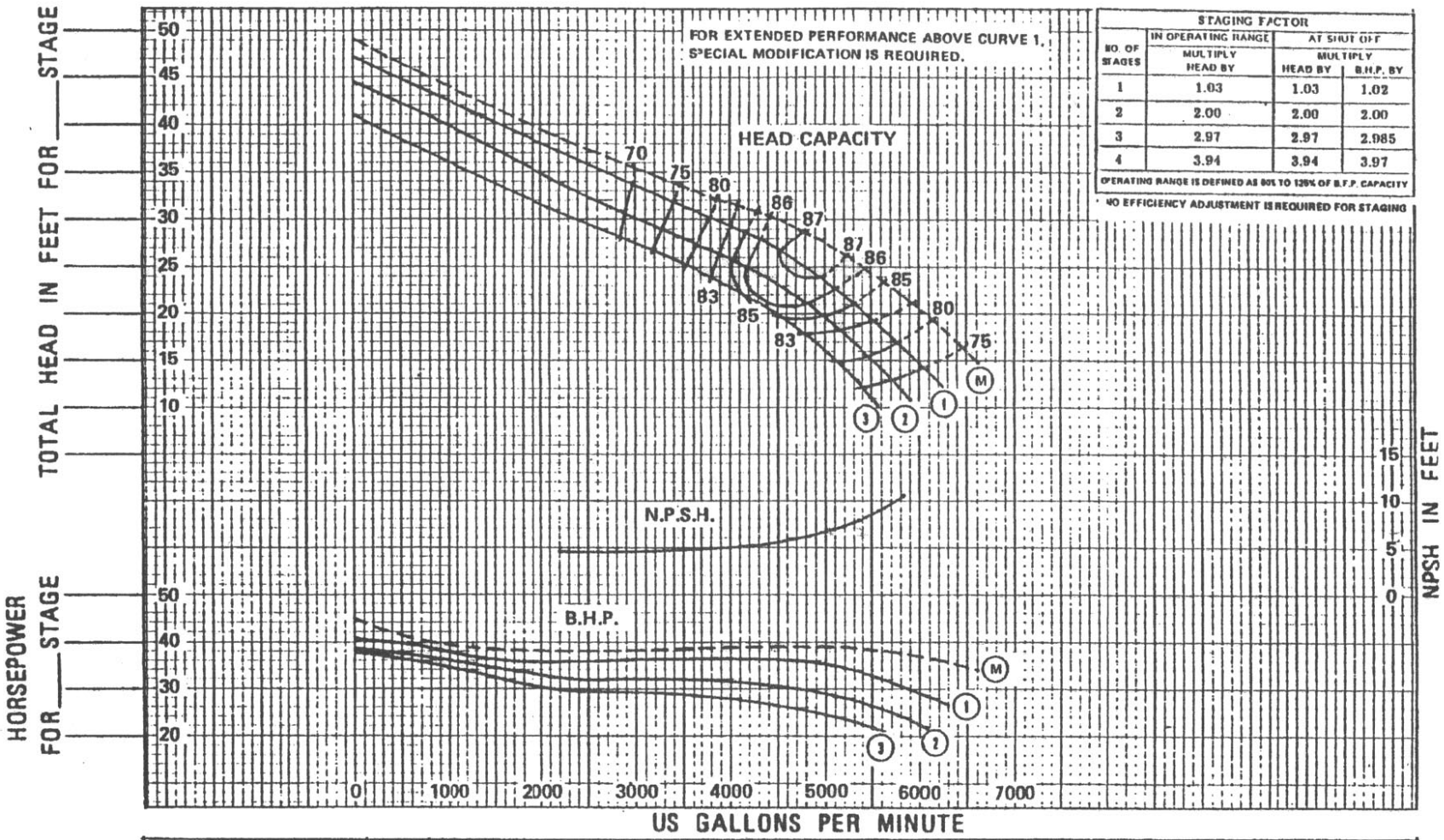
0 100
VERTICAL SCALE, IN FEET

ATTACHMENT E

Horizontal Well Pump – Sample Curves

VERTICAL TURBINE PUMPS
Model 20HH - 885 Rpm

Peerless Pump Company
Indianapolis, IN 46207-7026



STAGING FACTOR			
NO. OF STAGES	IN OPERATING RANGE MULTIPLY HEAD BY	AT SHUT OFF MULTIPLY HEAD BY	AT SHUT OFF MULTIPLY B.H.P. BY
1	1.03	1.03	1.02
2	2.00	2.00	2.00
3	2.97	2.97	2.985
4	3.94	3.94	3.97

OPERATING RANGE IS DEFINED AS 80% TO 120% OF B.E.P. CAPACITY

* NO EFFICIENCY ADJUSTMENT IS REQUIRED FOR STAGING

HYDRAULIC PERFORMANCE WARRANTY	CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
Guaranteed at designated point only, and contingent on:	1	4600653	11-5/16" x 14-3/4"	57403
Proper flow to pump suction	2	4600653	10-5/16" x 14-5/16"	57652
Proper submergence Fluid free of gas, air & abrasives Proper lateral setting of impeller	3	4600653	9-5/8" x 14-3/32"	57803
	M	4600653	FULL DIAMETER EXTENDED PERFORMANCE	57426

Customer _____

Item _____

Peerless Ref. No: _____

Laboratory Performance — BOWL 4600117 C.I. PLASTIC COATED

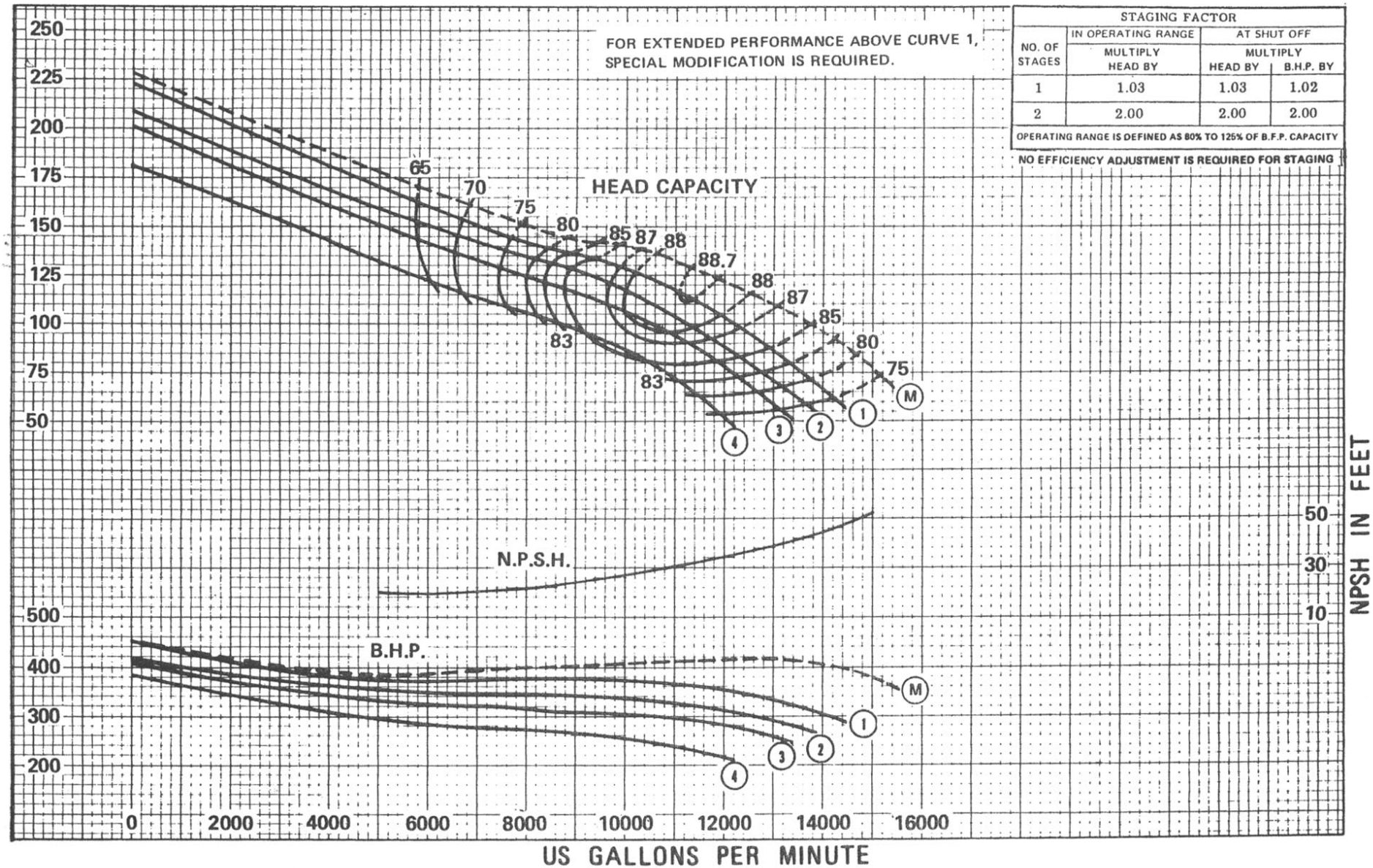
SIZE 20HH — RPM 885 — CURVE 4806221

PUMP DESCRIPTION: Driver _____; Head _____; Column _____

GUARANTEED BOWL☐ FIELD☐ PERFORMANCE: Capacity _____ gpm; Head _____ ft; Eff _____ %; BHP _____

ATTACHMENT F

Injection Well Station – Sample Curves

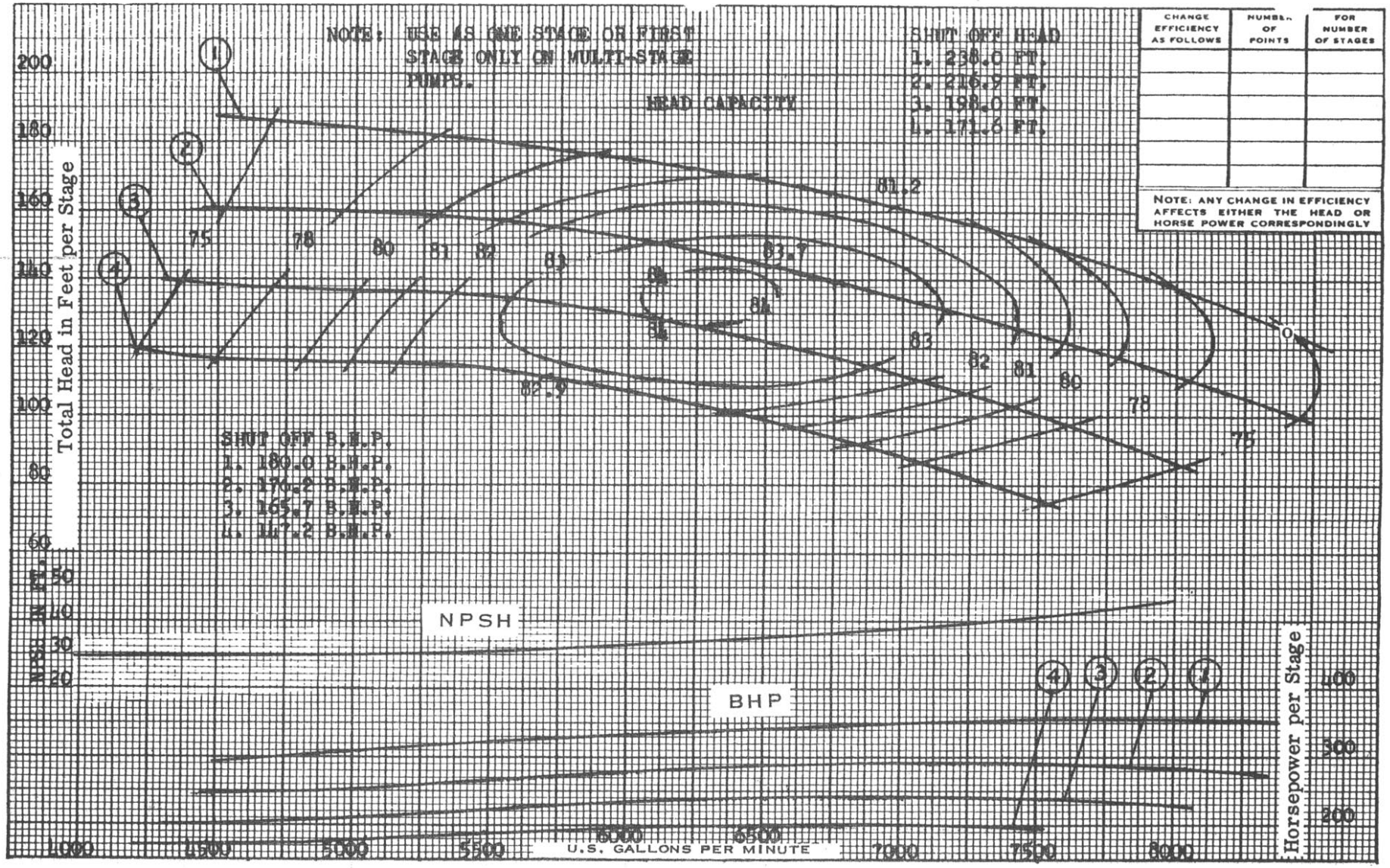


STAGING FACTOR			
NO. OF STAGES	IN OPERATING RANGE	AT SHUT OFF	
	MULTIPLY HEAD BY	MULTIPLY HEAD BY	MULTIPLY B.H.P. BY
1	1.03	1.03	1.02
2	2.00	2.00	2.00

OPERATING RANGE IS DEFINED AS 80% TO 125% OF B.F.P. CAPACITY

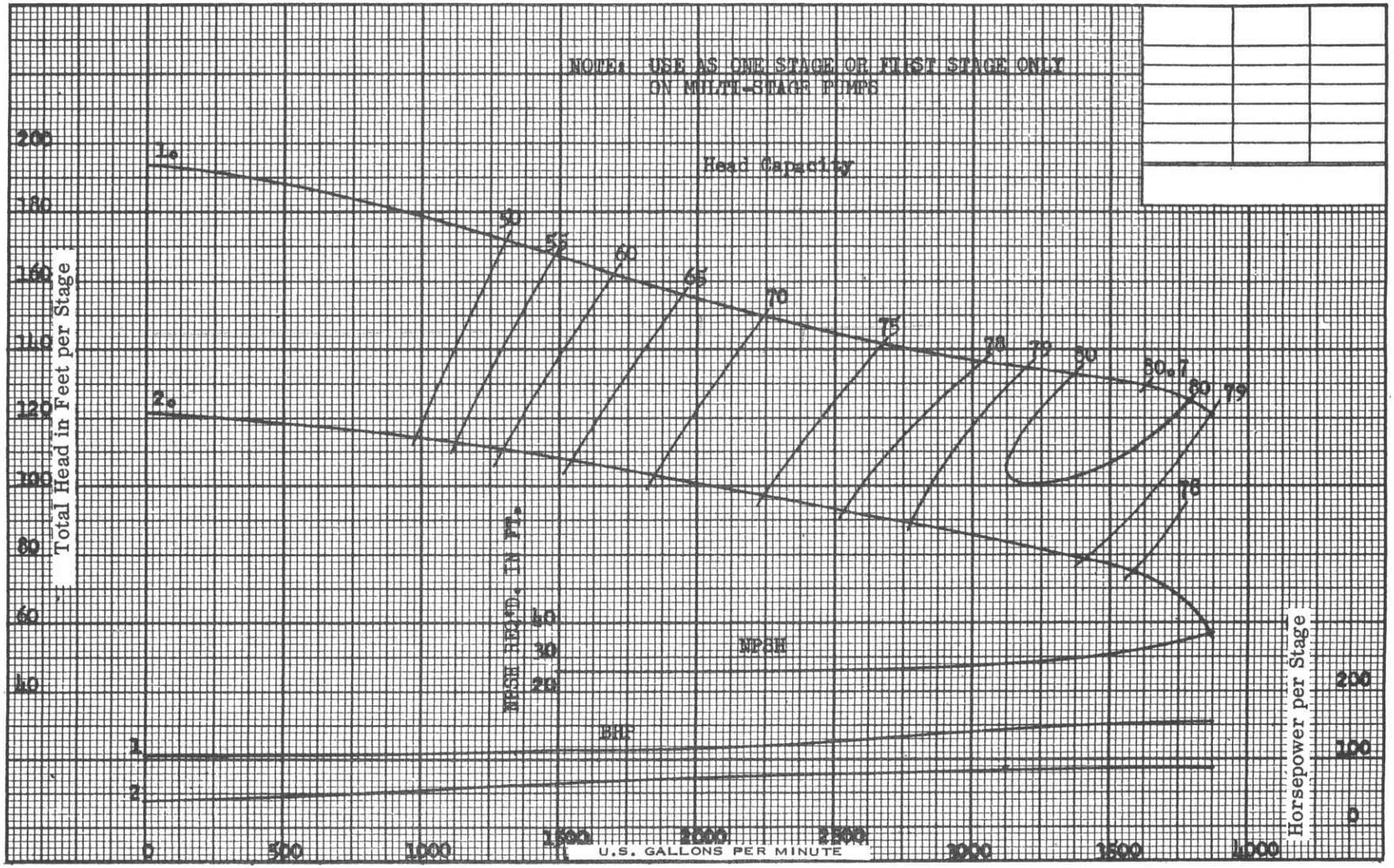
NO EFFICIENCY ADJUSTMENT IS REQUIRED FOR STAGING

20HH Curve No. 4806188 (6-84) Impeller No. 4600652 1785 RPM

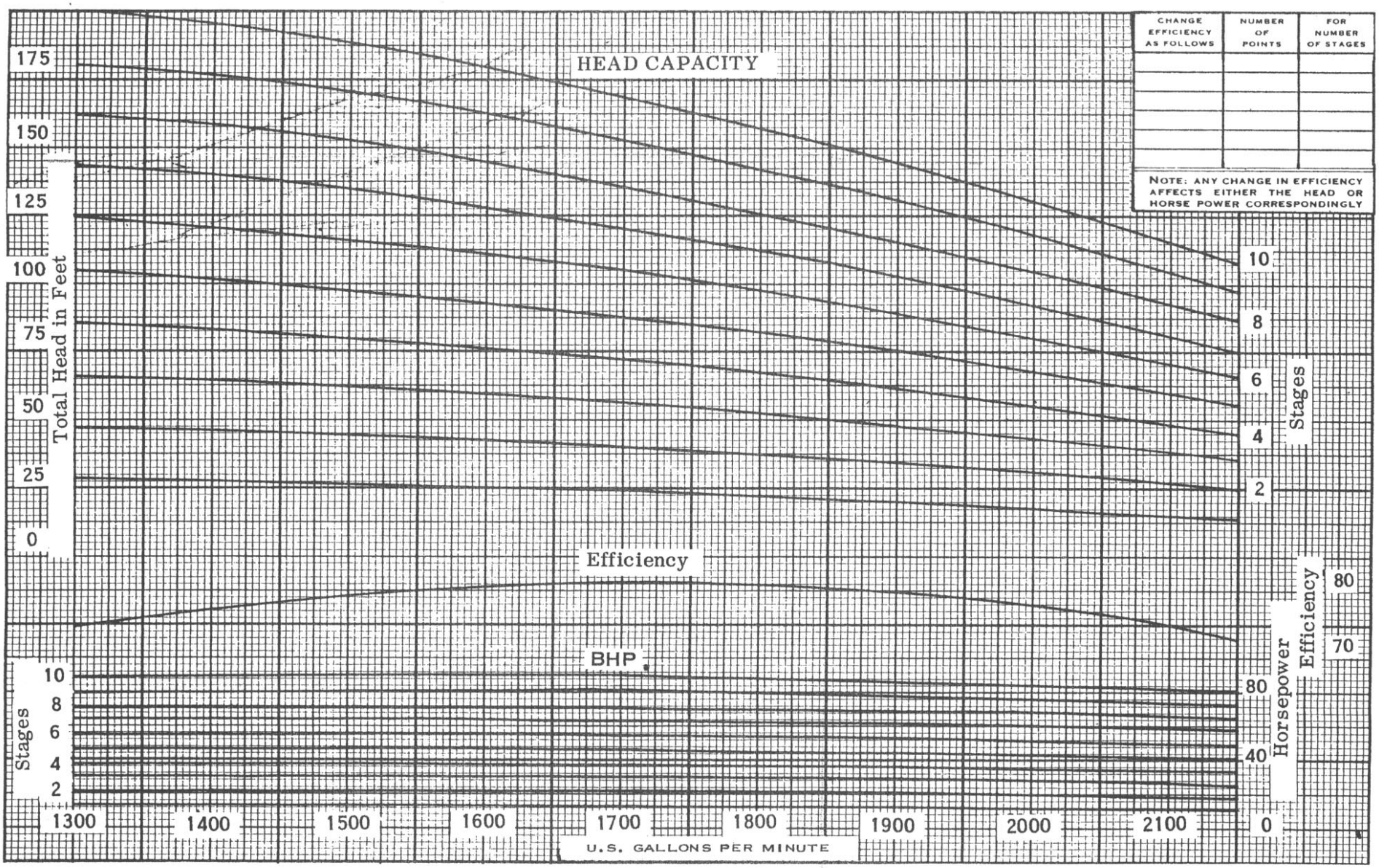


20HXB Curve No. 2846855 (12-84) Impeller No. 2617886 1785 RPM

1760 RPM



18MA Curve No. 2827375 (10-74) Impeller No. 2606879 1760 RPM



10MFH Curve No. 2805175 (10-74) Impeller No. 2602101 **1760 RPM**

ATTACHMENT G

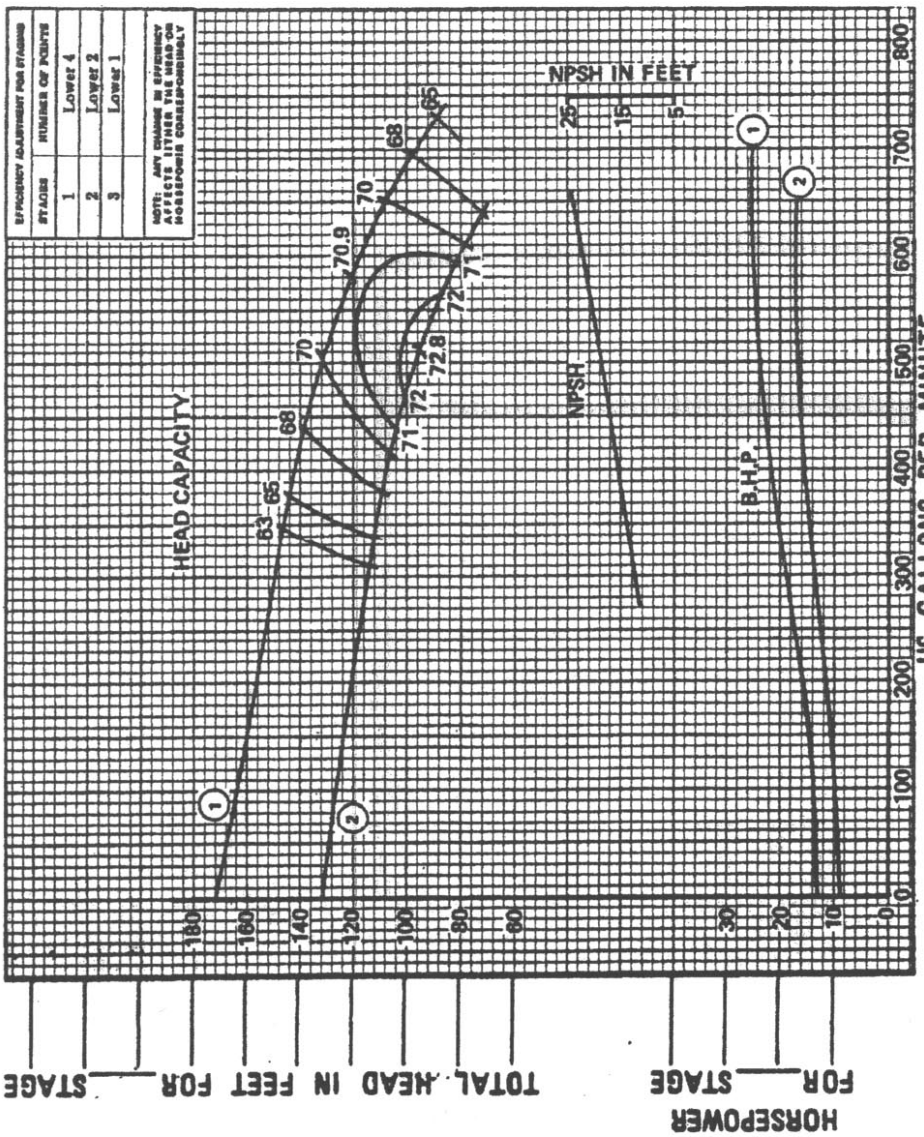
Recovery Pump – Sample Curves

VERTICAL TURBINE PUMPS
Model 9LA - 3460 Rpm

Peerless Pump Company
Indianapolis, IN 46207-7026

2 POLE 60 HERTZ PERFORMANCE

Capacity _____ gpm
Head _____ Feet
BHP _____
EFFICIENCY _____ %
DRIVER _____
HEAD _____
COLUMN _____



CURVE NO.	IMPELLER NO.	IMPELLER DIA.	TAKEN FROM
1	T84391	6-11/16	55739
2	T84391	6-1/16	55753
3			
4			

Customer _____
Item _____
Peerless Ref. No:
Laboratory Performance
SIZE 9LA RPM 3460 BOWL 2604262 CIE CURVE 48062273

ATTACHMENT H

Public Statement on Ultraviolet (UV) Light for Treatment of Public Water Supplies

Recommended Standards For Water Works

2003 Edition

Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers

Illinois Indiana Iowa Michigan Minnesota Missouri
New York Ohio Ontario Pennsylvania Wisconsin

POLICY STATEMENT
ON
ULTRA VIOLET LIGHT
FOR TREATMENT OF PUBLIC WATER SUPPLIES

Ultra Violet (UV) Light treatment devices may be used to treat bacteriologically unsafe groundwater from drinking water wells. However, reviewing authorities expect water system owners to take all steps possible to obtain a naturally safe water source before considering treatment. A naturally safe water source provides the best long-term public health protection and there is no reliance on a treatment device to assure safe water. There must be a determination that the bacteriologically unsafe water is not due to the influence of surface water.

Recent research has demonstrated the effectiveness of UV as a primary disinfectant. While this policy statement does not specifically cover UV treatment for surface water or groundwater under the direct influence of surface water, it is not the intent of this policy to discourage such use. Portions of this policy are applicable to the treatment of effectively filtered surface water. The reviewing authority shall be contacted regarding use of UV treatment for these applications.

When a naturally safe groundwater source is not available, or the system owner wishes to provide UV treatment for other reasons, the following criteria shall be considered. Supplemental disinfection to provide a residual in the water distribution system may be required by the approval authority. When UV light treatment devices are used for non-health related purposes the UV device may provide doses less than indicated in the following criteria.

A. CRITERIA FOR UV WATER TREATMENT DEVICES

1. UV water treatment devices must comply with criteria approved by the reviewing authority or Class A criteria under ANSI/NSF Standard 55 - Ultraviolet Microbiological Water Treatment Systems; each UV water treatment device shall meet the following standards;

   a. Ultraviolet radiation at a wavelength of 253.7 nanometers shall be applied at a minimum dose of 40 millijoules per square centimeter (mJ/cm^2) at the failsafe set point at the end of lamp life;

   b. The UV device shall be fitted with a light sensor to safely verify that UV light is being delivered into the reactor;

   c. The UV light assembly shall be insulated from direct contact with the influent water by a quartz (or high silica glass with similar optical and strength characteristics) lamp jacket to maintain proper operating lamp temperature;

   d. The design and installation of the UV reactor shall ensure that the manufacturer's maximum rated flow and pressure cannot be exceeded;

   e. The UV assemblies shall be accessible for visual observation, cleaning and replacement of the lamp, lamp jackets and sensor window/lens;

   f. A narrow band UV monitoring device shall be provided that is sensitive to germicidal UV light. It shall be accurately calibrated so that it indicates the true irradiance (mJ/cm^2) at 253.7 nanometers and be installed at the location critical for that unit. The device shall trigger an audible alarm in the event the sensor or lamp fails or if insufficient dosage is detected as defined in item "a" above;

g. An automatic shutdown valve shall be installed in the water supply line ahead of the UV treatment system that will be activated whenever the water treatment system loses power or is tripped by a monitoring device when the dosage is below its alarm point of 40 mJ/cm^2. When power is not being supplied to the UV unit the valve shall be in a closed (fail-safe) position.

h. The UV housing shall be stainless steel 304 or 316L;

2. A flow or time delay mechanism wired in series with the well or service pump shall be provided to permit a sufficient time for tube warm-up per manufacturer recommendations before water flows from the unit upon startup. Where there are extended no-flow periods and fixtures are located a short distance downstream of the UV unit, consideration should be given to UV unit shutdown between operating cycles to prevent heat build-up in the water due to the UV lamp:

3. A sufficient number (required number plus one) of parallel UV treatment systems shall be provided to assure a continuous water supply when one unit is out of service;

4. No bypasses shall be installed;

5. All water from the well shall be treated. The well owner may request a variance to treat only that portion of the water supply that is used for potable purposes provided that the daily average and peak water use is determined and signs are posted at all non-potable water supply outlets.

6. The well or booster pump(s) shall have adequate pressure capability to maintain minimum water system pressure after the water treatment devices;

B. PRETREATMENT

The reviewing authority will determine pre and post treatment on a specific case basis depending on raw water quality. See Section G for raw water quality limitations. If coliform bacteria or other microbiological organisms are present in the untreated water, a 5 micron filter shall be provided as minimum pretreatment.

C. PROCESS CONTROL WATER QUALITY MONITORING

Total coliform monitoring and other parameters required by the reviewing authority will be used to evaluate UV treatment effectiveness. The minimum monitoring frequency will be as follows:

Startup and 2 weeks after start up - one raw and one treated sample.
Monthly thereafter - raw and treated.

Monitoring for additional parameters or total coliform on an increased frequency may be required by the reviewing authority.

D. ONLINE MONITORING, REPLACEMENT PARTS

UV light intensity of each installed unit shall be monitored continuously. Treatment units and the water system shall automatically shutdown if the UV dosage falls below the required output of 40 mJ/cm^2. Water systems that have source water exceeding 5 NTU turbidity may be required to install an online turbidimeter ahead of the UV water treatment device. An automatic shutdown valve shall be installed and operated in conjunction with the turbidimeter. Each owner shall have available on site at least one replacement lamp, a 5 micron replacement filter and, where applicable, a replacement cyst reduction filter and any other components necessary to keep the treatment system in service.

E. SEASONAL OPERATIONS

UV water treatment devices that are operated on a seasonal basis shall be inspected and cleaned prior to use at the start of each operating season. The UV water treatment system including the filters shall be disinfected prior to placing the water treatment system back into operation. A procedure for shutting down and starting up the UV treatment system shall be developed for or by each owner based upon manufacturer recommendations and submitted in writing to the review authority.

F. RECORD KEEPING AND ACCESS

A record shall be kept of the water quality test data, dates of lamp replacement and cleaning, a record of when the device was shutdown and the reason for shutdown, and the dates of prefilter replacement.

The reviewing authority shall have access to the UV water treatment system and records.

Water system owners will be required to submit operating reports and required sample results on a monthly or quarterly basis as required by the reviewing authority.

G. RAW WATER QUALITY CHARACTERISTICS

The water supply shall be analyzed for the following water quality parameters and the results shall be included in the UV application. Pretreatment is required for UV installations if the water quality exceeds any of the following maximum limits. When an initial sample exceeds a maximum limit, a check sample shall be taken and analyzed.

Parameter	Maximum
UV 254nm Absorption	20 percent at 1 cm
Dissolved Iron	0.3 mg/L
Dissolved Manganese	0.05 mg/L
Hardness	120 mg/L*
Hydrogen sulfide (if odor is present)	Non-Detectable
Iron Bacteria	None
pH	6.5 to 9.5
Suspended Solids	10 mg/L
Turbidity	1.0 NTU
Total Coliform	1,000/100 ML
E. Coli	**
Cryptosporidium	**
Giardia	**

* A higher hardness may be acceptable to the reviewing authority if experience with similar water quality and reactors shows there are no treatment problems or excessive maintenance required.

** These organisms may indicate that the source is either a surface water or ground water under the direct influence of surface water and may require additional filtration pretreatment. Consult the reviewing authority for guidance.

Raw water quality shall be evaluated and pretreatment equipment shall be designed to handle water quality changes. Variable turbidity caused by rainfall events is of special concern.

Adopted April, 2003