MEMORANDUM

Date: August 30, 2006

TO: Town Commission

FROM: Bruce St. Denis, Town Manager

SUBJECT: Reclaimed Water Alternatives Discussion – September 21, 2006 Regular Workshop Meeting

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The Town Commission asked that the subject of reclaimed water be brought to you at the September 21, 2006 Regular Workshop Meeting. In anticipation of that discussion I am providing you with two documents in advance of the agenda publication date.

A. A summary of the recommendations of a Town Commission appointed Water Advisory Committee – The Water Advisory Committee reviewed the information supplied by CDM and other consultants. The individual members also brought their own sources of information to the Committee for their consideration.

B. CDM's Irrigation Water Supply Options Evaluation (February 2002) – This analysis was prepared after extensive analysis of the Town's irrigation requirements including both groundwater and potable and reviewing the options available to the Town for an alternative irrigation water source.

The project costs shown in the report are clearly out of date. The most recent update of the information indicated that the cost of bringing reclaimed water to the Island had increased from $28.5 million to $35 - $45 million. This figure does not include the cost of running lines into residential areas.

If the Town Commission wishes to move forward with looking into an irrigation water alternative staff should be directed to update the numbers in this report. However, I believe that once this is done the relative costs between the alternatives will remain the same.

There is a companion CDM report which shows the data used in completing the irrigation alternatives report. A copy is available in my office for individual Commissioner review. If any Commissioner requests their own copy one will be provided to each Commissioner.

The following is a series of bullet points that will hopefully provide a framework for the discussion at the September 21, 2006 Regular Workshop Meeting. I have tried to frame the bullets to be as non-controversial as possible although it is possible that some people might not agree with all of my observations.

If any Town Commissioner wishes to have additional research or elaboration of any one of the bullet points please let me know and the additional information will be provided.

1. Because the Town does not have its own wastewater treatment plant we cannot produce our own reclaimed water.

2. The Town sends approximately 2 million gallons of untreated wastewater to Manatee County each day. This would theoretically produce approximately 1.5 million gallons of reclaimed water.

3. Manatee County indicated they would be willing to sell us 1.5 million gallons per day of reclaimed water. This option was not pursued because of the cost of getting the water to Longboat Key as well as the low number of units to be sold which would result in a higher cost per unit.

4. Manatee County's wastewater is treated to secondary treatment levels. This means that some nutrients such as nitrogen are not removed making the use of Manatee's reclaimed water may not be as desirable as for use in a waterfront community.

5. Sarasota treats their wastewater to advanced wastewater treatment standards which is permitted for disposal in Sarasota Bay waters.

6. The City of Sarasota's 3 – 4 mgd of reclaimed water currently goes to several customers, the largest of which is the Hi Hat Ranch property. The contract between the City of Sarasota and Hi Hat Ranch has been in place for approximately 25 years.

7. The City of Sarasota currently does not charge the Hi Hat Ranch, or many of its other customers anything for the reclaimed water. We have had indications from the City of Sarasota that as contracts are renegotiated users will pay for the water as it is now considered a commodity.

8. Hi Hat is currently in negotiations with the City of Sarasota for continuing the water contract and they have indicated they are willing to pay some charge for the water although to our knowledge the rate has not been established.

9. The negotiations between the City and the Hi Hat Ranch are complex as they include items beyond the delivery of reclaimed water including the cost of the infrastructure the City has already invested on the Hi Hat property as well as potential land sales between the two parties.

10. The City has indicated they are willing to continue discussions regarding the sale of reclaimed water with both the Hi Hat Ranch and the Town of Longboat Key at this time.

11. The advantages to the City working with Longboat Key on the reclaimed water project include being able to construct a supply line for reclaimed water up to Bird Key, St Armand's and Lido Keys for the use of the residents there.

12. Many of the Town's larger properties (primarily condominium communities) use groundwater for irrigation. The quality of the water ranges from acceptable for irrigation use, to poor. Because of the limited data available it is not possible to do a meaningful water quality trend analysis on the Town's groundwater although data is collected regularly. However, the fact that the Town's groundwater quality will deteriorate further over time has not been disputed by a single water expert. The ones we have talked to have said that degradation of the groundwater quality should be taken as a given in the Town's water quality discussions.

13. Further degradation of the Town's groundwater would primarily affect the multi-family communities and the golf course. There are also several single family home communities that rely on groundwater.

14. At this point it appears that the only viable reclaimed water option to the Town is to work with the City of Sarasota. The water we need to get is the same supply currently being sent to the Hi Hat Ranch. If that water goes under contract to someone else, supply alternatives become significantly more complicated and expensive to deliver to the Island.

15. The Town of Longboat Key is meeting the current Southwest Florida Water Management District (SWFWMD) allocation restrictions on its potable water use. It is entirely possible that this allocation could be reduced during future permit application processes. At that point the only real option for the Town would be to become more restrictive for the use of potable water for irrigation. This would primarily affect single family homes.

16. When we were working on the reclaimed water project in 2001-2002 it was projected that the delivered cost of the water would be $2.67 per thousand gallons. At that time people thought it was foolish to move forward because the Town was selling potable water for $1.18 per thousand gallons (0 – 7,000 gallons) and $1.87 (7,000 gallons and up). In the past 4-5 years the cost of potable water has increased to the range of $2.50 to $9.00 per thousand gallons depending on total consumption.

17. Even if we were willing to pay for it the expanded use of potable water for irrigation would be a violation of both our SWFWMD permit and our potable water contract with Manatee County.

18. All of the inexpensive options for potable water production have been utilized within our region of Florida. The cost to develop new water supply sources will increase dramatically per thousand gallons which will result in a significant increase in wholesale water cost.

19. I do not believe that Longboat Key needs reclaimed water today. I firmly believe that planning for a future alternative irrigation water source is critical for the Town's future.

20. It will take 3-5 years to design, permit, and construct a reclaimed water system to the Island. It could take slightly longer to develop an R/O program.

21. To finance the capital cost of a reclaimed water project it will be necessary to schedule a referendum for either a revenue or general obligation bond. The language for a bond referendum needs to be approved 10-12 weeks before the referendum date.

22. Representatives of the Longboat Key Club have indicated in recent discussions that they have completed their reverse osmosis (R/O) study. They indicated they only plan to do R/O for the Islandside Course at this time. They plan to use the Gulf of Mexico as their water source. They are investigating the use and permitting of exfiltration trenches for a concentrate disposable method.

23. The Longboat Key Club has indicated they are considering renting or leasing the R/O equipment for Islandside with the intention of becoming part of the Town's reclaimed water program should it become available.

This general information is being distributed to the Town Commission in advance of the September 21, 2006 Regular Workshop Meeting. Any information that presents itself between now and that meeting will be included in the September 21, 2006 Regular Workshop Meeting materials.

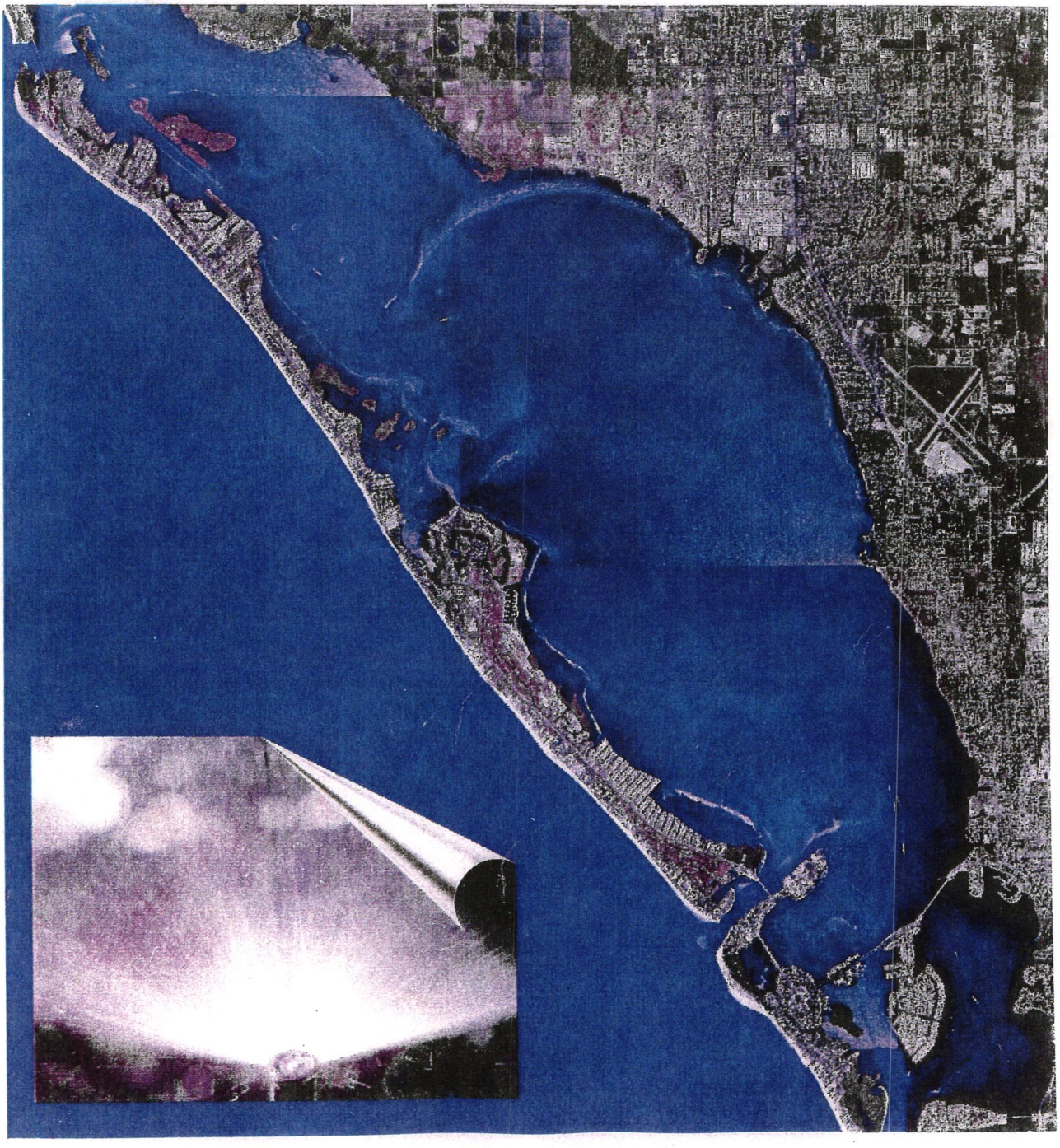
Please don't hesitate to contact me if you have any questions or wish to discuss this information further prior to the Workshop.

CDM

Town of Longboat Key

Irrigation Water Supply Options Evaluation

February 2002



Final Report

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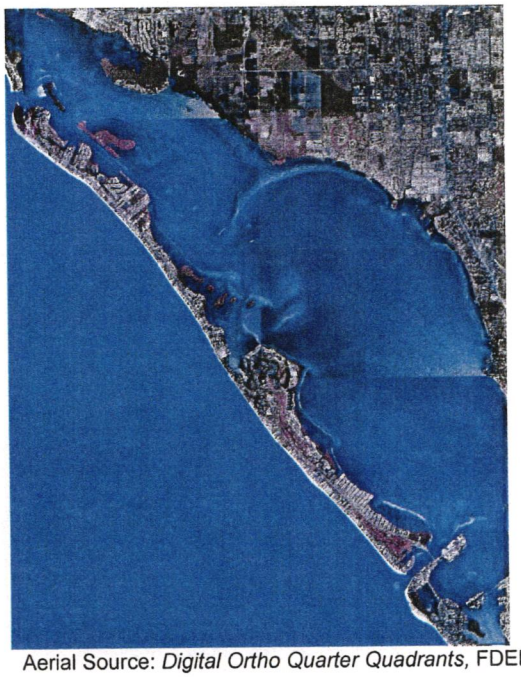
Executive Summary

The Town of Longboat Key is a barrier island located along the west coast of Florida between Sarasota Bay and the Gulf of Mexico. The Town is located in both Sarasota and Manatee Counties. Barrier islands typically have minimal groundwater supplies and generally receive potable water from mainland sources. The Town of Longboat Key receives potable and wastewater services from Manatee County.



Aerial Source: *Digital Ortho Quarter Quadrants*, FDEP

A general decline of groundwater quality has been observed for irrigation wells located on Longboat Key. This decline is partly attributed to salt water intrusion caused by long term withdrawals and prolonged drought conditions.

Groundwater samples collected through a groundwater testing program initiated by the Town indicate that the current groundwater quality does not meet desirable irrigation standards. Ideally, the desired chloride and total dissolved solids (TDS) levels for irrigation water is less than 350 milligrams per liter (mg/l) and 1,000 mg/l, respectively. Results of the testing program and well permit review clearly indicated that the southwest and southeast portions of the Town of Longboat Key have the greatest amount of permitted groundwater withdrawal, permitted wells, and the poorest groundwater quality. The south portion of the island has average chloride concentrations greater than 500mg/l and TDS concentrations greater than 1,900 mg/l. The north portion of the island has an acceptable average chloride concentration around 310 mg/l, however the average TDS concentration is greater than 1,400 mg/l.

The continued use of the groundwater resources as practiced today may lead to further decline of groundwater quality. Once the groundwater source is inadequate for irrigation use, well owners will require equal access to potable water for irrigation. The potable water supply and system of Longboat Key cannot support additional demands. Should the demand for potable water increase above the current demand, severe water restrictions would be required to ensure all residents have accessible drinking water.

The decline of groundwater quality, the constraints on the potable water supply and use, and the continued drought conditions of the region are significant components of the Town's decision to investigate alternative irrigation sources. This report evaluates the feasibility of the available alternative irrigation options.

Irrigation demand projections indicated that the Town of Longboat Key requires 4 to 6 million gallons per day on an average and dry season demand basis. To provide a reliable supply of irrigation water for the Town, several options were considered as possible sources. These alternatives included reclaimed water supplies from the City of Sarasota and Manatee County; Longboat Key owned water reclamation facility; construction of a brackish groundwater desalination facility; construction of a seawater desalination facility; and installation of ultra-filtration membrane components in the existing wastewater lift stations. **Table ES-1** summarizes the costs for the evaluated options.

The more practical and economically feasible alternative for irrigation supply is receiving reclaimed water from the City of Sarasota. Option B for the City of Sarasota has 2.5 mgd of reclaimed water available for the Town of Longboat Key and can maximize wet weather flows for storage. The City of Sarasota has existing submerged land leases for the critical subaqueous crossings. This will help to expedite the permitting process and overall project schedule. An additional advantage is the potential opportunity of receiving some cooperative grant assistance from SWFWMD.

The City of Sarasota supply option requires the installation of a subaqueous reclaimed water transmission main and Aquifer Storage and Recovery (ASR) facility. The Longboat Key reclaimed transmission system would connect the City of Sarasota 24-inch reclaimed water pipeline in the vicinity of Coconut Avenue and Gulfstream Avenue. **Figure ES-1** depicts the recommended pipeline route and ASR facility location.

The inclusion of reclaimed water into the overall water supply resources of Longboat Key will provide a viable irrigation alternative that could ultimately reduce the demand on groundwater and potable water resources. This reduction of groundwater withdrawals on Longboat Key may help decrease the declining groundwater quality trend. A reclaimed water supply system in Longboat Key provides a long-term sustainable landscape irrigation supply that will assist in maintaining the aesthetics and viability of Longboat Key.

Table ES-1

Summary of Costs per 1,000 Gallons of Irrigation Water

Source of Supply	Scenario	Capacity (mgd)	Capital $/1,000 Gallons	O&M $/1,000 Gallons	Total $/1,000 Gallons
City of Sarasota	Scenario 1	2.5	$2.01	$0.32	**$2.33**
	Scenario 2	2.5	$1.88	$0.32	**$2.20**
	Scenario 3 A	4.0	$2.24	$0.32	**$2.56**
	Scenario 3 B	4.0	$2.34	$0.32	**$2.66**
	Scenario 4	4.0	$2.23	$0.32	**$2.55**
Manatee County	Scenario 1	1.5	$3.24	$0.43	**$3.67**
	Scenario 2	1.5	$3.11	$0.43	**$3.54**
	Scenario 3	2.5	$2.48	$0.32	**$2.80**
	Scenario 4	2.5	$2.39	$0.32	**$2.71**
Longboat Key	Water Reclamation Facility	2.5	$2.66	$1.23	**$3.89**
	Brackish Water Desalination Facility	2.5	$2.71	$2.48	**$5.19**
	Seawater Desalination Facility	2.5	$3.50	$3.63	**$7.13**

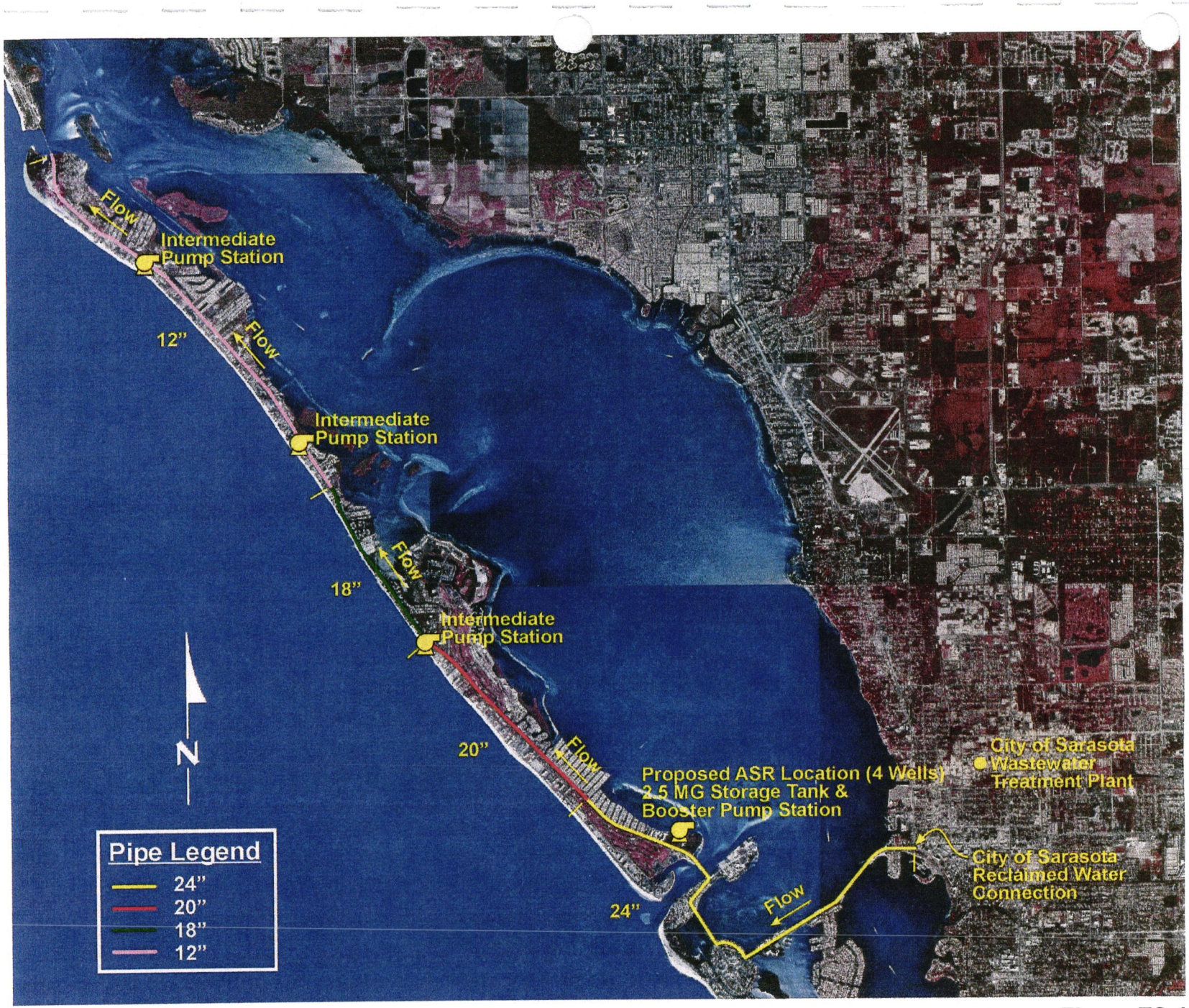


Figure ES-1
Reclaimed Pipeline Route
Recommended Supply Option

CDM

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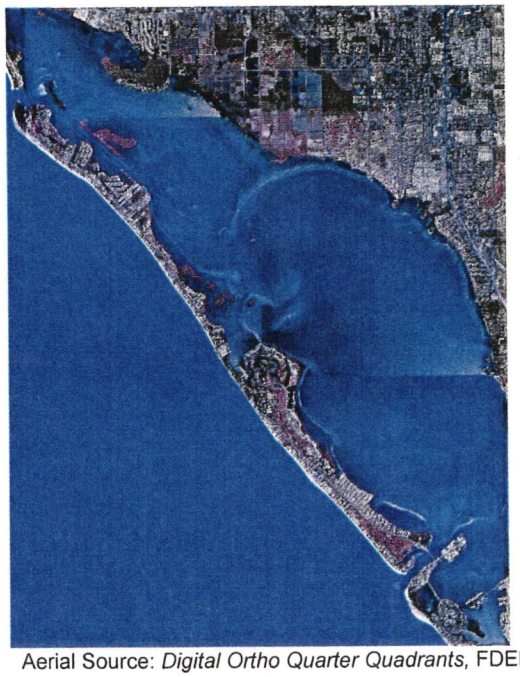
Section 1
Introduction

1.1 Background

The Town of Longboat Key is a barrier island located along the west coast of Florida between Sarasota Bay and the Gulf of Mexico. The Town is located in both Sarasota and Manatee Counties. Based on the 2000 US Census, the permanent resident population is estimated at 7,600. The Town's population typically increases to slightly less than 21,000 residents during the late fall and winter months. The seasonal population increase is due to out-of-state ownership of vacation properties and tourism.

Due to the geographical location of the Town, local water resources for the residents are limited. Barrier islands typically have minimal groundwater supplies and generally receive potable water from mainland sources. The Town of Longboat Key receives potable and wastewater services from Manatee County.



Aerial Source: *Digital Ortho Quarter Quadrants*, FDEP

It is estimated the Town uses approximately 15 to 20% potable water from Manatee County and approximately 80 to 85% local groundwater to meet irrigation demands. Landscape irrigation is a significant component of the Town's total water usage.

The Town is considering implementing an alternative water source for non-potable applications, specifically irrigation. Influencing factors for providing alternative water to the residents of Longboat Key are: groundwater quality deterioration, groundwater withdrawal stresses, and increased potable water usage beyond that which is available through current Manatee County agreement allocations. The local groundwater resources are being used to provide water for landscape and green space irrigation on Longboat Key.

A general decline of groundwater quality has been observed for irrigation wells located on Longboat Key. This decline is partly attributed to salt water intrusion caused by long term withdrawals.

Three naturally occurring water constituents are instrumental in defining the "quality" of the groundwater for irrigation use. The key parameters are chloride, total dissolved solids (TDS), and sulfate. TDS is a measurement of dissolved solids including chlorides, sulfates, calcium, magnesium, sodium, potassium, and bicarbonates. Poor water quality, namely saline water, causes stress and injury to plants. Soluble salts, such as chloride and sulfate salts, can impede plant growth. The accumulation of these salts in plants and soil cause dehydration and nutrient uptake deficiencies. Ideally, the desired chloride and TDS levels for irrigation water is less than 350 milligrams per liter (mg/l) and 1,000 mg/l, respectively.

Groundwater samples collected through a groundwater testing program initiated by the Town indicate that the current groundwater quality does not meet desirable irrigation standards. The southwest and southeast portions of the Town of Longboat Key have the greatest amount of permitted groundwater withdrawal, permitted wells, and the poorest groundwater quality. Historically, groundwater wells on Longboat Key have experienced a general decline in water quality. The historical trend and current groundwater quality of Longboat is discussed in detail in the report titled, *Evaluation of Irrigation Water Quality Trends and Groundwater Usage, Town of Longboat Key,* dated February 2002, CDM.

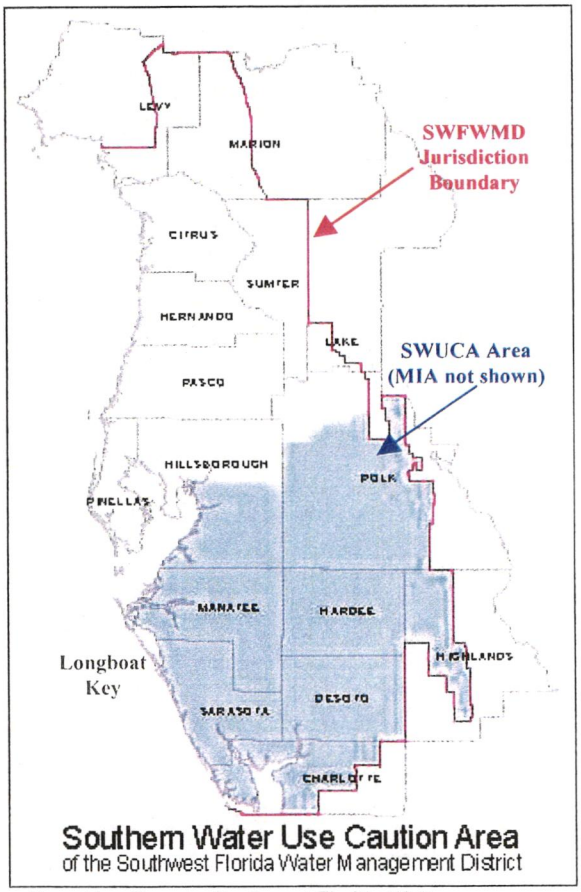
Continued use of the groundwater resources as practiced today may lead to further decline of groundwater quality. Lower quality groundwater will further limit the plant species selection and in turn affect the landscaping aesthetics on Longboat Key.

The Town of Longboat Key receives potable water from Manatee County. Current potable water demands by the Town are exceeding the supply agreement with Manatee County. The current water agreement (rate resolution R-01-66) between the Town and Manatee County reserves an average daily flow of 2.50 mgd of Manatee County's potable water capacity for the Town of Longboat Key. It is estimated approximately 25% of the potable water demand is utilized for landscape and green space irrigation.

Once the groundwater source is inadequate for irrigation use, well owners will require equal access to potable water for irrigation. The potable water supply and system of Longboat Key cannot support these potential additional demands. Should the demand for potable water increase above the current demand, severe water restrictions would be required to ensure all residents have accessible drinking water.

Longboat Key is located within the Southern Water Use Caution Area (SWUCA) and Most Impacted Area (MIA) of the Southwest Water Management District (SWFWMD). SWFWMD established the Southern Water Use Caution Area in 1992 to meet the water supply needs of the region while protecting the water resources and related natural systems. The Southern Water Use Caution Area is designated where water resources are or will become critical within 20 years dating from 1992. The water resource concerns include the decline of lake levels connected to the Floridan Aquifer and saltwater intrusion in the Floridan Aquifer. The Most Impacted Area is the most critical area of the Southern Water Use Caution Area. Groundwater use within the Most Impacted Area is subject to more stringent regulations.

SWFWMD is encouraging and regulating groundwater and potable water conservation efforts throughout the region. As encouragement, SWFWMD offers cooperative grants to provide financial assistance to communities for the use of alternative irrigation supplies. SWFWMD determines the recipients of the grants based on the ability of the proposed system to offset potable water consumption and/or reduce withdraw from the Floridan Aquifer for non-potable water use.



Base Map Source: *Southwest Florida Water Management District*

Above and beyond the Southern Water Use Caution Area designation, recent drought events have aggravated the decline in groundwater quality. As a result of the drought conditions, SWFWMD has placed weekly watering restrictions on the region on a regular basis. As a part of the Town's proactive position on conserving Longboat's groundwater resources, the Town Commission has exercised the right to further restrict weekly irrigation beyond the SWFWMD restrictions.

The decline of groundwater quality, the constraints on the potable water supply and use, and the continued drought conditions of the region are all components of the Town's decision to investigate alternative irrigation sources. This report evaluates the feasibility of the available alternative irrigation options.

1.2 Alternatives

To provide a reliable supply of irrigation water for the Town, several options were considered as possible sources. The water supply options evaluated in this report include:

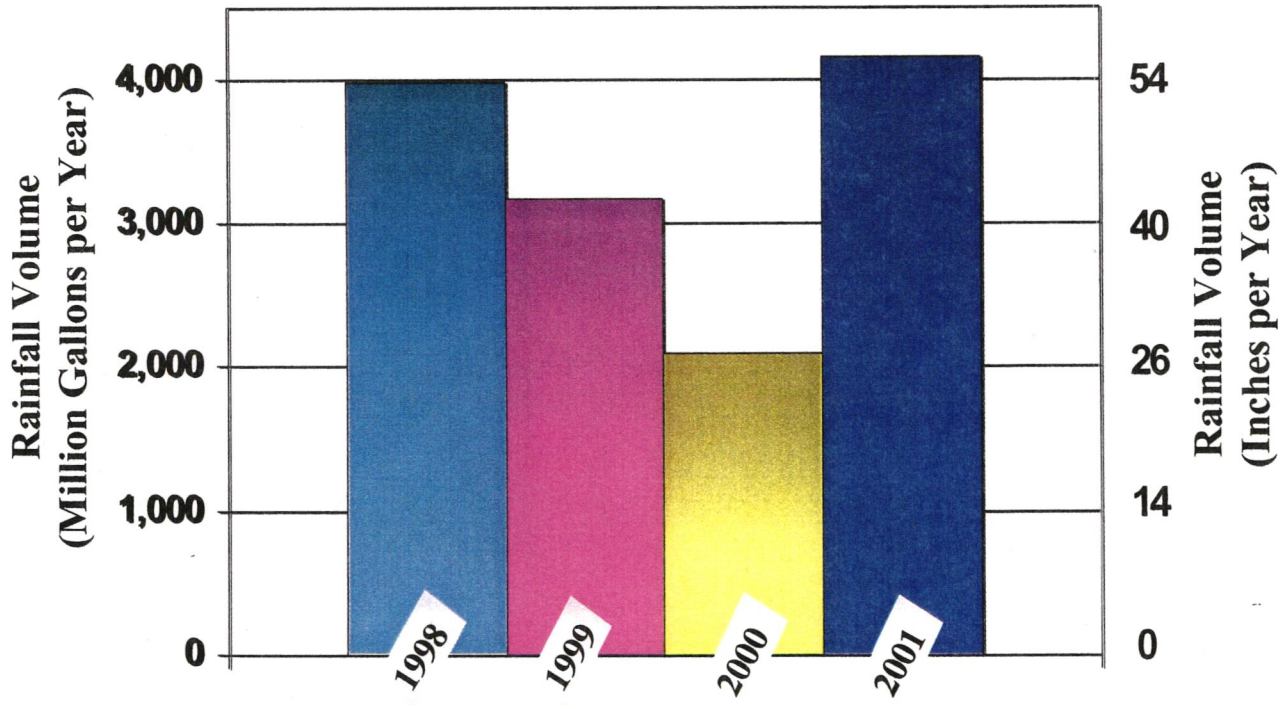
- Construction of a reclaimed water transmission system from the mainland using two potential suppliers. Specifically considered as reclaimed suppliers are City of Sarasota and Manatee County (Sections 3.1.4 and 3.1.5);
- Construction of a Longboat Key water reclamation facility (Section 3.1.6) and;
- Construction of a Longboat Key brackish groundwater desalination facility (Section 3.2.1);
- Construction of a Longboat Key seawater desalination facility (Section 3.2.2);
- Construction of raw wastewater ultra filtration membrane plants at existing wastewater lift stations on Longboat Key (Section 3.2.5).

In order to evaluate these options, this report reviews the current nature of irrigation demands on Longboat Key including existing well location and production rates, groundwater quality, and potable water demands. In addition, this report estimates the total potential irrigation demand based on current land use planning and property appraiser map information.

The focus of this report is to provide a summary of alternatives available to the Town for planning and public policy decisions. The review of each alternative presented in this report includes conceptual plans, conceptual cost information, and permitting issues.

Section 2
Irrigation Water Demand

Water is supplied to area plants through two primary means, rainfall and irrigation. The Town of Longboat Key's previous 4-year rainfall amounts are based on the closest proximity rainfall station. Southwest Florida Water Management District (SWFWMD) maintains rainfall data collection site No. 285 located on Longboat Key in the vicinity of the Sarasota and Manatee County line. SWFWMD uses rainfall data collection sites throughout the district area to record daily rainfall. The monthly rainfall records for Longboat Key are summarized in **Table 2-1**. The volume of rainwater accumulated on Longboat Key per year was calculated based on inches recorded for record year over the entire area of Longboat Key. **Figure 2-1** depicts a graphical representation of rainfall volume versus record year.



Note: 2000 and 2001 do not include rainfall data for the month of December

Figure 2-1
Yearly Rainfall Volume for Longboat Key

Table 2-1
Longboat Key Rainfall Data

Year	Month	Rainfall (inches) [1]	Number of Days with Rainfall Accumulation	Yearly Total Number of Days with Rainfall Accumulation	Total Cummulative Rainfall per year (inches)	Yearly Rainfall Volume over Longboat Key (mg) [2]
1998	January	7.32	14			
	February	6.47	7			
	March	9.67	5			
	April	0.1	1			
	May	1.40	6			
	June	2.28	4			
	July	5.18	11			
	August	6.10	8			
	September	9.53	16			
	October	0.67	5			
	November	2.59	5			
	December	1.16	5	87	52.47	3,973
1999	January	3.63	4			
	February	0.66	4			
	March	0.63	5			
	April	0.51	2			
	May	0.72	3			
	June	3.62	9			
	July	10.52	11			
	August	7.66	14			
	September	7.42	12			
	October	3.59	9			
	November	0.45	2			
	December	2.46	6	81	41.87	3,170
2000	January	0.33	3			
	February	0.69	4			
	March	0.54	4			
	April	1.74	3			
	May	0.34	1			
	June	4.54	11			
	July	6.90	16			
	August	4.14	10			
	September	6.49	10			
	October	0.12	1			
	November	1.83	5			
	December	Not Collected		68	27.66	2,094
2001	January	0.43	3			
	February	0.00	0			
	March	12.29	7			
	April	0.37	2			
	May	0.30	3			
	June	7.09	12			
	July	16.75	17			
	August	3.35	8			
	September	11.88	12			
	October	2.38	4			
	November	0.00	0			
	December	Information not yet available		68	54.84	4,152

1. Data provided by SWFWMD Rainfall Data Collection Station 285 (Longboat Key County Line).
2. Volume calculation based on cummulative inches of rainfall per year distributed over the area of Longboat Key (2,788 acres).

2.1 Existing Irrigation Usage

In order to evaluate an alternative water source for irrigation on Longboat Key, the amount of water required for irrigation or irrigation water demand must be estimated. The conceptual plans of the alternative supply options presented in Section 3 are based on the irrigation water demand.

The current irrigation demand of Longboat Key is met by groundwater and potable water sources. Wells located throughout Longboat Key provide the groundwater supply. Potable water supply is provided to Longboat Key by Manatee County. Data available from well records and potable water accounts have been used to establish a best estimate of current irrigation usage. This usage estimate provides insight into the relative distribution of the groundwater and potable water irrigation supplies currently used. Because there is limited data available to estimate the current irrigation usage, additional methods are utilized to better define the irrigation water demand for Longboat Key.

2.1.1 Groundwater Usage for Irrigation

Detailed groundwater review and well information are comprehensively presented in a separate document titled, Town of Longboat Key *Evaluation of Irrigation Water Quality Trends and Groundwater Usage*, February 2002. The main related components for groundwater usage are presented herein for reference. Many Town of Longboat Key residents, condominiums, and businesses utilize wells for irrigation. Groundwater wells are permitted through the Southwest Florida Water Management District (SWFWMD). Two types of SWFWMD permits provide groundwater use information:

- Water Use Permit (WUP) - required for wells that withdraw an annual average greater than 100,000 gpd, have an outside diameter equal to or greater than 6 inches in diameter, and/or are located within the SWFWMD Most Impacted Area of the Southern Water Use Caution Area.

- Well Construction/Alteration Permit - required prior to installing, repairing, deepening, or abandoning any size well.

As described in Section 1, the Town of Longboat Key is located within the SWFWMD Most Impacted Area of the Southern Water Use Caution Area. Available permits in the SWFWMD records database have been examined for pertinent withdrawal information. Records on the existing use of groundwater for irrigation are limited. Many of the wells do not have totalizing flow meters. However, some larger wells permitted through the WUP program are required to keep groundwater withdrawal records. Available permit data were reviewed to estimate current irrigation usage.

A total of 21 WUP permits have been granted to entities located on Longboat Key. Fourteen WUP permits are active, six are inactive, and one represents

Longboat Key's volume of groundwater used from Manatee County wells for potable water production. Six of the fourteen active WUP permits require submittal of monthly groundwater withdrawal totals. A summary of the active WUP permit withdrawal (actual and permitted) is presented in **Table 2-2**.

Table 2-2
SWFWMD Active Water Use Permit Withdrawal Summary

Entity	Withdrawal Volume Average Daily Flow	
	Permitted Pumpage (gpd)	Actual Pumpage (gpd)
Beachplace Association	62,000	ND
Fairway Bay Association	44,000	47,224
Gulfshore of Longboat Key (Possibly Gulf Tides)	1,000	ND
Harbourside Golf Course	470,700	436,322
Inn on the Beach	24,100	35,040
Islandside Golf Course	284,200	239,811
Marina Bay Association	16,600	21,957
Promenade Condominiums	9,600	ND
Queens Harbour	59,700	ND
Seaplace Association	42,000	ND
The Sanctuary	18,800	ND
Longboat Harbour	29,500	ND
Winding Oaks	18,000	ND
Winward Bay Incorporated	36,100	ND

ND = No Data

According to SWFWMD records, the six active WUPs have twenty-two wells. The twenty-two WUP wells pump a total average daily flow of 0.8 million gallons per day (mgd). Comparing the actual metered withdrawal average flow to the permitted withdrawal average flow from the WUPs indicated that on average the recorded use exceeds the permitted withdrawal by 12%. Applying this average exceedance to the remaining active WUP permitted withdrawals suggests that the total active WUP permittees withdraw an estimated 1.1 mgd or 7.7 million gallons per week of groundwater.

The well construction/alteration permit records maintained by SWFWMD provide information on the amount of smaller wells constructed on the island that are not regulated through the WUP program. The SWFWMD permit database has record of 365 well construction/alteration permits granted since 1970. A well construction/alteration permit is granted each time a well is altered. Therefore, some duplication of records can occur. For example, one well could conceivably have a permit record for installation as an irrigation well, a permit for repair of the well, and a permit for the abandonment of the well. The SWFWMD database does not link repair, replacement, or

abandonment permits to the original installation permits. The database entries were evaluated and where possible duplications were discovered, they were removed.

Of the 365 construction/alteration permits, 149 are actively permitted for irrigation use not including wells permitted under the WUP program. Quantifying the volume utilized from these 149 unmetered irrigation wells is difficult because individual well production capabilities and well owner watering habits vary greatly. These wells could account for a significant amount of groundwater use. For example, if it is assumed that the average user waters for approximately 4 hours per week at a well production velocity of 5 ft/s, the 149 irrigation wells would produce approximately 1.2 mgd or 8,400,000 gallons per week of groundwater for irrigation. Using these assumptions, a summary of withdrawal volume estimates from well construction permit wells is presented in **Table 2-3**.

In the absence of complete meter data, a total groundwater irrigation volume cannot be accurately determined. WUP withdrawal and well construction permits account for 2.3 mgd or 16.1 million gallons per week of groundwater use for irrigation. Therefore, this estimate represents the best available approximation of irrigation use of groundwater supplies.

2.1.2 Potable Water Usage for Irrigation

Potable water records from Longboat Key were evaluated to estimate potable water irrigation usage. Records from the monthly customer-billing database and the Town's daily master meter were analyzed. The Town's master meter measures the total volume of potable water used by Longboat Key customers. The master meter is read daily and the volume of water consumed is recorded.

Table 2-3
Groundwater Withdrawal Volume from Irrigation Wells

Well Diameter (in.)	Groundwater Withdrawal Volume (gpd)	Number of Irrigation Wells in Manatee Co.	Number of Irrigation Wells in Sarasota Co.	Manatee Withdrawal (gpd)	Sarasota Withdrawal (gpd)	Total Withdrawal (gpd)
2	1,678	0	2	0	3,356	**3,356**
3	3,775	10	7	37,752	26,427	**64,179**
4	6,712	29	65	194,634	436,249	**630,883**
4.5	8,494	1	0	8,494	0	**8,494**
5	10,487	10	10	104,868	104,868	**209,735**
6	15,101	4	7	60,404	105,707	**166,110**
8	26,846	1	3	26,846	80,538	**107,384**
Total		**55**	**94**	**432,998**	**757,145**	**1,190,141**

Note: 1. Irrigation wells do not include wells regulated under water use permits.
2. Each well is assumed to yield groundwater at a rate of 5 ft/s for 4 hours per week.

The customer-billing database provides monthly potable water consumption for each customer. Two types of potable water meters are available to Longboat Key customers: irrigation and multipurpose. Potable water supplied through multipurpose meter connections can be used for domestic and irrigation applications. Potable water supplied through irrigation meter connections is strictly for irrigation. The customer accounts were categorized into the following use types:

- Single family, (multipurpose connection);
- Multi-family, (multipurpose connection);
- Business, (multipurpose connection);
- Common area (CA)/vacant residential (VR), (multipurpose connection); and
- Irrigation Meters (irrigation connection).

The potable water consumption for the categories is illustrated on **Figure 2-2**.

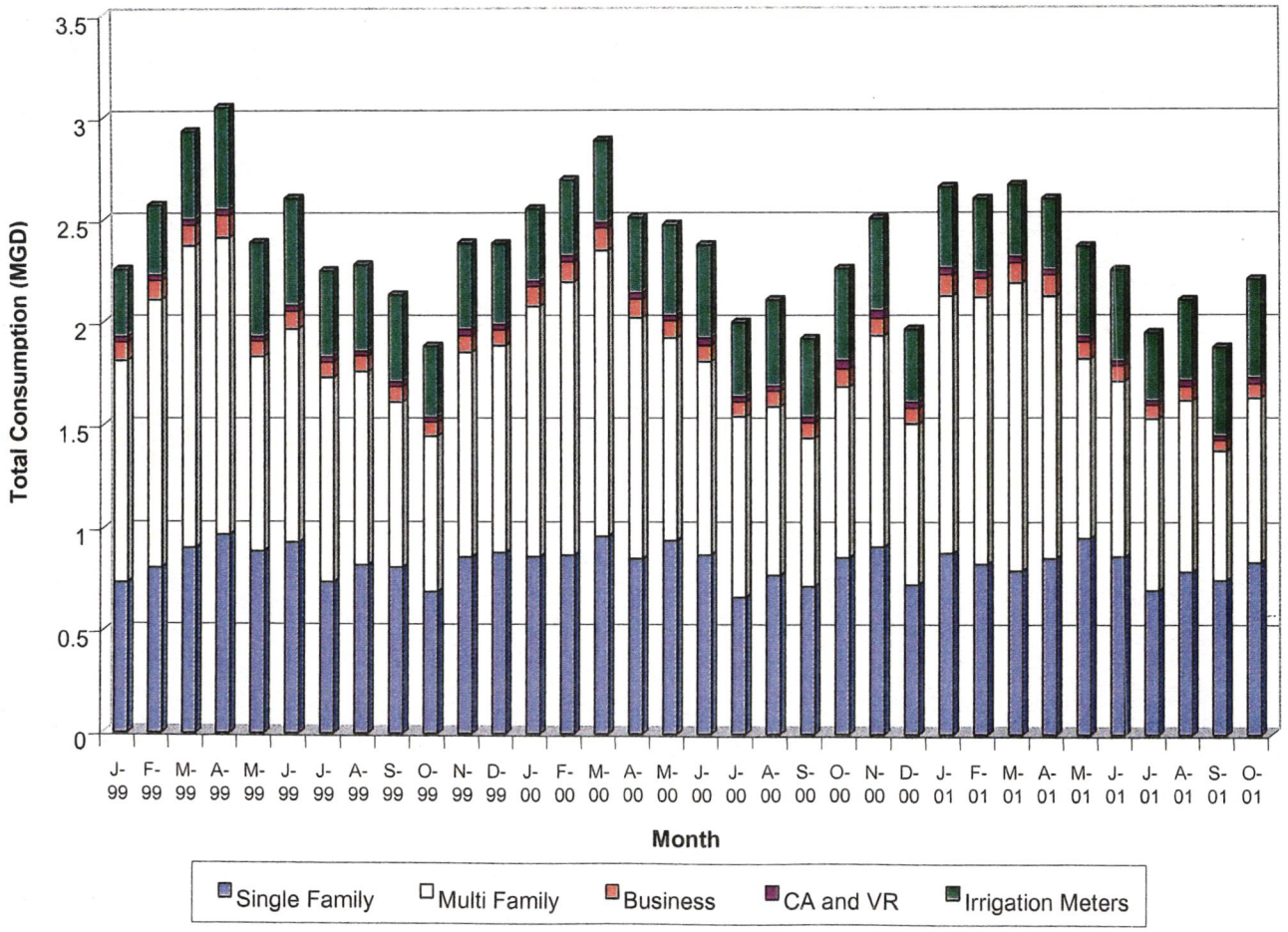


Figure 2-2
Three-Year Water Use

Figure 2-2 indicates that consumption of potable water is highest during the months of January, February, March, and April. It is of note that the potable records analyzed represent a time period of irrigation restriction due to draught conditions (SWFWMD regulated).

In order to estimate the amount of potable water used for irrigation through multipurpose meter connections, the daily master meter records were analyzed. Master meter volume records for irrigation days were compared to volume records for non-irrigation days over a 23-month period. An average 27% increase in potable water consumption is realized on irrigation days. Percent volume increases on irrigation days are illustrated on **Figure 2-3**.

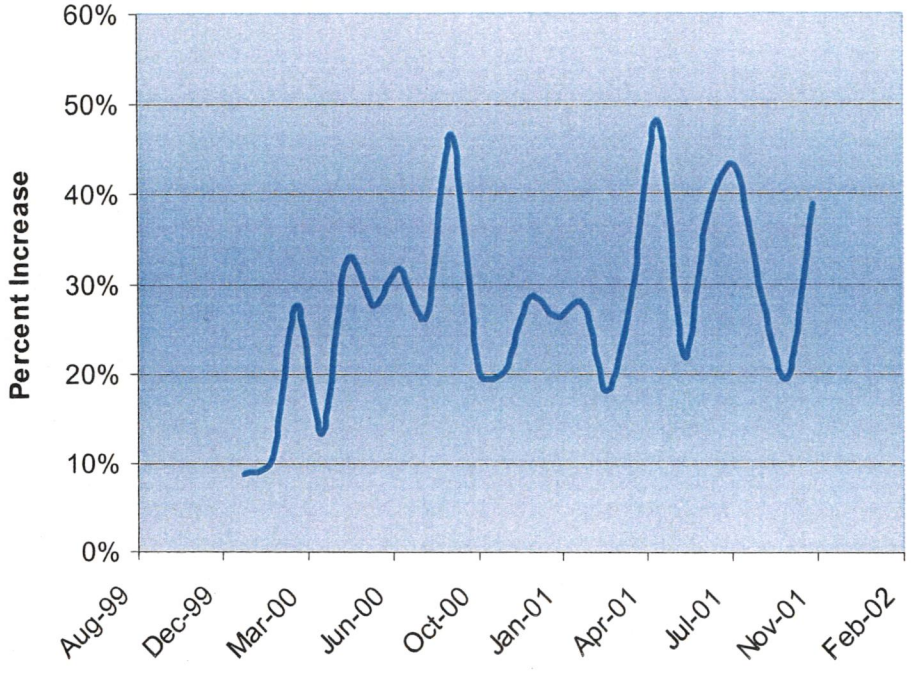


Figure 2-3
Average Percent Increase on Irrigation Days

Utilizing the percent increase for irrigation and the Town's average potable water consumption, approximately 600,000 to 700,000 gallons per day (gpd) or 4.2 to 4.9 million gallons per week of potable water are used for irrigation.

According to the customer database records, 400,000 gpd or 2.8 million gallons per week is attributed to irrigation only meter connections. Therefore, approximately 200,000 to 300,000 gpd or 1.4 to 2.1 million gallons per week can be attributed to multipurpose meter connections.

2.1.3 Irrigation Usage Estimate

The previous discussions have accounted for an estimated 3.0 mgd or 21,000,000 gallons per week of irrigation usage by the Town of Longboat Key residents. Of that total volume, 80% to 85% is from a groundwater source and 20% to 25% is from potable water. A summary of the weekly withdrawal volumes and sources are presented on **Figure 2-4**.

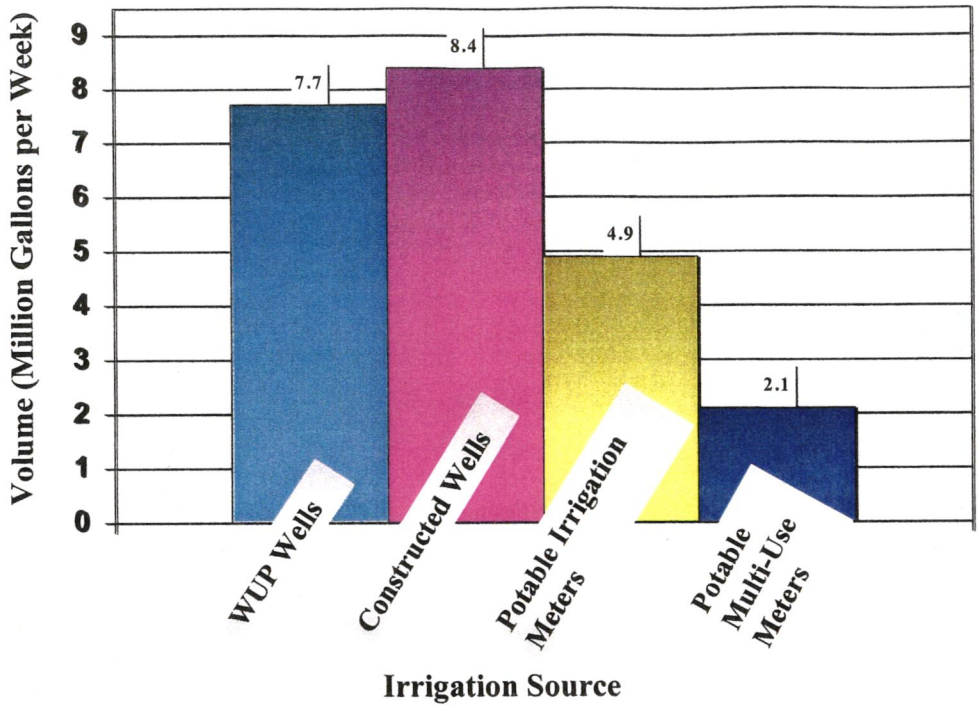


Figure 2-4
Irrigation Source Volume

2.2 Projected Irrigation Water Demand

The irrigation volumes presented in Section 2.1 represent a best estimate based on available data. Because the available data is limited, these volumes may not account for the entire irrigation usage on Longboat. In order to design an irrigation supply system for the Town, a conservative, yet realistic, irrigation water demand must be defined.

The irrigation volume required by a parcel of land is found by multiplying the irrigable acreage by acceptable irrigation application rates. Acceptable irrigation application rates have been established by SWFWMD and the Florida Department of Environmental Protection (FDEP). The FDEP and SWFWMD guidelines recommend an annual average irrigation application rate of 1.0 inch per week with 1.5 inches per week during the dry season. These application rates maintain healthy, aesthetic lawn and landscape.

Irrigable acreage is defined as the area of a parcel that requires irrigation or the area of green space. This is essentially the entire parcel acreage minus any impervious areas, such as building footprints, driveways, and sidewalks. Data

on the irrigable acreage is not readily available. Therefore, the irrigable acreage of Longboat was estimated using two sources: land use and property appraiser data.

Using irrigable acreage estimates and the guideline application rates, irrigation volumes can be established. The resulting volume would be the irrigation demand for the entire island. Only a portion of the potential customers will subscribe to an irrigation utility. For this reason, a subscriber rate is estimated for each land use. The subscriber rate is a subjective factor that estimates the percentage of customers participating in the irrigation water system. Considering the constraints on the groundwater and potable water supplies and the high irrigation demand on Longboat Key, it is reasonable to assume that a subscriber rate for the irrigation water system up to 90% depending on user type can occur. Applying the assigned percent subscriber rate to the irrigable acreage gives a representative irrigation water demand for the system.

Watering in many residential and commercial communities usually happens over a limited amount of hours during the day. This can lead to an excessive or peak demand for irrigation water over a short period of time. The distribution pipeline system design must accommodate the largest volume needed during a peak demand hour. For that purpose a peak factor is applied to the average design flow (ADF) to establish the peak hour demand. It is standard methodology to use the flow rate during the peak hour as the maximum design capacity for an irrigation water distribution system.

For small users like single and multi family homes in residential communities it is assumed that the peak hour demand is approximately 3 times the demand of average day. In accordance with Environmental Protection Agency guidelines for water reuse, large users including Golf Courses experience lower peak hour demands. This is mostly due to existing on-site storage facilities like ponds and lakes that can be used for operational flow equalization. Therefore, a peak hour demand factor of 2.0 was assumed for this user group.

The following two subsections present two approaches to defining the projected irrigation water demand. Through these estimates an annual average demand, a dry season demand, and a peak hour demand are generated.

2.2.1 Projected Irrigation Water Demand from Land Use

The land use on Longboat Key has been compiled using several data sources including: the Florida Geographic Data Library, the Florida Department of Environmental Protection Geographic Information System Geodata Directory, USGS quadrangle maps, the Town of Longboat Key Planning, Zoning, and Building Department, Sarasota County Geographical Information System Data, and Manatee County Maps. A geographic information system data file

was created to represent the most current information available. The compiled land use distribution of Longboat Key is presented on **Figure 2-5**.

According to the Town of Longboat Key adopted 1990 Comprehensive Plan, the Town is approximately 95% built out. Therefore, the current and future land use designations are essentially identical and do not require separate analysis.

Table 2-4
Land Use Area of Longboat Key

Land Use Category	Area (acres)	Percent of Total Area
Long Boat Key		
Beaches Other Than Swimming Beaches	3	0.1%
Swimming Beaches	191	6.9%
Commercial And Services	253	9.1%
Freshwater Marshes	1	0.03%
Hardwood Conifer Mixed	56	2.0%
Institutional	5	0.2%
Lakes	5	0.2%
Mangrove Swamps	223	8.0%
Open Land	85	3.2%
Recreational (Other Than Golf Courses)	68	2.4%
Golf Courses	286	10.3%
Reservoirs	65	2.3%
Residential High Density > 5 Dwelling Units	851	30.5%
Residential Low Density < 2 Dwelling Units	20	0.7%
Residential Med Density 5 ≥ 2 Dwelling Units	379	13.6%
Right Of Way (Gulf Of Mexico Drive)	120	4.3%
Saltwater Marshes	1	0.04%
Shrub And Brushland	23	0.8%
Tidal Flats/Submerged Shallow Platform	87	3.1%
Transportation (Other Than Roads)	7	0.2%
Upland Hardwood Forests	51	1.8%
Utilities	1	0.03%
Wetland Coniferous Forests	3	0.1%
Wetland Forested Mixed	4	0.1%
Total	**2,788**	**100%**

Land use areas were evaluated using the Geographic Information System database. The total land area of Longboat Key is approximately 2,790 acres, including several small mangrove islands along the northeastern shore of the key. **Table 2-4** summarizes the areas of each land use category. Residential areas comprise the largest land use group and cover approximately 45% or 1,250 acres of the total land area of Longboat Key. Table 2-4 indicates that more than two-thirds of the residential areas contain five dwelling units or more per acre (high density residential).

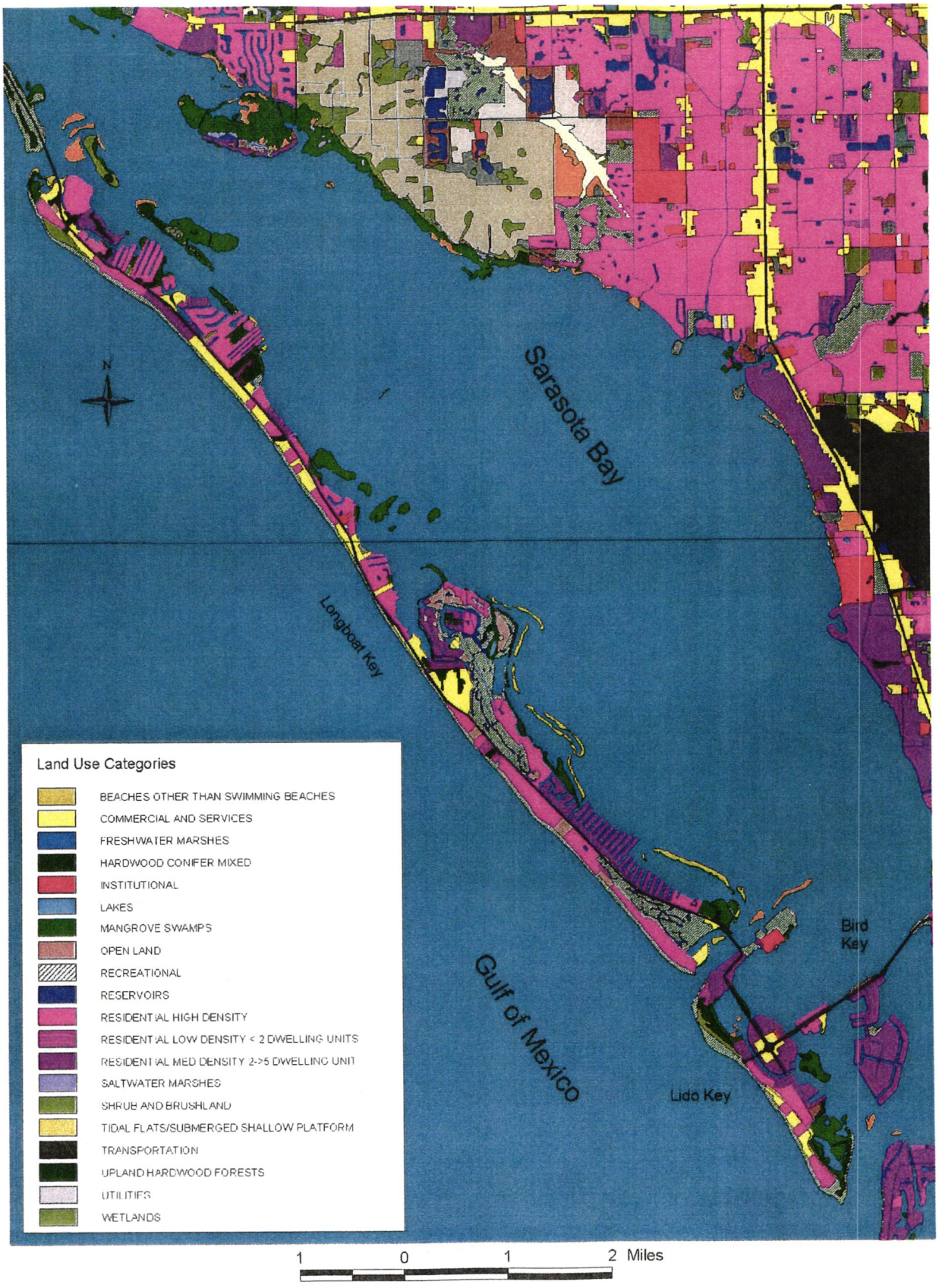


Figure 2-5
Land Use Distribution of Longboat Key

CDM

The two existing golf courses (Islandside Golf Course and Harborside Golf Course) form the second largest land use group, with a total combined area of 286 acres or approximately 10% of the island's area. Most of the lakes are located on the property of the golf courses. **Figure 2-6** depicts the land use percent distribution of Longboat Key.

The total acreages presented in Table 2-3 were used to determine irrigable acreage from land uses. A percent irrigable value was established for each land use category. For example, the percent irrigable value of 70% assigned to

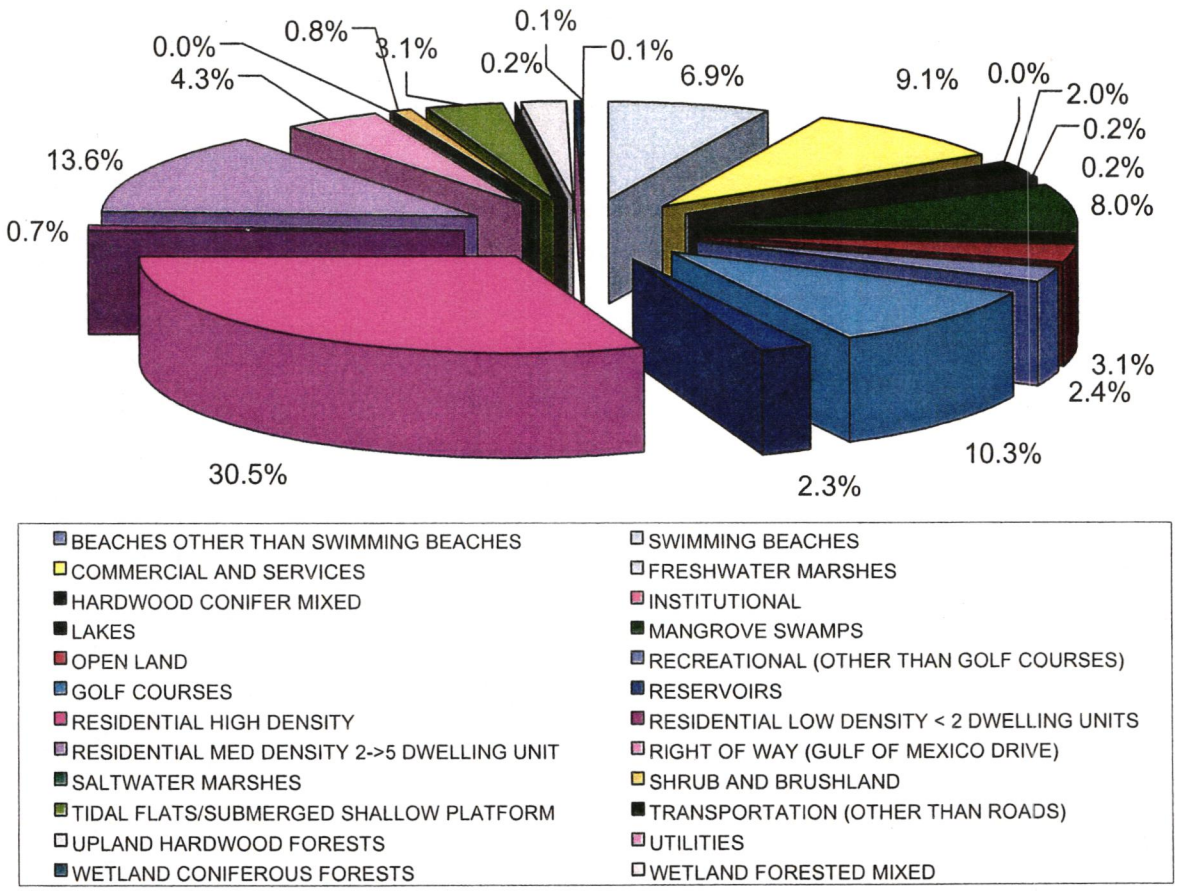


Figure 2-6
Land Use Percent Distribution on Longboat Key

single-family (low density) landscape was found using property appraiser information. Specifically, impervious areas for the parcels were evaluated subtracted from the total parcel acreage. The resulting percentage was applied to the single-family (low density) land use. The remaining land use percent irrigable values were similarly established.

Total acreages, percent irrigable, and the resulting irrigable acreages for the land use categories are presented in **Table 2-5**. **Figure 2-7** illustrates the allocation of the irrigable areas on Longboat Key based on land use.

Table 2-5
Irrigable Irrigation Estimates from Land Use

Land Use Category	Area (acres)	Percent Irrigable	Irrigable Acres
Beaches Other Than Swimming Beaches	3.1	0%	0
Swimming Beaches	191	0%	0
Commercial And Services	253	60%	152
Freshwater Marshes	0.8	0%	0
Hardwood Conifer Mixed	56	0%	0
Institutional	5.4	10%	1
Lakes	4.9	0%	0
Mangrove Swamps	223	0%	0
Open Land	85	45%	38
Recreational (Other Than Golf Courses)	68	85%	58
Golf Courses	286	75%	215
Reservoirs	65	0%	0
Residential High Density	851	45%	383
Residential Low Density < 2 Dwelling Units	20	70%	14
Residential Med Density 2->5 Dwelling Units	379	60%	227
Right Of Way (Gulf Of Mexico Drive)	120	75%	90
Saltwater Marshes	1.2	0%	0
Shrub And Brushland	23	0%	0
Tidal Flats/Submerged Shallow Platform	87	0%	0
Transportation (Other Than Roads)	6.6	0%	0
Upland Hardwood Forests	51	0%	0
Utilities	1.0	40%	0
Wetland Coniferous Forests	3.2	0%	0
Wetland Forested Mixed	3.6	0%	0
TOTAL	**2,788**		**1,178**

As previously described, guideline application rates and a subscriber percentage are applied to the irrigable acreages. The resulting irrigation water demands for the land use categories are summarized in **Table 2-6**.

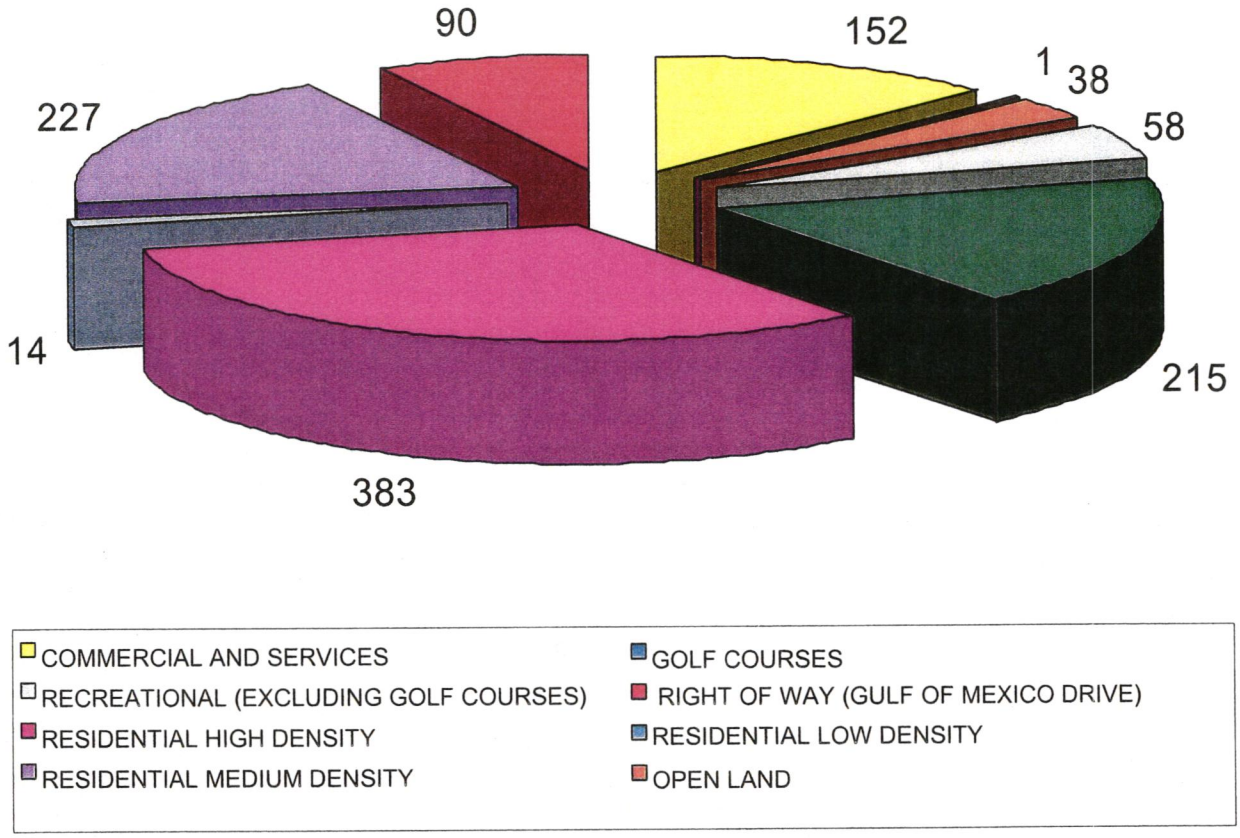


Figure 2-7
Town of Longboat Key Irrigable Acreage

2.2.2 Projected Irrigation Water Demand from Property Appraiser Data

Longboat Key is located in both Sarasota and Manatee County. Copies of Sarasota County and Manatee County property appraiser databases and section maps were acquired for Longboat Key parcels. Based on the Longboat Key tax code, 6,339 Longboat Key parcels were identified in the Sarasota County database. The Manatee County property appraiser database identifies 3,497 Longboat Key parcels. Therefore, a total of 9,836 Longboat Key parcels were identified. From the section maps and the appraiser database information, condominium, subdivision, and business areas were identified.

Table 2-6
Irrigation Water Demand from Land Use

Land Use Category	Irrigable Acres	Percent Subscriber Rate	Average Annual Irrigation Rate (in/wk)	Average Dry Season Irrigation Rate (in/wk)	Average Annual Demand (Thousand gpd)	Dry Season Demand (Thousand gpd)	Peak Hour Demand Factor	Peak Hour Demand (Thousand gpd)
Beaches Other Than Swimming Beaches	0	0%	1.0	1.5	0	0	3.00	0
Swimming Beaches	0	0%	1.0	1.5	0	0	3.00	0
Commercial And Services	152	75%	1.0	1.5	442	662	3.00	1,325
Freshwater Marshes	0	0%	1.0	1.5	0	0	3.00	0
Hardwood Conifer Mixed	0	0%	1.0	1.5	0	0	3.00	0
Institutional	1	100%	1.0	1.5	2	3	3.00	6
Lakes	0	0%	1.0	1.5	0	0	3.00	0
Mangrove Swamps	0	0%	1.0	1.5	0	0	3.00	0
Open Land	38	90%	1.0	1.5	134	201	3.00	402
Recreational (Other Than Golf Courses)	58	100%	1.0	1.5	224	337	3.00	673
Golf Courses	215	100%	1.0	1.5	832	1,248	2.00	1,664
Reservoirs	0	0%	1.0	1.5	0	0	3.00	0
Residential High Density	383	90%	1.0	1.5	1337	2,005	3.00	4,010
Residential Low Density < 2 Dwelling Units	14	75%	1.0	1.5	40	60	3.00	120
Residential Med Density 2->5 Dwelling Units	227	75%	1.0	1.5	662	992	3.00	1,985
Right Of Way (Gulf Of Mexico Drive)	90	100%	1.0	1.5	351	526	3.00	1,052
Saltwater Marshes	0	0%	1.0	1.5	0	0	3.00	0
Shrub And Brushland	0	0%	1.0	1.5	0	0	3.00	0
Tidal Flats/Submerged Shallow Platform	0	0%	1.0	1.5	0	0	3.00	0
Transportation (Other Than Roads)	0	0%	1.0	1.5	0	0	3.00	0
Upland Hardwood Forests	0	0%	1.0	1.5	0	0	3.00	0
Utilities	0	100%	1.0	1.5	2	2	3.00	5
Wetland Coniferous Forests	0	0%	1.0	1.5	0	0	3.00	0
Wetland Forested Mixed	0	0%	1.0	1.5	0	0	3.00	0
TOTAL	**1,178**				**4,024**	**6,033**		**11,242**

Condominium parcels were delineated from the section maps, aerial maps, and original plats obtained from the Clerk of Circuit Court. A digital planimeter was used to measure the overall condominium parcel area and impervious areas. The difference of the two areas is the irrigable acreage. Impervious areas included area under structure, parking areas, pools, tennis courts, and sidewalks.

Irrigable acreages for subdivision areas were calculated using a different methodology. After each subdivision was identified, a query of all parcels from the property appraiser's database pertaining to that subdivision was performed. The structure square footage was subtracted from the total land square footage for each individual parcel within the subdivision. A percentage was then applied to the value to account for impervious areas, such as driveways, sidewalks, and pool areas. This resulted in an irrigable acreage value. The individual parcel irrigable acreages were summed giving a total for the subdivision.

Irrigable acreages for business areas were calculated in the same manner as subdivision areas. Addresses from the potable water customer consumption database were used to identify parcels in the property appraiser's databases pertaining to the business areas. The structure square footage for each parcel associated with individual business areas was subtracted from the total land square footage. A percentage was then applied to the value to account for impervious areas, such as parking areas and sidewalks. The percentage was based on evaluating the individual parcel layout on the aerial maps.

Irrigable areas for the two golf courses, Islandside golf course and Harbourside golf course, were determined by assuming each golf course had 90% irrigable area. This percentage is based on visual observation of the aerial maps and on accepted criteria. This factor was applied to the total land area of the golf courses identified in the property appraiser's database.

A summary of the resulting irrigable acreages based on the property appraiser data is presented in **Tables 2-7 and 2-8**.

Using the irrigable acreages from condominium, subdivision, and business areas, the projected irrigation water demand is established. As previously described, guideline application rates and a subscriber percentage are applied to the irrigable acreages. The resulting irrigation water demands for the condominiums, single-family homes, and businesses are summarized in **Table 2-9.** The resulting demands were 3.7 mgd average and 5.8 mgd dry season.

Table 2-7
Irrigable Acreage from Property Appraiser Data
Sarasota County

Entity	Irrigable Acreage
SARASOTA COUNTY	
Multi-Family, Condos	
Tangerine Bay	3.90
Sands Point Condo	2.58
L'Ambiance	6.34
Longboat Key Towers	1.97
The Sanctuary	6.30
Privateer	1.60
Beaches	1.89
Bay Harbour Apartments	1.00
Regent Place	1.42
Beachplace	9.42
Promenade Condo	2.77
Water Club	4.79
Players Club	4.17
Telcon Beach	1.18
The Colony	5.95
Seaplace	13.11
Aquarius Club	1.49
Sunset Beach	2.37
En Provence	2.28
Villa di Lancia	2.73
Vizcaya	2.89
Islander Club	2.26
Beachcomber	0.55
Sea Gate Club	2.02
Veranda Beach Club	1.19
Islands West	1.37
Four Winds Beach Resort	1.17
Veinte	0.80
Marina Bay	2.72
Gulf Tides of Longboat Key	0.56
Neptune Apartments	0.29
Gulf Key	0.40
Apollo	0.17
Starfish/Tree House	0.22
PortoBello	1.71
Island Court	0.31
Buttonwood Cove	3.22
The Diplomat	0.63
Longboat Bay Club	0.57
Longboat Arms	1.13
Dock on the Bay	0.94
Sea Horse Beach Resort	0.54
Sea Bird	0.34
Continental's Sea Club	0.55
The Pierre	2.60
Fairway Bay	9.92
Harbour Links @LBK Club Harbourside	1.55
Grand Bay - Harbourside	8.55
Longboat Key Yacht and Tennis Club	0.43
Beach Harbor Club Apartments	2.09
Silver Beach	1.70
Bayport Beach and Tennis Club	10.46
Multi-Family, Condos Subtotal	**141.11**

Table 2-7
Irrigable Acreage from Property Appraiser Data
Sarasota County

Entity	Irrigable Acreage
SARASOTA COUNTY	
Single Family	
Lighthouse Subdivision	7.88
Regent Court Subdivision	6.57
Country Club Shores	75.60
Bay Isles	90.94
Bay Isles Beach Club	
Coquina Beach	10.12
Harbour Oaks II	2.94
Harbour Court	1.23
Emerald Pointe North - Harbourside	0.80
Triton Cove - 3020 - 3080 GMD	0.51
Winding Oaks - 3401 - 3439 Winding Oaks	4.73
Sabal Cove	10.62
Buttonwood Harbor	2.49
Twin Shores Mobile Home	1.84
Gulf Shore Trailer Park	2.96
Longboat Shores	16.93
Weston Pointe	2.74
Corey's Landing	9.94
Queen's Harbour	14.22
Roger Koch Sub	1.07
Benedict Sub	4.42
Longboat Key Estates	11.13
Single Family Subtotal	**279.68**
Business Areas	
FDOT, Quick Point, Water Plant, Lift Station	35.7
Overlook Park	0
Chart House and Shops	2.24
Islandside Golf Course	123
Harbourside Golf Course	244
Harbourside Drive Marina	
Town Plaza	
Harbour Square	0.38
The Boathouse on Longboat	0.97
Sailboat Square	0.9
St. Mary's Catholic Church	11.83
Business Areas Subtotal	**419.02**
SARASOTA COUNTY TOTAL	**839.81**

Table 2-8
Irrigable Acreage from Property Appraiser Data
Manatee County

Entity	Irrigable Acreage
MANATEE COUNTY	
Multi-Family/Condos	
Longboat Key Yacht and Tennis Club	0.87
(Also known as Mark I and Mark II)	
Pelican Harbor & Beach Club	3.00
(Includes Turtle Crawl)	
Longboat Harbour North (Windward Bay)	10.40
Longboat Harbour South	2.27
(Also known as Sutton Place)	
First Longboat Harbour	2.81
The Castillian	2.40
Longboat Beach House	0.65
Tiffany Plaza	1.32
LBK Harbor Towers	1.10
La Playa	0.57
Arbomar Apartments Condominium	0.66
The Grande at Longboat Key	0.33
Longboat Key Casa del Mar	2.34
Sun n Sea	1.33
Longboat Hilton	2.01
Sand Cay Condominium	1.69
(Also known as Key Cove)	
Holiday Beach Resort	1.03
(Also known as Shore Acres)	
Westchester	2.89
Holiday Inn	4.10
White Sands of Longboat	0.67
Gulf Front Condominium	0.36
Club Longboat Beach and Tennis	2.43
SeaGrape Inn	0.37
The Seascape	0.32
Sarasota Outrigger	0.28
Covert 1,2, 3	2.45
Longboat Landing Condominium	0.50
Beach Castle	0.52
Little Gull - Timeshare	0.88
Longboat Terrace	1.33
Longboat Cove	1.13
Sunrise Shores	0.49
Banyan Bay Club	1.41
GMD Center	0.48
The Arbors	0.28
Rivera Beach	0.37
Blue Galaxy	0.23
Tides of Longboat	0.74
Continental's Sea Club I and III	1.29
Wicker Inn	1.01
Sea Oats Apartments	0.38
Longboat Sandpipers Condominium	0.82
St. Judes Apartments	0.49

Table 2-8
Irrigable Acreage from Property Appraiser Data
Manatee County

Entity	Irrigable Acreage
MANATEE COUNTY	
Key Apartments	0.15
Cedars East	3.58
Cedars West	2.00
Spanish Main Yacht Club	6.74
Silver Sands	0.54
Cannons Cottages/Sleepy Lagoon	0.51
Beach Walk	1.19
The Bayou	0.15
Buccaneer Inn/Dream Island	0.86
Whitney Beach	4.88
Lerfald Landings	0.15
Longboat Pass Apartments	0.21
Lands End	1.58
Sea Pines	1.11
Longbeach Condominium	1.20
360 North Condominium	0.83
Northgate of Longboat Key	0.82
Faine Apartments	0.43
Harbour Villa Club at the Buccaneer	2.33
The Shore Condominium	2.34
Sea Twig Condominium	0.42
Salty Acres Condominium	0.41
Avignon Villas Condominium	0.26
Villa Dos Palmas	0.23
Villa Casuarina	0.26
Seaside of Longboat	0.22
Embassy Court Condominium	0.26
Multi-Family, Condos Subtotal	**94.67**
Single Family	
Sandham Subdivision	6.92
Emerald Harbor	32.30
La Lenaire Isle	26.28
Long Beach	41.03
Longboat Key	42.65
RL Middleton	0.42
Hibiscus Way	2.48
Crim	1.21
Landwirth	0.49
Wendy	0.33
Savarese Inlet	0.53
Tramonto Estates	1.85
Conrad Beach	6.45
Reclinata	2.43
TJ Oxford	2.19
Rauch	2.24
Robert Lennox	2.95
Sleepy Lagoon	74.40
Snug Harbor	0.58

Table 2-8
Irrigable Acreage from Property Appraiser Data
Manatee County

Entity	Irrigable Acreage
MANATEE COUNTY	
Tranquillo	1.28
Laguna at Longboat Key	6.23
Yonkers	2.44
Hideaway Bay	4.99
Bayview Estates	4.96
Dream Island	14.30
Charlie's Subdivision	1.32
Mary Regina Reese Subdivision	0.40
Mariah Subdivision	0.48
Shipman's Add	0.72
Bailey Dobson	6.49
Cedar Woodlands	1.84
Pelton Place	0.45
H&M Associates	1.78
Single Family not in Subdivision	34.41
Single Family Subtotal	**329.82**
Business Areas	
Durante Park	0.83
Cannons Marina	0.33
Buccaneer Marina/Dock Master	0.10
General Harris St. - Public Works & Business	0.52
Whitney Beach Shops	0.21
Village Plaza	0.23
North Key Plaza	0.48
Harbour Square	0.19
Church	2.65
Business Areas Subtotal	5.54
MANATEE COUNTY TOTAL	**430.03**

Table 2-9
Projected Irrigation Water Demand from Property Appraiser Data

RECLAIMED SERVICE SITE	Irrigable Acreage	Subscriber Rate	Acreage	Annual Average Demand (mgd)	Dry Season Demand (mgd)
Sarasota County - Multi-Family/Condos	141	90%	127	0.47	0.74
Manatee County - Multi-Family/Condos	94.67	90%	85	0.32	0.50
Total Multi-Family/Condos	**235.78**	**90%**	**212**	**0.79**	**1.23**
Sarasota County - Single Family	280	75%	210	0.78	1.22
Manatee County - Single Family	329.82	75%	247	0.92	1.44
Total Single Family	**609.50**	**75%**	**457**	**1.70**	**2.66**
Sarasota County - Business Areas	419.02	75%	314	1.17	1.83
Manatee County - Business Areas	5.54	75%	4	0.02	0.02
Total Business Areas	**424.56**	**75%**	**318**	**1.19**	**1.85**
Projected Reclaimed Water Demand Total	**1,270**		**988**	**3.68**	**5.75**

2.3 Irrigation Water System Design Flows

In Section 2.2 two approaches were taken to defining the irrigation water demand. Both estimates projected irrigation demands within 10% of each other. Therefore, irrigation demand design flows for the Town of Longboat Key will be an estimated annual average demand of approximately 4.0 mgd and a dry season demand of approximately 6.0 mgd. In weekly volumes, this translates to an annual average of 28 million gallons per week and a dry season demand of 42 million gallons per week.

Section 3
Irrigation Supply Alternatives

There are several alternatives and methods to obtaining supplies applicable for irrigation water. The irrigation supply alternative methods are reviewed based on their technical, economical, and permitting merits of feasibility. This section reviews three primary alternative approaches for irrigation supply. Conceptual planning and costs are described in combination with key benefits and issues associated with reclaimed water, membrane technology (desalination), and wastewater treatment.

3.1 Reclaimed Water

Reclaimed water is defined by the Florida Department of Environmental Protection (FDEP) as water from a domestic wastewater treatment plant that has received a high level of treatment and disinfection for beneficial reuse. The required level of treatment and disinfection vary depending on the end use and the anticipated public exposure. There are many applications for reuse of reclaimed water such as the following:

- Landscape and Agricultural Irrigation
- Recreational Irrigation: Golf Courses, Tennis Courts, Parks
- Groundwater Recharge
- Industrial Uses
- Fire Protection
- Toilets
- Wetland Restoration

Strict regulations govern the reuse and treatment of reclaimed water and applications. Reclaimed water used by the Town of Longboat Key would be regulated by Florida Administrative Code Chapter 62-610 Part III Slow Rate Land Application; Public Access Areas, Residential Irrigation, and Edible Crops. Under these regulations the wastewater undergoes, at a minimum, secondary treatment and high-level disinfection. Stringent operating and sampling protocol required at the treatment facility ensure the safety of the reclaimed water for irrigation.

Communities throughout Florida are utilizing reclaimed water for landscape, turf and green space irrigation. Southwest Florida Water Management District (SWFWMD) and the FDEP, the US Environmental Protection Agency, the Florida Department of Health, and many other government agencies encourage the use of reclaimed water for non-potable applications. The Statement of Support for Water Reuse exemplifies the agency support. A copy of the statement is presented in **Figure 3-1**.

Statement of Support for Water Reuse

The Florida Department of Environmental Protection; the United States Environmental Protection Agency, Region 4; the Florida Department of Health; the Florida Public Service Commission; the Florida Department of Agriculture and Consumer Services; the Florida Department of Community Affairs; the Northwest Florida Water Management District; the South Florida Water Management District; the St. Johns River Water Management District; the Southwest Florida Water Management District; and the Suwannee River Water Management District (collectively "Participating Agencies") adopt the following joint statement of support for water reuse:

Whereas, water reuse is defined as the beneficial use of reclaimed water (treated wastewater) for landscape and golf course irrigation; agricultural irrigation; industrial uses; toilet flushing; fire protection; decorative water features; ground water recharge; indirect potable reuse; wetlands creation, restoration, and enhancement; and other uses allowed by Florida's reuse rules; and

Whereas, Florida Statutes establish the encouragement and promotion of water reuse as state objectives; and

Whereas, Florida's Water Resource Implementation Rule advocates and directs that reuse of reclaimed water be established as an integral part of water and wastewater management programs in Florida; and

Whereas, water reuse provides an environmentally sound means for managing wastewater, while conserving water and replenishing valuable water supplies; and

Whereas, Florida law and regulations are fully protective of public health and environmental quality; and

Whereas, the capacity of water reuse systems in Florida exceeds one billion gallons per day; and

Whereas, Florida's extensive experience with water reuse has demonstrated the viability and acceptability of water reuse practice; and

Whereas, the EPA has recognized Florida's Water Reuse Program for excellence in 1993, 1996, and 1999; and

Whereas, the EPA encourages water reuse as a means for managing wastewater under the provisions of the Clean Water Act; and

Whereas, Florida Statutes require the Florida Public Service Commission to allow recovery of all prudent reuse costs in customer rates, which may be allocated among the utilities' water, wastewater, or reuse customers, or any combination thereof; and

Whereas, the Florida Department of Environmental Protection and the water management districts have formally agreed to assist the Florida Public Service Commission in rate cases in the proper evaluation of reuse issues and the resulting costs, and promote customer acceptance of reuse through expert testimony at formal hearings, and at informal customer meetings; and

Whereas, Congress established pollution prevention as a national objective in the Pollution Prevention Act of 1990 and the EPA includes increased efficiency in the use of water as part of a new environmental ethic; and

Whereas, the EPA, the Florida Department of Environmental Protection, and the state's water management districts have participated in the funding of water reuse systems in Florida and all Participating Agencies have encouraged and promoted the safe implementation of water reuse in Florida.

Now, therefore, the Participating Agencies resolve to continue to encourage and promote water reuse, to work together to overcome institutional and regulatory disincentives and funding constraints, to ensure protection of public health and environmental quality, and to promote public acceptance of water reuse in Florida.

Florida Department of Agriculture And Consumer Services

Southwest Florida Water Management District

Use it Again, Florida!

Figure 3-1
Agency Statement of Support for Water Reuse

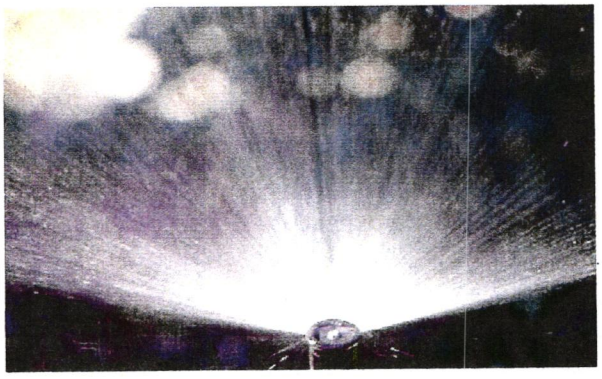
The promotion of reuse of reclaimed water is established as a formal state objective in 373.250, Florida Statutes.

As a part of the State's promotion of reuse, the FDEP produces an annual inventory of reuse in Florida. Based on the FDEP's 2000 Reuse Inventory, 457 of 587 permitted wastewater facilities in Florida produce reclaimed water for reuse in their service area. The wastewater facilities have reuse capabilities of 1,116 mgd or 51% of the total permitted wastewater treatment capacity of 2,220 mgd. In the year 2000, 575 mgd of reclaimed water was used for beneficial reuse. **Table 3-1** summarizes a few of the local area communities local to Longboat Key that have reuse systems and their capacities.

Table 3-1
Local Reuse Systems

Facility	Permitted Reuse Capacity (mgd)
City of Sarasota	7.6
Manatee County	28.8
Sarasota County	9.1
City of Venice	2.6

Currently, there are three possible sources of reclaimed water for the Town of Longboat Key: the City of Sarasota, Manatee County, or construction of a Longboat Key water reclamation facility. This section evaluates conceptual reclaimed water transmission systems to deliver the City of Sarasota and Manatee County supplies and the feasibility of constructing a water reclamation facility for Longboat Key. Each reclaimed water system alternative is evaluated based upon anticipated project cost, permitting and constructability issues.



3.1.1 Design Criteria

Each reclaimed water transmission system alternative was conceptually developed using the design criteria summarized in **Table 3-2**.

Table 3-2
Design Criteria

Design Parameter	Design Value
Average Velocity of Flow in Pipe	2.5 feet per second (fps)
Peak Hour Velocity of Flow in Pipe	Approximately 7.5 fps
Peak Hour Demand Factor (Average Day Demand Ratio)	3.0
Average Depth of Cover of Piping (Standard Trench Design)	3.0 feet
Isolation Valve Spacing	2,000 feet
Maximum System Pressure	100 psi
Operating Design Pressure	60 –70 psi
Minimum Design Pressure	30 psi
Residential Irrigation Period	8 hours per day
Golf Course Irrigation Period	12 hours per day
Pipe Material	PVC (DR 18) or HDPE (SDR 11)
System Control / Demand Valves	Included
Residential Distribution System	Not Included
Stand-by Power System	Not Included
Individual Customer Meters	Not Included

3.1.2 Reclaimed Water System Storage

Reclaimed water systems are unique utility systems. Reclaimed water systems rely on the daily operations of the wastewater treatment systems for their supply. Whereas, reclaimed water demands are directly affected by both time of day and seasonal / weather conditions.

Similar to the peak irrigation demand hours discussed in Section 2.2, the reclaimed supply is delivered from the wastewater treatment plant at varying rates during the day. The reclaimed water supply flow is dependent on the wastewater flow to the treatment plant. Typical flow variations of wastewater flow and reclaimed irrigation demand seen throughout one day are presented on **Figure 3-2**. It is evident from Figure 3-2 that the peak irrigation hours do not necessarily correspond to peak supply or wastewater flow hours. Operational storage is required to equalize the daily flow variations.

Although reclaimed water supplies vary throughout the day, it is relatively consistent throughout the year. In contrast, irrigation demand is greatest during the dry season and minimal during the rainy season. Thus, wet weather seasonal storage is a critical component to reclaimed systems.

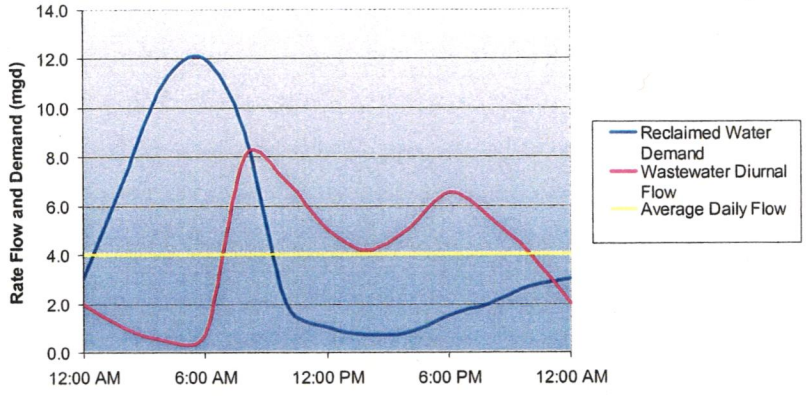
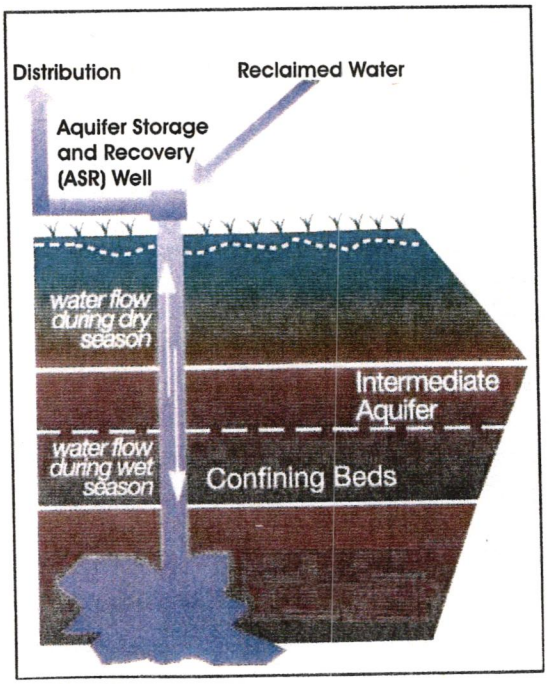


Figure 3-2
Diurnal Supply and Demand Example

Because of the seasonality and fluctuations of the supply and demand of reclaimed water systems, successful reclaimed water systems employ storage systems in the form of ponds, ground storage tanks and Aquifer Storage and Recovery (ASR) facilities. The larger the storage volumes, the larger the percentage of the reclaimed water produced annually can be applied to users by the water reclamation facilities. During dry periods of peak demand, stored reclaimed water produced during times of excess supply can be retrieved from storage and made available to meet the peak demand. In order to meet peak demands, significant volumes of storage are required.

Because large volumes of reclaimed water need to be stored, ASR is becoming attractive for use with reclaimed water systems. ASR stores reclaimed water underground within low water quality aquifers during times of excess supply. During period of peak demands, the ASR reverses operation and retrieves the stored reclaimed water from the aquifer.



Aquifer Storage and Recovery Concept

Large volumes required for adequate reclaimed water system operation can be stored relatively inexpensively as compared to ground storage tanks or storage ponds. The ASR is underground and typically does not impede other uses of the land, as would ground storage tanks or storage ponds.

ASR systems and ground storage tanks are also used together to help supplement the average reclaimed water supply from the water reclamation facilities during peak hour

irrigation demand periods. The use of the systems provides operational storage for the reclaimed water system and allows the reclaimed water system to operate adequately during periods when demand is greater than the reclaimed water production rate at the water reclamation facility.

The conceptual design scenarios presented in this report allow for additional hydraulic capacity in the pipeline above the annual average daily flow. The basis for the larger capacity is to give the Town the ability to receive additional flow from the reclaimed supplier during wet weather seasonal conditions. Typically, the supplier will have a surplus of reclaimed water to distribute during wet weather due to the decreased demands. The Town will be able to take advantage of reclaimed surplus and inject this into the ASR system.

3.1.2.1 Aquifer Storage Recovery

The storage of excess reclaimed water for use during times when demand is greater than the supply will be required to maximize the service area of the reclaimed water system for Longboat Key. ASR is increasingly being recognized as an effective tool for managing water resources in western coastal Florida. The ASR process may have application within the Longboat Key reclaimed water system.

The ASR process stores water in an aquifer during periods when excess water is available and recovers the stored water from the aquifer when needed. The storage of water in an aquifer below ground has a number of advantages over conventional storage methods. When utilizing ASR, storage space is available at a relatively low cost, project locations can be selected where convenient, subject to favorable hydrogeologic conditions, evaporative losses are minimized, and underground storage helps to provide protection from contamination.

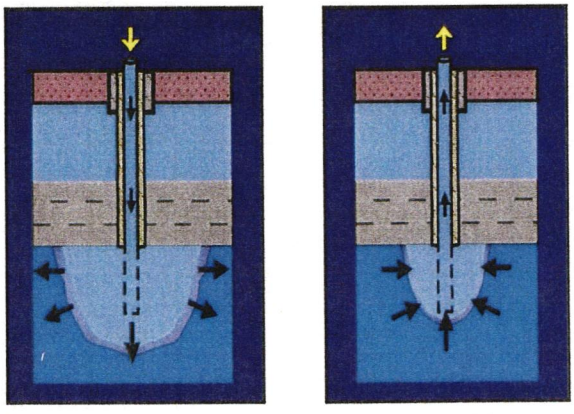


Figure 3-3
ASR Wellhead and ASR Well

Figure 3-3 is a conceptual illustration of an ASR system. **Figure 3-4** shows a completed ASR wellhead and a conceptual drawing of an ASR well. Several successful ASR systems are currently being operated within the State of Florida. In the Longboat Key area, test well construction permits for reclaimed water ASR systems have been issued by FDEP to Manatee County and the City of Sarasota. Aquifer storage and recovery wells are regulated by Underground Injection Control (UIC) rules administered by the FDEP.

The suitability of an aquifer to function as a storage zone is dependent on a number of hydrogeologic factors that affect the ability of the zone to both receive injected water and to return the water with appropriate quality for use. The primary aquifer characteristics affecting the suitability of a zone for ASR purposes are transmissivity, leakance, and dispersivity. An understanding of the geology and hydrogeology of the Longboat Key area is also important in determining the best potential ASR storage zone.

The hydrogeology of northwestern Sarasota County and southwestern Manatee County is fairly consistent, although some lateral and vertical changes in formation thickness occur. Water quality generally decreases with depth and with proximity to the coast.

The decrease in water quality, however, may prove to be an advantage for permitting an ASR Facility as the increased salinity and sulfate content may result in total dissolved solids concentrations that are appropriate for an ASR storage zone.

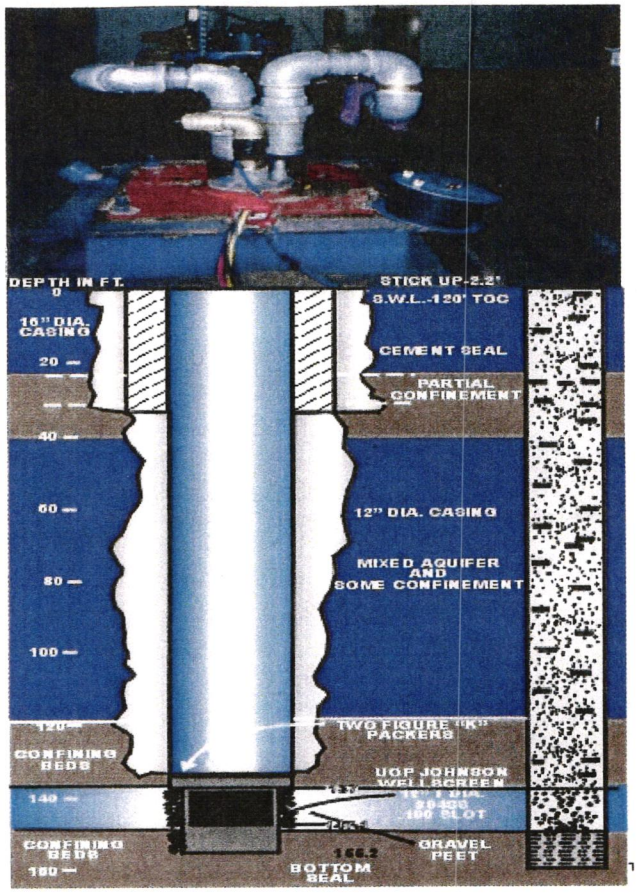


Figure 3-4
Conceptual Illustration of ASR System

The ASR system for Longboat Key could be located on the mainland or on Longboat Key. Locating the ASR on Longboat Key is beneficial because the reclaimed water transmission system from the mainland can be sized to provide the annual average day demand, thus reducing the diameters of the piping. The feasibility of placing an ASR facility on Longboat Key is discussed in detail in the report titled, *ASR Feasibility Evaluation, Town of Longboat Key*, dated February 2002, CDM.

3.1.2.2 Aquifer Ground Storage Tanks and Booster Pump Stations

A ground storage tank and booster pump station are anticipated to be required along with ASR to provide peak flows and maintain reclaimed water system pressures required for adequate operation. During periods of demand in excess of the supply, the ASR wells will supplement the ground storage tank volume and provide the additional reclaimed water needed to fill the ground storage tank between periods of peak demand. The ground storage tank will be sized to provide enough capacity to meet peak hourly demands over and

above average daily supply. The booster pump station will draw water from the ground storage tank and pump it into either the transmission or trunk systems depending on the location of the reclaimed water booster pump station and ground storage tank based on the demand within the system. **Figure 3-5** depicts a conceptual booster pump station layout.

Reclaimed water irrigation trends tend to follow either a single diurnal or dual diurnal parabolic distribution. A single diurnal demand has one peak demand period during each day. The single diurnal peak demand period is estimated to be approximately 8 hours per day and is assumed to occur between 4 am and noon. Figure 3-2 illustrates a single diurnal demand. A dual diurnal reclaimed water trend indicates that there are two peak demand periods per day. The duration of the dual diurnal periods is approximately 6 hours per day each. The dual diurnal peak demand periods are usually from 4 am to 10 am and from 4 pm to 10 pm. Based on these demand distributions, the required ground storage tank volume and ASR supply can be determined.

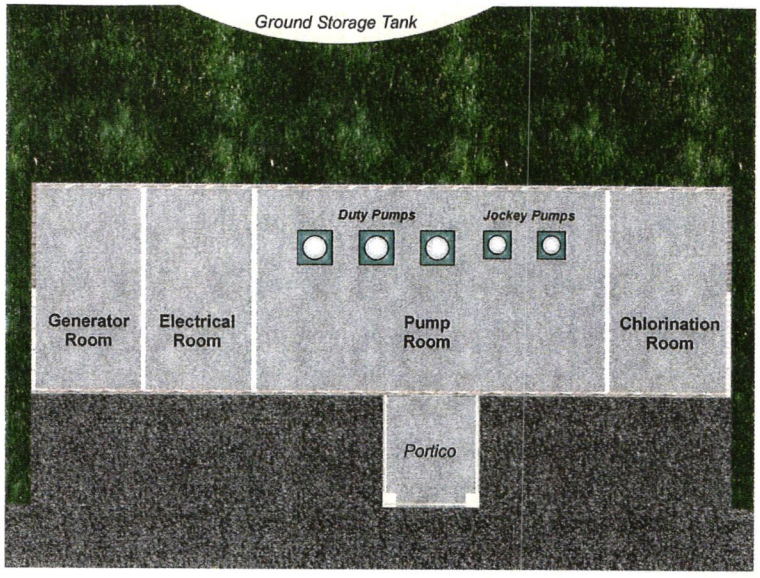


Figure 3-5
Conceptual Booster Pump Station Layout

Typically, the single diurnal curve will predict the volume of the ground storage tank due to the longer peak demand period and the dual diurnal distribution will govern the number of ASR wells needed to fill the ground storage tank due to the shorter fill times between peak demand events. For the purpose of this report, two annual average daily flow (AADF) scenarios were analyzed.

3.1.3 Project Schedule

For planning purposes, design, bidding, construction, and system startup will be similar for either mainland supply option. A summary of the estimated schedule is presented on **Figure 3-6**. The construction timeframe could be expedited by issuing multiple contracts.

Tasks	Start	Finish
Design	04/02	02/03
Permitting	04/02	12/02
Competitive Bid	03/03	06/03
Construction	06/03	12/04

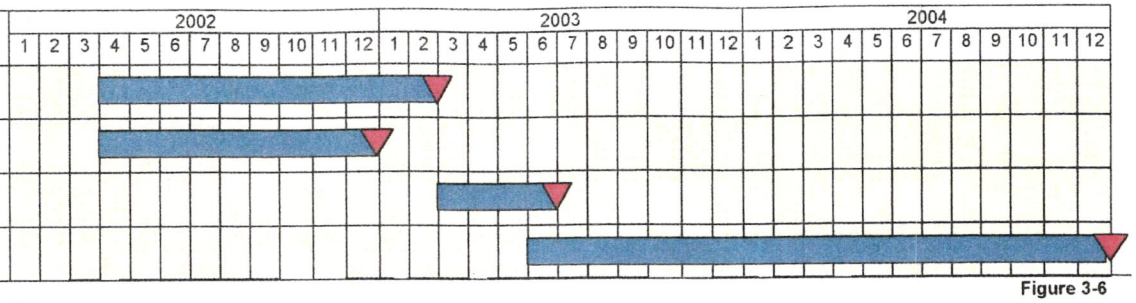
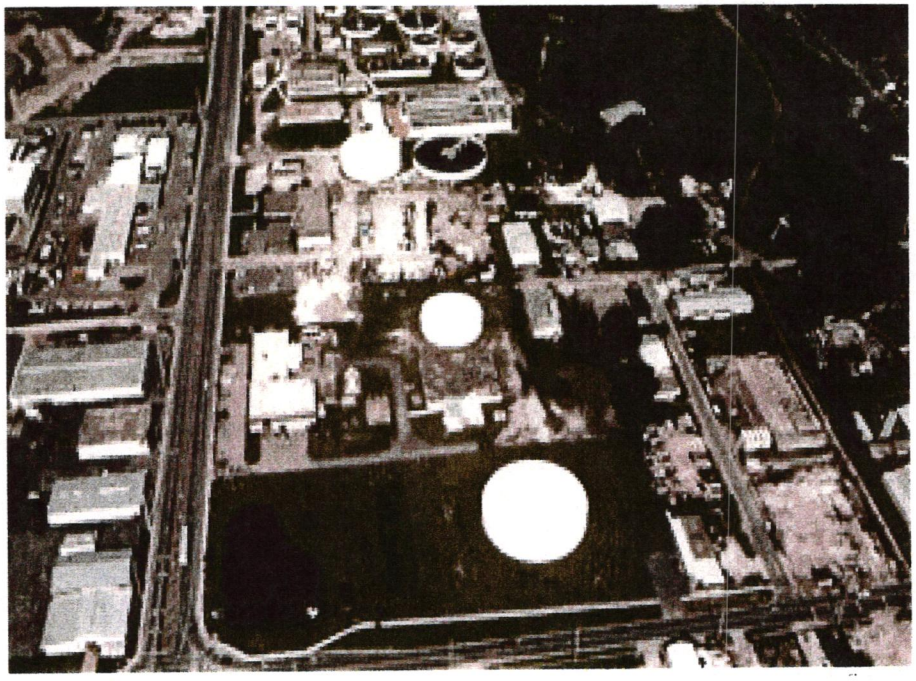


Figure 3-6
Project Schedule

3.1.4 City of Sarasota Supply Option

The City of Sarasota produces high quality reclaimed water from their existing Advanced Wastewater Treatment Facility. The City of Sarasota has been providing reclaimed water to its customers since about 1990. The City of Sarasota can make 2.5 million gallons per day (mgd) of reclaimed water available to Longboat Key. As discussed in Section 2, the projected irrigation water demand to irrigate Longboat Key is approximately 4 mgd on an annual average basis.



City of Sarasota Advanced Wastewater Treatment Facility
Source: City of Sarasota Public Work Department

This section provides the preliminary evaluation of four reclaimed water transmission system configuration scenarios using the City of Sarasota as the supply of reclaimed water for Longboat Key. The scenarios consider the 2.5 and 4 mgd anticipated reclaimed water average day supplies and the location of reclaimed water storage facilities (either on Longboat Key or the mainland). A summary of the scenarios is presented in Section 3.1.4.2.

3.1.4.1 City of Sarasota's Existing Reclaimed Water System

The City of Sarasota's wastewater facility is an advanced wastewater treatment (AWT) plant. The system is designed for 10.2 mgd annual average daily flow and 13.0 mgd maximum monthly average daily flow. Flow from the plant has averaged 6.3 mgd from October 1, 2000 to September 31, 2001.

The City of Sarasota advanced wastewater treatment plant produces high-quality reclaimed water. A summary of the reclaimed water quality for the year 2001 is presented in **Table 3-3**.

Table 3-3
City of Sarasota Reclaimed Water Quality

Parameter	Standard (mg/l)	City of Sarasota Reclaimed Water Quality[1] (mg/l)
Chloride	250[2]	172
Total Dissolved Solids	500[2]	928[3]
Sulfate	250[2]	261
Total Nitrogen (TN)	3.0[4]	1.02
Total Phosphorus (TP)	1.25[4]	0.06
Fecal Coliform	75th percentile shall be below detection limit and no one sample shall exceed 25 fecal coliforms / 100 mL[5]	<1 fecal coliforms / 100 mL

(1) Average for Year 2001
(2) FAC Chapter 62-550, Drinking Water Standard
(3) Higher than most years because of equipment renovation (typically 500 mg/l)
(4) City of Sarasota Permit Surface Water Discharge Limit
(5) FAC Chapter 62-600, Reclaimed Water Standard

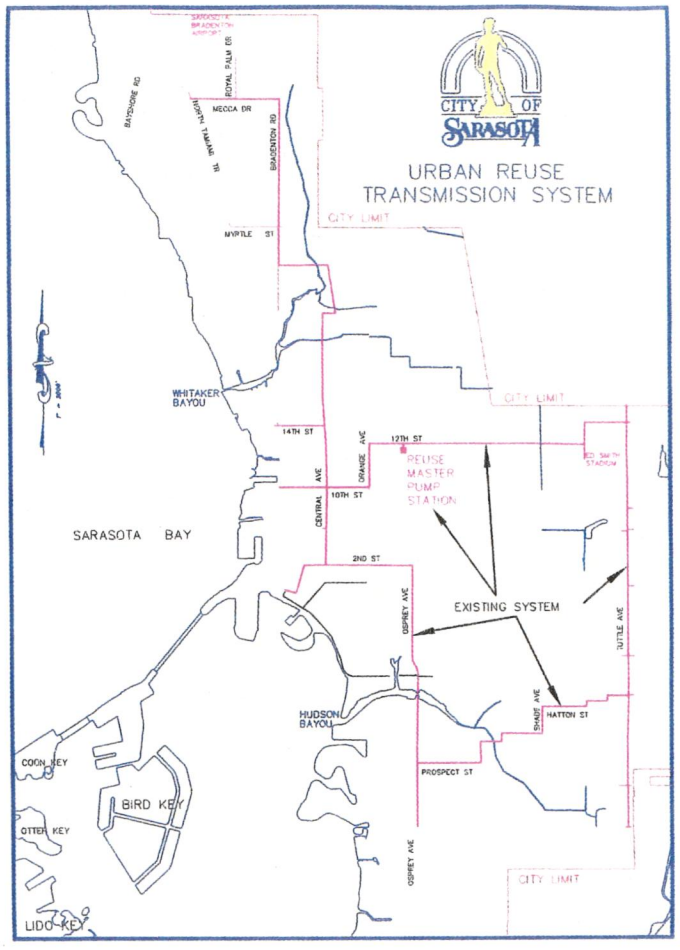


Figure 3-7
City of Sarasota
Urban Reuse Transmission System

The City of Sarasota operates an Urban/Agricultural reuse system with a permitted capacity of 7.6 mgd. **Figure 3-7** shows the existing City of Sarasota Urban Reclaimed Water System. The urban reuse system serves parks, golf courses, citrus groves, and agricultural land. The Bobby Jones Golf Complex, Ed Smith Stadium Complex, Bayfront Park, Main Street streetscape, Five Points Park, North Trail medians, and Martin Luther King Way streetscape all use reclaimed water from the City of Sarasota for irrigation. The agricultural reuse system serves the Hi Hat Ranch and is not depicted on Figure 3-7. The Hi Hat Ranch is located in eastern Sarasota County.

The City of Sarasota reclaimed water system includes a 185 million gallon storage pond that provides storage of reclaimed water to meet peak demands. The operation storage volume of the pond is at capacity with the current reclaimed water customer demands. It is assumed that additional reclaimed water storage facilities will be required for new customers added to the reuse system. The City of Sarasota has applied to the Manasota Basin Board of the SWFMWD for cooperative grant funding for reuse at Payne Park.

According to the report titled, *City of Sarasota – Reuse System Water Balance*, dated October 2001, the City of Sarasota's average supply of reclaimed water has ranged from 6.8 mgd to 8.3 mgd since 1993. Future reuse system plans include obtaining 1.75 mgd of additional wastewater flow from Sarasota County for a total supply capacity of approximately 8.5 mgd. In this report, the City has currently allocated 2.5 mgd to the Town of Longboat Key. The report also reflects that the City has identified 3 areas that desire reclaimed water service. These areas include Bird and Lido Keys, St. Armands, and coastal lands on the mainland just north and south of the City of Sarasota.

3.1.4.2 City of Sarasota Reclaimed Water System Scenarios

The reclaimed water system will be comprised of three subsystems: a transmission, storage, and delivery system. The transmission system includes those facilities required to convey reclaimed water from the mainland to Longboat Key. The storage system includes those facilities for ASR, ground storage tank, and pumping facilities. The delivery system is comprised of the trunk pipeline along Gulf of Mexico Drive and booster pump stations. The trunk system will form the backbone of the reclaimed water system on Longboat Key. Reclaimed water distribution systems will connect to the trunk system to distribute reclaimed water to customers.

Four reclaimed water system scenarios have been developed for conveying reclaimed water from the City of Sarasota supply to Longboat Key. Each scenario proposes to have the reclaimed water transmission system run along the John Ringling Causeway to Bird and Lido Keys and St. Armands. The reclaimed water transmission system will be installed in the side and back streets off of St. Armands Circle to minimize disruption as it makes its way to the northern area of Lido Key. The reclaimed water transmission system will cross New Pass and terminate on Longboat Key near Quick Point. Four subaqueous crossings are anticipated for the reclaimed water transmission system. The general alignment for the reclaimed water transmission system is similar for all four scenarios.

The trunk system will generally run from Quick Point at the south end of Longboat Key north along Gulf of Mexico Drive. The trunk system also includes in line booster pump stations to maintain adequate reclaimed water pressure for delivery to customers.

To provide pressure to the distribution system and storage to meet dry weather and peak hour demands, the reclaimed water transmission system will need to be equipped with a dedicated reclaimed water ASR well(s), a ground storage tank, a booster pump station and transmission pipeline. The location of these facilities affects the overall operation and capital cost of the reclaimed water system. These facilities could be located on Longboat Key or possibly at the City of Sarasota's ASR facility in Payne Park. The reclaimed water demand of Longboat Key differs from the supply currently available. Therefore, four scenarios were considered for the City of Sarasota supply option.

The following represents a summary of the City of Sarasota supply scenarios:

- **Scenario No. 1**
  A 20-inch transmission main will deliver an average daily flow (ADF) of 2.5 mgd to Longboat Key and 1.0 mgd to Bird and Lido Keys. The transmission main will originate at the City of Sarasota 24-inch distribution line in the

vicinity of Coconut Avenue and Gulfstream Avenue. The ASR, booster pump station and ground storage tank facility will be located on the southern tip of Longboat Key at the Quickpoint Nature Preserve. The 20-inch transmission main will transport a peak wet weather flow of 10.5 mgd to the Longboat Key ASR facility. The trunk system is designed to deliver the 2.5 mgd ADF from the Quickpoint Nature Reserve to the Sarasota/Manatee County Line. Scenario No. 1 is illustrated on **Figure 3-8**.

- **Scenario No. 2**
  A 20-inch transmission main will deliver an ADF of 2.5 mgd to Longboat Key and 1.0 mgd to Bird and Lido Keys. The ASR, booster pump station and ground storage tank facility will be located at the City of Sarasota ASR Facility in Payne Park. The transmission main will originate at Payne Park, run west on Morrill Street to Gulfstream Avenue, then Northwest to John Ringling Boulevard. The trunk system is designed to deliver the 2.5 mgd ADF the south point of Longboat Key to the Sarasota/Manatee County Line. Scenario No. 2 is illustrated on **Figure 3-9**.

- **Scenario No. 3 - Option A**
  A 20-inch transmission main will deliver an ADF of 4.0 mgd to Longboat Key and 1.0 mgd to Bird and Lido Keys. The ASR, booster pump station, and ground storage tank facility will be located on the southern tip of Longboat Key at the Quickpoint Nature Preserve. The transmission main will originate at the City of Sarasota 24-inch distribution line in the vicinity of Coconut Avenue and Gulfstream Avenue. The 20-inch transmission main will transport a peak wet weather flow of 10.5 mgd to the Longboat Key ASR facility. The trunk system is designed to deliver the 4.0 mgd ADF from the Quickpoint Nature Reserve to the North point of Longboat Key. Scenario No. 3 Option A is illustrated on **Figure 3-10**.

- **Scenario No. 3 - Option B**
  A 24-inch transmission main will deliver an ADF of 4.0 mgd to Longboat Key and 1.0 mgd to Bird and Lido Keys. The transmission main will originate at the City of Sarasota 24-inch distribution line in the vicinity of Coconut Avenue and Gulfstream Avenue. The ASR, booster pump station, and ground storage tank facility will be located on the southern tip of Longboat Key at the Quickpoint Nature Preserve. The 20-inch transmission main will transport a peak wet weather flow of 15 mgd to the Longboat Key ASR facility.

  The trunk system is designed to deliver the 4.0 mgd ADF from the Quickpoint Nature Reserve to the North point of Longboat Key. Scenario No. 3 Option B is illustrated on **Figure 3-11**.

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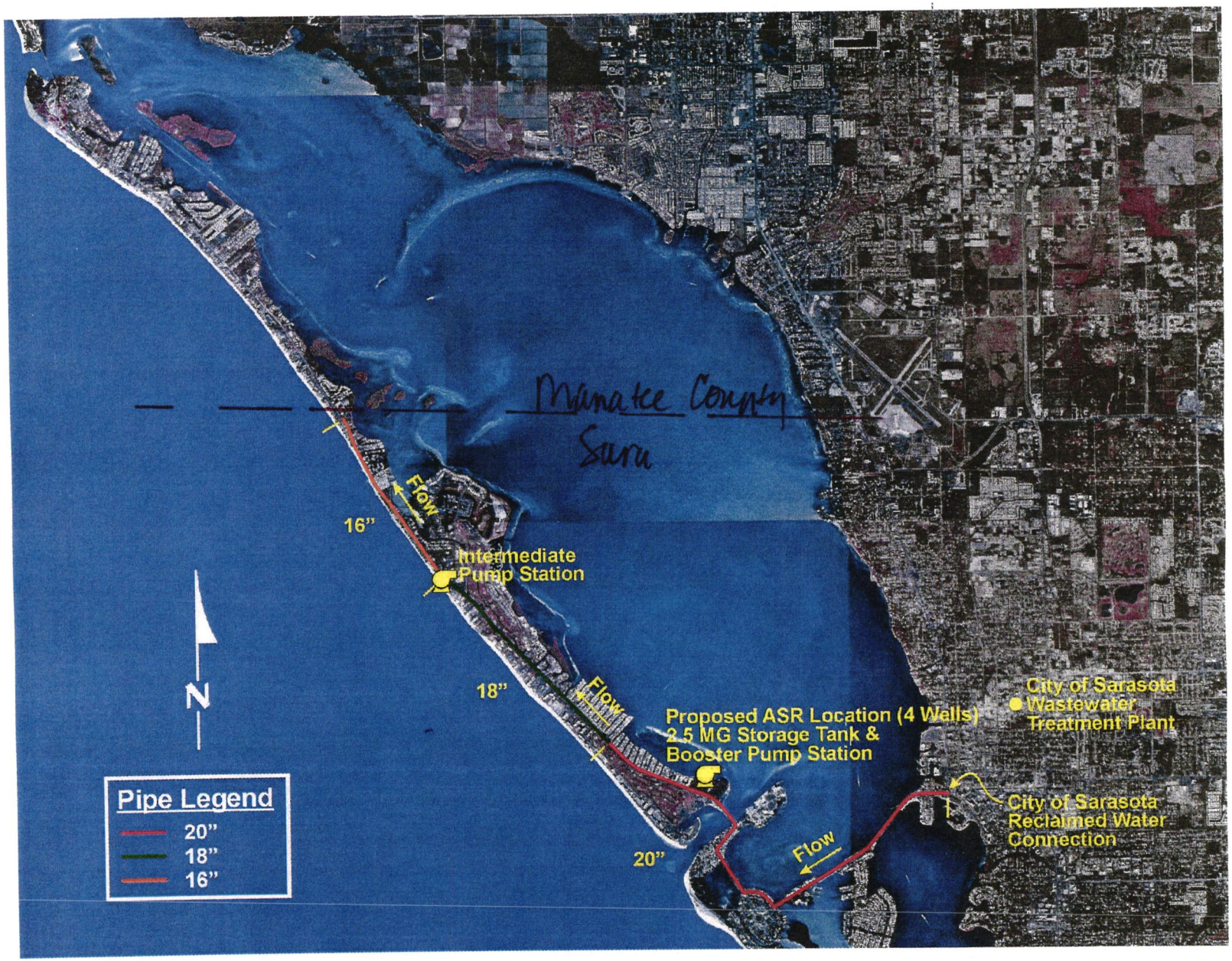

Figure 3-8
Reclaimed Pipeline Route
Sarasota County Supply - Scenario No. 1

CDM

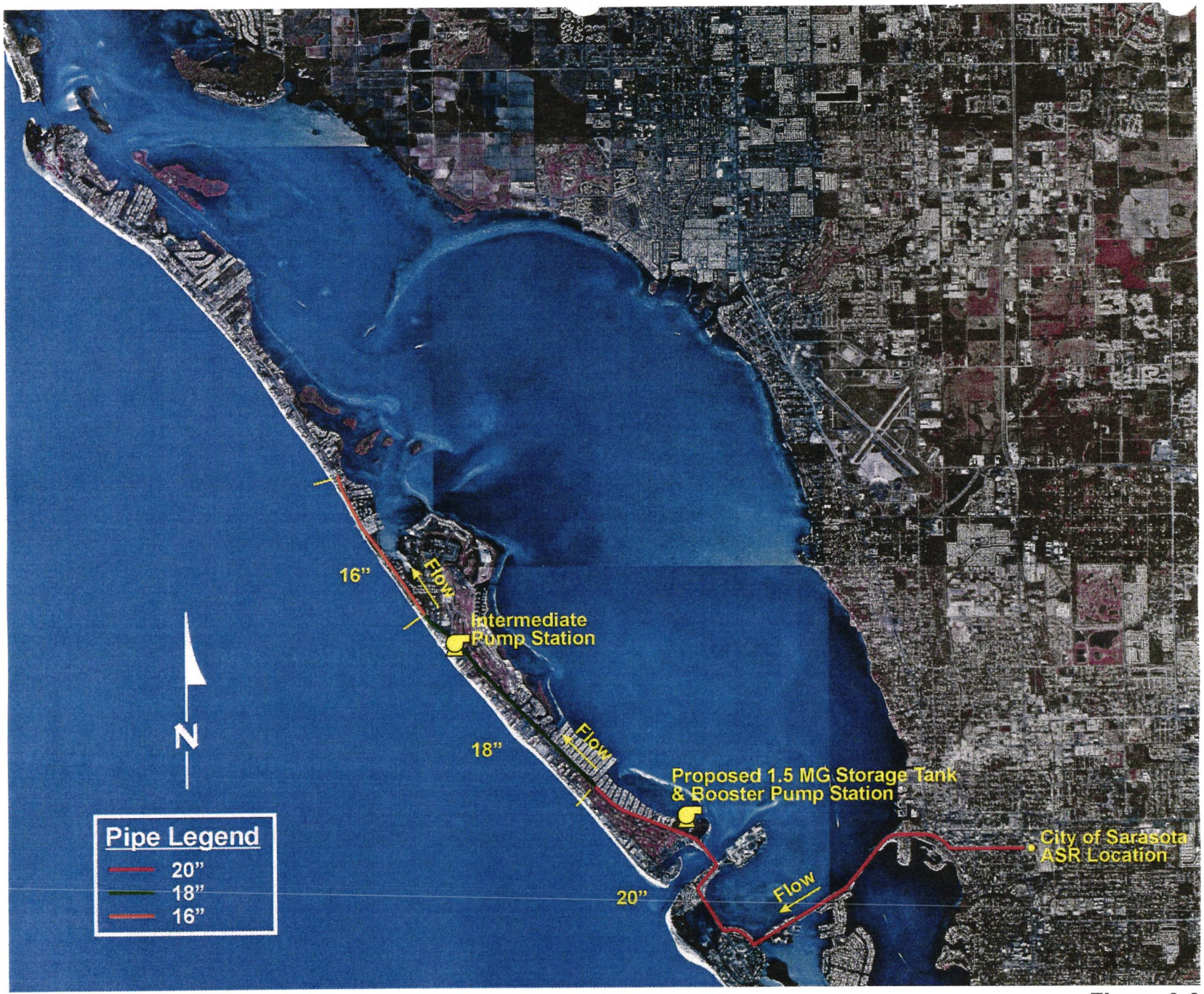

Figure 3-9
Reclaimed Pipeline Route
Sarasota County Supply – Scenario No. 2

CDM

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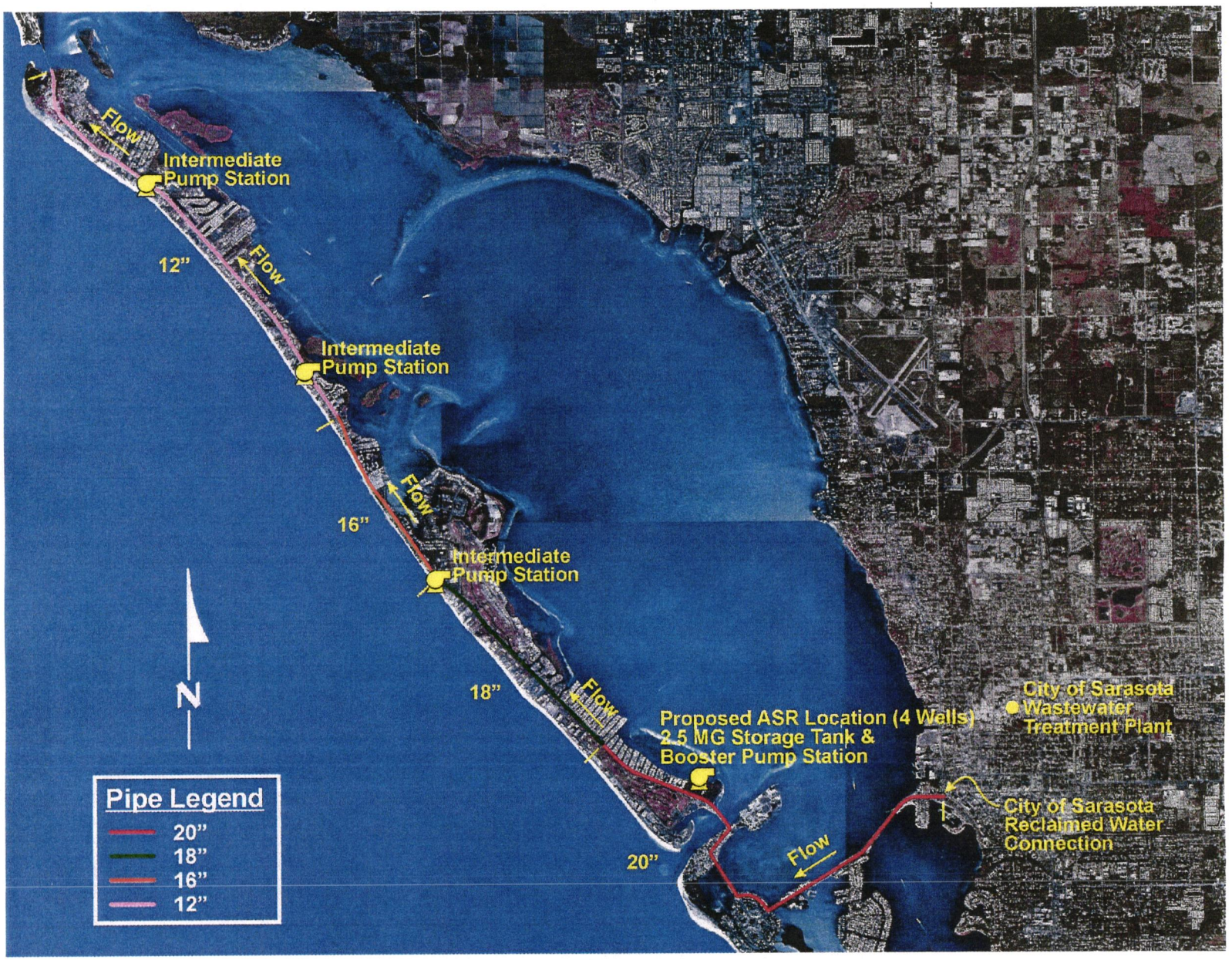

Figure 3-10
Reclaimed Pipeline Route
Sarasota County Supply - Scenario No. 3a

CDM

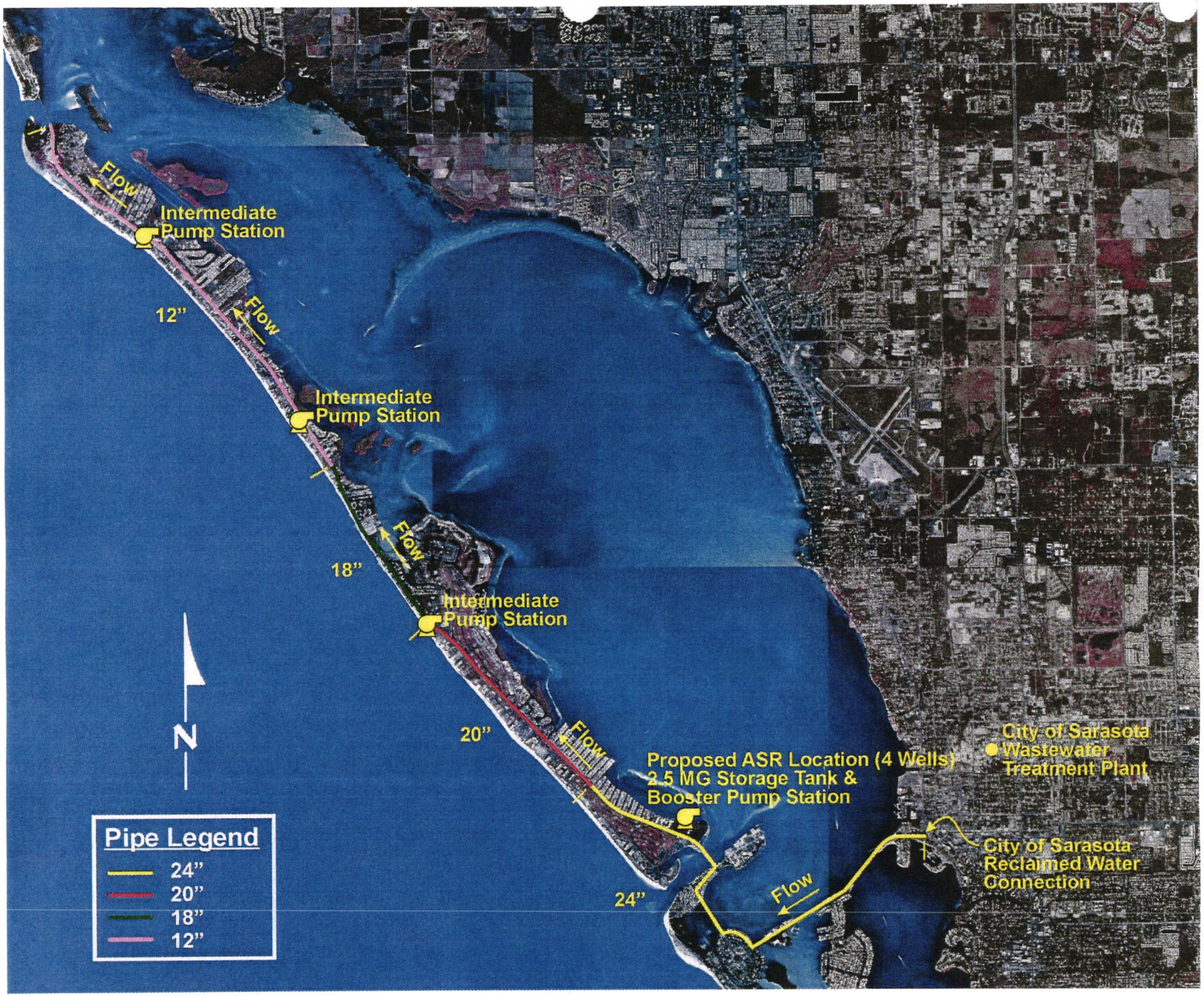

Figure 3-11
Reclaimed Pipeline Route
Sarasota County Supply – Scenario No. 3b

CDM

- **Scenario No. 4**
  A 24-inch transmission main will deliver an ADF of 4.0 mgd to Longboat Key and 1.0 mgd to Bird and Lido Keys. The ASR, booster pump station, and ground storage tank facility will be located at the City of Sarasota ASR Facility in Payne Park. The transmission main will originate at Payne Park, run west on Morrill Street to Gulfstream Avenue, then Northwest to John Ringling Boulevard. The trunk system is designed to deliver the 4.0 mgd ADF the south point of Longboat Key to the Sarasota/Manatee County Line. Scenario No. 4 is illustrated on **Figure 3-12**.

Figure 3-13
Conceptual Ground Storage Tank/Booster Pump Station Site

Scenarios 3 and 4 address the options currently being considered for obtaining the reclaimed water supply sufficient to irrigate the entire Town of Longboat Key.

If the ground storage tank, booster pump station, and ASR facilities are located on Longboat Key, it is proposed that the facilities be located at the Town of Longboat Key's potable water facility near Quick Point Nature Preserve. **Figure 3-13** provides a conceptual configuration of the ground storage tank and booster pump station facilities. Another option for ASR well locations is near the Islandside Golf Course practice range.

Preliminary analyses provide that a 4.0 mgd demand will require three booster pump stations to be installed in the trunk system along Gulf of Mexico Drive. To meet the annual average supply of 4.0 mgd with a peak hour of 12 mgd, the system would require a 2.5-million ground storage tank and 4 ASR wells with an approximate aquifer storage volume of 300 million gallons.

The main difference between the City of Sarasota Supply Option scenarios, other than the reclaimed water demand, is the location of the ASR Facility. Locating the ASR facility on Longboat Key provides the most flexibility and control of the ASR system for the Town.

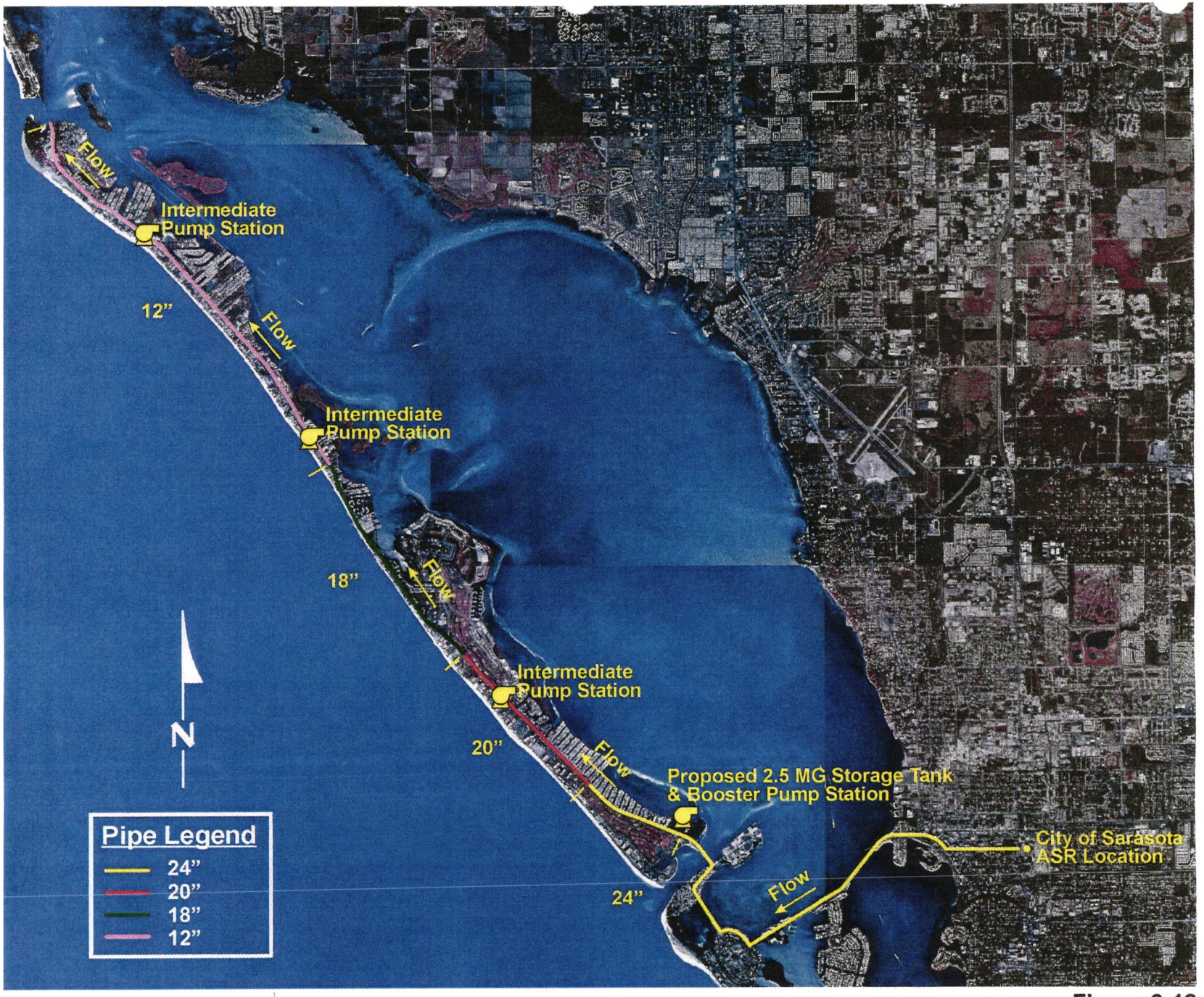

Figure 3-12
Reclaimed Pipeline Route
Sarasota County Supply – Scenario No. 4

CDM

Table 3-4 presents the summaries of each scenario with regard to the transmission main. The detail for the opinions of probable project costs is discussed below.

Table 3-4
Summary of City of Sarasota Supply Options

Scenario	Average Day Reclaimed Water Supply Flow (mgd)	Subtotal $	25% Contingency	Total $
City of Sarasota 1	2.5	19,360,000	4,840,000	24,200,000
City of Sarasota 2	2.5	18,084,000	4,521,000	22,605,000
City of Sarasota 3A	4.0	21,510,000	5,378,000	26,888,000
City of Sarasota 3B	4.0	22,533,000	5,633,000	28,166,000
City of Sarasota 4	4.0	21,423,000	5,356,000	26,779,000

3.1.4.3 Planning and Conceptual Project Cost

The anticipated planning and conceptual project costs are an important criterion for evaluating the four City of Sarasota Supply Option scenarios. The major project components of each scenario have been identified. These major components provide the basis for the development of the planning level opinions of probable project cost for each scenario. The reclaimed water system is comprised of two systems, transmission and trunk. As previously discussed, the reclaimed water transmission system conveys the reclaimed water from the City supply on the mainland to Longboat Key. The transmission system includes the anticipated ASR Facility and associated ground storage tank and booster pump station. The trunk system includes the reclaimed water mains and intermediate booster pump stations located on Longboat Key and typically within the right-of-way of Gulf of Mexico Drive. Operation and Maintenance (O&M) was estimated based on historical operations data of similar systems.

- **Scenario 1 - Planning and Conceptual Project Cost**

  City of Sarasota Supply Scenario 1 consists of 2.5 mgd delivered to an ASR Facility on the south end of Longboat Key and distributed part way up the island to the county line. **Table 3-5** provides a summary of the major components, their associated estimated unit costs, extended cost and total conceptual planning cost anticipated for Scenario 1. Based upon the preliminary quantity takeoff for Scenario 1, the conceptual planning cost is $24,200,000. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under this scenario is approximately $2.33

Table 3-5
City of Sarasota - Scenario 1
ASR Facility Located on LBK
Reclaimed Main for South Portion of Longboat Key

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
20-inch Transmission (Sarasota Connection to Longboat Key Booster Pump Station)	13,950	5.75	115	1,604,250
Jack and Bore				225,000
20-inch Subaqueous Ringling Causeway Transmission	3,000	NA	390	1,170,000
20-inch Subaqueous Bird Key to Coon Key Transmission	1,500	NA	390	585,000
20-inch Subaqueous St. Armands Key to City Island Transmission	400	NA	390	156,000
20-inch Subaqueous City Island to Longboat Key Transmission	1,600	NA	390	624,000
Subtotal Transmission	*20,450*			*4,364,250*
Storage				
ASR Test/Monitor/Production Well	1	NA	700,000	700,000
ASR Wells	3	NA	400,000	1,200,000
20-inch ASR Connection Pipe	2,200	5.75	115	253,000
2.5 MG Ground Storage Tank	1	NA	600,000	600,000
Reclaimed High Service Pump Station	1	NA	2,200,000	2,200,000
Subtotal Storage				*4,953,000*
Delivery Trunk System				
20-inch Trunk Main (Longboat Key Booster Pump Station to Country Club Shores)	5,400	5.75	115	621,000
18-inch Trunk Main (Country Club Shores to Bay Isles Pkwy.)	10,900	5.60	101	1,098,720
16-inch Trunk Main (Bay Isles Pkwy. To County Line)	10,500	5.50	88	924,000
Intermediate Booster Pump Station	1	NA	300,000	300,000
Subtotal Delivery Trunk	*26,800*			*2,943,720*
Delivery Pump Station Improvements				*2,700,000*
Subtotal Reclaimed System				*14,960,970*
Permitting				75,000
Engineering, Survey, Geotech				3,650,000
Inflation Allowance (3.5%)				524,000
Administrative/Legal (1%)				150,000
Subtotal				19,360,000
Contingency (25%)				4,840,000
TOTAL				**$24,200,000**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
2. Pump Station Upgrade from existing 4 - 40 HP to 8 - 75 HP.
3. Direct connections to customer base via private irrigation system or other are not included.
4. Pipe material is estimated as PVC or HDPE.
5. Price based on basic Electrical and Instrumentation.
6. Subaqueous directional drilling is the assumed crossing method.
7. LBK 2.5 ADF and 1 mgd Other. Peak Flows into ASR up to 10.5 mgd.

- **Scenario 2 - Planning and Conceptual Project Cost**

  City of Sarasota Supply Scenario 2 consists of 2.5 mgd delivered from an ASR Facility at the City of Sarasota Payne Park Key and distributed part way up the island to the county line. **Table 3-6** provides a summary of the major components, their associated estimated unit costs, extended cost and total conceptual planning costs anticipated for Scenario 2. Based upon the preliminary quantity takeoff for Scenario 2, the conceptual planning cost is $22,605,000. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under Scenario 2 is approximately $2.20.

- **Scenario 3 - Option A Planning and Conceptual Project Cost**

  City of Sarasota Supply Scenario 3A consists of 4.0 mgd delivered via a 20-inch pipeline to an ASR Facility on the south end of Longboat Key and distributed to the north end of the island. **Table 3-7** provides a summary of the major components, their associated estimated unit costs, extended cost and total conceptual planning cost anticipated for Scenario 3 Option A. Based upon the preliminary quantity takeoff for Scenario 3, the conceptual planning cost is $26,888,000. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under this scenario is approximately $2.56.

- **Scenario 3 - Option B Planning and Conceptual Project Cost**

  City of Sarasota Supply Scenario 3B consists of 4.0 mgd delivered via a 24-inch pipeline to an ASR Facility on the south end of Longboat Key and distributed to the north end of the island. **Table 3-8** provides a summary of the major components, their associated estimated unit costs, extended cost and total conceptual planning cost anticipated for Scenario 3 Option B. Based upon the preliminary quantity takeoff for Scenario 3, the conceptual planning cost is $28,166,000. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under this scenario is approximately $2.66.

- **Scenario 4 - Planning and Conceptual Project Cost**

  City of Sarasota Supply Scenario 4 consists of 4.0 mgd delivered from an ASR Facility at the City of Sarasota Payne Park Key and distributed from the south end of Longboat Key to the north end. **Table 3-9** provides a summary of the major components, their associated estimated unit costs, extended cost and total conceptual planning cost anticipated for Scenario 4. Based upon the preliminary quantity takeoff for Scenario 4, the conceptual planning cost is $26,779,000. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under Scenario 4 is approximately $2.55.

Table 3-6
City of Sarasota - Scenario 2
ASR Facility Located in City of Sarasota
Reclaimed Main for South Half of the Island

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
20-inch Transmission (Sarasota ASR Facility to Longboat Key Booster Pump Station)	21,600	5.75	115	2,484,000
Jack and Bore				225,000
20-inch Subaqueous Ringling Causeway Transmission	3,000	NA	390	1,170,000
20-inch Subaqueous Bird Key to Coon Key Transmission	1,500	NA	390	585,000
20-inch Subaqueous St. Armands Key to City Island Transmission	400	NA	390	156,000
20-inch Subaqueous City Island to Longboat Key Transmission	1,600	NA	390	624,000
Subtotal Transmission	*28,100*			*5,244,000*
Storage				
ASR Test/Monitor/Production Well	1	NA	700,000	700,000
ASR Wells	2	NA	400,000	800,000
20-inch ASR Connection Pipe	2,200	5.75	115	253,000
1.5 MG Ground Storage Tank	1	NA	500,000	500,000
ASR High Service Pump Station	1	NA	1,800,000	1,800,000
Subtotal Storage				*4,053,000*
Delivery Trunk System				
20-inch Trunk Main (Longboat Key Booster Pump Station to Country Club Shores)	5,400	5.75	115	621,000
18-inch Trunk Main (Country Club Shores to Bay Isles Pkwy.)	10,900	5.60	101	1,098,720
16-inch Trunk Main (Bay Isles Pkwy. To County Line)	10,500	5.50	88	924,000
Intermediate Booster Pump Station	1	NA	300,000	300,000
Subtotal Delivery Trunk	*26,800*			*2,943,720*
Delivery Pump Station Improvements				*1,500,000*
Subtotal Reclaimed System				*13,741,000*
Permitting				75,000
Engineering, Survey, Geotech				3,650,000
Inflation Allowance (3.5%)				481,000
Administrative/Legal (1%)				137,000
Subtotal				18,084,000
Contingency (25%)				4,521,000
TOTAL				**$22,605,000**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
3. Direct connections to customer base via private irrigation system or other are not included.
4. Pipe material is estimated as PVC or HDPE.
5. Price based on basic Electrical and Instrumentation.
6. Subaqueous directional drilling is the assumed crossing method.
7. LBK 2.5 mgd ADF and 1 mgd Other. Peak Flows into ASR up to 10.5 mgd.

Table 3-7
City of Sarasota - Scenario 3
Option A
ASR Facility Located on Longboat Key
Reclaimed Main for Entire Island

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
20-inch Transmission (Sarasota Connection to Longboat Key Booster Pump Station)	13,950	5.75	115	1,604,250
Jack and Bore				225,000
20-inch Subaqueous Ringling Causeway Transmission	3,000	NA	390	1,170,000
20-inch Subaqueous Bird Key to Coon Key Transmission	1,500	NA	390	585,000
20-inch Subaqueous St. Armands Key to City Island Transmission	400	NA	390	156,000
20-inch Subaqueous City Island to Longboat Key Transmission	1,600	NA	390	624,000
Subtotal Transmission	*20,450*			*4,364,250*
Storage				
ASR Test/Monitor/Production Well	1	NA	700,000	700,000
ASR Wells	3	NA	400,000	1,200,000
20-inch ASR Connection Pipe	2,200	5.75	115	253,000
2.5 MG Ground Storage Tank	1	NA	600,000	600,000
Reclaimed High Service Pump Station	1	NA	2,200,000	2,200,000
Subtotal Storage				*4,953,000*
Delivery Trunk System				
20-inch Trunk Main (Longboat Key Booster Pump Station to Country Club Shores)	5,400	5.75	115	621,000
18-inch Trunk Main (Country Club Shores to Bay Isles Pkwy.)	10,900	5.60	101	1,098,720
16-inch Trunk Main (Bay Isles Pkwy. To County Line)	10,500	5.50	88	924,000
12-inch Trunk Main (County Line to North End)	24,300	5.00	60	1,458,000
Intermediate Booster Pump Station	3	NA	300,000	900,000
Subtotal Delivery Trunk	*51,100*			*5,002,000*
Delivery Pump Station Improvements				*2,700,000*
Subtotal Reclaimed System				*17,019,000*
Permitting				75,000
Engineering, Survey, Geotech				3,650,000
Inflation Allowance (3.5%)				596,000
Administrative/Legal (1%)				170,000
Subtotal				21,510,000
Contingency (25%)				5,378,000
TOTAL				**$26,888,000**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
2. Pump Station Upgrade from existing 4 - 40 HP to 8 - 75 HP.
3. Direct connections to customer base via private irrigation system or other are not inlcuded.
4. Pipe material is estimated as PVC or HDPE.
5. Price based on basic Electrical and Instrumentation.
6. Subaqueous directional drilling is the assumed crossing method.
7. LBK 2.5 to 3.5 mgd ADF and 1 mgd Other. Peak Flows into ASR up to 10.5 mgd.

Table 3-8
City of Sarasota - Scenario 3
Option B
ASR Facility Located on Longboat Key

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
24-inch Transmission (Sarasota Connection to Longboat Key Booster Pump Station)	13,950	6.00	144	2,008,800
Jack and Bore				225,000
24-inch Subaqueous Ringling Causeway Transmission	3,000	NA	400	1,200,000
24-inch Subaqueous Bird Key to Coon Key Transmission	1,500	NA	400	600,000
24-inch Subaqueous St. Armands Key to City Island Transmission	400	NA	400	160,000
24-inch Subaqueous City Island to Longboat Key Transmission	1,600	NA	400	640,000
Subtotal Transmission	*20,450*			*4,833,800*
Storage				
ASR Test/Monitor/Production Well	1	NA	700,000	700,000
ASR Wells	3	NA	400,000	1,200,000
24-inch ASR Connection Pipe	2,200	6.00	144	316,800
2.5 MG Ground Storage Tank	1	NA	600,000	600,000
Reclaimed High Service Pump Station	1	NA	2,200,000	2,200,000
Subtotal Storage				*5,016,800*
Delivery Trunk System				
24-inch Trunk Main (Longboat Key Booster Pump Station to Country Club Shores)	5,400	6.00	144	777,600
20-inch Trunk Main (Country Club Shores to Bay Isles Pkwy.)	10,900	5.75	115	1,253,500
18-inch Trunk Main (Bay Isles Pkwy. To County Line)	10,500	5.60	101	1,058,400
12-inch Trunk Main (County Line to North End)	24,300	5.00	60	1,458,000
Intermediate Booster Pump Station	3	NA	300,000	900,000
Subtotal Delivery Trunk	*51,100*			*5,447,500*
Delivery Pump Station Improvements				*2,700,000*
Subtotal Reclaimed System				*17,998,000*
Permitting				75,000
Engineering, Survey, Geotech				3,650,000
Inflation Allowance (3.5%)				630,000
Administrative/Legal (1%)				180,000
Subtotal				22,533,000
Contingency (25%)				5,633,000
TOTAL				**$28,166,000**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
2. Pump Station Upgrade from existing 4 - 40 HP to 8 - 75 HP.
3. Direct connections to customer base via private irrigation system or other are not inlcuded.
4. Pipe material is estimated as PVC or HDPE.
5. Price based on basic Electrical and Instrumentation.
6. Subaqueous directional drilling is the assumed crossing method.
7. LBK 2.5 to 3.5 mgd ADF and 1 mgd Other. Peak Flows into ASR up to 15 mgd.

Table 3-9
City of Sarasota - Scenario 4
ASR Facility Located in City of Sarasota
Reclaimed Main for Entire Island

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
24-inch Transmission (Sarasota ASR Facility to Longboat Key Booster Pump Station)	21,600	6.00	144	3,110,400
Jack and Bore				225,000
24-inch Subaqueous Ringling Causeway Transmission	3,000	NA	400	1,200,000
24-inch Subaqueous Bird Key to Coon Key Transmission	1,500	NA	400	600,000
24-inch Subaqueous St. Armands Key to City Island Transmission	400	NA	400	160,000
24-inch Subaqueous City Island to Longboat Key Transmission	1,600	NA	400	640,000
Subtotal Transmission	*28,100*			*5,935,400*
Storage				
ASR Test/Monitor/Production Well	1	NA	700,000	700,000
ASR Wells	2	NA	400,000	800,000
20-inch ASR Connection Pipe	2,200	5.75	115	253,000
1.5 MG Ground Storage Tank	1	NA	500,000	500,000
ASR High Service Pump Station	1	NA	1,800,000	1,800,000
Subtotal Storage				*4,053,000*
Delivery Trunk System				
24-inch Trunk Main (Longboat Key Booster Pump Station to Country Club Shores)	5,400	6.00	144	777,600
20-inch Trunk Main (Country Club Shores to Bay Isles Pkwy.)	10,900	5.75	115	1,253,500
18-inch Trunk Main (Bay Isles Pkwy. To County Line)	10,500	5.60	101	1,058,400
12-inch Trunk Main (County Line to North End)	24,300	5.00	60	1,458,000
Intermediate Booster Pump Station	3	NA	300,000	900,000
Subtotal Delivery Trunk	*51,100*			*5,448,000*
Delivery Pump Station Improvements				*1,500,000*
Subtotal Reclaimed System				*16,936,000*
Permitting				75,000
Engineering, Survey, Geotech				3,650,000
Inflation Allowance (3.5%)				593,000
Administrative/Legal (1%)				169,000
Subtotal				21,423,000
Contingency (25%)				5,356,000
TOTAL				**$26,779,000**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
3. Direct connections to customer base via private irrigation system or other are not inlcuded.
4. Pipe material is estimated as PVC or HDPE.
5. Price based on basic Electrical and Instrumentation.
6. Subaqueous directional drilling is the assumed crossing method.
7. LBK 2.5 to 3.5 mgd ADF and 1 mgd Other. Peak Flows into ASR up to 10.5 mgd.

3.1.4.4 Permitting

Based on the selected routes, the following presents a summary of key permits and issues associate with the construction of a transmission system and storage delivering reclaimed water from the City of Sarasota to the Town of Longboat Key:

- FDEP, Army Corp of Engineers, and SWFWMD; *Environmental Resource Permit/ Authorization to use Sovereign Submerged Lands/ Federal Dredge and Fill Permit* (Form 62-343.900(1) FAC). Based on Chapter 62-4.050 FAC, the permit application fee is estimated at $5,500. The permit application fee is required by the agencies and does not account for preparation of the permit and supporting information.

  This permit is submitted as a joint application to the FDEP, Army Corp of Engineers, and the SWFWMD. Specifically it will permit the subaqueous crossings, wetland impacts, and floodplain encroachment.

  The City of Sarasota is currently installing a new 24" potable water main under the Ringling Causeway pass and has an active Environmental Resource Permit/submerged land lease permit. The lease will expire in June 2003. Additionally, the City of Sarasota has another active Environmental Resource Permit/submerged land lease permit for crossing New Pass that expires in 2004. If the City of Sarasota Supply Option is selected, these portions of the project could be design and installed early to take advantage of the existing permits. If new submerged or sovereign land leases are necessary, it is anticipated that it could take as much as 6-9 months to obtain depending on the position of the public within 500 feet of the crossing.

  Key issues that affect the issuance of this permit will be the disturbance of wetlands and sea grass habitats. This is a time intensive permitting process. Therefore, utilizing the City of Sarasota established permit would be advantageous.

- FDEP; *Wastewater Construction Permit Modification* (Form No. 62-610.300(4)(a)1. FAC). Based on Chapter 62-4.050 FAC, the permit application fee is estimated at $5,500. The permit application fee is required by the agencies and does not account for preparation of the permit and supporting information.

  The supplier will be required to submit to the FDEP information on the improvements to the transmission system. It is anticipated that the Town of Longboat Key will need to coordinate with the City of Sarasota for submittal.

- FDEP; *Injection Well Construction Permit* (Form No. 62-528.900(i) FAC). Based on Chapter 62-4.050 FAC, the permit application fee is estimated at $750 per ASR well. Submittal of a construction application report pursuant to Chapter 62-528.450 FAC is also required.

  This permits the construction of a Class V, Group VII for injection of non-hazardous fluids into or above geologic formations that contain potable water quality sources. The City of Sarasota currently has a Class V injection test well construction permit for ASR.

- SWFWMD; *Consumptive Water Use Permit* (Form No. WUP-3 46.20-003). This SWFWMD permit will regulate withdrawals from the ASR system. Based on 40D-1.607 FAC, a permit application fee of $1,000 is required.

- FDEP; *Operation Permit for a Class V, Group VII, Well* (Application Report per Chapter 62-528.455 FAC). Based on Chapter 62-4.050, a permit fee of $750 per ASR well is required. This FDEP permit will regulate the operation of the ASR wells.

- FDEP; *Water Quality Criteria Exemption* (Application Report per Chapter 62-520.500) Based on Chapter 62-4.050, a permit fee for $5,000 is required. A renewal application is required every 5 years. This FDEP permit allows for the injection of wastewater not meeting secondary water standards. Based upon the 2001 reclaimed water quality data from the City of Sarasota, this permit would not be required.

- Florida Department of Transportation; *Utility Permit* (Form No. FDOT 710-010-85). No fee is required for this permit. This utility permit allows for the installation and adjustment of utility facilities within the Florida Department of Transportation's jurisdiction. The duration of the permit is one year.

3.1.4.5 Funding

Various funding options are available to the Town of Longboat Key for the construction of a reclaimed system. The following funding sources were evaluated for the City of Sarasota Supply Option:

- Revenue Bonds
- State Revolving Fund (SRF) Loans
- General Obligation Bonds
- SWFWMD Manasota Basin Board Grants

The best funding combination for the City of Sarasota Supply option is the SRF Loans and applying for a SWFWMD grant. The SRF loan is currently at 3% and 20 years. The Revenue Bonds are at 5% and 30 years. Funding options and revenue sources for the City of Sarasota Supply Option are investigated in detail in the report titled, *Evaluation of Funding Options, Project Costs, and Revenue Sources, Town of Longboat Key*, CDM, February 2002.

3.1.5 Manatee County Supply Option

It appears that Manatee County could provide 1.5 mgd of reclaimed water to Longboat Key from the Southwest Regional Treatment Plant. As discussed in Section 2, the projected reclaimed water demand to irrigate Longboat Key in its entirety is approximately 4 mgd. This section provides the preliminary evaluation of four reclaimed water supply scenarios for Longboat Key. The scenarios consider a 1.5 mgd supply and for comparison purposes a 2.5 mgd average daily flow (ADF) as well as the location of reclaimed water storage facilities (either on Longboat Key or the mainland).

Manatee County Southwest Regional Treatment Plant

3.1.5.1 Manatee County Reclaimed Water System

Manatee County currently owns and operates three subregional wastewater treatment plants: the North Regional Treatment Plant, the Southwest Regional Treatment Plant, and the Southeast Regional Treatment Plant. The Southwest Regional Treatment Plant has a treatment capacity of 18 mgd, and currently treats an annual average of approximately 13.8 mgd. The North Regional Treatment Plant and the Southeast Regional Treatment Plant each have a treatment capacity of 5.4 mgd. The total capacity of the Manatee County reuse system is 28.8 mgd.

Manatee County's Southwest Regional Treatment Plant produces high quality reclaimed water. A summary of the reclaimed water quality for the year 2001 is presented in **Table 3-10**.

Table 3-10
Manatee County Reclaimed Water Quality

Parameter	Standard (mg/l)	Manatee County SWRTP Reclaimed Water Quality[1] (mg/l)
Chloride	250[2]	291
Total Dissolved Solids	500[2]	816
Sulfate	250[2]	152
Total Nitrogen (TN)	N/A	14.9
Total Phosphorus (TP)	N/A	2.10
Fecal Coliform	75th percentile shall be below detection limit and no one sample shall exceed 25 fecal coliforms / 100 mL[3]	<1 fecal coliforms / 100 mL

[1] Average for Year 2001
[2] FAC Chapter 62-550, Drinking Water Standard
[3] FAC Chapter 62-600, Reclaimed Water Standard

Manatee County is implementing the Manatee Agricultural Reuse Supply Project (MARS) that will maximize the use of reclaimed water for agricultural reuse in eastern Manatee County. The project will interconnect the Southeast Regional Treatment Plant, Southwest Regional Treatment Plant, and North Regional Treatment Plant facilities to provide a regional reuse system for future potential interconnects with the City of Bradenton and the City of Palmetto. Additionally, the County plans to extend residential reuse distribution lines in the western portion of the County associated with the Southwest Regional Treatment Plant service area.

Upon completion of the Manatee Agricultural Reuse Supply Project the County anticipates a reuse demand of 22.3 mgd for the regional interconnected system. This is 84 percent of the total reclaimed water available. Potential customers for the remaining 4.3 mgd are the Town of Longboat Key, Florida Power and Light, and other County demands. Reclaimed water supplied to Longboat Key would be distributed from the Southwest Regional Treatment Plant.

3.1.5.2 Manatee County Reclaimed Water System Scenarios

Four reclaimed water system scenarios have been developed for conveying reclaimed water from the Manatee County Southwest Regional Treatment

Plant. Each scenario proposes to have the reclaimed water transmission system originate at the treatment plant and run south along 75th Street West then on south and west via orange grove access roads to the Sarasota Bay. The pipeline route will traverse Sarasota Bay via a subaqueous crossing to the Joan M. Durante Community Park. The pipeline route will then run west through the park to the Gulf of Mexico Drive and the trunk system.

The trunk system will generally run along the Gulf of Mexico Drive Right-of-way to the south and north. The trunk system also includes in line booster pump stations to maintain adequate reclaimed water pressure for delivery to customers.

To provide pressure to the distribution system and storage to meet dry weather and peak hour demands, the reclaimed water transmission system will need to be equipped with a dedicated reclaimed water ASR well(s), a ground storage tank, and a booster pump station. The location of these facilities will affect the overall operation and capital cost of the reclaimed water system. Current estimates of approximately 1.5 mgd reclaimed supply from Manatee County may be available. A Manatee County reclaimed supply of 2.5 mgd was evaluated for comparison cost purposes and in the event, future supplies might come available. The following represents a summary of the Manatee County supply scenarios:

- **Scenario No. 1**
  An 18-inch transmission main will deliver an ADF of 1.5 mgd to Longboat Key. The ASR, booster pump station and ground storage tank facility will be located at the Durante Community Park on Longboat Key. The 18-inch transmission main will transport a peak wet weather flow of 7.5 mgd to the Longboat Key ASR facility. The trunk system is designed to deliver the 1.5 mgd ADF from Durante Park to the North end of the Island and to the County Line. Scenario No. 1 is illustrated on **Figure 3-14**.

- **Scenario No. 2**
  A 16-inch transmission main will deliver an ADF of 1.5 mgd to Longboat Key. The ASR, booster pump station and ground storage tank facility will be located at the Manatee County Southwest Regional Treatment Plant. The 16-inch transmission main will transport a peak flow of 6 mgd to Longboat Key. The trunk system is designed to deliver the 1.5 mgd ADF from Durante Park to the North end of the Island and to the County Line. Scenario No. 2 is illustrated on **Figure 3-15**.

- **Scenario No. 3**
  A 20-inch transmission main will deliver an ADF of 2.5 mgd to Longboat Key. The ASR, booster pump station and ground storage tank facility will be located at the Durante Community Park on Longboat Key. The 20-inch transmission main will transport a peak wet weather flow of 10.5 mgd to the

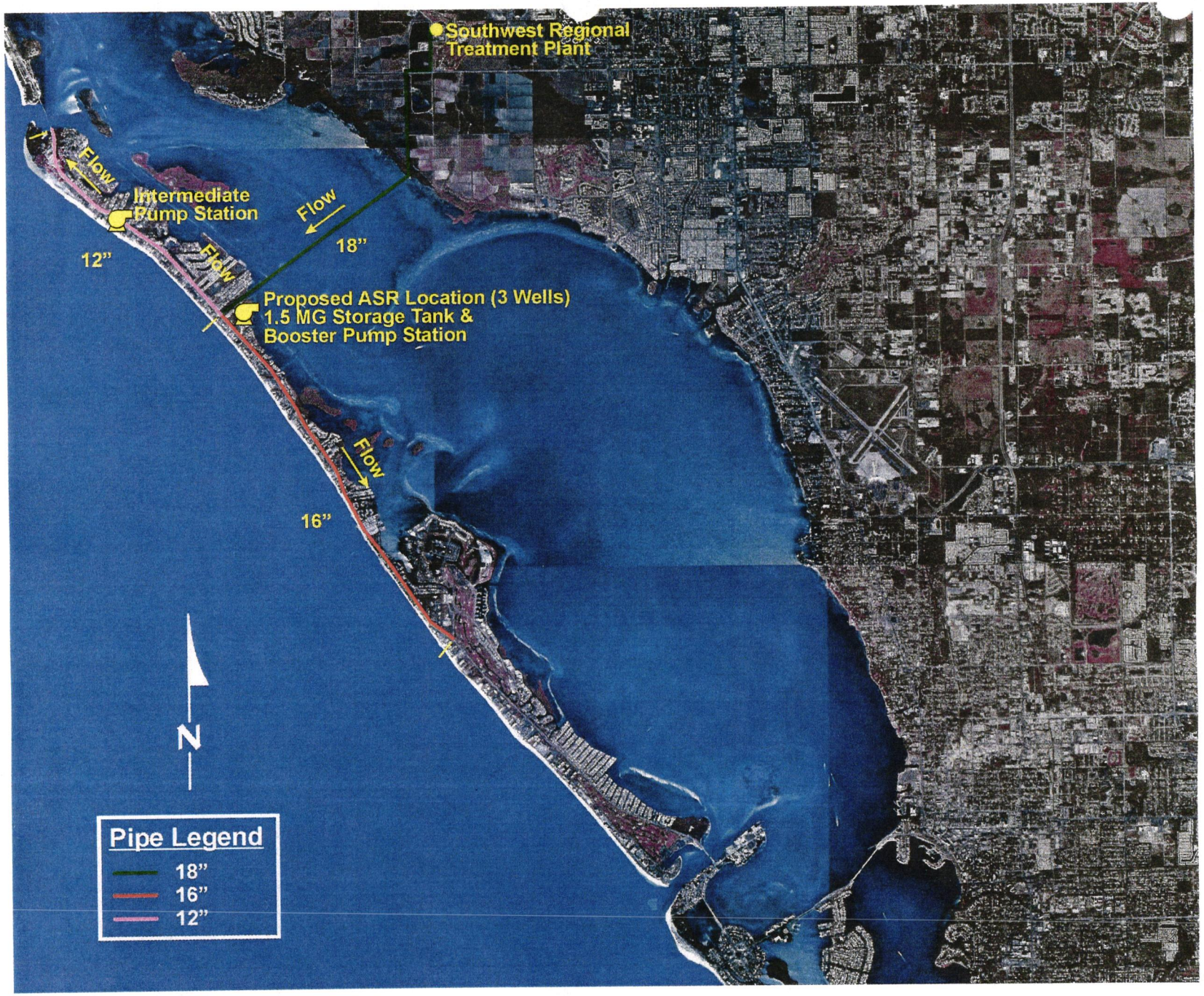

Figure 3-14
Reclaimed Pipeline Route
Manatee County Supply – Scenario No. 1

CDM

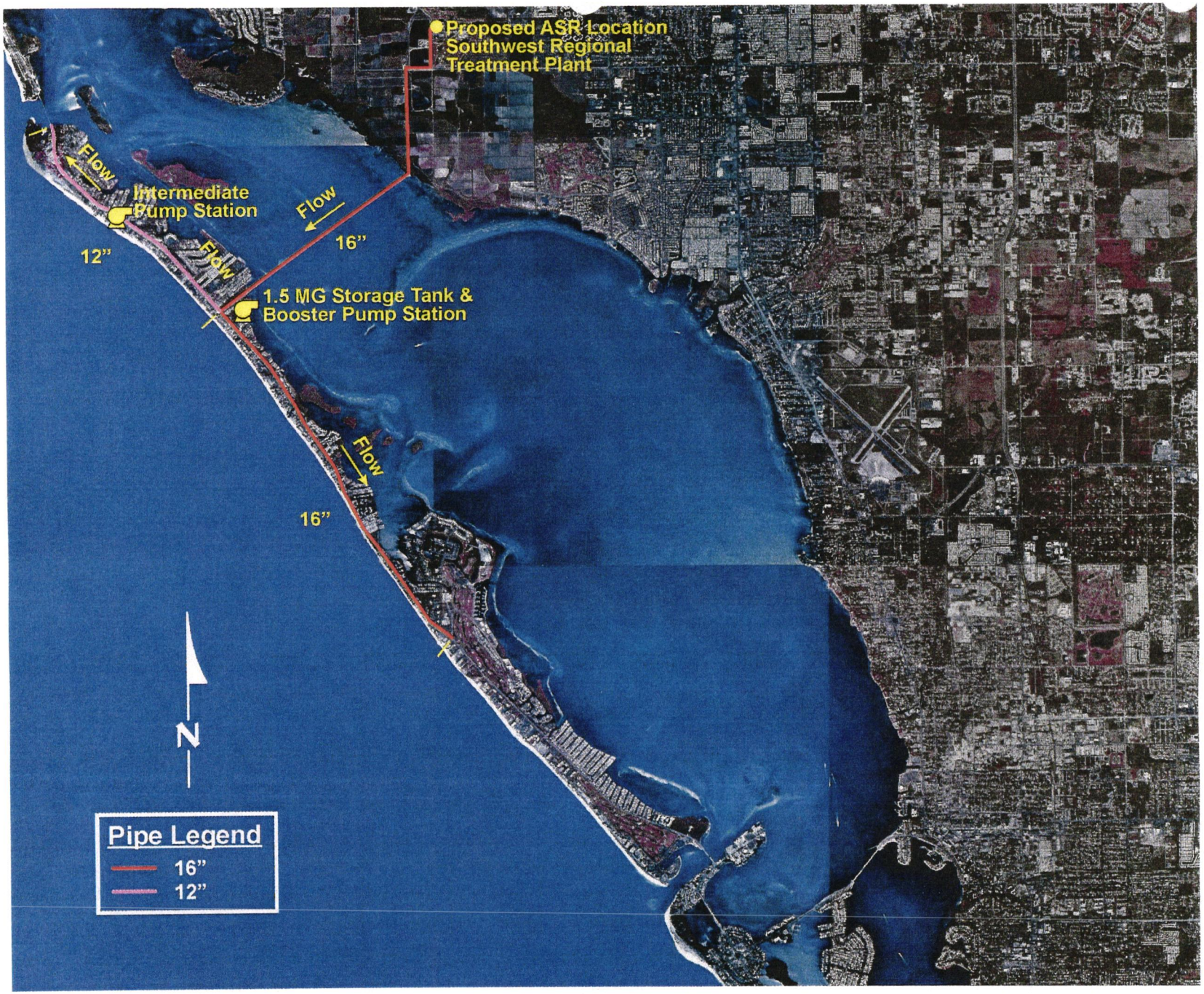

Figure 3-15
Reclaimed Pipeline Route
Manatee County Supply – Scenario No. 2

CDM

Longboat Key ASR facility. The trunk system is designed to deliver the 2.5 mgd ADF from Durante Park to the North end and the South end of the Island. Scenario No. 3 is illustrated on **Figure 3-16**.

- **Scenario No. 4**
  An 18-inch transmission main will deliver an ADF of 2.5 mgd to Longboat Key. The ASR, booster pump station and ground storage tank facility will be located at the Manatee County Southwest Regional Treatment Plant. The 18-inch transmission main will transport a peak flow of 7.5 mgd to Longboat Key. The trunk system is designed to deliver the 2.5 mgd ADF from Durante Park to the North end and South end of the Island. Scenario No. 4 is illustrated on **Figure 3-17**.

Figure 3-18
Conceptual Ground Storage Tank/Booster Pump Station Site Plan at Durante Park

The main difference between these scenarios, other than the reclaimed water volume, is the location of the ASR Facility. If the ASR Facility is located on the mainland, it requires that the transmission pipes be sized to provide sufficient flow from the ASR wells to the ground storage tank to meet the demands required to fill the ground storage tank between diurnal peak demands during the dry season.

Preliminary analyses provide that under a 1.5 - 2.5 mgd demand, the trunk system will required one booster pump station along Gulf of Mexico Drive. A supply of 1.5 - 2.5 mgd annual average with a peak of 0.2 - 0.3 million gallons per hour, the system would require a 1.5-million ground storage tank and 3 ASR wells with an approximate aquifer storage volume of 200 million gallons.

Figure 3-18 illustrates the conceptual configuration for a ground storage tank/ booster pump station facility at Durante Park.

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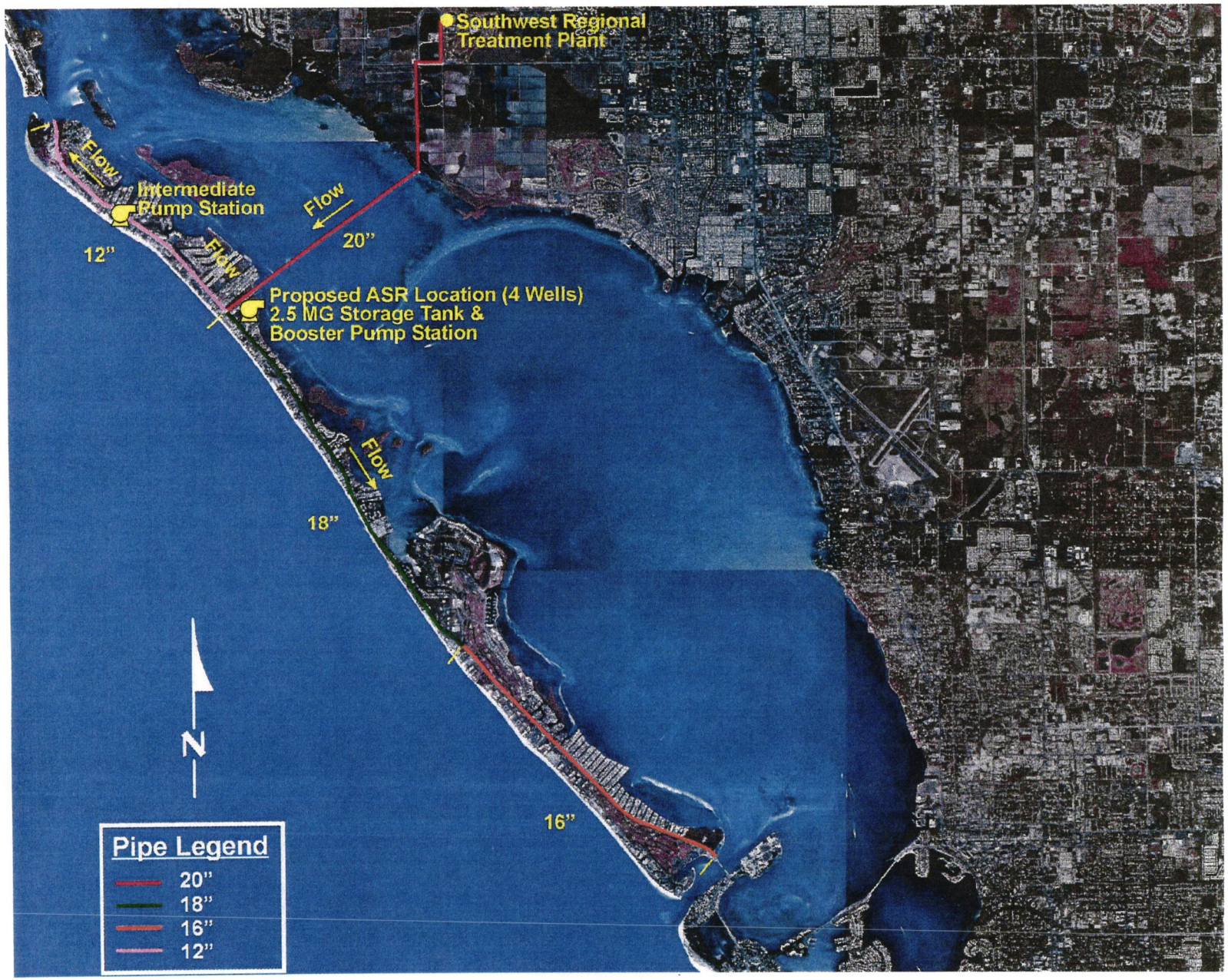

Figure 3-16
Reclaimed Pipeline Route
Manatee County Supply - Scenario No. 3

CDM

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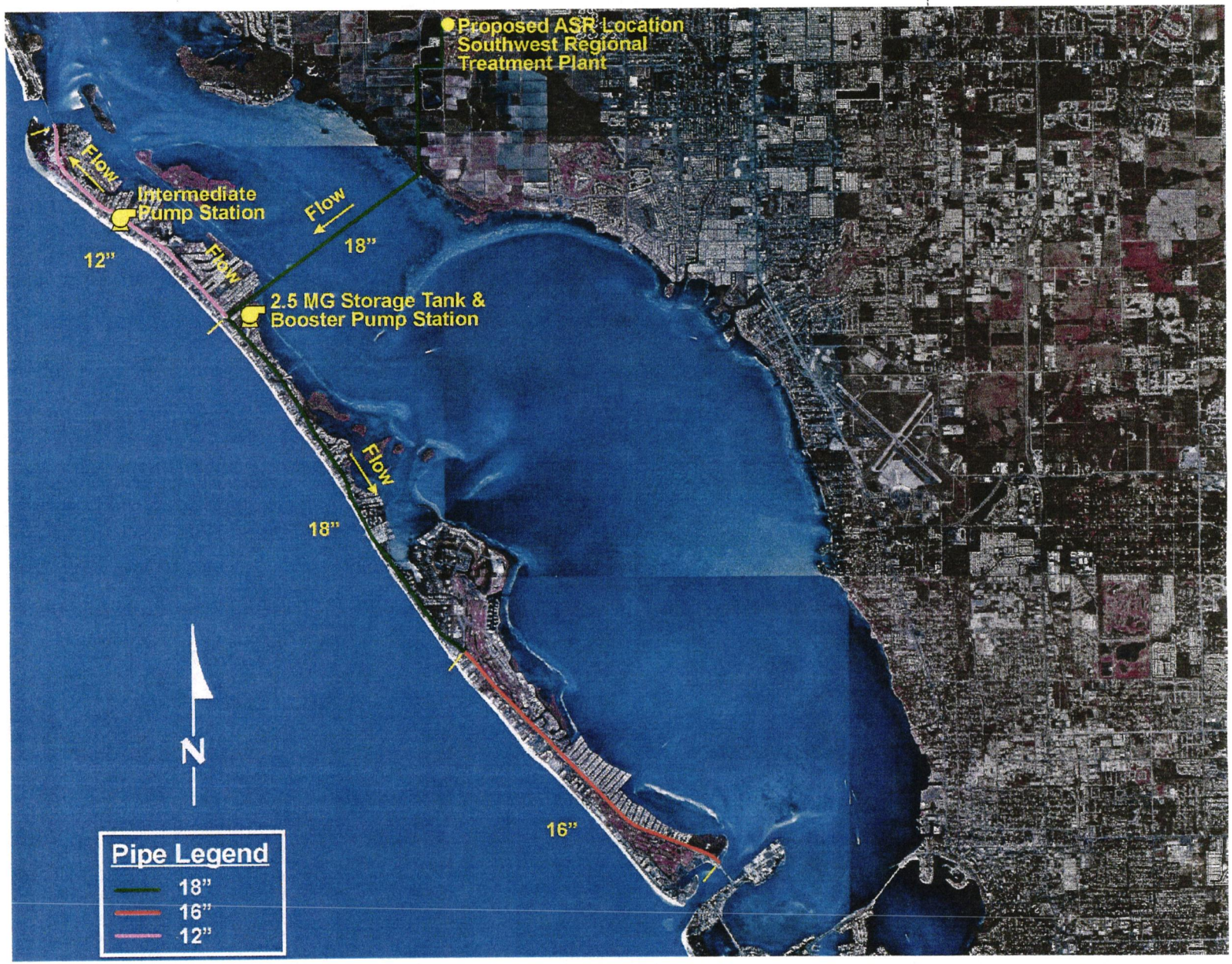


Figure 3-17
Reclaimed Pipeline Route
Manatee County Supply - Scenario No. 4

CDM

Table 3-11 presents the summaries of each scenario with regard to the reclaimed water average day supply and the opinions of probable project costs. Details of the opinions of probable costs are discussed below.

Table 3-11
Summary of Manatee County Supply Options

Scenario	Average Day Reclaimed Water Supply Flow (mgd)	Subtotal $	25% Contingency	Total $
Manatee County 1	1.5	20,754,560	5,189,000	25,943,560
Manatee County 2	1.5	19,917,600	4,979,000	24,896,600
Manatee County 3	2.5	23,850,200	5,963,000	29,813,200
Manatee County 4	2.5	22,992,200	5,748,000	28,740,200

3.1.5.3 Planning and Conceptual Construction Cost

The anticipated conceptual planning costs is an important criterion for evaluating the four Reclaimed Water Supply Option scenarios. The major project components of each scenario have been identified. These major components provide the basis for the development of the planning level of conceptual costs.

The reclaimed water system is comprised of three systems: transmission, storage and delivery. As previously discussed, the reclaimed water transmission system conveys the reclaimed water from the Manatee County Southwest Regional Treatment Plant on the mainland to Longboat Key. The transmission system includes the anticipated ASR Facility and associated ground storage tank and booster pump station. The trunk system includes the reclaimed water mains and intermediate booster pump stations located on longboat key and typically within the right-of-way of Gulf of Mexico Drive.

- **Scenario 1 - Planning and Conceptual Project Cost**

  Manatee County Supply Scenario 1 consists of 1.5 mgd delivered to an ASR Facility at Durante Park on Longboat Key and distributed from the county line to the north end of the island. **Table 3-12** provides the summary of the major components, their associated estimated unit costs, the extended cost, and the total conceptual planning cost anticipated for Scenario 1. Based upon the preliminary quantity takeoff for Scenario 1, the conceptual planning cost is $25,943,560. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under Scenario 1 is approximately $3.67.

Table 3-12
Manatee County
Scenario 1 - 1.5 mgd
ASR Facility Located on Longboat Key
Reclaimed Main for North Portion of Longboat Key

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
18-inch Transmission	7,800	5.60	100.8	786,240
18-inch Subaqueous Sarasota Bay Transmission	13,000	NA	380	4,940,000
Subtotal Transmission	*20,800*			*5,726,240*
Storage				
ASR Test/Monitor/Production Well	1	NA	1,000,000	1,000,000
ASR Wells	2	NA	400,000	800,000
18-inch ASR Connection Pipe	1,650	5.60	101	166,320
1.5 MG Ground Storage Tank	1	NA	500,000	500,000
ASR High Service Pump Station	1	NA	1,800,000	1,800,000
Subtotal Storage				*4,266,320*
Delivery Trunk System				
12-inch Trunk Main (Durante Park to North End)	13,800	5.00	60	828,000
16-inch Trunk Main (Durante Park to Bay Isles Pkwy.)	21,000	5.50	88	1,848,000
Intermediate Booster Pump Station	2	NA	300,000	600,000
Subtotal Delivery Trunk	*34,800*			*3,276,000*
Manatee Delivery Pump Station Improvements				*2,750,000*
Subtotal Reclaimed System				*16,018,560*
Permitting				75,000
Engineering, Survey, Geotech				3,940,000
Inflation Allowance (3.5%)				561,000
Administrative/Legal (1%)				160,000
Subtotal				20,754,560
Contigency (25%)				5,189,000
TOTAL				**$25,943,560**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
2. Improvements located at the Manatee County SWWTP plant are estimated.
3. Direct connections to customer base via private irrigation system or other are not inlcuded.
4. Pipe material is estimated as PVC or HDPE.
5. Price based on basic Electrical and Instrumentation.
6. Subaqueous multi-directional drilling and open cuts are assumed crossing methods.
7. LBK 1.5 mgd ADF. Peak Flows into ASR up to 7.5 mgd.

- **Scenario 2 - Planning and Conceptual Project Cost**

  Manatee County Supply Scenario 2 consists of 1.5 mgd delivered from an ASR Facility at the Manatee County ASR Facility and distributed from the county line to the north end of the island. **Table 3-13** provides the summary of the major components, their associated estimated unit costs, the extended cost, and the total conceptual planning cost anticipated for Scenario 2. Based upon the preliminary quantity takeoff for Scenario 2, the conceptual planning cost is $24,896,600. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under this scenario is approximately $3.54.

- **Scenario 3 - Planning and Conceptual Project Cost**

  Manatee County Supply Scenario 3 consists of 2.5 mgd delivered to an ASR Facility at Durante Park on Longboat Key and distributed from Bay Isles Parkway to the north end of the island. **Table 3-14** provides the summary of the major components, their associated estimated unit costs, the extended cost, and the conceptual planning cost anticipated for Scenario 3. Based upon the preliminary quantity takeoff for Scenario 3, the conceptual planning cost is $29,813,200. The cost for 1,000 gallons of reclaimed water including capital costs and O&M costs under Scenario 3 is approximately $2.80.

- **Scenario 4 - Planning and Conceptual Project Cost**

  Manatee County Supply Scenario 4 consists of 2.5 mgd delivered from an ASR Facility at the Manatee County ASR Facility and distributed from Bay Isles Parkway to the north end of the island. **Table 3-15** provides the summary of the major components, their associated estimated unit costs, the extended cost, and the total conceptual planning cost anticipated for Scenario 4. Based upon the preliminary quantity takeoff for Scenario 4, the conceptual planning cost is $28,740,200. As under Scenario 3, the cost for 1,000 gallons of reclaimed water including capital costs and O&M costs is approximately $2.71.

3.1.5.4 Permitting

Based on the selected routes, the following presents a summary of key permits and issues associated with the construction of a transmission system and storage delivering reclaimed water from the Manatee County Southwest Regional Treatment Plant to the Town of Longboat Key:

Table 3-13
Manatee County
Scenario 2 - 1.5 mgd
ASR Facility Located in Manatee County
Reclaimed Main for North Portion of Longboat Key

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
16-inch Transmission	7,800	5.50	88	686,400
16-inch Subaqueous Sarasota Bay Transmission	13,000	NA	370	4,810,000
Subtotal Transmission	*20,800*			*5,496,400*
Storage				
ASR Test/Monitor/Production Well	1	NA	1,000,000	1,000,000
ASR Wells	2	NA	400,000	800,000
16-inch ASR Connection Pipe	1,650	5.50	88	145,200
1.5 MG Ground Storage Tank	1	NA	500,000	500,000
ASR High Service Pump Station	1	NA	1,800,000	1,800,000
Subtotal Storage				*4,245,200*
Delivery Trunk System				
12-inch Trunk Main (Durante Park to North End)	13,800	5.00	60	828,000
16-inch Trunk Main (Durante Park to Bay Isles Pkwy.)	21,000	5.50	88	1,848,000
Intermediate Booster Pump Station	2	NA	300,000	600,000
Subtotal Delivery Trunk	*34,800*			*3,276,000*
Manatee Delivery Pump Station Improvements				*2,200,000*
Subtotal Reclaimed System				*15,217,600*
Permitting				75,000
Engineering, Survey, Geotech				3,940,000
Inflation Allowance (3.5%)				533,000
Administrative/Legal (1%)				152,000
Subtotal				19,917,600
Contingency (25%)				4,979,000
TOTAL				**$24,896,600**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
2. Improvements located at the Manatee County SWWTP plant are estimated.
3. Improvements at existing County ASR systems are not estimated.
4. Direct connections to customer base via private irrigation system or other are not inlcuded.
5. Pipe material is estimated as PVC or HDPE.
6. Price based on basic Electrical and Instrumentation.
7. Subaqueous multi-directional drilling and open cuts are assumed crossing methods.
8. LBK 1.5 mgd ADF. Peak Flows into ASR up to 6 mgd.

Table 3-14
Manatee County
Scenario 3 - 2.5 mgd
ASR Facility Located on Longboat Key
Reclaimed Main for Entire Island

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
20-inch Transmission	7,800	5.75	115	897,000
20-inch Subaqueous Sarasota Bay Transmission	13,000	NA	390	5,070,000
Subtotal Transmission	*20,800*			*5,967,000*
Storage				
ASR Test/Monitor/Production Well	1	NA	1,000,000	1,000,000
ASR Wells	3	NA	400,000	1,200,000
20-inch ASR Connection Pipe	2,200	5.75	115	253,000
2.5 MG Ground Storage Tank	1	NA	600,000	600,000
ASR High Service Pump Station	1	NA	1,800,000	1,800,000
Subtotal Storage				*4,853,000*
Delivery Trunk System				
12-inch Trunk Main (Durante Park to North End)	13,800	5.00	60	828,000
18-inch Trunk Main (Durante Park to Bay Isles Pkwy.)	21,000	5.60	101	2,116,800
16-inch Trunk Main (Durante Park to Bay Isles Pkwy.)	17,800	5.50	88	1,566,400
Intermediate Booster Pump Station	3	NA	300,000	900,000
Subtotal Delivery Trunk	*52,600*			*5,411,200*
Manatee Delivery Pump Station Improvements				*2,750,000*
Subtotal Reclaimed System				*18,981,200*
Permitting				75,000
Engineering, Survey, Geotech				3,940,000
Inflation Allowance (3.5%)				664,000
Administrative/Legal (1%)				190,000
Subtotal				23,850,200
Contingency (25%)				5,963,000
TOTAL				**$29,813,200**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
2. Improvements located at the Manatee County SWWTP plant are estimated.
3. Direct connections to customer base via private irrigation system or other are not inlcuded.
4. Pipe material is estimated as PVC or HDPE.
5. Price based on basic Electrical and Instrumentation.
6. Subaqueous multi-directional drilling and open cuts are assumed crossing methods.
7. LBK 2.5 mgd ADF. Peak Flows into ASR up to 10.5 mgd.

Table 3-15
Manatee County
Scenario 4 - 2.5 mgd
ASR Facility Located in Manatee County
Reclaimed Main for Entire Island

Component	Quantity	Base Units	Unit Costs	Total
Transmission System	Linear Feet (LF)	$/inch/LF	$/LF	$
18-inch Transmission	7,800	5.60	101	786,240
18-inch Subaqueous Sarasota Bay Transmission	13,000	NA	380	4,940,000
Subtotal Transmission	*20,800*			*5,726,240*
Storage				
ASR Test/Monitor/Production Well	1	NA	1,000,000	1,000,000
ASR Wells	3	NA	400,000	1,200,000
18-inch ASR Connection Pipe	2,200	5.60	101	221,760
1.5 MG Ground Storage Tank	1	NA	600,000	600,000
ASR High Service Pump Station	1	NA	1,800,000	1,800,000
Subtotal Storage				*4,821,760*
Delivery Trunk System				
12-inch Trunk Main (Durante Park to North End)	13,800	5.00	60	828,000
18-inch Trunk Main (Durante Park to Bay Isles Pkwy.)	21,000	5.60	101	2,116,800
16-inch Trunk Main (Durante Park to Bay Isles Pkwy.)	17,800	5.50	88	1,566,400
Intermediate Booster Pump Station	3	NA	300,000	900,000
Subtotal Delivery Trunk	*52,600*			*5,411,200*
Manatee Delivery Pump Station Improvements				*2,200,000*
Subtotal Reclaimed System				*18,159,200*
Permitting				75,000
Engineering, Survey, Geotech				3,940,000
Inflation Allowance (3.5%)				636,000
Administrative/Legal (1%)				182,000
Subtotal				22,992,200
Contingency (25%)				5,748,000
TOTAL				**$28,740,200**

1. Land Acquisition, mitigation requirements, or easement purchases are not included.
2. Improvements located at the Manatee County SWWTP plant are estimated.
3. Improvements at existing County ASR systems or related equipment or land are not included.
4. Direct connections to customer base via private irrigation system or other are not inlcuded.
5. Pipe material is estimated as PVC or HDPE.
6. Price based on basic Electrical and Instrumentation.
7. Subaqueous multi-directional drilling and open cuts are assumed crossing methods.
8. LBK 2.5 mgd ADF. Peak Flows into ASR up to 7.5 mgd.

- FDEP, Army Corp of Engineers, and SWFWMD; *Environmental Resource Permit/ Authorization to use Sovereign Submerged Lands/ Federal Dredge and Fill Permit* (Form 62-343.900(1) FAC). Based on Chapter 62-4.050 FAC, the permit application fee is estimated at $5,500. The permit application fee is required by the agencies and does not account for preparation of the permit and supporting information.

  This permit is submitted as a joint application to the FDEP, Army Corp of Engineers, and the SWFWMD. Specifically it will permit the subaqueous crossings, wetland impacts, and floodplain encroachment.

  It is anticipated that it could take as much as 6-9 months to obtain a sovereign submerged land lease depending on the position of the public within 500 feet of the crossing.

  Key issues that affect the issuance of this permit will be the disturbance of wetlands and sea grass habitats. The Manatee County Scenarios involve a lengthy crossing of Sarasota Bay. Directional drilling would be utilized to minimize sea grass disturbance, however the proposed area of crossing does have a significant number of sea grass beds. Public opposition and agency scrutiny over the environmental impacts could further increase this time intensive permitting process.

- FDEP; *Wastewater Construction Permit Modification* (Form No. 62-610.300(4)(a)1. FAC). Based on Chapter 62-4.050 FAC, the permit application fee is estimated at $5,500. The permit application fee is required by the agencies and does not account for preparation of the permit and supporting information.

  The supplier will be required to submit to the FDEP information on the improvements to the transmission system. It is anticipated that the Town of Longboat Key will need to coordinate with Manatee County for submittal.

- FDEP; *Injection Well Construction Permit* (Form No. 62-528.900(i) FAC). Based on Chapter 62-4.050 FAC, the permit application fee is estimated at $750 per ASR well. Submittal of a construction application report pursuant to Chapter 62-528.450 FAC is also required.

  This permits the construction of a Class V, Group VII for injection of non-hazardous fluids into or above geologic formations that contain potable water quality sources. Manatee County currently has a Class V injection test well construction permit for ASR.

- SWFWMD; *Consumptive Water Use Permit* (Form No. WUP-3 46.20-003). This SWFWMD permit will regulate withdrawals from the ASR system. Based on 40D-1.607 FAC, a permit application fee of $1,000 is required.

- FDEP; *Operation Permit for a Class V Well, Group VII* (Application Report per Chapter 62-528.455 FAC). Based on Chapter 62-4.050, a permit fee of $750 per ASR well is required. This FDEP permit will regulate the operation of the ASR wells.

- FDEP; *Water Quality Criteria Exemption* (Application Report per Chapter 62-520.500) Based on Chapter 62-4.050, a permit fee for $5,000 is required. A renewal application is required every 5 years. This FDEP permit allows for the injection of wastewater not meeting secondary water standards.

- Florida Department of Transportation; *Utility Permit* (Form No. FDOT 710-010-85). No fee is required for this permit. This utility permit allows for the installation and adjustment of utility facilities within the Florida Department of Transportation's jurisdiction. The duration of the permit is one year.

3.1.5.5 Funding

Various funding options are available to the Town of Longboat Key for the construction of a reclaimed system. The following funding sources were evaluated for the Manatee County Supply Option:

- Revenue Bonds

- State Revolving Fund (SRF) Loans

- General Obligation Bonds

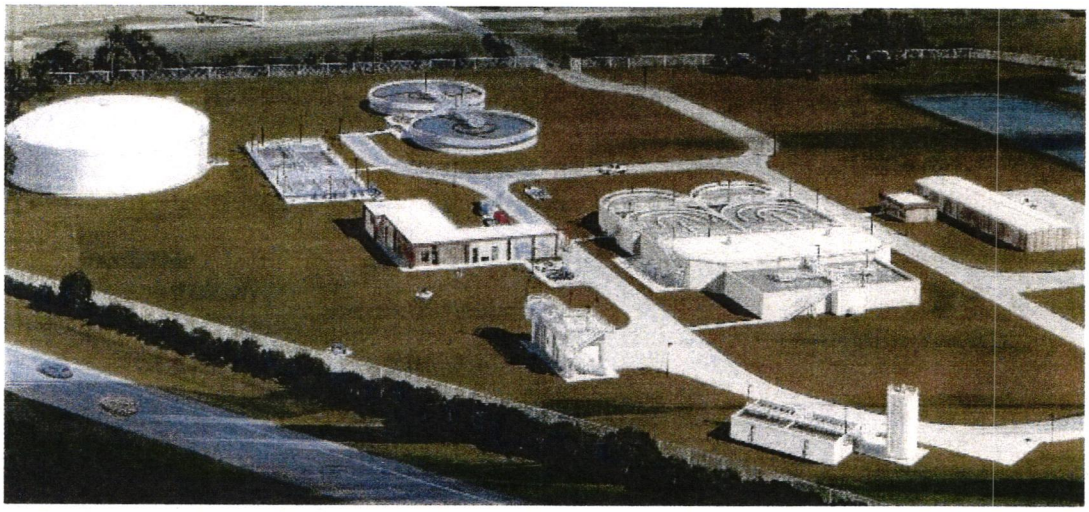
- SWFWMD Manasota Basin Board Grants

The Town of Longboat Key submitted an application for a SWFWMD grant for a Manatee County reclaimed supply project in 2001. This application was denied due to SWFWMD monies already appropriated for the MARS program. Therefore, further pursuit of a SWFWMD grant for the Manatee County Supply Option is futile. The best funding choice for the Manatee County Supply option is an SRF Loan. The SRF loan is currently at 3% and 20 years. The Revenue Bonds are at 5% and 30 years. Funding options and revenue sources for the Manatee County Supply Option are investigated in detail in the report titled, *Evaluation of Funding Options, Project Costs, and Revenue Sources, Town of Longboat Key*, CDM, February 2002.

3.1.6 Water Reclamation Facility

The Town could develop its own water reclamation facility to treat its collected wastewater and produce reclaimed water. The new water reclamation facility could be located upon Longboat Key or the on the mainland. Land costs will be significant if the water reclamation facility is located upon Longboat Key. If the water reclamation facility were sited on the mainland, a new transmission system would be required to convey the reclaimed water back to Longboat Key. The reclaimed water transmission system would be similar to the systems discussed in the Manatee County or City of Sarasota supply options.

The current average daily wastewater flow is approximately 2.0 mgd. Unfortunately, the current wastewater flow will not satisfy the projected average day reclaimed water demand of 4 to 6 mgd.



Artist Rendition of a Water Reclamation Facility

Advanced secondary treatment would have to be utilized by a treatment plant facility intended to produce reclaimed water acceptable for reuse as landscape irrigation water. FDEP has specific design requirements for wastewater treatment facilities intended as a source of reclaimed water. Two of these FDEP requirements are providing 1-day storage capacity of reject water (reclaimed water which does not pass standards) and a minimum of 3-days of wet weather storage. Current trends have been to move wastewater treatment facilities off barrier islands. This is primarily due to the level of impact potentially received from tropical storms and hurricanes.

A 2.5-mgd advanced secondary wastewater treatment plant consisting of screening and grit removal, diffused-air suspended growth activation, secondary clarification, filtration, disinfection, and high service reclaimed water pumping would be the basic system. Hydraulics of the existing wastewater lines would need evaluation to best determine connections and potential re-piping to accommodate flow to the water reclamation facility.

It is anticipated that the new water reclamation facility would operate as a "scalping plant" and would not have sludge processing on site. Waste activated sludge would be sent to an existing regional water reclamation facility for further processing and stabilization. The transport and handling fees of this sludge would be an additional cost. Although sludge is handled off-site, there would be concern of the odors generated from the wastewater system.

Approximately 5 to 6 acres would be required to construct these treatment facilities and associated reject reclaimed water storage. For information purposes, the average value for vacant land computed in 2001 for Longboat Key is $430,455 per acre. If the vacant land is located within the Sarasota County limits, the average land is estimated at $771,743 per acre. Vacant land located within Manatee County limits is estimated at $305,671 per acre. Costs do not incorporate in the 5 acres of land required for the facility or the loss of tax revenues the Town would incur if the new water reclamation facility were sited on Longboat Key.

An operations staff of 6 or 7 personnel would be necessary to operate the wastewater treatment plant 24 hours per day, 7 days per week. Class I reliability would be required. Class I reliability is a system of redundancy to primary operating equipment for the water reclamation facility, thus, associated equipment costs.

Figure 3-19 provides a conceptual site plan of a water reclamation facility layout.

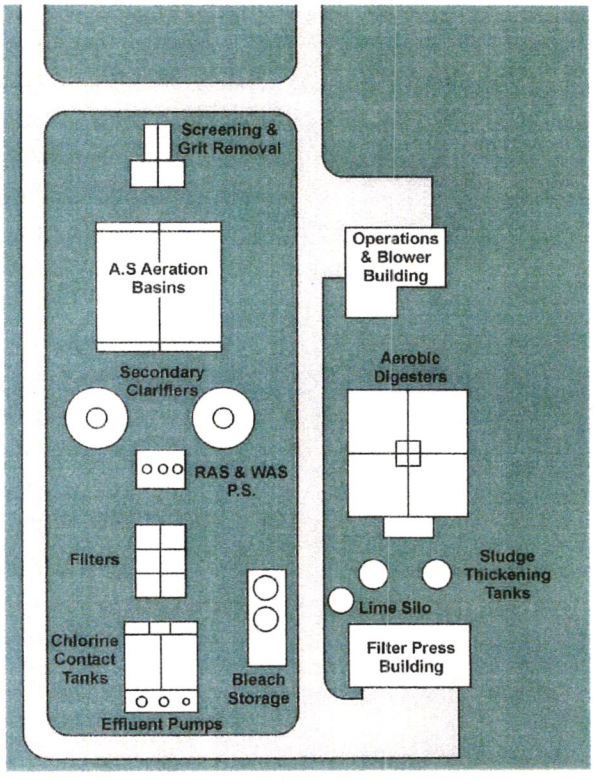


Figure 3-19
Conceptual Site Plan of a Water Reclamation Facility

The estimated planning costs for the capital is $4.25 per gallon and O&M cost for the facility is equivalent to $1.00 per thousand gallons of wastewater treated. Costs do not incorporate the 5 to 6 acres of land required for the facility or the loss of tax revenues the Town would incur if the new water reclamation facility were on Longboat Key. Zoning restrictions would also be a significant consideration in this facility. Planning costs are summarized in **Table 3-16**.

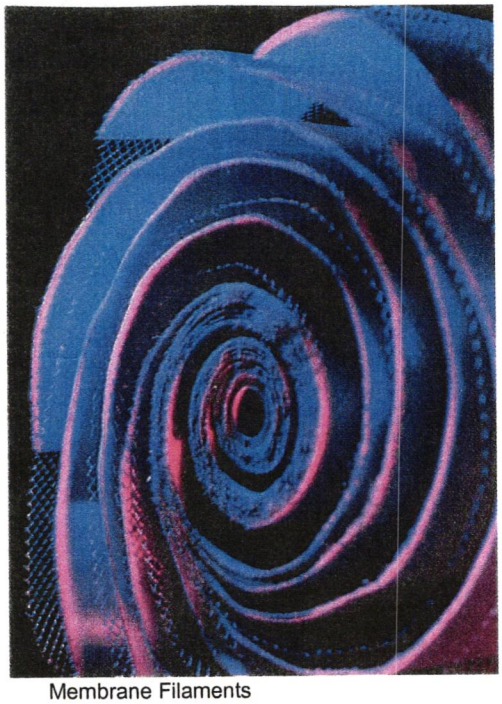
Table 3-16
Water Reclamation Facility Conceptual Cost

Item	Capital $	O&M $/1000 gallons
Water Reclamation Facility (2.5 mgd) *$4.25 per gallon* Process Tankage, Equipment, Chemical System, Operations Building, Odor Control, Sludge Handling	10,625,000	1.00
Distribution Piping [1]	5,447,500	0.15
Storage System [2]	5,016,800	0.08
Miscellaneous (Administration, Legal, Engineering)	4,450,000	NA
Sub-total	25,539,300	1.23
25% Contingency	6,384,825	NA
Water Reclamation Facility Total	*31,924,125*	NA
Water Reclamation Facility Rate per 1,000 Gallons	2.66	1.23
Total Water Reclamation Facility rate to Customer $ per 1,000 gallons [3]	$3.89	NA

[1] Distribution Piping Capital Costs from City of Sarasota, Scenario 3, Option B
[2] Storage System Capital Costs from City of Sarasota, Scenario 3, Option B
[3] Water rates are based on comparable SRF, 3%, 20 years and 2.25 mgd commitment

3.2 Membrane Technology (Desalination)

Applications of membrane technology have been used in a variety of industries, such as pharmaceuticals and electronics, for over 40 years. A readily recognized industry utilizing membrane technology is the domestic supply of drinking water. With the implementation and regiment of the Federal Safe Drinking Water Act (SDWA), membrane technology has been elevated to the top of the list as a viable means for treating water supplies. Over the past 30 years, the membrane industry has continuously improved and developed into a treatment method, which is cost competitive with more conventional forms of water treatment. As of September 1999, Florida had permitted over 230 million gallons of drinking water membrane facilities.



Membrane Filaments

Commonly termed as desalination, reverse osmosis (RO) membranes could be used to treat either brackish groundwater or seawater to produce water for irrigation purposes in the Town of Longboat Key. Water produced from a desalination system will be of high quality comparable to that of drinking water. Desalination is a proven and reliable means of water treatment and is technically feasible.

Desalination using reverse osmosis membranes is a pressure driven technology allowing for the separation and rejection of impurities. Salts, such as chlorides, are a portion of the many parameters rejected through the reverse osmosis process. Feed water (either groundwater or seawater) is pre-treated and boosted to a sufficient pressure for the RO membranes to purify the water.

The process produces two streams of water. One stream is termed *permeate* (product water i.e., drinking water) and the other stream is *brine* (concentrate) reject. The rates of the quantity of product water produced to the amount of raw feed water pumped are termed *recovery*. For a seawater supply source, a typical product water recovery of 35% to 50% could be expected. For example, a 2.5 mgd product stream would require 5.0 mgd of source water supply on a basis of 50% recovery. The remaining 2.5 mgd is rejected and requires handling and disposal by an acceptable means. **Figure 3-20** depicts a typical process flow of a RO system and disposal handling of the by-product brine reject.

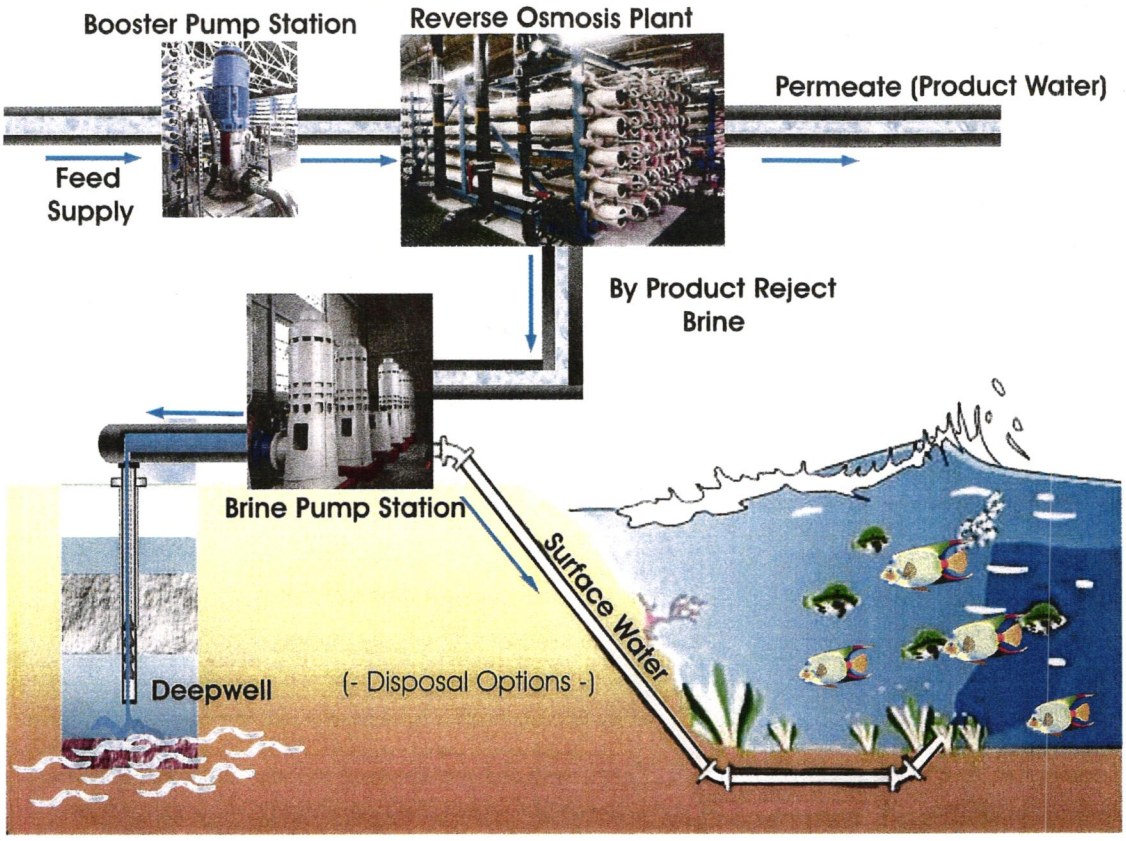


Figure 3-20
Typical Process Flow of a RO System

In specific application to Longboat Key, the following possibilities of desalination and associated waste by-product stream disposal were considered:

1. RO Facility located on Longboat Key using brackish groundwater from production wells as a supply feed water source.

2. RO facility located on Longboat Key using seawater from the Gulf of Mexico, Sarasota Bay, or beach wells as a supply feed water source.

3. Waste by-product reject handling and disposal through surface water discharge or deep well injection.

4. Conceptual planning costs for an equivalent 2.5 mgd reverse osmosis system for comparison to 2.5 mgd reclaimed water system.

A 2.5-mgd system was reviewed for basis of comparison to the reclaimed system. In actuality, if desalination were applied, we would recommend sizing a system for 4 to 6 mgd. The 2.5 mgd RO system would not meet the projected irrigation demands and there would not be the ability to store large excesses of water because of the fixed production output. There are not any known desalination facilities in operation for the sole purposes of producing and supplying irrigation water. The primary reason for this is attributed to the relatively high costs incurred for the intended application.

Costs for a drinking water desalination facility to replace the existing potable water supplies for Longboat Key were not reviewed. Costs for the non-potable desalination systems would be similar if the system were considered for potable water production and tie-in to the existing potable water lines servicing the Island. Direct costs were not computed for a drinking water system because of the following key items:

1. If tied into and mixed with existing potable water, then the system must be designed as a drinking water facility. This will include additional disinfection processes, 24-hour operating staff, and full system monitoring and compliance comparable to that of a drinking water utility.

2. Comparable rates are greater than current potable water rates using the current Manatee County water supply. Additionally, potential termination costs associated with the active water contract have not been reviewed.

3. The existing potable lines on Longboat Key (16-inch in the North of LBK reducing to an 8-inch in the South of LBK) do not have sufficient hydraulic carrying capacity to accommodate both the potable and irrigation demands and peaks.

4. Although this approach improves the Town's potable water situation, the water produced would still be under the current SWFWMD water shortage rules on irrigation restrictions.

3.2.1 RO Facility with Brackish Groundwater Supply

A brackish groundwater well field could potentially be developed on Longboat Key to function as the supply feed water source for the RO Plant. Groundwater supplies from the Suwannee Limestone of the Upper Floridan Aquifer would be evaluated for water quality, yield and productivity, and potential drawdown impacts and influences to existing Longboat Key wells users. As required through the Southwest Florida Water Management District (SWFWMD) permitting, a Water Use Permit (WUP) would be necessary with supporting documentation.

Supporting documentation includes a model determining aquifer characteristics, drawdown assessment, permeability and transmissivity, and impacts, if any, to existing well users. A further requirement would be a reuse feasibility document substantiating need for groundwater withdrawals over the implementation of reclaimed water. Product water generated from the RO plant is of high water quality comparable to that of drinking water. If permitted, the water would fall under the current irrigation restrictions in place by SWFWMD. Attached in **Appendix A** is SWFWMD Governing Board Order SWF 01-83 for reference.

Anticipated recovery from RO units supplied by local area groundwater is 50% to 75%. Detailed specific water quality characteristics of the feed water supply determine the optimum recovery of product water from the RO membranes. Therefore, an anticipated range of recovery is presented for planning purposes. For 2.5 mgd of product water, then 3.13 mgd (75%) to 5 mgd (50%) of feed water is required. The quantity generated for handling and by-product waste disposal is 0.8 mgd to 2.5 mgd. Depending on the water quality, the anticipated membrane feed pressures would be in the order of 180 to 300 pounds per square inch (psi). Operating pressures are an important consideration due to the direct influence of power costs on operation costs. The land area required to accommodate a facility this size is 2 to 3 acres. A typical layout for this facility is shown on **Figure 3-21**.

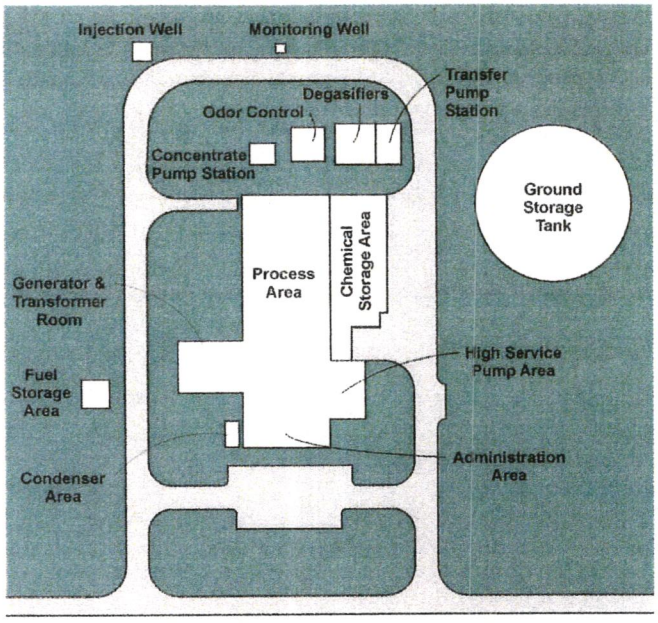


Figure 3-21
Conceptual Site Plan of a RO Facility

Conceptual planning costs for this system are presented in Table 3-17.

3.2.2 RO Facility with Seawater Supply

Seawater can be used as a feed supply source to the RO facility. The expected recoveries for seawater desalination system are in the range of 35% to 50%. Seawater desalination systems operate at higher pressure than brackish water RO plants. The anticipated operating pressures are on the order of 700 to 1,000 psi. The higher operating pressures and level of feed water quality contribute to increased O&M costs for these systems due to the power demand.

The required land area is considered comparable to the brackish water RO system, thus, 2 to 3 acres. The desalination facility site layout is comparable to that presented on Figure 3-21. There are two means of obtaining the seawater

supply source for the desalination facility. One means which seawater can be obtained is through a surface water withdrawal from the Gulf of Mexico or Sarasota Bay. Another means of obtaining seawater is through the installation of a series of vertical shallow beach wells.

A seawater intake structure could potentially be developed to function as the supply feed water source for an RO Plant. The seawater intake would be classified as a surface water withdrawal and within the permitting jurisdiction of the Florida Department of Environmental Protection (FDEP) and potentially, the US Environmental Protection Agency (US EPA). Product water generated from this supply source would not fall under the SWFWMD irrigation restrictions.

In the case of vertical seawater shallow beach well withdrawals, the depth of the beach well is estimated at 20 feet or less in order to draw seawater and avoid associated irrigation restrictions for groundwater. The shallow vertical beach wells would have an estimated 50-gallon per minute (gpm) withdrawal rate and a minimum of 50 feet separation. For a 2.5 mgd system, this equates to 35 to 40 wells spaced over ½ to ¾ of a mile of beach area. Above ground wellheads can be minimized by manifolding no more than five wells. This system would operate much like a dewatering operation and influences to shoreline stability would need to be evaluated.

Conceptual planning costs for this system are presented in Table 3-18.

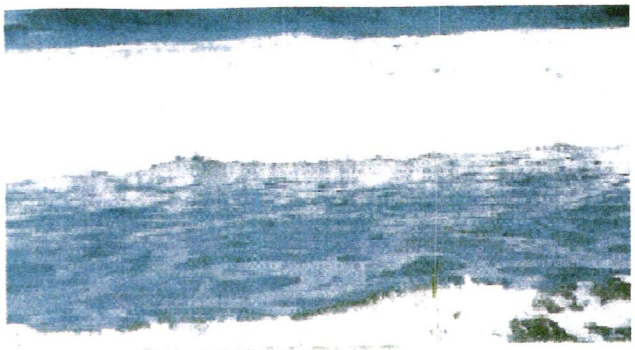
3.2.3 RO Reject Handling and Disposal

An area of primary consideration is the handling of the reject stream for ultimate disposal. There are a variety of methods used for the reject by-product disposal. The two most common forms applicable for Longboat Key is either surface water discharge or deep well injection. A third potential is discharge to an existing wastewater treatment plant (WWTP) for handling.

This option is not considered due to the potential impacts primarily due to salts on the wastewater treatment plant final effluent and lack of wastewater treatment plant proximity for discharge. The primary considerations involving either surface water discharge or deep well injection are highlighted.

Surface Water Discharge Disposal of Reject Stream

One of the more practiced forms of reject stream disposal is discharge via local area surface water (receiving water). Surface water disposal currently constitutes the majority of by-product handling in Florida. Its popularity is attributed to affordability, availability, water quality, and mixing volume associated with the receiving water.

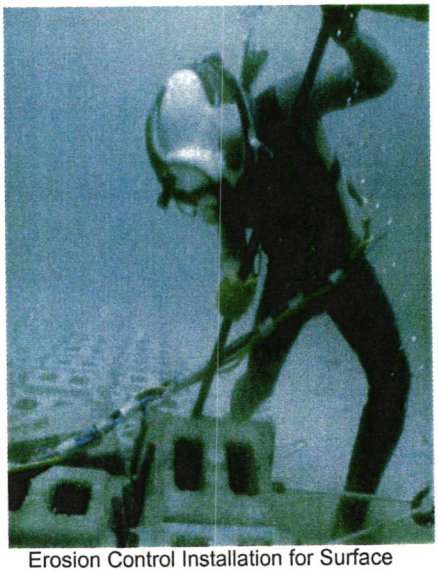


Discharges can range in types of surface waters (i.e., canals, tidally influenced water bodies, rivers) as long as the reject discharge can meet the criteria established for the given receiving water body. This also includes conveyance swales or systems that eventually transport to a surface water body. The surface waters are regulated on federal, state, and local level. Increasing scrutiny by regulatory agencies and regulations has made this disposal method more difficult to obtain and maintain in recent years.

- Hydrogen Sulfide
- Chloride
- Fluoride
- pH
- Nutrients (TP and TN)
- Ammonia
- Dissolved Oxygen
- Metals (i.e., Copper, Iron)
- Radionuclides (i.e., Radium 226/228)
- Conductivity
- Total Dissolved Solids

Florida is one of the largest users of associated surface water disposal practices. Surface waters in Florida have minimum water quality criteria established depending on the classification assigned.

Surface waters surrounding Longboat Key are the Gulf of Mexico and Sarasota Bay. The Gulf of Mexico is classified as Class III Marine Water. It is likely, through sufficient ambient water quality studies and evaluation, a surface water discharge of reject could be permitted into the Gulf of Mexico. Sarasota Bay is classified as a Class II or Class III (depending on location) Marine Water with an Outstanding Florida Water (OFW) designation by FDEP.



Erosion Control Installation for Surface Water Discharge
Source: Armortec

Discharges are generally prohibited into Outstanding Florida Water classifications. Sarasota Bay is also an identified under SWFWMD Surface Water Improvement and Management (SWIM) program, thus, equally protected and preserved under this program. Permitting a reject surface water discharge into Sarasota Bay is unlikely.

Within the past decade, toxicity issues have become one of the largest stumbling blocks for concentrate disposal to surface water. Surface water discharges cannot cause acute or chronic toxicity. Invertebrate and vertebrate organisms considered indigenous for the receiving water are used to conduct these toxicity tests.

Reject discharges typically fail the acute toxicity when invertebrate organisms (i.e., mysidopsis bahia, sea urchin) are tested, thus, introducing a significant and costly problem into the discharge process. This condition has hampered permitting and compliance of reject disposal to surface waters. Mechanisms and testing protocols have been implemented by regulatory agencies to assist in this toxicity problem. In the 2001 Legislative session, Senate Bill 536 known as the "Desal Bill" passed and went into immediate effect. The intent of the "Desal Bill" is to define "by product" permitting and disposal handling by the reviewing agencies. The "Desal Bill" may assist in streamlining some of the known permitting challenges associated with by-product disposal. The benefits, however, are defined for desalination drinking water facilities only.

Operations for concentrate discharges to surface water systems are directly impacted by these factors and represent a fundamental level of importance to the facility operations. There is a significant level of plant operations and interactions necessary to maintain permit compliance. For example, operations must handle the mechanical, chemical, testing, and reporting for the RO reject. This is quite comprehensive in nature covering the post-treatment system (if applicable), discharge lines, outfall structure, and associated budgeting, scheduling, and testing of the RO reject and the receiving water.

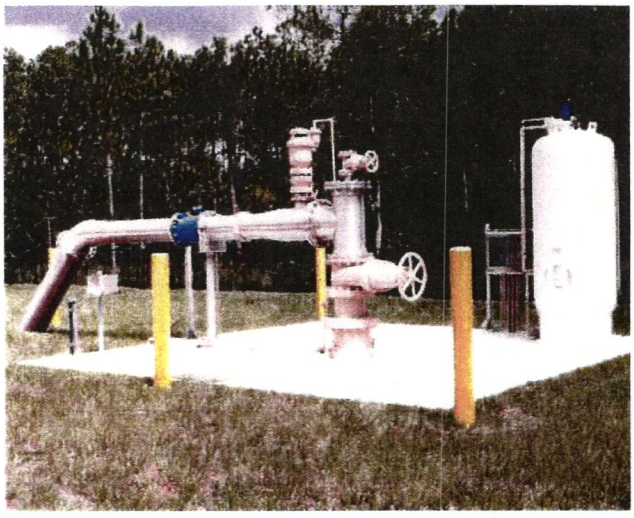
Deep Well Injection of Reject Stream

Deep well injection is a possible means of disposal of a Longboat Key RO reject. This method does require a detailed analysis for permitting determination. This method of RO reject handling involves discharging the reject underground through means of deep well injection. Injection of fluids into underground sources has been in wide practice for many years. Deep well injection is commonly used for wastewater effluent and industrial wastes. Deep wells are classified by the types of fluid to be injected. RO reject is classified as an industrial waste and requires a Class I injection well for disposal. Permitting for deep wells is controlled by the Underground Injection Control (UIC) Technical Advisory Committee (TAC), comprised of federal, state, and local regulatory agencies. Permitting for deep well injection requires

Deep Well Injection Well Head

that the RO reject not migrate to drinking water sources (total dissolved solids less than 10,000 mg/L). The reject quality needs to be compatible with the injection zone water.

Site-specific geologic conditions dictate whether this option is acceptable through a detailed and extensive means of exploration, evaluation, and regulatory review. Confining impermeable beds must be of sufficient thickness to maintain the concentrate within the injection zone. Upward leakage of the injected fluids is a concern and receives close scrutiny by regulatory agencies.



Deep Well Injection Well Head

Deep well injection involves strict well design and construction. Due to the industrial classification, the Class I well require an additional tuber and packer system adding to the systems costs. Additional monitoring wells are required for water quality monitoring of aquifer zones adjacent, above, or below the injection zones. Unlike disposal to surface waters, deep well injection requires a backup disposal method. This is due to the need for the system to be removed from operation for mechanical integrity testing and maintenance. Backup disposal can be another deep well or permitted surface water discharge.

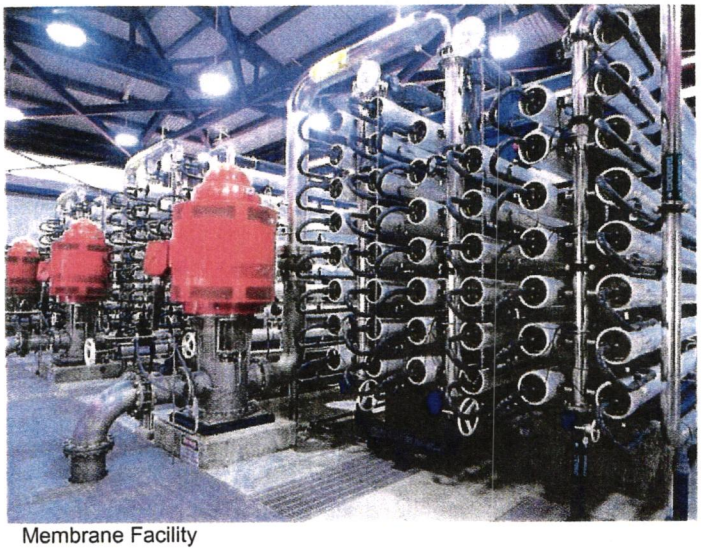
Operations of deep wells require attention to operating pressures into the well and flow rates. Certain concentrate water chemistries interacting with the aquifer's characteristics can contribute to precipitation of various compounds (i.e., Calcium carbonate, Calcium sulfate). These constituents can cause plugging of the well. There is a significant level of monitoring for the deep well operation, process train, pumping station (if applicable), and surrounding monitoring wells network.

3.2.4 Desalination System Costs

RO system costs depend on a variety of factors including siting, membrane performance and design, applicable regulations, and intended product use. The membranes independently priced do not represent a significant capital cost investment in the overall facility costs. However, the incorporation of these necessary components such as facility building, chemicals, etc. increases the capital investment costs to comparable levels of other water treatment technology.

The conceptual capital planning values applied are based on comparable applications within the industry within the past five years. The RO facilities are used to provide drinking water supplies. Application of a large scale (50,000 gpd or greater) RO system strictly for the purpose of irrigation supply is not in operation in Florida.

Land purchase costs and tax revenue losses from removing land from a tax role have not been included in the capital or O&M estimates. For information purposes, the average value for vacant land computed in 2001 for Longboat Key is $430,455 per acre. If the vacant land is located within the Sarasota County limits, the average land is estimated at $771,743 per acre. Vacant land located within Manatee County limits is estimated at $305,671 per acre.


Membrane Facility

The capital planning values used include feed water supply development (i.e. well field), building, RO equipment and related components, chemicals, site development, access road and parking, stormwater facilities, and reject disposal. The RO capital costs per gallon do not include land acquisition, storage, distribution, engineering, legal, administration, permitting and supporting documentation for disposal.

Storage, distribution, and engineering are comparable to that of the reclaimed system reviewed for Longboat Key in this section. For comparison purposes, these costs are combined with the RO capital and estimated O&M.

Brackish Groundwater Desalination

For conceptual planning purposes, capital costs for a brackish groundwater RO facility is estimated at $2.50 per gallon. Thus, a 2.5 mgd RO system is estimated at $6,250,000. This cost does not include land, well field, storage, distribution piping, or disposal permitting. It is estimated that a 2.5-mgd facility would need approximately 2 to 3 acres of land for the building and associated equipment, access road, chemical storage, parking, reject by-product pump station, and storm water facilities. A typical RO plant site layout was presented on Figure 3-21. Planning costs are summarized in **Table 3-17**.

Table 3-17
Brackish Groundwater Desalination Costs

Item	Capital $	O&M $/1000 gallons
Brackish Groundwater Reverse Osmosis System (2.5 mgd) *$2.50 per gallon* RO Equipment, Pumps, Chemical Feed, Building	6,250,000	1.80
Well field Development, Monitoring, Raw Transmission Lines (4 mgd), $0.60 per gallon	2,400,000	0.15
Disposal System, Monitoring (2.5 mgd) $1.00 per gallon	2,500,000	0.30
Distribution Piping [1]	5,447,500	0.15
Storage System [2]	5,016,800	0.08
Miscellaneous (Administration, Legal, Engineering)	4,450,000	NA
Sub-total	26,064,300	2.48
25% Contingency	6,516,075	NA
Brackish Groundwater Total	*32,580,375*	NA
Brackish Water Rate per 1,000 Gallons	2.71	2.48
Total Water rate to Customer $ per 1,000 gallons [3]	$5.19	NA

[1] Distribution Piping Capital Costs from City of Sarasota, Scenario 3, Option B
[2] Storage System Capital Costs from City of Sarasota, Scenario 3, Option B
[3] Water rates are based on comparable State Revolving Fund, 3%, 20 years and 2.25 mgd commitment

Seawater Desalination Facility
For conceptual planning purposes, capital costs for a seawater RO facility is estimated at $4.50 per gallon. Thus, a 2.5-mgd seawater RO system is estimated at $11,250,000. The estimated seawater RO facility O&M costs are $3.00 per 1,000 gallons. These costs do not include land, disposal permitting, storage, or distribution piping. Planning costs are summarized in **Table 3-18**.

Although the application of membrane technology is viable, the equivalent costs for the system does not make this option economical in comparison to any of the reclaimed water alternative. Increasing the size of the system to meet total demand of 4 to 6 mgd would increase the costs even more. The advantage to an RO system would be the flexibility of use and potentially meeting Longboat Key's ultimate irrigation demand.

3.2.5 Wastewater Pump Station - Membrane Conversion

The Town of Longboat Key has a wastewater collection and transmission system. This system currently collect raw wastewater from homes and businesses on Longboat Key and conveys it to the mainland for treatment by the Manatee County Southwest Regional Treatment Plant. The wastewater collection system has 48 lift stations that pump the collected wastewater to the master pump station that pumps the wastewater to the mainland for treatment.

The concept of applying membranes to filter the collected raw wastewater has been suggested. The concept involves the installation of ultrafilter membrane cassettes into the wet wells of the existing wastewater lift stations.

The membranes have a driving pressure (approximate 4 psig) applied and filter the feed water by drawing it through the membranes and into a filtrate collection system. The ultrafilter membranes have a nominal pore size of 0.02 µm that can remove suspended solids, protozoa, bacteria and viruses from water supplies. Under proper operating conditions the membranes can provide over a 6 log (99.9999 percent) removal of Cryptosporidium and Giardia.

The Zenon ZeeWeed system has been used in activated sludge aeration basins, secondary clarifiers and chlorine contact chambers. The ZeeWeed system requires physical and biological pretreatment of the process water. Discussions with Zenon revealed that the membranes would not perform well in the filtration of raw wastewater. Raw wastewater contains high levels of solids and greases that would clog or blind the membranes. Zenon did not recommend that its ZeeWeed system be placed into wastewater lift stations.

Table 3-18
Seawater Desalination Costs

Item	Capital $	O&M $/1000 gallons
Seawater Reverse Osmosis System (2.5 mgd) *$4.50 per gallon* RO Equipment, Chemical Feed, Building	11,250,000	3.00
Seawater Intake (5 mgd) $1.00 per gallon	5,000,000	0.10
Disposal System, Monitoring (2.5 mgd) $1.00 per gallon	2,500,000	0.30
Distribution Piping [1]	5,447,500	0.15
Storage System [2]	5,016,800	0.08
Miscellaneous (Administration, Legal, Engineering)	4,450,000	NA
Sub-total	33,664,300	3.63
25% Contingency	8,416,075	NA
Seawater Total	*42,080,375*	NA
Seawater Rate per 1,000 Gallons	3.50	3.63
Total Water rate to Customer $ per 1,000 gallons [3]	$7.13	NA

[1] Distribution Piping Capital Costs from City of Sarasota, Scenario 3, Option B
[2] Storage System Capital Costs from City of Sarasota, Scenario 3, Option B
[3] Water rates are based on comparable State Revolving Fund, 3%, 20 years and 2.25 mgd commitment

The ZeeWeed system would also required additional land for its above ground systems. The ZeeWeed controls, instrumentation and air systems for membrane cleaning would require up to an additional 20 foot by 20 foot site adjacent to each lift station. The filtered reclaimed water would also need to be pumped to the irrigation location.

Based upon the current wastewater flows produced by the Town (estimated to be 2 mgd), there is not sufficient raw wastewater produced to meet the projected average day reclaimed water demand of 4 mgd. Additionally, the filtered wastewater solid would need to be conveyed over to the mainland for treatment in the Manatee County Southwest Water Reclamation Facility. The thickened wastewater solids would require significant modifications to the lift stations' pumps and force mains. New force main pig launching and retrieval stations would be required to provide for frequent periodic cleaning of the force mains.

The concentration of the wastewater solids at each lift station would increase the potential for odors being created at each lift station and associated corrosion of concrete and ferrous elements at each station. Additional operation and maintenance activities at each lift station would be required to address the accumulation of wastewater solids that are not pumped into the transmission system.

Based upon the negative feedback received from Zenon, and the other associated issues with the direct filtration of raw wastewater for the purposes of producing reclaimed water, the ZeeWeed alternative is rejected and will not be considered further.

Section 4
Summary and Recommendations

4.1 Summary

Based on a review of the Southwest Florida Water Management District (SWFWMD) and continuing on-site sampling of the groundwater quality on Longboat Key, it has been determined that a majority of the irrigation supply wells on Longboat Key are experiencing a general increase in chloride and total dissolved solids (TDS) concentrations. Groundwater samples collected through the Town's Groundwater Testing Program indicate that current groundwater quality is above desirable irrigation levels. The historical trend and current groundwater quality of Longboat is discussed in detail in the report titled, *Evaluation of Irrigation Water Quality Trends and Groundwater Usage, Town of Longboat Key*, dated February 2002, CDM.

Groundwater wells regulated through SWFWMD's water use permit program indicated that the wells are encroaching on their permitted capacities and in several cases they exceed them. With the volume limitation and diminishing water quality of the groundwater wells, there is an increased demand for potable water for irrigation. Currently the Town is exceeding their allotted capacity from Manatee County for potable water.

The Town has two options to reduce its landscape irrigation demands placed on the groundwater and potable water resources. The first option is to implement strict demand management watering restrictions on a regular basis to limit use. Due to the ongoing drought conditions coupled with the diminishing groundwater quality, the Town recently implemented this option when it passed a restrictive irrigation resolution (Resolution 01-12). This resolution limits the use of water for irrigation to one time per week. This resolution comes as the SWFWMD increased the district wide restrictions to two days per week. The ongoing need for watering restrictions to control groundwater quality and potable water use will make it difficult for Longboat Key to maintain its landscaping, thereby, reducing the aesthetics of the island. This alternative works for the short term, but does not provide a long-term solution that will improve the overall water supply resources of Longboat Key.

The second option is to locate and implement an additional source of water for landscape irrigation. The inclusion of an alternative irrigation water source into the overall water supply resources of Longboat Key will assist in reducing demands on groundwater and potable water resources.

This reduction of groundwater withdrawals on Longboat Key may help decrease the declining groundwater quality trend. The inclusion of an alternative water source will provide a long-term sustainable landscape irrigation supply that will maintain the aesthetics and viability of Longboat Key.

SWFWMD well record and potable water meter databases provide insight into the relative distribution of the groundwater and potable water irrigation supplies currently used. These data sources provided insight of 3 million gallons per day (mgd) or 21 million gallons per week accounted usage for irrigation. Additional methods were utilized to better define the irrigation demand of Longboat Key. An estimated irrigation demand of 4 mgd or 28 million gallons per week for Longboat was projected using land use and property appraiser data.

This report reviewed several alternative irrigation water sources. These alternatives included reclaimed water supplies from the City of Sarasota and Manatee County; Longboat Key owned water reclamation facility; construction of a brackish groundwater desalination facility; construction of a seawater desalination facility; and installation of ultra-filtration membrane components in the existing wastewater lift stations.

Table 4-1 summarizes the conceptual planning costs reviewed for each alternative and varying scenarios. These costs are presented in Section 3 of this report. The total cost per 1,000 gallons represents an anticipated user rate based on the following financial criteria:

1. Each scenario's capital per 1,000 gallons amounts were computed using an assumption of Florida State Revolving Fund loan program at 3% and 20 years payoff. The revenue base was set on a uniform commitment of 2.25 mgd.

2. The Operation and Maintenance (O&M) cost per 1000 gallons is based on similar system annual operating costs and estimates.

3. The summation of the capital per 1,000 gallons and the O&M per 1,000 gallons provides a projected user water rate per 1,000 gallons.

Table 4-1

Summary of Costs per 1,000 Gallons of Irrigation Water

Source of Supply	Scenario	Capacity (mgd)	Capital $/1,000 Gallons	O&M $/1,000 Gallons	Total $/1,000 Gallons
City of Sarasota	Scenario 1	2.5	$2.01	$0.32	**$2.33**
	Scenario 2	2.5	$1.88	$0.32	**$2.20**
	Scenario 3 A	4.0	$2.24	$0.32	**$2.56**
	Scenario 3 B	4.0	$2.34	$0.32	**$2.66**
	Scenario 4	4.0	$2.23	$0.32	**$2.55**
Manatee County	Scenario 1	1.5	$3.24	$0.43	**$3.67**
	Scenario 2	1.5	$3.11	$0.43	**$3.54**
	Scenario 3	2.5	$2.48	$0.32	**$2.80**
	Scenario 4	2.5	$2.39	$0.32	**$2.71**
Longboat Key	Water Reclamation Facility	2.5	$2.66	$1.23	**$3.89**
	Brackish Water Desalination Facility	2.5	$2.71	$2.48	**$5.19**
	Seawater Desalination Facility	2.5	$3.50	$3.63	**$7.13**

Preliminary findings indicate that the membrane technology and Longboat Key water reclamation facility alternatives are either not practical for the application, not economically feasible, represent significant permitting issues, or not technically feasible over the implementation of a reclaimed water transmission system from mainland sources.

Reclaimed water could provide the Town with a viable irrigation alternative that could ultimately reduce the demand of groundwater withdrawals to the

Town. However, due to the recent drought and overall acceptance of reclaimed water, the demand for reclaimed water in Florida is increasing rapidly.

Reclaimed water supplies are limited and may not be available to Longboat Key in the future. There are two potential suppliers of reclaimed water in the vicinity of the Town. These suppliers are the City of Sarasota and Manatee County. The City of Sarasota has available a 2.5 mgd or 17.5 million gallons per week supply and Manatee County has available a 1.5 mgd or 10.5 million gallons per week supply for the Town.

SWFWMD is currently not in favor of the Manatee County supply option because it will reduce the amount of water available to the agricultural users located in East Manatee County. Cooperative grant funding will have a higher priority to SWFWMD if the reclaimed source is provided from the City of Sarasota.

The transmission main route to Longboat Key from the City of Sarasota passes through Bird and Lido Keys. This allows the City of Sarasota to provide some of the City's irrigation largest users (based on a survey conducted by the City) access to the reclaimed water. The City of Sarasota route would connect at an existing 24-inch reclaimed water main located at Coconut Avenue and Gulfstream Avenue cross John Ringling Causeway and New Pass to the keys. Another advantage to the City of Sarasota is an existing submerged land lease construction permit due to expire in June 2003. The subaqueous crossings are short enough that directional drilling is possible, thus, minimizing bay impacts.

The Manatee County route would most likely cross Sarasota Bay where the existing wastewater force main is located. This crossing (est. 13,000 feet) is too long for directional drilling, thus, requiring open cut trenching. There are sensitive sea grasses within this crossing area and associated significant permitting issues.

In order to place the estimated demand and available mainland quantities into perspective, a summary of the demands and supplies are presented on **Figure 4-1**.

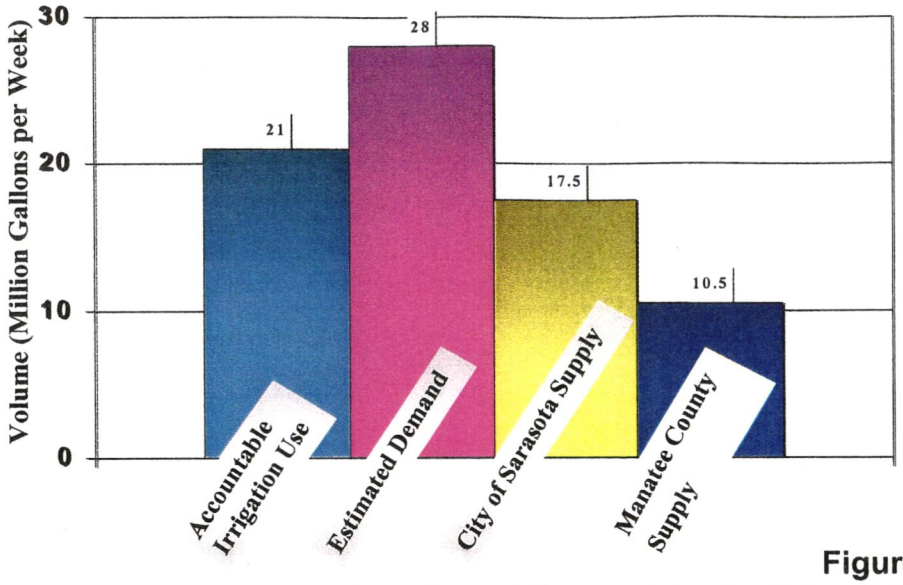


Figure 4-1
Supply and Demand for Reclaimed Water

4.2 Recommendations

Based on the current conditions and trends of the groundwater quality throughout Longboat Key and the increasing demand for potable water, Longboat Key may require an additional source(s) of water for landscape irrigation in the near future. The information developed and evaluated indicate the best alternative is to obtain reclaimed water from the City of Sarasota.

The City of Sarasota does have reclaimed water available and is willing to provide this water to the Town. The City of Sarasota option does have existing submerged land leases for critical subaqueous crossings. This will help to expedite the permitting process and overall project schedule. This option is also may receive some cooperative grant assistance from SWFWMD.

Of the available scenarios for reclaimed water from the City of Sarasota, Scenario 3, Options A and B present the best overall system configuration, storage and delivery. Both options within Scenario 3 offer the following features:

- Conceptual pipeline routes provide reclaimed service capabilities from the South end to the North end of Longboat Key. This allows for maximum resident access to the reclaimed supply.

- The subaqueous transmission main, storage system, and delivery are sized for handling additional reclaimed water flows during wet weather conditions.
- The Aquifer Storage and Recovery wells (ASR) provide maximum underground storage to meet seasonal demands.
- The ground storage tank is provided to accommodate operational system demands.
- Option A sizing could take up to 10.5 mgd during wet weather conditions. Option B sizing could take up to 15 mgd during wet weather conditions.

Of Scenario 3 - Options A and B, the estimated reclaimed water rate is $2.56 and $2.66 per 1,000 gallons, respectively. The projected reclaimed rates are basically 0.10 per 1,000 gallons in difference. Based on this, Longboat Key should give additional consideration to Option B. Option B presents a conceptual system allowing for a potential 4.5 mgd more in wet weather flow and subsequent storage capacity.

To maximize the beneficial use of reclaimed water within Longboat Key, the reclaimed water system should have some level of demand management measures incorporated into it operating protocol. The management of reclaimed water as an important natural resource will allow Longboat Key to maximize reclaimed water's benefit to the Town's residents and businesses.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

IN RE:

MODIFICATION OF EXISTING
WATER SHORTAGE RESTRICTIONS

BOARD ORDER NO. SWF 01- 83

The Governing Board of the Southwest Florida Water Management District ("District"), received evidence and information from District staff regarding appropriate horticultural practices and the effective implementation and enforcement of water shortage restrictions. Based upon that evidence and information, the Governing Board finds and determines:

FINDINGS OF FACT

Previous Actions

1. The District's water shortage plan was adopted by Rule on November 19, 1984, and is codified in Chapter 40D-21, Florida Administrative Code (F.A.C.).

2. Rule 40D-21.231 (1), F.A.C., states that the District may declare a water shortage for any affected source class and may declare a water shortage for any geographic portion of the District which impacts that source class.

3. The District's "two-days/week lawn watering" restrictions and other mandatory water shortage measures were declared and modified by Board Orders 92-12, 92-21, 92-60, and SWF 93-105 in accordance with Chapter 40D-21, F.A.C.

4. On April 26, 2000, Executive Director Order No. SWF 00-18 was issued, imposing mandatory water use restrictions on water users and water use permittees on an emergency basis in response to the drought as a means of containing water demand and its impact on natural systems. These emergency restrictions temporarily modified the water shortage restrictions that were previously declared by Board Orders 92-12, 92-21, 92-60, and SWF 93-105 in accordance with Chapter 40D-21, F.A.C.

5. On June 28, 2000, Executive Director Order No. SWF 00-18 was modified to extend these emergency restrictions until sufficient water resource recovery had occurred.

6. On December 21, 2000, a second modification to Executive Director Order No. 00-18 was issued to impose a temporary seasonal adjustment to the establishment period provisions of the emergency restrictions for new turfgrass only. This temporary

seasonal adjustment, which was limited to communities served by public supply systems most acutely impacted by the drought, expired on March 2, 2001.

7. On October 30, 2001, the Governing Board authorized the Executive Director to issue a Third Order Modifying Executive Director Order No. SWF 00-18, continuing the emergency restrictions for water users served directly or indirectly by Tampa Bay Water's Consolidated Permit Wellfields, but rescinding the emergency declaration and emergency restrictions for all other water users. This action restored Board Orders 92-12, 92-21, 92-60, and SWF 93-105 to full force and effect in 13 counties and to those water users in the remaining 3 counties that do not receive water directly or indirectly from Tampa Bay Water's Consolidated Permit Wellfields.

8. District staff has reviewed information based on the University of Florida's Institute of Food and Agricultural Science (IFAS) horticultural research, including field-tested input from horticultural experts and members of the District's advisory committees, which indicate that a 30-day establishment period exemption may not be sufficient to consistently assure the survival of new plant material. As a result of this review, District staff have formulated modifications to Board Orders 92-12, 92-21, 92-60, and SWF 93-105.

9. District staff has reviewed information related to the effective implementation and enforcement of water shortage restrictions, including input from local governments, members of the District's advisory committees and representatives from other water management districts. This information specifically related to the following topics: issuance of variances, local jurisdictions which straddle water management district boundaries, situations involving the use of reclaimed water and fountains, and horticultural practices of golf courses and other athletic operations. As a result of this review, District staff has formulated modifications to Board Orders 92-12, 92-21, 92-60, and SWF 93-105.

CONCLUSIONS OF LAW

10. The Governing Board of the District is duly authorized by Sections 373.175(1) and 373.246(2), Florida Statutes (F.S.), and Chapter 40D-21, F.A.C., to issue Orders declaring the existence of a water shortage within all or part of the District where insufficient surface or ground water is available to meet the needs of the users, or when conditions are such as to require the temporary reduction in total use within the area in order to protect the water resources from serious harm.

11. The Governing Board is further authorized by law, in accordance with a declared water shortage, to impose such restrictions as may be necessary to reduce demand on available water supplies, including but not limited to apportioning, rotating, limiting or prohibiting the use of water resources within the District in order to meet the present and anticipated needs of the users within the District.

12. The Governing Board, appropriate county and city officials, and all law enforcement authorities may enforce the Orders lawfully adopted by the Governing Board by

administrative action, suit for injunction, criminal proceedings, or other appropriate action as authorized by Chapter 373, F.S., and by adoption and enforcement of local government ordinances for such purposes.

ORDER

Therefore, based upon the foregoing Findings of Fact and Conclusions of Law, it is hereby Ordered that:

Modifications to Board Orders 92-12, 92-21, 92-60 and SWF 93-105

13. Board Orders 92-12, 92-21, 92-60, and SWF 93-105 remain in effect, except as modified below and by the continuation of "one-day/week lawn restrictions" and other mandatory water shortage measures for certain water users in the District as specified by the Third Order Modifying Executive Director Order No. SWF 00-18, and modifications thereto.

14. Newly installed turfgrass (sod, seed, plugs and sprigs) and any other plant material may be watered as follows:

    a. The establishment period exemption specified below may be modified or overidden by stricter provisions of any locally-imposed measures.

    b. During a 60-day establishment period that begins the day the plant material is installed, new turfgrass and other plant material may be irrigated without regard to the normally allowable watering days (i.e., on any day of the week).

    c. On the day any plant material is installed, it may be irrigated once without regard to the normally allowable watering times (i.e., it may be watered immediately, even during otherwise restricted hours of the day).

    d. Sprigs within an athletic operation (soccer field, baseball diamond, golf course, etc.) may be syringed without regard to the normally allowable watering times throughout the establishment period exemption.

    e. Plant material other than turfgrass may continue to be irrigated without regard to the normally allowable watering times if low-volume irrigation technology is used. This existing standard exemption is also available after the establishment period exemption ends.

    f. Except as described above, or as provided for in other existing standard exemptions, all establishment period irrigation shall occur during normally allowable watering hours.

    g. Establishment period irrigation shall be limited to areas containing new plant materials only. An entire zone of an irrigation system may only be used for

establishment period irrigation if the zone waters an area that contains at least 50% new plant material. Partial zone plantings and dispersed plantings shall be watered by some other, more targeted means of temporary supplemental irrigation technology (i.e., handwatering, manual sprinkler, or other plant-appropriate watering methods).

15. Previously issued District variances (written permission to vary from District restrictions, including staff-approved alternative irrigation plans) remain in effect, as modified as follows:

   a. Some variances contain specific expiration dates. An expired variance is considered to be invalid.

   b. A variance may also be declared invalid by District staff if the property owner or its agent violates the terms and conditions of that variance.

   c. Any valid District variance may be modified or overidden by stricter provisions of any locally-imposed measures.

   d. Any property with a valid District variance issued after March 2, 1992 but prior to April 26, 2000 may use both of the two watering days specified for each section of the property (i.e., each section of the property may be watered on two days each week, if necessary).

   e. Any property with a valid District variance issued after April 26, 2000 but prior to October 30, 2001 which contained provisions for a second watering day for each section of the property may also use the second watering day (i.e., each section of the property may be watered on two days each week, if necessary).

   f. Any property with a valid District variance issued after April 26, 2000 that did not specify a second watering day for each section of the property is modified as follows: each section of the property may also be irrigated on the day of the week that occurs three days following the originally specified day (for example, if an alternative irrigation plan stipulates that a certain section of the property can be watered only on Fridays, it may now also be watered on Mondays).

16. Irrigation using reclaimed water (water that has received at least secondary treatment and is reused after leaving a wastewater treatment facility) shall be restricted as follows:

   a. Use continues to be unrestricted, with respect to watering days, unless modified or overidden by stricter provisions of any locally-imposed measures.

   b. An irrigation source must be 100% reclaimed water to be eligible for this exemption (in other words, if a reclaimed water system or irrigation system also uses potable water, pond water or some other supply, the use of this blended water is restricted as if it contained no reclaimed water).

   c. District staff request that all properties voluntarily conserve reclaimed water by only irrigating during the hours of 12:01 a.m. to 10 a.m. or 4 p.m. to 11:59 p.m.

   d. District staff also request that all properties voluntarily conserve reclaimed water by limiting applications to no more than 3/4 inch of water in each zone.

17. The use of any fountain or water feature is allowed, unless modified or overidden by stricter provisions of any locally-imposed measures, provided it is properly maintained and also:

    a. Recycles water, or

    b. Exclusively uses reclaimed water (i.e., 100% of the water being used has received at least secondary treatment and is reused after leaving a wastewater treatment facility), or

    c. Provides a necessary water quality benefit.

18. Golf course turfgrass irrigation shall be restricted as follows:

    a. Each tee shall be watered no more than three days per week.

    b. Each green shall continue to be watered no more than three days per week.

    c. Each fairway shall continue to be watered no more two days per week.

    d. All other provisions and standard exemptions shall continue to apply, except as modified above.

19. Other athletic operations shall be restricted as follows:

    a. One half of the athletic field(s) may be irrigated on Tuesdays and/or Saturdays.

    b. The other half may be irrigated on Wednesdays and/or Sundays.

    c. All other provisions and standard exemptions shall continue to apply, except as modified above.

20. Except as provided for above, all other terms and conditions of Board Orders 92-12, 92-21, 92-60, and SWF 93-105 shall remain in full force and effect.

21. The District's Governing Board hearby requests that appropriate county and city officials, including but not limited to law enforcement authorities, enforce the Orders as amended.

22. A summary of enforcement activity, including number of warnings and citations issued, shall be submitted to the District by each applicable local government agency on a monthly basis.

23. Local governments shall consider adopting or revising resolutions and ordinances which facilitate enforcement implementation and reporting.

24. This Order shall become effective on November 12, 2001.

DONE AND ORDERED by the Governing Board in Hernando County, Florida, on OCTOBER 30, 2001.

SOUTHWEST FLORIDA WATER
MANAGEMENT DISTRICT

By: _____
Ronnie E. Duncan, Chair

Approved as to Legal
Form and Content
_____
Attorney

Attest: Janet D. Kovach
Janet D. Kovach, Secretary
(Seal)

Filed this 14th day of NOVEMBER, 2001.
Dianne M. Kell
Deputy Agency Clerk

NOTICE OF RIGHTS

Persons whose substantial interests are affected by this Order may request an administrative hearing in accordance with Sections 120.569 and 120.57, Florida Statutes (F.S.), and Chapter 28-106, Florida Administrative Code (F.A.C.). A request for a hearing must:(1) explain how the petitioner's substantial interests will be affected by the District's action; (2) state all material facts disputed by the petitioner, or state that there are no disputed facts; and (3) otherwise comply with Chapter 28-106, F.A.C.

A request for hearing must be filed with (received by) the Agency Clerk of the District at the District's Brooksville address, 2379 Broad Street, Brooksville, FL 34604-6899 within 21 days of receipt of this notice. Receipt of notice is deemed to be the fifth day after the date on which this notice is deposited in the United States mail. Failure to file a request for hearing within this time period shall constitute a waiver of any right any person may have to request a hearing under Sections 120.569 and 120.57, F.S.

Mediation pursuant to Section 120.573, F.S., and Rule 28-106.111, F.A.C., to settle an administrative dispute regarding the District's action in this matter is not available prior to the filing of a request for hearing.

In accordance with Section 120.569(1), F.S., the following judicial review may be available: A party who is adversely affected by final agency action may seek review of the action in the appropriate District Court of Appeal pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, within thirty (30) days after the rendering of the final action by the District.

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