City of Naples

Integrated Water Resources Plan

Final Report

July 2008

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TETRA TECH

CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

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EXECUTIVE SUMMARY

BACKGROUND

This Integrated Water Resources Plan was developed for the City of Naples to identify water needs, water supply options and funding requirements during a twenty year planning period. Tetra Tech prepared potable and reclaimed water master plans in 2002 which recommended capital improvements to each system. Based on the master plans, the City has completed the first phase of the reclaimed water distribution system expansion, completed a reclaimed water aquifer storage and recovery (ASR) exploratory well and developed a five year capital improvements program (CIP) that includes a $56.8 million for expansion to the potable water treatment facility and for further expansion to the reclaimed water distribution system. Since it has been more than five years since the completion of the master plans, the City requested that Tetra Tech prepare this Integrated Water Resources Plan to consider water supply as a whole including potable and irrigation needs, and to ensure that the current CIP as it relates to water supply takes into consideration changes in construction costs, water treatment technology, population trends and environmental conditions.

WATER SUPPLY NEEDS

Based on the twenty year population projections, the City will require a water supply capacity of 48 million gallons per day (MGD). This projection is based on an overall growth rate of 1.4% within the water service area, with an average growth rate of 0.7% within the City limits and 2% outside the City limits. The City's existing lime softening water treatment facility can supply up to 24 MGD of capacity. This capacity is limited both by anticipated regulatory limitations on this resource and existing hydraulic limitations on the raw water supply system. It is anticipated that growth in the wastewater service area will increase wastewater flow and the supply of reclaimed water that is available to 9 MGD during the twenty year planning period. Therefore, the City's existing facilities should provide 33 MGD of the 48 MGD that is needed during the 20 year planning period and an additional 15 MGD of new water supply and treatment is required.

ALTERNATIVES EVALUATED

Ten alternatives were evaluated to meet the projected twenty year water supply needs. All new water supply sources proposed met the criteria established by the South Florida Water Management District (SFWMD) for an Alternative Water Supply. New water supply sources

that do not meet the Alternative Water Supply designation would be subject to shorter consumptive use permit durations and more stringent water restrictions during drought periods.

All available water supply sources within the City of Naples were considered in the evaluation. Capital costs were developed for alternatives which were considered feasible based on water quality and quantity available. For potable water supply, these potential sources included brackish groundwater from the lower Hawthorn aquifer and sea water from the Gulf of Mexico. For irrigation water supply, potential new sources included the Golden Gate Canal supplemented with storm water. Water from the Gordon River or Naples Bay was considered in the plan, but due to the variability in quantity and quality these sources were not considered feasible alternatives. A summary of the anticipated capital costs associated with the alternatives evaluated is provided below:

Alternative No.	Preliminary Opinion of Probable Cost ($ Millions)	Existing Facilities		New Facilities				Capacity Needed (MGD)
		Existing Potable Capacity (MGD)	Existing Reclaimed Capacity (MGD)	Brackish Groundwater w/ RO Treatment Capacity (MGD)	Sea Water w/ RO Treatment Capacity (MGD)	Golden Gate Canal Supplemented with Storm water / Actiflo Treatment Capacity (MGD)	Surficial Aquifer Groundwater w/ Disinfection Treatment Capacity (MGD)	
1	$102	**24**	**9**	**15**	0	0	0	48
2	$117	**24**	**9**	**10**	0	**5**	0	48
3	$128	**24**	**9**	0	0	**15**	0	48
4	$131	**24**	**7** [1]	**17**	0	0	0	48
5	$135	**19** [2]	**9**	**20**	0	0	0	48
6	$156	**14** [2]	**9**	**20**		0	5	34
7	$196	**24**	**9**	0	**15**		0	48
8	$206	0	**9**	**39**	0	0	0	48
9	$222	0	**9**	**34**	0	0	**5**	48
10	$386	0	**9**	0	**39**	0	0	48

Notes:
1. Option 4 utilizes reverse osmosis treatment on the reclaimed water which reduces the water supply available.
2. Options 5 and 6 consider a partial phase out of the existing lime softening treatment facility.
3. Options 8-10 consider a total phase out of the existing lime softening treatment facility.

Alternative 1 has the lowest anticipated capital cost and involves a 15 MGD expansion to the potable water system with the construction of a reverse osmosis water treatment plant at the same site as the existing water treatment facility to treat brackish groundwater from the lower Hawthorn aquifer. Alternative 2 also involves expansion of the potable water system, but with the construction of a smaller reverse osmosis water treatment plant. In alternative 2 additional future capacity needs are met by expanding the irrigation water system capacity with treated canal and storm water. Alternative 3 does not expand the potable water system at all, and relies solely on the expansion of the irrigation water supply system with canal and storm water to meet future water supply needs. Alternative 4 considers expansion of the potable water system, and treatment of reclaimed water with reverse osmosis to remove chlorides. This alternative offers the highest water quality as compared to the previous 3 alternatives. Operation and maintenance (O&M) costs were considered for the top four alternatives and are summarized below:

Alt.	Potable Water System Cost ($)	Reclaimed Water System Cost ($)	Total Estimated O&M Cost ($)
1	$9,417,000	$3,550,000	$12,967,000
2	$8,099,000	$4,522,000	$12,621,000
3	$5,918,000	$6,194,000	$12,112,000
4	$10,279,000	$5,799,000	$16,078,000

Alternative 4 has the highest operation and maintenance cost because it includes reverse osmosis treatment of both the potable and reclaimed water which is very energy intensive. Based on the high capital and O&M costs, alternative 4 was eliminated from consideration. Alternative 3 has the lowest operation and maintenance costs because it does not include reverse osmosis treatment. A present value analysis of the O&M cost savings does not justify the additional capital costs associated with alternative 3; however, this alternative provides the most environmental benefits.

Alternatives 1, 2 and 3 are good options to meet the City's 20 year water supply needs. A comparison of non cost factors for these alternatives can be found below.

Summary of Non Cost Factors
Top 3 Options

Non Cost Factor	Alternative 1	Alternative 2	Alternative 3
Public Health and Safety			
Increased Fire Flow Capacity	5	4	2
Potable Water Quality	5	4	2
Environmental Issues			
Enhancement of Naples Bay	3	4	5
Protection of Groundwater Supplies	3	4	5
Concentrate Disposal Quantity	3	4	5
Potential Wetlands Impacts	3	3	3
Regulatory Issues			
Permittability	4	4	4
Compliance with Regulatory Agency Goals	4	4	4
Compliance with Customer Expectation			
Aesthetic Water Quality	4	3	3
Water Supply Diversity			
Number of Supply Options Utilized	3	5	3
Total Score Non Cost Factors	37	39	36

A comparison of non-cost factors between the three alternatives yields a slightly higher score for alternative 2. A brief summary of the positive factors associated with alternative 2 is found below:

Alternative 2 Non Cost Advantages:

1. Alternative 2 scores high on environmental issues including:

a. Reduction of freshwater discharges to Naples Bay through the use of canal and storm water.
b. Less reliance on groundwater to meet future water supply needs.

2. Alternative 2 scores high on water supply diversity as it draws on multiple water resources to meet future needs lowering the City's exposure to degrading water quality or quantity with any one option.
3. Alternative 2 includes blending of canal and storm water with reclaimed water which should lower chlorides in the reclaimed water supply.

Alternative 2 is the recommended capital improvements program (CIP). The recommended twenty year CIP is broken down into five year segments. Years 1-5 is summarized below.

ALTERNATIVE 2 RECOMMENDED CIP YEARS 1-5 : $67.5 MILLION

The first five years of the water supply CIP totals $44.3 million and includes:

- Regulatory upgrades to the existing water treatment facility
- Exploratory well program for brackish water supply
- Exploratory well program for concentrate disposal
- Exploratory well program for ASR
- Pilot testing and preliminary design for reverse osmosis water treatment plant
- Consumptive use permitting for existing well fields, brackish groundwater and Golden Gate Canal
- Golden Gate Canal intake structure and piping
- Potable water main interconnect to reuse storage tanks for backup water supply
- Reclaimed water system expansion

In addition to the above recommended water supply CIP, the City has identified $23.2 million in capital projects during the first 5 years. Of the $67.5 million planned in the first five years, it is anticipated that $55 million will be funded with a bond and the remaining balance will be funded from operations.

ALTERNATIVE 2 RECOMMENDED CIP YEARS 5-10: $49 MILLION

The second five years of the water supply CIP include:

- Continuation of the ASR program from the first five years
- Design for the reverse osmosis water treatment plant
- Construction of a reverse osmosis water treatment plant

ALTERNATIVE 2 RECOMMENDED CIP YEARS 10-20: $24 MILLION

The last ten years of the CIP includes construction of the canal and / or storm water treatment facilities, and further expansion of the reclaimed water distribution system.

FINANCIAL EVALUATION

Tetra Tech completed a Comprehensive Water, Wastewater and Reclaimed Water Rate Study for the City in 2007. The study recommended various rate increases to meet the specific needs of the system. The water and wastewater rate recommendations that were approved by the City Council included two 12.74% water rate increases in FY 2009 and 2010 to meet the projected capital needs of the water system.

As part of this Integrated Water Resources Plan, a financial evaluation was conducted to determine the sufficiency of these rate increases in light of the CIP recommendations above. The evaluation determined that the proposed rate increases meet the funding needs for the first five years.

A general analysis of the 5 to 10 year time frame shows that additional rate increases will be required to meet the CIP needs, but it is difficult to accurately project the amount of the rate increase at this time due to variability in the projections over time.

Based on the financial evaluations the following is concluded and recommended:

1. Current water rate increases in 2009 and 2010 will generate revenues to meet the capital needs of the system for the next five years.
2. Additional rate increases will be required to meet the CIP for years 5 to 10.
3. The City should reevaluate its rates every three years or prior to securing debt funding.

4. The City should continue to pursue grants and consider using impact fees to offset the cost of the CIP.

CITY COUNCIL WORKSHOP

At a workshop on June 2, 2008, the recommendations found in the Integrated Water Resources Plan were presented to the City Council. During the workshop, the Council gave City staff a strategic direction, and stressed that the Integrated Water Resources Plan should be a living document that is updated regularly. The strategic direction included developing the water supply and storage resources listed below in order of importance to the Council.

1. Aquifer storage and recovery
2. Golden Gate Canal water supplemented by storm water
3. Brackish groundwater

This strategic direction fits within the recommended capital improvements for alternative 2. However, by giving ASR and the Golden Gate Canal a higher priority than brackish groundwater, the Council sought to leave open the possibility of expanding these resources further and reducing the quantity of brackish groundwater required in the future. This strategy is somewhat of a hybrid between alternatives 2 and 3 in that it seeks to minimize use of brackish groundwater if ASR is successful, but recognizes the need to develop a brackish groundwater supply for the future. The Council requested that City staff provide Council with an annual update on the program, and that the recommendations in the report be updated by an outside consultant every three to five years. The director of the Big Cypress Basis, Clarence Tears, spoke at the workshop in support of the Council's strategy.

SECTION 1

INTRODUCTION

1.1 GENERAL

The purpose of this integrated water resources plan is to identify water supply needs and sustainable water supply sources for a 20-year planning period. Existing water supply needs within the City's water service area are met with the surficial aquifer in the East Golden Gate and Coastal Ridge well fields withdrawing from the lower Tamiami aquifer. Alternative water supply use is currently limited to reclaimed water, which has primarily been used to meet golf course and commercial irrigation water demands but has recently been expanded to include residential irrigation.

In order to sustain existing natural resources, the City intends to expand its alternative water supply sources to meet projected demands. Available alternative water supply options to meet potable demands within the City of Naples include brackish groundwater supplies and surface waters including the Gulf of Mexico and the Gordon River. Available alternative water supply options to meet non-potable demands include expansion of the reclaimed water system, Golden Gate canal water, storm water, and storage of these waters by aquifer storage and recovery.

1.2 PROJECT GOAL

The main goal of this integrated water resources plan is to identify sufficient sources of water and the funding that will be required to meet potable and irrigation water demands within the City of Naples water service area through 2028 (20-year planning period), while sustaining natural resources and enhancing Naples Bay.

1.3 PROJECT PRIORITIES

Priorities for this project were developed to ensure that this plan meets the specific needs for the City of Naples. The project priorities in order of importance are:

1. Public Health and Safety. The highest priority for water supply is to ensure that public health and safety is maintained. This includes compliance with current and future drinking water regulations and availability of fire flow. To this extent, the potable water system takes priority over all supplemental water supply facilities.

2. Enhancement of Naples Bay. Reducing fresh water discharges to Naples Bay is a priority for the City of Naples. Potential projects discussed in this water supply plan to reduce freshwater discharges include utilizing the Golden Gate Canal or stormwater as supplemental water supply sources and eliminating effluent discharges from the wastewater treatment facility.

3. Protection of Other Natural Resources. Protection of wetlands, groundwater and other natural resources within the City's water service area is a priority. This water supply plan will focus on sustainable water supply projects that protect natural resources to the maximum extent possible.

4. Compliance with Regulatory Agency Goals. Compatibility with regulatory agency goals is essential to a successful water supply plan. This water supply plan will be compatible with goals and priorities outlined in the Lower West Coast Water Supply Plan and other regulatory guidance publications.

5. Compliance with Customer Expectations. Compliance with customer expectations for aesthetic issues such as color and hardness in drinking water supply and chlorides in irrigation water supply will be goal of all potential water supply projects identified in this plan.

6. Compliance with Funding Limitations. The City of Naples intends to review user rates and charges every five (5) years. The City recently updated water, wastewater and stormwater user charges. Therefore projects identified for the first five (5) years of the twenty (20) year capital improvements program in this water supply plan will be within the funding limitations of the current user charges. This water supply plan should be updated every five (5) years prior to the user rate and charge review.

SECTION 2

WATER DEMAND PROJECTIONS

2.1 GENERAL

The City of Naples is a coastal community located in western Collier County in southwest Florida. The City's water demand is driven by tourism and a strong seasonal population, coupled with a large retirement population. Much of the City is developed, and there is a general perception that additional opportunities for growth are limited to infill and redevelopment.

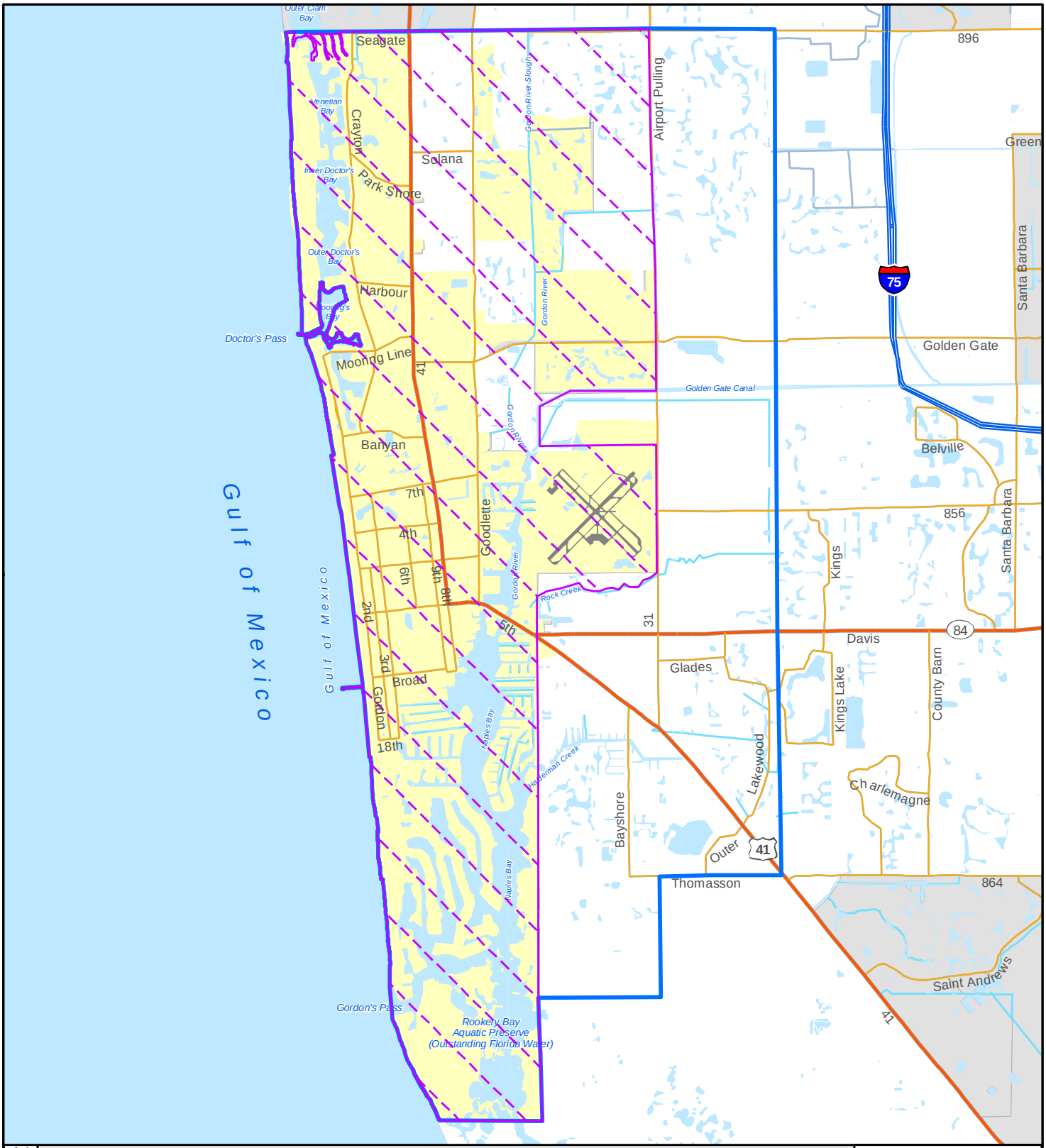
Initial population data for this section was obtained from an April 2008 report from Morris-Depew and Associates, Inc. that details the projections and methodologies for the City of Naples Water Service area. These projections have been amended as described later in this section. Sources utilized in the preparation of the population data and projections include the University of Florida Bureau of Economics and Business Research (BEBR), the Regional Planning Council (RPC), the Collier County Planning Department, the South Florida Water Management District Planning Department, the Lower West Coast Water Supply Plan, the City's Comprehensive Land Use Plan, and the United States Census Department.

2.2 SERVICE AREA DESCRIPTIONS

The existing water and wastewater service areas include the entire City limits and some portions of Collier County. Both service areas are bounded to the west by the Gulf of Mexico and are bounded by the City limits on the south side of the service area. The northern boundary of both service areas is located along the northern City limits extending to the east to encompass areas outside the City limits. The eastern boundaries of the water and wastewater service areas extend past the eastern City limits, with the water service area extending 1 to 2 miles further east of the wastewater service area. **Figure 2-1** illustrates the existing City limits and the City's existing water and wastewater service areas. The water service area encompasses approximately 33 square miles of land area. The existing wastewater service area encompasses approximately 18.6 square miles.

2.2.1 Land Use

The existing land uses within the City's water service area are shown on **Table 2-1.** It should be noted that a small percentage of the residential land use area consists of Rights of Way (ROW). Also, all land use calculations subtract the area of water bodies.



SOURCE: City of Naples Planning Data; Collier County Planning Data

LEGEND

- City of Naples City Limits
- Water Service Area
- Sewer Service Area

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SERVICE AREA MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE
2 - 1

TABLE 2-1
CITY OF NAPLES
LAND USE WITHIN WATER AND WASTEWATER SERVICE AREAS

Water Service Area Land Use Description	Area (ac)		
Airport	650		
Beach Front Estates	54		
Commercial	576		
Conservation	863		
Downtown	394		
Institutional	212		
Recreational	812		
Residential (City)	**4,168**	→	**24% of Service Area**
Urban Residential (County)	**6,254**	→	**36% of Service Area**
Urban Coastal (County)	**1,272**	→	**7% of Service Area**
Mixed Use (County)	**1,604**	→	**9% of Service Area**
Estates (County)	6		
Industrial (County)	687		
Waterfront (County)	62		
Total	**17,614**	**Acres**	

Wastewater Service Area Land Use Description	Area (ac)		
Airport	622		
Beach Front Estates	54		
Commercial	544		
Conservation	863		
Downtown	394		
Institutional	212		
Recreational	812		
Residential (City)	**4,168**	→	**40% of Service Area**
Urban Residential (County)	**2,620**	→	**25% of Service Area**
Urban Coastal (County)	5		
Mixed Use (County)	153		
Estates (County)	6		
Industrial (County)	23		
Waterfront (County)	62		
Total	**10,560**	**Acres**	

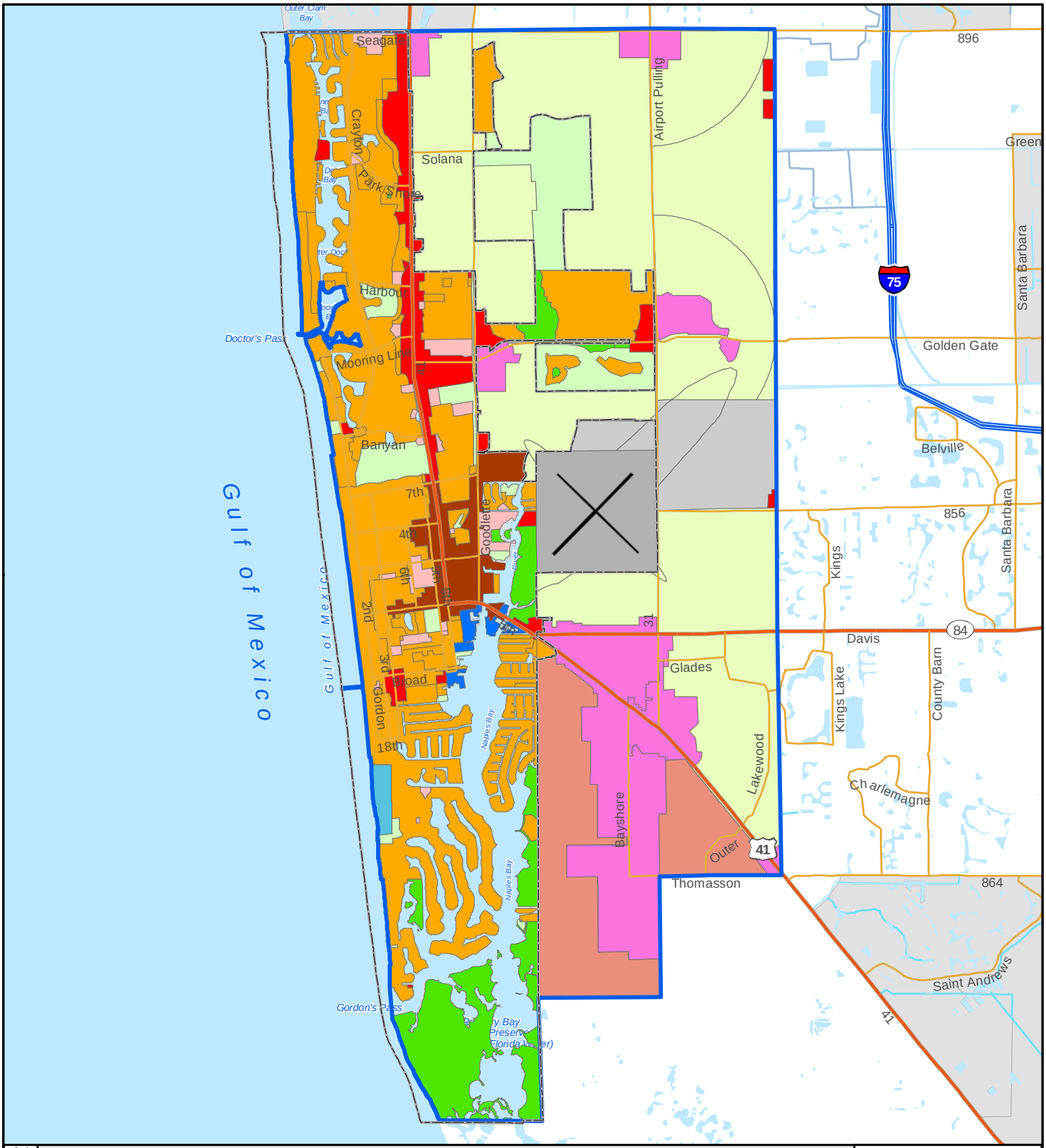
Figure 2-2 illustrates the land use within the City's service areas. For the water service area, residential land use accounts for 60% of the land use. The largest land use is the County's Urban Land Use category which accounts for 36% of the service area land use, and the second largest land use is the City's Residential Land Use category which accounts for 24% of the service area land use. The next largest land use categories are the County's Urban Coastal and Mixed Use which together account for 16% of the service area land use. Overall, the majority of land within the water service area is located outside of the City limits; land within the County accounts for 56% of the total land within the service area while land within the City limits accounts for 44% of total land within the wastewater service area.

For the wastewater service area, residential land accounts for 65% of the land use. The largest land use is the City's Residential Land Use category. Unlike the water service area, the majority of land within the wastewater service area is located within the City limits. Land within the City limits accounts for 74% of the total land within the wastewater service area.

2.3 WATER SERVICE AREA POPULATION PROJECTIONS

2.3.1 Service Area Population Components

The Collier County Metropolitan Planning Organization prepares population estimates broken down by Traffic Analysis Zones (TAZs), based upon U.S. Department of Census and BEBR estimates and projections. **Figure 2-3** shows the City's municipal boundaries, the water service area, the wastewater service area and the component TAZs. **Table 2-2** lists the component TAZs, detailing whether they fall within the City's municipal boundaries or outside the boundaries.



SOURCE: City of Naples Planning Data; Collier County Planning Data

LEGEND

City of Naples City Limits

Water Service Area

City of Naples Future Land Use

- Airport
- Beach Front Estates
- Commercial
- Conservation
- Downtown
- Institutional
- Recreation
- Residential
- Runway
- Waterfront

Collier County Future Land Use

- Conservation
- Commercial
- Estates
- Industrial
- Mixed Use
- Urban Coastal
- Urban Res.

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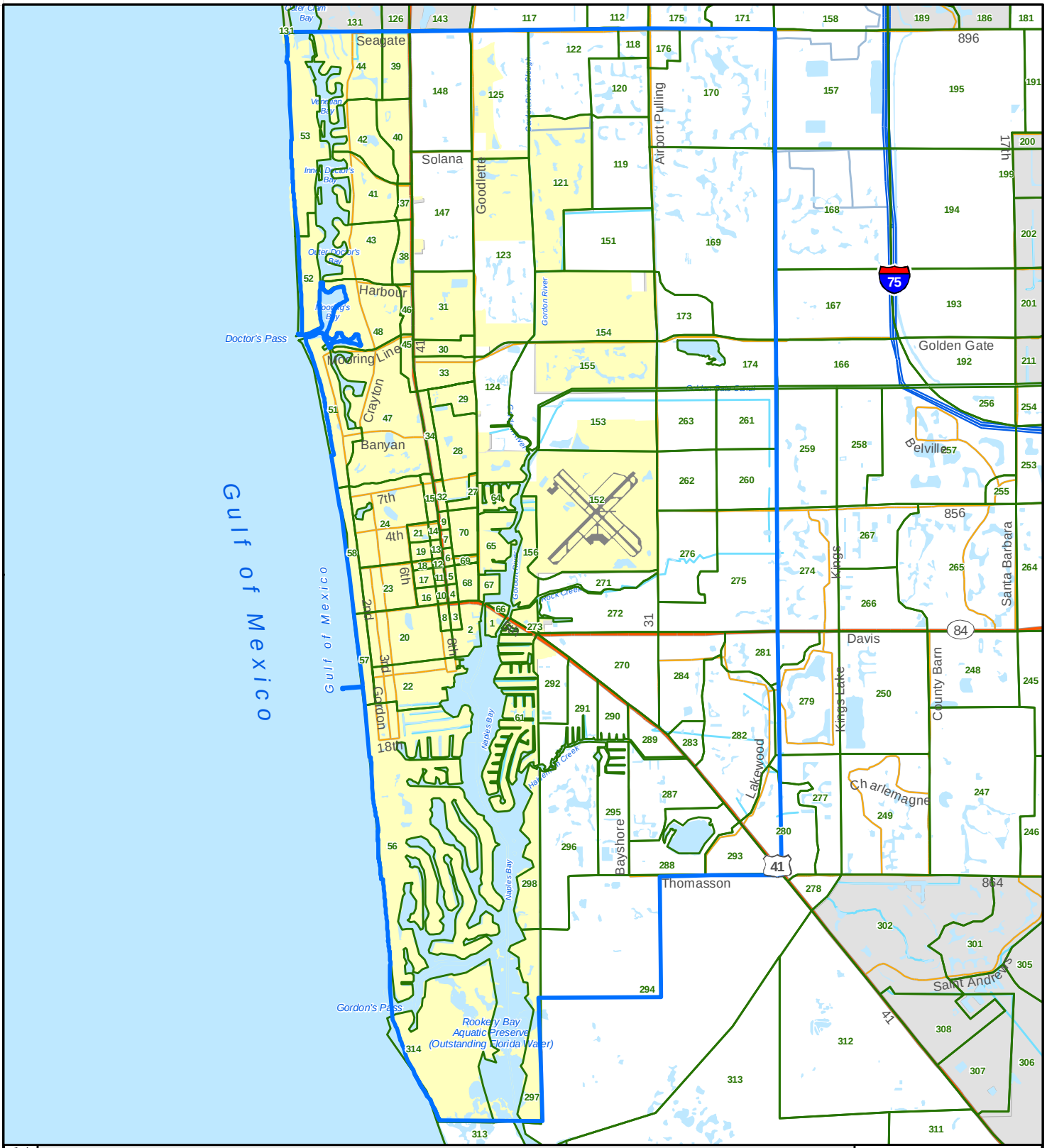
FUTURE LAND USE MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE
2 - 2



LEGEND

City of Naples
City Limits

Water Service Area

Traffic Analysis Zones

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TRAFFIC ANALYSIS ZONES MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE
2 - 3

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TABLE 2-2
Water and Wastewater Service Area TAZ Locations

TAZ #	Location	TAZ #	Location	TAZ #	Location	TAZ #	Location
1	City	34	City	120	County	275	County
2	City	37	City	121	City	276	County
3	City	38	City	122	County	280	County
4	City	39	City	123	County	281	County
5	City	40	City	123.1	City	282	County
6	City	41	City	124	County	283	County
7	City	42	City	124.1	City	284	County
8	City	43	City	125	County	287	County
9	City	44	City	147	County	287.1	County
10	City	45	City	148	County	288	County
11	City	46	City	151	County	289	County
12	City	47	City	152	County	290	County
13	City	48	City	153	County	291	County
14	City	51	City	154	City	292	County
15	City	52	City	155	County	294.1	County
16	City	53	City	155.1	City	295	County
17	City	56	City	156.6	City	296	County
18	City	57	City	169	County	297	City
19	City	58	City	170	County	298	City
20	City	61	City	173	County	314	City
21	City	64	City	174	County		
22	City	65	City	176	County		
23	City	66	City	260	County		
24	City	67	City	261	County		
27	City	68	City	262	County		
28	City	69	City	263	County		
29	City	70	City	270	County		
30	City	118	County	271	County		
31	City	119	County	272	County		
33	City	119.1	County	273	City		

Legend:

TAZ Located Within Water and Wastewater Service Areas

TAZ Located Within Water Service Area Only

2.3.2 Historical Population Data

The historical population for the incorporated City of Naples was investigated to determine growth patterns for the City. As noted previously, the City, and the attendant Water Service Area, does not exhibit extreme growth trends. The majority of growth within the Water Service Area results from infill development and re-development projects. Therefore, the extreme growth that characterizes, or has characterized, much of the rest of Southwest Florida is not seen in the City of Naples. It is nevertheless the case that some growth does occur, and that seasonal growth is exhibited in the various population models used to project demographics in the City's Water Service Area. **Table 2-3** shows the population estimates prepared by the US Census, based upon the 2000 Census data, for the years 2000 through 2006 and compares the changes between 1980, 1990, 2000, and 2006 as reported by the US Census.

TABLE 2-3
City of Naples
Census Data Historic Population

Year	Prior Census Data	2000 Census
1980	17,581	
1990	19,505	
2000	20,976	20,063
2001		21,157
2002		21,184
2003		21,338
2004		21,530
2005		21,804
2006		21,975

Source: US Census Bureau

2.3.3 Applied Growth Rates

Based upon the change between 1980 and 2006, it is estimated that the City grew by approximately 169 persons per year. The calculation of the differential between 1990 and 2006 yields a growth rate of approximately 154 persons per year for the City, demonstrating that growth slowed somewhat during the 1990's.

When compared to Collier County, it is apparent that the primary growth in the area is occurring in the County portions of the service area. **Table 2-4** compares the growth in Naples to the County-wide growth that occurred during this period.

TABLE 2-4
Collier County and Naples Population, 2000-2006

Total Population	Collier County	Naples
July, 1 2006	314,649	21,975
July, 1 2005	307,864	21,804
July, 1 2004	296,678	21,530
July, 1 2003	286,173	21,338
July, 1 2002	276,049	21,184
July, 1 2001	264,590	21,157
July, 1 2000	254,154	21,063
April, 1 2000 (Estimates Base)	251,377	21,028
April, 1 2000 (Census 2000)	251,377	20,976

Source: US Census Bureau

Given the dramatic difference in the growth rates between the City and the County, it appears to be more methodologically sound to base the growth rates of the areas in question upon the respective growth rates of each parent entity. In other words, projections for the City should be based upon the City's historical growth rates, while those areas within the City's Water Service Area, but outside the municipal boundaries, should be based upon the County's growth rate. Overall, population within the County grew at an average rate of 3.3% per year. However, the portions of the County located within the City's service area grew at a slower rate of 2% per year. **Table 2-5** provides historical population data for the City's entire service area.

TABLE 2-5
City of Naples Water Service Area Historic Population

Service Area Component	2002	2003	2004	2005	2006	2007
City Permanent Population	21,184	21,338	21,530	21,804	21,975	22,146
Unincorporated Area Permanent Population	25,151	25,572	25,850	26,076	26,735	27,751
City Seasonal Population	12,396	12,478	12,515	12,575	12,668	12,789
Unincorporated Area Seasonal Population	5,030	5,114	5,170	5,215	5,347	5,551
Total Water Service Area Population	**63,806**	**64,502**	**65,065**	**65,670**	**66,724**	**68,212**

2.3.4 Projected Population

To project population within the City limits, the 2007 population of 22,146 was utilized as a starting point. The projected population through 2028 was calculated to be 26,071 persons utilizing the historic limited growth rate that has characterized the municipal boundaries. Similarly, population in the unincorporated County portions of the service area was projected starting with the 2007 population of 27,751. The planning study found in the appendix of this report utilized the higher growth rate for the entire County to project population. However, population growth within the portions of the County located in the City's water service area were lower than in other areas of the County. Therefore, for the purpose of this water supply plan, the population projections for the County portions of the service area were projected at the historic growth rate of 2% over the 20 year planning period which resulted in a projected 2028 population of 41,332. The total permanent population for the water service area including both the City and County portions of the service area was projected to be 67,403 persons in 2028.

As noted previously, the City is characterized by a significant seasonal population. The seasonal population represents a demand placed upon services and facilities during the period (primarily) between Thanksgiving and Easter. In the City's Evaluation and Appraisal Report (EAR) prepared in 2005 it was estimated that seasonal residents represented an increase of more than 50% during peak months. **Table 2-6,** taken from the EAR shows the estimated and projected seasonal population increases for the City. Applying the increases calculated through 2028, a total of 14,524 seasonal residents are projected to need water service within the City's boundaries.

TABLE 2-6
City Seasonal Population Estimates

	1996	2000	2004	2005	2010	2015	2020
Peak Seasonal Increase	12,271	12,293	12,515	12,575	13,040	13,444	13,860

Source: City of Naples Comprehensive Plan Evaluation and Appraisal Report, December 2005

The planning study found in the appendix of this report assumes that the ratio of seasonal residents to permanent residents is the same in the City. However, for the purpose of this water supply plan, a lower ratio of seasonal to permanent residents was assumed for the population projections. Information obtained from the Collier County Comprehensive Planning Department was utilized to project the seasonal component of the population in the County portions of the water service area. Based on the County's Comprehensive Plan data which can be found in **Appendix B** of this report, the seasonal component of population within the County is 20% of the permanent population. Applying this ratio of seasonal to permanent population, a total of 8,266 seasonal residents are projected to need water service within the County portion of the

service area. The total population growth projected for the water service area amounts to an increase of 21,642 persons over the next 20 years with a total service demand rising from 68,551 to 90,193 persons. As mentioned previously, the majority of growth will occur outside the municipal boundaries, and by the end of the forecast period, seasonal residents will amount to approximately 25% of the total population served.

These population projections were compared to the projections found in the 2005 update to the Lower West Coast Water Supply Plan, which projected a permanent population of 75,625 persons in the City's Water Service Area. The Lower West Coast Water Supply Plan projections do not include a seasonal component. The population projections developed under this planning assignment show a permanent population of 64,419 and a seasonal population of 22,065 for a total projected population of 86,484 persons in 2025. Overall, this projected population is 14% higher than the projected population in the Lower West Coast Water Supply Plan based on adding the seasonal component of the projected population. **Table 2-7** shows the population projections through 2028.

TABLE 2-7
City of Naples Water Service Area
Population Projection

	Inside City Limits			Outside City Limits			Total Service Area		
Year	**Permanent**	**Seasonal**	**Total**	**Permanent**	**Seasonal**	**Total**	**Permanent**	**Seasonal**	**Total**
2008	22,319	12,854	35,173	27,815	5,563	33,378	50,134	18,417	68,551
2009	22,493	12,947	35,440	28,372	5,674	34,046	50,865	18,621	69,486
2010	22,669	13,044	35,713	28,939	5,788	34,727	51,608	18,832	70,440
2011	22,845	13,125	35,970	29,518	5,904	35,422	52,363	19,029	71,392
2012	23,024	13,206	36,230	30,108	6,022	36,130	53,132	19,228	72,360
2013	23,203	13,287	36,490	30,710	6,142	36,852	53,913	19,429	73,342
2014	23,384	13,368	36,752	31,325	6,265	37,590	54,709	19,633	74,342
2015	23,567	13,444	37,011	31,951	6,390	38,341	55,518	19,834	75,352
2016	23,750	13,527	37,277	32,590	6,518	39,108	56,340	20,045	76,385
2017	23,936	13,610	37,546	33,242	6,648	39,890	57,178	20,258	77,436
2018	24,122	13,693	37,815	33,907	6,781	40,688	58,029	20,474	78,503
2019	24,311	13,776	38,087	34,585	6,917	41,502	58,896	20,693	79,589
2020	24,500	13,860	38,360	35,277	7,055	42,332	59,777	20,915	80,692
2021	24,691	13,943	38,634	35,982	7,196	43,178	60,673	21,139	81,812
2022	24,884	14,026	38,910	36,702	7,340	44,042	61,586	21,366	82,952
2023	25,078	14,109	39,187	37,436	7,487	44,923	62,514	21,596	84,110
2024	25,274	14,192	39,466	38,184	7,637	45,821	63,458	21,829	85,287
2025	25,471	14,275	39,746	38,948	7,790	46,738	64,419	22,065	86,484
2026	25,669	14,358	40,027	39,727	7,945	47,672	65,396	22,303	87,699
2027	25,870	14,441	40,311	40,522	8,104	48,626	66,392	22,545	88,937
2028	26,071	14,524	40,595	41,332	8,266	49,598	67,403	22,790	90,193

2.4 EXISTING WATER DEMAND

2.4.1 Water User Profile

Billing data provided by the City of Naples lists water meters for the service area by size both inside and outside the City limits as of Fiscal Year 2006. This section uses billing data to provide a profile of water users within the City's water service area. The American Water Works Association (AWWA) meter equivalencies were used to estimate the number of ERUs usually associated with each meter size. **Table 2-8** shows the breakdown of total water meters by single family, multifamily and commercial classes broken down even further by location. **Table 2-9** presents the resulting ERUs from the meter data.

TABLE 2-8
2006 Water Meters

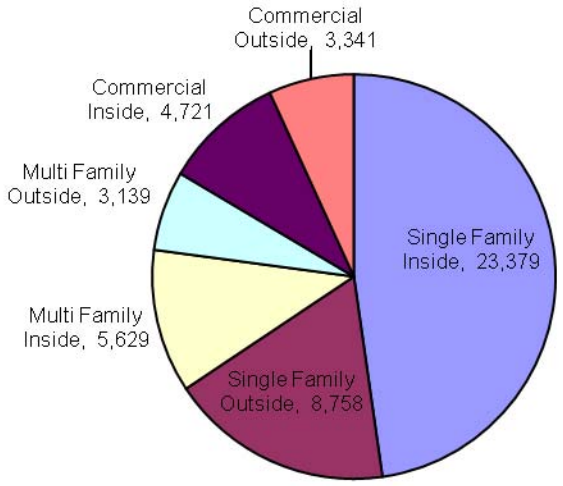
	Water Accounts								
	Single Family		Multi Family		Commercial		Total		
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Combined
5/8" x 3/4"	2,897	6,930	43	223	637	645	3,577	7,798	11,375
1"	1,664	659	122	72	247	262	2,033	993	3,026
1.5"	1,482	28	232	121	214	177	1,928	326	2,254
2"	1,110	5	294	167	200	84	1,604	256	1,860
3"	2	0	34	15	31	19	67	34	101
4"	0	0	33	17	10	2	43	19	62
6"	0	0	8	1	1	1	9	2	11
8"	0	0	0	1	0	1	0	2	2
Total	7,155	7,622	766	617	1,340	1,191	9,261	9,430	18,691

TABLE 2-9
2006 Water ERUs

	Water ERUs								
	Single Family		Multi Family		Commercial		Total		
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Combined
5/8" x 3/4"	2,897	6,930	43	223	637	645	3,577	7,798	11,375
1"	4,160	1,648	305	180	618	655	5,083	2,483	7,565
1.5"	7,410	140	1,160	605	1,070	885	9,640	1,630	11,270
2"	8,880	40	2,352	1,336	1,600	672	12,832	2,048	14,880
3"	32	0	544	240	496	304	1,072	544	1,616
4"	0	0	825	425	250	50	1,075	475	1,550
6"	0	0	400	50	50	50	450	100	550
8"	0	0	0	80	0	80	0	160	160
Total	23,379	8,758	5,629	3,139	4,721	3,341	33,729	15,238	48,966

The water user profile for the service area is illustrated in **Figure 2-4** based on the 2006 water billing data. As shown, the largest water use is single and multi family residential within the City limits.

Figure 2-4
The City of Naples
Water Customer Profile (ERUs)



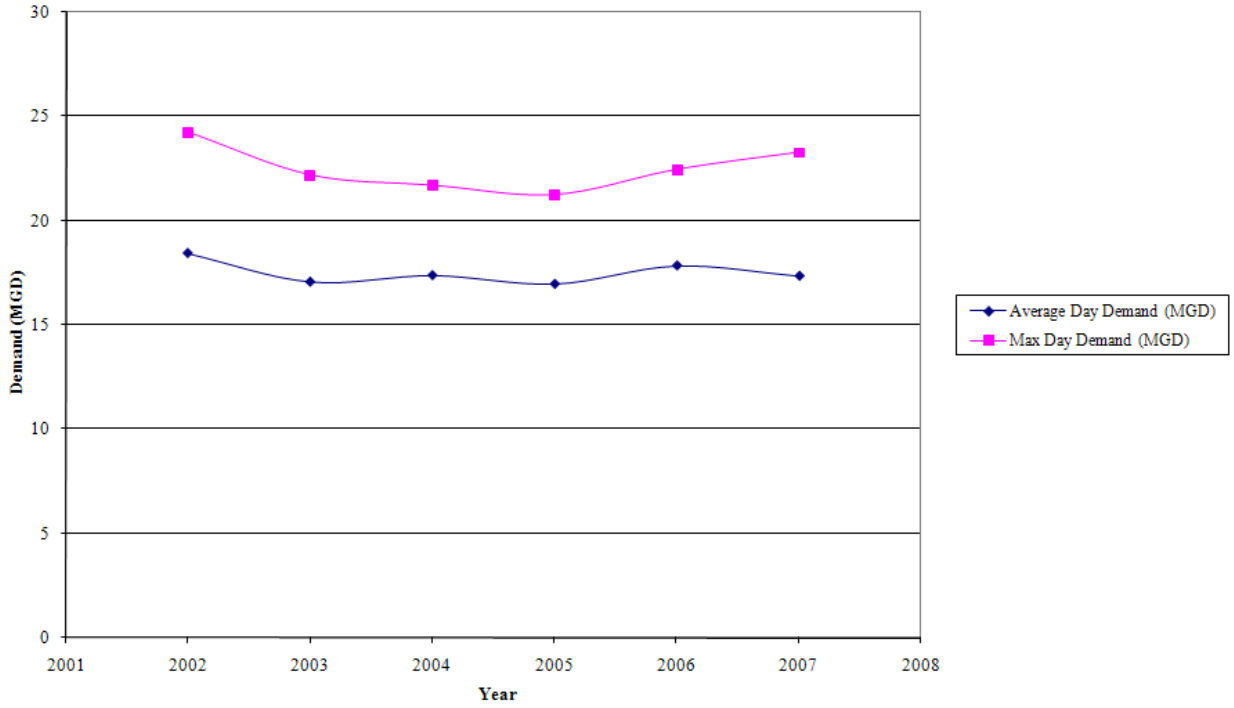
2.4.2 Historical Water Demands

Table 2-10 and **Figure 2-5** present historical water demand data from the City's water treatment plant.

TABLE 2-10
Historical Water Demand

Year	Population	Avg Demand (MGD)	Max Day Demand (MGD)	Max Day / Avg Day Factor	Average Per Capita Demand
2002	63,806	18.44	24.23	1.31	289
2003	64,502	17.08	22.18	1.30	265
2004	65,065	17.39	21.69	1.25	267
2005	65,670	16.98	21.24	1.25	259
2006	66,724	17.85	22.45	1.26	268
2007	68,212	17.36	23.27	1.34	255

Figure 2-5
Historical Water Demand Data



Based on the data, the average per capita water use within the service area was 267 gallons per day per capita (gpcd). The maximum ratio of maximum daily flow and average daily flow occurred in 2007 and was 1.34.

Irrigation accounts for a large component of the water demand within the City of Naples. Of the 267 gpcd, the majority of this water is used for irrigation. As such, the variation in gross per capita demand is driven by rainfall. A review of meter data indicates that irrigation represents approximately 65% of the total potable water use. Based on this percentage the potable water demand will be projected based on the following per capita numbers:

Average per capita water demand:	270 gpcd
Average per capita potable demand:	95 gpcd
Average per capita irrigation demand:	175 gpcd

In discussions with the South Florida Water Management District and Big Cypress Basin about the renewal of the City's consumptive use permit, it has been communicated that use of non-

alternative water supply sources such as the City's existing wellfields must be below 200 gpcd. This will require the expansion of alternative water supply sources within the City of Naples.

2.5 PROJECTED WATER DEMAND

Water demand was projected based on the population and per capita water demands presented in this section. **Table 2-12** shows the projected water demand, not including existing reclaimed water irrigation demand.

TABLE 2-12
Projected Non-Reclaimed Water Demand

		Potable Demand			Irrigation Demand (Non-Reclaimed)			Total Demand (Non—Reclaimed)			
	Population	GPCD	Avg. Day (MGD)	Max Day (MGD)	GPCD	Avg. Day (MGD)	Max Day (MGD)	Avg Day (MGD)	Max Day (MGD)	MDD/ADD	GPCD
2008	68,551	95	6.51	8.73	175	12.00	16.08	18.51	24.80	1.34	270
2009	69,486	95	6.60	8.85	175	12.16	16.29	18.76	25.14	1.34	270
2010	70,440	95	6.69	8.97	175	12.33	16.52	19.02	25.49	1.34	270
2011	71,392	95	6.78	9.09	175	12.49	16.74	19.28	25.83	1.34	270
2012	72,360	95	6.87	9.21	175	12.66	16.97	19.54	26.18	1.34	270
2013	73,342	95	6.97	9.34	175	12.83	17.20	19.80	26.54	1.34	270
2014	74,342	95	7.06	9.46	175	13.01	17.43	20.07	26.90	1.34	270
2015	75,352	95	7.16	9.59	175	13.19	17.67	20.35	27.26	1.34	270
2016	76,385	95	7.26	9.72	175	13.37	17.91	20.62	27.64	1.34	270
2017	77,436	95	7.36	9.86	175	13.55	18.16	20.91	28.02	1.34	270
2018	78,503	95	7.46	9.99	175	13.74	18.41	21.20	28.40	1.34	270
2019	79,589	95	7.56	10.13	175	13.93	18.66	21.49	28.80	1.34	270
2020	80,692	95	7.67	10.27	175	14.12	18.92	21.79	29.19	1.34	270
2021	81,812	95	7.77	10.41	175	14.32	19.19	22.09	29.60	1.34	270
2022	82,952	95	7.88	10.56	175	14.52	19.45	22.40	30.01	1.34	270
2023	84,110	95	7.99	10.71	175	14.72	19.72	22.71	30.43	1.34	270
2024	85,287	95	8.10	10.86	175	14.93	20.00	23.03	30.86	1.34	270
2025	86,484	95	8.22	11.01	175	15.13	20.28	23.35	31.29	1.34	270
2026	87,699	95	8.33	11.16	175	15.35	20.57	23.68	31.73	1.34	270
2027	88,937	95	8.45	11.32	175	15.56	20.86	24.01	32.18	1.34	270
2028	90,193	95	8.57	11.48	175	15.78	21.15	24.35	32.63	1.34	270

2.5.1 Reclaimed Water Demand

In addition to the water demands presented above, the existing reclaimed water demands should be factored into the total irrigation water demand projections**. Table 2-13** presents the historic reclaimed water demand as well as the average quantity of water discharged to the Gordon River.

TABLE 2-13
Historical Reclaimed Water Demand and Gordon River Discharge Data

Year	Annual Average River Discharge (MGD)	Annual Average Reuse (MGD)
2000	1.10	6.10
2001	0.99	5.63
2002	2.92	4.29
2003	2.35	4.77
2004	1.79	4.99
2005	1.73	5.51
2006	1.05	5.79
2007	0.70	5.67
Average	1.58	5.34

The existing reclaimed water demand will continue over the 20-year planning period of this study, and the existing river discharge will be utilized in the future to offset projected irrigation demands listed in the previous section.

2.5.2 Total Potable and Irrigation Water Demand

Total potable and irrigation water demand projects are illustrated in **Table 2-14**. These demands include the irrigation demands projected based on irrigation water use included in the existing potable demand as well as the existing reclaimed water use. As illustrated in the table, it is estimated that on an average day basis, the City's total water demand will grow from 23.85 MGD to 29.69 MGD in the 20 year planning period, and that on a maximum day basis, the City's total water demand will grow from 31.96 MGD to 39.79 MGD. Over the planning period, the total water demand includes approximately 30% potable demand and 70% irrigation water demand. The percentage of irrigation water is higher than the 65% previously mentioned because of the inclusion of the existing reclaimed water use.

TABLE 2-14
Total Potable and Irrigation Water Demands

Year	Potable Demand		Irr. Demand (Inc. Existing Reclaimed)		Total Base Demand		Planned Facility
	Avg. Day (MGD)	Max Day (MGD)	Avg. Day (MGD)	Max Day (MGD)	Avg Day (MGD)	Max Day (MGD)	Capacity (MGD)
2008	6.51	8.73	17.34	23.23	23.85	31.96	38
2009	6.60	8.85	17.50	23.45	24.10	32.30	39
2010	6.69	8.97	17.67	23.67	24.36	32.64	39
2011	6.78	9.09	17.83	23.90	24.62	32.99	40
2012	6.87	9.21	18.00	24.12	24.88	33.34	40
2013	6.97	9.34	18.17	24.35	25.14	33.69	40
2014	7.06	9.46	18.35	24.59	25.41	34.05	41
2015	7.16	9.59	18.53	24.83	25.69	34.42	41
2016	7.26	9.72	18.71	25.07	25.96	34.79	42
2017	7.36	9.86	18.89	25.31	26.25	35.17	42
2018	7.46	9.99	19.08	25.56	26.54	35.56	43
2019	7.56	10.13	19.27	25.82	26.83	35.95	43
2020	7.67	10.27	19.46	26.08	27.13	36.35	44
2021	7.77	10.41	19.66	26.34	27.43	36.76	44
2022	7.88	10.56	19.86	26.61	27.74	37.17	45
2023	7.99	10.71	20.06	26.88	28.05	37.59	45
2024	8.10	10.86	20.27	27.16	28.37	38.01	46
2025	8.22	11.01	20.47	27.44	28.69	38.45	46
2026	8.33	11.16	20.69	27.72	29.02	38.89	47
2027	8.45	11.32	20.90	28.01	29.35	39.33	47
2028	8.57	11.48	21.12	28.31	29.69	39.79	48

Table 2-14 includes a recommended planned facility capacity. This value was calculated by taking the projected maximum day demand and adding 20%. There are many reasons that it is recommended that the City have some excess capacity planned into its water supply facilities. First, water supply projects take a minimum of 5 years to develop, construct and place into service. Second as mentioned previously in this section, the planning study found in the appendix of this report projected a higher rate of growth than included in this water supply plan. Because these growth projections were much higher than those found in the Lower West Coast Water Supply plan, it would not be feasible to obtain a consumptive use permit based on these numbers. However, it is recommended that the City build some additional capacity into planned water supply projects and reevaluate population growth trends at least every five (5) years. Finally, water demand is highly dependent on rainfall, and building some excess capacity into proposed facilities will help to ensure that the City has adequate water supply during drought conditions.

It is clear from the data that irrigation water demand is the largest component of existing water use. Over time, irrigation water demand within the City is projected to reach 28.31 MGD while potable water demand is projected to be only 11.48 MGD. As such, it is prudent to seek alternative lower quality water sources to meet projected irrigation needs and preserve high quality groundwater supplies for potable uses.

As mentioned earlier in this section, the City will be required by the South Florida Water Management district to seek alternative water supply sources for water demands greater than 200 gpcd over the 20-year planning period. Based on this restriction, use of the existing wellfield would be limited to 24 MGD on a maximum day demand basis. All other water supply needs would have to be met with alternative water supply sources.

2.5.3 Projected Reclaimed Water Available

Wastewater flow and reclaimed water availability was projected for the 20-year planning period utilizing the same TAZ and planning data discussed earlier in this section. Table 2-15 shows the historic wastewater flow, population and per capita information.

TABLE 2-15
Historical Wastewater Flow Data

Year	Population	Wastewater Flow (MGD)	Average Per Capita Flow (gpcd)
2002	41,753	6.90	165
2003	42,020	7.08	168
2004	42,264	6.80	161
2005	42,622	7.24	170
2006	42,904	6.83	159
2007	43,361	6.36	147

The per capita wastewater flow has gone down over time which is the result of the City's on going program to address inflow and infiltration in the wastewater collection system. This trend in reduced wastewater flow per capita will likely continue, and has been considered in the projected reclaimed water availability over the 20 year planning period. The wastewater flow and reclaimed water availability over the 20 year planning period was projected based on a starting per capita wastewater flow of 150 gpcd and an ending per capita wastewater flow of 140 gpcd. Table 2-16 shows the projected wastewater flow and reclaimed water availability.

TABLE 2-16
Projected Wastewater Flow and Reclaimed Water Availability

	Population	GPCD	Projected Avg. Wastewater / Reclaimed Water Flow (MGD)
2008	43,769	150	6.57
2009	44,207	150	6.63
2010	44,655	145	6.48
2011	45,091	145	6.54
2012	45,534	145	6.60
2013	45,980	145	6.67
2014	46,432	140	6.50
2015	46,885	140	6.56
2016	47,347	140	6.63
2017	47,818	140	6.69
2018	48,293	140	6.76
2019	48,774	140	6.83
2020	49,261	140	6.90
2021	49,753	140	6.97
2022	50,251	140	7.04
2023	50,755	140	7.11
2024	51,266	140	7.18
2025	51,782	140	7.25
2026	52,303	140	7.32
2027	52,833	140	7.40
2028	53,368	140	7.47

During the 20 year planning period, it is projected that an average of 7.5 MGD and a maximum of 9 MGD of reclaimed water will be available for use as an alternative water supply. Based on this and per capita limits on the existing wellfields, the 20 year planned facility capacity of 48 MGD will be met with the following water supply sources:

Existing Wellfields:	24 MGD
Reclaimed Water:	9 MGD
New Alternative Water Supply Sources:	15 MGD
Total Facility Capacity	48 MGD

New alternative water supply sources to meet the projected need of 15 MGD will be identified later in this report.

SECTION 3

WATER SUPPLY SOURCES

3.1 GENERAL

There are four (4) potential sources of water that can be used to satisfy the potable and irrigation water demands for the City of Naples. These water supply sources include:

- Ground Water – Potable and Irrigation
- Reclaimed Water – Irrigation Only
- Surface Water – Potable and Irrigation
- Storm Water – Irrigation Only

Data for each potential source was collected from technical publications and reports for the area and those relevant reports prepared for the City. Available groundwater quality and quantity data from the City's water plant records, SFWMD, USGS, Big Cypress Basin, and Collier County were reviewed and utilized to identify groundwater supply sources. The existing surficial aquifer wells that can be utilized to supplement irrigation water and brackish groundwater sources for potable water supply were also identified in the study. Data from the City's reclaimed water aquifer storage and recovery (ASR) program was also used to identify future ASR locations and potential brackish groundwater supply sources and quality.

The City of Naples Stormwater Master Plan was used to review stormwater collection and routing. The stormwater analysis focused on existing stormwater pumping facilities as key locations for capturing stormwater as an alternative water supply source for irrigation. Available surface water quality and quantity data was utilized to identify key locations for supplementing irrigation water with surface water.

3.2 GROUND WATER

The ground water supply in an area is affected by multiple factors including, but not limited to, precipitation, evapotranspiration, recharge and discharge from various aquifers, the hydrogeologic parameters of the geologic units, the lithology, and the proximity of lower quality waters, i.e. seawater. An understanding of the geologic and hydrogeologic conditions in the area is presented to better understand the potential water supply sources that can be utilized to provide either potable or irrigation water to the City.

3.2.1 Geology and Hydrogeology

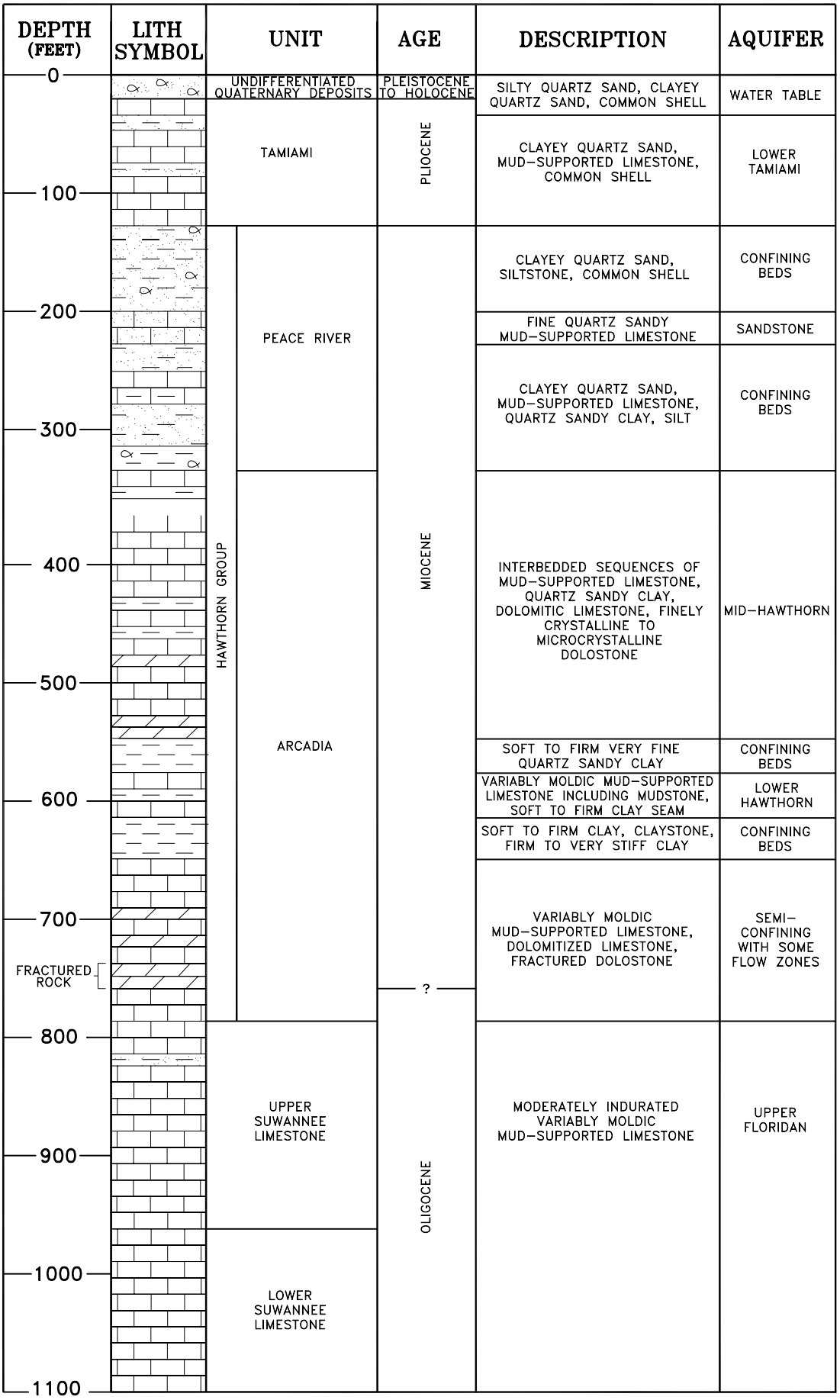
The general geology and hydrogeology of the Naples area is similar to that encountered in the ASR exploratory test well (EW-1) presented in **Figure 3-1**. The hydro geologic system in Collier County is a multi-layered system consisting of six distinct producing zones, which are in descending order to the lowermost unit:

- Unconfined surficial aquifer (water table aquifer)
- Lower Tamiami aquifer
- Sandstone aquifer
- Mid-Hawthorn aquifer
- Lower Hawthorn aquifer
- Upper Floridan aquifer

As described by Knapp, et al (1986), the surficial aquifer system nomenclature is used for the water table and hydraulically connected aquifers lying above the top of the laterally extensive beds of lower permeability found in the Hawthorn Group. The surficial aquifer system is divided into two aquifers, the water table and Lower Tamiami. They are separated by the leaky Tamiami confining zone. The base of the Lower Tamiami aquifer is formed by the lower permeability Upper Hawthorn confining zone. The surficial aquifer system is up to 250 feet thick in central Collier County, thins to about 50 feet along the northern County boundary, and is about 120 feet thick in EW-1.

The water table aquifer extends from near land surface to the top of the Tamiami confining zone. It is composed of generally fine to medium grained, well-sorted quartz sands with minor amounts of shell and organics. Below these uppermost beds and to the top of the Tamiami confining beds are sandy biogenic limestones of the Tamiami Formation that can, in many areas produce large quantities of water. Well cemented and low permeability limestone occurs locally as a cap rock over the top of the Tamiami Formation. Although of low primary permeability, fracturing has created a high secondary permeability, which helps vertical recharge. Ranges of transmissivity, storage and leakance (where semi-confined) of the water table are 1.2×10^{3} gpd/ft to 2×10^{6} gpd/ft; 2.0×10^{-4} to 3×10^{-1} (dimensionless); and 4.7×10^{-7} day-1 to 5.1×10^{-1} day^{-1}, respectively. Transmissivity is generally lower along the coast because the aquifer is composed of fine-grained clastic deposits. In the central portion of the County, the aquifer is highly porous and has highly clastic carbonate facies, producing transmissivities between 100,000 gpd/ft to 300,000 gpd/ft.

Hydraulically separating the water table and Lower Tamiami aquifers are the Tamiami confining beds. These low permeability poorly indurated limestones, dolosilts and calcareous sandy clays



G:\Hydro\NAPLES\Water Supply Feasibility\Hydrocolumn_BW.dwg

Plotted: May 07, 2008 – 3:35pm by chad.sanford

Source: Water Resource Solutions, 2007

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STRATIGRAPHIC COLUMN - ASR TEST WELL (EW-1)
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE 3-1

retard the vertical movement of water and are referred to as "semi-confining" or "leaky" layers. Leakance is between 1.0 x 10^{-4} and 1 x 10^{-1} day^{-1}.

The Lower Tamiami aquifer is a major producer of good quality water in Collier County and is the main aquifer for the City of Naples. The yield of the aquifer decreases as sand content increases near the base of the unit due to poorly sorted clastic facies and the presence of silt and micrite, reducing the effective porosity. The thickness of the limestone sequence thickens along the coast. The top of the Lower Tamiami aquifer occurs between sea level and 100 feet below NGVD. Paralleling Alligator Alley, it is about 200 feet thick and over 75 feet thick in most other areas. The range of hydraulic parameters, as obtained from aquifer or well tests, for transmissivity, storage and leakance are 6 x 10^{4} gpd/ft to 1.5 x 10^{6} gpd/ft, 4.0 x 10^{-5} to 1.8 x 10^{-1} (dimensionless), 3.3 x 10^{-5} day^{-1} to 1.5 x 10^{-1} day^{-1}, respectively.

In general, the intermediate aquifer system/confining unit acts to confine the underlying Floridan aquifer system. The intermediate aquifer system/confining unit is composed predominately of low permeability clays, dolosilts, limestones, and mixtures of these lithologies. Highly permeable limestones and dolomites are present and water within them is under artesian conditions. Two aquifers are delineated and discussed in this report. These are the Sandstone aquifer, which is relatively thin and discontinuous, and the mid-Hawthorn aquifer, which underlies all of the study area. These two aquifers are isolated from adjacent water bearing strata above and below by clayey dolosilts and low permeability limestones.

The upper Hawthorn confining zone is comprised of low permeability beds in the uppermost part of the Hawthorn Group. It is composed of low permeability, phosphate clayey dolosilts and sands, which separate the Lower Tamiami aquifer from the Sandstone aquifer, where present. The Hawthorn confining zone averages about 30 feet thick, but can be up to 80 feet thick. In southern Collier County the underlying Sandstone aquifer pinches out and Hawthorn confining zone lies directly on the mid-Hawthorn Confining zone. Where this occurs, they are termed the upper Hawthorn confining bed. Leakance of the Upper Hawthorn confining zone, primarily derived from tests conducted on lower aquifer ranges from 3 x 10^{-5} day^{-1} to 1.5 10^{-4} day^{-1}.

Lithologically, the Sandstone aquifer is composed of sandy limestone, sandstones, sandy dolomites, and calcareous sands confined above and below by clayey dolosilts. Individual beds of sandstone and limestone are highly permeable where intergranular and moldic porosities are well developed. The beds are sometimes interbedded with poorly indurated limestone and clayey dolosilt, creating several producing zones. The aquifer dips gently to the southeast from the Lee-Collier County boundary and ranges from 100 feet below NGVD in that area to 300 feet below NGVD near Alligator Alley (U.S. Highway 84). As the unit dips to the southeast, it gradually thins and is absent south of Alligator Alley and in western Collier County. The

thickest sequences of the aquifer were identified from well logs west of Immokalee and along Highway 846. In EW-1, the Sandstone aquifer was encountered around 200 ft below land surface and was approximately 25 feet thick. Transmissivity ranges in five tests, from 6,000 gpd/ft to 110,000 gpd/ft. Storage in those same tests range from 3.0×10^{-5} to 1.5×10^{-4}.

The mid-Hawthorn confining zone is composed of a relatively thick sequence of clayey dolosilts locally interbedded with thin seams of porous limestone, sand, and dolomites. The unit effectively separates the mid-Hawthorn aquifer from overlying aquifers. A rubble bed of very coarse phosphate and quartz sand that can be traced through characteristic geophysical signatures throughout most of the lower west coast is present at the base of this zone. Thin seams of limestone, sand, and dolomite are locally capable of producing small quantities of water under artesian pressure. They are, however, not considered a significant source and are cased off in wells tapping underlying aquifers. Leakance of this zone is very low. Two aquifer tests were conducted and yielded estimates of leakance as 1.3×10^{-6} and 1.7×10^{-4} day^{-1}, forming a relatively low permeability zone between the Sandstone and mid-Hawthorn aquifers. In EW-1, the mid-Hawthorn confining zone is approximately 100 feet thick.

The term "mid-Hawthorn aquifer" was applied as described by others to the phosphatic limestones and dolomites lying below a regional disconformity in Lee County, Florida. This aquifer has been referred to as the "upper Hawthorn aquifer" by the U.S. Geological Survey. This aquifer is present throughout the lower west coast, and in many areas it is capable of producing significant quantities of water. Lithologically, the unit consists of sandy and phosphatic limestones and dolomites, which exhibit intergranular, moldic, and possible fracture and solution porosity. The reworked zone at the base of the overlying confining zone may in some areas be a part of the aquifer. The mid-Hawthorn aquifer is interbedded with lower permeability beds of dolosilt and poorly indurated limestone. The aquifer dips to the east-southeast from a high of 150 feet below NGVD in central Lee County. In Collier County the unit occurs between 300 and 400 feet below NGVD. The aquifer averages about 100 feet in thickness. In EW-1, the top of the mid-Hawthorn aquifer occurs at about 320 feet below land surface and its thickness is approximately 200 feet. Three aquifer tests on the mid-Hawthorn aquifer are reported by Knapp, et al. Transmissivity ranged from 18,000 to 70,000 gpd/ft and storage from 5.0×10^{-5} to 9.0×10^{-3}.

Below the mid-Hawthorn aquifer lie the lower Hawthorn confining beds and the lower Hawthorn aquifer. The lower Hawthorn confining bed consists of quartz sandy clay to soft to firm clay, claystone, and stiff clay. The lower Hawthorn aquifer consists of variably moldic mudstone and mud-supported limestone. The thickness of the lower Hawthorn aquifer in EW-1 was approximately 40 feet.

The upper Floridan aquifer lies beneath the lower Hawthorn confining beds. The permeable units at the base of Arcadia Formation of the Hawthorn Group which consist of sandy limestone and calcareous sandstone are commonly included within the upper Floridan aquifer. The formation below the Hawthorn Group is the Suwannee Limestone. The Suwannee Limestone consists of moderately indurated, variably moldic limestone in EW-1. Generally, the Suwannee Limestone is a fossiliferous, medium grained calcarenite with minor amounts of quartz sand. The lower part of the Suwannee Limestone has contains more fine-grained, phosphatic, clastic material and interbeds of micrite and clay (Reese, 2000). The thickness of the Suwannee Limestone is commonly 300 to 400 feet in Lee and western Collier Counties. The test well EW-1 penetrated about 300 feet of the Suwannee Limestone. The transmissivity of the lower Hawthorn/upper Suwannee aquifer interval in a nearby test in Collier County was about 110,000 gpd/ft (Missimer, 1991).

3.2.2 Ground Water Quality

The City of Naples pumps fresh ground water from the Lower Tamiami aquifer, treats the raw water through the lime softening process, and provides the finished potable water to its customers. The City pumps 30 wells from the Coastal Ridge wellfield and 22 wells from the East Golden Gate wellfield to meet its water demands. **Tables 3-1** and **3-2** list the wells, construction dates and specifications, design flows, most recent actual flow measured, and well status for the Coastal Ridge wellfield and the East Golden Gate wellfield, respectively. **Figures 3-2** and **3-3** show the well locations for the Coastal Ridge wellfield and East Golden Gate wellfield, respectively. The water quality from the City's existing wells meets the state's primary and secondary drinking water standards. Chloride concentrations for wells within both wellfields can be found in **Appendix D**. The saltwater intrusion monitoring wells for the Coastal Ridge Wellfield had an average chloride concentration in 2007 of 77 mg/L. The chloride concentration for the East Golden Gate wellfield in January 2001 was 33 mg/L.

The analytical laboratory results for water quality samples collected within the last ten years in the local aquifers from the water table aquifer to the lower Floridan aquifer are presented in Table 3-3. The locations of the sampled wells are depicted in **Figure 3**-4. The table identifies the station ID, the depth of well sampled, the aquifer(s) sampled, the average chloride result, the most recent chloride result, the sample date, the water type, and the source of the data. The water types are divided into three rough groups:

1) Fresh – water containing less than 1,000 mg/L total dissolved solids concentration
2) Brackish – water containing between 1,000 and 10,000 mg/L total dissolved solids concentration
3) Saline – water containing greater than 10,000 mg/L total dissolved solids concentration

TABLE 3-1
Coastal Ridge Wellfield Summary

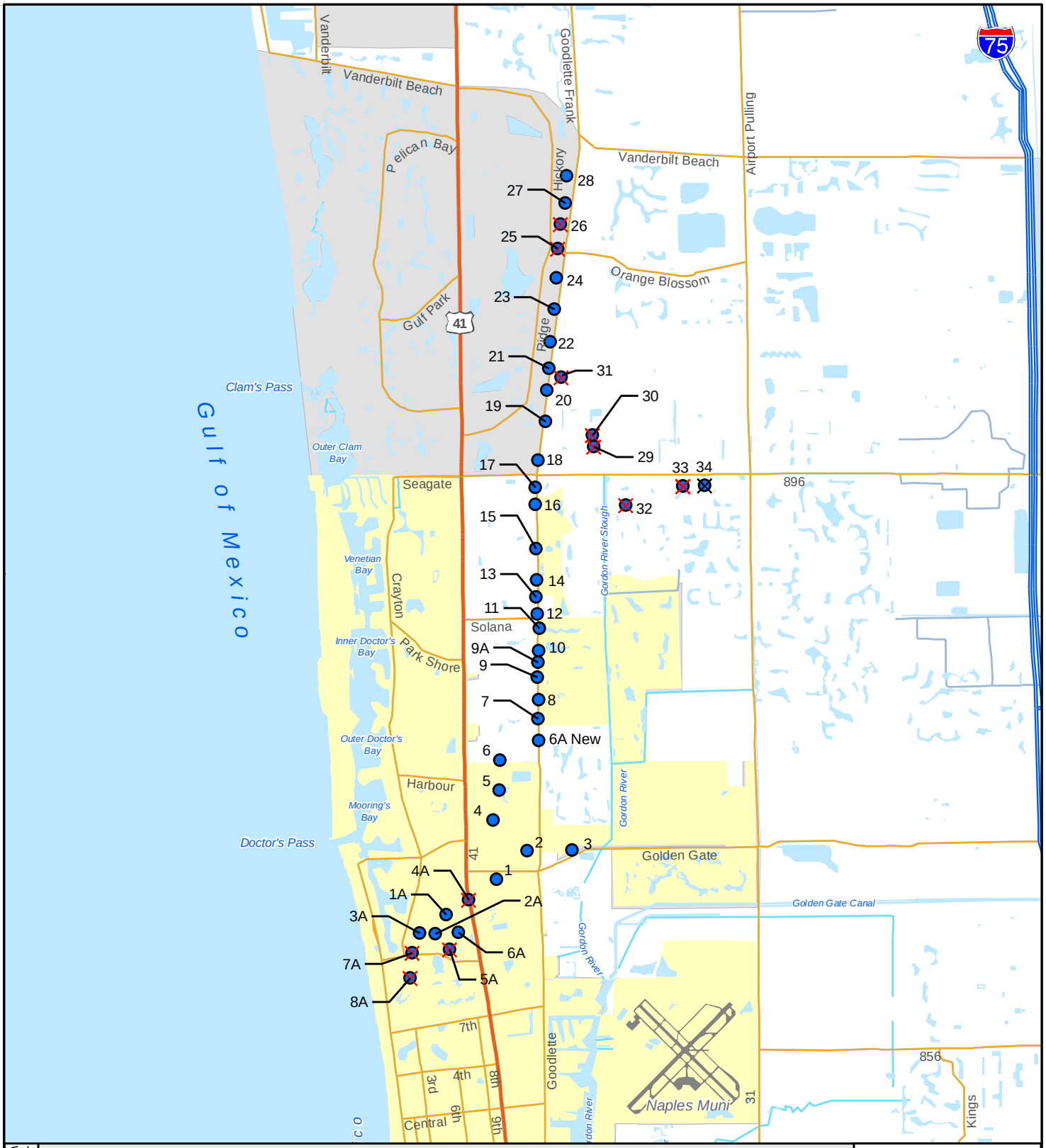
Well No.	Installation Date	Casing Diameter (in)	Total Depth (ft)	Casing Depth (ft)	Design Flow (gpm)	Recent Actual Flow (gpm)	Well Status
1	1958	8	90	56	350	250	On-line
1a	1953	6	96	85	350	980	On-line
2	1958	8	87	57	350	187	On-line
2a	1976	8	85	58	350	460	On-line
3	1958	8	89	56	350	283	On-line
4	1962	8	82	53	350	145	On-line
5	1962	8	82	53.5	350	346	On-line
6	1962	8	82	51	350	274	On-line
6a	2002	8	80	48	350	295	On-line
7	1964	8	89	59.5	350	194	On-line
8	1964	8	80	59	350	269	On-line
9	1964	8	87	63	350	187	On-line
9a	2002	8	80	52	350	304	On-line
10	1964	8	87	53.5	350	312	On-line
11	1965	8	80	64	350	190	On-line
12	1965	8	83	63	350	530	On-line
13	1965	8	83	63	350	280	On-line
14	1965	8	83	64	350	260	On-line
15	1965	8	83	64	350	312	On-line
16	1968	10	80	Unk	350	263	On-line
17	1969	10	85	61	350	153	On-line
18	1969	10	85	61	350	315	On-line
19	1969	10	85	61	350	257	On-line
20	1969	10	85	62	350	336	On-line
21	1969	10	85	61	350	437	On-line
22	1969	10	85	61	350		Abandoned
23	1971	10	85	61	350	460	On-line
24	1971	10	85	63	350	340	On-line
25	1971	10	85	62	350		Abandoned
26	1971	10	85	62	350		Abandoned
27	1971	8	85	61	350	305	On-line
28	1971	8	85	61	350	130	On-line
29	1974	8	Unk	61	350		Abandoned
30	1974	8	Unk	61	350		Abandoned
31	1974	8	Unk	61	350		Abandoned
32	1974	8	Unk	61	350		Abandoned
33	1974	8	Unk	61	350		Abandoned
34	1974	8	Unk	61	350		TBA
37(3A)	1954	6	76	55	350		Possible Blend
38(4A)	1956	6	73	50	350		Abandoned
39(5A)	1956	6	Unk	Unk	350		Abandoned
41(7A)	1968	10	85	70	350		Abandoned
42(8A)	1968	10	86	67.8	350		Abandoned

TBA – To Be Abandoned
Unk – Unknown

TABLE 3-2
East Golden Gate Well Summary

Well No.	Installation Date	Casing Diameter (in)	Total Depth (ft)	Casing Depth (ft)	Design Flow (gpm)	Recent Actual Flow (gpm)	Well Status
1	1978	14	71	42	500	1,060	On-line
2	1978	14	93	47.5	500	440	On-line
3	1978	14	80	39	500	616	On-line
4	1978	14	81	42	700	820	On-line
5	1978	14	98	42	900	1202	On-line
6	1978	14	101	42	500	809	On-line
7	1978	14	109	47	900	430	On-line
8	1978	14	133	42	900	947	On-line
9	1978	14	82	42	700	692	On-line
10	1978	14	131	42	700	642	On-line
11	1981	14	112	37	600	364	On-line
12	1981	14	100	37	700	456	On-line
13	1981	14	100	40	700	785	On-line
14	1981	14	80	38	700	235	On-line
16	1981	14	137	39	1,000	843	On-line
17	1981	14	117	40	1,000	715	On-line
18	1981	14	100	39	1,000	832	On-line
19	1985	14	85	42	1,000	1,190	On-line
20	1985	14	86	46	1,000	1,148	On-line
21	1985	14	78	51	700	1,041	On-line
22	1988	14	80	60	350		TBA
23	1988	14	75	59	750	960	On-line
24	1988	14	85	55	400	322	On-line
25	TBD	16	80	50	1,000		Proposed
26	TBD	16	80	50	1,000		Proposed

TBA – To Be Abandoned
TBD – To Be Determined



LEGEND

City of Naples City Limits

Coastal Ridge Wellfield

Abandoned Well

Well To Be Abandoned

N

0 5,000 Feet

TETRA TECH

COASTAL RIDGE WELLFIELD MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE 3 - 2

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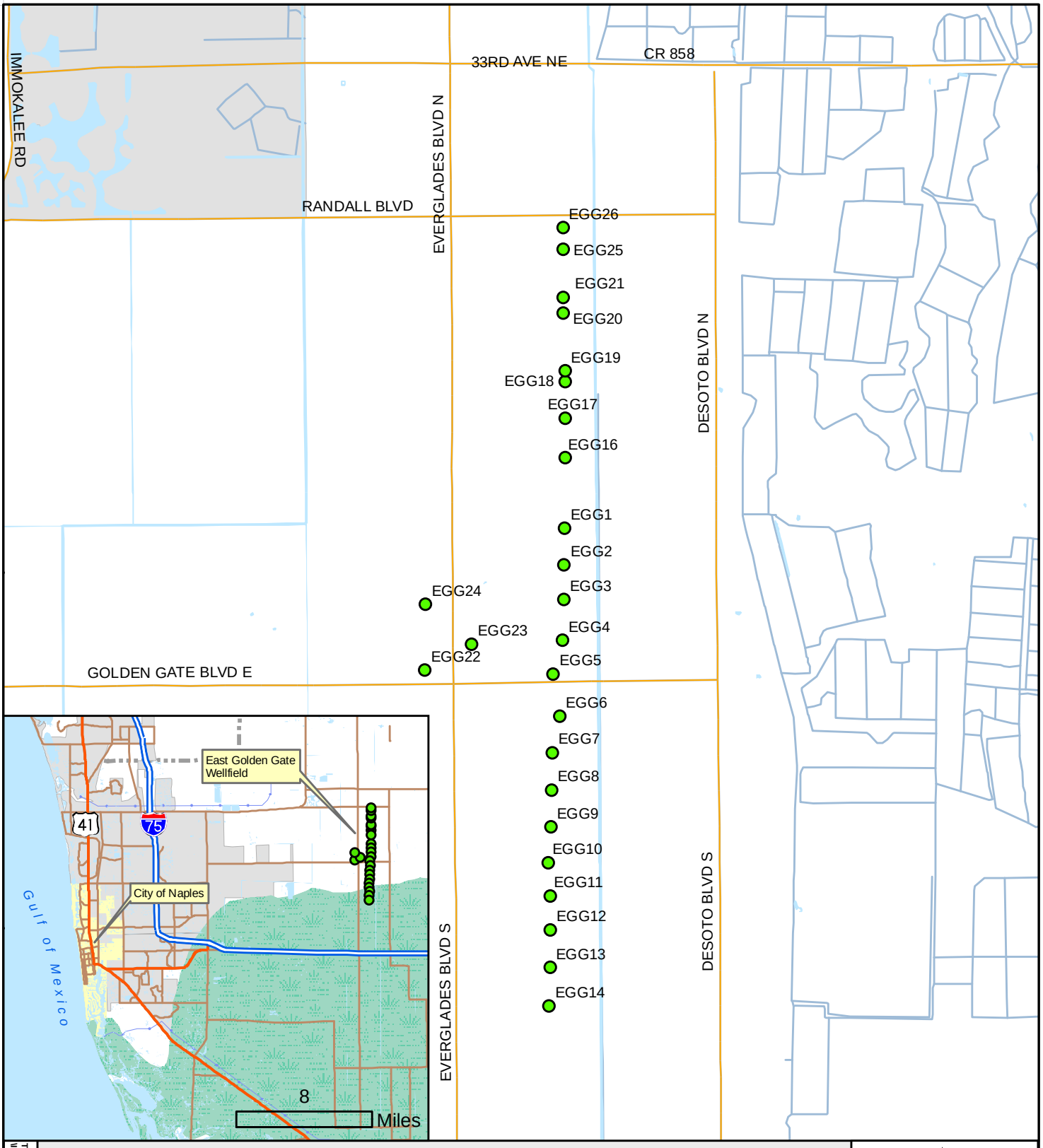

LEGEND

East Golden Gate Wellfield

City of Naples City Limits

N

0 5,000 Feet

TETRA TECH

EAST GOLDEN GATE WELLFIELD MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE 3 - 3

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TABLE 3-3
Groundwater Quality Data

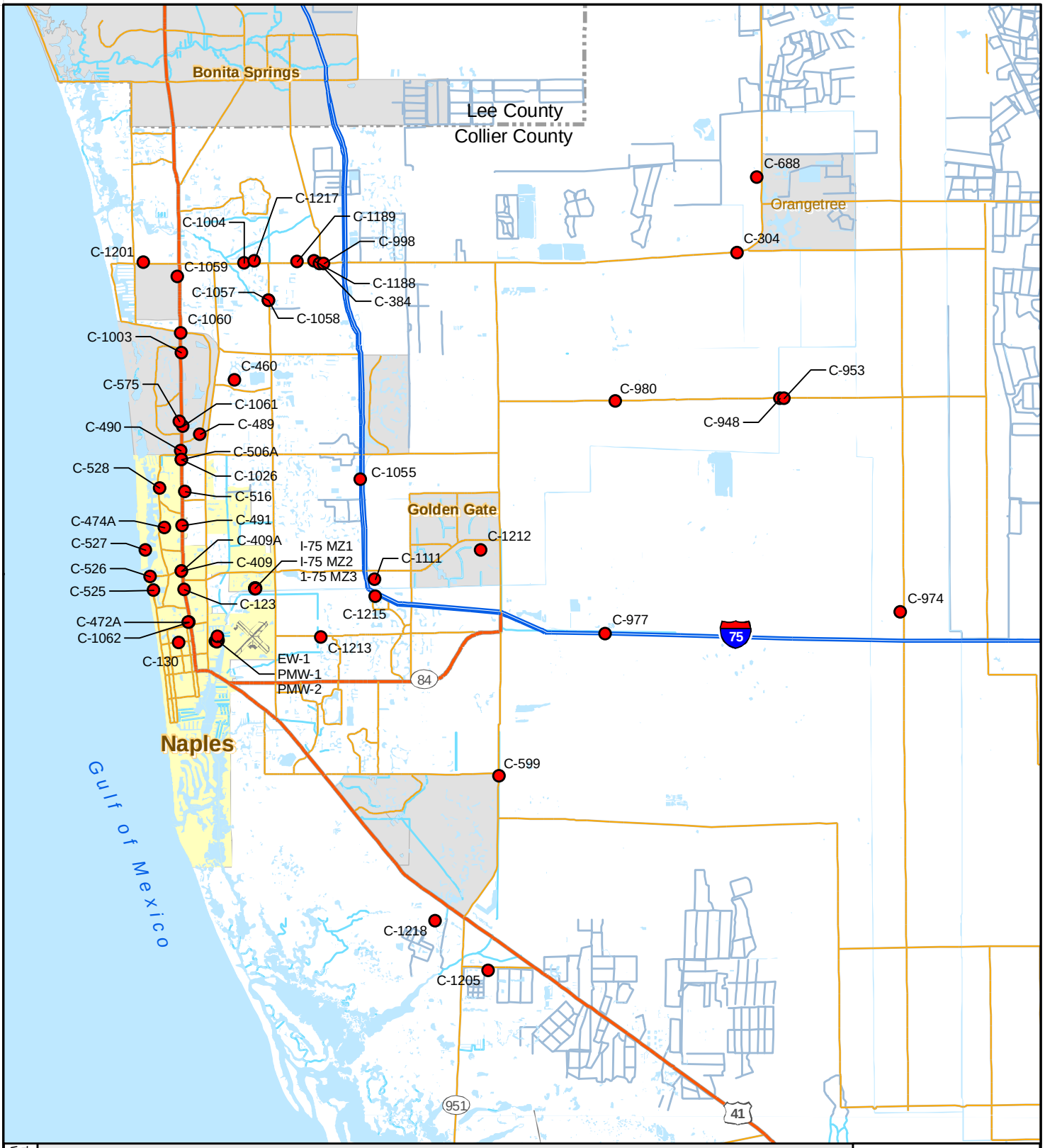
WELL/ STATION ID	DEPTH (ft)	AQUIFER	AVERAGE CHLORIDE (mg/L)	MOST RECENT CHLORIDE (mg/L)	MOST RECENT SAMPLE DATE	WATER TYPE	SOURCE
BC23	0.3	Water Table	35	47	Oct-06	Fresh	SFWMD DBHYDRO
C-409	16	Water Table	--	39	May-99	Fresh	USGS WRIR 01
C-953	40	Water Table	--	22	Apr-00	Fresh	USGS WRIR 01-4159
C-1026	38	Water Table	--	65	Apr-99	Fresh	USGS WRIR 01-4159
C-1057	20	Water Table	--	43	May-99	Fresh	USGS WRIR 01-4159
C-1059	25	Water Table	50	24	Apr-04	Fresh	USGS WRD 2004 VOL. 2B
C-1060	25	Water Table	--	48	May-99	Fresh	USGS WRIR 01-4159
C-1061	25	Water Table	65	92	Apr-04	Fresh	USGS WRD 2004 VOL. 2B
C-1062	24	Water Table	--	91	May-99	Fresh	USGS WRIR 01-4159
C-1217	29	Water Table	--	140	May-00	Fresh	USGS WRIR 01-4159
C-1218	11	Water Table	--	290	May-00	Fresh	USGS WRIR 01-4159
C-384, C-490, C-599, C-1055, C-1057, C-1003 & C-980	15	Water Table	32	--	Jan-98	Fresh	LWCWSP
PMW-1	16	Water Table	3,137	5,880	Aug-07	Saline	ASR PILOT STUDY EW-1 COMPLETION REPORT
PMW-2	16	Water Table	--	240	Aug-07	Fresh	ASR PILOT STUDY EW-1 COMPLETION REPORT
C-123	157	Lower Tamiami	--	24	May-99	Fresh	USGS WRIR 01
C-130	72	Lower Tamiami	--	74	May-99	Fresh	USGS WRIR 01
C-304	130	Lower Tamiami	--	46	Apr-00	Fresh	USGS WRIR 01
C-409A	73	Lower Tamiami	--	25	May-99	Fresh	USGS WRIR 01
C 460	66	Lower Tamiami	34	50	Apr-04	Fresh	USGS WRD 2004 VOL. 2B
C-472A	70	Lower Tamiami	--	65	May-00	Fresh	USGS WRIR 01-4159
C-474A	72	Lower Tamiami	--	120	May-99	Fresh	USGS WRIR 01-4159

TABLE 3-3
Groundwater Quality Data (CONT'D.)

WELL/ STATION ID	DEPTH (ft)	AQUIFER	AVERAGE CHLORIDE (mg/L)	MOST RECENT CHLORIDE (mg/L)	MOST RECENT SAMPLE DATE	WATER TYPE	SOURCE
C 489	83	Lower Tamiami	56	76	Apr-04	Fresh	USGS WRD 2004 VOL. 2B
C-490	71	Lower Tamiami	--	15	Apr-99	Fresh	USGS WRIR 01-4159
C-491	71	Lower Tamiami	--	16	Jun-00	Fresh	USGS WRIR 01-4159
C-506A	71	Lower Tamiami	--	23	May-99	Fresh	USGS WRIR 01
C 516	63	Lower Tamiami	26	30	Apr-04	Fresh	USGS WRD 2004 VOL. 2B
C-525	83	Lower Tamiami	--	700	Apr-00	Brackish	USGS WRIR 01-4159
C 526	68	Lower Tamiami	2,840	3,500	Apr-04	Brackish	USGS WRD 2004 VOL. 2B
C-527	72	Lower Tamiami	--	8,300	May-00	Saline	USGS WRIR 01-4159
C 528	80	Lower Tamiami	22	20	Apr-04	Fresh	USGS WRD 2004 VOL. 2B
C-977	140	Lower Tamiami	--	880	Apr-00	Fresh	USGS WRIR 01-4159
C 998	62	Lower Tamiami	--	115	Apr-04	Fresh	USGS WRD 2004 VOL. 2B
C-1004	60	Lower Tamiami	--	150	Apr-00	Fresh	USGS WRIR 01-4159
C-1058	80	Lower Tamiami	--	170	Apr-00	Fresh	USGS WRIR 01-4159
C-1189	75	Lower Tamiami	--	180	Apr-00	Fresh	USGS WRIR 01-4159
C-1201	60	Lower Tamiami	--	860	Apr-00	Brackish	USGS WRIR 01-4159
C-1205	101	Lower Tamiami	--	14,000	Jun-00	Saline	USGS WRIR 01-4159
C-1212	101	Lower Tamiami	--	1700	Jun-00	Brackish	USGS WRIR 01-4159
C-1213	84	Lower Tamiami	--	300	May-00	Fresh	USGS WRIR 01-4159
C-1215	87	Lower Tamiami	--	150	May-00	Fresh	USGS WRIR 01-4159
C-688	242	Sandstone	--	48	Mar-00	Fresh	USGS WRIR 01-4159
C-1188	225	Sandstone	--	1,200	Mar-00	Brackish	USGS WRIR 01-4159
C-948	420	Mid Hawthorn	--	180	Nov-99	Fresh	USGS WRIR 01-4159
C-974	460	Mid Hawthorn	--	2,000	Nov-99	Brackish	USGS WRIR 01-4159
EW-1	334 - 505	Mid Hawthorn	--	2,260	Jan-07	Brackish	ASR PILOT STUDY EW-1 COMPLETION REPORT

TABLE 3-3
Groundwater Quality Data (CONT'D.)

WELL/ STATION ID	DEPTH (ft)	AQUIFER	AVERAGE CHLORIDE (mg/L)	MOST RECENT CHLORIDE (mg/L)	MOST RECENT SAMPLE DATE	WATER TYPE	SOURCE
EW-1	481 - 690	Mid Hawthorn to Lower Hawthorn	--	2,100	Apr-07	Brackish	ASR PILOT STUDY EW-1 COMPLETION REPORT
C-575	652	Lower Hawthorn	795	1,200	Dec-00	Brackish	USGS WRIR 01-4159
I75 MZ1	760	Lower Hawthorn/ Upper Floridan	1,537	1,500	Jun-07	Brackish	SFWMD DBHYDRO
I75 MZ2	1050	Upper Floridan	3,837	3,783	Aug-07	Brackish	SFWMD DBHYDRO
EW-1	818 – 1,100	Upper Floridan	--	4,800	May-07	Brackish	ASR PILOT STUDY EW-1 COMPLETION REPORT
EW-1	1,100	Upper Floridan	--	12,600	May-07	Saline	ASR PILOT STUDY EW-1 COMPLETION REPORT
C-1111	1,158 – 1,185	Upper Floridan	--	10,200	--	Saline	USGS WRIR 98-4253
C-1111	1,287 – 1,318	Upper Floridan	--	14,300	--	Saline	USGS WRIR 98-4253
C-1111	1,469 – 1,524	Upper Floridan	--	17,000	--	Saline	USGS WRIR 98-4253
C-1111	1,852 – 1,901	Lower Floridan	--	16,300	--	Saline	USGS WRIR 98-4253
C-1111	2,195 – 2,251	Lower Floridan	--	19,300	--	Saline	USGS WRIR 98-4253
I75 MZ3	2350	Lower Floridan	18,936	19,436	Aug-07	Saline	SFWMD DBHYDRO



LEGEND

- Station / Well Locations
- City of Naples City Limits

GROUNDWATER QUALITY DATA
STATION / WELL LOCATION MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE
3 - 4

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The water table aquifer around the City of Naples predominantly contains fresh water except when saltwater sources are close by such as the Gulf of Mexico, Naples Bay, or any canals or waterways directly connected to the those sources. Chloride concentrations range from 22 mg/L to 290 mg/L in the fresh wells, and 5,880 mg/L in the saline well.

In the Lower Tamiami aquifer, the water quality ranges from fresh to saline and is also impacted by the proximity of the well to saline water sources. The chloride concentrations range from 15 mg/L to 14,000 mg/L. Again most of the wells are fresh that penetrate the Lower Tamiami aquifer.

There is limited data for the remaining aquifers in the Naples area, because these aquifers are rarely used. There were two wells in the area that penetrate the Sandstone aquifer. The chloride concentration in the inland well was fresh at 48 mg/L and in the well closer to the coast it was brackish at 1,200 mg/L. The mid-Hawthorn aquifer wells were predominantly brackish at around 2,000 mg/L for chloride concentrations, with a fresh well further to the north of these wells. The wells that were open to the lower Hawthorn had chloride concentrations that ranged from 795 to 2,100 mg/L and were brackish. The upper Floridan aquifer wells had chloride concentrations from about 3,800 to 17,000 mg/L, and therefore ranged from brackish to saline. The lower Floridan aquifer water samples were collected at depths of greater than 1,850 feet and were saline with chloride concentrations between 16,300 and 19,400 mg/L.

3.2.3 Ground Water Uses

The aquifers are classified for potential future use based on the predominant water type encountered, the productivity of the aquifer, the ability to get withdrawals permitted, and the potential end uses of the raw water. Table 3-4 indicates these classifications for the seven aquifers in the Naples area. The productivity was based on the range of measured transmissivity values in the general area and the Lower West Coast of Florida using the following breakdown:

- Low – Between 0 and 1,000 gpd/ft
- Moderate – Between 1,000 and 10,000 gpd/ft
- High – Between 10,000 and 100,000 gpd/ft
- Very High – Greater than 100,000 gpd/ft

The potential uses include potable, irrigation and aquifer storage and recovery (ASR) and were primarily selected based on the water quality and the productivity of the aquifer. The ability to permit or the probability of receiving a water use permit for withdrawals from each aquifer was also estimated. The water table and lower Tamiami aquifers are currently being used for potable supply and it is very unlikely that the South Florida Water Management District will permit

significant additional withdrawals from these aquifers due to the potential of impacts to wetlands or existing legal users.

TABLE 3-4
Groundwater Uses

Aquifer	Predominant Water Type	Productivity	Alt. Water Supply per SFWMD?	Permittable as a New Supply?	Potential Uses
Water Table	Fresh	Low to Very High	No	No	Potable, Irrigation
Lower Tamiami	Fresh	High to Very High	No	No	Potable, Irrigation
Sandstone	Brackish	Moderate to High	No	Limited	Potable, Irrigation, ASR
Mid-Hawthorn	Brackish	Moderate to High	No	Limited	Potable, Irrigation, ASR
Lower Hawthorn	Brackish	High	Yes	Yes	Potable, Irrigation
Upper Floridan	Brackish to Saline	High to Very High	Yes	Yes	Potable, Irrigation
Lower Floridan	Saline	High to Very High	Yes	Yes	Potable, Irrigation

Both the Sandstone aquifer and the mid-Hawthorn aquifer are potential ASR storage zones if moderate transmissivity zones can be identified. The deeper zones have a potential to be too productive and there is greater chance that any water injected in the aquifer will be migrate away from the well making recovery very poor. The first exploratory ASR well for the City had such a zone that would likely have poor recovery. The next proposed test location for ASR is to the north where moderate transmissivity zones will be sought. The ideal zone is where the transmissivity is high enough to allow storage of significant water without too much injection pressure, but not too high where all the water stored moves away.

The Sandstone aquifer is thin in the Naples area and may not be productive enough for an RO source. The mid-Hawthorn aquifer is a substantial aquifer and could supply high quality water for a reverse osmosis water treatment plant, but this aquifer is currently not considered alternative water supply source by the SFWMD. The lower Hawthorn, upper Floridan, and lower Floridan aquifers all have potential to provide source water for a reverse osmosis water treatment plant. However, these three aquifers also have a higher potential for saline water upconing or lateral intrusion leading to a degrading water quality. Because the lower Hawthorn

is the most shallow source that is considered as an alternative water supply, it should be explored first as a source for sustainable water supply for a reverse osmosis water treatment plant. However a combination of mid-Hawthorn and lower Hawthorn wells may be necessary. Use of mid-Hawthorn wells would mean that the consumptive use permit duration would be limited to a maximum of 5 years and per capita limits may apply to this water use.

3.3 RECLAIMED WATER

The City of Naples in 2007 supplied 1,903 MG of reclaimed water to a number of customers for irrigation purposes for an annual average day use of 5.67 MGD. The average reclaimed water use for the last eight years was 5.34 MGD. The reclaimed water not used by the existing reuse customers is discharged to the Gordon River. Over the last eight years the City has discharged between 0.70 and 2.52 MGD of unused reclaimed water on an annual average basis to the Gordon River. Within the 20 year planning period, reclaimed water flows are expected to reach a maximum flow of 9 MGD.

The City is in the process of expanding its reclaimed water system in order to provide irrigation water to more customers to reduce the overall demand of the potable water. The chloride concentration of the reclaimed water has been an issue with many residents within the City who are concerned with the water quality affecting their plants. The average chloride concentration in the reclaimed water in 2007 was about 600 mg/L. Chloride concentrations of the City's reclaimed water for the last eleven years are provided in **Appendix E**. Infiltration of ground water into the gravity sewer system in areas close to the Gordon River and the Gulf of Mexico is suspected for the increased chloride concentration in the reclaimed water. The City is in the process of lining portions of the gravity sewer system and lift stations that are suspected of causing the elevated chlorides in order to remediate the water quality of the treated water.

In order to take full advantage of the reclaimed water system to reduce the demands on the potable system, the City is seeking alternate sources of fresh water that they can blend with the reclaimed water to reduce chloride concentration to their goal of 400 mg/L. Some potential fresh water sources are ground water from the water table or lower Tamiami aquifers, the Golden Gate canal, or stored stormwater. Additionally, the City is investigating the potential of using aquifer storage and recovery (ASR) in order to store reclaimed water during low reclaimed water demand periods in the ground and recover the same water when demand increases.

3.4 SURFACE WATER

3.4.1 Golden Gate Canal

The Golden Gate Canal was constructed in the 1960's to lower groundwater levels to allow residential development. There is a series of weirs along the canal that prevent over-drainage of the surficial aquifer. The canal is a freshwater source and should be considered as a supplemental water supply source for the City of Naples.

Measurements taken for chloride in the canal have ranged from 44 mg/L in September 2005 to 88 mg/l in January 2008. Additional water quality results for the canal are provided in **Appendix F**. The flow data statistics for the Golden Gate Canal at weir #1 as reported by the South Florida Water Management District (SFWMD) and the United States Geological Survey (USGS) show that for the period of record the mean flow into the Gordon River has been 201 million gallons per day (MGD). The flow versus time record for the Golden Gate Canal is presented in **Figure 3-5. Tables 3-5** and **3-6** show the statistics for the period of record. The minimum flow recorded was 0 MGD, which occurs only about 5% of the time. Approximately 90% of the time the flow through the weir is greater than 7 MGD. The calculated median flow is 103 MGD and the maximum flow recorded was 1,993 MGD. **Figure 3-6** shows the flow distribution for the period of record.

TABLE 3-5
Golden Gate Canal Flow Statistics

Flow Statistic	
Minimum	0 MGD
Maximum	1,993 MGD
Median	103 MGD
Mean	201 MGD

TABLE 3-6
Gate Canal Flow Distribution

Frequency of Occurrence	
5 %	0 MGD
10 %	≤ 7 MGD
20 %	≤ 28 MGD
30 %	≤ 48 MGD
40 %	≤ 72 MGD
50%	≤ 103 MGD

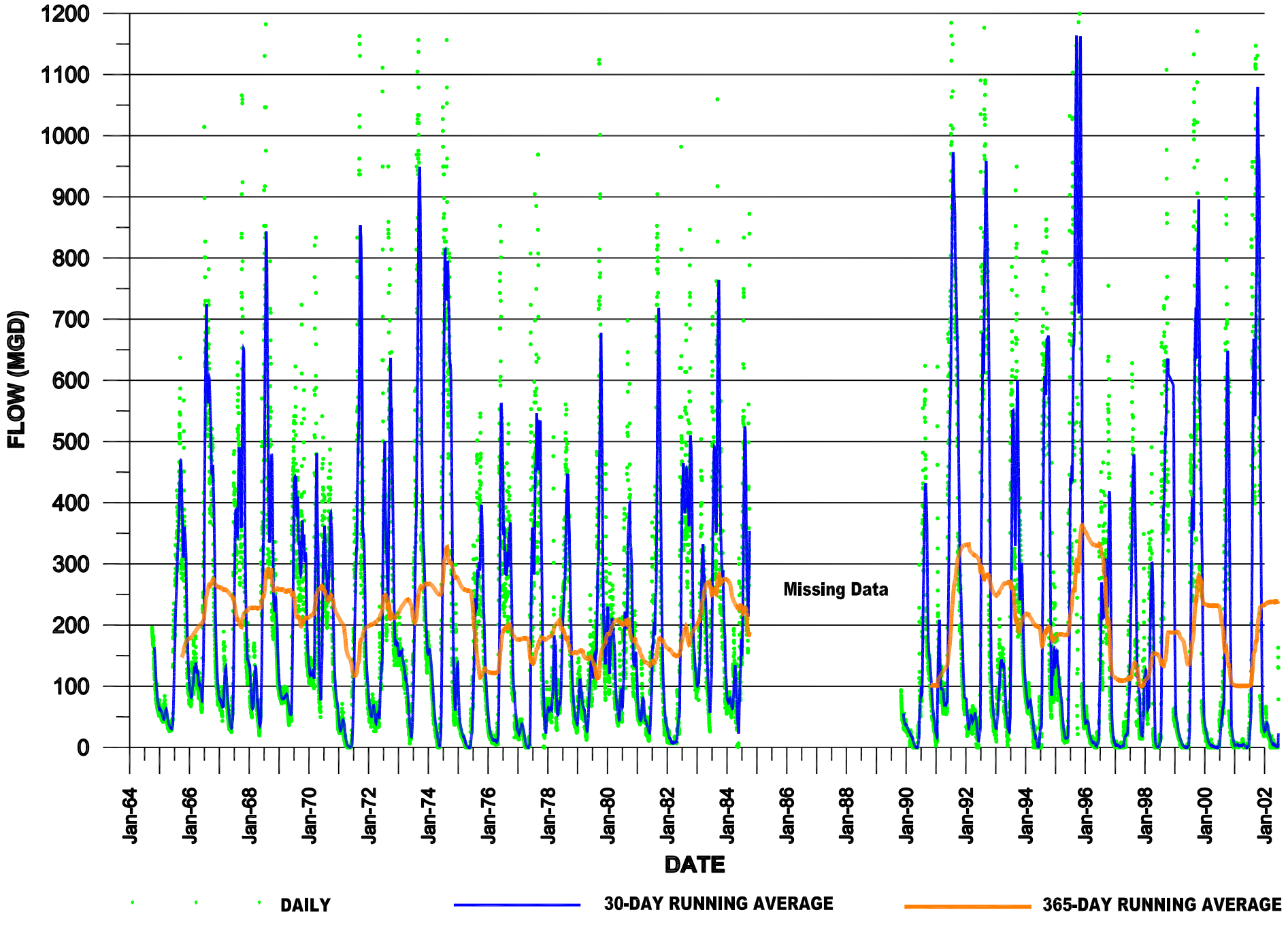
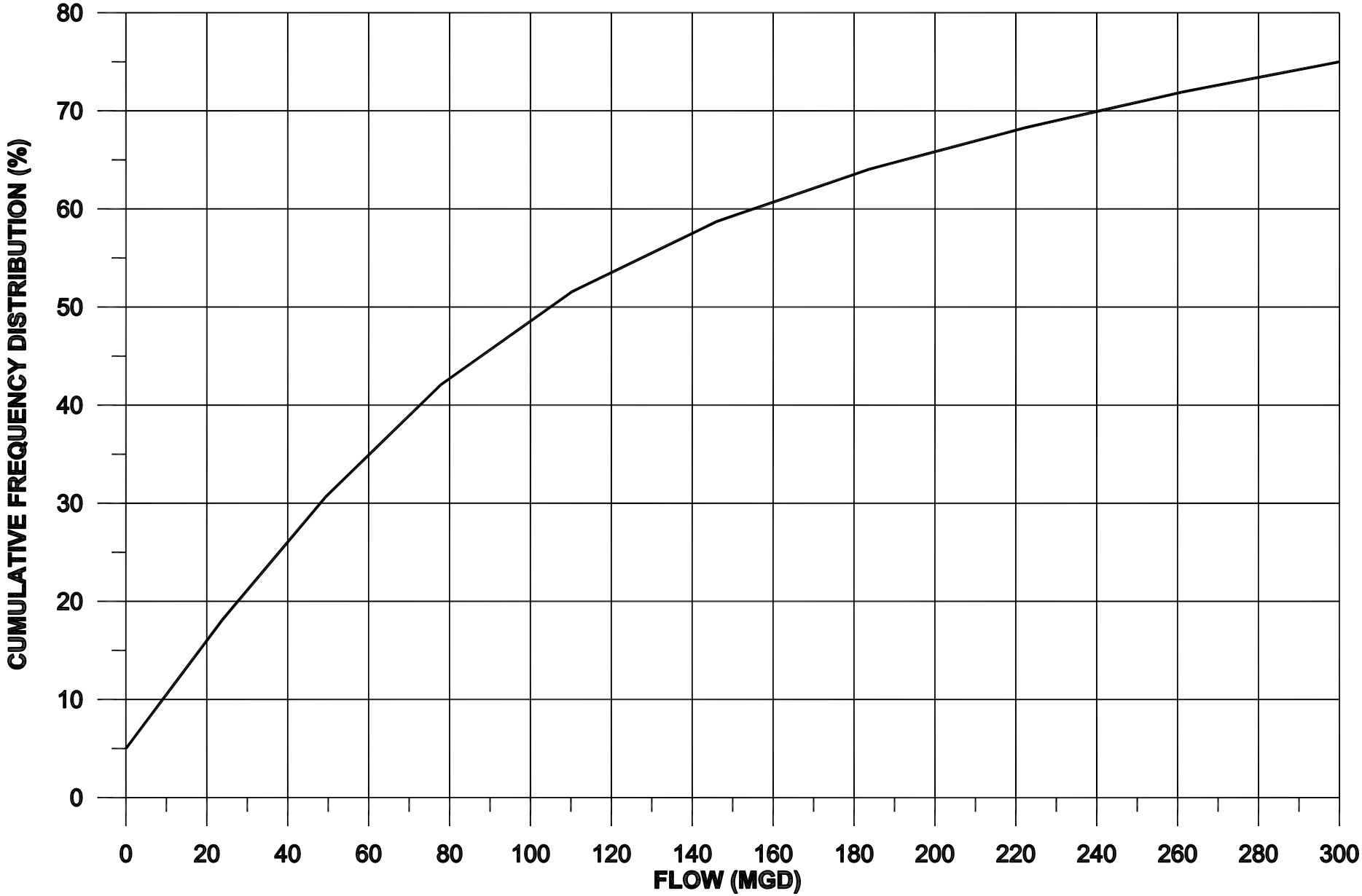


FIGURE 3-5

TETRA TECH
Infrastructure Offices Throughout Florida
Orlando * Fort Myers
201 EAST PINE STREET - SUITE 1000 - ORLANDO, FL 32801
TELEPHONE (407) 839-3955 - FAX (407) 839-3790 - WWW.TETRATECH.COM

FLOW vs. TIME
GOLDEN GATE CANAL WEIR #1
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN



G:\Hydro\NAPLES\Water Supply Feasibility\ggflowdist.dwg

Plotted: May 16, 2008 – 2:01pm by chad.sanford

FIGURE 3-6

TETRA TECH
Infrastructure Offices Throughout Florida
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CUMULATIVE FREQUENCY DISTRIBUTION OF FLOW
GOLDEN GATE WEIR #1
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

This supplemental water supply source will require the use of an aquifer storage and recovery system to be considered an alternative water supply source, and because water is not available from the canal during certain months in the year, this is a critical component of the success of this alternative. To determine a worst case scenario in terms of storage required, flow statistics from 2001 were considered as it was the year with the most frequent occurrence of zero discharge over the weir in the last ten years. The flow distribution for 2001 is shown below in Table 3-7.

TABLE 3-7
Gate Canal Flow Distribution

Frequency of Occurrence	
12 %	0 MGD
14 %	≤ 1 MGD
15 %	≤ 2 MGD
18 %	≤ 3 MGD
23%	≤ 4 MGD
27%	≤ 5 MGD
42%	≤ 10 MGD

As shown in the distribution above, in a dry year, 5 MGD of canal water may not be available 27% of the time or approximately 100 days out of the year. However, at least 2 MGD is available for all but 55 days out of the year. During extended drought periods, irrigation water demands can be reduced with watering restrictions. The one day per week watering schedule in early 2008 reduced water demand by 30%. Two to three ASR wells with a storage capacity of 100 million gallons each and a withdrawal and injection capacity of 1 MGD each should adequately provide for periods of low or no canal flow.

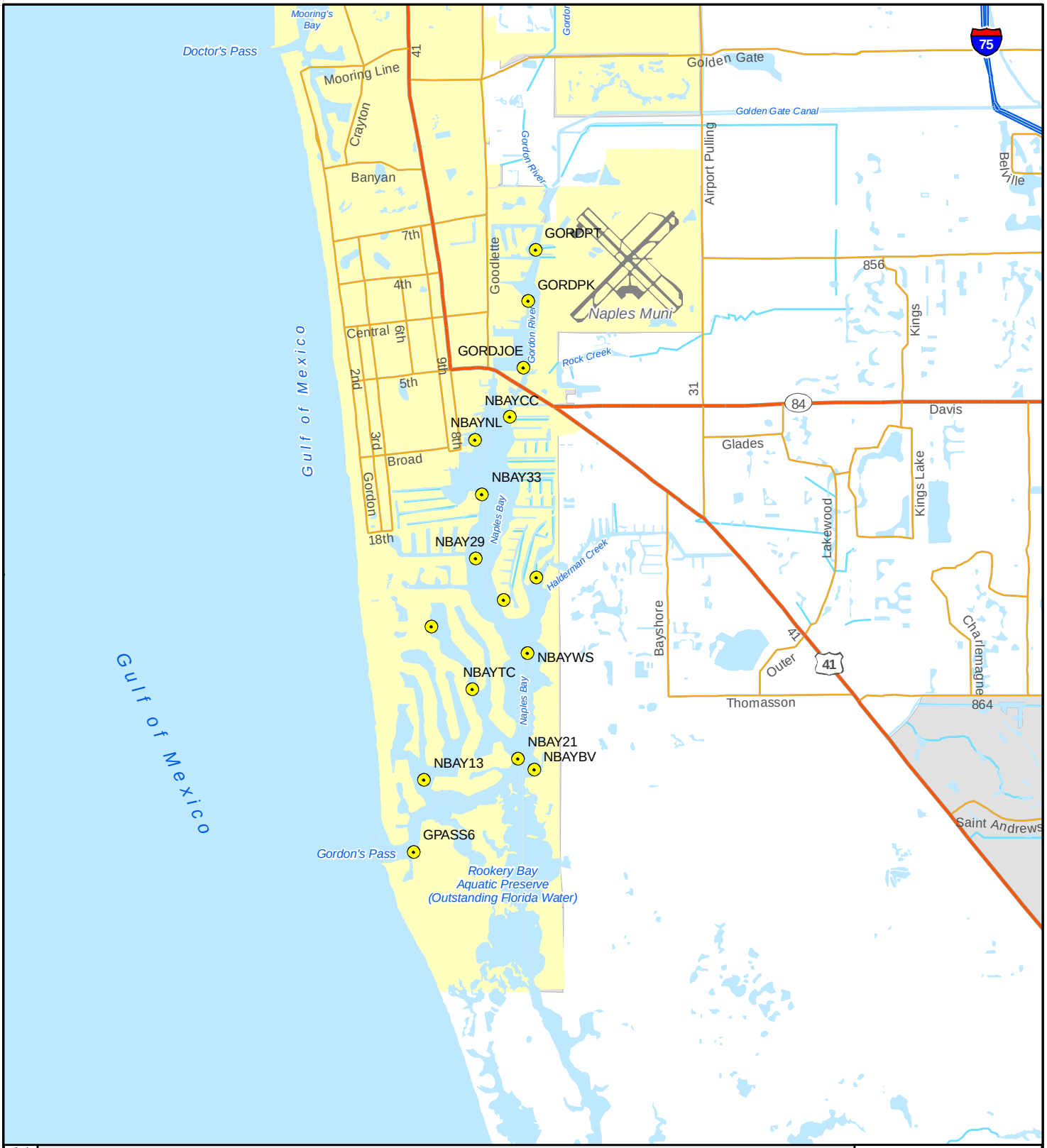
Since the SFWMD would like to reduce the discharges to Naples Bay as much as possible, receiving a water use permit for surface water withdrawal from the Golden Gate Canal in order to augment the reclaimed water system should be obtainable. The lowering of freshwater discharges to the Gordon River and Naples Bay will enhance the water of that natural system and benefit the environment. Weir upgrades along the canal have been on-going to better control weir elevation and raise upstream water levels to restore upstream waterways wetlands and increase aquifer recharge. In addition, there are projects planned to divert water from the Golden Gate Canal upstream of the City of Naples water service area. These projects will reduce the volume of canal water that is available to the City during the dry season. It is recommended that the City include use of the Golden Gate Canal in the consumptive use permit renewal application that is due in June 2008.

Since the Golden Gate Canal is a freshwater source, blending of canal water with reclaimed water will reduce chloride concentrations in the reclaimed water system.

3.4.2 Gordon River and Naples Bay

The City of Naples maintains water quality sampling stations along the Gordon River and Naples Bay as depicted in **Figure 3-7**. The analytical results during the period from February 2006 to August 2007 are presented as averages in **Table 3-8** and as maximum values in **Table 3-9**. The chloride concentrations from these stations ranged on average from about 7,600 mg/L at station GordPt, which is the point furthest upstream sampled on the Gordon River near Port Avenue, to 18,200 mg/L at station NBayBV, which is near Bay View Park. The maximum chloride concentrations at these locations are 19,821 mg/L and 22,004 mg/L, respectively, which show the variability of the water quality within the Gordon River and Naples Bay throughout the year.

This water source is highly variable, but always saline. In addition to the high chloride concentrations in these samples, there are other dissolved solids that would require treatment such as magnesium, sulfate, and iron to name a few. The biological activity would also affect treatment including enterococcus group bacteria and coliform bacteria. Due to the high salinity and water quality variability, the treatment costs for this source water would be considerable.



LEGEND

- City of Naples Water Quality Sampling Stations
- City of Naples City Limits

N

0 5,000 Feet

TETRA TECH

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WATER QUALITY SAMPLING STATIONS
MAINTAINED BY THE CITY OF NAPLES
CITY OF NAPLES INTEGRATED WATER RESOURCES PLAN

FIGURE
3 - 7

TABLE 3-8
WATER QUALITY SAMPLING PROGRAM IN NAPLES BAY
AVERAGES FOR SAMPLING PERIOD 02/2006 TO 08/2007

PARAMETER, UNIT	STATION															
	GORDJOE	GORDPK	GORDPT	GPASS6	NBAY13	NBAY21	NBAY29	NBAY33	NBAYBV	NBAYCC	NBAYHC	NBAYKF	NBAYLLO	NBAYNL	NBAYTC	NBAYWS
Alkalinity, mg/l	173	174	190	131	135	144	152	149	136	162	146	149	137	160	139	144
Calcium, mg/l	264	325	194	416	392	362	414	308	457	342	404	323	473	374	363	337
Chloride, mg/l	10,136	13,326	7,612	16,994	18,184	15,221	15,160	13,664	18,200	12,388	14,585	15,874	16,733	13,586	15,876	15,548
Total Hardness, mg/l	3,023	3,774	2,454	6,016	5,535	5,033	5,111	4,367	5,413	4,209	4,882	4,564	5,326	4,625	5,247	4,950
Magnesium, mg/l	615	678	445	1,273	1,147	1,084	947	898	1,096	741	926	954	1,029	793	1,089	1,013
Salinity, ppth	24	22	19	33	34	33	30	28	32	26	28	31	33	27	33	30
Sulfate, mg/l	1,510	1,843	814	2,779	2,623	2,831	1,930	2,198	2,604	1,790	2,062	2,259	2,364	1,856	2,513	2,425
Arsenic, ug/l	6.13	10.50	5.29	15.26	15.99	12.65	14.19	11.09	14.41	11.84	14.53	13.73	12.91	10.31	13.58	12.67
Cadmium, ug/l	ND	NM	ND	ND	NM	ND	NM	ND	NM	NM	NM	ND	NM	NM	ND	ND
Chromium, ug/l	1.20	0.89	0.61	3.54	2.45	2.26	1.93	2.03	5.56	3.41	2.05	14.50	2.22	2.03	2.49	2.41
Copper, ug/l	7.25	3.36	2.47	1.80	2.85	2.73	3.51	4.32	2.53	3.62	4.39	3.61	3.13	4.74	2.95	3.22
Iron, ug/l	423	563	401	454	514	391	510	353	471	529	418	389	425	475	409	386
Lead, ug/l	0.71	0.45	0.50	0.22	0.58	0.21	0.45	0.48	0.46	0.44	0.44	0.47	0.44	0.42	0.15	0.18
Zinc,ug/l	6.95	6.27	5.96	5.27	4.40	3.93	5.13	7.33	5.49	5.77	6.33	7.62	4.58	7.12	4.64	7.30
BOD,mg/l	2.39	2.30	2.06	1.10	2.41	1.58	4.70	2.23	2.42	3.86	2.71	1.71	3.51	2.41	1.73	1.60
Chlorophyll a,mg/m3	8.44	8.00	10.86	5.17	5.86	5.43	8.63	8.22	7.60	24.48	13.08	6.30	10.53	8.40	5.20	5.05
Enterococcus Group Bacteria, cfu/100ml	25.33	44.29	52.57	35.00	19.00	4.67	1.80	6.00	4.00	34.33	12.33	2.67	22.89	30.60	8.00	43.33
Diss. Oxygen, mg/l	5.90	5.78	5.85	6.18	6.30	6.42	5.54	6.08	6.36	5.42	5.36	5.93	5.66	5.93	6.27	5.83
DO Saturation, %	97.20	NM	102.60	94.60	NM	94.40	NM	97.70	NM	NM	NM	93.10	NM	NM	95.60	99.20
Fecal Coliform, cfu/100ml	36.25	52.64	119.80	8.13	22.00	18.33	13.11	65.67	9.22	29.40	30.75	22.71	44.43	42.20	19.00	19.33
Total Coliform, cfu/100ml	50.50	243.50	307.00	114.00	152.33	541.00	165.33	373.00	289.00	167.25	129.33	216.67	182.00	253.00	77.75	133.00
Pheophytin, mg/m3	7.53	7.84	6.48	3.40	8.73	4.65	6.75	4.44	6.10	5.92	5.12	4.90	6.78	4.65	9.70	4.18
TOC,mg/l	10.98	8.99	8.24	3.85	4.44	4.90	5.25	6.34	4.67	7.14	5.84	5.59	5.72	8.09	4.74	5.45
TSS,mg/l	6.14	34.71	5.25	14.14	8.50	10.25	7.29	7.00	8.25	14.43	5.86	7.60	8.54	9.17	6.78	9.20
Turbidity, NTU	2.11	2.47	2.14	1.61	2.00	2.04	2.67	1.93	2.50	2.54	2.47	1.81	2.35	2.76	1.81	2.02
Ammonia, mg/l	0.07	0.08	0.08	0.07	0.08	0.05	0.09	0.04	0.08	0.09	0.07	0.05	0.07	0.14	0.06	0.05
Nitrite, mg/l	0.005	0.005	0.01	0.002	0.002	0.003	0.004	0.004	0.003	0.004	0.003	0.004	0.003	0.005	0.002	0.004
Nitrate, mg/l	0.07	0.04	0.10	0.02	0.02	0.03	0.04	0.04	0.03	0.05	0.03	0.04	0.02	0.05	0.03	0.03
Nitrite+Nitrate, mg/l	0.07	0.04	0.10	0.03	0.02	0.03	0.04	0.04	0.03	0.06	0.03	0.04	0.02	0.05	0.03	0.03
TKN, mg/l	0.76	0.65	0.66	0.57	0.45	0.64	0.49	0.66	0.42	0.57	0.68	0.64	0.58	0.44	0.53	0.56
Total N, mg/l	0.74	0.63	0.79	0.61	0.47	0.69	0.53	0.52	0.46	0.56	0.64	0.60	0.54	0.50	0.49	0.47
Ortho phosphate, mg/l	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.01	0.02
Total Phosphorus, mg/l	0.05	0.06	0.06	0.03	0.04	0.04	0.04	0.04	0.04	0.06	0.05	0.04	0.05	0.05	0.04	0.04
pH	7.57	7.37	7.46	7.89	7.84	7.86	7.66	7.70	7.81	7.46	7.60	7.77	7.83	7.57	7.88	7.80
Color, PCU	44.44	44.55	52.50	14.29	18.33	26.25	23.75	34.38	17.00	38.50	27.50	28.75	23.75	40.00	23.75	25.50
Secchi depth, m	1.14	0.98	1.10	1.58	1.29	1.47	1.01	1.10	0.70	0.96	1.08	1.29	1.19	0.93	1.39	1.11
Specific Conductivity, uS/cm	37,762	33,469	30,189	50,853	51,252	49,465	45,504	43,325	48,640	39,261	42,112	46,411	49,545	41,039	50,647	46,053
Temperature, deg C	25.75	26.75	25.46	25.36	26.36	25.28	26.74	26.50	26.32	26.73	27.43	26.28	26.77	27.15	26.03	27.01

TABLE 3-9
WATER QUALITY SAMPLING PROGRAM IN NAPLES BAY
MAXIMUMS FOR SAMPLING PERIOD 02/2006 TO 08/2007

PARAMETER, UNIT	STATION															
	GORDJOE	GORDPK	GORDPT	GPASS6	NBAY13	NBAY21	NBAY29	NBAY33	NBAYBV	NBAYCC	NBAYHC	NBAYKF	NBAYLLO	NBAYNL	NBAYTC	NBAYWS
Alkalinity, mg/l	226	254	243	148	164	179	218	184	168	227	186	189	165	209	164	171
Calcium, mg/l	460	468	350	468	525	466	858	470	875	561	744	432	999	882	478	454
Chloride, mg/l	22,762	35,365	19,821	21,049	22,599	22,562	21,083	19,751	22,004	19,095	20,589	29,724	21,628	19,896	22,075	20,834
Total Hardness, mg/l	5,446	5,368	4,700	6,837	7,300	6,921	6,659	6,774	6,487	6,004	6,398	6,679	6,939	6,196	6,720	6,322
Magnesium, mg/l	1,114	1,148	936	1,500	1,458	1,400	1,346	1,360	1,334	1,202	1,308	1,360	1,400	1,256	1,342	1,274
Salinity, ppth	35	34	34	37	37	37	36	35	37	35	36	37	36	35	37	37
Sulfate, mg/l	2,800	3,540	2,500	3,140	2,960	5,760	2,890	2,920	3,070	2,750	2,870	2,980	2,880	2,780	2,920	3,120
Arsenic, ug/l	15.36	32.80	10.90	30.80	35.00	25.20	32.70	20.60	34.40	33.10	35.20	24.50	37.30	21.10	32.80	27.80
Cadmium, ug/l	ND	NM	ND	ND	NM	ND	NM	ND	NM	NM	NM	ND	NM	NM	ND	ND
Chromium, ug/l	1.33	0.89	1.12	4.80	2.86	2.43	2.65	2.24	8.42	4.21	2.75	26.83	2.80	2.80	2.63	2.50
Copper, ug/l	31.30	4.81	5.95	2.50	10.10	4.66	4.70	5.36	4.58	5.57	7.17	5.45	5.47	5.84	4.99	4.66
Iron, ug/l	720	980	720	680	740	620	760	610	710	900	760	530	750	830	600	690
Lead, ug/l	2.82	1.93	1.97	0.45	2.00	0.39	1.71	1.71	1.73	1.92	1.75	1.64	2.04	1.86	0.21	0.28
Zinc,ug/l	16.00	9.62	17.00	11.00	15.00	13.00	7.60	18.00	16.00	7.82	18.00	26.00	13.00	9.93	15.00	32.00
BOD,mg/l	2.70	3.10	2.42	1.10	2.42	2.43	4.70	2.78	2.42	5.30	3.00	2.02	7.80	2.50	2.52	2.19
Chlorophyll a,mg/m3	13.40	12.30	18.20	7.50	8.50	7.50	15.50	17.10	14.40	113.20	21.90	9.10	34.20	15.50	6.90	8.00
Enterococcus Group Bacteria, cfu/100ml	68	163	84	100	64	12	3	11	7	123	28	4	51	106	18	230
Diss. Oxygen, mg/l	7.59	8.47	8.51	7.51	8.03	7.49	7.34	8.26	7.57	7.95	7.70	7.87	7.70	7.88	8.20	8.40
DO Saturation, %	97.20	0.00	102.60	94.60	0.00	94.40	0.00	97.70	0.00	0.00	0.00	93.10	0.00	0.00	95.60	99.20
Fecal Coliform, cfu/100ml	94	108	440	29	64	54	58	320	37	103	74	73	190	200	40	55
Total Coliform, cfu/100ml	53	520	600	200	393	541	260	688	560	393	200	571	473	629	141	260
Pheophytin, mg/m3	9.10	14.80	9.10	3.50	15.00	9.00	10.00	9.50	10.00	13.00	10.90	8.50	10.90	6.40	15.80	8.10
TOC,mg/l	36.60	18.60	14.00	6.60	8.70	11.00	9.70	11.00	11.00	13.00	10.00	11.00	10.00	13.00	8.40	10.50
TSS,mg/l	9.00	202.00	11.00	41.00	14.00	31.00	16.00	13.00	11.00	36.00	10.00	11.00	20.00	14.00	14.00	19.00
Turbidity, NTU	2.85	3.30	3.50	4.50	2.80	3.70	4.00	2.60	3.60	3.60	3.80	2.90	5.90	3.90	2.60	3.30
Ammonia, mg/l	0.11	0.21	0.15	0.19	0.18	0.14	0.21	0.09	0.17	0.24	0.15	0.12	0.17	0.44	0.15	0.11
Nitrite, mg/l	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.01
Nitrate, mg/l	0.18	0.11	0.24	0.03	0.04	0.04	0.09	0.07	0.08	0.15	0.05	0.08	0.04	0.08	0.05	0.07
Nitrite+Nitrate, mg/l	0.19	0.12	0.25	0.04	0.04	0.04	0.09	0.07	0.08	0.15	0.05	0.08	0.04	0.09	0.05	0.07
TKN, mg/l	0.89	0.96	1.35	0.87	1.10	1.41	0.95	0.79	0.77	0.95	1.80	0.80	0.88	0.86	0.72	0.82
Total N, mg/l	1.03	1.00	1.46	0.90	1.10	1.44	0.95	0.84	0.78	1.00	1.80	0.84	0.92	0.92	0.74	0.84
Ortho phosphate, mg/l	0.04	0.07	0.05	0.02	0.04	0.02	0.04	0.03	0.04	0.07	0.04	0.03	0.05	0.05	0.02	0.04
Total Phosphorus, mg/l	0.08	0.09	0.10	0.07	0.05	0.06	0.07	0.05	0.06	0.08	0.07	0.05	0.09	0.08	0.06	0.04
pH	7.80	7.72	7.77	8.05	8.09	8.11	7.96	8.01	8.09	7.73	7.90	7.98	8.05	7.81	8.11	8.01
Color, PCU	100.00	80.00	120.00	30.00	50.00	60.00	50.00	60.00	50.00	100.00	60.00	60.00	60.00	80.00	50.00	50.00
Secchi depth, m	1.50	1.40	1.50	3.00	1.70	2.30	1.30	1.30	0.70	1.10	1.20	2.00	2.10	1.00	2.10	1.50
Specific Conductivity, uS/cm	52,638	51,725	51,500	55,524	55,431	55,219	54,000	53,183	55,568	52,854	54,912	55,196	54,850	53,116	55,132	55,076
Temperature, deg C	31.53	30.47	30.80	30.50	31.47	31.64	31.18	31.92	30.72	30.70	31.90	32.00	31.14	30.70	31.52	31.95

3.4.3 Gulf of Mexico

The Gulf of Mexico offers another saline water source for the City's consideration. Although the water quality is equal to or greater than the salinity encountered in the Gordon River and Naples Bay, it would likely be fairly more consistent than water quality in the river and bay. The requirements for a desalination water treatment facility would include not only an intake location, but also a discharge location and a source of significant electrical power. Generally speaking, the capital and operating costs associated with desalination water treatment facilities make this option not feasible. These facilities are usually located near a coastal power plant to take advantage of the economies of scale gained for water intake, concentrate disposal and power needs. In order to separate the water from the significant total dissolved solids concentration, the pressure of the reverse osmosis system would be about 1,000 psi and the plant would draw about 10 to 14 kW-hr per 1,000 gallons of treated water (AWWA, 2008).

3.5 STORM WATER

Much of the early development that created the City of Naples did not properly consider the flood potential and the natural resources of the estuaries and low lying areas that made up this coastal region. The Naples area is characterized by very low topography, limited freeboard in the wetlands and lakes, heavy rainfall patterns (geographic positioning subject to receiving frequent tropical storms and hurricanes), and high tidal activity. These characteristics result in situations that cause flooding. In some cases, runoff waters exceed the capabilities of the original canals, ditches and culverts to convey the stormwater. In addition, the lack of understanding of how high tidal surges could rise above mean sea level led to roadways and building structures constructed lower than the elevation of frequent water surges. These historic deficiencies have led to frequent flooding throughout the City. The over drainage of high ground water from off-site Collier County and the introduction of urbanization pollutants from both the City and surrounding Collier County has resulted in a significant decline in the viability of Naples Bay to continue as an important regional estuary.

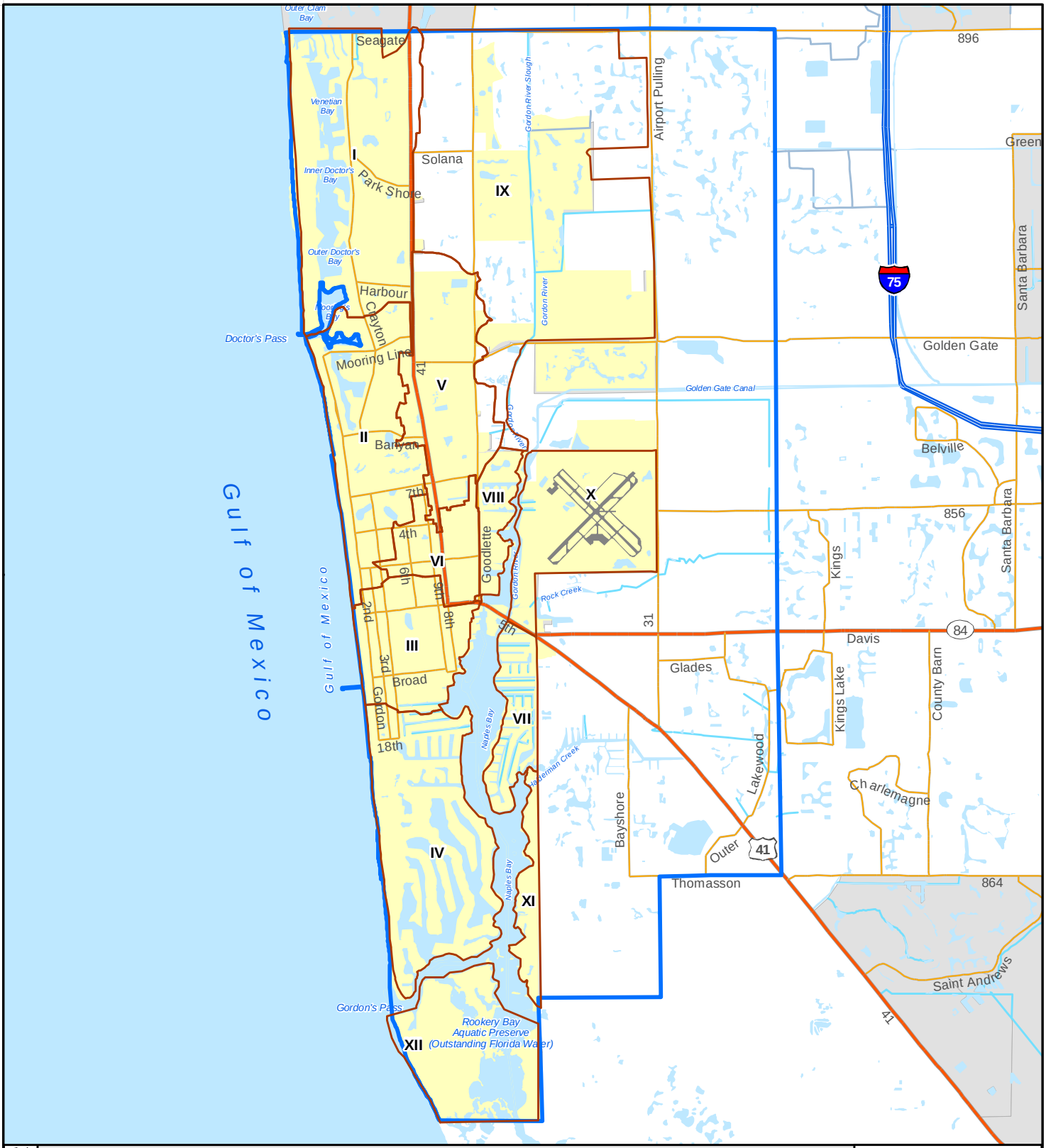
Stormwater is not a reliable water supply as it is generally not available during drought conditions when supplemental water supply sources are most needed. Aquifer storage and recovery can be utilized to store large quantities of stormwater for later use, but this water has to be treated prior to injection into an ASR system. Treatment of stormwater can be challenging as large quantities of water need to be treated over short period of time. Nevertheless, the City of Naples can consider using the excess stormwater collected within the city limits as a fresh blend water source in order to augment the quantity of reclaimed water supplied for irrigation. By using some of the collected stormwater for irrigation and reducing the overall discharge of

stormwater to the Gordon River and Naples Bay, the City will be enhancing the water quality of the river and bay, which should lead to an improvement of the estuarine environment.

The City is divided into twelve drainage basins as defined by various stormwater master plans over the years and depicted in **Figure 3-8**. The City has three (3) main stormwater pump stations which could be utilized to divert stormwater to a treatment facility as illustrated in **Figure 3-9.** However, water quality measurements indicate that Stations 1 (Cove Inn) and 3 (Lantern Lake) have shown high salinity values. The high salinity is most likely from groundwater or tidally influenced lakes that drain to the pump stations. High salinity eliminates these stations from consideration as part of a supplemental water supply system. Previous water quality sampling at Pump Station 2 (Public Works) has shown relatively low salinity. This pump station is also relatively close to the existing wastewater treatment plant. Diversion of water from this pump station to the filtration facilities at the wastewater treatment plant will be considered as part of the supplemental water supply plan.

In addition to diverting stormwater from Pump Station 2 as a supplemental water supply, there are several Watershed Management projects involving stormwater that the City is involved with that may lead to additional supplemental water supply sources. The location of these projects is illustrated in **Figure 3-10** and a description of each one is provided below.

1. The Gordon River Water Quality Park. This project involves a series of interconnected ponds, polishing marshes and wetlands on 50 acres of land located at the corner of Goodlette Frank Road and Golden Gate Parkway. Water flow will be directed from golf courses, residential areas, and streets to holding ponds and constructed wetlands which will act as natural filter marshes. The goal of this project is to improve water quality as it passes through the ponds and wetlands, before reaching the Gordon River and Naples Bay. Native vegetation will be used to slow down the water and cause some pollutants to drop out of circulation. Nutrients and other pollutants will be taken up by some of the plants as the water moves by. The County has obtained a permit, which can be found in Appendix G, to construct an exploratory ASR well at this site to store treated stormwater from the polishing marshes and wetlands. The proposed capacity of the initial ASR well is 1 MGD. Preliminary design data for the water quality park indicates that the treatment capacity will be in the neighborhood of 3 MGD. The City has obtained grant funds from the Big Cypress Basin to construct an exploratory ASR well. It is recommended that the City seek a partnership with the County on this project whereby the City supplies grant funds for construction of the exploratory ASR well in exchange for locating ASR wells on this property for the purpose of obtaining supplemental water supply to augment the City's reclaimed water system. The cost and scheduling benefits of partnering with the County on this a project make it a favorable pursuit for the City.



SOURCE: City of Naples Planning Data; Collier County Planning Data

LEGEND

City of Naples
City Limits

City of Naples
Basin Delineation

N

0 6,000 Feet

TETRA TECH

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BASIN DELINEATION MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

FIGURE
3 - 8

Public Works Pump Station
Inflow Pipe Size - 60"
Outflow Force Main Quantity and Size - 2 @ 36"
Number of Pumps - 3
Pump Horsepower - 2 @ 125hp (electric)
- 1 @ 25hp (electric)
Total Dynamic Head - 25'
Wetwell Size - 20'L x 20'W x 20'D

Cove Pump Station
Inflow Pipe Size - 72"
Outflow Force Main Quantity and Size - 3 @ 36"
Number of Pumps - 4
Pump Horsepower - 3 @ 150hp (diesel)
- 1 @ 15 hp (electric)
Total Dynamic Head - 25'
Wetwell Size - 20'L x 20'W x 20'D

Port Royal Pump Station
Inflow Pipe Size - 48"
Outflow Force Main Quantity and Size - 3 @ 10"
Number of Pumps - 3
Pump Horsepower - 3 @ 20hp (electric)
Total Dynamic Head - 15'
Wetwell Size (Length, Width, Depth) - 15'L x 8'W x 12'D

LEGEND

City of Naples City Limits

Stormwater Pump Stations

City of Naples Basins I - XII

0 2,700 Feet

Disclaimer:

This map document represents a generalized overview sumary of the City's Stormwater Basin Studies and does not represent a survey. Geographic locations are approximations based upon the best available information at the time of publishing.

Source: City of Naples, FL; Collier County 2005 Aerials

STORMWATER PUMP STATIONS MAP

CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

TETRA TECH

FIGURE 3-9

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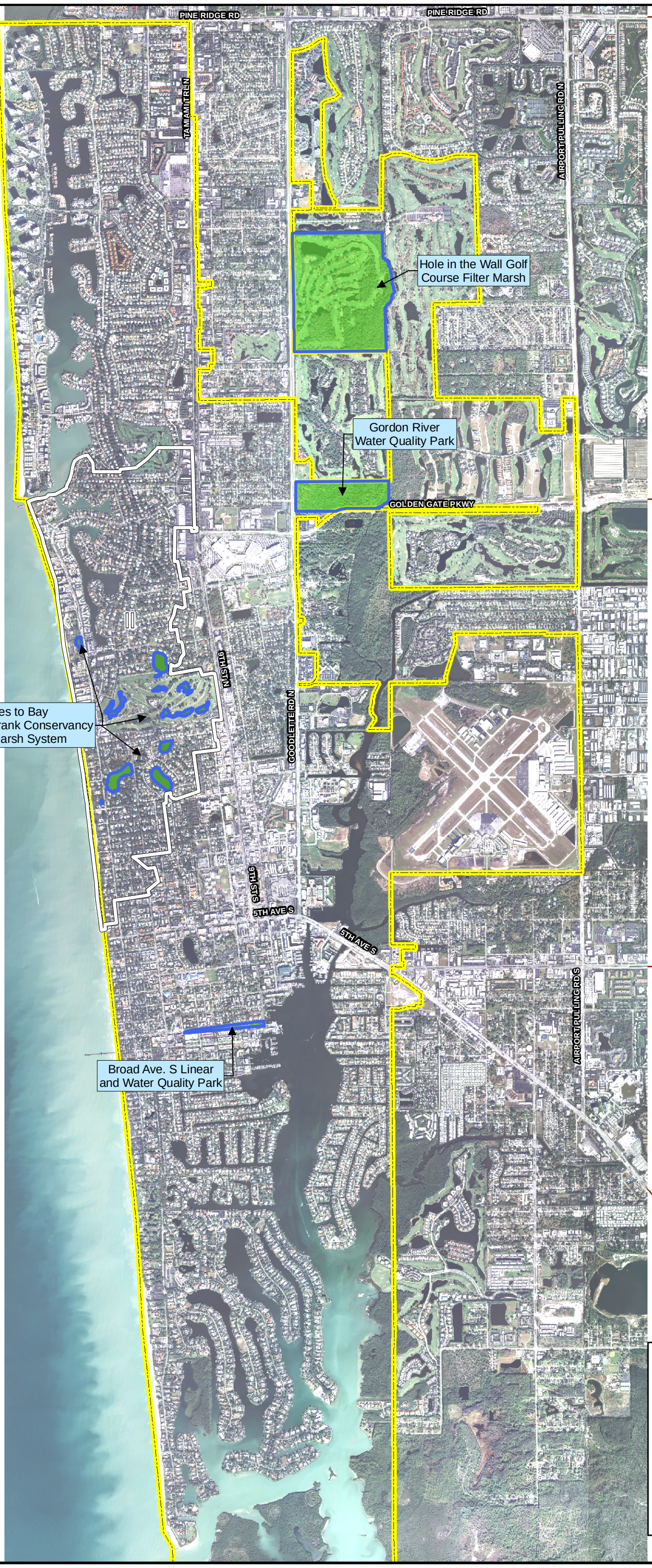


LEGEND

- City of Naples City Limits
- Water Quality Project
- Basin II

N

0 2,700 Feet

Source: Collier County 2005 Aerials

WATERSHED & STORMWATER MANAGEMENT INITIATIVES

CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

TETRA TECH

FIGURE 3-10

TT11X17PR\\GIS\200\08516\08007\Maps\IWRP_5-16-08\ BPWQParksF3-10.mxd [05-15-08 bam]

2. Broad Avenue Water Quality Park. This project involves constructing a filter marsh at Broad Avenue to improve water quality entering Naples Bay and decrease flooding in the area. This project is currently being designed and permitted. Because of the location of this project, salinity in the background groundwater and surrounding surface waters may limit the use of this as a supplemental water supply source for the City's reuse system. However, if the water quality is acceptable and conditions at this site are favorable for an ASR well, water from the water quality park could be diverted to the ASR system and utilized as a supplemental water supply for the City's reuse system. This project may be explored if ASR turns out to not be feasible at the Gordon River Water Quality Park.

3. Lakes to Bay Goodlette-Frank Conservancy Filter Marsh System. This project is currently in the early conceptual phase and involves connecting a series of stormwater lakes located in downtown Naples. A filter marsh is proposed to receive stormwater from this system before it enters Naples. Salinity could be a water quality concern relative to the use of this project as a supplemental water supply project, but if water quality is acceptable and a feasible ASR site was identified, this project could have a supplemental water supply component.

4. Hole in the Wall Golf Course Filter Marsh System. The owners of the Hole in the Wall Golf Course are planning a major renovation that will involve raising the fairways 2-3 feet and expanding the existing lake system. The golf course has an existing cypress swamp which acts as a natural filter marsh system. With the expansion of the lake system, golf course representatives have indicated that excess storm water from the Gordon River Water Quality Park (Item No. 1 above) above its treatment capacity could be treated in the cypress swamp filter marsh in quantities up to approximately 19 MGD. The City has been asked to support this project with $3.52 million and unlimited allocations of reclaimed water at no cost to the golf course in consideration of the pollutant reductions to the river from the expanded filter marsh system. In initial discussions, it has been indicated that the golf course would utilize all of the treated water and that the City would not get any storm water or reclaimed water from the filter marsh. It should be noted that the golf course currently uses less than 200,000 gallons per day of reclaimed water, and the use of the 19 MGD of water from the filter marsh system has not been revealed to the City. The City would not get any water supply benefit from this project other than possible use of a 100 ft. by 100 ft. area for one ASR well.

SECTION 4

WATER RESOURCE FEASIBILITY ANALYSIS

4.1 INTRODUCTION

Water quality goals must be set to ensure compliance with federal, state and local regulations, and must take into consideration water quality expectations and preferences of customers. Potable and irrigation water quality goals will be outlined in this section. In addition, available water resources to meet projected demands will be compared in terms of the level of treatment required, availability, seasonal influences and environmental impacts. Recommendations will be made for water sources that should be evaluated further. Based on these recommendations specific projects will be developed in Section 5 of this report.

4.2 WATER QUALITY GOALS

4.2.1 Irrigation Water Quality Goals

The City's existing public access reclaimed water system is regulated by the Florida Department of Environmental Protection (FDEP) under Chapter 62-610 of the Florida Administrative Code (FAC). These regulations require that the reclaimed water utilized in public access areas meet secondary treatment and high level disinfection requirements. In addition, the reclaimed water must have no more than 5 mg/l of total suspended solids (TSS). The City's existing wastewater treatment facility and reclaimed water meet or exceed these water quality requirements.

For supplemental irrigation water sources such as storm water and canal water blended with reclaimed water, the regulatory requirement for treatment is the same as the reclaimed water regulatory requirement above. If these water sources are not blended with reclaimed water, there is no regulatory requirement, but the goal is to provide a water quality that is consistent with the reclaimed water system.

In addition to the above requirements, within all coastal communities, there is a specific concern in regard to chloride accumulation from irrigation water or from saltwater spray during windy conditions. Excessive accumulation of chloride can cause burning of the leaf tips or margins and

cause premature yellowing of leaves. Generally within a coastal community, landscape plans should account for salt spray and moderately high chloride irrigation water by use of moderately tolerant plants. Moderately tolerant landscaping is generally defined as being tolerant to chloride content between 350 mg/l and 700 mg/l. The City of Naples irrigation water quality goal for chloride is to provide reclaimed water that is below 400 mg/l. This goal is based on the historic reclaimed water chloride data which indicates that even with inflow and infiltration repair work on the gravity sewer system, a certain quantity of native ground or surface water is always present in the system.

4.2.2 Potable Water Quality Goals

Potable water treatment and distribution facilities must meet the requirements of the FDEP and United States Environmental Protection Agency (USEPA). The primary rules and regulations which apply to the City of Naples potable water system are Chapters 62-550, 62-551, 62-555 and 62-560, of the Florida Administrative Code (FAC), as well as the amendments to the Safe Drinking Water Act (SDWA). The purpose of these rules and regulations are to ensure that public supply of drinking water meet the minimum requirements of the SDWA (Public Law 93-523), (as amended in 1986 and 1996), and the Florida Safe Drinking Water Act (Sections 403.850-403.864 of the Florida Statutes). Generally, the state adopts the national primary and secondary drinking water standards of the federal government, and creates additional rules to fulfill state requirements. There are instances where the FDEP drinking water quality standards are more stringent than those of the USEPA. A summary of all current and currently known future drinking water regulations can be found in **Appendix H**.

The City of Naples water treatment facilities meets all current FDEP and USEPA regulations. The City's treatment facilities are not in compliance with chlorine contact requirements of the proposed groundwater rule. The groundwater rule is part of 62-555 FAC, but FDEP has postponed required compliance with this regulation. The latest guidance from FDEP on this regulation is that compliance will be required sometime during 2009.

In addition to regulatory requirements for potable water, it is important to meet customer expectations for aesthetic characteristics. Recommended aesthetic water quality goals for the City of Naples potable water system are listed in **Table 4-1**.

Table 4-1
Drinking Water
Aesthetic Water Quality Goals

Parameter	Regulatory Requirement	Water Quality Goal
Color	15 parts color	5 pt-Co
Total Organic Carbon	Unregulated	<2 mg/l
Total Hardness	Unregulated	120 mg/l

4.3 IRRIGATION WATER SUPPLY OPTIONS

Available irrigation water supply options include the Golden Gate Canal, storm water, groundwater, reclaimed water and storage of these sources through aquifer storage and recovery, above ground storage tanks or lined ponds. This section will provide an overview of each source in terms of treatment parameters, treatment required, seasonal influences, water quantity available, environmental impacts and anticipated costs. Estimated treatment cost data utilized within this section is based on cost curves for various treatment technologies developed for this project. These cost curves can be found in **Appendix I** of this report.

4.3.1 Golden Gate Canal

As identified in Section 3 of this report, the Golden Gate Canal has large volumes of water available for most of the year. There is a seasonal influence on this water source and there will be times during the year when water is not available. This moderate seasonal influence makes storage an important component for the use of canal water for irrigation because during periods of low canal flow, irrigation water demands will be at their highest. Based on a review of water levels within the canal, it is estimated that water will be available from the canal at least 10 months of the year in quantities greater than 5 MGD. Based on preliminary discussions with the Big Cypress Basin and the South Florida Water Management District, it is possible that the control weir can be lowered making 5 MGD of water available at all times. Water quality concerns for irrigation water from the canal include total suspended solids, turbidity and fecal coli form. Recommended treatment includes an Actiflo type clarification system which can remove suspended solids, organics, color, and heavy metals. This process would be followed by disinfection of the water supply. Treatment costs for this type of system are moderate.

Withdrawal of water from the canal is not anticipated to have any adverse environmental impacts as long as minimum flow requirements for the weir are maintained. Since water within the canal is considered fresh, withdrawal of water for irrigation will reduce freshwater flows into Naples Bay.

4.3.2 Storm Water

Utilizing storm water for irrigation is problematic mainly because when storm water is available, there is no demand for irrigation water and when it is not available for long periods of time there is a huge irrigation demand. This makes large storage volumes an integral component to storm water system designed to provide irrigation water supply. Storage costs will be discussed later in this section of the report. Water quality concerns for storm water that will be utilized for irrigation include total suspended solids, turbidity and fecal coli form. Treatment required is the same as treatment required for canal water and includes an Actiflo type clarification system and disinfection. Treatment costs for this type of system are moderate. There are no adverse environmental impacts from utilizing storm water for irrigation water, and capturing storm water for irrigation will reduce freshwater flows to Naples Bay.

4.3.3 Surficial Aquifer Groundwater

The City currently has potable water supply wells which are no longer utilized for drinking water and could be utilized to supplement irrigation water. Further development of irrigation water supply will reduce the demand for drinking water and additional wells could be converted to irrigation water supply wells. The City's existing wells meet all primary and secondary drinking water regulations and therefore there are no water quality concerns. Disinfection is the only treatment that would be required. Treatment costs for this type of system are low. Maintaining the existing groundwater withdrawal quantities is not anticipated to have any adverse environmental impacts. It is unlikely that the South Florida Water Management District would allow expanded use of the surficial aquifer for irrigation water, but conversion of existing potable water supply wells to irrigation water supply wells would likely be permittable.

4.3.4 Reclaimed Water

The City currently utilizes an average of 5.3 MGD of reclaimed water for irrigation, and discharges an average of 1.6 MGD to the Gordon River. When the sewer service area is built out, it is anticipated that a maximum of 9 MGD of reclaimed water will be available for irrigation. There is currently a concern with chloride concentration in the reclaimed water. The City has an on-going monitoring and sewer system repair program to address this issue. Treatment options available for chloride reduction in reclaimed water are reverse osmosis and blending with lower chloride water. The cost of treatment with reverse osmosis is considered high when compared to other options and would include pretreatment, reverse osmosis facilities and concentrate disposal through deep injection. The need for disposal of the high chloride waste product generated with this process also creates a moderate potential for adverse environmental impacts when compared to other options.

Facilities required to blend sufficient quantities of water with 9 MGD of reclaimed water to reduce chloride concentrations in compliance with the water quality goals would include a blending basin and ground storage facilities. Storage facilities were not included in other treatment costs presented in this section, but for blending additional storage facilities are considered part of the treatment facilities required. On a cost per gallon basis, facilities required for blending are considered low when compared to other options.

4.3.5 Summary of Irrigation Water Sources

A summary of the irrigation water options is illustrated below. Based on the information presented in this section and in the table, all options are recommended for further consideration.

Table 4-2
Irrigation Water Source and Treatment Options

Water Source	Treatment Parameters	Treatment Required	Seasonal Influence	Water Quantity Available	Environmental Impacts	Anticipated Cost per Gallon
Golden Gate Canal Water	TSS and fecal coli form	Actiflo and disinfection	Moderate	High	Low Potential	Moderate
Storm Water	TSS and fecal coli form	Actiflo and disinfection	Very High	High	Low Potential	Moderate
Surficial Aquifer Groundwater	None	Disinfection	Low	High	Low to Moderate Potential	Low
Reclaimed Water	Chlorides	Blending and Sewer System Repairs	Moderate	Moderate	Low Potential	Low
Reclaimed Water	Chlorides	Membrane Treatment	Moderate	Moderate	Moderate Potential	High

4.4 IRRIGATION WATER STORAGE OPTIONS

Because irrigation use is seasonal, storage is an important component of any of the water source options. There are three options available for storage of irrigation water and these include aquifer storage and recovery (ASR), above ground storage tanks and lined ponds. Based on the operation of other ASR wells in Collier County, it is anticipated that aquifer storage and recovery wells within Naples could store up to 100 million gallons with a recovery of approximately 1 MGD. The anticipated cost of a 300 million gallon ASR system is $4.8 million. Above ground concrete storage tanks come in sizes up to 10 million gallons, require approximately an acre of land, and cost approximately $3.5 million. Lined storage ponds have a low construction cost comparatively, but require large amounts of land. A 5 million gallon pond is anticipated to cost approximately $0.5 million to construct but would require 6 acres of land. All three storage options are feasible for the City of Naples and will be considered as part of specific projects developed further in Section 5 of this report.

Table 4-3
Irrigation Water Storage Options

Storage Option	Anticipated Storage Volume	Anticipated Construction Cost per Gallon
Aquifer Storage and Recovery	100 MG per well	Moderate
Ground Storage Tanks	10 MG	Moderate
Lined Ponds	5 MG	Low

4.5 POTABLE WATER SOURCE OPTIONS

Available potable water sources to meet projected demands include the surficial aquifer, intermediate aquifer, Floridan aquifer, the Gordon River, Naples Bay and the Gulf of Mexico. This section will present a general overview of treatment required for each potential water source, relative cost for treatment, water quantity available, potential permitting issues, seasonal influences and environmental impacts. Costs found within this section are based on cost curves developed for this project which can be found in **Appendix F** of this report.

4.5.1 Surficial Aquifer

As discussed in the previous section, the City currently utilizes the surficial aquifer for its existing water supply. Water treatment parameters from this aquifer are hardness, color and organics. The City currently utilizes a lime softening process for hardness removal. The City's water treatment plant is currently not in compliance with the chlorine contact time requirements of the groundwater rule which has a compliance deadline in 2009. To correct this issue at the existing facility, improvements are necessary. Improvements that would bring the facility into compliance include installation of a new clearwell, chemical feed facilities, ground storage and high service pumping facilities. The cost of these improvements is considered low to moderate. There are no anticipated adverse environmental impacts or impacts to other groundwater users from the City's continued use of its surficial aquifer wellfield and lime softening treatment facility.

4.5.2 Intermediate Aquifer and Floridan Aquifers

Within the intermediate aquifer, there are two water producing zones, the Sandstone aquifer and mid-Hawthorn aquifer. Productivity within the intermediate aquifer system is considered highly variable in southwest Florida, but step drawdown testing conducted at the City's ASR test well indicates that the Sandstone and mid-Hawthorn aquifers may be productive aquifers within the City of Naples. The lower Hawthorn aquifer within the Floridan aquifer system is highly productive and is also a potential source of brackish groundwater for the City of Naples. Other portions of the Floridan aquifer are likely too saline to be considered a feasible water supply option.

Water quality concerns within the intermediate and Floridan aquifers include chlorides and total dissolved solids. Treatment with reverse osmosis would be required for this water supply, and the capital cost of the required treatment facilities are considered moderate when compared to other options. There is a potential for impacts to other water users if the City were to develop an intermediate aquifer wellfield which would have to be evaluated further. Within the Floridan aquifer, there is the potential for upconing or lateral intrusion based on the high transmissivity and productivity of this aquifer system. In addition, disposal of the high chloride concentrate generated from the reverse osmosis treatment process creates a moderate potential for adverse impacts with this option when compared to other options.

4.5.3 Surface Water

Potential surface water sources for potable water within the City of Naples include the Gordon River, Naples Bay and Gulf of Mexico. Water quality in these sources is at times similar with water quality in the Gordon River and Naples Bay being highly seasonal. Because of the seasonal nature of the Gordon River and Naples Bay, these are not good sources for potable water supply. The Gulf of Mexico does not have a seasonal influence and there is a nearly unlimited of quantity of water available from this source. Treatment of this water source would require desalination with high pressure reverse osmosis. This cost of treatment for this type of facility is considered very high when compared to other options. In addition, recovery within a desalination process can be as low as 25% creating a large volume of concentrate waste that has to be disposed of making the potential for environmental impacts and regulatory requirements from this treatment and disposal process high when compared to other treatment options.

4.5.4 Summary of Potable Water Supply Options

A summary of potable water source options is provided in Table 4-4. Based on the information presented in the table, groundwater sources are the most feasible potable water supply options for the City of Naples. Specific groundwater supply projects will be identified for further consideration in Section 5 of this report. Surface water for potable water supply is most likely not feasible based on the high cost and high potential for environmental impacts. However, for comparison purposes, sea water from the Gulf of Mexico will be compared to other water supply options in Section 5 of this report. The Gordon River and Naples Bay will not be considered further due to their seasonal nature and high potential for environmental impacts.

Table 4-4
Potable Water Source and Treatment Options

Source	Treatment Parameters	Treatment Required	Seasonal Influence	Water Quantity Available	Environmental Impacts	Anticipated Cost per Gallon
Surficial Aquifer	Hardness, color, organics	Lime softening and disinfection	Low	High	Low to Moderate Potential	Low
Intermediate and Floridan Aquifer	Chlorides and TDS	Membrane treatment	Low	High	Moderate Potential	Moderate
Gordon River and Naples Bay	Chlorides, TDS, fecal coliform	Membrane treatment	High	Moderate	High Potential	Very High
Gulf of Mexico	Chlorides, TDS, fecal coliform	Membrane Treatment	Low	High	Very High Potential	Very High

SECTION 5
INTEGRATED WATER RESOURCES PLAN DEVELOPMENT

5.1 GENERAL

This Section provides details on the specific water supply alternatives that were developed based on information in previous sections of this report. Ten water supply alternatives were identified to meet the 20 year projected water demand. All alternatives are based on an installed water supply facility capacity of 48 MGD at the end of the 20 year planning period. As discussed in Section 2, the City will require 15 MGD of new water supply sources. Water supply alternatives considered included various combinations of potable water supply, reclaimed water supply, canal and storm water supply. In addition to developing new water supply, reallocation of existing resources was considered. In developing these options, the use of canal or storm water was combined into one alternative water supply source. These two sources of water are highly dependent on the success of an ASR program. The quantity of canal versus storm water that can be utilized will depend on the geographic location of the successful ASR program within the City. In addition to consideration of ASR location, treatment costs for these water supply sources are the same or very similar depending on the specific site constraints. For these reasons, the use of canal / storm water is considered as one alternative in this section. The selected water supply alternatives are presented below.

5.2 TOP 10 WATER SUPPLY ALTERNATIVES

The top ten water supply alternatives that were considered are discussed in more detail below.

5.2.1 Water Supply Alternative 1

Alternative 1 includes maximizing use of the existing lime softening treatment plant with 24 MGD of capacity. This capacity is limited by the anticipated per capita limit on the existing wellfield for the 20 year planning period. Alternative 1 also includes use of the lower Hawthorne aquifer as a water supply for a new reverse osmosis (RO) water treatment plant (WTP) and use of the projected build out reclaimed water supply available. A summary of alternative 1 water sources is found below:

- Potable Water Supply
    - 24 MGD Lime Softening – Existing Wellfields
    - 15 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield

- Irrigation Water Supply
    - 9 MGD Reclaimed Water

The new 15 MGD RO water treatment facility would be located on the same site as the City's existing lime softening treatment facility. The plant would include a new wellfield, pretreatment, post treatment, and concentrate disposal. This alternative would also include a new clearwell and transfer pump station for blending the lime softened water with RO permeate, a new ground storage tank, and a new high service pump station. The wellfield for the RO process would need to be capable of supplying up to 20 MGD (firm capacity) of raw water based on an assumed recovery of 75%. Concentrate disposal is assumed to comprise deep well injection.

The reclaimed water supply for alternative 1 includes the reclaimed water from the City's wastewater treatment plant effluent, which is projected to have 9 MGD of reclaimed water available during the planning period.

5.2.2 Water Supply Alternative 2

Alternative 2 includes maximizing use of the existing wellfield and lime softening treatment facility similar to alternative 1. However, alternative 2 takes into consideration use of a wider range of water supply options. In this alternative, the reclaimed water system would be expanded to use supplemental water from either the Golden Gate canal or a storm water source. The expanded reclaimed system would offset demand on the potable system. A summary of the water supply sources proposed for alternative 2 is found below:

- Potable Water Supply
    - 24 MGD Lime Softening – Existing Wellfields
    - 10 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield

- Irrigation Water System Supply
    - 9 MGD Reclaimed Water
    - 5 MGD Golden Gate Canal Water or Storm water
    - Canal or Storm Water ASR System

Irrigation water supply for alternative 2 includes maximizing use of the projected 9 MGD of reclaimed water that will be available over the planning period as well as utilizing water from the Golden Gate Canal or storm water. The supplemental irrigation water would allow for expansion of the reclaimed water system, thereby increasing the amount of irrigation demand served by alternative waters and decreasing the amount of irrigation demand served by the potable water supply. The cost for treating the canal or storm water for supplementing reclaimed

water system is based on the Actiflo treatment system due to its small footprint and ability to remove suspended solids. Disinfection is also required to use canal or storm water. To incorporate the supplemental canal or storm water supply into the reclaimed water system, this alternative includes the following:

- Intake structure and raw water pump station on the Golden Gate Canal;
- Transmission piping from the raw water pump station to the canal water treatment site;
- Actiflo treatment process (includes a coagulation tank, maturation tank, and clarification tank), disinfection system, clearwell, and transfer pump station at the canal water treatment site;
- Transfer piping from the canal water treatment site to the wastewater treatment plant site for blending with the reclaimed water;
- A new 5 MG ground storage tank for additional reclaimed water storage at the wastewater treatment plant site; and
- Expansion of the reclaimed water system to shift the irrigation demand from potable water to reclaimed water.

The 5 million gallon (MG) ground storage tank at the wastewater treatment plant site would be constructed where the work shops are currently located due to the proximity to the existing ground storage tanks. The work shops would need to be relocated on-site to make room for the new ground storage tank.

An ASR system and the associated transfer piping capable of providing water to the canal water treatment system during dry periods when water from the canal is not limited is also included as part of this alternative.

5.2.3 Water Supply Alternative 3

Compared to the previous alternatives that considered developing new potable water supply sources, alternative 3 proposes using the existing wellfields only, and developing extensive irrigation sources to offset demand on the potable system. A summary of the proposed water supply sources included in alternative 3 is provided below:

- Potable Water Supply
    - 24 MGD Lime Softening – Existing Wellfields

- Irrigation Water System Supply
    - 9 MGD Reclaimed Water
    - 15 MGD Golden Gate Canal or Storm Water
    - Canal or Storm Water ASR System

The potable water supply for Alternative 3 includes the existing 24 MGD Lime Softening WTP. To meet the disinfection requirements for the groundwater rule by 2009, this option would include an ozone system for disinfection, a new clearwell for contact time, and new ground storage facilities. This alternative includes expanding the reclaimed water system to the point where enough of the irrigation demand is supplied by the reclaimed water system to offset any growth in the potable water demand. Therefore, no additional potable water supplies are included in this alternative.

The irrigation water supply for alternative 3 includes the reclaimed water from the City's wastewater treatment plant supplemented with water from the Golden Gate Canal and storm water. The supplemental water would allow for expansion of the reclaimed water system, thereby increasing the amount of irrigation demand served by alternative waters rather than by the potable water supply. The cost for treating the canal water and stormwater for reclaimed water use is based on the Actiflo treatment system due to its small footprint and ability to remove suspended solids. Disinfection is also required to use the water from the canal and stormwater. To incorporate the supplemental canal water supply and stormwater into the reclaimed water system, this alternative includes the following:

- Intake structure and raw water pump station on the Golden Gate Canal;
- Transmission piping from the raw water pump station to the canal water treatment site;
- Actiflo treatment process (includes a coagulation tank, maturation tank, and clarification tank), disinfection system, clearwell, and transfer pump station at the canal water treatment site;
- A new 5 MG ground storage tank for additional water storage at the canal water treatment site;
- Transfer piping from the canal water treatment site to the wastewater treatment plant site for blending with the reclaimed water;
- Transfer piping from a storm water park to the treatment site,
- A new 5 MG ground storage tank for additional reclaimed water storage at the wastewater treatment plant site; and
- Expansion of the reclaimed water system to shift the irrigation demand from potable water to reclaimed water.

The 5 MG ground storage tank at the wastewater treatment plant site would be constructed where the work shops are currently located due to the proximity to the existing ground storage tanks. The work shops would need to be relocated on-site to make room for the new ground storage tank.

An ASR system and associated transfer piping capable of providing canal or storm water to the treatment system during dry periods when these flows are not available is also included as part of this alternative.

5.2.4 Water Supply Alternative 4

Water supply alternative 4 considers treating the existing reclaimed water supply with reverse osmosis for chloride removal. This process will reduce the quantity of reclaimed water that is available over the planning period, as only 75% of the water that is treated is recovered. The remaining 25% must be disposed of in a deep injection well. This option also includes expansion of the potable water treatment with a 17 MGD reverse osmosis water treatment facility. The existing lime softening treatment plant is utilized to its maximum capacity of 24 MGD with this option. A summary of the water supply options in this alternative is found below:

- Potable Water Supply
  - 24 MGD Lime Softening – Existing Wellfields
  - 17 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield

- Irrigation Water System Supply
  - 7 MGD Reclaimed Water

No expansion to the reclaimed water system is required with this alternative as it reduces the quantity of reclaimed water that is available. This alternative offers higher water quality as compared to the previous alternatives presented.

5.2.5 Water Supply Alternative 5

Compared to the previous alternatives, alternative 5 considers limiting use of the existing wellfields for potable water supply, and developing an expanded lower Hawthorn water supply wellfield. This option also considers utilizing the existing wellfields as supplemental irrigation water supply. A summary of the water supply options in this alternative is found below:

- Potable Water Supply
    - 14 MGD Lime Softening – Existing Wellfields
    - 20 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield

- Irrigation Water System Supply
    - 9 MGD Reclaimed Water
    - 5 MGD Groundwater – Existing Wellfield

The potable water supply for this alternative includes reducing the capacity of the existing 30 MGD Lime Softening WTP to 14 MGD and a new 20 MGD RO WTP. The existing lime softening plant utilizes groundwater from the Coastal Ridge wellfield and the East Golden Gate wellfield, which are surficial aquifer supplies. This alternative would reduce the amount of withdrawal from the surficial aquifer. Alternative 4 consists of an additional 20 MGD of potable water from a new RO WTP utilizing raw water from the lower Hawthorn aquifer. The new RO WTP would be located on the existing lime softening WTP site.

The new 20 MGD RO WTP would include a new wellfield, pretreatment, post treatment, and concentrate disposal. This alternative would also include a new clearwell and transfer pump station for blending the lime softened water with RO permeate, a new ground storage tank, and a new high service pump station. The wellfield for the RO process would need to be capable of supplying up to 26.67 MGD (firm capacity) of raw water based on an assumed recovery of 75%. Concentrate disposal is assumed to comprise deep well injection.

This alternative includes supplementing the irrigation water supply with 5 MGD of water from the existing wellfields. The decrease in capacity of the Lime Softening WTP would allow for some of the surficial aquifer wells that serve the Lime Softening WTP to be redirected to supplement the reclaimed water system.

The supplemental water would allow for expansion of the reclaimed water system, thereby increasing the amount of irrigation demand served by alternative waters and decreasing the amount of irrigation demand served by the potable water supply. To incorporate the supplemental canal water supply into the reclaimed water system, this alternative includes the following:

- Transfer pumps and transmission piping to redirect groundwater from the water treatment plant site to the wastewater treatment plant site for blending with the reclaimed water;

- A new 5 MG ground storage tank for additional reclaimed water storage at the wastewater treatment plant site; and
- Expansion of the reclaimed water system to shift the irrigation demand from potable water to reclaimed water.

The 5 MG ground storage tank at the wastewater treatment plant site would be constructed where the work shops are currently located due to the proximity to the existing ground storage tanks. The work shops would need to be relocated on-site to make room for the new ground storage tank.

5.2.6 Water Supply Alternative 6

Alternative 6 is similar to the previous alternative considered except that it considers the use of canal or storm water to supplement the reclaimed water system rather than groundwater from the City's existing wellfields. A summary of water supply sources considered in this alternative is provided below:

- Potable Water Supply
  - 14 MGD Lime Softening – Existing Wellfields
  - 20 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield

- Irrigation Water System Supply
  - 9 MGD Reclaimed Water
  - 5 MGD Golden Gate Canal or Storm Water
  - Canal or Storm Water ASR System

5.2.7 Water Supply Alternative 7

Alternative 7 considers the use of the Gulf of Mexico for new water supply while maximizing use of the existing water treatment facility and reclaimed water supply. A summary of water supply sources considered in this alternative is provided below:

- Potable Water Supply
  - 24 MGD Lime Softening – Existing Wellfields
  - 15 MGD High Pressure Reverse Osmosis (RO) – Gulf of Mexico

- Irrigation Water System Supply
  - 9 MGD Reclaimed Water

With this alternative, a new high pressure reverse osmosis water treatment facility would be constructed on the same site as the existing lime softening water treatment plant. Raw water would be withdrawn from the Gulf of Mexico, and concentrate would be disposed of in a deep injection well. The reclaimed water system would be expanded to provide a distribution capacity of 9 MGD.

5.2.8 Water Supply Alternative 8

Compared to the previous alternatives, alternative 8 considers developing a new lower Hawthorn water supply as the sole potable water supply source for the City of Naples. With this alternative, the existing lime softening water treatment facility would be abandoned. A summary of the water supply sources considered in this alternative is provided below:

- Potable Water Supply
  - 39 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield

- Irrigation Water System Supply
  - 9 MGD Reclaimed Water

This alternative would eliminate withdrawals from the surficial aquifer as it considers abandoning the existing treatment facilities. The new 39 MGD RO WTP would include a new wellfield, pretreatment, post treatment, and concentrate disposal. This alternative would also include a new clearwell and transfer pump station, a new ground storage tank, and a new high service pump station. The 39 MGD RO WTP would be constructed in phases to allow for the phasing out of the lime softening plant and demolition of existing equipment required to make room on the existing WTP site. The wellfield for the RO process would need to be capable of supplying up to 52 MGD (firm capacity) of raw water based on an assumed recovery of 75%. Concentrate disposal is assumed to comprise deep well injection.

5.2.9 Water Supply Alternative 9

Compared to the previous alternative, alternative 9 also considers eliminating use of the existing wellfields. However, in this alternative, the new potable water supply is offset by the use of canal or storm water as an irrigation water supply. A summary of water supply sources considered in alternative 9 is provided below:

- Potable Water Supply
  - 34 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield

- Irrigation Water System Supply
    - 9 MGD Reclaimed Water
    - 5 MGD Golden Gate Canal or Storm Water
    - Canal or Storm Water ASR System

The potable water supply for this alternative is very similar to the previous except the capacity is reduced to 34 MGD and consequently the wellfield for the RO process would need to be capable of supplying up to 45.35 MGD (firm capacity) of raw water based on an assumed recovery of 75%. The 5 MGD reduction of potable water supply in Alternative 2 would be possible with an expansion of the reclaimed water system large enough to offset the irrigation demands utilizing supplemental stormwater.

5.2.10 Water Supply Alternative 10

Compared to the previous alternative, alternative 10 also considers eliminating use of the existing wellfields, and replacing them with a 39 MGD high pressure reverse osmosis water treatment facility to treat sea water from the Gulf of Mexico. A summary of water supply sources considered in alternative 10 is provided below:

- Potable Water Supply
    - 39 MGD High Pressure Reverse Osmosis (RO) – Gulf of Mexico

- Irrigation Water System Supply
    - 9 MGD Reclaimed Water

This alternative would eliminate withdrawals from the surficial aquifer as it considers abandoning the existing treatment facilities. The new 39 MGD RO WTP would include a new Gulf of Mexico intake structure, pretreatment, post treatment, and concentrate disposal. This alternative would also include a new clearwell and transfer pump station, a new ground storage tank, and a new high service pump station. The 39 MGD RO WTP would be constructed in phases to allow for the phasing out of the lime softening plant and demolition of existing equipment required to make room on the existing WTP site. Concentrate disposal is assumed to comprise deep well injection.

5.3 PRELIMINARY OPINION OF COST

A preliminary opinion of cost for each alternative was prepared to reduce the number of alternatives for consideration based on capital costs. Table 5-1 presents a summary of the cost opinion for each alternative. The breakdown for each alternative is provided in Tables 5-2

through 5-11. The costs presented below include capital costs, permitting, design, and construction administration. All proposed facilities are to be located on existing City property and therefore land acquisition was not included.

Table 5-1
Summary of Preliminary Opinion of Probable Costs
Top 10 Water Supply Alternatives

Alternative No.	Preliminary Opinion of Probable Cost ($ Millions)	Existing Facilities		New Facilities				Capacity Needed (MGD)
		Existing Potable Capacity (MGD)	Existing Reclaimed Capacity (MGD)	Brackish Groundwater w/ RO Treatment Capacity (MGD)	Sea Water w/ RO Treatment Capacity (MGD)	Golden Gate Canal Supplemented with Storm water / Actiflo Treatment Capacity (MGD)	Surficial Aquifer Groundwater w/ Disinfection Treatment Capacity (MGD)	
1	$102	**24**	**9**	**15**	0	0	0	48
2	$117	**24**	**9**	**10**	0	**5**	0	48
3	$128	**24**	**9**	0	0	**15**	0	48
4	$131	**24**	**7** (1)	**17**	0	0	0	48
5	$135	**19** (2)	**9**	**20**	0	0	0	48
6	$156	**14** (2)	**9**	**20**		0	5	34
7	$196	**24**	**9**	0	**15**		0	48
8	$206	0	**9**	**39**	0	0	0	48
9	$222	0	**9**	**34**	0	0	**5**	48
10	$386	0	**9**	0	**39**	0	0	48

Notes:
1. Option 4 utilizes reverse osmosis treatment on the reclaimed water which reduces the water supply available.
2. Options 5 and 6 consider a partial phase out of the existing lime softening treatment facility.
3. Options 8-10 consider a total phase out of the existing lime softening treatment facility.

Table 5-2
Preliminary Opinion of Probable Costs
Alternative 1

Potable Water System Supply	
5 MG Ground Storage Tank	$2,000,000
New Raw Water Supply Wells	$9,200,000
15 MGD RO Treatment Process	$13,700,000
High Service Pump Station (90 MGD)	$3,500,000
Degasifiers and Odor Control w/Clearwell	$2,500,000
Concentrate Disposal Wells	$6,000,000
Chlorine and Ammonia Feed Systems	$2,100,000
Bulk Chemical Storage	$1,000,000
Electrical & Instrumentation (20%)	$8,000,000
Site Work (10%)	$4,000,000
Yard Piping (15%)	$6,000,000
Potable Water Interconnect at Reclaimed Tank	$400,000
Raw Water Transmission Piping	$4,600,000
Subtotal for Potable Water System Supply	$63,000,000
Mobilization, Bonds, Permits, General Conditions (7%)	$4,410,000
Contingency (30%)	$18,900,000
Engineering, Permitting & Construction Administration	$8,631,000
Total for Potable Water System Supply	*$94,941,000*
Reclaimed Water System Supply	
Reclaimed Water System Expansion	$4,900,000
Subtotal for Reclaimed Water System Supply	$4,900,000
Mobilization, Bonds, Permits, General Conditions (7%)	$343,000
Contingency (30%)	$1,470,000
Engineering, Permitting and Construction Administration	$671,300
Total for Reclaimed Water System Supply	*$7,384,300*
Total for Alternative 1	**$102,325,300**

Table 5-3
Preliminary Opinion of Probable Costs
Alternative 2

Potable Water System Supply	
5 MG Ground Storage Tank	$2,000,000
New Raw Water Supply Wells	$6,200,000
10 MGD RO Treatment Process	$9,800,000
High Service Pump Station (80 MGD)	$3,100,000
Degasifiers and Odor Control w/Clearwell	$1,900,000
Concentrate Disposal Wells	$6,000,000
Chlorine and Ammonia Feed Systems	$1,900,000
Bulk Chemical Storage	$750,000
Electrical & Instrumentation (20%)	$6,330,000
Site Work (10%)	$3,165,000
Yard Piping (15%)	$4,747,500
Potable Water Interconnect at Reclaimed Tank	$400,000
Raw Water Transmission Piping	$2,000,000
Subtotal for Potable Water System Supply	$48,292,500
Mobilization, Bonds, Permits, General Conditions (7%)	$3,380,475
Contingency (30%)	$14,487,750
Engineering, Permitting & Construction Administration	$6,616,073
Total for Potable Water System Supply	*$72,776,798*
Reclaimed Water System Supply	
Canal Water Intake and Pump Station	$400,000
5 MGD Actiflo Treatment Process	$3,500,000
Sodium Hypochlorite System	$250,000
Clearwell	$300,000
Transfer Pump Station	$200,000
5 MG Ground Storage Tank	$2,000,000
ASR Wells	$4,800,000
Electrical and Instrumentation (20%)	$2,290,000
Site Work (10%)	$1,145,000
Yard Piping (15%)	$1,717,500
Canal Water Transmission Piping	$550,000
Treated Canal Water Transfer Piping	$825,000
ASR Transmission Piping	$700,000
Reclaimed Water System Expansion	$10,800,000
Subtotal for Reclaimed Water System Supply	$29,477,500
Mobilization, Bonds, Permits, General Conditions (7%)	$2,063,425
Contingency (30%)	$8,843,250
Engineering, Permitting & Construction Administration	$4,038,418
Total for Reclaimed Water System Supply	*$44,422,593*
Total for Alternative 2	**$117,199,390**

Table 5-4
Preliminary Opinion of Probable Costs
Alternative 3

Potable Water System Supply	
Clearwell	$1,100,000
5 MG Ground Storage Tank	$2,000,000
High Service Pump Station (60 MGD)	$2,300,000
Ozonation System	$7,000,000
Electrical & Instrumentation (20%)	$2,480,000
Site Work (10%)	$1,240,000
Yard Piping (15%)	$1,860,000
Subtotal for Potable Water System Supply	$17,980,000
Mobilization, Bonds, Permits, General Conditions (7%)	$1,258,600
Contingency (30%)	$5,394,000
Engineering, Permitting & Construction Administration	$2,463,260
Total for Potable Water System Supply	*$27,095,860*
Reclaimed Water System Supply	
Canal Water Intake and Pump Station	$700,000
10 MGD Actiflo Treatment Process - Canal Water	$6,900,000
Sodium Hypochlorite System	$380,000
Clearwell	$450,000
Transfer Pump Station	$400,000
5 MG Ground Storage Tank	$2,000,000
ASR Wells	$11,750,000
5 MGD Actiflo Treatment Process - Stormwater	$3,500,000
Sodium Hypochlorite System	$250,000
Clearwell	$300,000
Transfer Pump Station	$200,000
5 MG Ground Storage Tank	$2,000,000
Electrical and Instrumentation (20%)	$5,766,000
Site Work (10%)	$2,883,000
Yard Piping (15%)	$4,324,500
Canal Water Transmission Piping	$600,000
Treated Canal Water Transfer Piping	$1,175,000
Stormwater Transmission Piping	$1,400,000
Treated Stormwater Transfer Piping	$275,000
ASR Transmission Piping	$1,200,000
Reclaimed Water System Expansion	$20,300,000
Subtotal for Reclaimed Water System Supply	$66,753,500
Mobilization, Bonds, Permits, General Conditions (7%)	$4,672,745
Contingency (30%)	$20,026,050
Engineering, Permitting & Construction Administration	$9,145,230
Total for Reclaimed Water System Supply	*$100,597,525*
Total for Alternative 3	**$127,693,385**

Table 5-5
Preliminary Opinion of Probable Costs
Alternative 4

Potable Water System Supply	
5 MG Ground Storage Tank	$2,000,000
New Raw Water Supply Wells	$10,500,000
17 MGD RO Treatment Process	$15,200,000
High Service Pump Station (100 MGD)	$3,900,000
Degasifiers and Odor Control w/Clearwell	$2,750,000
Concentrate Disposal Wells	$6,000,000
Chlorine and Ammonia Feed Systems	$2,200,000
Bulk Chemical Storage	$1,150,000
Electrical & Instrumentation (20%)	$8,740,000
Site Work (10%)	$4,370,000
Yard Piping (15%)	$6,555,000
Raw Water Transmission Piping	$4,900,000
Subtotal for Potable Water System Supply	$68,265,000
Mobilization, Bonds, Permits, General Conditions (7%)	$4,778,550
Contingency (30%)	$20,479,500
Engineering, Permitting & Construction Administration	$9,352,305
Total for Potable Water System Supply	*$102,875,355*
Reclaimed Water System Supply	
RO Preatreatment	$4,000,000
7 MGD RO Treatment Process	$7,500,000
Bulk Chemical Storage	$600,000
Electrical & Instrumentation (20%)	$2,420,000
Site Work (10%)	$1,210,000
Yard Piping (15%)	$1,815,000
Transfer Piping to Concentrate Disposal Well	$1,000,000
Subtotal for Reclaimed Water System Supply	$18,545,000
Mobilization, Bonds, Permits, General Conditions (7%)	$1,298,150
Contingency (30%)	$5,563,500
Engineering, Permitting and Construction Administration	$2,540,665
Total for Reclaimed Water System Supply	*$27,947,315*
Total for Alternative 4	**$130,822,670**

Table 5-6
Preliminary Opinion of Probable Costs
Alternative 5

Potable Water System Supply	
5 MG Ground Storage Tank	$2,000,000
New Raw Water Supply Wells	$12,300,000
20 MGD RO Treatment Process	$17,500,000
High Service Pump Station (80 MGD)	$3,100,000
Degasifiers and Odor Control w/Clearwell	$3,100,000
Concentrate Disposal Wells	$6,000,000
Chlorine and Ammonia Feed Systems	$1,900,000
Bulk Chemical Storage	$1,300,000
Electrical & Instrumentation (20%)	$9,440,000
Site Work (10%)	$4,720,000
Yard Piping (15%)	$7,080,000
Raw Water Transmission Piping	$5,800,000
Subtotal for Potable Water System Supply	$74,240,000
Mobilization, Bonds, Permits, General Conditions (7%)	$5,196,800
Contingency (30%)	$22,272,000
Engineering, Permitting & Contingency	$10,170,880
Total for Potable Water System Supply	*$111,879,680*
Reclaimed Water System Supply	
5 MG Ground Storage Tank	$2,000,000
Groundwater Transfer Pump Station	$200,000
Electrical and Instrumentation (20%)	$440,000
Site Work (10%)	$220,000
Yard Piping (15%)	$330,000
Groundwater Transmission Piping	$1,000,000
Reclaimed Water System Expansion	$10,800,000
Subtotal for Reclaimed Water System Supply	$14,990,000
Mobilization, Bonds, Permits, General Conditions (7%)	$1,049,300
Contingency (30%)	$4,497,000
Engineering, Permitting & Contingency	$2,053,630
Total for Reclaimed Water System Supply	*$22,589,930*
Total for Alternative 5	**$134,469,610**

Table 5-7
Preliminary Opinion of Probable Costs
Alternative 6

Potable Water System Supply	
5 MG Ground Storage Tank	$2,000,000
New Raw Water Supply Wells	$12,300,000
20 MGD RO Treatment Process	$17,500,000
High Service Pump Station (80 MGD)	$3,100,000
Degasifiers and Odor Control w/Clearwell	$3,100,000
Concentrate Disposal Wells	$6,000,000
Chlorine and Ammonia Feed Systems	$1,900,000
Bulk Chemical Storage	$1,300,000
Electrical & Instrumentation (20%)	$9,440,000
Site Work (10%)	$4,720,000
Yard Piping (15%)	$7,080,000
Raw Water Transmission Piping	$5,800,000
Subtotal for Potable Water System Supply	$74,240,000
Mobilization, Bonds, Permits, General Conditions (7%)	$5,196,800
Contingency (30%)	$22,272,000
Engineering, Permitting and Construction Administration	$10,170,880
Total for Potable Water System Supply	*$111,879,680*
Reclaimed Water System Supply	
Canal Water Intake and Pump Station	$400,000
5 MGD Actiflo Treatment Process	$3,500,000
Sodium Hypochlorite System	$250,000
Clearwell	$300,000
Transfer Pump Station	$200,000
5 MG Ground Storage Tank	$2,000,000
ASR Wells	$4,800,000
Electrical and Instrumentation (20%)	$2,290,000
Site Work (10%)	$1,145,000
Yard Piping (15%)	$1,717,500
Canal Water Transmission Piping	$425,000
Treated Canal Water Transfer Piping	$550,000
ASR Transmission Piping	$700,000
Reclaimed Water System Expansion	$10,800,000
Subtotal for Reclaimed Water System Supply	$29,077,500
Mobilization, Bonds, Permits, General Conditions (7%)	$2,035,425
Contingency (30%)	$8,723,250
Engineering, Permitting and Construction Administration	$3,983,618
Total for Reclaimed Water System Supply	*$43,819,793*
Total for Alternative 6	**$155,699,473**

Table 5-8
Preliminary Opinion of Probable Costs
Alternative 7

Potable Water System Supply	
Seawater Intake Station	$5,000,000
15 MGD Desalination WTP	$115,000,000
High Service Pump Station (90 MGD)	$3,500,000
Raw Water Transmission Piping	$1,500,000
Subtotal for Potable Water System Supply	$125,000,000
Mobilization, Bonds, Permits, General Conditions (7%)	$8,750,000
Contingency (30%)	$37,500,000
Engineering, Permitting & Construction Administration	$17,125,000
Total for Potable Water System Supply	*$188,375,000*
Reclaimed Water System Supply	
Reclaimed Water System Expansion	$4,900,000
Subtotal for Reclaimed Water System Supply	$4,900,000
Mobilization, Bonds, Permits, General Conditions (7%)	$343,000
Contingency (30%)	$1,470,000
Engineering, Permitting and Construction Administration	$671,300
Total for Reclaimed Water System Supply	*$7,384,300*
Total for Alternative 7	**$195,759,300**

Table 5-9
Preliminary Opinion of Probable Costs
Alternative 8

Potable Water System Supply	
5 MG Ground Storage Tank	$2,000,000
New Raw Water Supply Wells	$24,000,000
39 MGD RO Treatment Process	$32,300,000
High Service Pump Station (90 MGD)	$3,500,000
Degasifiers and Odor Control w/Clearwell	$5,400,000
Concentrate Disposal Wells	$10,000,000
Chlorine and Ammonia Feed Systems	$2,100,000
Bulk Chemical Storage	$2,400,000
Electrical & Instrumentation (20%)	$16,340,000
Site Work (10%)	$8,170,000
Yard Piping (15%)	$12,255,000
Raw Water Transmission Piping	$13,600,000
Subtotal for Potable Water System Supply	$132,065,000
Mobilization, Bonds, Permits, General Conditions (7%)	$9,244,550
Contingency (30%)	$39,619,500
Engineering, Permitting & Construction Administration	$18,092,905
Total for Potable Water System Supply	*$199,021,955*
Reclaimed Water System Supply	
Reclaimed Water System Expansion	$4,900,000
Subtotal for Reclaimed Water System Supply	$4,900,000
Mobilization, Bonds, Permits, General Conditions (7%)	$343,000
Contingency (30%)	$1,470,000
Engineering, Permitting & Construction Administration	$671,300
Total for Reclaimed Water System Supply	*$7,384,300*
Total for Alternative 8	**$206,406,255**

Table 5-10
Preliminary Opinion of Probable Costs
Alternative 9

Potable Water System Supply	
5 MG Ground Storage Tank	$2,000,000
New Raw Water Supply Wells	$20,900,000
34 MGD RO Treatment Process	$28,400,000
High Service Pump Station (80 MGD)	$3,100,000
Degasifiers and Odor Control w/Clearwell	$4,800,000
Concentrate Disposal Wells	$10,000,000
Chlorine and Ammonia Feed Systems	$1,900,000
Bulk Chemical Storage	$2,100,000
Electrical & Instrumentation (20%)	$14,640,000
Site Work (10%)	$7,320,000
Yard Piping (15%)	$10,980,000
Raw Water Transmission Piping	$11,600,000
Subtotal for Potable Water System Supply	$117,740,000
Mobilization, Bonds, Permits, General Conditions (7%)	$8,241,800
Contingency (30%)	$35,322,000
Engineering, Permitting & Construction Administration	$16,130,380
Total for Potable Water System Supply	*$177,434,180*
Reclaimed Water System Supply	
Canal Water Intake and Pump Station	$400,000
5 MGD Actiflo Treatment Process	$3,500,000
Sodium Hypochlorite System	$250,000
Clearwell	$300,000
Transfer Pump Station	$200,000
5 MG Ground Storage Tank	$2,000,000
ASR Wells	$4,800,000
Electrical and Instrumentation (20%)	$2,290,000
Site Work (10%)	$1,145,000
Yard Piping (15%)	$1,717,500
Canal Water Transmission Piping	$425,000
Treated Canal Water Transfer Piping	$950,000
ASR Transmission Piping	$700,000
Reclaimed Water System Expansion	$10,800,000
Subtotal for Reclaimed Water System Supply	$29,477,500
Mobilization, Bonds, Permits, General Conditions (7%)	$2,063,425
Contingency (30%)	$8,843,250
Engineering, Permitting & Construction Administration	$4,038,418
Total for Reclaimed Water System Supply	*$44,422,593*
Total for Alternative 9	**$221,856,773**

Table 5-11
Preliminary Opinion of Probable Costs
Alternative 10

Potable Water System Supply	
Seawater Intake Station	$10,000,000
39 MGD Desalination WTP	$235,000,000
High Service Pump Station (90 MGD)	$3,500,000
Raw Water Transmission Piping	$2,700,000
Subtotal for Potable Water System Supply	$251,200,000
Mobilization, Bonds, Permits, General Conditions (7%)	$17,584,000
Contingency (30%)	$75,360,000
Engineering, Permitting & Construction Administration	$34,414,400
Total for Potable Water System Supply	*$378,558,400*
Reclaimed Water System Supply	
Reclaimed Water System Expansion	$4,900,000
Subtotal for Reclaimed Water System Supply	$4,900,000
Mobilization, Bonds, Permits, General Conditions (7%)	$343,000
Contingency (30%)	$1,470,000
Engineering, Permitting and Construction Administration	$671,300
Total for Reclaimed Water System Supply	*$7,384,300*
Total for Alternative 10	**$385,942,700**

5.4 OPERATION AND MAINTAINANCE COSTS

The cost of operation and maintenance (O&M) should be considered when considering a capital program. The O&M costs for the first four (4) options identified in the previous section were compared and are illustrated in Table 5-12. For the purpose of evaluation, the costs all assume that the facilities would be placed into service immediately. There are many other assumptions included in these O&M costs such as chemical dosages and power costs which would be determined more specifically during preliminary design of the project. These costs are presented to provide a relative order of magnitude. Preliminary design of the facilities is required to obtain more accurate costs. A description of the top four options is provided below:

Alternative No. 1: Preliminary Opinion of Probable Cost - $101 Million

- Potable Water Supply
    - 24 MGD Lime Softening – Existing Wellfields
    - 15 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield
- Irrigation Water System Supply
    - 9 MGD Reclaimed Water

Alternative No. 2: Preliminary Opinion of Probable Cost - $116 Million

- Potable Water Supply
    - 24 MGD Lime Softening – Existing Wellfields
    - 10 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield
- Irrigation Water System Supply
    - 9 MGD Reclaimed Water
    - 5 MGD Golden Gate Canal Water or Storm water
    - Canal or Storm Water ASR System

Alternative No. 3: Preliminary Opinion of Probable Cost - $127 Million

- Potable Water Supply
    - 24 MGD Lime Softening – Existing Wellfields
- Irrigation Water System Supply
    - 9 MGD Reclaimed Water
    - 15 MGD Golden Gate Canal or Storm Water
    - Canal or Storm Water ASR System

Alternative No. 4: Preliminary Opinion of Probable Cost - $131 Million

- Potable Water Supply
    - 24 MGD Lime Softening – Existing Wellfields

    - 17 MGD Reverse Osmosis (RO) – New Lower Hawthorn Wellfield
- Irrigation Water System Supply
    - 7 MGD Reclaimed Water

Table 5-12
Summary of Preliminary Estimate of Annual O&M Costs
Top 4 Options

Alternative	Potable Water System Cost ($)	Reclaimed Water System Cost ($)	Total Cost ($)
1	$9,417,000	$3,550,000	$12,967,000
2	$8,099,000	$4,522,000	$12,621,000
3	$5,918,000	$6,194,000	$12,112,000
4	$10,279,000	$5,799,000	$16,078,000

Alternative 4 has the highest operation and maintenance cost because it includes reverse osmosis treatment of both the potable and reclaimed water which is very energy intensive. Based on the high capital and O&M costs, alternative 4 was eliminated from consideration. Alternative 3 has the lowest operation and maintenance costs because it does not include reverse osmosis treatment. A present value analysis of the O&M cost savings does not justify the additional capital costs associated with alternative 3; however, this alternative provides the most environmental benefits.

Alternatives 1, 2 and 3 are good options to meet the City's 20 year water supply needs. A comparison of non cost factors for these alternatives can be found below.

5.5 NON COST FACTORS

Non cost factors were considered for the remaining three alternatives. Table 5-13 provides a summary of non cost factors considered and scores each alternative with a value of 1-5, with 5 being the most favorable alternative and 1 being the least favorable.

Table 5-13
Summary of Non Cost Factors
Top 3 Options

Non Cost Factor	Alternative 1	Alternative 2	Alternative 3
Public Health and Safety			
Increased Fire Flow Capacity	5	4	2
Potable Water Quality	5	4	2
Environmental Issues			
Enhancement of Naples Bay	3	4	5
Protection of Groundwater Supplies	3	4	5
Concentrate Disposal Quantity	3	4	5
Potential Wetlands Impacts	3	3	3
Regulatory Issues			
Permittability	4	4	4
Compliance with Regulatory Agency Goals	4	4	4
Compliance with Customer Expectation			
Aesthetic Water Quality	4	3	3
Water Supply Diversity			
Number of Supply Options Utilized	3	5	3
Total Score Non Cost Factors	37	39	36

A comparison of non-cost factors between the three alternatives yields a slightly higher score for alternative 2. A brief summary of the positive factors associated with alternative 2 is found below:

Alternative 2 Non Cost Advantages:

1. Alternative 2 scores high on environmental issues including:
    a. Reduction of freshwater discharges to Naples Bay through the use of canal and storm water.
    b. Less reliance on groundwater to meet future water supply needs.
2. Alternative 2 scores high on water supply diversity as it draws on multiple water resources to meet future needs lowering the City's exposure to degrading water quality or quantity with any one option.
3. Alternative 2 includes blending of canal and storm water with reclaimed water which should lower chlorides in the reclaimed water supply.

5.5 RECOMMENDATIONS

The use of additional alternative water supply options such as the Golden Gate Canal and stormwater for supplemental irrigation water supply offer environmental and practical benefits. From an environmental standpoint, use of these water supply sources decrease fresh water flows into Naples Bay, which has been identified as a goal of this water supply plan. From a practical standpoint, maximizing use of these alternative water supply sources gives the City greater flexibility to deal with potential water shortages and regulatory constraints in the future. Although preliminary testing at the ASR site located at the City's wastewater facility indicate that brackish water supply is available within the City, additional testing is required. If water quality were to begin to degrade in the City's existing surficial wellfields or a new brackish water wellfield, regulatory restrictions could be imposed and additional treatment may be required. The City must also consider that there are competing interests for use of the Golden Gate Canal as a supplemental water supply, and it is important to secure a consumptive use permit for this source as soon as possible.

It is recommended that the City pursue multiple water sources to meet future water demands as represented by alternative 2. For the purpose of this planning effort, alternative 2 was included in the next sections of this report. Since the capital costs of this alternative are higher, planning for this option is the more conservative approach.

SECTION 6
CAPITAL IMPROVEMENTS PROGRAM

6.1 GENERAL

This section presents the recommended capital improvement program for the 20-year planning period. As discussed previously in this report, it is important to reevaluate this program every five years and make necessary adjustments based on population growth, regulatory changes, inflationary price increases and the status of the recommended projects.

6.2 RECOMMENDED CAPITAL IMPROVEMENTS PROGRAM

As discussed previously, alternatives 1 or 2 discussed in Section 5 of the report are good options for the 20 year water supply plan, but for the purpose of this planning effort, alternative 2 is recommended as it is the more conservative option.

The recommended 20 year capital improvements program is shown in Table 6-1 further described below.

6.2.1 Alternative 2 Recommended CIP Years 1-5

The first five years of the water supply CIP include:

- Regulatory upgrades to the existing water treatment facility
- Exploratory well program for brackish water supply
- Exploratory well program for concentrate disposal
- Exploratory well program for ASR
- Pilot testing and preliminary design for reverse osmosis water treatment plant
- Consumptive use permitting for existing well fields, brackish groundwater and Golden Gate Canal
- Golden Gate Canal intake structure and piping
- Potable water main interconnect to reuse storage tanks for backup water supply
- Reclaimed water system expansion to Central Avenue

In addition to the above recommended water supply CIP, the City has identified $23.2 million in capital projects during the first 5 years.

The targeted location for brackish water supply wells is illustrated in Figure 6-1. For the ASR system, the first ASR exploratory well location proposed is the Gordon River Water Quality Park. If this well is successful, it is recommended that a second exploratory well be constructed at Hole in the Wall Golf Course. If the exploratory well at the Gordon River Water Quality Park is not successful, it is recommended that a second exploratory well be constructed on the airport property or near the Golden Gate Canal Intake Structure.

Regulatory upgrades to the existing water treatment facility include construction of a clearwell, new chemical feed facilities, new storage and high service pump facilities. These improvements are illustrated in Figure 6-2. This figure also shows the proposed location of the RO process building improvements which are proposed in the next five year CIP.

6.2.2 Alternative 2 Recommended CIP Years 5-10

The CIP in years 5-10 includes the design and construction of a 10 MGD reverse osmosis water treatment facility on the same site as the existing lime softening water treatment facility. It is recommended that the plant be constructed so as to be easily expandable in the future. This CIP also includes completion of the ASR well program from the previous five years.

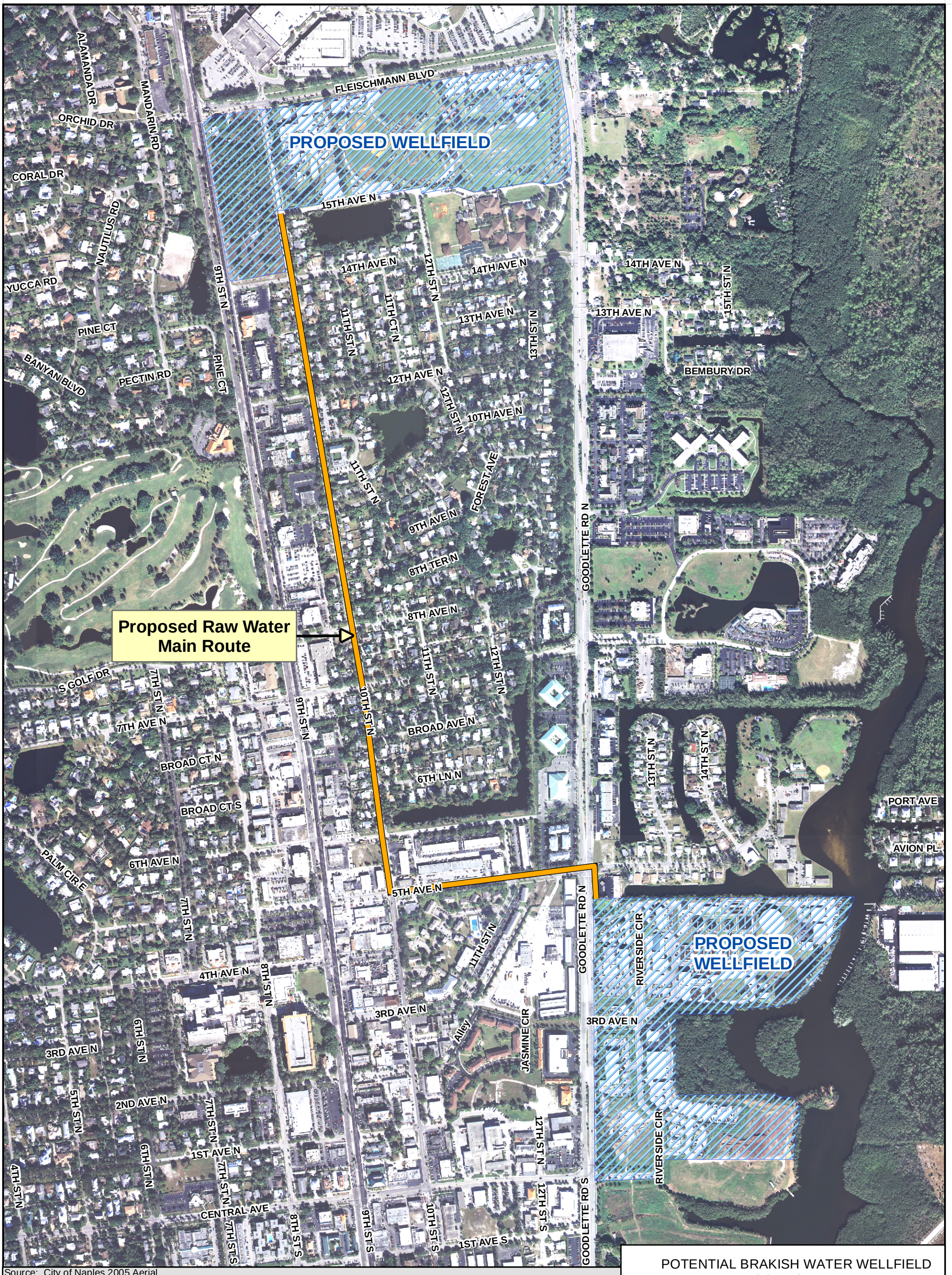
6.2.3 Alternative 2 Recommended CIP Years 10-20

The last ten years of the CIP includes construction of the canal and / or storm water treatment facilities, and expansion of the reclaimed water distribution system. The proposed treatment system location is illustrated in Figure 6-3. However, the location of this site is dependent on the location of the successful ASR program which will be determined during the previous exploratory program. If the Gordon River Water Quality Park and Hole in the Wall sites are the successful ASR locations, the treatment facility could be planned on the City's Solano Road Pump Station site. A site plan for the treatment facilities is illustrated in Figure 6-4. The proposed expansion to the reclaimed water transmission and distribution system is illustrated in Figure 6-5.

TABLE 6-1
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

Alternative 2 Recommended 20 Year Capital Improvements Program

City of Naples CIP Project	CIP Years 1-5	CIP Years 5-10	CIP Years 10-15	CIP Years 15-20
Potable Water Supply				
5 MG Ground Storage Tank	$2,000,000			
High Service Pump Station	$3,100,000			
Degasifiers / Odor Control w/ Clearwell	$1,500,000	$400,000		
Chlorine and Ammonia Feed	$1,900,000			
Bulk Chemical Storage	$750,000			
New Raw Water Supply Wells	$2,500,000	$3,700,000		
Concentrate Disposal Well	$1,500,000	$4,500,000		
RO Treatment Process	$300,000	$9,500,000		
Electrical and Instrumentation	$2,710,000	$3,620,000		
Site Work	$1,355,000.0	$1,810,000.0		
Yard Piping	$2,032,500.0	$2,715,000.0		
Raw Water Transmission Piping		$2,000,000		
Reuse Tank Water Main Connection	$400,000			
Subtotal Potable Water Supply	$20,047,500	$28,245,000		
Mobilization and General Requirements	$1,403,325	$1,977,150		
Contingency	$6,014,250	$8,473,500		
Engineering, Permitting & Construction Administration	$2,746,508	$3,869,565		
Subtotal Potable Water Supply	**$30,211,583**	**$42,565,215**		
Irrigation Water Supply				
Canal Water Intake and Pump Station	$350,000		$50,000	
Canal Water Treatment and Disinfection System			$3,500,000	$250,000
Clearwell and Transfer Station			$350,000	$150,000
5 MG Ground Storage Tank			$2,000,000	
ASR Program	$1,750,000	$3,050,000		
Electrical and Instrumentation	$420,000	$610,000	$1,180,000	$80,000
Site Work	$210,000.0	$305,000.0	$590,000.0	$40,000.0
Yard Piping	$315,000.0	$457,500.0	$885,000.0	$60,000.0
Canal Water Piping and ASR Piping	$1,400,000		$325,000	$350,000
Reclaimed Water Distribution Expansion	$4,900,000		$5,400,000	$500,000
Subtotal Irrigation Water Supply	$9,345,000	$4,422,500	$14,280,000	$1,430,000
Mobilization and General Requirements	$654,150	$309,575	$999,600	$100,100
Contingency	$2,803,500	$1,326,750	$4,284,000	$429,000
Engineering, Permitting & Construction Administration	$1,280,265	$605,883	$1,956,360	$195,910
Subtotal Irrigation Water Supply	**$14,082,915**	**$6,664,708**	**$21,519,960**	**$2,155,010**
Additional City CIP Costs	**$23,200,000**	**TBD**	**TBD**	**TBD**
Total 5 Year CIP	**$67,500,000**	**$49,200,000**	**$21,500,000**	**$2,200,000**



Source: City of Naples 2005 Aerial

LEGEND

- Proposed Wellfield Location
- Proposed Raw Water Main Route

POTENTIAL BRAKISH WATER WELLFIELD
LOCATION MAP
CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

TETRA TECH

N

0 600 Feet

FIGURE 6-1

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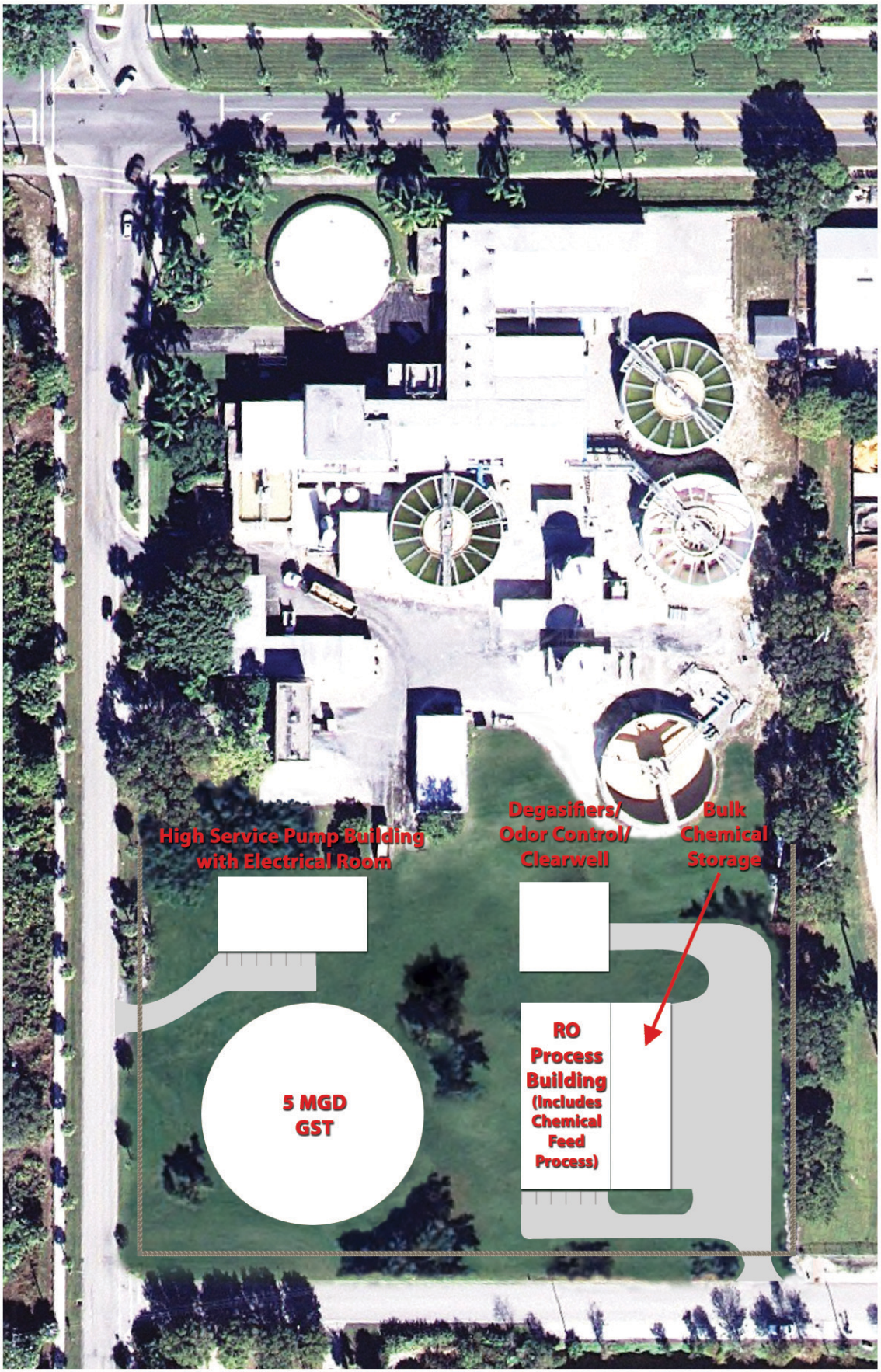

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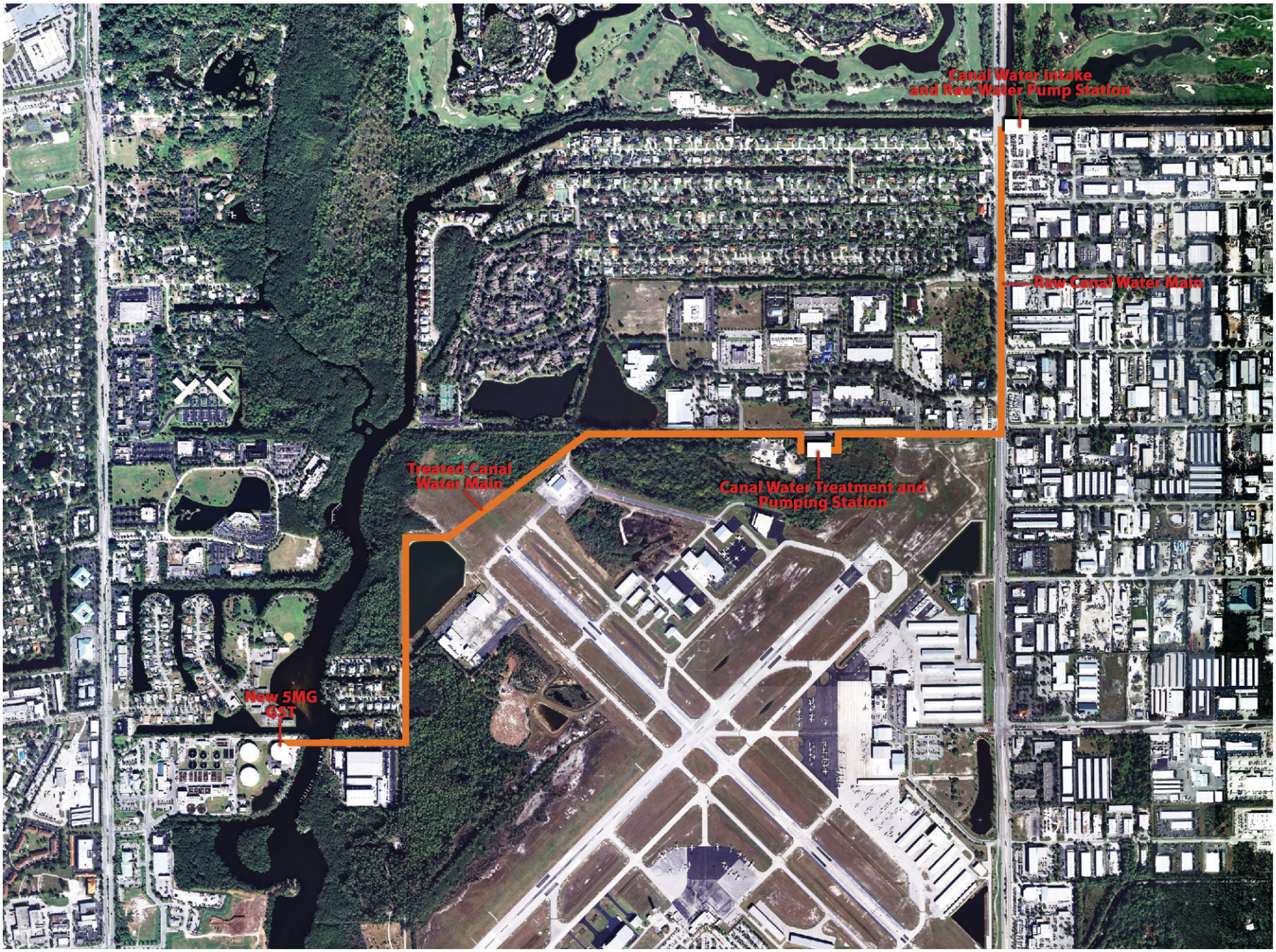
TETRA TECH

City of Naples
Integrated Water Resources Plan
Alternative 2 Recommended 20-year CIP
Potable Water Treatment Facility

FIGURE 6-2

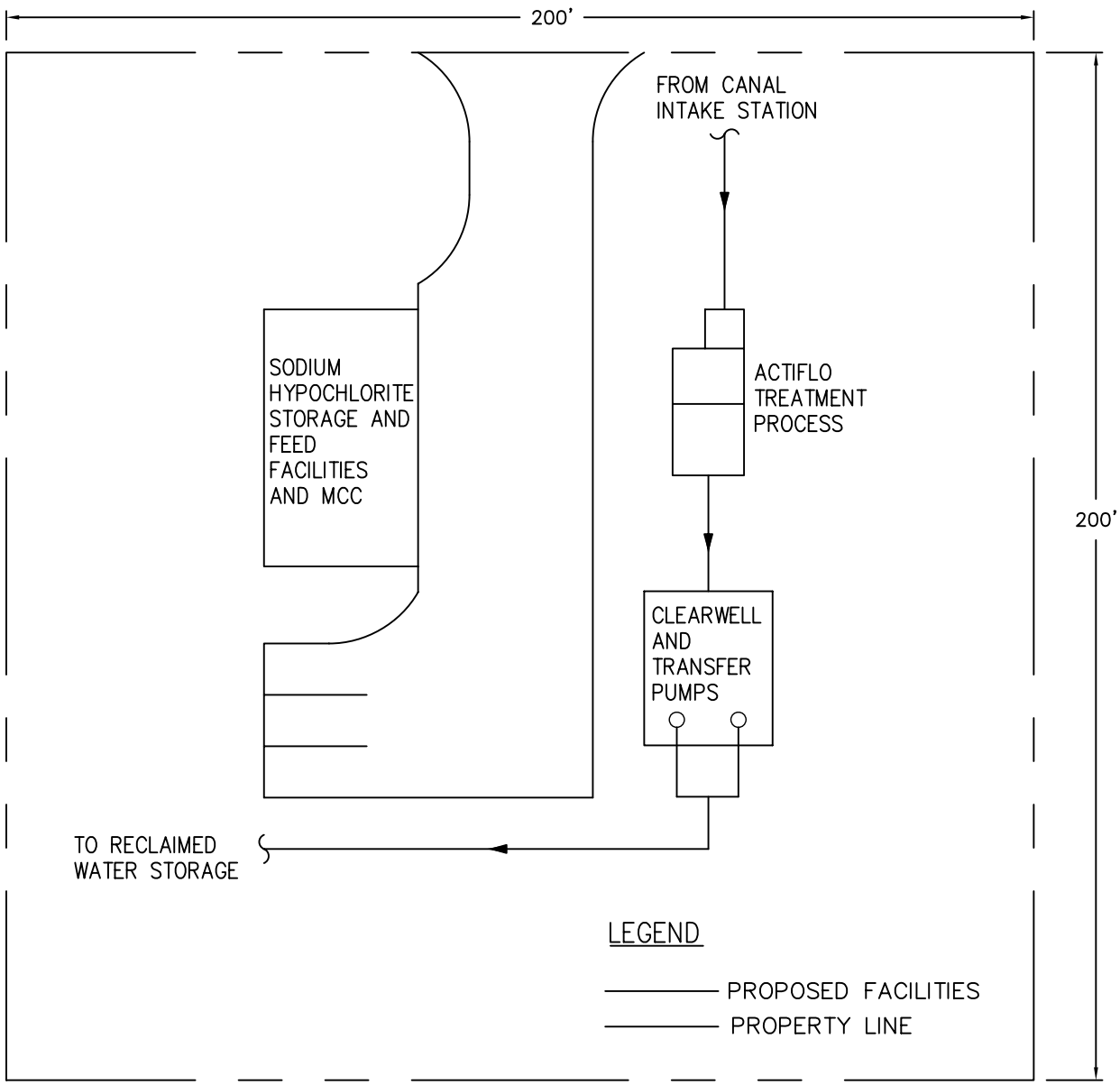


200-08516-8007 Naples_Fig6-3.PSD

TETRA TECH

City of Naples
Integrated Water Resources Plan
Alternative 2 Recommended 20-year CIP
Canal Pump Station

FIGURE
6-3



G:\Environmental\ENVIRON\Jcb\Projects\Naples Cost Curves\FIGURE 6-4.dwg

Plotted: May 29, 2008 – 5:56pm by hernan.lopez

FIGURE 6-4

TETRA TECH
Infrastructure Offices Throughout Florida
Orlando • Fort Myers
201 EAST PINE STREET – SUITE 1000 – ORLANDO, FL 32801
TELEPHONE (407) 839-3955 – FAX (407) 839-3790 – WWW.TETRATECH.COM

CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN
ALTERNATIVE 2 RECOMMENDED 20-YEAR CIP
CANAL PUMP STATION SITE PLAN

WWTP

Central Ave

LEGEND

City of Naples
City Limits

Existing Reuse Mains

Proposed Reuse Mains

WWTP Wastewater Treatment Plant

0 N 2,700 Feet

Source: Collier County 2005 Aerials

RECOMMENDED 20-YEAR CIP REUSE TRANSMISSION AND DISTRIBUTION CITY OF NAPLES INTEGRATED WATER RESOURCES PLAN

TETRA TECH

FIGURE 6-5

TT11X17PR\\GIS\200\08516\08007\Maps\IWRP_5-16-08\
BPReusePhasingF6-5.mxd [05-23-08 bam]

SECTION 7
PROGRAM FUNDING

7.1 OBJECTIVE

The previous section of this report identified the capital and operating costs for the recommended 20 year capital improvement program options. This section of the report will discuss funding of these programs and the impact on user rates and charges.

7.2 BACKGROUND

The City's water and wastewater utility is structured as an enterprise activity, and as such is expected to generate revenues sufficient to meet fiscal requirements. User rates, the primary source of revenue generation, are comprised of certain one-time charges and a series of continuing rates, charges and fees each with a specific purpose.

In 2007, The City retained Tetra Tech to provide consulting services associated with a comprehensive review of the existing user rates and charges as well as the development charges for water, wastewater, and reuse utility services. The deliverable for the project was the comprehensive rate study report, which is provided in the document titled The City of Naples Comprehensive Utility Rate and Charge Study. The water and wastewater rates designed in the study were approved and implemented by the City Council in early 2008. The reclaimed water rates were not adopted due to events in associated with the reclaimed water system. These rates are likely to be reevaluated in the third and fourth quarters of FY 2008.

7.3 2007 RATE STUDY AND ANALYSIS

The rate analysis began by identifying the revenue requirements to be funded from the monthly user rates and charges for Fiscal Year 2007/08, the year in which the proposed rates and rate structure would be implemented. The revenue requirements were based on the City's preliminary operating budget for the utility system and other factors. Once identified, the revenue requirements were allocated to the separate utility functions of water, wastewater and

reclaimed water. This allocation process provides the basis for developing cost-of-service rate components in accordance the proposed rate structure revisions.

The water, wastewater and reclaimed water rate study was heavily reliant upon a detailed analysis of the system customers and accompanying usage characteristics. The existing customer base and metered/billable flows provide the determinants utilized in calculating the monthly user rates and charges, and become the foundation for projecting future revenues generated by the water, wastewater and reclaimed water systems. As such, an analysis of recent customer billing data was conducted in order to obtain an understanding of the existing customers, customer classes, and metered usage per customer within each class. The data was sorted into sub-classes of users pursuant to the services received in order to determine the average number of accounts, total flows, and revenues for the water, wastewater, and reclaimed water systems by customer class and meter size for the period. The results of the customer analysis provide the applicable number of equivalent residential units, metered water flow (separated by usage block), and billable wastewater and reuse flows that are applied in the development of the user rates.

The design and development of monthly user rates and charges for water, wastewater, and reclaimed water service utilizes the rate determinants associated with each rate component for the Test Year. This is accomplished by utilizing the projected number of accounts, equivalent residential units and billable flow for each of the three systems. In general, the calculation of the rates involves a simple process of dividing the rate determinants into the applicable allocated costs for each rate component to determine the proposed water, sewer, and reclaimed water rates and charges. However, there are also other subjective factors that must be considered.

Rates for the different systems saw increases for various reasons. The most prominent are the following:

- Increased costs for operations and maintenance of the Utility (sewer rates had not been updated since 1999)
- New debt that is to be issued for the expanded reclaimed system and other planned water supply projects
- Additional funds needed to finance the planned CIP

Based on the rate analyses developed herein, the previous and adopted monthly user rates for water and wastewater are summarized in Tables 7-1 and 7-2. The reclaimed rates presented in Table 7-3 were not adopted along with the water and wastewater rates. The reclaimed rates will be reviewed again in 2008 to better assess the impact of the reclaimed project.

Table 7-1
Adopted and Previous Water Rates

Bi-Monthly Base Charges:

Meter Size	Previous	Adopted	% Difference
5/8" - 3/4"	$ 11.75	$ 12.50	6.38%
1.0"	19.82	31.25	57.67%
1.5"	39.65	62.50	57.63%
2.0"	63.41	100.00	57.70%
3.0"	118.91	200.00	68.19%
4.0"	198.15	312.50	57.71%
6.0"	396.35	625.00	57.69%
8.0"	634.15	1,000.00	57.69%

Volume Charges (per 1,000 gallons):

Usage Block	Previous	Adopted	% Difference
0 – 15,000	$ 1.22	$ 1.01	-17.21%
15,001 – 30,000	1.45	1.77	22.07%
30,001 – 45,000	1.83	2.53	38.25%
Over 45,000	1.83	3.03	65.57%

Table 7-2
Adopted and Previous Wastewater Rates

	Previous	Adopted[1]	% Difference
Bi-Monthly Base Charge:	$ 25.92	$ 33.00	27.31%
Volume Charges (per 1,000 gallons)[2] :	$ 2.20	$ 3.45	56.82%

Notes:
(1) Commercial customer base charge varies with meter size
(2) Single Family Residential customers are capped at 20,000 gallons per billing period

Table 7-3
Existing and Proposed Reclaimed Rates (not adopted)

	Existing	Proposed [1]	% Difference
Bi-Monthly Base Charge:	N/A	$ 4.00	N/A
Volume Charges (per 1,000 gallons) :			
General[2]	$ 0.80	$ 1.50	87.50%
Government/Institutional	$ 0.38	$ 0.38	0.00%
Bulk Users	$ 0.32	$ 0.32	0.00%

Notes:
(1) General customers only
(2) Per City Code: residents with reclaimed service are not subject to wastewater cap.

7.4 CIP FUNDING

The CIP used for the Rate Study was developed and provided by City Staff and totaled $73.1 million. Table 7-4 provides a summary of the sources and uses for the projected CIP through fiscal year 2011 used in the Rate Study.

Table 7-4
CIP Funding Sources and Uses

	FY 2008	FY 2009	FY 2010	FY 2011
CIP				
Water Production	$ 2,031,700	$ 3,095,000	$ 26,281,500	$ 25,075,500
Water Distribution	606,000	570,000	570,000	570,000
Wastewater Treatment	3,765,000	3,135,000	353,000	240,000
Wastewater Collections	894,000	773,000	760,000	1,060,000
Utilities Maintenance	1,892,000	460,000	460,000	460,000
Total	$ 9,188,700	$ 8,033,000	$ 28,424,500	$ 27,407,500
Funding				
Debt	$ 5,750,000	$ 4,006,000	$ 26,200,000	$ 25,000,000
Operations	2,107,805	4,027,000	2,224,500	2,407,500
Reserves	1,330,895	-	-	-
Total	$ 9,188,700	$ 8,033,000	$ 28,424,500	$ 27,407,500

In addition to funding from operations, debt and reserves; the City has a history of successfully receiving grant funding for many different projects including recent Reclaimed and Stormwater projects. No assumptions for grant funding were included in the Rate Study due to the unpredictable nature of the grant awards.

It is recommended that the City apply for grants to fund its alternative water supply projects. To address the challenge of ensuring the state's water supply, the 2005 Florida Legislature enacted the Water Protection and Sustainability Program. The precedent-setting law encourages cooperation between municipalities, counties, and the state's five water management districts in the protection and development of water supplies. More specifically, the law requires the regional water supply planning function of water management districts to promote alternative water supply projects - for example tapping reclaimed and stormwater - both accommodate growth and to reduce the use of traditional ground and surface water supplies, such as aquifers and lakes.

The Water Protection and Sustainability Program provides significant annual recurring state funding, underscoring the state's commitment to protect and enhance our water supply. Funds

available under the comprehensive program are administered and matched by Florida's five water management districts, for alternative water supply projects.

The South Florida Water Management District administers funds through the Alternative Water Supply Funding Program. Cities, utilities, homeowners associations, community development districts, and other water users and suppliers can apply for up to 40% of project construction costs under the new program.

7.5 FUTURE RATE INCREASES

The City has adopted a policy of indexing utility rates every year according to the Florida Public Service Commission Deflator Index. Doing so will keep rates up to date with inflation and help avoid rate shock to users.

In addition to indexing to account for inflation, it is recommended that the City periodically review rates. Capital needs of the Utility change with time and project priorities change as well. With a review every 3 to 5 years, the rates can provide adequate funding for operations, debt service, and the CIP.

7.5 PLANNED RATE INCREASES

In calculating the expected revenues to be generated from the water, wastewater and reclaimed water systems, certain assumptions were made with regard to the annual indexing of user rates. Projections of fiscal requirements have been escalated to account inflationary impacts, which subsequently necessitates a similar rate adjustment provision to maintain revenue sufficiency in future years. The level of rate indexing has been determined to be 2.74 percent per year on all user rate and charge components.

It is anticipated that a $55,000,000 30-year revenue bond will be issued in 2010 for construction of the City's new water treatment plant as shown previously. The additional annual debt service is expected to be approximately $3,340,000. Per the recommendations of the Rate Study, the current rate Ordinance provides for water rate increases of 12.74% for Fiscal Years 2009 and 2010 to fund the debt service associated with the CIP. After FY 2010, it is assumed that the City will index the rates annually as provided in the Ordinance.

The projected water and wastewater rates for fiscal years 2007/08 through 20011/12 are shown below in Tables 7-5 and 7-6. Due to the uncertain nature of the level of reclaimed water rates, which are anticipated to be reviewed in the summer of 2008, the current rates with indexing are maintained throughout the projections. Potential future increases in the reclaimed rates will provide additional revenues that can offset the revenue requirements on the water system.

Table 7-5
Projected Water Rates

		To be Implemented October 1,				
	2007	**2008**	**2009**	**2010**	**2011**	**2012**
Base Facility Charge						
5 / 8" x 3/4"	$ 11.75	$ 12.50	$ 14.09	$ 15.89	$ 16.32	$ 16.77
1.0"	19.82	31.25	35.23	39.72	40.81	41.93
1.5"	39.65	62.50	70.46	79.44	81.62	83.85
2.0"	63.41	100.00	112.74	127.10	130.59	134.16
3.0"	118.91	200.00	225.48	254.21	261.17	268.33
4.0"	198.15	312.50	352.31	397.20	408.08	419.26
6.0"	396.35	625.00	704.63	794.39	816.16	838.52
8.0"	634.15	1,000.00	1,127.40	1,271.03	1,305.86	1,341.64
Gallonage Rates [(1)]						
Block 1 (0-15,000)	$ 1.22	$ 1.01	$ 1.14	$ 1.28	$ 1.32	$ 1.36
Block 2 (15,001 – 30,000)	1.45	1.77	2.00	2.25	2.31	2.37
Block 3 (30,001 – 45,000)	1.83	2.53	2.85	3.22	3.30	3.39
Block 4 (above 45,000)	1.83	3.03	3.42	3.85	3.96	4.07

Notes:
(1) Assessed per thousand gallons.

Table 7-6
Projected Wastewater Rates

	To be Implemented October 1,					
	2007	**2008**	**2009**	**2010**	**2011**	**2012**
Base Facility Charge						
5 / 8" x 3/4" [1]	$ 25.92	$ 33.00	$ 33.90	$ 34.83	$ 35.79	$ 36.77
1.0"	25.92	49.50	50.86	52.25	53.68	55.15
1.5"	25.92	82.50	84.76	87.08	89.47	97.92
2.0"	25.92	165.00	169.52	174.17	178.94	183.84
3.0"	25.92	264.00	271.23	278.67	286.30	294.15
4.0"	25.92	528.00	542.47	557.33	572.60	588.29
6.0"	25.92	825.00	847.61	870.83	894.69	919.20
8.0"	25.92	1,650.00	1,695.21	1,741.66	1,789.38	1,838.41
Gallonage Rates [2]						
Per 1,000 gallons	$ 2.20	$ 3.45	$ 3.54.	$ 3.64	$ 3.74	$ 3.84

Notes:
(1) All Residential and Multi-Family users are charged based on the 5/8" x 3/4" rate. Commercial users will be charged based upon the actual installed meter size.
(2) Up to 20,000 gallons/period for Residential. There is no sewer cap for users with separate irrigation or reuse meters.

7.6 CURRENT CIP

The CIP and rates presented above were designed previous to the CIP presented in Section 6. The recommendation of Alternative 2 is used in this section to determine the adequacy of the recently designed rates and planned rate increases. The dollar values associated with Alternative 2 are summarized in Table 7-7 below.

Table 7-7
20 Year CIP – Alternative 2

	Years 1-5	**Years 5-10**	**Years 10-15**	**Years 15-20**
CIP				
Potable Water Supply	$ 30,211,583	$ 42,565,215	$ 0	$ 0
Irrigation Water Supply	14,082,915	6,664,708	21,519,960	2,155,010
Total	$ 44,294,498	$ 49,229,923	$ 21,519,960	$ 2,155,010

In addition to the water supply CIP, the City has developed an updated 5 Year Utility CIP. **Table 7-8** below shows the updated CIP.

Table 7-8
5 Year Utility CIP from City

	FY 2009	FY 2010	FY 2011	FY 2012	FY 2012
CIP					
Water Production(1)	$1,460,000	$1,531,500	$363,000	$438,000	$405,000
Water Distribution	754,000	1,155,000	820,000	820,000	570,000
Wastewater Treatment	989,000	1,124,000	724,000	401,000	513,000
Wastewater Collections	1,040,000	1,175,000	1,230,000	1,070,000	1,370,000
Utilities Maintenance	2,255,000	745,000	745,000	750,000	750,000
Total	$6,498,000	$5,730,500	$3,882,000	$3,479,000	$3,608,000

Notes: (1) Excludes $56.8 million water suuply project

The City's CIP also included $56,800,000 for the potable water supply projects. For the purposes of this study, the amount is removed in favor of the Alternative 2 costs shown in Table 7-7.

The 5 Year CIP including the potable and irrigation water supply projects as well as the City's projected needs totals at $67,500,000. The original CIP in Table 7-4 that the current rates and anticipated increases were designed for totaled at $74,938,700. Since the CIP is less than the CIP utilized in setting the current rates, the rates designed in the 2007 Study are adequate to cover the expected improvements. After funding from operations, the amount to be funded through debt $55,000,000. Table 7-9 below demonstrates that the new CIP will require slightly less funds and therefore needs no rate increases over those presented previously. The annual payment for the bond assumes a 5% issuance cost, 5% annual interest rate, and a 30 year term.

Table 7-9
Funding Needs for CIP

5 Year CIP from City	$	23,197,500
5 Year Water and Reclaimed Supply:		44,302,500
Total 5 Year CIP:	$	67,500,000
5 Year Funds from Operations*:		12,500,000
Remaining Funds needed to be bonded:	$	55,000,000
Annual Payment on Bond:	$	3,697,340
Original 5 year Bond Amount:	$	55,000,000

*Funds from Operations includes $1,000,000 budgeted annually for pay-as-you-go capital, and approximately $1,500,000 annually from renewal and replacement funds.

In preparing the analysis for the 5 to 10 year CIP it is important to note that financial projections greater than five years are somewhat speculative given the varying nature of inflation, interest rates, the shift of potable demand to reclaimed and other key factors. Years 5-10 of the Alternative 2 CIP require $49,229,923 to fund the remainder of the potable water supply and irrigation water supply projects. In order to project these costs more accurately, they must be adjusted for inflation. The Engineering News Record tracks the Construction Cost Index, which is used to track the rate of inflation in construction costs. The average annual increase in construction costs according to the CCI for the past 5 years has been 4.27%. After applying 5 years of inflation to the $49,229,923, the adjusted construction cost is $60,677,269.

7.7 CONCLUSIONS AND OBSERVATIONS

A 5 year pro forma operating statement is shown below and includes the debt coverage for the 5 year CIP as shown in Table 7-9. Payments on the projected series 2009 bonds are assumed to begin in Fiscal Year 2010. Based on the analysis presented herein there are the following conclusions and recommendations:

- The analysis presented above shows that the rates designed in the 2007 rate study and the associated increases already approved by the City will adequately fund the updated CIP for the next 5 years. However, a specific allocation of the CIP costs between water and reclaimed water rates is yet to be determined.

- In years 5-10, the City will need to increase rates further to fund the remainder of the CIP although it is difficult to determine what the level of the rate increase will be at this time.
- It is recommended that the City evaluate the adequacy of the rates every 3 years or when debt funding is required..

	2008	2009	2010	2011	2012	2013
OPERATING REVENUES	$28,419,217	$31,189,956	$33,483,122	$34,375,806	$35,295,601	$36,243,330
OTHER REVENUES	$1,750,600	$1,766,500	$1,765,700	$1,770,000	$1,774,400	$1,778,900
IMPACT FEES	$541,000	$553,100	$554,800	$556,500	$558,300	$560,000
TOTAL REVENUES	$30,710,817	$33,509,556	$35,803,622	$36,702,306	$37,628,301	$38,582,230
TOTAL O&M	$19,440,700	$20,087,700	$20,705,900	$21,343,300	$22,001,400	$22,681,900
NET REVENUES	$11,270,117	$13,421,856	$15,097,722	$15,359,006	$15,626,901	$15,900,330
Less Impact Fees	-$541,000	-$553,100	-$554,800	-$556,500	-$558,300	-$560,000
Funds Available for Debt Service	$10,729,117	$12,868,756	$14,542,922	$14,802,506	$15,068,601	$15,340,330
DEBT SERVICE						
SRF Loan	$845,000	$845,000	$845,000	$845,000	$845,000	$845,000
2007 BQ A	718,000	718,000	718,000	718,000	718,000	718,000
2007 BQ B	409,900	409,900	409,900	409,900	409,900	409,900
New Debt (WTP)	0	0	3,697,340	3,697,340	3,697,340	3,697,340
Stormwater SRF	255,800	255,800	255,700	255,700	255,800	255,800
New Debt (Stormwater)	927,000	927,000	927,000	927,000	927,000	927,000
Total Debt Service	$3,155,700	$2,228,700	$5,925,940	$5,925,940	$5,926,040	$5,926,040
REMAINING BALANCE	$7,573,417	$10,640,056	$8,616,982	$8,876,566	$9,142,561	$9,414,290
TOTAL NON OPERATING EXPENDITURES	$5,443,800	$5,606,300	$5,745,400	$5,859,900	$5,904,700	$5,950,800
FINAL BALANCE	$2,129,617	$5,033,756	$2,871,582	$3,016,666	$3,237,861	$3,463,490
DEBT SERVICE COVERAGE (excluding impact fees)						
Net Revenues/Debt Service	**3.40**	**5.77**	**2.45**	**2.50**	**2.54**	**2.59**
Coverage Requirement	1.35	1.35	1.35	1.35	1.35	1.35
Gross Revenues/Debt+O&M+R&R	**1.27**	**1.40**	**1.26**	**1.25**	**1.26**	**1.26**
Coverage Requirement	1.00	1.00	1.00	1.00	1.00	1.00

APPENDIX A

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City of Naples Water Service Area

Population Projections, 2008—2028

April 28, 2008

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LANDSCAPE ARCHITECTS

City of Naples Water Service Area Population Projections, 2008—2028
April 28, 2008

Introduction

Naples is a coastal resort community located in Southwest Florida. Tied to the more northerly and easterly sections of the State by I-75, the City's water demand relies upon tourism and a strong seasonal population, coupled with a large retirement population, for significant components of its service demand. Much of the City is developed, and there is a general perception that additional opportunities for future growth are limited to infill and redevelopment.

A demographic projection is required for The City of Naples to complete an application for a Water Use Permit from The South Florida Water Management District. The City of Naples water treatment plant (WTP) uses water from the Lower Tamiami Aquifer to sustain their service area. The data derived from the necessary population forecasting will provide predicate data for the City's water demand projections. Water demand projections are not directly related to population figures; an increase in population does increase water use, but not proportionally. For purposes of this study, population data was taken from the following sources: University of Florida Bureau of Economics and Business Research (BEBR), Regional Planning Council (RPC), County Planning Departments, the District Planning Department, the City's Comprehensive Land Use Plan (developed under Chapter 9J-5, F.A.C.), and the United States Census.

Water Service Territory Population Estimates and Projections

According to the District's Basis of Review, "To receive a general or individual permit, an applicant must demonstrate that the proposed water use is a reasonable-beneficial use of water, as required by Section 373.223, F.S. In order to demonstrate that a water use is reasonable beneficial, the Applicant must show "need" for the water in the requested amount." Additionally, the District notes, "For twenty year duration permits, the permittee shall ensure that, on a continual basis, the conditions for permit issuance are met for the duration of the permit, including requirements for attaining the maximum reasonable-beneficial use of water, preventing inefficient uses of water, and ensuring that uses continue to be consistent with the public interest. Every five years the permittee shall be required to evaluate and update the water use based on current District rules regarding efficiency of use and reasonable demands. Demonstration of "need" requires consideration of several factors, including: 1) legal control over the project site, facilities, and for public water supplies, the proposed service area, and 2) compatibility of the proposed water use with the land use at the project site or area to be supplied water. Demonstration of "demand" is dependent on the specific water use classification requirements set forth in Sections 2.2 through 2.8." In this instance, where a 20 year

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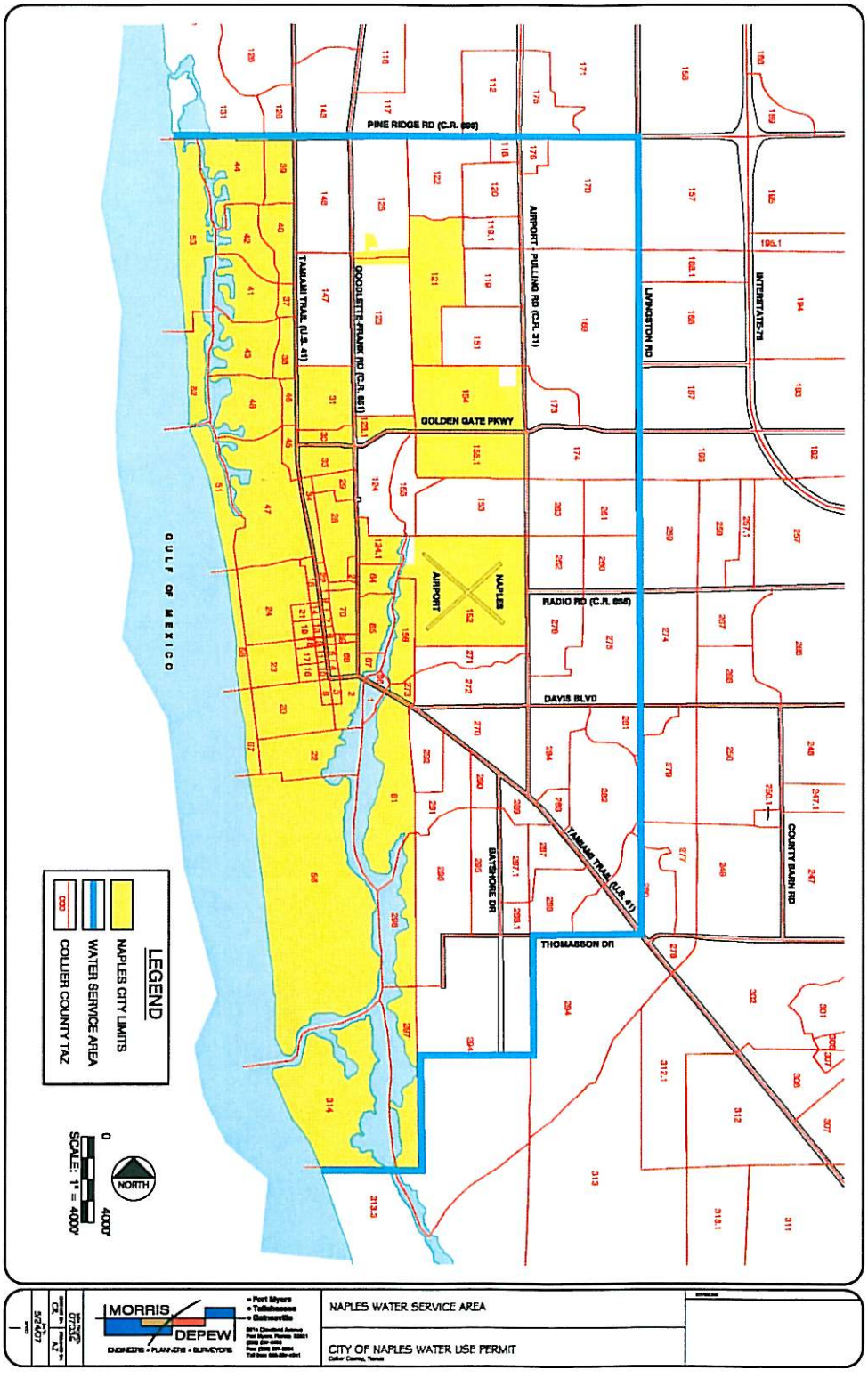


Figure 1: Water Service Area, TAZ & City Limits

permit is being requested, the District rules provide, "For public water supply use class, the quantity of water to be allocated for a 20 year duration permit shall not exceed that quantity necessary to meet the demands of the population existing at the time of permit renewal at the per capita rate approved under the Basis of Review."

In service areas where there are significant seasonal population changes, the District requires that permit applicants estimate the seasonal population for use in conjunction with permanent population in the calculation of per capita daily water demand. Sources for population data include the prevailing Comprehensive Land Use Plan (developed under Chapter 9J-5, F.A.C.). In the case of the Naples Water Service Area, because the service area is greater than the municipal boundaries of the City, the District permits other accepted sources of population data to validate the projections including the following: (1) University of Florida Bureau of Economics and Business Research (BEBR), (2) Regional Planning Council (RPC), (3) County Planning Departments, or the (4) District Planning Department.

Population Projection Method: Applied Growth Rate

The population projection technique of applied growth rate utilizes census tract and block group data for those tracts listed within the water service area. The Collier County Metropolitan Planning Organization prepares population estimates broken down by Traffic Analysis Zones (TAZ's), based upon U. S. Department of Census and BEBR estimates and projections. Using this data, the growth rate was determined for and applied to the total population of the water service area, calculated as a sum of the population of the TAZ's within the area.

Figure 1 shows the City's municipal boundaries, the Water Service Area, and the component TAZ's. Table 1 lists the component TAZ's, detailing whether they fall within the City's municipal boundaries or outside the boundaries and within the Water Service Area. Based upon BEBR and Census data, the Metropolitan Planning Organization has compiled population estimates through April 1, 2006 by TAZ for all of Collier County.

As noted above, the City, and the attendant Water Service Area, does not exhibit extreme growth trends. The majority of growth within the Water Service Area results from infill development and re-development projects. As a result, the extreme growth that characterizes much of the rest of Southwest Florida is not seen in the City of Naples. It is nevertheless the case, however, that some growth does occur, and that seasonal growth is exhibited in the various population models used to project demographics in the City's Water Service Area. Attachment 2 shows the permanent population estimates by TAZ for the years between 2000 and 2005 in the Naples Water service Area. The total permanent population increase from 2000 to 2006 was slightly less than 2,000 permanent residents (1,943), or an estimated 324 persons per year.

Table 1: TAZ Location

TAZ #	Location	TAZ #	Location	TAZ #	Location	TAZ #	Location
1	City	34	City	120	County	275	County
2	City	37	City	121	City	276	County
3	City	38	City	122	County	280	County
4	City	39	City	123	County	281	County
5	City	40	City	123.1	City	282	County
6	City	41	City	124	County	283	County
7	City	42	City	124.1	City	284	County
8	City	43	City	125	County	287	County
9	City	44	City	147	County	287.1	County
10	City	45	City	148	County	288	County
11	City	46	City	151	County	288.1	County
12	City	47	City	152	City	289	County
13	City	48	City	153	County	290	County
14	City	51	City	154	City	291	County
15	City	52	City	155	County	292	City
16	City	53	City	155.1	City	294.1	County
17	City	56	City	156.1	City	295	County
18	City	57	City	169	County	296	County
19	City	58	City	170	County	297	City
20	City	61	City	173	County	298	City
21	City	64	City	174	County	314	City
22	City	65	City	176	County		
23	City	66	City	260	County		
24	City	67	City	261	County		
27	City	68	City	262	County		
28	City	69	City	263	County		
29	City	70	City	270	County		
30	City	118	County	271	County		
31	City	119	County	272	County		
33	City	119.1	County	273	City		

Based upon the US Census data, growth within the municipal limits of the City of Naples has averaged +/- 167 persons per year over the most recent period. Table 2 shows the population estimates prepared by the US Census, based upon the 2000 Census data, for the years 2000 through 2006. Table 3 compares the changes between 1980, 1990, 2000, and 2006, as reported by the US Census. Based upon the change between 1980 and 2006, it is estimated that the City grew by +/- 169 persons per year. The calculation of the differential between 1990 and 2006 yields a growth rate of +/- 154 persons per year for the City, demonstrating that growth slowed somewhat during the 1990's.

Table 2: City Census Data

	Naples, Florida
Total Population	
July 1, 2006	21,975
July 1, 2005	21,804
July 1, 2004	21,530
July 1, 2003	21,338
July 1, 2002	21,184
July 1, 2001	21,157
July 1, 2000	21,063
April 1, 2000 (Estimates Base)	21,028
April 1, 2000 (Census 2000)	20,976

Source: U.S. Census Bureau

When compared to Collier County, it is apparent that the primary growth in the area is occurring in the unincorporated areas. Table 4 compares the growth in Naples to the County-wide growth that occurred during this period.

Table 3: 1980, 1990, 2000, & 2006 Naples Population

	2006	2000	1990	1980
Population	21,975	20,976	19,505	17,581

Source: U.S. Census Bureau

During the period between 2000 and 2006, Collier County grew by 63,272 persons per year, or at a rate of 3.81% compounded. Contrasted to the City—with a growth rate of 0.78%, compounded—that figure represented a growth rate nearly five times that which occurred within the municipal boundaries.

Table 4: Collier County and Naples Population, 2000—2006

	Collier County, Florida	Naples, Florida
Total Population		
July 1, 2006	314,649	21,975
July 1, 2005	307,864	21,804
July 1, 2004	296,678	21,530
July 1, 2003	286,173	21,338
July 1, 2002	276,049	21,184
July 1, 2001	264,590	21,157
July 1, 2000	254,154	21,063
April 1, 2000 (Estimates Base)	251,377	21,028
April 1, 2000 (Census 2000)	251,377	20,976

Source: U.S. Census Bureau

Given the dramatic difference in the growth rates between the City and the County, it appears to be more methodologically sound to base the growth rates of the areas in question upon the respective growth rates of each parent entity. In other words, projections for the City should be based upon the City's historical growth rates, while those areas within the City's Water Service Area, but outside the municipal boundaries, should be based upon the County's growth rate. This is consistent with the growth demonstrated in Attachment 2 showing the population estimates compiled by TAZ. Many of the TAZ's within the City show little or no growth while the TAZ's located outside of the corporate limits tend to show more significant increases in population.

Starting with the TAZ's in the unincorporated portion of the Water Service Area, base data for 2006 showed a permanent population of 26,735 persons. Using the County's growth rate as calculated by the U. S. Census and the University of Florida's Bureau of Economic and Business Research (BEBR), projections through 2028 were prepared on an annual basis. Similarly, using the City's starting population of 21,975 persons, as calculated by the Census and BEBR, and projecting the more limited growth rate that has characterized growth within the municipal boundaries, population was projected to 2028. For the City, population was projected to grow to 26,071 persons, while for the unincorporated area within the Water Service Area population was projected to grow to 60,862 persons.

As noted above, the City is characterized by a significant seasonal population. These 'snowbirds' represent a demand placed upon services and facilities during the period (primarily) between Thanksgiving and Easter. Criteria for estimating seasonal population area as follows:

- Seasonal population is defined as residents of the area for two weeks to six months and is a part of the socioeconomic projections required by the TAZ transportation models.

- An inventory of time shares, hotel rooms and secondary non-primary residents are utilized to gather information on location and characteristics the data sets, expansion plans, as well as the number and types of residents during peak and low seasons.

- Seasonal residents are divided into two categories for projections, namely those residing in secondary non-primary residents and those residing in permanent housing units.

- The permanent housing component of seasonal population is based on the ratio of 2000 "non-park mobile home" seasonal housing units by TAZ to the 2000 total housing units by TAZ.

• This ratio is assumed to be constant over time since no evidence is available on which to quantify any systematic change.

• Seasonal population is projected by multiplying the seasonal units with the 2000 estimate of seasonal persons per household. This estimate of seasonal persons per households is held constant over time.

Table 5: City Seasonal Population Estimates

	1996	2000	2004	2005	2010	2015	2020
Peak Seasonal Increase	12,271	12,293	12,515	12,575	13,040	13,444	13,860

Source: City of Naples Comprehensive Plan Evaluation and Appraisal Report, December 2005

In the City's Evaluation and Appraisal Report (EAR) prepared in 2005 it was estimated that seasonal residents represented an increase of more than 50% during peak months. Table 5, taken from the EAR shows the estimated and projected seasonal population increases for the City. Applying the increases calculated through 2028, a total of 14,524 seasonal residents are projected to need water service within the City's boundaries. Applying the same ratio of permanent to seasonal population for the unincorporated areas within the Water Service Area, 33,904 seasonal residents are projected to need water service by 2028. Annual projections for the City's permanent and seasonal population, along with the unincorporated areas within the Water Service Area, are included as Attachment 3.

Conclusion

There are four (4) clear components of the population projection for the Naples Water Service Area: City Permanent Population; City Seasonal Population; Unincorporated Permanent Service Population; and Unincorporated Seasonal Service Population. The projections for Permanent City Population were prepared by taking U. S. Census data, confirmed by BEBR, and projecting an average growth rate based upon growth over the last 26 years. This resulted in very modest growth of the permanent population, a condition to be expected in such a mature jurisdiction. For the Unincorporated Permanent Population, the County's growth rate was used and a more robust rate of growth occurred. Once again, given the difference in the growth opportunities available for the two political jurisdictions, this is not surprising.

Seasonal population is more difficult to predict. Using the City's approved seasonal population figures from the EAR and calculating the projected growth rates provided the modest growth in seasonal population that tracked the growth in the permanent population. For the unincorporated areas within the Water Service Area TAZ data was used as a base for the projections, just as was the case for the permanent population in these areas. The ratio of seasonal to permanent residents within the City was used to calculate a projection for seasonal population within the unincorporated areas of the

Water Service Area. Attachment 3 provides annual projections for each category, while Table 6 provides summaries. The total population growth projected for the Water Service Area amounts to an increase of 31,883 persons over the next 20 years with total service demand rising from 59,511 persons to a total of 91,394 persons. The majority of growth will occur outside the municipal boundaries, and by the end of the forecast period, seasonal residents will amount to +/- 36% of the total population served.

Table 6: Naples Water Service Area Population Projections, 2008—2028

Year	2008	2013	2018	2023	2028
City Perm. Population	22,319	23,202	24,122	25,078	26,071
Uninc. Perm. Population	28,812	34,735	41,874	50,484	60,862
City Seas. Population	12,845	13,286	13,693	14,109	14,524
Uninc. Seas. Population	16,592	19,890	23,771	28,403	33,904
WSA Total	80,578	91,113	103,460	118,074	135,361

Attachments:
Water Service Area Population Estimates by Traffic Analysis Zone, 2000—2005
Water Service Area Population Projections, 2006—2028
Water Service Area and TAZ Map
Author's Resume

Attachments

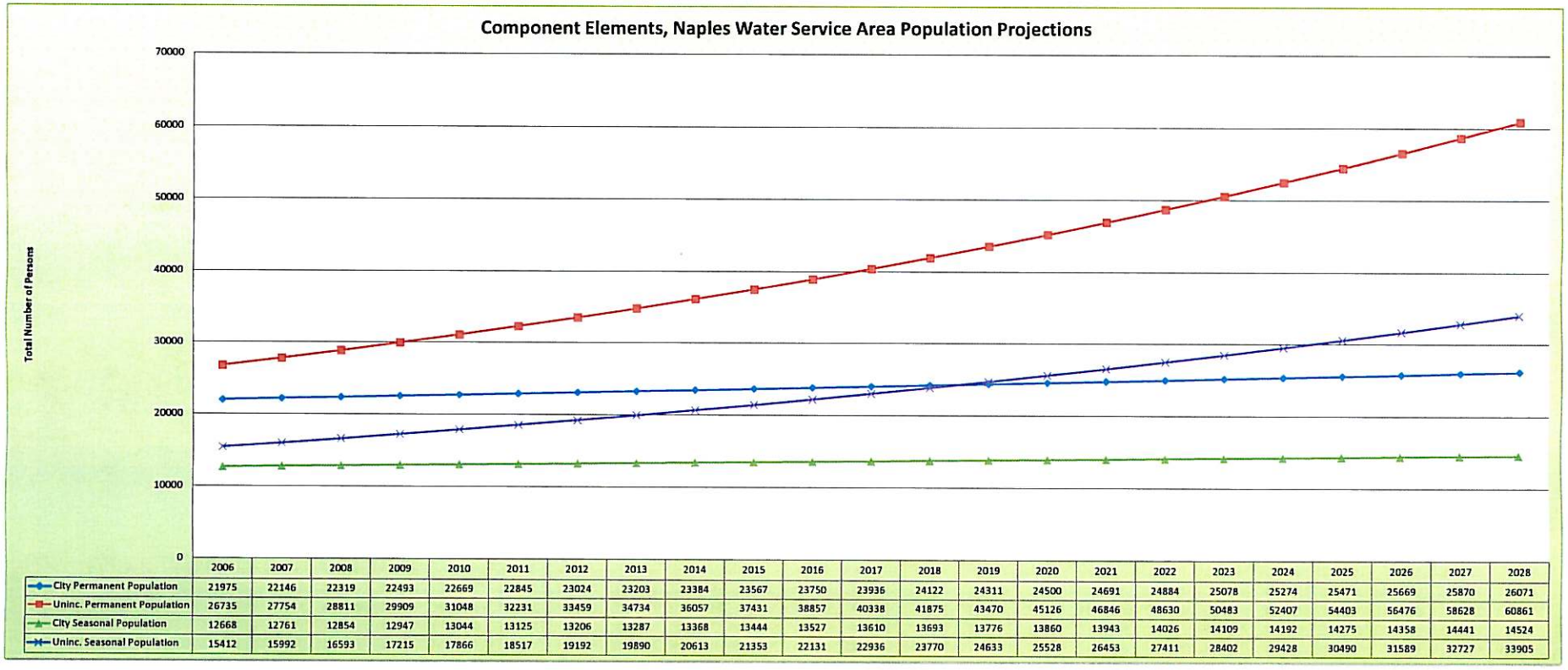
Attachment 1: Water Service Area Population Estimates by Traffic Analysis Zone, 2000—2005

TAZ	2000	2001	2002	2003	2004	2005
1	77	77	77	77	77	77
2	115	115	115	115	115	115
3	53	53	53	53	53	53
4	-	-	-	-	-	-
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	-	-	-	-	-	-
8	14	14	14	14	14	14
9	-	-	-	-	-	-
10	-	-	-	-	-	-
11	-	-	-	-	-	-
12	-	-	-	-	-	-
13	9	9	9	9	9	9
14	-	-	-	-	-	-
15	142	142	142	142	142	142
16	61	61	61	61	61	61
17	46	46	46	46	46	46
18	23	23	23	23	23	23
19	47	47	47	47	47	47
20	809	824	870	897	897	897
21	-	-	-	-	-	-
22	726	726	726	726	726	726
23	654	654	654	654	654	654
24	795	806	814	832	843	843
27	-	-	-	-	-	-
28	981	981	981	981	981	981
29	-	-	-	-	-	-
30	-	-	-	-	-	-
31	956	956	958	958	958	958
33	-	-	-	-	-	-
34	47	47	47	47	47	47
37	-	-	-	-	-	-
38	-	-	-	-	-	-
39	49	49	49	49	49	49
40	222	222	222	222	222	222
41	294	294	294	302	302	302
42	217	217	217	217	217	217
43	858	858	858	858	858	858
44	587	587	587	587	587	587
45	698	698	698	698	698	698
46	603	603	610	674	674	674
47	-	-	-	-	-	-
48	2	2	2	2	2	2
51	-	-	-	-	-	-
52	-	-	-	-	-	-
53	1,042	1,042	1,042	1,042	1,059	1,059
56	-	-	-	-	-	-
57	-	-	-	-	-	-
58	1,688	1,694	1,712	1,724	1,724	1,724
61	-	-	-	-	-	-
64	-	-	-	-	-	-
65	-	-	-	-	-	-
66	527	527	527	527	527	527
67	-	56	56	56	56	56
68	-	-	-	-	-	-
69	87	87	87	87	87	87
70	-	-	-	-	1	1
118	2,490	2,937	3,269	3,316	3,319	3,319
119	-	-	-	-	-	-
119.1	-	-	-	-	-	-
120	184	245	299	312	312	329
121	695	695	695	695	695	695
122	491	493	494	496	497	499
123	102	102	102	102	102	102
123.1	2,058	2,058	2,060	2,060	2,060	2,060
124	416	416	416	416	416	416
124.1	-	-	-	-	-	-
125	412	412	412	412	412	412
147	-	-	-	-	-	-
148	-	-	-	-	-	-
151	-	-	-	-	-	-
152	-	-	-	-	-	-
153	1,600	1,603	1,603	1,609	1,617	1,617
154	-	3	3	3	3	3
155	1,761	1,776	1,781	1,783	1,790	1,793
155.1	-	-	6	38	62	62
156	-	-	-	-	-	-
169	313	432	504	592	636	654
170	1,295	1,487	1,648	1,765	1,831	1,917
173						
174						
176						16
260						
261						
262						
263						
270						
271						
272	1,412	1,496	1,666	1,675	1,692	1,692
273	271	271	271	271	271	271
275	1,347	1,347	1,356	1,358	1,361	1,361
276	924	937	943	943	970	1,015
280	1,900	1,903	1,908	1,928	1,944	1,946
281	988	990	990	990	993	993
282	1,548	1,548	1,548	1,548	1,548	1,548
283	141	141	141	141	141	141
284	1,455	1,455	1,455	1,455	1,455	1,455
287	613	615	624	627	630	633
287.1	-	-	-	-	-	-
288	523	529	545	549	565	565
288.1	613	615	624	627	630	633
289	523	529	545	549	565	565
290	547	547	547	547	547	547
291	419	419	422	422	422	422
292	187	187	189	189	194	199
294.1	1,162	1,165	1,168	1,168	1,168	1,168
295	-	-	-	-	-	-
296	715	728	741	751	767	796
297	1,145	1,147	1,154	1,176	1,178	1,178
298	1,127	1,129	1,132	1,132	1,160	1,161
314	-	-	-	-	1	1
Total	41,804	42,672	43,860	44,371	44,709	44,939

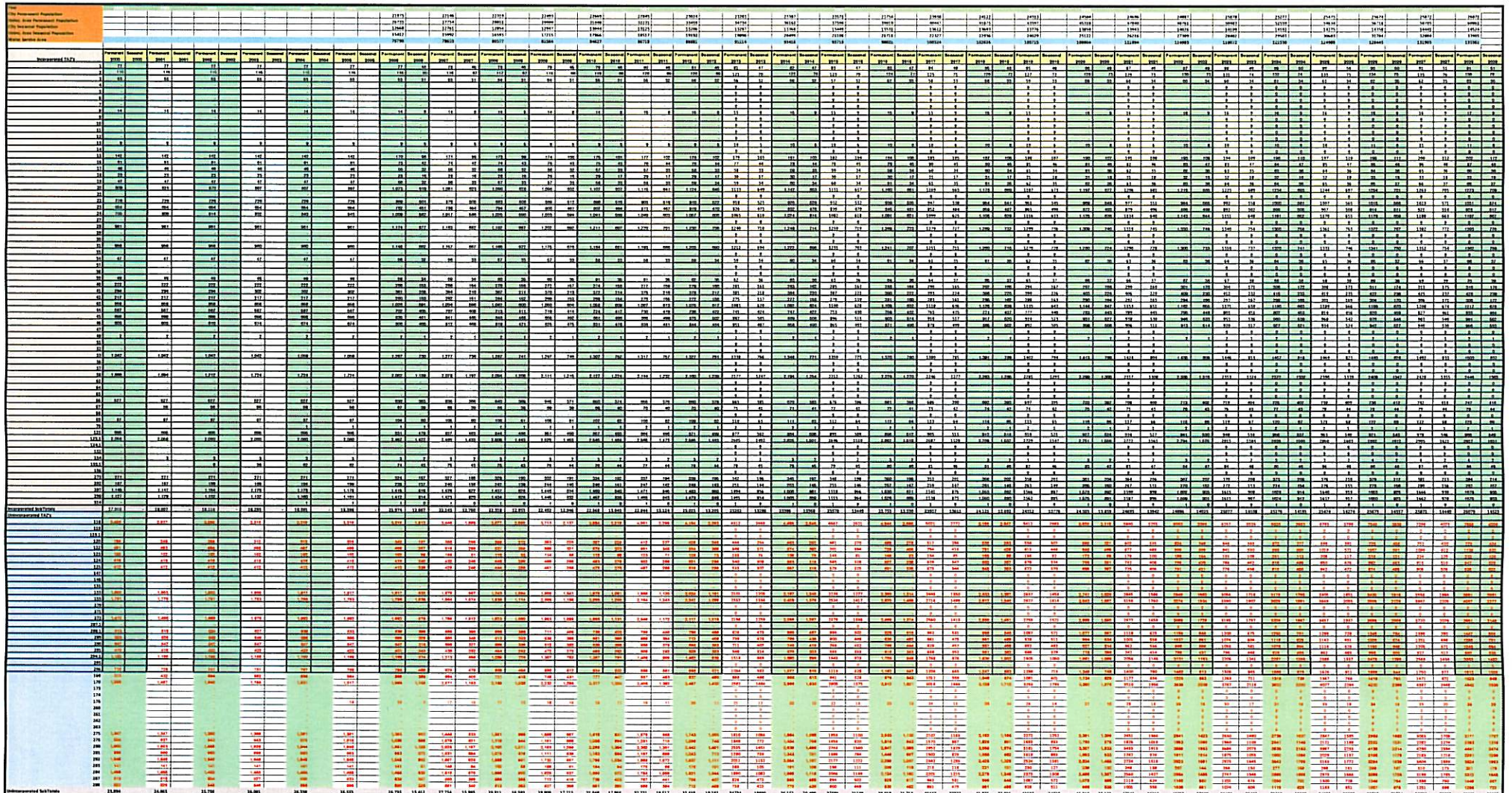
Attachment 2: Water Service Area Population Projections, 2006—2028

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
City Permanent Population	21975	22146	22319	22493	22669	22845	23024	23203	23384	23567	23750	23936	24122	24311	24500	24691	24884	25078	25274	25471	25669	25870	26071
Uninc. Area Permanent Population	26735	27754	28811	29909	31048	32231	33459	34734	36057	37431	38857	40338	41875	43470	45126	46846	48630	50483	52407	54403	56476	58628	60861
City Seasonal Population	12668	12761	12854	12947	13044	13125	13206	13287	13368	13444	13527	13610	13693	13776	13860	13943	14026	14109	14192	14275	14358	14441	14524
Uninc. Area Seasonal Population	15412	15992	16593	17215	17866	18517	19192	19890	20613	21353	22131	22936	23770	24633	25528	26453	27411	28402	29428	30490	31589	32727	33905
Water Service Area	76790	78653	80577	82564	84627	86719	88880	91114	93422	95795	98266	100820	103460	106190	109015	111933	114951	118072	121300	124639	128093	131666	135362

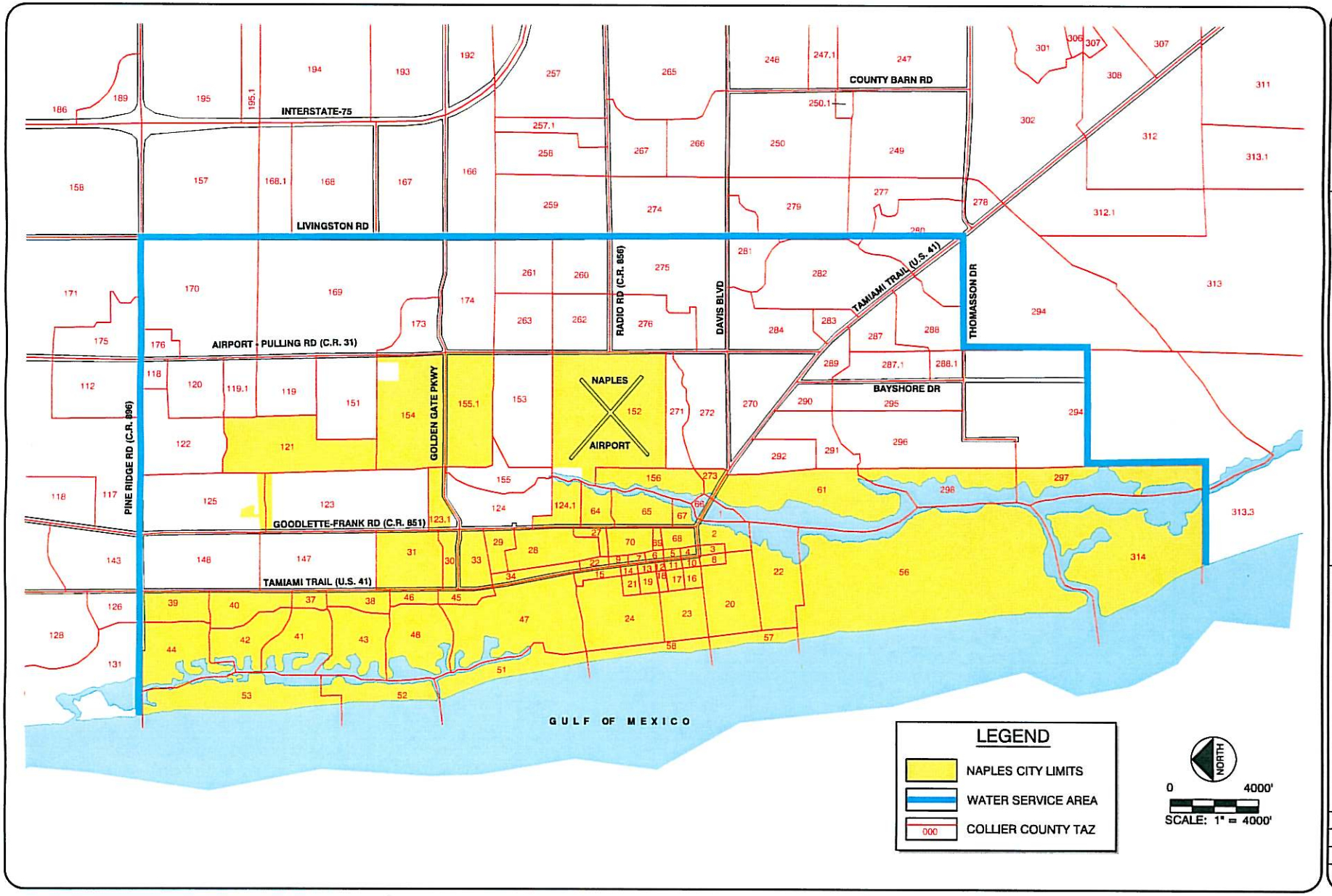
WATER SERVICE AREA POPULATION PROJECTIONS, 2006-2028



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
City Permanent Population	21975	22146	22319	22493	22669	22845	23024	23203	23384	23567	23750	23936	24122	24311	24500	24691	24884	25078	25274	25471	25669	25870	26071
Uninc. Permanent Population	26735	27754	28811	29909	31048	32231	33459	34734	36057	37431	38857	40338	41875	43470	45126	46846	48630	50483	52407	54403	56476	58628	60861
City Seasonal Population	12668	12761	12854	12947	13044	13125	13206	13287	13368	13444	13527	13610	13693	13776	13860	13943	14026	14109	14192	14275	14358	14441	14524
Uninc. Seasonal Population	15412	15992	16593	17215	17866	18517	19192	19890	20613	21353	22131	22936	23770	24633	25528	26453	27411	28402	29428	30490	31589	32727	33905



Attachment 3: Water Service Area and TAZ Map



NAPLES WATER SERVICE AREA

CITY OF NAPLES WATER USE PERMIT

Collier County, Florida

MORRIS DEPEW

ENGINEERS • PLANNERS • SURVEYORS

• Fort Myers
• Tallahassee
• Gainesville

2314 Cleveland Avenue
Fort Myers, Florida 33901
(239) 337-3993
Fax (239) 337-2502
Toll free: 866-337-7411

DEP PROJECT
07036

CHECKED BY
CR

DESIGNED BY
AZ

DATE
5/24/07

SHEET
1

Attachment 4: Author's Resume

MORRIS DEPEW
ENGINEERS • PLANNERS • SURVEYORS

PROFESSIONAL QUALIFICATIONS

David W. Depew, Ph.D., AICP
President & Principal

EDUCATION

University of Florida, B.A., Honors, Political Science, 1972.
McMaster University, M.A., Comparative Political Development, 1973.
Johns Hopkins University, Policy Analysis and Public Administration, 1973-1976.
Kennedy-Western University, Ph.D., Public Administration, 1997-2004.

PROFESSIONAL REGISTRATION

Certified Planner, American Institute of Certified Planners (since 1983).

AFFILIATIONS & HONORS

Member, American Institute of Certified Planners.
Member, American Planning Association.
Member, Florida Planning and Zoning Association.
Associate Member, Urban Land Institute.
Member/Vice President/President, Association of Eminent Domain Professionals.
Member/Chairman, Fort Myers Historic Preservation Commission, 1999-2006.
Member, Fort Myers Charter Review Commission.
Chairman, Lee County Local Planning Agency, 1982-1984.
Member, Real Estate Investment Society.

AREA OF EXPERTISE

Land planning, development permitting, zoning, comprehensive planning, transportation planning, traffic analysis, policy analysis, eminent domain-related planning issues, demographics and statistical modeling.

CURRENT RESPONSIBILITIES

As President and a principal of Morris-Depew Associates, Dr. Depew is responsible for the management of all phases of land use planning and project permitting. He is also responsible for the development of research methodology, staff supervision, regulatory agency contacts, and client relations. His duties also include the ongoing business management of the firm.

RELEVANT EXPERIENCE

Dr. Depew has acquired extensive experience over more than 25 years in the management of significant planning and permitting projects. Much of his experience has been acquired in Southwest Florida since 1980 where he served as the primary planning manager and consultant for a number of large public and private organizations. He is an acknowledged expert on regional planning and permitting issues and has been certified as an expert witness in a variety of legal and administrative proceedings in numerous jurisdictions across Florida.

Prior to founding Morris-Depew Associates, he was a planning, permitting, and financial consultant to a variety of public and private clients throughout Southwest Florida.

Dr. Depew was previously the Director of Community Development for Lee County with responsibility for all planning and permitting activities. In this position, he successfully supervised major revisions to Lee County's Land Development Regulations and Comprehensive Plan, both of which were recognized state-wide for quality, as well as the development of a new series of permitting procedures, various sub-area studies, and development review policies. During that period of time, he served as Lee County's Local Planning Agency, supervised the Metropolitan Planning Organization's staff efforts, and initiated Lee County's first efforts at comprehensive growth management legislation.

He also served in the following high-level positions: Acting Director and Senior Planner, Long Range Planning Department, Lee County, Florida; Assistant Manager, and Research Associate II, Mayor's Office of Manpower Resources, Baltimore, Maryland; Computer Applications Consultant, Geneva, Switzerland; and Instructor, The American College, Leysin, Switzerland.

REPRESENTATIVE PROJECTS & CLIENTS

Litigation

Zemel vs. Lee County; inverse condemnation case and administrative hearing; representing owner.
Southern States Utilities vs. Collier Family Enterprises; condemnation case; representing condemning authority.
FDOT vs. Swor; right of way condemnation; representing owner.

REPRESENTATIVE PROJECTS & CLIENTS (continued)

Lee County vs. Abdallah, inverse condemnation, representing owner.
Feinstein vs. Johnson Engineering, Inc., liability dispute, representing Johnson Engineering, Inc., defendant.
City of Sanibel vs. Wilson, right of way acquisition, representing owner.
FDOT vs. The Landings Homeowners' Association, right of way acquisition, representing owners.
Lee County vs. Royal Palm Square Associates, Inc., right of way acquisition, representing condemning agency.
Lee County vs. Commerce Group, right of way acquisition, representing condemning agency.
In Re Seago Group, bankruptcy action, representing plaintiff.
FDOT vs. KB Holdings (Boulis), right of way acquisition, representing owner.
FDOT vs. Coral Ridge Cemetery, right of way acquisition, representing owner.
FDOT vs. Mobil Oil, right of way acquisition, representing condemning authority.
FDOT vs. TransNation Title Insurance Co., right of way acquisition, representing condemning authority.
Collier County vs. Northside Construction, right of way acquisition, representing owner.
Stardial vs. Town of Fort Myers Beach, land use dispute, representing property owner.
Kessler, et. al. vs. City of Naples and Collier Enterprises, permit challenge representing Collier Enterprises.
Jonesboro, et. al. vs. Alachua County, et. al., comprehensive plan challenge.
Crouch vs. City of Newberry, representing intervenor in defense of annexation by City.
Batreal, Caron vs. City of Newberry, representing City in defense of ordinance challenge.
Cossu-Cohen vs. Town of Fort Myers Beach, ordinance challenge representing Fort Myers Beach.
Miami Corporation vs. City of Titusville, permit challenge representing Miami Corporation.
City of Lakeland vs. Southwest Florida Water Management District, permit challenge representing City.

Comprehensive & Site Planning

Lee County Port Authority, acquisition consultant for Airport Expansion.
Gulf Harbour Yacht and Country Club, golf course/marina residential DRI.
Flex Bon Plaza, commercial center.
Pueblo Bonito, farm worker housing development.
International Center, mixed use commercial, industrial, residential development.
American U-Store It, urban redevelopment and adaptive re-use of existing facilities.
Cypress Lake Center, urban redevelopment and adaptive re-use of existing shopping center.
Sun Coast Acura Dealership, commercial development.
Manor Care Skilled Nursing Facility, ALF development.
Arden Courts of Fort Myers, ALF development.
McGregor Baptist Church, religious facility.
Temple Beth-El, religious facility.
Faith Fellowship Ministries, religious facility.
Presbyterian Retreat, religious facility.
Pineland Marina, commercial marina.
Corkscrew Woods, aggregate mining and re-use development planning and permitting.
Bocilla Island Club West, residential infill development.
Sun Harvest Citrus, commercial development.
Coca Cola Distribution Facility, commercial/industrial development.
Kelly Greens Homeowners Association, land use consulting, comprehensive planning.
Edison Park Homeowners Association, land use consulting.
Anderson-Columbia, industrial permitting, Suwannee County, Madison County, Columbia County.
Airport Technology Center, industrial planned development.
D-75 Commerce Center, interchange commercial development.
ACT Shelter, community facility expansion.
Bonita Grande Mine, aggregate mining and re-use development planning and permitting.
University Lakes—West Lakes, aggregate mining and re-use development planning and permitting.
Palmas del Sol, DRI modification and NOPC processing.
Vanderbilt Beach Property Owners, Collier County Ordinance Amendments.
Osceola County, Comprehensive Plan Amendments
Captiva Community Panel, preparation of a community plan and Comprehensive Plan Amendments, Lee County.
Boca Grande Community Panel, preparation of a community plan and Comprehensive Plan Amendments, Charlotte and Lee Counties.
Town of McIntosh, Land Development Regulations amendments.
Sanibel Board of Realtors, proposed Land Development Regulations for build-back regulations, Sanibel.
Charter School Sites, 2 charter school sites located in Lee County, Florida.
Bokeelia Seaport, residential re-development and historic preservation efforts, Bokeelia, Florida
Spring Hills Development of Regional Impact, Mixed Use development, Alachua County, Florida
Forkosh Properties, mixed use development, Sebring, Florida
Ballew Properties, mixed use development, Lake Placid Florida
Gulf Coast Landfill, sanitary landfill, recycling, solid waste transfer station, and industrial development, Lee County, Florida.
Premier Airport Park, industrial development, Lee County, Florida
The Fountains, mixed use Development of Regional Impact, Lee County, Florida
Corkscrew Excavation, aggregate mining and re-use development representing owner.

APPENDIX B

COLLIER COUNTY PERMANENT POPULATION ESTIMATES and PROJECTIONS

April 1st 2000 - 2020

By Planning Community and City

April 1st 2000 - 2020

Planning Community	estimates 2000	estimates 2001	estimates 2002	estimates 2003	estimates 2004	estimates 2005	estimates 2006	projections 2007	projections 2008	projections 2009	projections 2010	projections 2011	projections 2012	projections 2013	projections 2014	projections 2015	projections 2016	projections 2017	projections 2018	projections 2019	projections 2020
NN - North Naples	47,657	50,056	52,292	53,944	55,328	56,737	57,671	58,745	59,880	61,069	62,296	63,315	64,366	65,451	66,569	67,723	68,695	69,692	70,715	71,765	72,841
SN - South Naples	21,610	22,431	23,106	24,034	24,998	25,614	26,070	27,051	28,087	29,173	30,293	31,224	32,184	33,174	34,195	35,248	36,136	37,046	37,981	38,939	39,922
CN - Central Naples	18,323	18,884	19,354	19,762	19,994	20,241	20,393	20,496	20,604	20,717	20,834	20,931	21,032	21,135	21,242	21,352	21,444	21,539	21,637	21,737	21,839
EN - East Naples	24,385	24,558	24,859	24,977	25,180	25,296	25,411	26,005	26,633	27,291	27,970	28,534	29,115	29,715	30,334	30,972	31,510	32,062	32,628	33,208	33,804
GG - Golden Gate	35,325	37,855	39,267	41,662	42,951	44,033	44,554	45,294	46,077	46,897	47,743	48,446	49,171	49,919	50,691	51,486	52,157	52,845	53,550	54,274	55,017
UE - Urban Estates	16,713	18,995	22,776	27,537	31,758	35,149	36,928	38,712	40,597	42,574	44,612	46,306	48,053	49,854	51,713	53,629	55,245	56,903	58,603	60,347	62,135
RE - Rural Estates	18,815	21,019	23,589	26,678	29,767	32,183	34,636	37,636	40,807	44,131	47,558	50,407	53,344	56,374	59,499	62,722	65,440	68,227	71,086	74,018	77,026
M - Marco	1,350	1,365	1,375	1,393	1,405	1,413	1,469	1,495	1,521	1,549	1,578	1,601	1,626	1,651	1,677	1,704	1,727	1,750	1,774	1,799	1,824
RF - Royal Fakapalm	7,811	8,442	9,203	9,988	10,739	12,282	13,711	15,423	17,232	19,129	21,084	22,709	24,385	26,114	27,897	29,736	31,287	32,877	34,508	36,182	37,898
C - Corkscrew	1,019	1,209	1,253	1,277	1,446	1,729	1,941	2,957	4,030	5,155	6,315	7,279	8,273	9,299	10,357	11,448	12,367	13,311	14,278	15,271	16,289
I - Immokalee	21,845	22,219	22,410	22,800	23,872	24,244	24,453	25,024	25,627	26,260	26,912	27,454	28,013	28,590	29,185	29,798	30,315	30,845	31,390	31,948	32,520
BC - Big Cypress	190	197	199	200	202	203	204	205	206	208	209	211	212	213	215	216	217	219	220	221	222
Unincorporated SUM	215,043	227,234	239,686	254,255	267,640	279,124	287,442	299,042	311,300	324,152	337,404	348,415	359,773	371,488	383,570	396,031	406,536	417,312	428,366	439,704	451,333

Cities	estimates 2000	estimates 2001	estimates 2002	estimates 2003	estimates 2004	estimates 2005	estimates 2006	projections 2007	projections 2008	projections 2009	projections 2010	projections 2011	projections 2012	projections 2013	projections 2014	projections 2015	projections 2016	projections 2017	projections 2018	projections 2019	projections 2020
Everglades City	479	488	508	522	527	527	527	741	867	888	909	916	923	930	937	944	951	958	965	972	980
Marco Island	14,879	15,066	15,206	15,346	15,576	15,647	15,719	15,899	16,079	16,259	16,547	16,736	16,924	17,113	17,301	17,490	17,689	17,889	18,088	18,288	18,487
Naples	20,976	21,687	22,057	22,343	22,443	22,490	22,970	23,386	23,704	24,022	24,340	24,599	24,858	25,117	25,376	25,635	25,848	26,061	26,274	26,487	26,700
Incorporated SUM	36,334	37,241	37,771	38,211	38,546	38,664	39,216	40,026	40,650	41,169	41,796	42,250	42,705	43,159	43,614	44,069	44,488	44,908	45,327	45,747	46,167

COUNTYWIDE TOTAL	251,377	264,475	277,457	292,466	306,186	317,788	326,658	339,068	351,950	365,321	379,200	390,665	402,478	414,647	427,184	440,100	451,024	462,219	473,693	485,451	497,500

notes:

1) 2000 Naples, Marco Island, Everglades City, Unincorporated County and County-wide totals are estimates from the U.S. Census Bureau, Census 2000 Redistricting Data (Public Law 94-171).

2) 2000 Planning Community estimates are based upon County Planning staff review of 2000 Census maps and population data.

3) 2001, 2003, 2004, 2005 and 2006 Naples, Marco Island, Everglades City, Unincorporated County and County-wide totals are estimates from BEBR (Bureau of Economic and Business Research) at the University of Florida.

4) 2002 Naples, Everglades City, and County-wide totals are estimates from BEBR.

5) Due to dispute by City of Marco Island over the 2002 estimate provided by BEBR, the 2002 Marco Island estimate is from the City of Marco Island (midpoint between 2001 and 2003 estimates). The unincorporated BEBR estimate is reduced by the amount of th Island increase over the BEBR estimate (407 persons).

6) 2001-2006 Planning Community estimates were prepared by County Planning staff using Certificate of Occupancy data & persons per dwelling unit ratios derived from 2000 Census.

7) Naples and Marco Island projections were provided by respective city's Planning staff, in 5-year increments. In-between years are straightline projections prepared by County Planning staff. (Naples' projections were received in 2004.)

8) 2007 - 2010 Everglades City totals are projections prepared by it's consultant (in 2005). County staff prepared projections from 2011-2020.

9) 2007 - 2020 County-wide totals are projections based upon BEBR Medium Range growth rates between 2005-2010, 2010-2015, and 2015-2020, per BEBR Bulletin #147, Feb. 2007.

10) Planning Community projections were prepared by County Planning staff using Certificate of Occupancy data & persons per dwelling unit ratios derived from 2000 Census.

11) Planning Community projections do not reflect projected buildout population figures, as prepared in 1994 and 2005.

12) Some of the Totals may not equal the sum of the individual figures due to rounding.

Prepared by Collier County Comprehensive Planning Department June 21, 2007.

COLLIER COUNTY PERMANENT POPULATION ESTIMATES and PROJECTIONS

October 1st 2000 - 2019

By Planning Community and City

October 1st 2000 - 2019

Planning Community	estimates 2000	estimates 2001	estimates 2002	estimates 2003	estimates 2004	estimates 2005	projections 2006	projections 2007	projections 2008	projections 2009	projections 2010	projections 2011	projections 2012	projections 2013	projections 2014	projections 2015	projections 2016	projections 2017	projections 2018	projections 2019
NN - North Naples	48,857	51,174	53,118	54,636	56,032	57,204	58,208	59,312	60,475	61,683	62,806	63,841	64,909	66,010	67,146	68,209	69,194	70,204	71,240	72,303
SN - South Naples	22,020	22,769	23,570	24,516	25,306	25,842	26,561	27,569	28,630	29,733	30,758	31,704	32,679	33,684	34,721	35,692	36,591	37,514	38,460	39,430
CN - Central Naples	18,604	19,119	19,558	19,878	20,118	20,317	20,445	20,550	20,661	20,776	20,883	20,981	21,083	21,188	21,297	21,398	21,492	21,588	21,687	21,788
EN - East Naples	24,472	24,708	24,918	25,078	25,238	25,353	25,708	26,319	26,962	27,630	28,252	28,824	29,415	30,024	30,653	31,241	31,786	32,345	32,918	33,506
GG - Golden Gate	36,590	38,561	40,465	42,307	43,492	44,294	44,924	45,686	46,487	47,320	48,095	48,809	49,545	50,305	51,088	51,821	52,501	53,198	53,912	54,645
UE - Urban Estates	17,854	20,885	25,156	29,647	33,453	36,039	37,820	39,655	41,586	43,593	45,459	47,179	48,954	50,784	52,671	54,437	56,074	57,753	59,475	61,241
RE - Rural Estates	19,917	22,304	25,133	28,222	30,975	33,409	36,136	39,221	42,469	45,845	48,982	51,875	54,859	57,937	61,111	64,081	66,833	69,656	72,552	75,522
M - Marco	1,358	1,370	1,384	1,399	1,409	1,441	1,482	1,508	1,535	1,563	1,589	1,614	1,639	1,664	1,691	1,716	1,739	1,762	1,787	1,811
RF - Royal Fakapalm	8,127	8,823	9,595	10,363	11,511	12,996	14,567	16,327	18,180	20,106	21,897	23,547	25,250	27,006	28,817	30,512	32,082	33,693	35,345	37,040
C - Corkscrew	1,114	1,231	1,265	1,362	1,588	1,835	2,449	3,493	4,593	5,735	6,797	7,776	8,786	9,828	10,902	11,907	12,839	13,794	14,775	15,780
I - Immokalee	22,032	22,314	22,605	23,336	24,058	24,348	24,739	25,326	25,944	26,586	27,183	27,734	28,302	28,887	29,491	30,057	30,580	31,118	31,669	32,234
BC - Big Cypress	194	198	200	201	202	203	204	206	207	209	210	211	213	214	215	217	218	219	220	222
Unincorporated SUM	221,139	233,460	246,971	260,948	273,382	283,283	293,242	305,171	317,726	330,778	342,910	354,094	365,630	377,529	389,801	401,284	411,924	422,839	434,035	445,519

Cities	estimates 2000	estimates 2001	estimates 2002	estimates 2003	estimates 2004	estimates 2005	projections 2006	projections 2007	projections 2008	projections 2009	projections 2010	projections 2011	projections 2012	projections 2013	projections 2014	projections 2015	projections 2016	projections 2017	projections 2018	projections 2019
Everglades City	484	498	515	525	527	527	634	804	878	899	912	919	926	933	940	947	954	961	969	976
Marco Island	14,973	15,136	15,276	15,461	15,612	15,683	15,809	15,989	16,169	16,403	16,641	16,830	17,019	17,207	17,396	17,590	17,789	17,989	18,188	18,387
Naples	21,332	21,872	22,200	22,393	22,467	22,730	23,178	23,545	23,863	24,181	24,470	24,729	24,988	25,247	25,506	25,742	25,955	26,168	26,381	26,594
Incorporated SUM	36,788	37,506	37,991	38,379	38,605	38,940	39,621	40,338	40,910	41,483	42,023	42,478	42,932	43,387	43,841	44,278	44,698	45,117	45,537	45,957
COUNTYWIDE TOTAL	257,926	270,966	284,962	299,326	311,987	322,223	332,863	345,509	358,635	372,260	384,933	396,572	408,562	420,916	433,642	445,562	456,622	467,956	479,572	491,475

notes:

1) These estimates and projections are based upon the spreadsheet of permanent population prepared for April 1, 2000-2020.

2) Estimates and projections are derived from data obtained from: 2000 Census; Bureau of Economic and Business Research (BEBR) population bulletins; Collier County Comprehensive Planning staff; Planning staff from Naples and Marco Island; and, an Everglad

3) Some of the Totals may not equal the sum of the individual figures due to rounding.

Prepared by Collier County Comprehensive Planning Department June 21, 2007.

COLLIER COUNTY PEAK SEASON POPULATION ESTIMATES and PROJECTIONS 2000 - 2029

2000 - 2029

	estimates 2000	estimates 2001	estimates 2002	estimates 2003	estimates 2004	estimates 2005	projections 2006	projections 2007	projections 2008	projections 2009	projections 2010	projections 2011	projections 2012	projections 2013	projections 2014	projections 2015	projections 2016	projections 2017
Unincorporated Area	265,366	280,152	296,365	313,137	328,058	339,940	351,890	366,205	381,271	396,933	411,491	424,913	438,756	453,035	467,761	481,540	494,309	507,406
COUNTYWIDE	309,511	325,159	341,954	359,191	374,384	386,668	399,436	414,611	430,362	446,712	461,919	475,886	490,275	505,099	520,371	534,674	547,946	561,547

	projections 2018	projections 2019	projections 2020	projections 2021	projections 2022	projections 2023	projections 2024	projections 2025	projections 2026	projections 2027	projections 2028	projections 2029
Unincorporated Area	520,842	534,622	547,358	558,994	570,869	582,990	595,362	607,133	618,276	629,618	641,164	652,918
COUNTYWIDE	575,486	589,770	602,961	615,002	627,284	639,811	652,588	664,754	676,282	688,009	699,940	712,078

notes:

1) Estimates and projections are derived from data obtained from: 2000 Census; Bureau of Economic and Business Research (BEBR) population bulletins; Collier County Comprehensive Planning staff; and, Planning staff from Naples and Marco Island.

2) Peak Season population is derived by increasing each year's October 1 permanent population by20% (.20).

3) Based upon BEBR Medium Range growth rate projections.

Prepared by Collier County Comprehensive Planning Department June 21, 2007.

APPENDIX C

D

Urban and Agricultural Demand Projections

OVERVIEW

Water demands in this 2005–2006 LWC Plan Update are considered both in terms of the water needed to meet the demands of the users/customers (net demand) and the withdrawal demands (gross demands) on the water resources. This appendix explains and presents projections for both the user/customer demands and the demands on the water resources.

In previous water supply plans, the net demands and water withdrawal demands were identified together. This approach, however, had to be modified to address the situations in which net and gross demands differ. For instance, in the LWC Planning Area, a large percentage of new utility demands are being met using brackish water sources, and withdrawals from these sources are 20 percent to 25 percent higher than those from freshwater sources using conventional treatment processes. This is due to the water treatment process at reverse osmosis (RO) plants, which yields both potable water (about 75 percent to 80 percent) of water entering the plant and a concentrate containing the salts (about 20 percent to 25 percent) of water entering the plant.

Demand assessments for 2000 and projections through 2025 in five-year time frames are presented in this appendix for the following water use categories:

- Public Water Supply.
- Domestic Self-Supply and Small Public Supply Systems.
- Commercial and Industrial Self-Supply.
- Recreational Self-Supply.
- Thermoelectric Power Generation Self-Supply.
- Agricultural Self-Supply.

The Public Water Supply category encompasses potable water supplied by water treatment facilities with projected average pumpages greater than 100,000 gallons per day (GPD) in 2025 to all types of customers, not just residential. Within this water use category, net demands which reflect customer demands are referred to

as "finished water demands" since they are measured by the treated water leaving the plants. The other five water use categories are self-supplied. The Domestic Self-Supply category includes households whose sources of domestic water are private wells, as well as small utilities. Commercial and Industrial Self-Supply refers to self-supplied business operations. Recreational Self-Supply includes irrigation demands for golf courses and other large landscaped areas, such as parks and cemeteries. Thermoelectric Power Generation Self-Supply water primarily represents replacement water for evaporative losses from cooling water and boiler make-up water at power plants. Agricultural water use includes demands for crop irrigation.

GENERAL DESCRIPTION OF METHODOLOGY AND DATA SOURCES

This section describes the data, information and procedures used to develop the water demand estimates for this 2005–2006 LWC Plan Update. The demands are those of the people of the LWC Planning Area and their activities, especially as reflected in land use. Therefore, estimates and projections of population and land use are basic to estimating water demands. These estimates and projections need to reflect appropriate breakdowns by location and type of use (e.g., crop type for agricultural use). Another key is to develop appropriate use factors that can be applied to the population and land use information as appropriately defined and broken down by location and use type.

The water demand projections include analyses during average rainfall conditions and 1-in-10 year drought demand conditions, as mandated by Subsection 373.0361(2)(a)l, Florida Statutes (F.S.).

Activity Factors

Population

Of the six use categories, population is the chief independent variable for projection purposes for public water supplies and domestic self-supplies.

2000 Population

U.S. Census data was used as the basis for the 2000 population and the distribution of that population to sub-county areas. Census block level information from the census count was used as the basic unit of analysis. Total population, occupied housing units and persons per occupied housing unit were obtained from the Census for blocks within each county.

Information from District permit files and data from utilities were used to define the areas served by each utility. The utilities' data was especially important in identifying the areas actually served by each utility because, in many cases, these areas were somewhat smaller than the franchised and permitted service areas. The focus on areas actually served by utilities allowed for a closer correspondence between the estimated population and the population served. While data from the 1990 and earlier Censuses had identified the source of water for households, this was no longer included in the 2000 Census. Populations in areas not served by utilities were included as self-supplied population.

The geographic areas represented by the census blocks and utility-served areas were input as polygon layers into the SFWMD Geographic Information System (GIS). The two layers were overlaid to determine if census blocks were inside or outside the area served by each utility. Imagery was used to review decisions when necessary. The populations by census block for each Public Water Supply utility and for Domestic Self-Supply users were then calculated. The populations for each utility-served area were then totaled.

In Glades, Hendry and Charlotte counties, portions of the population were assigned to the Kissimmee Basin (KB) Planning Area, the Lower East Coast (LEC) Planning Area and the Southwest Florida Water Management District (SWFWMD), respectively. These shares were based on detailed analyses from the 2000 Census distributions of population. The split of Charlotte County's population between the SFWMD and the SWFWMD was obtained from a detailed study conducted for the SWFWMD (GIS Associates 2004).

Population Projections

The goal of water supply planning is to use the best available data to estimate future populations. For estimating county populations, the latest medium county population projections published by the Bureau of Economics and Business Research (BEBR) of the University of Florida are primarily used. In preparing this plan update, the BEBR's county level projections were used for Lee, Hendry, Glades and Charlotte counties. These projections are updated on an annual basis, and the projections used were issued in February 2006 (BEBR 2006). For Collier County, alternative projections, which were approved for use by the Florida Department of Community Affairs (FDCA), show higher growth than the latest medium BEBR projections. The BEBR projections and the alternative projections used for Collier County provided county level controls in five-year increments from 2000 to 2025. For Glades, Hendry and Charlotte counties, the portions of the population assigned to the KB Planning Area, the LEC Planning Area and the SWFWMD were the same as those developed for 2000, based on Census of Population data.

For Collier and Lee counties, the projected share of total county population growth for each utility service area was based on the projected traffic analysis

zone (TAZ) population growth in each county. Traffic zone analyses are useful in projecting distribution of population because they analyze relatively small population areas and are integrated into each county's transportation planning process. In Collier County, there are 439 TAZs, while in Lee County there are 1,318 TAZs.

In addition, GIS information on the areas each utility expects to serve in the future was obtained from the utilities. The two layers were overlaid to determine if traffic analysis zones were inside or outside the area served by each utility. Population estimates were then calculated for each utility by deciding which polygons were inside or outside of utility-served boundaries. The populations for each utility-served area were then totaled. For Hendry, Glades and Charlotte counties, TAZ projections were not available and the future distribution of population estimates generally followed the historic shares of population.

The projections used in this plan update are believed to represent a reasonable balance of long- and short-term factors affecting the development of the LWC Planning Area. However, recent proposals for the development of large communities in Charlotte and Hendry counties, which are not anticipated in the recent growth trends, and the continuing high growth rate in Collier and Lee counties emphasize the uncertainties associated with 20-year population projections.

As a new requirement of state law, specific Water Supply Development projects are included in this plan update to address projected needs for the next 20 years. The District recognizes that there are public water supply utilities conducting detailed studies to estimate population and demand increases, and identify the most appropriate water supply project options to meet future needs. In addition, other large water users, especially thermoelectric utilities and agricultural users, will require time to identify the specific water supply projects intended to meet water needs for the next 20 years. For these reasons, the District will consider amending the regional water supply plans on an annual basis for the next three years to allow for the inclusion of additional, specific alternative water supply projects. Such amendments, if needed, are proposed to be done during January and February for the next three years. Only local governments that are affected by the additional alternative water supply projects would be required to amend their comprehensive plans, consistent with the requirements of Section 163.3177(6)(c), F.S. It is anticipated that at the end of the three-year period, that this annual plan amendment process would be re-evaluated.

Land Use Projections

Land use projections were developed jointly for the LWC Plan Update and Southwest Florida Feasibility Study (SWFFS). The two study areas differ in only a few areas. The 2005–2006 LWC Plan Update has a planning horizon through 2025 and the SWFFS has a planning horizon through 2050. In order to support

hydrologic modeling and the development of project alternatives, the spatial distribution of land use was estimated for 2025 and 2050 conditions. Additional details on this effort can be found in *Estimation of Spatially Distributed Future Land Use in a Rapidly Developing Area* (Liebermann 2006).

The spatial distribution method used the most current GIS datasets of land use categories, public and conservation lands, and county growth plans. County and municipal planners verified the growth plans. Agricultural experts provided verification of the current and build-out acreages expected by the major producers. These and other GIS layers were combined for analysis. Logical rules were developed to resolve the combination of layers and competing future uses, and to differentiate between 2025 and 2050 conditions. It is recognized that the projections resulting from these rules simply represent one "best estimate" out of many possible scenarios. It is quite possible that urban growth will exceed these estimates and will supplant agriculture in additional areas. This appendix does not use the geographic location detail provided in this analysis. The total acreages by crop type presented here are consistent with the total acreage by basin and county in the GIS analysis.

The information used directly to develop the demand estimates includes:

- Irrigated land use by county or sub-county area.
- Land use details (such as crop type) consistent with those used in water supply plans.

However, some lands currently used for citrus will be removed from agricultural use to become part of the Caloosahatchee (C-43) West Reservoir Project, one of the District's Acceler8 projects. Therefore, future irrigated citrus acreage has already been adjusted for this site-specific loss.

Estimates and Projections of Water Use Factors

Public Water Supply and Self-Supply Demands

For public water supply and self-supply demands, the finished water demands per capita for each utility are based on historical data and held constant into the future.

Per capita water use rates in 2000 for each utility were calculated by dividing finished water demands by the permanent resident population served by public water supply utilities. These per capita rates include: total use (incorporating use by seasonal residents and tourists); commercial and industrial utility supplied use; losses incurred in water delivery; and, use by permanent residents. Some utilities use a planned level of service, which is different from the 2000 estimate. For those utilities, the planned level of service, finished water demand per capita estimates were used.

Domestic Self-Supply per capita rates were based on the average Public Water Supply per capita for the county. For Public Water Supply and Domestic Self-Supply use, 1-in-10 year demand conditions are represented by a use that is 6 percent higher than the average demands.

To determine the gross demands, information regarding the sources and efficiency factors are needed. Conventional treatment processes for freshwater sources generally show insignificant differences between raw water withdrawals and finished water demands. On the other hand, for nanofiltration of fresh water, finished water production is generally 85 percent to 90 percent of raw water withdrawals. For reverse osmosis treatment of brackish water, freshwater production is generally about 75 percent to 80 percent of raw water withdrawals. Aquifer storage and recovery (ASR) systems generally recover about 75 percent of water placed into storage. Reuse of reclaimed water substitutes for water resource withdrawals that would otherwise be required by irrigators, some of whom may have alternatively used potable water. These factors are typical for applications in determining water withdrawal demands; however, when specific information was available as to the expected factor for a particular utility or project, this information was used.

Irrigation Demands

The Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) Model was used to estimate net irrigation demands for agricultural and recreational uses. Irrigation requirements were calculated for average and 1-in-10 year drought demands. To estimate agricultural and recreational irrigation demands, the 2000 and projected irrigated acreages were evaluated using 36 years of rainfall and potential evapotranspiration climatic data from appropriate meteorological stations. The analyses also considered growing seasons, soil types, irrigation methods and strategies.

Agricultural 1-in-10 year drought demands are higher than demands under average conditions, with the difference depending somewhat on soil and crop type. Recreational use has similar differences between average and drought demand estimates.

Irrigation application efficiencies reflect the ability of each type of irrigation system to place water into the root zone of the crop, directly meeting the needs of farmers. The result of applying the efficiencies to the net irrigation demand estimates provides estimates of gross irrigation demands, which are typically the withdrawal demands (demands on the water resource). Efficiencies for irrigation systems are typically 85 percent for low-volume systems, 75 percent for overhead sprinkler systems, 50 percent for flood systems and 35 percent for sprinkler systems on containerized nurseries.

DEMAND ESTIMATES AND PROJECTIONS BY CATEGORY OF WATER USE

(1 & 2) Public Water Supply and Domestic Self-Supply Demands

Public Water Supply and Domestic Self-Supply demand estimates and projections were developed from 2000 through 2025 in five-year increments. The Domestic Self-Supply category includes small public supply systems with projected demands of less than 0.1 million gallons per day (MGD), as well as residents who supply their own indoor domestic water needs. Water demands were forecast by multiplying population projections by per capita finished water demand use rates.

The finished water demands (net demands) are the demands of each utility's customers, which include permanent residents, seasonal residents, tourists, commercial, government and industrial users. The concept of customer demands as applied to public water suppliers is essentially equivalent to finished water leaving the water treatment plants. While utility finished water production includes unaccounted for water, as well as water whose use is eventually metered, the finished water production is still a good measure of utility customer demands. This is because a significant portion of the unaccounted for water is used, but simply is unmetered. The rest of the water, while not ultimately used by customers, is limited through the consumptive use permitting (CUP) process.

In some cases, the finished water demands met by each utility are not significantly different from the raw water withdrawals, but the differences are becoming more important and many of the differences arise from the decisions made regarding source and treatment methods. The finished water demands of any utility's customers do not include water used in treatment processes, the effects of ASR systems, or the effects of bulk sales and purchases. However, in order to produce the finished water provided to utility customers, there is a larger water withdrawal demand, reflecting what is withdrawn from the water resource, including all of the supply necessary to overcome process inefficiencies and bulk deliveries.

Projection Methodology

The basic finished water projection methodology for the Public Water Supply and Domestic Self-Supply users was to estimate populations served by each utility and apply a per capita consumption based on finished water demands per capita for each user. The raw water withdrawals are projected based on the finished water demand projections and the source and treatment methods capacities identified through the projects in Chapter 7 and the expected efficiencies and utilization of those capacities.

Projection Results

Table 1 shows the projected Public Water Supply population by planning sub-area. **Table 2** provides finished water demands under average conditions by utility, while **Table 3** provides the finished water needs for 1-in-10 year drought demands. In the same manner, **Table 4** provides estimated raw water withdrawals under average conditions, while **Table 5** provides raw water withdrawals under 1-in-10 year drought conditions.

Table 1. Public Water Supply and Domestic Self-Supply Projections of Population Served by Utility.

Utility	2000	2005	2010	2015	2020	2025
Collier County						
Ave Maria Utility	0	5,608	11,208	17,142	23,507	30,200
Collier County Utilities	113,102	155,739	198,311	243,426	291,824	342,711
Everglades City	1,173	1,367	1,561	1,767	1,987	2,219
FGUA (Golden Gate)	12,677	14,001	15,322	16,723	18,226	19,805
Immokalee	18,164	22,572	26,973	31,637	36,640	41,901
Marco Island	15,333	16,121	16,908	17,741	18,636	19,576
Naples	52,411	56,722	61,026	65,587	70,480	75,625
Self-Supplied	38,517	45,471	52,414	59,772	67,666	75,965
Collier County Total	251,377	317,601	383,723	453,795	528,966	608,002
Glades County						
Glades Self-Supplied	3,020	3,127	3,414	3,612	3,777	3,942
Moore Haven	3,052	3,156	3,435	3,627	3,787	3,947
Glades County Total	6,072	6,283	6,849	7,239	7,564	7,889
Hendry County						
Clewiston	14,928	15,881	17,403	18,677	19,916	20,949
Future Western Hendry County	0	820	2,130	3,225	4,291	5,179
Hendry County Correctional	1,267	1,362	1,514	1,640	1,763	1,865
Hendry Self-Supplied	10,395	10,400	10,408	10,416	10,422	10,428
LaBelle	4,641	5,279	6,298	7,150	7,979	8,671
Port LaBelle	3,096	3,355	3,768	4,113	4,450	4,729
Hendry County Total	34,327	37,097	41,521	45,221	48,821	51,821
Lee County						
Boca Grande Supplied	0	919	1,919	2,788	3,596	4,318
Bonita Springs Utilities	34,415	45,446	57,287	67,534	77,067	85,850
Cape Coral, City of	61,650	104,118	149,844	189,739	226,898	260,035
Fort Myers, City of	48,314	56,287	64,830	72,301	79,260	85,465
Greater Pine Island W/A	9,064	12,024	15,202	17,978	20,564	22,870
Island Water Association	6,522	7,751	8,071	8,300	8,423	8,547
Lee County Utilities	176,681	201,286	227,637	250,687	272,157	291,302
Lehigh Acres (FGUA)	18,850	29,803	41,587	51,873	61,453	69,996
Self-Supplied	85,392	83,764	82,024	80,500	79,081	77,816
Lee County Total	440,888	541,398	648,400	741,700	828,499	906,199
Charlotte County						
Charlotte County Self-Supplied	5,438	6,163	6,865	7,525	8,132	8,673
Charlotte County Total	5,438	6,163	6,865	7,525	8,132	8,673
LWC Planning Area Total	738,102	908,542	1,087,358	1,255,480	1,421,982	1,582,584

Table 2. Public Water Supply and Domestic Self-Supply Finished Water Demand Projections by Utility (Average Demands).

Utility	2000	2005	2010	2015	2020	2025
Collier County						
Ave Maria Utility	0.00	0.62	1.23	1.89	2.59	3.32
Collier County Utilities	22.28	29.48	36.69	45.03	53.99	63.40
Everglades City	0.37	0.43	0.49	0.56	0.63	0.70
FGUA (Golden Gate)	1.33	1.47	1.61	1.75	1.91	2.08
Immokalee	2.60	3.23	3.86	4.53	5.24	6.00
Marco Island	5.23	6.60	7.96	8.35	8.77	9.21
Naples	19.43	19.63	19.83	21.32	22.91	24.58
Self-Supplied	8.90	10.50	12.11	13.81	15.63	17.55
Collier County Total	60.14	71.96	83.78	97.23	111.67	126.84
Glades County						
Glades Self-Supplied	0.42	0.43	0.47	0.50	0.53	0.55
Moore Haven	0.40	0.41	0.45	0.48	0.50	0.52
Glades County Total	0.82	0.85	0.92	0.98	1.02	1.07
Hendry County						
Clewiston	3.40	3.03	2.00	2.15	2.29	2.41
Future Western Hendry County	0.00	0.11	0.28	0.42	0.56	0.67
Hendry County Correctional	0.22	0.23	0.26	0.28	0.30	0.32
Hendry Self-Supplied	1.40	1.40	1.40	1.40	1.40	1.40
LaBelle	0.63	0.71	0.85	0.97	1.08	1.17
Port LaBelle	0.24	0.26	0.29	0.32	0.34	0.37
Hendry County Total	5.88	5.74	5.08	5.54	5.98	6.34
Lee County						
Boca Grande Supplied	0.00	0.12	0.26	0.38	0.48	0.58
Bonita Springs	5.90	7.79	9.82	11.58	13.21	14.72
Cape Coral	8.31	14.03	20.20	25.58	30.58	35.05
FGUA (Lehigh)	1.58	3.01	4.20	5.24	6.21	7.07
Fort Myers	6.76	7.88	9.07	10.12	11.09	11.96
Greater Pine Island	1.11	1.47	1.86	2.20	2.52	2.80
Island Water	3.21	3.82	3.97	4.09	4.15	4.21
Lee County Utilities	20.83	23.73	26.84	29.56	32.09	34.34
Lee County Self-Supplied	11.49	11.27	11.04	10.83	10.64	10.47
Lee County Total	59.19	73.12	87.26	99.56	110.97	121.20
Charlotte County						
Charlotte County Self-Supplied	0.71	0.80	0.89	0.98	1.06	1.13
Charlotte County Total	0.71	0.80	0.89	0.98	1.06	1.13
LWC Planning Area Total	126.74	152.47	177.93	204.29	230.70	256.58

Table 3. Public Water Supply and Domestic Self-Supply Finished Water Demand Projections by Utility (1-in-10 Year Drought Demands).

Utility	2000	2005	2010	2015	2020	2025
Collier County						
Ave Maria Utility	0.00	0.66	1.30	2.00	2.75	3.52
Collier County Utilities	23.62	31.24	38.89	47.73	57.23	67.20
Everglades City	0.39	0.46	0.52	0.59	0.67	0.74
FGUA (Golden Gate)	1.41	1.56	1.71	1.86	2.02	2.20
Immokalee	2.76	3.42	4.09	4.80	5.55	6.36
Marco Island	7.65	8.05	8.44	8.85	9.30	9.76
Naples	20.60	20.81	21.02	22.60	24.28	26.05
Self-Supplied	9.43	11.13	12.84	14.64	16.57	18.60
Collier County Total	65.86	77.31	88.81	103.07	118.37	134.43
Glades County						
Glades Self-Supplied	0.45	0.46	0.50	0.53	0.56	0.58
Moore Haven	0.42	0.44	0.48	0.50	0.53	0.55
Glades County Total	0.87	0.90	0.98	1.04	1.08	1.13
Hendry County						
Clewiston	3.60	3.21	2.12	2.28	2.43	2.55
Future Western Hendry County	0.00	0.11	0.29	0.44	0.59	0.71
Hendry County Correctional	0.23	0.25	0.27	0.30	0.32	0.34
Hendry Self-Supplied	1.48	1.48	1.49	1.49	1.49	1.49
LaBelle	0.67	0.76	0.90	1.03	1.14	1.24
Port LaBelle	0.25	0.28	0.31	0.34	0.37	0.39
Hendry County Total	6.24	6.09	5.39	5.87	6.34	6.72
Lee County						
Boca Grande Supplied	0.00	0.13	0.27	0.40	0.51	0.62
Bonita Springs	6.25	8.26	10.41	12.27	14.00	15.60
Cape Coral	8.81	14.88	21.41	27.11	32.42	37.15
FGUA (Lehigh)	1.67	3.19	4.45	5.55	6.58	7.49
Fort Myers	7.17	8.35	9.62	10.72	11.76	12.68
Greater Pine Island	1.18	1.56	1.97	2.33	2.67	2.97
Island Water	3.40	4.04	4.21	4.33	4.39	4.46
Lee County Utilities	22.08	25.15	28.45	31.33	34.01	36.40
Lee County Self-Supplied	12.18	11.95	11.70	11.48	11.28	11.10
Lee County Total	62.74	77.51	92.49	105.53	117.63	128.47
Charlotte County						
Charlotte County Self-Supplied	0.75	0.85	0.95	1.04	1.12	1.20
Charlotte County Total	0.75	0.85	0.95	1.04	1.12	1.20
LWC Planning Area Total	136.46	162.66	188.62	216.55	244.54	271.96

Table 4. Public Water Supply and Domestic Self-Supply Raw Water Withdrawals by Utility (Average Demands).

Utility	2000	2005	2010[b]	2015[b]	2020[b]	2025[b]
Collier County						
Ave Maria Utility	0.00	0.70	1.37	2.16	3.04	3.95
Collier County Utilities	24.39	35.30	44.91	56.11	67.98	80.52
Everglades City	0.37	0.43	0.50	0.57	0.64	0.71
FGUA (Golden Gate)	1.36	1.53	1.68	1.83	2.00	2.17
Immokalee	2.65	3.30	4.00	4.84	5.73	6.70
Marco Island	6.14	7.87	9.89	10.83	11.12	11.56
Naples	19.80	20.03	21.80	23.50	25.20	27.10
Collier Self-Supplied	8.90	10.50	12.11	13.81	15.63	17.55
Collier County Total	63.61	79.66	96.26	113.65	131.34	150.26
Glades County						
Glades Self-Supplied	0.42	0.43	0.47	0.50	0.53	0.55
Moore Haven	0.41	0.42	0.46	0.49	0.52	0.53
Glades County Total	0.83	0.85	0.93	0.99	1.05	1.08
Hendry County						
Clewiston[a]	3.46	3.10	2.60	2.80	3.00	3.20
Future Western Hendry County	0.00	0.11	0.35	0.53	0.70	0.84
Hendry County Correctional	0.22	0.23	0.28	0.30	0.32	0.34
Hendry Self-Supplied	1.40	1.40	1.40	1.40	1.40	1.40
LaBelle	0.64	0.71	1.13	1.25	1.38	1.50
Port LaBelle	0.24	0.27	0.32	0.38	0.40	0.44
Hendry County Total	5.96	5.82	6.08	6.66	7.20	7.72
Lee County						
Boca Grande Supplied	0.00	0.15	0.35	0.48	0.60	0.73
Bonita Springs	6.00	8.90	11.40	13.70	15.60	17.30
Cape Coral	12.50	16.70	24.40	30.00	35.60	43.90
FGUA (Lehigh)	1.61	3.06	4.44	5.74	6.96	8.03
Fort Myers	8.45	9.90	11.40	12.60	13.90	15.00
Greater Pine Island	1.74	1.88	2.32	2.75	3.15	3.50
Island Water	4.01	4.78	5.00	5.10	5.20	5.30
Lee County Self-Supplied	11.49	11.27	11.04	10.83	10.64	10.47
Lee County Utilities	21.70	25.92	30.37	33.45	36.31	38.85
Lee County Total	67.50	82.56	100.72	114.65	127.96	143.08
Charlotte County						
Charlotte County Self-Supplied	0.71	0.80	0.89	0.98	1.06	1.13
Charlotte County Total	0.71	0.80	0.89	0.98	1.06	1.13
LWC Planning Area Total	138.61	169.69	204.88	236.93	268.61	303.27

a. Water through 2008 supplied by US Sugar and includes industrial/commercial component. See Section 3 for additional detail. This also applies to Table 5.

b. Raw water projections are blank where future supplies were not identified and demand projections showed deficit conditions. The District will propose future supply projects for these areas if none are provided by local governments. This also applies to Table 5.

Table 5. Public Water Supply and Domestic Self-Supply Raw Water Withdrawals by Utility (1-in-10 Year Drought Demands).

Utility	2000	2005	2010[b]	2015[b]	2020[b]	2025[b]
Collier County						
Ave Maria Utility	0.00	0.74	1.45	2.29	3.22	4.19
Collier County Utilities	25.85	37.42	47.60	59.48	72.06	85.35
Everglades City	0.39	0.46	0.53	0.60	0.68	0.75
FGUA (Golden Gate)	1.44	1.62	1.78	1.94	2.12	2.30
Immokalee	2.81	3.50	4.24	5.13	6.07	7.10
Marco Island	6.51	8.34	10.48	11.48	11.79	12.25
Naples	20.99	21.23	23.11	24.91	26.71	28.73
Collier Self-Supplied	9.43	11.13	12.84	14.64	16.57	18.60
Collier County Total	67.43	84.44	102.04	120.47	139.22	159.28
Glades County						
Glades Self-Supplied	0.45	0.46	0.50	0.53	0.56	0.58
Moore Haven	0.43	0.45	0.49	0.52	0.55	0.56
Glades County Total	0.88	0.90	0.99	1.05	1.11	1.14
Hendry County						
Clewiston[a]	3.67	3.29	2.76	2.97	3.18	3.39
Future Western Hendry County	0.00	0.12	0.37	0.56	0.74	0.89
Hendry County Correctional	0.23	0.24	0.30	0.32	0.34	0.36
Hendry Self-Supplied	1.48	1.48	1.48	1.48	1.48	1.48
LaBelle	0.68	0.75	1.20	1.33	1.46	1.59
Port LaBelle	0.25	0.29	0.34	0.40	0.42	0.47
Hendry County Total	6.32	6.17	6.44	7.06	7.63	8.18
Lee County						
Boca Grande Supplied	0.00	0.16	0.37	0.51	0.64	0.77
Bonita Springs	6.36	9.43	12.08	14.52	16.54	18.34
Cape Coral	13.25	17.70	25.86	31.80	37.74	46.53
FGUA (Lehigh)	1.71	3.24	4.71	6.08	7.38	8.51
Fort Myers	8.96	10.49	12.08	13.36	14.73	15.90
Greater Pine Island	1.84	1.99	2.46	2.92	3.34	3.71
Island Water	4.25	5.07	5.30	5.41	5.51	5.62
Lee County Self-Supplied	12.18	11.95	11.70	11.48	11.28	11.10
Lee County Utilities	23.00	27.48	32.19	35.46	38.49	41.18
Lee County Total	71.55	87.51	106.76	121.53	135.64	151.66
Charlotte County						
Charlotte County Self-Supplied	0.75	0.85	0.94	1.04	1.12	1.20
Charlotte County Total	0.75	0.85	0.94	1.04	1.12	1.20
LWC Planning Area Total	146.93	179.87	217.17	251.15	284.73	321.47

a. Water through 2008 supplied by US Sugar and includes industrial/commercial component. See Section 3 for additional detail. This also applies to Table 5.

b. Raw water projections are blank where future supplies were not identified and demand projections showed deficit conditions. The District will propose future supply projects for these areas if none are provided by local governments. This also applies to Table 5.

(3) Commercial and Industrial Self-Supply

This category includes Commercial and Industrial demands not supported by a public utility. Water used for commercial and industrial purposes supplied by utilities is included with other utility demands.

Projection Methodology

These water uses were estimated for 2000 by the U.S. Geological Survey (USGS 2004), which directly contacted the users. In the LWC Planning Area, the largest uses are associated with mining and food processing. Inspection of data for earlier years assembled by the USGS indicates that the levels of use and changes in use are not related to population and general economic development, but they had remained small and changed erratically. For these reasons, the 2000 Commercial and Industrial demands were held constant through 2025. The one exception is that in 2000, U.S. Sugar supplied both its own needs and the Public Water Supply needs of the City of Clewiston and the use was classified as Public Water Supply. This will continue through the summer of 2008, at which time U.S. Sugar will supply only its own needs and its use classification will become Commercial and Industrial Self-Supply. A separate utility is being established to serve the City of Clewiston. Commercial and Industrial demands are also not estimated to change between average and 1-in-10 year drought demand conditions and the withdrawal demands are considered to be the same as the user demands.

Projection Results

Table 6 summarizes the Commercial and Industrial Self-Supply demand estimates and projections in the LWC Planning Area.

Table 6. Commercial and Industrial Self-Supply Demand (MGD).

County Area	2000	2005	2010	2015	2020	2025
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	5.8	5.8	5.8	5.8	5.8	5.8
Glades - Southern	4.1	4.1	4.1	4.1	4.1	4.1
Hendry - Western Hendry	0.7	0.7	3.1	3.1	3.1	3.1
Lee	16.0	16.0	16.0	16.0	16.0	16.0
LWC Planning Area Total	26.6	26.6	28.9	28.9	28.9	28.9

(4) Recreational Self-Supply

The Recreational Self-Supply water use category includes self-supplied irrigation demands for golf courses and other large landscaped areas, such as parks and cemeteries.

Projection Methodology

Landscape and recreational uses were identified as a specific land use in the previously described GIS land use analysis. These uses have a significant impact on urban water use and reclaimed water use; therefore, patterns of golf course development in urbanized areas were thoroughly evaluated. A database of more than 160 golf courses was compiled for southwestern Florida, and these golf courses were correlated to existing water-use permits. The best estimate is that the irrigated area of golf courses will grow from 18,500 acres to 28,000 acres by about 2030, with an average of 120 irrigated acres per 18-hole course. Using existing patterns of urban development and the locations of water-use permits, both existing and proposed (likely future) locations for about 80 new golf courses were mapped.

Recreational irrigation demand estimates during average and l-in-10 year drought conditions were made using the AFSIRS Model. The irrigation requirements were calculated similarly to other irrigation requirements, using a representative irrigation system/rainfall station/soil type combinations for each county.

Projection Results

Recreational Self-Supply acreage projections are shown in **Table 7**. These acreages include the golf course acreage discussed above and estimated acreage of other large landscaped areas. The projected net irrigation (user) demands are shown in **Table 8** for both average conditions and for 1-in-10 year drought conditions. Gross irrigation demands (withdrawal demands) for average and for 1-in-10 year drought conditions are shown in **Table 9**. At present, and in the future, a substantial portion of the Recreational Self-Supply demands is or will be met by the reuse of reclaimed water. This will not only reduce withdrawal demands on the water resources, but also provide additional recharge of the Surficial Aquifer.

Table 7. Recreational Self-Supply Acreage in the LWC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Glades - Southern	322	421	521	620	720	819
Hendry - Western Hendry	499	584	669	755	840	925
Lee	11,193	11,594	11,995	12,396	12,797	13,199
Charlotte - SFWMD Portion	1	1	1	1	1	1
Collier	11,392	11,964	12,536	13,108	13,680	14,252
Total LWC Planning Area	23,406	24,564	25,723	26,881	28,039	29,197

Table 8. Net Irrigation Demands for Recreational Self-Supply Users in the LWC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	15.9	16.7	17.5	18.3	19.1	19.9
Glades - Southern	0.3	0.5	0.6	0.7	0.8	0.9
Hendry - Western Hendry	0.8	1.0	1.1	1.3	1.4	1.5
Lee	20.6	21.3	22.0	22.8	23.5	24.2
LWC Planning Area Total	37.7	39.5	41.3	43.0	44.8	46.6
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	19.2	20.2	21.2	22.1	23.1	24.1
Glades - Southern	0.5	0.6	0.8	0.9	1.1	1.2
Hendry - Western Hendry	1.0	1.2	1.3	1.5	1.7	1.8
Lee	24.0	24.8	25.7	26.6	27.4	28.3
LWC Planning Area Total	44.7	46.8	49.0	51.1	53.3	55.4

Table 9. Gross Irrigation Demands for Recreational Self-Supply Users in the LWC Planning Area.

Sub-County Area	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	21.2	22.3	23.4	24.4	25.5	26.6
Glades - Southern	0.5	0.6	0.7	0.9	1.0	1.2
Hendry - Western Hendry	1.1	1.3	1.5	1.7	1.9	2.1
Lee	27.4	28.4	29.4	30.4	31.3	32.3
LWC Planning Area Total	50.2	52.6	55.0	57.4	59.8	62.2
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	25.6	26.9	28.2	29.5	30.8	32.1
Glades - Southern	0.7	0.9	1.1	1.3	1.5	1.7
Hendry - Western Hendry	1.3	1.6	1.8	2.0	2.2	2.5
Lee	32.0	33.1	34.3	35.4	36.6	37.7
LWC Planning Area Total	59.6	62.5	65.3	68.2	71.0	73.9

(5) Thermoelectric Power Generation Self-Supply

The major use of water at thermoelectric power plants is for cooling purposes. In the LWC Planning Area, and in most of south Florida, this use has until recently been met by flow-through cooling using tidal and not fresh or brackish aquifer water. This is the case for FPL's Fort Myers plant, which uses water from the tidal Caloosahatchee for cooling. The other power plant uses are boiler make-up water and ancillary uses, such as domestic type use by employees. As an example, for these uses FPL's Fort Myers Plant relies on water from the Sandstone Aquifer. In the 2000 LWC Plan, the estimated Thermoelectric Power Generation Self-Supply freshwater demands for 1995 were only 0.8 MGD. The USGS estimate of these demands in 2000 was 0.2 MGD. This pattern is changing as a significant percentage of new power plants are expected to use evaporative cooling towers and fresh water for cooling.

Projection Methodology

Projections were made in conjunction with Florida Power & Light (FPL), the major electric supplier in south Florida, and reflect growth expectations in power demands; strategies for obtaining the electricity to meet those demands (which leads to estimation of power plant construction); types and locations of power plants; types of cooling facilities; and, ability to achieve efficiencies in water use. Most of these factors are subject to considerable uncertainty, and the efficacy of meeting demands from freshwater sources vs. saltwater sources needs further

consideration, as does the cost-effectiveness of design and operational strategies that could significantly reduce water use below the amounts estimated.

The estimates presented in **Table 10** include only the generating capacity expected to be located in the LWC Planning Area. Significant additional capacity has been proposed for areas within the Lake Okeechobee Service Area, which are outside the LWC Planning Area. Those demands are included in the 2005–2006 KB, LWC and UEC plan updates. Thermoelectric Power Generation demands are estimated to be the same for average and 1-in-10 year drought conditions.

Projection Results

Projections of fresh and brackish water for Thermoelectric Power Demands are presented in **Table 10**. These projections are the same for average and 1-in-10 year drought demands and for user/customer demands and water withdrawal demands.

Use of the Sandstone Aquifer at the Ft. Myers Plant at quantities presently permitted accounts for the use in Lee County. The remaining projections account for five planned plants, which will use cooling towers as the heat rejection method. None of these plants has been sited other than to identify their general location within the LWC Planning Area. The efficacy and availability of water sources will be a consideration in the site selection and the primary source of water for the plants will be alternative water supplies, including captured excess stormwater, Floridan Aquifer water and reclaimed water.

Table 10. Projected Thermoelectric Power Demands (MGD).

Sub-County	2000	2005	2010	2015	2020	2025
Lee County	0.2	0.5	0.5	0.5	0.5	0.5
LWC Area (location unspecified)	0.0	0.0	7.6	51.2	58.8	66.4
Total	0.2	0.5	8.1	51.7	59.3	66.9

(6) Agricultural Self-Supply

Agricultural water use includes irrigated commercially grown crop categories as developed by the Water Demand Projection Subcommittee, composed of representatives from Florida's five water management districts. These categories are: 1) citrus, 2) other fruits and nuts, 3) vegetables, melons and berries, 4) field crops, 5) sod, 6) greenhouse/nursery, 7) pasture and 8) miscellaneous.

Projection Methodology

The agricultural demand assessment uses acreage estimates developed as part of the overall GIS land use analysis. To estimate the demands associated with the acreage for each crop, information from District Water Supply Assessments and previous hydrologic modeling efforts was used to identify soil types, growing seasons, irrigation system types and irrigation system efficiencies.

The actual Agricultural Self-Supply demand calculations for this LWC Plan Update were made using the AFSIRS Model. This is a change from the 2000 LWC Plan, which used a modified Blaney-Criddle Model to estimate supplemental requirements for irrigation.

The AFSIRS Model calculates both net and gross irrigation requirements. A crop's net irrigation requirement is the amount of water delivered to the root zone of the crop, while gross irrigation requirement includes both the net irrigation requirement and the losses incurred in getting irrigation to the crop's root zone. Irrigation efficiency refers to the average percent of total water applied that is delivered to the plant's root zone. This relationship is expressed as follows:

Gross Irrigation Requirement = Net Irrigation Requirement / Irrigation Efficiency

Agricultural alternative water supply projects are likely to target changes in the sources and efficiencies of water delivery in order to meet the crop net irrigation demands. For instance, tailwater recovery could capture some of the water not effectively delivered to the root zone, and by recapturing and reusing this water, withdrawals from the water resource could ultimately be reduced.

Average and 1-in-10 year drought irrigation requirements were calculated using the District's AFSIRS Model. Historical weather data from the rainfall station was considered to best represent the crop/county combination used to calculate irrigation requirements.

Projections of irrigation system type and the effect of the corresponding irrigation efficiencies (shown in parentheses) were based on the interpretation of current ratios and trends. There are three basic types of irrigation systems currently used in south Florida crop production. These are seepage (50 percent), sprinkler (75 percent) and low-volume (85 percent) systems.

Available water capacity and depth of soil have a direct effect on effective rainfall. Another factor the AFSIRS Model considered explicitly is on-farm irrigation management strategy, which was combined with soil properties. The AFSIRS Model defines eight "generic" soil types representing the major kinds of

soils found in Florida. Runs for each crop for each basin were made using the most appropriate generic soil, as defined by the AFSIRS Model.

Improved pasture is defined by the SFWMD as pasture that has the facilities in place to carry out irrigation. Irrigation of pastureland is believed to be limited and based more on sales opportunities and extreme drought maintenance, and not as part of regular crop management. The water supply planning assumption that improved pasture is not irrigated does not preclude ranchers from acquiring SFWMD consumptive use permits or carrying out pasture irrigation.

Projection Results

Citrus

Overall, citrus acreage in the LWC Planning Area is expected to remain about the same, with modest declines expected in Collier County and increases in Glades County. Water use in the planning area is expected to show very little change through 2025. **Table 11** presents the acreage projections, while **Table 12** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 13** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 11. Citrus Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	8,056	9,979	11,902	13,825	15,748	17,671
Hendry - Western Hendry	92,017	91,723	91,430	91,136	90,843	90,549
Lee	16,373	16,276	16,179	16,083	15,986	15,889
Charlotte - SFWMD Portion	10,373	10,373	10,373	10,373	10,373	10,373
Collier	40,638	39,766	38,895	38,023	37,152	36,280
Total LWC Planning Area	167,457	168,118	168,779	169,440	170,101	170,762

Table 12. Net Irrigation Demands for Citrus in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands For Average Conditions (MGD)						
Charlotte - SFWMD Portion	9.5	9.5	9.5	9.5	9.5	9.5
Collier	38.3	37.4	36.6	35.8	35.0	34.2
Glades – Southern	9.7	11.8	13.8	15.6	17.4	19.1
Hendry - Western Hendry	106.4	106.0	105.7	105.3	105.0	104.7
Lee	21.5	21.4	21.3	21.1	21.0	20.9
LWC Planning Area Total	185.4	186.1	186.8	187.4	187.9	188.3
Net Irrigation Demands For 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	13.0	13.0	13.0	13.0	13.0	13.0
Collier	53.6	52.4	51.3	50.1	49.0	47.8
Glades – Southern	13.6	16.7	19.6	22.5	25.2	27.9
Hendry - Western Hendry	141.6	141.2	140.7	140.3	139.8	139.4
Lee	28.9	28.7	28.5	28.4	28.2	28.0
LWC Planning Area Total	250.7	252.0	253.2	254.3	255.3	256.2

Table 13. Gross Irrigation Demands for Citrus in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands For Average Conditions (MGD)						
Charlotte - SFWMD Portion	11.2	11.2	11.2	11.2	11.2	11.2
Collier	53.9	52.7	51.6	50.4	49.3	48.1
Glades – Southern	14.1	16.7	19.0	21.1	22.9	24.6
Hendry - Western Hendry	156.4	155.9	155.4	154.9	154.4	153.9
Lee	31.6	31.4	31.3	31.1	30.9	30.7
LWC Planning Area Total	267.2	267.9	268.4	268.6	268.7	268.5
Gross Irrigation Demands For 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	15.3	15.3	15.3	15.3	15.3	15.3
Collier	75.4	73.8	72.2	70.6	69.0	67.4
Glades – Southern	19.8	23.6	27.1	30.3	33.2	36.0
Hendry - Western Hendry	208.3	207.6	206.9	206.3	205.6	204.9
Lee	42.5	42.2	42.0	41.7	41.5	41.2
LWC Planning Area Total	361.3	362.5	363.5	364.2	364.6	364.8

Other Fruits and Nuts

The major crops in this category are avocados and mangos. Total acreage of "Other Fruits and Nuts" in the LWC Planning Area is small and concentrated in Lee and Collier counties. Modest declines in acreage are expected due to urbanization pressures. Water use is expected to decline as well. Overall, the acreage and water use declines are small. **Table 14** presents the acreage

projections, while **Table 15** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 16** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 14. Acres of Other Fruits and Nuts in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	8	8	8	8	8	8
Hendry - Western Hendry	65	63	61	59	57	55
Lee	139	124	109	93	78	63
Charlotte - SFWMD Portion	76	76	76	76	76	76
Collier	194	186	178	171	163	155
Total LWC Planning Area	482	457	432	407	382	357

Table 15. Net Irrigation Demands for Other Fruits and Nuts in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.2	0.1	0.1	0.1	0.1	0.1
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.2	0.2	0.1	0.1	0.1	0.1
LWC Planning Area Total	0.5	0.5	0.4	0.4	0.4	0.3
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.2	0.2	0.2	0.2	0.1	0.1
LWC Planning Area Total	0.7	0.6	0.6	0.6	0.5	0.5

Table 16. Gross Irrigation Demands for Other Fruits and Nuts in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.2	0.2	0.2	0.2	0.1	0.1
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.3	0.2	0.2	0.2	0.2	0.1
LWC Planning Area Total	0.7	0.6	0.6	0.5	0.5	0.5
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	0.3	0.3	0.2	0.2	0.2	0.2
Glades – Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.1	0.1	0.1	0.1	0.1	0.1
Lee	0.4	0.3	0.3	0.2	0.2	0.2
LWC Planning Area Total	0.9	0.8	0.8	0.7	0.7	0.6

Vegetables, Melons and Berries

The chief crops in this category include tomatoes, peppers, eggplant, squash, watermelons and tropical vegetables. Vegetable acreage through the projection period is expected to increase significantly in Hendry County and show some decline in most other sub areas of the LWC Planning Area. Water use changes parallel the changes in acreage.

Table 17 presents the acreage projections, while **Table 18** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 19** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 17. Vegetables, Melons and Berries Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	1,699	1,769	1,839	1,908	1,978	2,048
Hendry - Western Hendry	9,485	10,842	12,198	13,555	14,911	16,268
Lee	15,793	15,318	14,843	14,367	13,892	13,417
Charlotte - SFWMD Portion	6,239	5,830	5,421	5,013	4,604	4,195
Collier	43,676	42,315	40,953	39,592	38,230	36,869
Total LWC Planning Area	76,892	76,073	75,254	74,435	73,616	72,797

Table 18. Net Irrigation Demands for Vegetables, Melons and Berries in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	7.5	7.0	6.5	6.0	5.5	5.0
Collier	48.6	47.1	45.6	44.1	42.6	41.1
Glades – Southern	1.4	1.4	1.5	1.6	1.6	1.7
Hendry - Western Hendry	11.4	13.0	14.6	16.2	17.9	19.5
Lee	21.5	20.8	20.2	19.5	18.9	18.3
LWC Planning Area Total	90.3	89.4	88.4	87.4	86.5	85.5
Net Irrigation Demands for 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	9.4	8.8	8.2	7.6	7.0	6.3
Collier	61.0	59.1	57.2	55.3	53.4	51.5
Glades – Southern	2.0	2.1	2.2	2.2	2.3	2.4
Hendry - Western Hendry	14.3	16.4	18.4	20.5	22.5	24.6
Lee	26.4	25.6	24.8	24.0	23.2	22.4
LWC Planning Area Total	113.1	111.9	110.7	109.6	108.4	107.2

Table 19. Gross Irrigation Demands for Vegetables, Melons and Berries in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	14.9	14.0	13.0	12.0	11.0	10.0
Collier	93.5	90.6	87.7	84.8	81.9	79.0
Glades – Southern	1.9	1.9	2.0	2.1	2.2	2.2
Hendry - Western Hendry	22.7	26.0	29.2	32.5	35.7	39.0
Lee	41.3	40.1	38.8	37.6	36.3	35.1
LWC Planning Area Total	174.4	172.5	170.7	168.9	167.1	165.3
Gross Irrigation Demands for 1-in- 10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	18.8	17.6	16.4	15.1	13.9	12.7
Collier	117.3	113.6	110.0	106.3	102.6	99.0
Glades – Southern	2.7	2.8	2.9	3.0	3.1	3.2
Hendry - Western Hendry	28.6	32.7	36.8	40.9	45.0	49.1
Lee	50.7	49.2	47.7	46.2	44.6	43.1
LWC Planning Area Total	218.2	215.9	213.7	211.5	209.3	207.1

Field Crops - Sugarcane

Sugarcane is the principal field crop grown within the LWC Planning Area. Other field crops grown include rice, corn and soybeans. Because of its dominance in terms of acreage, sugarcane and "other field crops" are discussed separately.

Sugarcane is initially propagated by planting stalk cuttings. The first harvest takes place approximately 13 months after planting. Sugar production per unit of land surface declines gradually with each additional rotation, and in approximately four years, (one planting and three ratoons) the increased yields associated with replanting outweigh the costs. Because land may lay fallow for several months between crop rotation cycles, approximately 20 percent of the land associated with sugarcane production will not be harvested in any given year.

While the largest percentage of sugarcane acreage in south Florida is grown in the muck soils of the Everglades Agricultural Area (EAA), significant acreage occurs on the "sand lands" in portions of Hendry and Glades counties in the LWC Planning Area. Through the projection period, sugarcane acreage in Glades County is expected to grow by about 10,000 acres, while acreage in Hendry County is expected to remain relatively constant in the mid-60,000 acre-range. Water use per acre within each basin also remains the same, and therefore, water use parallels the changes in acreage.

Table 20 presents the acreage projections, while **Table 21** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 22** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 20. Sugarcane Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	29,115	31,037	32,959	34,882	36,804	38,726
Hendry - Western Hendry	63,364	64,105	64,846	65,587	66,328	67,069
Lee	0	0	0	0	0	0
Charlotte - SFWMD Portion	0	0	0	0	0	0
Collier	0	0	0	0	0	0
Total LWC Planning Area	92,479	95,142	97,805	100,469	103,132	105,795

Table 21. Net Irrigation Demands for Sugarcane in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	37.2	39.7	42.2	44.6	47.1	49.5
Hendry - Western Hendry	76.4	77.2	78.1	79.0	79.9	80.8
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	113.6	117.0	120.3	123.7	127.0	130.4
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	49.8	53.1	56.4	59.7	63.0	66.3
Hendry - Western Hendry	103.2	104.4	105.6	106.8	108.0	109.3
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	153.0	157.5	162.0	166.5	171.0	175.5

Table 22. Gross Irrigation Demands for Sugarcane in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	74.5	79.4	84.3	89.3	94.2	99.1
Hendry - Western Hendry	152.7	154.5	156.3	158.1	159.9	161.6
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	227.2	233.9	240.6	247.3	254.0	260.7
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.0	0.0	0.0	0.0	0.0	0.0
Collier	0.0	0.0	0.0	0.0	0.0	0.0
Glades - Southern	99.6	106.2	112.8	119.4	125.9	132.5
Hendry - Western Hendry	206.4	208.9	211.3	213.7	216.1	218.5
Lee	0.0	0.0	0.0	0.0	0.0	0.0
LWC Planning Area Total	306.1	315.1	324.0	333.0	342.0	351.0

Field Crops – Other Field Crops

Other field crops in the LWC Planning Area include primarily rice, seed corn and soybeans. Declines in acreage and water use are projected. **Table 23** presents the acreage projections, while **Table 24** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 25** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 23. Other Field Crops Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	1,193	1,132	1,071	1,011	950	889
Hendry - Western Hendry	218	204	190	175	161	147
Lee	1,172	1,094	1,017	939	862	784
Charlotte - SFWMD Portion	1,055	939	822	706	589	473
Collier	222	222	222	222	222	222
Total LWC Planning Area	3,860	3,591	3,322	3,053	2,784	2,515

Table 24. Net Irrigation Demands for Other Field Crops in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	1.3	1.2	1.0	0.9	0.7	0.6
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades - Southern	1.6	1.5	1.5	1.4	1.3	1.2
Hendry - Western Hendry	0.3	0.3	0.2	0.2	0.2	0.2
Lee	1.7	1.6	1.5	1.3	1.2	1.1
LWC Planning Area Total	5.1	4.7	4.4	4.0	3.6	3.3
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	1.7	1.5	1.3	1.1	0.9	0.7
Collier	0.3	0.3	0.3	0.3	0.3	0.3
Glades - Southern	2.1	2.0	1.9	1.8	1.7	1.6
Hendry - Western Hendry	0.3	0.3	0.3	0.3	0.3	0.2
Lee	2.1	1.9	1.8	1.6	1.5	1.4
LWC Planning Area Total	6.4	6.0	5.5	5.1	4.6	4.2

Table 25. Gross Irrigation Demands for Other Field Crops in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	2.6	2.3	2.0	1.7	1.5	1.2
Collier	0.3	0.3	0.3	0.3	0.3	0.3
Glades - Southern	3.2	3.1	2.9	2.7	2.6	2.4
Hendry - Western Hendry	0.5	0.5	0.5	0.4	0.4	0.4
Lee	3.3	3.1	2.9	2.7	2.5	2.2
LWC Planning Area Total	10.0	9.3	8.6	7.9	7.2	6.5
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	3.3	2.9	2.6	2.2	1.9	1.5
Collier	0.4	0.4	0.4	0.4	0.4	0.4
Glades - Southern	4.2	4.0	3.7	3.5	3.3	3.1
Hendry - Western Hendry	0.7	0.6	0.6	0.6	0.5	0.5
Lee	4.1	3.8	3.6	3.3	3.0	2.8
LWC Planning Area Total	12.7	11.8	10.9	10.0	9.1	8.2

Sod Production

Sod projections presented here refer to irrigated sod. Some sod may be harvested from pastureland, which is not irrigated. Pasture supporting cow-calf operations is typically not irrigated because it is not economical. Some pasture in the coastal areas may include horse farms, ranchettes, etc., which may be irrigated and may have been included with the sod production.

Significant growth in sod production and associated water use is expected in Hendry and Charlotte counties. This production will help meet the demands for sod for urban landscaping. Irrigation requirements are similar to those for recreational uses and on a per acre basis do not change over the projection period.

Table 26 presents the acreage projections, while **Table 27** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 28** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 26. Sod Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	9	9	9	9	9	9
Hendry - Western Hendry	475	1,195	1,915	2,635	3,355	4,075
Lee	665	567	469	372	274	176
Charlotte - SFWMD Portion	296	890	1,485	2,079	2,674	3,268
Collier	115	113	110	108	105	103
Lower West Coast Total	1,560	2,774	3,988	5,203	6,417	7,631

Table 27. Net Irrigation Demands for Sod in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.5	1.4	2.3	3.2	4.1	5.0
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.7	1.8	2.9	4.0	5.1	6.2
Lee	1.0	0.9	0.7	0.6	0.4	0.3
LWC Planning Area Total	2.4	4.2	6.1	7.9	9.8	11.6
Net Irrigation Demands for 1-in- 10 Conditions (MGD)						
Charlotte - SFWMD Portion	0.6	1.7	2.9	4.1	5.3	6.4
Collier	0.2	0.2	0.2	0.2	0.2	0.2
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	0.9	2.3	3.8	5.2	6.6	8.0
Lee	1.3	1.1	0.9	0.7	0.5	0.3
LWC Planning Area Total	3.1	5.4	7.8	10.2	12.6	15.0

Table 28. Gross Irrigation Demands for Sod in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.9	2.7	4.5	6.3	8.2	10.0
Collier	0.4	0.3	0.3	0.3	0.3	0.3
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	1.4	3.6	5.8	8.0	10.2	12.4
Lee	2.0	1.7	1.4	1.1	0.8	0.5
LWC Planning Area Total	4.8	8.5	12.2	15.9	19.6	23.3
Gross Irrigation Demands for 1-in- 10 Conditions (MGD)						
Charlotte - SFWMD Portion	1.2	3.5	5.8	8.2	10.5	12.8
Collier	0.5	0.4	0.4	0.4	0.4	0.4
Glades - Southern	0.0	0.0	0.0	0.0	0.0	0.0
Hendry - Western Hendry	1.9	4.7	7.5	10.3	13.2	16.0
Lee	2.6	2.2	1.8	1.5	1.1	0.7
LWC Planning Area Total	6.1	10.9	15.7	20.4	25.2	30.0

Greenhouse/Nursery

Estimated greenhouse/nursery acreage and irrigation requirements in the LWC Planning Area decline over the projection period, especially in the more urbanized counties of Lee and Collier.

Table 29 presents the acreage projections, while **Table 30** shows the projected net irrigation demands under average and 1-in-10 year drought conditions. **Table 31** shows the projected gross irrigation demands (water withdrawal demands) under average and 1-in-10 year drought conditions.

Table 29. Greenhouse/Nursery Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades - Southern	60	55	50	46	41	36
Hendry - Western Hendry	144	144	144	144	144	144
Lee	756	725	694	663	632	601
Charlotte - SFWMD Portion	81	81	81	81	81	81
Collier	631	596	561	526	491	456
Total LWC Planning Area	1,672	1,601	1,530	1,460	1,389	1,318

Table 30. Net Irrigation Demands for Greenhouse/Nursery in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.1	0.1	0.1	0.1	0.1	0.1
Collier	1.1	1.0	1.0	0.9	0.8	0.8
Glades - Southern	0.1	0.1	0.1	0.1	0.1	0.1
Hendry - Western Hendry	0.2	0.2	0.2	0.2	0.2	0.2
Lee	1.5	1.5	1.4	1.3	1.3	1.2
LWC Planning Area Total	3.1	2.9	2.8	2.7	2.6	2.4
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.2	0.2	0.2	0.2	0.2	0.2
Collier	1.2	1.2	1.1	1.0	1.0	0.9
Glades - Southern	0.1	0.1	0.1	0.1	0.1	0.1
Hendry - Western Hendry	0.3	0.3	0.3	0.3	0.3	0.3
Lee	1.7	1.7	1.6	1.5	1.5	1.4
LWC Planning Area Total	3.6	3.4	3.3	3.1	3.0	2.8

Table 31. Gross Irrigation Demands for Greenhouse/Nursery in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	0.4	0.4	0.4	0.4	0.4	0.4
Collier	2.1	2.0	1.9	1.7	1.6	1.5
Glades - Southern	0.3	0.3	0.2	0.2	0.2	0.2
Hendry - Western Hendry	0.7	0.7	0.7	0.7	0.7	0.7
Lee	2.1	2.0	1.9	1.8	1.7	1.7
LWC Planning Area Total	5.6	5.4	5.1	4.9	4.7	4.5
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	0.5	0.5	0.5	0.5	0.5	0.5
Collier	2.4	2.3	2.1	2.0	1.9	1.7
Glades - Southern	0.3	0.3	0.3	0.3	0.2	0.2
Hendry - Western Hendry	0.9	0.9	0.9	0.9	0.9	0.9
Lee	2.4	2.3	2.2	2.1	2.0	1.9
LWC Planning Area Total	6.5	6.2	6.0	5.7	5.5	5.2

Improved Pasture

Improved pasture is generally not irrigated and no irrigation demands are estimated since they would only relate to some of the acres some of the time.

Other Agricultural Uses

This plan update does not present estimates for cattle watering or aquaculture, the former because of its small size and the latter because most of the use represents localized flow-through, in which the water returns to the source from which it was taken.

Summary of Agricultural Results

Although estimates and projections for the agricultural subsections have been discussed in terms of crop/use categories, it is also important to summarize the results in terms of total acreage and use by subbasin. The acreage by subbasin is presented in **Table 32**, while total agricultural net irrigation demands are presented **Table 33**. Gross irrigation demands (water withdrawal demands) are presented in **Table 34**.

Table 32. Total Irrigated Agricultural Acreage in the LWC Planning Area.

County	2000	2005	2010	2015	2020	2025
Glades – Southern	40,140	43,989	47,839	51,688	55,538	59,387
Hendry – Western Hendry	165,768	168,276	170,784	173,291	175,799	178,307
Lee	34,898	34,104	33,311	32,517	31,724	30,930
Charlotte – SFWMD Portion	18,120	18,189	18,258	18,328	18,397	18,466
Collier	85,476	83,198	80,920	78,641	76,363	74,085
Total	344,402	347,757	351,111	354,466	357,820	361,175

Table 33. Net Irrigation Demands for Total Irrigated Agricultural Acreage in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Net irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	18.9	19.2	19.5	19.7	20.0	20.3
Collier	88.5	86.1	83.7	81.3	78.9	76.5
Glades - Southern	50.1	54.6	59.0	63.3	67.5	71.6
Hendry - Western Hendry	195.4	198.6	201.9	205.1	208.4	211.7
Lee	47.4	46.3	45.2	44.0	42.9	41.8
Total	400.3	404.8	409.2	413.5	417.7	421.8
Net Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	25.0	25.3	25.7	26.1	26.4	26.8
Collier	116.5	113.4	110.2	107.1	104.0	100.9
Glades - Southern	67.7	74.0	80.2	86.3	92.3	98.3
Hendry - Western Hendry	260.8	265.0	269.2	273.4	277.6	281.8
Lee	60.6	59.2	57.9	56.5	55.1	53.7
Total	530.6	536.9	543.2	549.3	555.4	561.4

Table 34. Gross Irrigation Demands for Total Irrigated Agricultural Acreage in the LWC Planning Area.

County/Acreage/Demand	2000	2005	2010	2015	2020	2025
Gross Irrigation Demands for Average Conditions (MGD)						
Charlotte - SFWMD Portion	30.1	30.7	31.2	31.8	32.3	32.9
Collier	150.4	146.2	142.0	137.7	133.5	129.3
Glades - Southern	94.0	101.4	108.5	115.4	122.1	128.5
Hendry - Western Hendry	334.6	341.3	348.0	354.7	361.4	368.1
Lee	80.7	78.6	76.5	74.5	72.4	70.3
Total	689.8	698.1	706.2	714.1	721.7	729.2
Gross Irrigation Demands for 1-in-10 Year Drought Conditions (MGD)						
Charlotte - SFWMD Portion	39.3	40.0	40.7	41.5	42.2	43.0
Collier	196.3	190.8	185.4	180.0	174.5	169.1
Glades - Southern	126.6	136.8	146.8	156.5	165.9	175.0
Hendry - Western Hendry	446.9	455.5	464.1	472.7	481.4	490.0
Lee	102.7	100.1	97.6	95.0	92.4	89.9
Total	911.7	923.3	934.6	945.7	956.4	967.0

TOTAL PLANNING AREA DEMAND AND PLAN COMPARISONS

Total Planning Area Demands

This section summarizes both the total user/customer demands and the water withdrawal demands in the LWC Planning Area. The net demands are the demands that the projects identified in the plan update will be designed to meet. They are presented for both average and 1-in-10 year drought conditions. **Table 35** shows user/customer demands and **Table 36** shows estimated water withdrawal demands from 2000 to 2025 for the LWC Planning Area for average and 1-in-10 year drought demands, respectively.

Table 35. Net Water Demands 2000 through 2025 by Water Use Category in the LWC Planning Area (MGD).

Water Use Category	2000	2005	2010	2015	2020	2025
Net Demands for Average Conditions (MGD)						
Public Water Supply	103.8	128.1	152.0	176.8	201.4	225.5
Domestic Self-Supply	22.9	24.4	25.9	27.5	29.3	31.1
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	37.7	39.5	41.3	43.0	44.8	46.6
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	400.3	404.8	409.2	413.5	417.7	421.8
Total Water Demands	591.5	623.9	665.4	741.4	781.4	820.8
Net Demands for 1-in-10 Year Drought Conditions (MGD)						
Public Water Supply	112.2	134.8	161.1	187.4	213.5	239.0
Domestic Self-Supply	24.3	25.9	27.5	29.2	31.0	33.0
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	44.7	46.8	49.0	51.1	53.3	55.4
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	530.6	536.9	543.2	549.3	555.4	561.4
Total Water Demands	738.6	771.5	817.8	897.6	941.4	984.6

Table 36. Gross Water Demands 2000 through 2025 by Water Use Category in the LWC Planning Area (MGD).

Water Use Category	2000	2005	2010	2015	2020	2025
User/Customer Demands for Average Conditions (MGD)						
Public Water Supply	115.7	145.3	179.0	209.4	239.4	272.2
Domestic Self-Supply	22.9	24.4	25.9	27.5	29.3	31.1
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	50.2	52.6	55.0	57.4	59.8	62.2
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	689.8	698.1	706.2	714.1	721.7	729.2
Total Water Demands	905.4	947.5	1003.1	1089.0	1138.4	1190.5
User/Customer Demands for 1-in-10 Year Drought Conditions (MGD)						
Public Water Supply	122.6	151.3	189.7	222.0	253.7	288.5
Domestic Self-Supply	24.3	25.9	27.5	29.2	31.0	33.0
Commercial & Industrial Self-Supply	26.6	26.6	28.9	28.9	28.9	28.9
Recreational Self-Supply	59.6	62.5	65.3	68.2	71.0	73.9
Thermoelectric Power Generation Self-Supply	0.2	0.5	8.1	51.7	59.3	66.9
Agricultural Self-Supply	911.7	923.3	934.6	945.7	956.4	967.0
Total Water Demands	1145.0	1190.1	1254.1	1345.7	1400.3	1458.2

Changes Compared to the 2000 LWC Plan

There were several changes made to the demand assessment and projection methodology from the 2000 LWC Plan to the 2005–2006 LWC Plan Update. These are summarized as follows:

Census blocks vs. Census block groups: The population analysis conducted in this 2005–2006 LWC Update used census blocks; whereas block groups were used for the 2000 LWC Plan. A Census block is the smallest Census geographic area, normally bounded by streets and other prominent physical features. A Census block has a higher resolution than a group of blocks (Census block group); therefore, use of blocks rather than block groups provide a higher level of precision.

A lower water use threshold for public water supply utilities from 500,000 to 100,000 gallons per day: This had the effect of increasing the number of Public Water Supply utilities analyzed in the 2005–2006 LWC Plan Update.

Supplemental irrigation needs determined use of the AFSIRS Model vs. a modified Blaney-Criddle Model: Both of these models estimate evapotranspiration (ET) in order to derive supplemental irrigation requirements for agricultural crops and outdoor irrigation. However, in south Florida, the Blaney-Criddle Model tends to overestimate ET, which is the driving component of supplemental irrigation. As a result, the Blaney-Criddle Model has the potential to overestimate supplemental irrigation requirements. To address this, District staff began using the AFSIRS Model as the regional water supply plans were updated. The AFSIRS Model yields supplemental irrigation requirements that better reflect historic use patterns, and are generally lower than the modified Blaney-Criddle Model on an annual basis.

Comparison of 2005–2006 LWC Plan and 2000 LWC Plan

Projected Water Demands

Table 37 compares the projected average gross water demands estimated in the 2000 LWC Water Supply Plan with those estimated for the 2005–2006 LWC Update. **Table 38** does the same for the 1-in-10 year drought projected demands.

Table 37. End Point Projections of Average Water Demands in the 2000 LWC Plan and 2025 LWC Plan Update using Gross Demand.

Water Use Category	2000 LWC Plan Average Demands for 2020 (MGD)	2006 LWC Plan Average Demands for 2025 (MGD)	% Change 2000 LWC Plan (2020) vs. 2005-2006 LWC Update (2025)
Public Water Supply	155.1	272.2	75%
Domestic Self-Supply and Small Public Supply Systems	17.6	31.1	77%
Commercial & Industrial Self-Supply	20.0	28.9	45%
Recreational Self-Supply (Golf Course)	197.7	62.2	-69%
Thermoelectric Power Generation Self-Supply	0.8	66.9	8263%
Agricultural Self-Supply	709.0	729.2	3%
Total Water Use	1100.1	1190.5	8%

a. Gross average demand projections totals to be determined when all project information is complete. See Table 4.

Table 38. End Point Projections of 1-in-10 Year Drought Demands in the 2000 LWC Plan and 2005–2006 LWC Plan Update using Gross Demand.

Water Use Category	2000 LWC Plan 1-in-10 Year Demands for 2020 (MGD)	2006 LWC Plan 1-in-10 Year Demands for 2025 (MGD)	% Change 2000 LWC Plan (2020) vs. 2005–2006 LWC Plan Update (2025)
Public Water Supply	165.9	288.5	74%
Domestic Self-Supply and Small Public Supply Systems	18.7	33.0	76%
Commercial & Industrial Self-Supply	20.0	28.9	45%
Recreational Self-Supply	229.0	73.9	-68%
Thermoelectric Power Generation Self-Supply	0.8	66.9	8262
Agricultural Self-Supply	841.0	967.0	15%
Total Water Use	1275.3	1458.2	14%

The most significant differences between the 2000 LWC Plan demand estimates and the demands estimated in this plan update occur for the following reasons:

- Population projections for the 2005-2006 LWC Plan Update show much larger growth than projections in the 2000 LWC Plan Update. This has a large effect on both Public Water Supply and Domestic Self-Supply demands.
- In the Thermoelectric Power Generation category, the 2000 LWC Plan did not project any additional power generation needs for the planning area. The current plan update projects five new power generation facilities to be located in the LWC Planning Area.

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United States Geological Survey. 2003. *USGS Water Use Data: 2000 Water Use Data for Florida by Category, County and Water Management District with Historical Tables by County and Water Management District*. February 10, 2003. USGS, Tallahassee, FL.

Liebermann, Timothy D. 2006. Estimation of Spatially Distributed Future Land Use in a Rapidly Developing Area, AWRA.

GIS Associates, Inc., Census Populations by Political and Geographic Boundaries of the Southwest Florida Water Management District (SWFWMD), Report Prepared for the Southwest Florida Water Management District, July 2004.

APPENDIX D

COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING PROGRAM
2007 CHLORIDE CONCENTRATIONS (mg/L)

Well	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CR2	178.7	195.1	195.7	236	203.9	173	93.3		229.2	253.5	239.4	232.3
MW2D	73.7	78.2	76.3	75.2	79.8	145.1	84.7	86.6	76	69.5	67.6	71.9
MW2S	62.2	66.4	43.6	29.3	79.4	79.1	76.3	87.4	48.5	44.5	20	24.5
CR11			141.4	173.5	158.2	150.2	96.9	130.4	148.3	40.6	145.7	211.1
MW11D	184.3	209.5	233	237.7	204.4	246.5	202.3	231.9	204.3	204	218.7	206.6
MW11S	113	29	10.5	5.8	31.5	234.1	103.1	41.5	19.3	135.6	167.8	82
CR18				34			33.8	39.2	41.1	38.5	39.3	45
MW18D	38	46.6	46.5	48.1	52.5	68.2	49.1	135.1	59.2	51.3	49.7	55
MW18S	30.1	34.6	62.9	81	55.5	105.7	119.1	73.7	98.6	67.5	113.7	90.8
CR23	59.6				73.5		59.8	62.7	64	64.5	53.4	47
MW23D	59.9	20	137.6	86	91.2	126.5	8.4	93.8	93.1	87.3	85.2	70
MW23S	49.2	72.6	81.7	57.7	101.8	55.2	78.7	105.5	85.2	84.2	79.3	56
CR28	92.1	85.6	93.6	99.2		100			98.4	103.3	104.3	104.9
MW28D	50.9	61	76.4	72.3	66.3	106.6	63.4	70.4	61.5	59.2	57.3	55.5
MW28S	19.7	53.5	49.8	30.5	72.8	106	70.8	75.8	42.2	33.4	31.7	57.6
1003	30.7	39.6	52.9	47.2	48.1	63.3	45.2	46.4	55.2	52	51	48.9
528	14	15.1	21	16.2	15.3	22.5	16.7	16.4	17.3	16.9	15.7	15.6
491	8.1	9.2	16.1	17.4	22.6	9	7.6	7.1	7.6	5.2	5.6	12.1
490	11.8	16.6	33.2	12.5	16.7	18.1	12.9	12	13.6	11.8	12.7	8.7
AVERAGE	**63**	**65**	**81**	**76**	**81**	**106**	**68**	**77**	**77**	**75**	**82**	**79**

77 **Average**
5.2 **Minimum**
253.5 **Maximum**

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt
Date:01/19/2007
Time:12:00

Analysis Performed
Date:01/29/2007
Time:7:49

Sample Acceptance Criteria:
Sample Preservation 4°C
Sample Date: 1/19/2007
Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2007

WELL	Sample #	Chloride mg/L	MATRIX
CR2	54546	178.7	DW
MW2D	54532	73.7	GW
MW2S	54533	62.2	GW
CR11	54547	NA	DW
MW11D	54534	184.3	GW
MW11S	54535	11.3	GW
CR18	54548	NA	DW
MW18D	54536	38.0	GW
MW18S	53537	30.1	GW
CR23	54549	59.6	DW
MW23D	54538	59.9	GW
MW23S	54539	49.2	GW
CR28	54550	92.1	DW
MW28D	54540	50.9	GW
MW28S	54541	19.7	GW
1003	54542	30.7	GW
528	54543	14.0	GW
491	54544	8.1	GW
490	54545	11.8	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 2/8/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt
Date:02/14/2007
Time:10:40

Analysis Performed
Date:02/22,27/2007
Time:11:00,9:46

Sample Acceptance Criteria:
Sample Preservation 4°C
Sample Date: 2/14/2007
Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2007

WELL	Sample #	Chloride mg/L	MATRIX
CR2	55023	195.1	DW
MW2D	55009	78.2	GW
MW2S	55010	66.4	GW
CR11	55024	na	DW
MW11D	55011	209.5	GW
MW11S	55012	29.0	GW
CR18	55025	na	DW
MW18D	55013	46.6	GW
MW18S	55014	34.6	GW
CR23	55026	na	DW
MW23D	55015	20.0	GW
MW23S	55016	72.6	GW
CR28	55027	85.6	DW
MW28D	55017	61.0	GW
MW28S	55018	53.5	GW
1003	55019	39.6	GW
528	55020	15.1	GW
491	55021	9.2	GW
490	55022	16.6	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 3/5/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt
Date:03/15/2007
Time:11:40

Analysis Performed
Date:03/26/07
Time:10:59

Sample Acceptance Criteria:
Sample Preservation 4°C
Sample Date: 3/15/2007
Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2007

WELL	Sample #	Chloride mg/L	MATRIX
CR2	55482	195.7	DW
MW2D	55468	76.3	GW
MW2S	55469	43.6	GW
CR11	55483	141.4	DW
MW11D	55470	233.0	GW
MW11S	55471	10.5	GW
CR18	55484	NA	DW
MW18D	55472	46.5	GW
MW18S	55473	62.9	GW
CR23	55485	NA	DW
MW23D	55474	137.6	GW
MW23S	55475	81.7	GW
CR28	55486	93.6	DW
MW28D	55476	76.4	GW
MW28S	55477	49.8	GW
1003	55478	52.9	GW
528	55479	21.0	GW
491	55480	16.1	GW
490	55481	33.2	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 3/19/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt
Date:4/18/2007
Time:13:00

Analysis Performed
Date:4/26/2007
Time:6:47

Sample Acceptance Criteria:
Sample Preservation 4°C
Sample Date: 4/18/2007
Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2007

WELL	Sample #	Chloride mg/L	MATRIX
CR2	56003	236.0	DW
MW2D	55989	75.2	GW
MW2S	55990	29.3	GW
CR11	56004	173.5	DW
MW11D	55991	237.7	GW
MW11S	55992	5.8	GW
CR18	56005	34.0	DW
MW18D	55993	48.1	GW
MW18S	55994	81.0	GW
CR23	56006	NA	DW
MW23D	55995	86.0	GW
MW23S	55996	57.7	GW
CR28	56007	99.2	DW
MW28D	55997	72.3	GW
MW28S	55998	30.5	GW
1003	55999	47.2	GW
528	56000	16.2	GW
491	56001	17.4	GW
490	56002	12.5	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 4/27/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt
Date:5/14/2007
Time:15:00

Analysis Performed
Date:5/15/2007
Time:7:10

Sample Acceptance Criteria:
Sample Preservation 4°C
Sample Date: 5/14/2007
Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2006

WELL	Sample #	Chloride mg/L	MATRIX
CR2	56404	203.9	DW
MW2D	56390	79.8	GW
MW2S	56391	79.4	GW
CR11	56405	158.2	DW
MW11D	56392	204.4	GW
MW11S	56393	31.5	GW
CR18	56406	na	DW
MW18D	56394	52.5	GW
MW18S	56395	55.5	GW
CR23	56407	73.5	DW
MW23D	56396	91.2	GW
MW23S	56397	101.8	GW
CR28	56408	na	DW
MW28D	56398	66.3	GW
MW28S	56399	72.8	GW
1003	56400	48.1	GW
528	56401	15.3	GW
491	56402	22.6	GW
490	56403	16.7	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 5/15/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt
Date:6/4/2007
Time:12:00

Analysis Performed
Date:6/5/2007
Time:10:30

Sample Acceptance Criteria:

Sample Preservation 4-9°C

Sample Date: 6/4/2007

Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2006

WELL	Sample #	Chloride mg/L	MATRIX
CR2	56698	173.0	DW
MW2D	56684	145.1	GW
MW2S	56685	79.1	GW
CR11	56699	150.2	DW
MW11D	56686	246.5	GW
MW11S	56687	234.1	GW
CR18	56700	no sample	DW
MW18D	56688	68.2	GW
MW18S	56689	105.7	GW
CR23	56701	no sample	DW
MW23D	56690	126.5	GW
MW23S	56691	55.2	GW
CR28	56702	100.0	DW
MW28D	56692	106.6	GW
MW28S	56693	106.0	GW
1003	56694	63.3	GW
528	56695	22.5	GW
491	56696	9.0	GW
490	56697	18.1	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 6/22/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt

Date: 7/16/2007
Time: 12:00

Analysis Performed

Date: 7/17/2007
Time: 10:27

Sample Acceptance Criteria:

Sample Preservation 4°C

Sample Date: 7/16/2007

Does the Sample meat NELAC Requirements?

Yes NO

Results on this report relate only to the samples identified in " Well, and Sample #"

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2008

WELL	Sample #	Chloride mg/L	MATRIX
CR2	57338	93.3	DW
MW2D	57324	84.7	GW
MW2S	57325	76.3	GW
CR11	57339	96.9	DW
MW11D	57326	202.3	GW
MW11S	57327	103.1	GW
CR18	57340	33.8	DW
MW18D	57328	49.1	GW
MW18S	57329	119.1	GW
CR23	57341	59.8	DW
MW23D	57330	8.4	GW
MW23S	57331	78.7	GW
CR28	57342	No Sample	DW
MW28D	57332	63.4	GW
MW28S	57333	70.8	GW
1003	57334	45.2	GW
528	57335	16.7	GW
491	57336	7.6	GW
490	57337	12.9	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 8/7/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt

Date:	8/13/2007
Time:	12:00

Analysis Performed

Date:	8/14,22/2007 9/4/2007
Time:	10:11,8:45,10:09

Sample Acceptance Criteria:

Sample Preservation 4°C

Sample Date: 8/13/2007

Does the Sample meet NELAC Requirements?

Yes NO

Results on this report relate only to the samples identified in " Well, and Sample #"

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2008

WELL	Sample #	Chloride mg/L	MATRIX
CR2	57743	No Sample	DW
MW2D	57729	86.6	GW
MW2S	57730	87.4	GW
CR11	57744	130.4	DW
MW11D	57731	231.9	GW
MW11S	57732	41.5	GW
CR18	57745	39.2	DW
MW18D	57733	135.1	GW
MW18S	57734	73.7	GW
CR23	57746	62.7	DW
MW23D	57735	93.8	GW
MW23S	57736	105.5	GW
CR28	57747	No Sample	DW
MW28D	57737	70.4	GW
MW28S	57738	75.8	GW
1003	57739	46.4	GW
528	57740	16.4	GW
491	57741	7.1	GW
490	57742	12.0	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 9/7/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt

Date:	9/24/2007
Time:	12:20

Analysis Performed

Date:	9/28/2007
Time:	13:00

Sample Acceptance Criteria:

Sample Preservation 4°C

Sample Date: 9/24/2007

Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2008

WELL	Sample #	Chloride mg/L	MATRIX
CR2	58418	229.2	DW
MW2D	58404	76.0	GW
MW2S	58405	48.5	GW
CR11	58419	148.3	DW
MW11D	58406	204.3	GW
MW11S	58407	19.3	GW
CR18	58420	41.1	DW
MW18D	58408	59.2	GW
MW18S	58409	98.6	GW
CR23	58421	64.0	DW
MW23D	58410	93.1	GW
MW23S	58411	85.2	GW
CR28	58422	98.4	DW
MW28D	58412	61.5	GW
MW28S	58413	42.2	GW
1003	58414	55.2	GW
528	58415	17.3	GW
491	58416	7.6	GW
490	58417	13.6	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 10/2/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt

Date:	10/29/2007
Time:	12:30

Analysis Performed

Date:	10/30/2007
Time:	8:52

Sample Acceptance Criteria:

Sample Preservation 4°C

Sample Date: 10/29/2007

Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2008

WELL	Sample #	Chloride mg/L	MATRIX
CR2	58951	253.5	DW
MW2D	58937	69.5	GW
MW2S	58938	44.5	GW
CR11	58952	40.6	DW
MW11D	58939	204.0	GW
MW11S	58940	135.6	GW
CR18	58953	38.5	DW
MW18D	58941	51.3	GW
MW18S	58942	67.5	GW
CR23	58954	64.5	DW
MW23D	58943	87.3	GW
MW23S	58944	84.2	GW
CR28	58955	103.3	DW
MW28D	58945	59.2	GW
MW28S	58946	33.4	GW
1003	58947	52.0	GW
528	58948	16.9	GW
491	58949	5.2	GW
490	58950	11.8	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 11/2/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt

Date:	11/28/2007
Time:	12:00

Analysis Performed

Date:	11/29/2007
Time:	7:45

Sample Acceptance Criteria:

Sample Preservation 4°C

Sample Date: 11/28/2007

Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2008

WELL	Sample #	Chloride mg/L	MATRIX
CR2	59392	239.4	DW
MW2D	59378	67.6	GW
MW2S	59379	20.0	GW
CR11	59393	145.7	DW
MW11D	59380	218.7	GW
MW11S	59381	167.8	GW
CR18	59394	39.3	DW
MW18D	59382	49.7	GW
MW18S	59383	113.7	GW
CR23	59395	53.4	DW
MW23D	59384	85.2	GW
MW23S	59385	79.3	GW
CR28	59396	104.3	DW
MW28D	59386	57.3	GW
MW28S	59387	31.7	GW
1003	59388	51.0	GW
528	59389	15.7	GW
491	59390	5.6	GW
490	59391	12.7	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: Shawn Davis Date: 12/5/07

DOCUMENT EFFECTIVE DATE 9/21/2004
SPECIFIC CONDITION 27
COASTAL RIDGE WELLFIELD SALTWATER INTRUSION MONITORING REPORT
PERMIT # 11-00017-W

Laboratory Receipt
Date:12/31/2007
Time:10:50

Analysis Performed
Date:1/2/2008
Time:7:37

Sample Acceptance Criteria:
Sample Preservation 4°C
Sample Date: 12/31/2007
Does the Sample meet NELAC Requirements?

Yes NO

LABORATORY NAME, ADDRESS, AND CERTIFICATION NUMBER

City of Naples Central Laboratory
1400 Third Ave N
Naples, Florida 34102 phone 239-213-4729
DOH # E55200 expires 6/30/2008

WELL	Sample #	Chloride mg/L	MATRIX
CR2	59889	232.3	DW
MW2D	59875	71.9	GW
MW2S	59876	24.5	GW
CR11	59890	211.1	DW
MW11D	59877	206.6	GW
MW11S	59878	82.0	GW
CR18	59891	45.0	DW
MW18D	59879	55.0	GW
MW18S	59880	90.8	GW
CR23	59892	47.0	DW
MW23D	59881	70.0	GW
MW23S	59882	56.0	GW
CR28	59893	104.9	DW
MW28D	59883	55.5	GW
MW28S	59884	57.6	GW
1003	59885	48.9	GW
528	59886	15.6	GW
491	59887	12.1	GW
490	59888	8.7	GW

I, Shawn Davis Laboratory Supervisor

do HEREBY CERTIFY that all attached analytical data are correct and unless noted meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC)

Signature: _____ Date: 1/2/08

EAST GOLDEN GATE WELLFIELD
JANUARY 2001 CHLORIDE CONCENTRATIONS (mg/L)

Well	Cl (mg/L)
1	115.2
2	50.7
4	15.7
5	18.3
6	20.5
7	35
8	22.2
9	23.1
10	29.6
11	21.8
12	33.4
14	21.8
17	37.8
18	34.3
20	21.8
21	17.2
22	50.7
23	19.6
Average	33
Minimum	15.7
Maximum	115.2

REPORT OF ANALYSES

CITY OF NAPLES-WTP
1000 FLEISCHMANN BLVD
275 13TH ST N
NAPLES, FL 34102-
Attn: CENTRAL LAB

DATE: 03/08/2001

GOLDEN GATE WELLS 2001 (Page 1 of 3)

	SAMPLE			DELIVERY TO LAB		
LAB No.	DATE	TIME	SAMPLER	DATE	TIME	MATRIX
25960	01/31/01	0847	RLS	01/31/01	1500	WA
25961	01/31/01	0859	RLS	01/31/01	1500	WA
25962	01/31/01	0908	RLS	01/31/01	1500	WA
25963	01/31/01	0914	RLS	01/31/01	1500	WA
25964	01/31/01	0920	RLS	01/31/01	1500	WA
25965	01/31/01	0932	RLS	01/31/01	1500	WA
25966	01/31/01	0938	RLS	01/31/01	1500	WA
25967	01/31/01	0948	RLS	01/31/01	1500	WA

PRELIMINARY RESULTS

CLIENT STATION ID	LAB NUMBER	CL- mg/L	COLOR PCU	HARDNESS mg/L CaCo3
422	25960	50.7	16.1	305
421	25961	17.2	89.9	275
420	25962	21.8	92.0	288
418	25963	34.3	51.3	305
417	25964	37.8	46.4	320
401	25965	115.2	27.4	370
402	25966	50.7	30.5	340
423	25967	19.6	37.2	365

LABORATORY DIRECTOR _____

REPORT OF ANALYSES

CITY OF NAPLES-WTP
1000 FLEISCHMANN BLVD
275 13TH ST N
NAPLES, FL 34102-
Attn: CENTRAL LAB

DATE: 03/08/2001

GOLDEN GATE WELLS 2001 (Page 2 of 3)

	SAMPLE			DELIVERY TO LAB		
LAB No.	DATE	TIME	SAMPLER	DATE	TIME	MATRIX
25968	01/31/01	0951	RLS	01/31/01	1500	WA
25969	01/31/01	0956	RLS	01/31/01	1500	WA
25970	01/31/01	1002	RLS	01/31/01	1500	WA
25971	01/31/01	1007	RLS	01/31/01	1500	WA
25972	01/31/01	1012	RLS	01/31/01	1500	WA
25973	01/31/01	1018	RLS	01/31/01	1500	WA
25974	01/31/01	1023	RLS	01/31/01	1500	WA
25975	01/31/01	1028	RLS	01/31/01	1500	WA

PRELIMINARY RESULTS

CLIENT STATION ID	LAB NUMBER	CL- mg/L	COLOR PCU	HARDNESS mg/L CaCo3
404	25968	15.7	35.1	305
405	25969	18.3	53.0	310
406	25970	20.5	67.4	320
407	25971	35.0	41.1	300
408	25972	22.2	82.1	310
409	25973	23.1	99.0	315
410	25974	29.6	52.0	290
411	25975	21.8	69.5	305

LABORATORY DIRECTOR _____

REPORT OF ANALYSES

CITY OF NAPLES-WTP
1000 FLEISCHMANN BLVD
275 13TH ST N
NAPLES, FL 34102-
Attn: CENTRAL LAB

DATE: 03/08/2001

GOLDEN GATE WELLS 2001 (Page 3 of 3)

	SAMPLE			DELIVERY TO LAB		
LAB No.	DATE	TIME	SAMPLER	DATE	TIME	MATRIX
25976	01/31/01	1033	RLS	01/31/01	1500	WA
25977	01/31/01	1038	RLS	01/31/01	1500	WA

PRELIMINARY RESULTS

CLIENT STATION ID	LAB NUMBER	Cl- mg/L	COLOR PCU	HARDNESS mg/L CaCo3
412	25976	33.4	35.4	320
414	25977	21.8	47.8	310

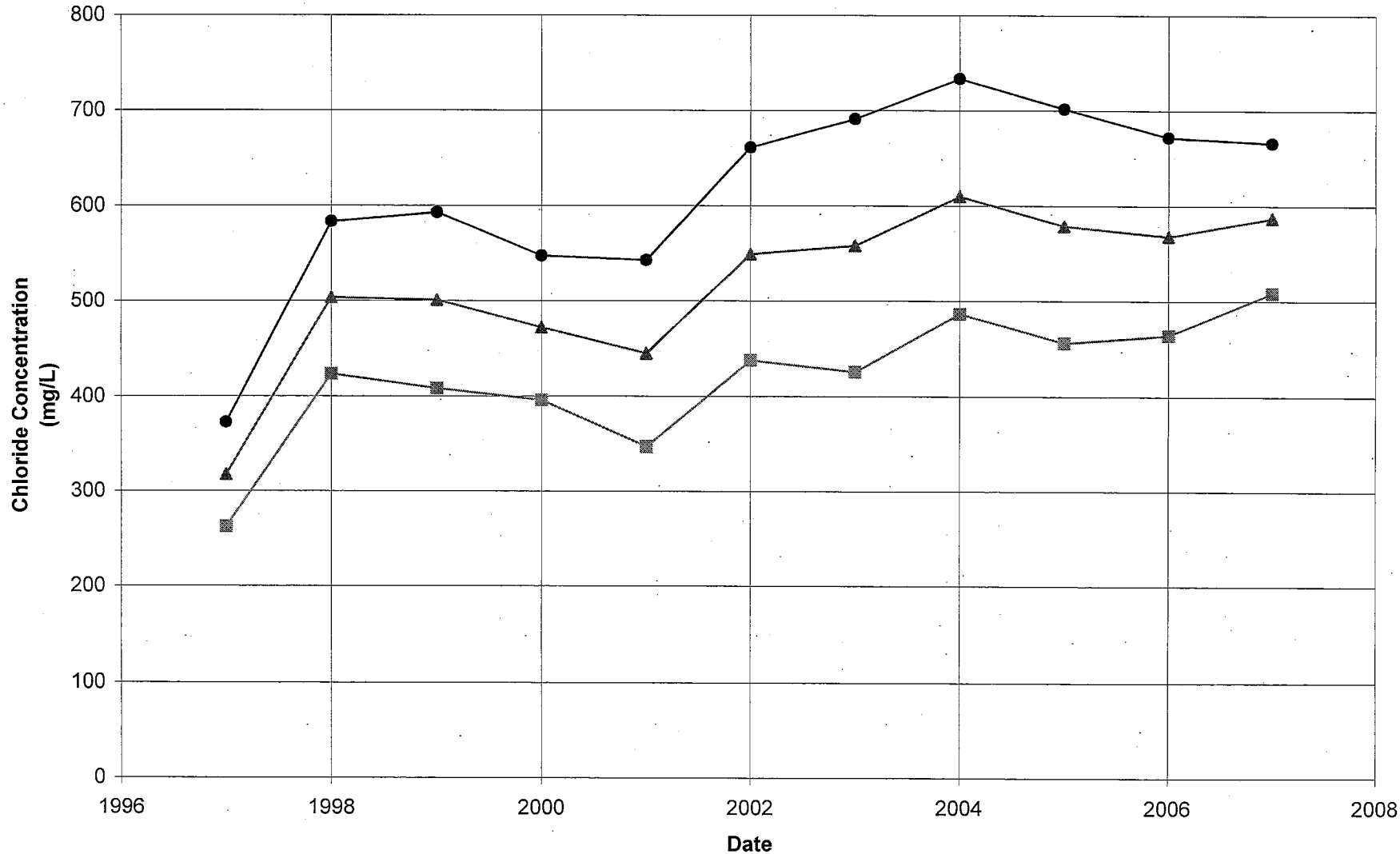
LABORATORY DIRECTOR _____

APPENDIX E

CITY OF NAPLES
RECLAIMED WATER CHLORIDE CONCENTRATIONS

Annual Average	Chloride High (mg/L)	Chloride Low (mg/L)	Chloride Average (mg/L)	Chloride Range (mg/L)
1997	373	263	318	110
1998	583	423	503	160
1999	593	408	500	185
2000	548	396	472	152
2001	543	347	445	196
2002	661	438	549	223
2003	691	426	558	265
2004	733	486	610	247
2005	702	456	579	246
2006	672	464	568	208
2007	666	508	587	158

Annual Reuse Chlorides vs. Time



CITY OF NAPLES
RECLAIMED WATER CHLORIDE CONCENTRATIONS

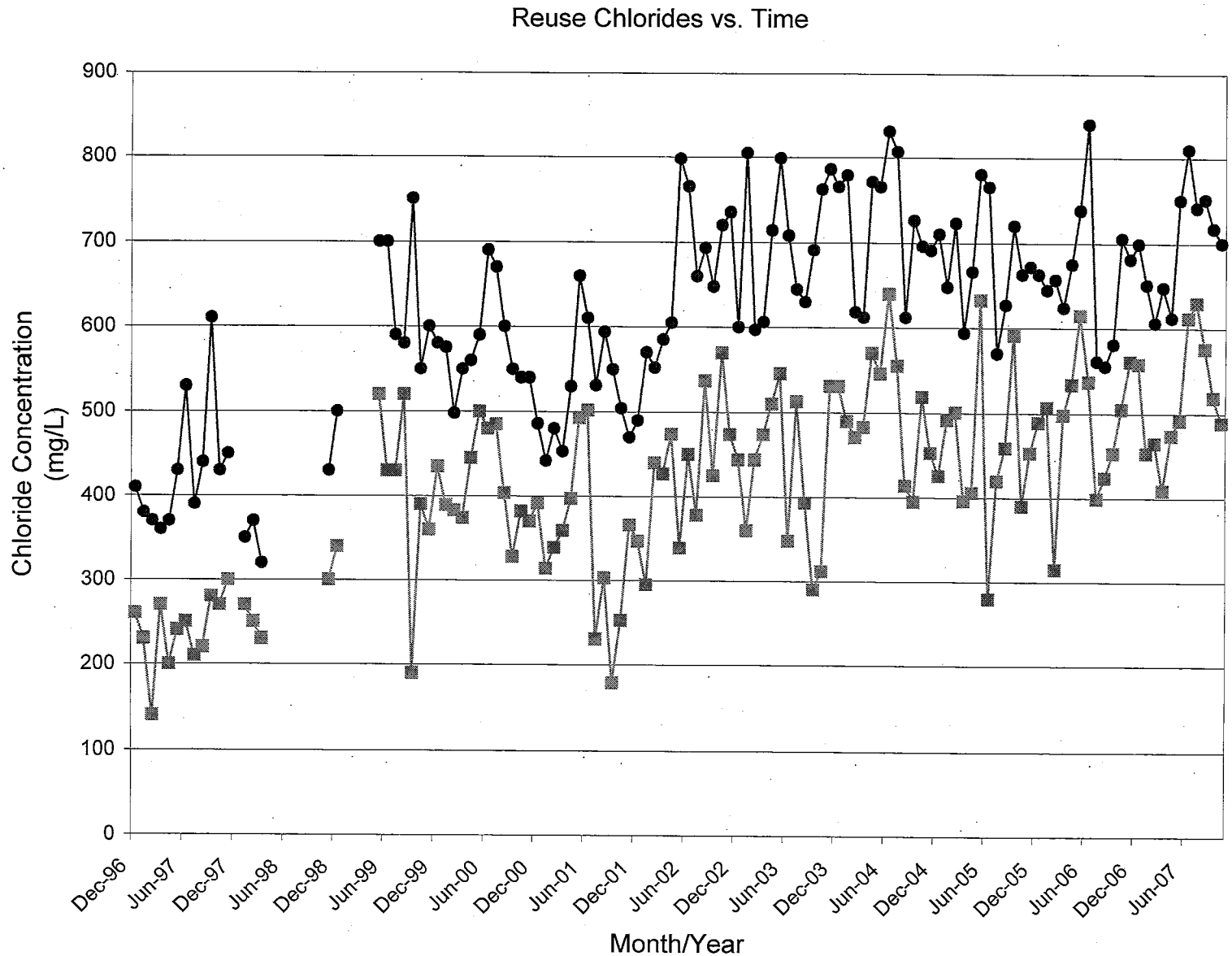
Date	Chloride High (mg/L)	Chloride Low (mg/L)	Chloride Range (mg/L)
Oct-07	700	489	211
Sep-07	717	519	198
Aug-07	751	576	175
Jul-07	741	630	111
Jun-07	810	612	198
May-07	750	492	258
Apr-07	612	474	138
Mar-07	648	409	239
Feb-07	606	465	141
Jan-07	651	453	198
Dec-06	699	558	141
Nov-06	681	561	120
Oct-06	705	505	200
Sep-06	581	453	128
Aug-06	555	424	131
Jul-06	561	399	162
Jun-06	840	537	303
May-06	738	615	123
Apr-06	675	534	141
Mar-06	624	498	126
Feb-06	657	315	342
Jan-06	645	507	138
Dec-05	663	489	174
Nov-05	672	453	219
Oct-05	663	390	273
Sep-05	720	591	129
Aug-05	627	459	168
Jul-05	570	420	150
Jun-05	765	279	486
May-05	780	633	147
Apr-05	666	406	260
Mar-05	594	396	198
Feb-05	723	501	222
Jan-05	648	492	156
Dec-04	710	426	284
Nov-04	691	453	238
Oct-04	696	519	177
Sep-04	726	395	331
Aug-04	612	414	198
Jul-04	807	555	252
Jun-04	831	640	191
May-04	765	546	219
Apr-04	771	570	201
Mar-04	612	483	129
Feb-04	618	471	147
Jan-04	779	490	289
Dec-03	765	531	234
Nov-03	786	531	255
Oct-03	762	312	450

CITY OF NAPLES
RECLAIMED WATER CHLORIDE CONCENTRATIONS

Date	Chloride High (mg/L)	Chloride Low (mg/L)	Chloride Range (mg/L)
Sep-03	691	290	401
Aug-03	630	393	237
Jul-03	645	513	132
Jun-03	708	348	360
May-03	799	546	253
Apr-03	714	510	204
Mar-03	606	474	132
Feb-03	597	444	153
Jan-03	805	360	445
Dec-02	600	444	156
Nov-02	735	474	261
Oct-02	720	570	150
Sep-02	648	425	223
Aug-02	693	537	156
Jul-02	660	378	282
Jun-02	765	450	315
May-02	798	339	459
Apr-02	605	474	131
Mar-02	585	427	158
Feb-02	552	440	112
Jan-02	570	295	275
Dec-01	490	347	143
Nov-01	470	366	104
Oct-01	504	252	252
Sep-01	550	179	371
Aug-01	594	303	291
Jul-01	531	230	301
Jun-01	610	502	108
May-01	660	493	167
Apr-01	530	397	133
Mar-01	453	359	94
Feb-01	480	339	141
Jan-01	442	314	128
Dec-00	486	392	94
Nov-00	540	370	170
Oct-00	540	382	158
Sep-00	550	328	222
Aug-00	600	404	196
Jul-00	670	485	185
Jun-00	690	480	210
May-00	590	500	90
Apr-00	560	445	115
Mar-00	550	374	176
Feb-00	498	383	115
Jan-00	575	389	186
Dec-99	580	435	145
Nov-99	600	360	240
Oct-99	550	390	160
Sep-99	750	190	560

CITY OF NAPLES
RECLAIMED WATER CHLORIDE CONCENTRATIONS

Date	Chloride High (mg/L)	Chloride Low (mg/L)	Chloride Range (mg/L)
Aug-99	580	520	60
Jul-99	590	430	160
Jun-99	700	430	270
May-99	700	520	180


Reuse Chlorides vs. Time
Chloride Concentration (mg/L)
900
800
700
600
500
400
300
200
100
0
Dec-96
Jun-97
Dec-97
Jun-98
Dec-98
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Jun-07
Month/Year

APPENDIX F

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

City of Naples Central Lab
380 Riverside Circle
Naples, FL 34102-

February 25, 2008
Project No: 78706

Laboratory Report

Project Name	**Golden Gate Canal Surface Water Analyses**
Sample Description	**Golden Gate Canal 60143**
Matrix	**Surface Water**
SAL Sample Number	**78706.01**
Date/Time Collected	**01/15/08 09:57**
Date/Time Received	**01/16/08 10:05**

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Volatile Organic Compounds (Primary DW)							
1,1,1-Trichloroethane	ug/l	0.3 U	EPA 502.2	0.3	01/22/08 22:28		JRW
1,1,2-Trichloroethane	ug/l	0.3 U	EPA 502.2	0.3	01/22/08 22:28		JRW
1,1-Dichloroethylene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
1,2,4 Trichlorobenzene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
1,2-Dichloroethane	ug/l	0.2 U	EPA 502.2	0.2	01/22/08 22:28		JRW
1,2-Dichloropropane	ug/l	0.3 U	EPA 502.2	0.3	01/22/08 22:28		JRW
Benzene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Carbon tetrachloride	ug/l	0.3 U	EPA 502.2	0.3	01/22/08 22:28		JRW
cis-1,2-Dichloroethylene	ug/l	0.2 U	EPA 502.2	0.2	01/22/08 22:28		JRW
Dichloromethane	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Ethylbenzene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Monochlorobenzene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
o-Dichlorobenzene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
para-Dichlorobenzene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Styrene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Tetrachloroethylene	ug/l	0.2 U	EPA 502.2	0.2	01/22/08 22:28		JRW
Toluene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
trans-1,2-Dichloroethylene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Trichloroethylene	ug/l	0.2 U	EPA 502.2	0.2	01/22/08 22:28		JRW
Vinyl chloride	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Xylenes (Total)	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
m/p-xylenes	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
o-xylene	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Trihalomethane Analyses							
Bromodichloromethane	ug/l	0.3 U	EPA 502.2	0.3	01/22/08 22:28		JRW
Bromoform	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Chloroform	ug/l	0.2 U	EPA 502.2	0.2	01/22/08 22:28		JRW
Dibromochloromethane	ug/l	0.5 U	EPA 502.2	0.5	01/22/08 22:28		JRW
Total Trihalomethanes	ug/l	0.2 U	EPA 502.2	0.2	01/22/08 22:28		JRW
Chlorinated Pesticides (Primary DW)							
Date Extracted		01/18/08	EPA 508.1			01/18/08 09:00	JLR
Chlordane	ug/l	0.05 U	EPA 508.1	0.05	01/22/08 22:33	01/18/08 09:00	DB
Toxaphene	ug/l	0.5 U	EPA 508.1	0.5	01/22/08 22:33	01/18/08 09:00	DB
Polychlorinated biphenyls (PCBs)	ug/l	0.2 U	EPA 508.1	0.2	01/22/08 22:33	01/18/08 09:00	DB
Chlorinated Herbicides (Primary DW)							
Date Extracted		01/21/08	EPA 515.3			01/21/08 08:30	KAA
Dalapon	ug/l	1 U	EPA 515.3	1	01/23/08 10:31	01/21/08 08:30	BTJ

FDOH Laboratory No. E84129
NELAP Accredited

Francis I. Daniels, Laboratory Director
Leslie C. Boardman, Q. A. Manager

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

City of Naples Central Lab
380 Riverside Circle
Naples, FL 34102-

February 25, 2008
Project No: 78706

Laboratory Report

Project Name	Golden Gate Canal Surface Water Analyses
Sample Description	Golden Gate Canal 60143
Matrix	Surface Water
SAL Sample Number	78706.01
Date/Time Collected	01/15/08 09:57
Date/Time Received	01/16/08 10:05

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Chlorinated Herbicides (Primary DW)							
2,4-D	ug/l	1 U	EPA 515.3	1	01/23/08 10:31	01/21/08 08:30	BTJ
Pentachlorophenol	ug/l	0.1 U	EPA 515.3	0.1	01/23/08 10:31	01/21/08 08:30	BTJ
2,4,5-TP (Silvex)	ug/l	0.25 U	EPA 515.3	0.25	01/23/08 10:31	01/21/08 08:30	BTJ
Dinoseb	ug/l	0.5 U	EPA 515.3	0.5	01/23/08 10:31	01/21/08 08:30	BTJ
Picloram	ug/l	0.75 U	EPA 515.3	0.75	01/23/08 10:31	01/21/08 08:30	BTJ
Semivolatile Analyses (Primary DW)							
Date Extracted		01/18/08	EPA 525.2			01/18/08 09:00	JLR
Alachlor	ug/l	0.2 U	EPA 525.2	0.2	01/18/08 22:47	01/18/08 09:00	BTJ
Atrazine	ug/l	0.06 U	EPA 525.2	0.06	01/18/08 22:47	01/18/08 09:00	BTJ
Benzo(a)pyrene	ug/l	0.1 U	EPA 525.2	0.1	01/18/08 22:47	01/18/08 09:00	BTJ
Di(2-ethylhexyl)adipate	ug/l	0.3 U	EPA 525.2	0.3	01/18/08 22:47	01/18/08 09:00	BTJ
Di(2-ethylhexyl)phthalate	ug/l	1.0 U	EPA 525.2	1.0	01/18/08 22:47	01/18/08 09:00	BTJ
Endrin	ug/l	0.1 U	EPA 525.2	0.1	01/18/08 22:47	01/18/08 09:00	BTJ
Heptachlor	ug/l	0.08 U	EPA 525.2	0.08	01/18/08 22:47	01/18/08 09:00	BTJ
Heptachlor Epoxide	ug/l	0.1 U	EPA 525.2	0.1	01/18/08 22:47	01/18/08 09:00	BTJ
Hexachlorobenzene	ug/l	0.05 U	EPA 525.2	0.05	01/18/08 22:47	01/18/08 09:00	BTJ
Hexachlorocyclopentadiene	ug/l	0.2 U	EPA 525.2	0.2	01/18/08 22:47	01/18/08 09:00	BTJ
Lindane	ug/l	0.06 U	EPA 525.2	0.06	01/18/08 22:47	01/18/08 09:00	BTJ
Methoxychlor	ug/l	0.05 U	EPA 525.2	0.05	01/18/08 22:47	01/18/08 09:00	BTJ
Simazine	ug/l	0.07 U	EPA 525.2	0.07	01/18/08 22:47	01/18/08 09:00	BTJ
Pesticide Analyses (Primary DW)							
Date Extracted		01/17/08	EPA 549.2			01/17/08 09:30	SMD
Diquat	ug/l	1 U	EPA 549.2	1	01/21/08 19:11	01/17/08 09:30	JKS
Semivolatile Compounds - Subcontract							
Acrylamide	ug/l	50 U,S27	EPA 8270	50	02/04/08 20:46	02/01/08	JG
Semivolatile Analyses							
2,3,7,8-TCDD (Dioxin)	ng/l	0.00044 U,S18	EPA 1613B	0.00044	01/26/08		CM
Volatile Organic Compounds - Subcontract							
Epichlorohydrin	ug/l	50 U,S27	EPA 8260	50	01/22/08 18:59		DY
Total Haloacetic Acids Analyses							
Date Extracted		01/18/08	EPA 552.2			01/18/08 09:00	SMD
Monochloroacetic Acid	ug/l	1 U	EPA 552.2	1	01/23/08 00:09	01/18/08 09:00	BTJ
Monobromoacetic Acid	ug/l	1 U	EPA 552.2	1	01/23/08 00:09	01/18/08 09:00	BTJ
Dichloroacetic Acid	ug/l	1 U	EPA 552.2	1	01/23/08 00:09	01/18/08 09:00	BTJ
Trichloroacetic Acid	ug/l	1 U	EPA 552.2	1	01/23/08 00:09	01/18/08 09:00	BTJ

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City of Naples Central Lab
380 Riverside Circle
Naples, FL 34102-

February 25, 2008
Project No: 78706

Laboratory Report

Project Name	Golden Gate Canal Surface Water Analyses
Sample Description	Golden Gate Canal 60143
Matrix	Surface Water
SAL Sample Number	78706.01
Date/Time Collected	01/15/08 09:57
Date/Time Received	01/16/08 10:05

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Total Haloacetic Acids Analyses							
Dibromoacetic Acid	ug/l	1 U	EPA 552.2	1	01/23/08 00:09	01/18/08 09:00	BTJ
Total Haloacetic Acids	ug/l	1 U	EPA 552.2	1	01/23/08 00:09	01/18/08 09:00	BTJ
Pesticide Analyses (Primary DW)							
Date Extracted		01/16/08	EPA 504.1			01/16/08 16:30	CDD
Dibromochloropropane	ug/l	0.005 U	EPA 504.1	0.005	01/17/08 02:59	01/16/08 16:30	BTJ
Ethylene Dibromide (EDB)	ug/l	0.005 U	EPA 504.1	0.005	01/17/08 02:59	01/16/08 16:30	BTJ
Carbamate Pesticides (Primary DW)							
Carbofuran	ug/l	0.5 U	EPA 531.1	0.5	01/18/08 12:34		JKS
Oxamyl (Vydate)	ug/l	0.5 U	EPA 531.1	0.5	01/18/08 12:34		JKS
Pesticide Analyses (Primary DW)							
Glyphosate	ug/l	10 U	EPA 547	10	01/21/08 17:28		JKS
Pesticide Analyses (Primary DW)							
Date Extracted		01/17/08	EPA 548.1			01/17/08 10:00	EMF
Endothall	ug/l	20 U	EPA 548.1	20	01/22/08 14:11	01/17/08 10:00	DB
Purgeable Halocarbons							
Bromodichloromethane	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
Bromoform	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
Bromomethane	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
Carbon tetrachloride	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
Chlorobenzene	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
Chloroethane	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
2-Chloroethyl vinyl ether	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
Chloroform	ug/l	0.2 U	EPA 601	0.2	01/22/08 22:28		JRW
Chloromethane	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
Dibromochloromethane	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
1,2-Dichlorobenzene	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
1,3-Dichlorobenzene	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
1,4-Dichlorobenzene	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
Dichlorodifluoromethane	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
1,1-Dichloroethane	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
1,2-Dichloroethane	ug/l	0.2 U	EPA 601	0.2	01/22/08 22:28		JRW
1,1-Dichloroethene	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
cis-1,2-Dichloroethene	ug/l	0.2 U	EPA 601	0.2	01/22/08 22:28		JRW
trans-1,2-Dichloroethene	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
1,2-Dichloropropane	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
cis-1,3-Dichloropropene	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW

FDOH Laboratory No. E84129
NELAP Accredited

Francis I. Daniels, Laboratory Director
Leslie C. Boardman, Q. A. Manager

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

City of Naples Central Lab
380 Riverside Circle
Naples, FL 34102-

February 25, 2008
Project No: 78706

Laboratory Report

Project Name	**Golden Gate Canal Surface Water Analyses**
Sample Description	**Golden Gate Canal 60143**
Matrix	**Surface Water**
SAL Sample Number	**78706.01**
Date/Time Collected	**01/15/08 09:57**
Date/Time Received	**01/16/08 10:05**

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Purgeable Halocarbons							
trans-1,3-Dichloropropene	ug/l.	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
Methylene chloride	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
1,1,2,2-Tetrachloroethane	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
Tetrachloroethene	ug/l	0.2 U	EPA 601	0.2	01/22/08 22:28		JRW
1,1,1-Trichloroethane	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
1,1,2-Trichloroethane	ug/l	0.3 U	EPA 601	0.3	01/22/08 22:28		JRW
Trichloroethene	ug/l	0.2 U	EPA 601	0.2	01/22/08 22:28		JRW
Trichlorofluoromethane	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
Vinyl chloride	ug/l	0.5 U	EPA 601	0.5	01/22/08 22:28		JRW
Purgeable Aromatics							
Benzene	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
Chlorobenzene	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
1,2-Dichlorobenzene	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
1,3-Dichlorobenzene	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
1,4-Dichlorobenzene	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
Ethylbenzene	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
Toluene	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
Xylenes (Total)	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
Methyl-t-butyl ether	ug/l	0.5 U	EPA 602	0.5	01/22/08 22:28		JRW
Inorganics							
Asbestos	MFL	0.74 U,S4	EPA 100.2	0.74	01/18/08	01/16/08 11:40	EMSL
Bromate	ug/l	5 U	EPA 300.1B	5	01/21/08 17:40		MLH
Chloride	mg/l	88	EPA 300.0	0.05	01/18/08 18:59		MLH
Chlorite	ug/l	50 U	EPA 300.1B	50	01/21/08 17:40		MLH
Color	CU	30	SM 2120 B	5	01/16/08 14:11		JSB
Corrosivity @ 32.2C		-1.1	SM2330B	0.1	01/22/08 15:11		MEJ
Corrosivity @ 57.2C		-0.67	SM2330B	0.1	01/22/08 15:11		MEJ
Corrosivity @ 20C		-1.3	SM2330B	0.1	01/22/08 15:11		MEJ
Cyanide	mg/l	0.005 U	SM 4500 CN	0.005	01/18/08 14:00	01/17/08 14:20	MCD
Fluoride	mg/l	0.12	EPA 300.0	0.01	01/17/08 11:58		MLH
Nitrate (as N)	mg/l	0.01 U,Q	EPA 300.0	0.01	01/17/08 11:58		MLH
Nitrite (as N)	mg/l	0.01 U,Q	EPA 300.0	0.01	01/17/08 11:58		MLH
Odor	TON	8 Q1	SM 2150 B	1	01/16/08 14:10		MLH
pH		7.9 Q5	EPA 150.1		01/16/08 14:03		JSB
Sulfate	mg/l	42	EPA 300.0	0.2	01/17/08 11:58		MLH
Foaming Agents	mg/l	0.05 U	SM 5540 C	0.05	01/16/08 15:06		MEJ
Total Dissolved Solids	mg/l	410	SM 2540 C	10	01/18/08 14:58	01/17/08 11:16	JSB

FDOH Laboratory No. E84129
NELAP Accredited

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SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

City of Naples Central Lab
380 Riverside Circle
Naples, FL 34102-

February 25, 2008
Project No: 78706

Laboratory Report

Project Name	**Golden Gate Canal Surface Water Analyses**
Sample Description	**Golden Gate Canal 60143**
Matrix	**Surface Water**
SAL Sample Number	**78706.01**
Date/Time Collected	**01/15/08 09:57**
Date/Time Received	**01/16/08 10:05**

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Metals							
Silver	mg/l	0.01 U	EPA 200.7	0.01	01/18/08 18:27	01/17/08 10:25	AMP
Aluminum	mg/l	0.32 I	EPA 200.7	0.1	01/18/08 18:27	01/17/08 10:25	AMP
Arsenic	mg/l	0.0010 I	SM 3113 B	0.001	02/08/08 10:55	01/17/08 09:45	SMW
Barium	mg/l	0.020 I	EPA 200.7	0.01	01/18/08 18:27	01/17/08 10:25	AMP
Beryllium	mg/l	0.002 U	EPA 200.7	0.002	01/18/08 18:27	01/17/08 10:25	AMP
Cadmium	mg/l	0.001 U	EPA 200.7	0.001	01/18/08 18:27	01/17/08 10:25	AMP
Chromium	mg/l	0.01 U	EPA 200.7	0.01	01/18/08 18:27	01/17/08 10:25	AMP
Copper	mg/l	0.005 U	EPA 200.7	0.005	01/18/08 18:27	01/17/08 10:25	AMP
Iron	mg/l	0.045 I	EPA 200.7	0.02	01/18/08 18:27	01/17/08 10:25	AMP
Mercury	mg/l	0.0001 U	EPA 245.1	0.0001	01/28/08 11:08	01/28/08 11:08	HWS
Manganese	mg/l	0.01 U	EPA 200.7	0.01	01/18/08 18:27	01/17/08 10:25	AMP
Sodium	mg/l	54	EPA 200.7	0.1	01/17/08 15:39	01/17/08 12:06	AMP
Nickel	mg/l	0.001 U	EPA 200.7	0.001	01/18/08 18:27	01/17/08 10:25	AMP
Lead	mg/l	0.001 U	SM 3113 B	0.001	01/24/08 15:20	01/17/08 09:45	HWS
Antimony	mg/l	0.001 U	SM 3113 B	0.001	02/04/08 11:26	01/17/08 09:27	LCB
Selenium	mg/l	0.001 U	SM 3113 B	0.001	01/23/08 14:45	01/17/08 09:45	HWS
Thallium	mg/l	0.001 U	EPA 200.9	0.001	02/05/08 11:29	01/17/08 09:15	LCB
Zinc	mg/l	0.012	EPA 200.7	0.003	01/18/08 18:27	01/17/08 10:25	AMP
Radiochemistry							
Gross Alpha (Incl. Uranium)	pCi/l	10±4.7	EPA 900.0	2.5	01/22/08 17:46	01/16/08 11:40	MJS
Gross Beta	pCi/l	3.0±1.3	EPA 900.0	2.0	01/29/08 11:05	01/28/08 09:30	MJS
Radium-226	pCi/l	1.3±0.1	EPA 903.1	0.03	01/22/08 14:00	01/16/08 16:00	AWW
Radium-228	pCi/l	0.6±0.2	EPA RA-05	0.4	01/28/08 13:23	01/24/08 15:30	AWW
Combined Uranium	pCi/l	1.4±0.4	EPA 908.0	0.3	01/31/08 16:20	01/17/08 08:45	ARM

FDOH Laboratory No. E84129
NELAP Accredited

Francis I. Daniels, Laboratory Director
Leslie C. Boardman, Q. A. Manager

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

City of Naples Central Lab
380 Riverside Circle
Naples, FL 34102-

February 25, 2008
Project No: 78706

Laboratory Report

Footnotes

*	Test results presented in this report meet all the requirements of the NELAC standards.
**	A statement of estimated uncertainty of test results is available upon request.
***	For methods marked with ***, all QC criteria have been met for this method which is equivalent to a SAL certified method.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
Q1	Sample received and analyzed beyond the accepted holding limit at client's request.
Q5	Analysis should be performed "immediately" in the field. Lab analysis was performed at a later time.
U	Analyte was undetected. Indicated concentration is method detection limit.
U,Q	Analyte was not detected; indicated concentration is method detection limit. Sample held beyond the accepted holding time.
U,S18	Analyte was not detected; indicated concentration is method detection limit. Analysis subcontracted to Summit Environmental Technologies, FDOH Cert. No. E87688.
U,S27	Analyte was undetected. Indicated concentration is method detection limit. Analysis subcontracted to TestAmerica, Austin, TX location.
U,S4	Analyte was not detected; indicated concentration is method detection limit. Analysis subcontracted to EMSL, FDOH Cert. No. E86795.

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

SAL Project No. 18'1060

Client Name	Contact / Phone:
City of Naples Central Lab	Shawn Davis (239) 213-4729
Project Name / Location	
Golden Gate Canal Surface Water Analyses	
Samplers: (Signature) Shawn Davis	

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool 4°C Misc. Inorganics*, Corrosivity	250ml P, H_2SO_4 Nutrients*	250ml P, HNO_3 Metals*	250ml P, NaOH Cyanide*	1LG, Cool 4°C Odor	40ml V, HCl; 502.2, THMs, and 601, 602	1LG, HCl 525.2,508.1	1LaP, H_2SO_4 549.2	40ml V, HCl 504.1	40ml V, MCAA 531.1	40ml Amber V, Cool 515.3	40ml V, Cool 548.1, 547	1/2 gal, HNO_3, U, Gross Beta Gross Alpha, R226-R228,	40 mL V, NH_4Cl Haloacetic Acids	1 LP, EDA Chlorite		
01	Golden Gate Canal 061413	1/15/07	957	SW		X	1	1	1	1	1	4	4	1	3	1	3	2	3	3	1		
02	Trip Blank	12/30/06	1244									1											

Page 7 of 8

Containers Prepared/Relinquished:	Date/Time: 12/13/07 1300	Received:	Date/Time:
Relinquished:	Date/Time: 01/15/07 1400	Received: DHL	Date/Time:
Relinquished: DHL	Date/Time:	Received: K. Vandmark	Date/Time: 1/16/08 1025
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:

Seal intact?	Y	N N/A
Samples intact upon arrival?	Y	N N/A
Received on ice? Temp 3.6	Y	N N/A
Proper preservatives indicated?	Y	N N/A
Rec'd within holding time?	Y	N N/A
Volatiles rec'd w/out headspace?	Y	N N/A
Proper containers used?	Y	N N/A

Instructions / Remarks:

Please Provide Conductivity for Gross Alpha

~~22~~ 25/cm

Primary and Secondary Inorganics icluding DBP (THM, HAA, Chlorite and Bromate).

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

SAL Project No. 16-1010

Client Name	Contact / Phone:
City of Naples Central Lab	Shawn Davis (239) 213-4729
Project Name / Location	
Golden Gate Canal Surface Water Analyses	
Samplers: (Signature)	
Shawn Davis	

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	1 LG Cool Asbestos (Subcontract)	1 LG, Cool Dioxin (Subcontract)	1 Envirocheck Filter, Cool Crypto & Giardia (Subcontract)	1 Sterile Filter, Cool Enteric Viruses (subcontract)	1 LP, HNO3 Photon Emmiters (Subcontract)	1 LG, Cool Acrylamide (Subcontract)	40 mL V, HCl Epichlorohydrin (Subcontract)
01	Golden Gate Canal 16,143	01/15/07	957	SW		X	1	1	1	1	1	2	3
	TRIP Blank	121307	1244										

Containers Prepared/ Relinquished:	Date/Time:	Received:	Date/Time:
LSH	121307 1300		
Relinquished:	Date/Time:	Received:	Date/Time:
	01/15/07 1400	DHL	
Relinquished:	Date/Time:	Received:	Date/Time:
DHL		K Hindmarsh	1/16/07 1025
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:

3, C

Instructions / Remarks:

Please Provide Conductivity for Gross Alpha

732 us/cm

Primary and Secondary Inorganics icluding DBP (THM, HAA, Chlorite and Bromate).

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

February 26, 2008

Ms. Cathy Knepper
City of Naples Central Lab
380 Riverside Circle
Naples, FL 34102

Dear Ms. Knepper:

Enclosed find laboratory results for the City of Naples' Golden Gate Canal Surface Water project, submitted 01/16/08. Please reference Southern Analytical Laboratories Project No. 78706.

This sample was subcontracted to Environmental Associates LTD (FDOH Lab No. E87851) and analyzed for cryptosporidium, giardia, and enteric viruses.

This sample was also subcontracted to FDOH-Bureau of Radiation Control (FDOH Lab No. E13800) and analyzed for photon emitters.

We appreciate this opportunity to be of service to the City of Naples. If you have any questions please do not hesitate to call (813) 855-1844.

Respectfully submitted,

Francis I. Daniels
Laboratory Director

FID/mln

Enclosures

ELAB, Inc. 8 East Tower Cr., Ormond Beach, FL 32174-87 **Date:** *12-Oct-05*

Analytical Report

CLIENT:	City of Naples Central Laboratory	**Client Sample ID:**	46431
Lab Order:	F05090225	**Collection Date:**	9/8/2005 11:15:00 AM
Project:	Golden Gate Canal 2005	**Sample Description:**	Golden Gate Canal
Lab ID:	F05090225-001	**Matrix:**	Surface Water

Analyses	Result	Qual	MDL	RL	Units	DF	Date Analyzed	Batch ID
ICP/MS METALS		**E200.8**	PrepDate:				Analyst: **JCO**	
Arsenic	0.0023		0.00013	0.0010	mg/L	1	09/15/05 16:48	R39984-A
Lead	0.000038	U	0.000038	0.0010	mg/L	1	09/15/05 16:48	R39984-A
Selenium	0.00035	I	0.00013	0.0010	mg/L	1	09/15/05 16:48	R39984-A
Thallium	0.00012	U	0.00012	0.0010	mg/L	1	09/15/05 16:48	R39984-A
MERCURY		**E245.1**	PrepDate: **9/12/2005 9:43:00 A**				Analyst: **JCO**	
Mercury	0.000021	IV	0.000012	0.00010	mg/L	1	09/13/05 12:55	30282
504: EDB/DBCP		**E504.1**	PrepDate: **9/12/2005 4:30:00 P**				Analyst: **JKR**	
1,2-Dibromo-3-chloropropane	0.0055	U	0.0055	0.020	µg/L	1	09/13/05 01:24	30291
1,2-Dibromoethane	0.0099	U	0.0099	0.010	µg/L	1	09/13/05 01:24	30291
Surr: Bromofluorobenzene	116		0	70-130	%REC	1	09/13/05 01:24	30291
508.1: ORGANOCHLORINE PESTS/PCB'S		**E508.1**	PrepDate: **9/12/2005 1:15:00 P**				Analyst: **JKR**	
Alachlor	0.023	U	0.023	0.10	µg/L	1	09/18/05 01:42	30293
Atrazine	0.13	U	0.13	0.30	µg/L	1	09/18/05 01:42	30293
gamma-BHC	0.0060	U	0.0060	0.010	µg/L	1	09/18/05 01:42	30293
Chlordane	0.080	U	0.080	0.10	µg/L	1	09/18/05 01:42	30293
Endrin	0.0080	U	0.0080	0.010	µg/L	1	09/18/05 01:42	30293
Heptachlor	0.0080	U	0.0080	0.030	µg/L	1	09/18/05 01:42	30293
Heptachlor epoxide	0.0060	U	0.0060	0.010	µg/L	1	09/18/05 01:42	30293
Hexachlorobenzene	0.0080	U	0.0080	0.10	µg/L	1	09/18/05 01:42	30293
Hexachlorocyclopentadiene	0.018	U	0.018	0.10	µg/L	1	09/18/05 01:42	30293
Methoxychlor	0.0090	U	0.0090	0.050	µg/L	1	09/18/05 01:42	30293
Simazine	0.24	U	0.24	1.5	µg/L	1	09/18/05 01:42	30293
Toxaphene	0.10	U	0.10	0.18	µg/L	1	09/18/05 01:42	30293
PCB 1016	0.10	U	0.10	0.10	µg/L	1	09/18/05 01:42	30293
PCB 1221	0.10	U	0.10	0.10	µg/L	1	09/18/05 01:42	30293
PCB 1232	0.080	U	0.080	0.10	µg/L	1	09/18/05 01:42	30293
PCB 1242	0.090	U	0.090	0.10	µg/L	1	09/18/05 01:42	30293
PCB 1248	0.10	U	0.10	0.10	µg/L	1	09/18/05 01:42	30293
PCB 1254	0.060	U	0.060	0.10	µg/L	1	09/18/05 01:42	30293
PCB 1260	0.090	U	0.090	0.10	µg/L	1	09/18/05 01:42	30293
Total PCBs	0.10	U	0.10	0.10	µg/L	1	09/18/05 01:42	30293
Surr: 4,4'-Dichlorobiphenyl	102		0		%REC	1	09/18/05 01:42	30293
515.3: CHLORINATED HERBICIDES		**E515.3**	PrepDate: **9/13/2005 1:00:00 P**				Analyst: **EM**	
2,4-D	0.074	U	0.074	0.11	µg/L	1	09/16/05 00:46	30310

Data Qualifier Code Key:

- I Analyte detected below quantitation limits
- U Not Detected Above the MDL
- x Value exceeds Maximum Contaminant Level
- Q Holding times for preparation or analysis exceeded
- V Analyte detected in the associated Method Blank

ELAB, Inc. 8 East Tower Cr., Ormond Beach, FL 32174-87 **Date:** *12-Oct-05*

Analytical Report

CLIENT:	City of Naples Central Laboratory	**Client Sample ID:**	46431
Lab Order:	F05090225	**Collection Date:**	9/8/2005 11:15:00 AM
Project:	Golden Gate Canal 2005	**Sample Description:**	Golden Gate Canal
Lab ID:	F05090225-001	**Matrix:**	Surface Water

Analyses	Result	Qual	MDL	RL	Units	DF	Date Analyzed	Batch ID
ANIONS BY ION CHROMATOGRAPHY		**E300.0**	PrepDate:				Analyst: **SSM**	
Chloride	44		0.036	0.50	mg/L	1	09/08/05 17:32	R39826-A
Fluoride	0.14		0.0076	0.050	mg/L	1	09/08/05 17:32	R39826-A
Nitrogen, Nitrate	0.13		0.0091	0.050	mg/L	1	09/08/05 17:32	R39826-A
Nitrogen, Nitrite	0.0091	U	0.0091	0.050	mg/L	1	09/08/05 17:32	R39826-A
Nitrogen, Nitrate-Nitrite	0.13		0.018	0.050	mg/L	1	09/08/05 17:32	R39826-A
Sulfate	25		0.051	0.50	mg/L	1	09/08/05 17:32	R39826-A
COLOR (TRUE)		**SM2120 B**	PrepDate:				Analyst: **MS**	
Color	80	x	10	10	c.u.	2	09/08/05 17:19	R39788
CYANIDE, TOTAL		**E335.4**	PrepDate: **9/12/2005 10:00:00**				Analyst: **JHI**	
Cyanide	0.0027	U	0.0027	0.010	mg/L	1	09/12/05 15:08	30299
MBAS, CALCULATED AS LAS, MOL WT 340		**SM5540C**	PrepDate: **9/8/2005 3:38:27 PM**				Analyst: **PPP**	
MBAS	0.050	I	0.024	0.10	mg/L	1	09/08/05 17:37	30252
ODOR		**SM2150B**	PrepDate:				Analyst: **MS**	
Odor	4.0	x	1.0	1.0	t.o.n.	1	09/08/05 12:40	R39785
PH		**E150.1**	PrepDate:				Analyst: **MS**	
pH	7.16	Q	0.100	0.100	pH units	1	09/08/05 16:01	R39783
SOLIDS, TOTAL DISSOLVED		**SM2540 C**	PrepDate: **9/9/2005**				Analyst: **MMA**	
Solids, Total Dissolved	370		1.2	5.0	mg/L	1	09/09/05 12:23	30269
ICP METALS		**E200.7**	PrepDate:				Analyst: **JCO**	
Barium	0.017		0.00039	0.010	mg/L	1	09/12/05 18:06	R39863
Beryllium	0.00015	U	0.00015	0.0010	mg/L	1	09/12/05 18:06	R39863
Cadmium	0.00032	U	0.00032	0.0010	mg/L	1	09/12/05 18:06	R39863
Chromium	0.00091	I	0.00059	0.0050	mg/L	1	09/12/05 18:06	R39863
Iron	0.68	x	0.014	0.040	mg/L	1	09/12/05 18:06	R39863
Manganese	0.013		0.00087	0.0050	mg/L	1	09/12/05 18:06	R39863
Nickel	0.0012	U	0.0012	0.0050	mg/L	1	09/12/05 18:06	R39863
Silver	0.0011	U	0.0011	0.0050	mg/L	1	09/12/05 18:06	R39863
Sodium	24		0.22	1.0	mg/L	1	09/12/05 18:06	R39863
Zinc	0.0046	I	0.0044	0.020	mg/L	1	09/12/05 18:06	R39863
ICP/MS METALS		**E200.8**	PrepDate:				Analyst: **JCO**	
Aluminum	0.012		0.0059	0.010	mg/L	1	09/15/05 16:48	R39984-A
Antimony	0.00040	U	0.00040	0.0010	mg/L	1	09/15/05 16:48	R39984-A

Data Qualifier Code Key:

- I Analyte detected below quantitation limits
- U Not Detected Above the MDL
- x Value exceeds Maximum Contaminant Level
- Q Holding times for preparation or analysis exceeded
- V Analyte detected in the associated Method Blank

ELAB, Inc. 8 East Tower Cr., Ormond Beach, FL 32174-87 Date: *12-Oct-05*

Analytical Report

CLIENT: City of Naples Central Laboratory
Lab Order: F05090225
Project: Golden Gate Canal 2005
Lab ID: F05090225-001

Client Sample ID: 46431
Collection Date: 9/8/2005 11:15:00 AM
Sample Description: Golden Gate Canal
Matrix: Surface Water

Analyses	Result	Qual	MDL	RL	Units	DF	Date Analyzed	Batch ID
515.3: CHLORINATED HERBICIDES		E515.3	PrepDate: 9/13/2005 1:00:00 P				Analyst: EM	
Dalapon	1.0	U	1.0	1.1	µg/L	1	09/16/05 00:46	30310
Dinoseb	0.12	U	0.12	0.21	µg/L	1	09/16/05 00:46	30310
Pentachlorophenol	0.011	U	0.011	0.042	µg/L	1	09/16/05 00:46	30310
Picloram	0.075	U	0.075	0.11	µg/L	1	09/16/05 00:46	30310
2,4,5-TP (Silvex)	0.016	U	0.016	0.21	µg/L	1	09/16/05 00:46	30310
Surr: DCAA	104		0	70-130	%REC	1	09/16/05 00:46	30310
524.2: VOLATILE ORGANIC COMPOUNDS		E524.2	PrepDate: 9/16/2005				Analyst: KFE	
Benzene	0.12	U	0.12	0.50	µg/L	1	09/16/05 22:44	30443
Carbon tetrachloride	0.12	U	0.12	0.50	µg/L	1	09/16/05 22:44	30443
o-Dichlorobenzene	0.070	U	0.070	0.50	µg/L	1	09/16/05 22:44	30443
p-Dichlorobenzene	0.070	U	0.070	0.50	µg/L	1	09/16/05 22:44	30443
1,2-Dichloroethane	0.13	U	0.13	0.50	µg/L	1	09/16/05 22:44	30443
1,1-Dichloroethene	0.22	U	0.22	0.50	µg/L	1	09/16/05 22:44	30443
cis-1,2-Dichloroethene	0.11	U	0.11	0.50	µg/L	1	09/16/05 22:44	30443
trans-1,2-Dichloroethene	0.13	U	0.13	0.50	µg/L	1	09/16/05 22:44	30443
Dichloromethane	0.27	U	0.27	0.50	µg/L	1	09/21/05 02:37	30507
1,2-Dichloropropane	0.090	U	0.090	0.50	µg/L	1	09/16/05 22:44	30443
Ethylbenzene	0.30	U	0.30	0.50	µg/L	1	09/16/05 22:44	30443
Monochlorobenzene	0.080	U	0.080	0.50	µg/L	1	09/16/05 22:44	30443
Styrene	0.080	U	0.080	0.50	µg/L	1	09/16/05 22:44	30443
Tetrachloroethene	0.090	U	0.090	0.50	µg/L	1	09/16/05 22:44	30443
Toluene	0.060	U	0.060	0.50	µg/L	1	09/16/05 22:44	30443
1,2,4-Trichlorobenzene	0.10	U	0.10	0.50	µg/L	1	09/16/05 22:44	30443
1,1,1-Trichloroethane	0.080	U	0.080	0.50	µg/L	1	09/16/05 22:44	30443
1,1,2-Trichloroethane	0.080	U	0.080	0.50	µg/L	1	09/16/05 22:44	30443
Trichloroethene	0.14	U	0.14	0.50	µg/L	1	09/16/05 22:44	30443
Vinyl chloride	0.17	U	0.17	0.50	µg/L	1	09/16/05 22:44	30443
Xylenes, Total	0.13	U	0.13	0.50	µg/L	1	09/16/05 22:44	30443
Surr: 4-Bromofluorobenzene	92.8		0	70-130	%REC	1	09/21/05 02:37	30507
Surr: 4-Bromofluorobenzene	93.4		0	70-130	%REC	1	09/16/05 22:44	30443
Surr: Dibromofluoromethane	104		0	70-130	%REC	1	09/16/05 22:44	30443
Surr: Dibromofluoromethane	99.8		0	70-130	%REC	1	09/21/05 02:37	30507
Surr: 1,2-Dichloroethane-d4	104		0	70-130	%REC	1	09/16/05 22:44	30443
Surr: 1,2-Dichloroethane-d4	99.0		0	70-130	%REC	1	09/21/05 02:37	30507
Surr: Toluene-d8	99.1		0	70-130	%REC	1	09/21/05 02:37	30507

Data Qualifier Code Key:
- J Analyte detected below quantitation limits
- U Not Detected Above the MDL
- X Value exceeds Maximum Contaminant Level
- Q Holding times for preparation or analysis exceeded
- V Analyte detected in the associated Method Blank

ELAB, Inc. 8 East Tower Cr., Ormond Beach, FL 32174-87 Date: *12-Oct-05*

Analytical Report

CLIENT: City of Naples Central Laboratory
Lab Order: F05090225
Project: Golden Gate Canal 2005
Lab ID: F05090225-001

Client Sample ID: 46431
Collection Date: 9/8/2005 11:15:00 AM
Sample Description: Golden Gate Canal
Matrix: Surface Water

Analyses	Result	Qual	MDL	RL	Units	DF	Date Analyzed	Batch ID
524.2: VOLATILE ORGANIC COMPOUNDS		**E524.2**	PrepDate: **9/16/2005**				Analyst: **KFE**	
Surr: Toluene-d8	99.1		0	70-130	%REC	1	09/16/05 22:44	30443
525.2: BASE NEUTRAL EXTRACTABLES		**E525.2**	PrepDate: **9/12/2005 8:00:00 A**				Analyst: **AE**	
Benzo(a)pyrene	0.078	U	0.078	0.10	µg/L	1	09/16/05 16:16	30313
Di(2-ethylhexyl)adipate	0.23	U	0.23	1.6	µg/L	1	09/16/05 16:16	30313
Di(2-ethylhexyl)phthalate	0.50	U	0.50	2.0	µg/L	1	09/16/05 16:16	30313
Surr: 1,3-Dimethyl-2-nitrobenzene	93.2		0		%REC	1	09/16/05 16:16	30313
Surr: Perylene-d12	92.0		0		%REC	1	09/16/05 16:16	30313
Surr: Triphenylphosphate	107		0		%REC	1	09/16/05 16:16	30313
531.1: CARBAMATES		**E531.1**	PrepDate: **9/9/2005 2:30:00 PM**				Analyst: **LMA**	
Carbofuran	0.69	U	0.69	2.0	µg/L	1	09/10/05 03:08	R39953
Oxamyl	0.72	U	0.72	2.0	µg/L	1	09/10/05 03:08	R39953
Surr: Propoxur	104		0		%REC	1	09/10/05 03:08	R39953
547: GLYPHOSATE		**E547**	PrepDate: **9/12/2005 3:00:00 P**				Analyst: **LB**	
Glyphosate	4.1	U	4.1	6.0	µg/L	1	09/12/05 23:25	R39891
548: ENDOTHALL		**E548.1**	PrepDate: **9/9/2005 8:15:00 AM**				Analyst: **AE**	
Endothall	4.4	U	4.4	9.0	µg/L	1	09/13/05 18:06	30235
549: DIQUAT/PARAQUAT BY HPLC		**E549.2**	PrepDate: **9/8/2005 10:20:00 A**				Analyst: **LMA**	
Diquat	0.35	U	0.35	0.40	µg/L	1	09/16/05 23:45	30236
2,3,7,8-TCDD BY EPA 1613		**E1613**	PrepDate: **9/15/2005**				Analyst: **SUB**	
2,3,7,8-TCDD	0.0044	U	0.0044	0.0050	ng/L	1	09/20/05 18:43	R40477
ASBESTOS		**E100.2**	PrepDate: **9/9/2005 4:30:00 PM**				Analyst: **SUB**	
Asbestos	0.37	U	0.37	0.37	MFL	1	09/22/05	R40224
GROSS ALPHA		**E900.0**	PrepDate: **9/13/2005 7:01:00 A**				Analyst: **SUB**	
Alpha, Gross	18.7 +/- 1.6		1.2	1.2	pCi/L	1	09/14/05 11:06	R40088
RADIUM 226		**E903.1**	PrepDate: **9/12/2005 9:36:00 A**				Analyst: **SUB**	
Radium-226	1.7 +/- 0.4		0.20	0.20	pCi/L	1	09/19/05 09:54	R40088
RADIUM 228		**RA05**	PrepDate: **9/12/2005 9:36:00 A**				Analyst: **SUB**	
Radium-228	0.8U +/- 0.5	U	0.80	0.80	pCi/L	1	09/16/05 12:17	R40088

Data Qualifier Code Key:

- I Analyte detected below quantitation limits
- U Not Detected Above the MDL
- x Value exceeds Maximum Contaminant Level
- Q Holding times for preparation or analysis exceeded
- V Analyte detected in the associated Method Blank

APPENDIX G

Florida Department of Environmental Protection

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

BY ELECTRONIC MAIL:

March 3, 2008

In the Matter of an
Application for Permit by:

Mr. Eugene Calvert, Director
Collier County Road Maintenance & Stormwater
2885 S Horseshoe Dr.

Naples, Florida 34104
Email: eugenecalvert@colliergov.net

Collier County - UIC
File Number: 262487-001-UC/5X
Class V Group 7 Aquifer Storage and Recovery Injection Well
Post-Wetland Treated Stormwater Storage and Recovery

NOTICE OF INTENT TO ISSUE PERMIT

The Department of Environmental Protection hereby gives notice that a Notice of Intent to Issue a Permit has been developed for the proposed project as detailed in the application specified above, for the reasons stated below.

The applicant, Mr. Eugene Calvert, Director, Collier County Road Maintenance & Stormwater, applied on March 3, 2006 to the Department of Environmental Protection for a construction permit to construct one, (1), Class V, Group 7, Aquifer Storage and Recovery, (ASR), injection and monitor well system.

The Department has permitting jurisdiction under chapter 403 of the Florida Statutes, and Chapters 62-4, 62-520, 62-522, 62-528, and 62-550 of the Florida Administrative Code. The project is not exempt from permitting procedures. The Department has determined that a construction permit is required for the proposed work. A separate permit shall be issued for each ASR system.

The Department intends to issue the permit based on its belief that reasonable assurances have been provided to indicate that the proposed project will not adversely impact water quality and the proposed project will comply with the appropriate provisions of Florida Administrative Code Rules 62-4, 62-520, 62-522, 62-528, and 62-550.

Pursuant to section 403.815 of the Florida Statutes, and Rule 62-110.106(7) of the Florida Administrative Code, you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The Notice must be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031 of the Florida Statutes, in the county where the activity is to take place.

The applicant shall provide proof of publication to the South District Office of the Department within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Sections 120.569 and 120.57 F.S., or all parties reach a written agreement

on mediation as an alternative remedy under section 120.573 before the deadline for filing a petition. Mediation is not available for this proceeding.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S. or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-5.207, F.A.C.

The Petition shall contain the following information:

a. The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

b. A statement of how and when each petitioner received notice of the Department's action or proposed action;

c. A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

d. A statement of the material facts disputed by Petitioner, if any;

e. A statement of facts which petitioner contends warrants reversal or modification of the Department's action or proposed action;

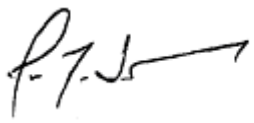
f. A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

g. A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Executed in Lee County, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION



Jon M. Iglehart
Director of District Management

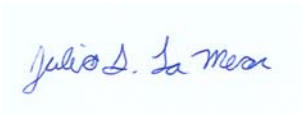
CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this **NOTICE OF INTENT TO ISSUE PERMIT** and all copies were mailed before the close of business on March 3, 2008 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section 120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.



3/4/08

Clerk Date

JMI/DR/mc

Enclosures

cc Tom J. Helgeson, P.E. (tom.helgeson@ch2m.com)
Nancy Marsh, EPA (marsh.nancy@epa.gov)
Craig Boomgaard, SWFWMD (cboomgaa@sfwmd.gov)
Joe Haberfeld, FDEP (joe.haberfeld@dep.state.fl.us)
John Powers, P.G., (John.Powers@CH2M.com)
Margaret Bishop, (margaretbishop@colliergov.net)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOTICE OF INTENT TO ISSUE PERMIT

The Department of Environmental Protection gives notice that a Draft Permit has been prepared for Mr. Eugene Calvert, Director, Collier County Road Maintenance & Stormwater, 2885 S Horseshoe Dr., Naples, Florida 34104, to construct one, (1), Class V, Group ,7 Aquifer Storage and Recovery (ASR) injection and monitor well system for the storage and recovery of wetland pre-treated and disinfected, stormwater run-off in the Mid or Lower Hawthorn aquifer system. The project is located at Gordon River Water Quality Park, Naples, Florida 34104, in the County of Collier, Florida (File No. 262487-001-UC/5X). This permit shall be for one ASR system.

The purpose of the project is to store wetland pre-treated and disinfected stormwater run-off in the Mid to Lower Hawthorn aquifer system during wet weather periods to be recovered during dry weather periods in order to meet the seasonal treatment wetland hydroperiod demands.

The Department intends to issue the permit based on its belief that reasonable assurances have been provided to indicate that the proposed project will not adversely impact water quality and the proposed project will comply with the appropriate provisions of Florida Administrative Code Rules 62-4, 62-520, 62-522, 62-528, and 62-550.

The Department has permitting jurisdiction under chapter 403 of the Florida Statutes, and Chapters 62-4, 62-520, 62-522, 62-528, and 62-550, of the Florida Administrative Code. The project is not exempt from permitting procedures. The Department has determined that a construction permit is required for the proposed work. A separate permit shall be issued for each ASR system.

Pursuant to section 403.815 of the Florida Statutes, and Rule 62-110.106(7) of the Florida Administrative Code, you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The Notice must be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031 of the Florida Statutes, in the county where the activity is to take place.

The applicant shall provide proof of publication to the South District Office of the Department within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Sections 120.569 and 120.57 F.S., or all parties reach a written agreement on mediation as an alternative remedy under section 120.573 before the deadline for filing a petition. Mediation is not available for this proceeding.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S. or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-5.207, F.A.C.

The Petition shall contain the following information:

a. The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

b. A statement of how and when each petitioner received notice of the Department's action or proposed action;

c. A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

d. A statement of the material facts disputed by Petitioner, if any;

e. A statement of facts which petitioner contends warrants reversal or modification of the Department's action or proposed action;

f. A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

g. A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

Florida Department of Environmental Protection

BY ELECTRONIC MAIL:

P E R M I T

PERMITTEE:
Mr. Eugene Calvert, Director
Collier County Road Maintenance & Stormwater
2885 S Horseshoe Dr.
Naples, Florida 34104
Email: eugenecalvert@colliergov.net

Collier County UIC
Permit/Cert. No: 262487-001-UC/5X
Date of Issue: **INTENT**
Expiration Date: **INTENT**
Latitude: 26.0º 52.0' 28.60" N
Longitude: ─ 82.0º 18.0' 33.50" W
Class V Group 7 Aquifer Storage and Recovery Injection Well
Post-Wetland Treated Stormwater Storage and Recovery

This permit is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.) and rules 62-4, 62-520, 62-528, and 62-550 of the Florida Administrative Code. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents, attached hereto or on file with the Department and made a part hereof and specifically described as follows:

Construct one, (1), Class V, Group 7, Mid or Lower Hawthorn Aquifer Storage and Recovery (ASR) injection well with two (2) storage zone (Mid or Lower Hawthorn Aquifer System) monitoring wells and one,(1), shallow zone monitor well, (Lower Tamiami/Sandstone Aquifer or Mid Hawthorn Aquifer), utilizing either Option “A” or “B” as outlined within the application documents on Exhibit 3, “Generalized Construction Details”, of the May 3, 2006 submittal. The proposed well construction consists of either an Option “A” Mid Hawthorn Aquifer System sixteen-inch, (16”), nominal inside diameter, (ID),cemented PVC casing with an open injection interval of 270 feet bls to approximately 400 feet bls, or an Option “B” Lower Hawthorn Aquifer System sixteen-inch,(16”), nominal ID, cemented PVC casing, injection and recovery well with an open injection interval of 600 feet bls to approximately 700 feet bls, and three monitor wells. The monitoring system will consist of six-inch, (6”), ID, PVC, monitor wells constructed to monitor either the Option “A” Mid Hawthorn Aquifer System at open hole intervals of approximately 130 to 160 feet below land surface, (BLS), and from 270 feet bls to approximately 400 feet bls. Option “B” Lower Hawthorn Aquifer System monitor wells are generally designed to monitor the open hole intervals of 350 feet bls to 400 feet bls and from 600 feet bls to 700 feet bls.

The purpose is to store, in either the Mid or Lower Hawthorn aquifer systems, wetland pre-treated and disinfected stormwater runoff from the Gordon River Water Quality Park Wetland Treatment System to meet the seasonal wetland hydro-period demands of the wetland treatment system. The ASR well is designed to inject at a maximum of 1 MGD (million gallons per day). This project is depicted on the Class V Group 7 Aquifer Storage and Recovery Injection Well application and associated documents submitted in support of the application. The location for this project is the Gordon River Water Quality Park, Naples, Florida 34104.

Subject to Specific Conditions 1-17.

SPECIFIC CONDITIONS:

1. General Criteria:

a. The terms, conditions, requirements, limitations and restrictions set forth in this permit are "permit conditions" and are binding and enforceable pursuant to section 403.141, F.S.

b. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action.

c. As provided in subsection 403.087(7), F.S., the issuance of this permit does not convey any vested rights or exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in this permit.

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

e. This permit does not relieve the permittee from liability for harm to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefrom; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

f. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, or are required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

g. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:

   (1) Have access to and copy any records that must be kept under conditions of this permit;

   (2) Inspect the facility, equipment, practices, or operations regulated or required under this permit; and

   (3) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

   (4) Reasonable time will depend on the nature of the concern being investigated.

SPECIFIC CONDITIONS:

h. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee should immediately provide the Department with the following information:

(1) A description of and cause of noncompliance; and

(2) The period of noncompliance, including dates and times; or, if not corrected the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent the recurrence of the noncompliance. The permittee shall be responsible for any and all damages that may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

i. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is proscribed by sections 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

j. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

k. This permit is transferable only upon Department approval in accordance with rules 62-4.120 and 62-528.350, F.A.C. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

l. This permit or a copy thereof shall be kept at the work site of the permitted activity.

m. The permittee shall comply with the following;

(1) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records shall be extended automatically unless the Department determines that the records are no longer required.

(2) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

(3) Records of monitoring information shall include:

(a) the date, exact place, and time of sampling or measurements;

(b) the person responsible for performing the sampling or measurements;

SPECIFIC CONDITIONS:

(c) the dates analyses were performed;

(d) the person responsible for performing the analyses;

(e) the analytical techniques or methods used;

(f) the results of such analyses.

(4) The permittee shall furnish to the Department, within the time requested in writing, any information which the Department requests to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit.

(5) If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

n. All applications, reports, or information required by the Department shall be certified as being true, accurate, and complete

o. Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each scheduled date

p. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application

q. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit

r. The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

s. This permit may be modified, revoked and reissued, or terminated for cause, as provided in 40 C.F.R. sections 144.39(a), 144.40(a), and 144.41 (1998). The filing of a request by the permittee for a permit modification, revocation or reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition

t. The permittee shall retain all records of all monitoring information concerning the nature and composition of injected fluid until five years after completion of any plugging and abandonment procedures specified under rule 62-528.435, F.A.C. The permittee shall deliver the records to the Department office that issued the permit at the conclusion of the retention period unless the permittee elects to continue retention of the records.

u. The permittee shall notify the Department as soon as possible of any planned physical alterations or additions to the permitted facility. In addition, prior approval is required for activities described in rule 62-528.410(1)(h).

SPECIFIC CONDITIONS:

v. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or injection activity that may result in noncompliance with permit requirements.

w. The permittee shall report any noncompliance which may endanger health or the environment including:

(1) Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or

(2) Any noncompliance with a permit condition or malfunction of the injection system that may cause fluid migration into or between underground sources of drinking water.

(3) Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

x. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures.

y. No underground injection is allowed that causes or allows movement of fluid into an underground source of drinking water if such fluid movement may cause a violation of any primary drinking water standard or may otherwise adversely affect the health of persons.

2. Signatories and Certification Requirements.

a. All reports and other submittals required to comply with this permit shall be signed by a person authorized under Rules 62-528.340(1) or (2), F.A.C.

In accordance with Rule 62-528.340(4), F.A.C., all reports shall contain the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

3. Drawings, plans, documents or specifications submitted by the Permittee, not attached hereto, but retained on file at the South Florida District Office, are made a part hereof. Any changes, except as provided elsewhere in this permit, must be approved by the Department before implementation.

SPECIFIC CONDITIONS:

4. The injection and monitor wells at the site shall be abandoned when posing a potential threat to the quality of the waters of the State. In the event a well must be plugged or abandoned, the permittee shall obtain a permit from the Department as required by Chapter 62-528, F.A.C. The permittee shall notify the Department and obtain approval prior to any well work or modification.

5. The permittee shall notify the Department in the event that any of the conditions of the permit cannot be met, including an emergency discharge, due to breakdown of equipment, power outages or damages by hazard of fires, wind or other causes in accordance with the following:

a. Notification shall be made in person, email, or by telephone within 24 hours of the event.

b. A written report shall be submitted within 5 days which describes the nature and cause of the breakdown or malfunction, the steps being taken to correct the problem and prevent its recurrence, emergency procedures in use pending correction of the problem and the time when the facility will again be operating in compliance with permit conditions.

6. Prior to the commencement of any work, the name of the Florida-registered driller(s) supervising the drilling operations and the driller's registration number shall be submitted to the Department. The permittee or the engineer of record shall provide the Department with copies of all required federal, state or local permits prior to spudding the wells.

7. The permittee shall retain the engineer of record or obtain the services of any professional engineer registered in the State of Florida for the inspection of the construction of this project. Upon completion the engineer shall inspect for conformity to construction permit applications and associated documents. The Department shall be notified immediately of any change of engineer.

8. The specifications for a temporary containment structure around the borehole during the drilling of the ASR well and storage zone monitor wells shall be submitted to and approved by the Department prior to those wells being constructed.

9. Pumping fluids other than the pre-treated and disinfected stormwater runoff from the Gordon River Water Quality Park Wetland Treatment System into the injection well will constitute a violation of this permit and shall constitute cause for revocation.

10. Operational Testing

a. Prior to operational testing:

(1) The permittee shall submit the following information to each member of the TAC:

(a) A draft well completion report with certification of well construction completion by the Professional Engineer of Record;

(b) Geophysical logs;

(c) Water Quality data;

(d) Mechanical integrity test data;

SPECIFIC CONDITIONS:

(e) Confining zone data;

(f) Natural background ground water quality samples shall be obtained from the ASR test well and each monitor well for primary and secondary standards (Chapter 62-550.310 and .320, F.A.C.), excluding dioxin, asbestos, acrylamide and epichlorohydrin. The analysis shall also include dissolved oxygen, total uranium, total iron, total and fecal coliform, E. coli, enterococci, Giardia and Cryptosporidium. "Natural background" means the condition of waters in the absence of man-induced alterations based on the best scientific information available to the Department (Rule 62-520.200(12), F.A.C.). The samples shall be taken after final completion and clearance of drilling fluids from each well, and prior to the initiation of any injection tests. .

(g) Source Water Fluid Analysis

a. Wetland Pre-treated Stormwater

(1) Prior to injection, the Wetland Pre-treated Stormwater analyses shall include:

(A) Primary and Secondary drinking water standards established in Chapter 62-550, Part III, F.A.C., (excluding asbestos, acrylamide, epichlorohydrin, and dioxin);

(B) Giardia lamblia and cryptosporidium, fecal coliform, E. coli, and enterococci; ammonia, total Kjeldahl nitrogen (TKN), total nitrogen, total phosphorus, orthophosphate, dissolved oxygen, and total uranium.

(2) Six evenly spaced samples shall be collected during the wet season portion of a one year period shall be taken from the combined wetland pre-treatment source waters at the pump station. The sample results shall be completed and submitted to the Department prior to operational (cycle) testing.

(3) One sample from the combined wetland pre-treated source waters shall be taken annually for all parameters listed in specific condition 10.a.(1) (g) a.(1) above. The permittee shall submit the results of source water analysis to the Department no later than the last day of the month immediately following the month of record. The results shall be submitted to .the Department of Environmental Protection, P.O. Box 2549, Fort Myers, FL 33902-2549. A copy of the reports shall also be sent to the Department of Environmental Protection, Underground Injection Control Program, Mail Station 3530, 2600 Blair Stone Road, Tallahassee, FL 32399-2400.

The source water analysis may be submitted in digital (*i.e.*,electronic) format—*via* direct Internet electronic mail (e-mail); CD ROM, or utilizing a 3.5" diskette. The file format to be utilized should be in Excel™ format or comma delimited text (a.k.a. "CSV"). Data files shall be electronically mailed via the internet simultaneously to both of the following addresses: david.rhodes@dep.state.fl.us and joe.haberfeld@dep.state.fl.us. The signatory pages, the laboratory data sheets and diskettes shall still be mailed to the Department pursuant to the previous paragraph.

(h) As-built well construction specifications

SPECIFIC CONDITIONS:

(i) Other data obtained during well construction

(j) Option "A" - The permittee shall provide an updated well inventory and physically verify all wells deeper than 100 feet below land surface that are within a 0.50-mile radius of the ASR test well. Operational status, existing use, depth of final casing, and total depth of the well shall be determined and submitted with the above-mentioned information.

(k) Option "B" - The permittee shall provide an updated well inventory and physically verify all wells deeper than 300 feet below land surface that are within a 0.50-mile radius of the ASR test well. Operational status, existing use, depth of final casing, and total depth of the well shall be determined and submitted with the above-mentioned information.

(l) An updated cycle testing plan shall be submitted to and approved by the Department prior to authorizing operational testing. A preliminary plan was presented in the May 3, 2006 letter from CH2M Hill to the Department.

b. Written authorization shall be obtained from the Department prior to cycle testing or operational testing.

c. Operational Testing Conditions – ASR Well

Specifications for proposed Class V Injection Well

Well Number	Casing Diameter (ID) and Type	Cased and Total Depths (bls)	Open Hole (bls)
ASR – 1(Option"A")	16" ID Sch 40 PVC	270'/400'	270'-400'

Well Number	Casing Diameter (ID)	Cased and Total Depths (bls)	Open Hole (bls)
ASR – 1(Option"B")	16" ID Sch 40 PVC	600'/700'	600'-700'

The injection well system shall be monitored in accordance with rule 62-528.615, F.A.C. The following injection well performance data shall be recorded and reported from the injection well instrumentation in the Monthly Operating Report as indicated below during each recharge and recovery cycle. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

Reporting	
Parameter	**Frequency**
Maximum Injection Pressure (psi)	Daily/Monthly
Minimum Injection Pressure (psi)	Daily/Monthly
Average Injection Pressure (psi)	Monthly
Maximum Flow Rate	Daily/Monthly
Minimum Flow Rate	Daily/Monthly
Average Flow Rate	Monthly
Total Volume Recharged (Gals)	Daily/Monthly
Total Volume Recovered (Gals)	Daily/Monthly
Net Storage (MG)	Monthly

SPECIFIC CONDITIONS:

Water Quality Parameters	***Sampling Frequency***
Gross Alpha (pCi/L)	*(see below)
Cryptosporidium and Giardia lamblia	Monthly (Injectate only)
E. coli and Enterococci	Monthly (Injectate only)
Total Trihalomethanes (mg/L)	Weekly
Dissolved Oxygen (mg/L)	Weekly
Total Iron (mg/L)	Weekly
Arsenic (µg/L)	Weekly**
Total Dissolved Solids (mg/L)	Weekly
Specific Conductivity (µmhos/cm)	Weekly
Total Alkalinity (mg/L)	Weekly
pH (SU)	Weekly
Chloride (mg/L)	Weekly
Sulfate (mg/L)	Weekly
Field Temperature (°C)	Weekly
Color (color units)	Weekly
Odor (TON)	Weekly
Fecal Coliform (# per 100 ml)	Weekly
Total Coliform (# per 100 ml)	Weekly
Oxidation-Reduction Potential	Weekly
Primary and Secondary Drinking Water Standards (Injectate, (Recharge), Water Only)	Annually***

*Beginning of recharge cycle and the beginning and end of each recovery cycle.
**Twice weekly during recovery; once weekly during injection.
***Plus giardia lamblia, cryptosporidium parvum, dissolved oxygen, total iron, total uranium, ammonia, total Kjeldahl nitrogen (TKN), total nitrogen, total phosphorus, orthophosphate fecal coliform, E. coli, and enteroccoci (asbestos, acrylamide, epichlorohydrin, and dioxin are excluded).

d. Operational Testing Conditions - Monitor Well System Monitor Wells

Option "A"

Well Number	Casing Diameter (ID)	Depth (bls) Cased/Total	Group or Formation	Monitoring Interval (bls)
SZMW-1	6" Sch PVC	270'/400'	Mid Hawthorn Aquifer	270'-400'
SZMW-2	6" Sch PVC	270'/400'	Mid Hawthorn Aquifer	270'-400'
SMW-1	6" Sch PVC	130'/160'	Tamiami/Sandstone Aquifer	130'-160'

Option"B"

Well Number	Casing Diameter (ID)	Depth (bls) Cased/Total	Group or Formation	Monitoring Interval (bls)
SZMW-1	6" Sch PVC	600'/700'	Lower Hawthorn Aquifer	600'-700'
SZMW-2	6" Sch PVC	600'/700'	Lower Hawthorn Aquifer	600'-700'
SMW-1	6" Sch PVC	350'/400'	Mid Hawthorn Aquifer	350'-400'

SPECIFIC CONDITIONS:

All monitor wells shall be monitored in accordance with rule 62-528.615, F.A.C. The following monitor well performance data shall be recorded and reported from the monitor well instrumentation in the Monthly Operating Report as indicated below during all recharge, storage and recovery cycles of the injection/production wells. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

During extended storage periods (greater than 30 days), the monitor well water quality parameters listed below may be sampled and analyzed monthly.

Reporting	
Parameter	**Frequency**
Maximum Water Level or Pressure (feet NAVD or psi)	Daily/Monthly
Minimum Water Level or Pressure (feet NAVD or psi)	Daily/Monthly
Average Water Level or Pressure (feet NAVD or psi)	Monthly
Water Quality Parameters	***Sampling Frequency***
Gross Alpha (pCi/L)	(SZMW only)*
Total Trihalomethanes (mg/L)	Weekly
Dissolved Oxygen (mg/L)	Weekly
Total Iron (mg/L)	Weekly
Arsenic (µg/L)	Weekly**
Total Dissolved Solids (mg/L)	Weekly
Specific Conductivity (µmhos/cm)	Weekly
Total Alkalinity (mg/L)	Weekly
pH (SU)	Weekly
Chloride (mg/L)	Weekly
Sulfate (mg/L)	Weekly
Field Temperature (°C)	Weekly
Color (color units)	Weekly
Odor (TON)	Weekly
Fecal Coliform (# per 100 ml)	Weekly
Total Coliform (# per 100 ml)	Weekly
Oxidation-Reduction Potential	Weekly

*Beginning and end of each recovery cycle. ** Twice weekly during recovery for SZMW-1 and SMW-1

e. A qualified representative of the Engineer of Record must be present for the start-up operations and the Department must be notified in writing of the date operational testing began for the subject wells.

f. Before authorizing operational testing the Department shall conduct an inspection of the facility to determine if the conditions of the permit have been met.

g. The permittee shall calibrate all pressure gauge(s), flow meter(s), chart recorder(s), and other related equipment associated with the injection well system on a semi-annual basis. The permittee shall maintain all monitoring equipment and shall ensure that the monitoring equipment is calibrated and in proper operating condition at all times. Laboratory equipment, methods, and quality control will follow EPA guidelines as expressed in Standard Methods for the Examination of Water and Wastewater. The pressuregauge(s), flow meter(s), and chart recorder(s) shall be calibrated using standard engineering methods.

SPECIFIC CONDITIONS:

h. The permittee shall submit monthly to the Department the results of all injection well and monitor well data required by this permit no later than the last day of the month immediately following the month of record. The results shall be sent to the Department of Environmental Protection, P.O. Box 2549, Fort Myers, Florida 33902-A copy of this report shall also be sent to the Department of Environmental Protection, Underground Injection Control Program, MS 3530, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.

i. If injection is to continue beyond the expiration date of this permit, the permittee shall apply for and obtain an operation permit. If necessary to complete the operational testing period, the permittee shall apply for renewal of the construction permit at least 60 days prior to the expiration date of this permit.

11. Prior to commencement of operational testing of the ASR well, the permittee shall obtain from the Department a Water Quality Exemption for any and all necessary parameters pursuant to Rule 62-520.500, F.A.C.

12. This project will be monitored by the Department with the assistance of the U.S. Environmental Protection Agency (USEPA), Region 4, and the Technical Advisory Committee (TAC) that consists of representatives of the following agencies whose addresses are included below:

a. Department of Environmental Protection - Fort Myers
b. Department of Environmental Protection – Tallahassee
c. South Florida Water Management District – West Palm Beach

Florida Department of Environmental Protection	Florida Department of Environmental Protection	South Florida Water Management District
South District Office	Bureau of Water Facilities Regulation	P.O. Box 24860
P.O. Box 2549	UIC Program, Mail Station 3530	West Palm Beach, FL 33416-4860
2295 Victoria Avenue, Ste 364	2600 Blair Stone Rd.	
Fort Myers, FL 33902-2549	Tallahassee, FL 32399-2400	

13. The permittee shall provide copies of all construction-related correspondence relative to this permit to each member of the TAC listed in specific condition 12.a. through d. above. Such correspondence includes but is not limited to reports, schedules, analyses and geophysical logs required by the Department under the terms of this permit. The permittee is not required to provide specific correspondence to any TAC member who submits to the permittee a written request to be omitted as a recipient of specific correspondence.

14. During the construction period allowed by this permit, daily progress reports shall be submitted to the Department and the Technical Advisory Committee (not the USEPA) each week. The reporting period shall run for seven (7) days and reports shall be mailed or electronically mailed within 48 hours of the last day of the reporting period. The report shall include, but is not limited to the following:

a. Description of daily footage drilled by diameter of bit or size of hole opener or reamer being used;

b. Description of work during installation and cementing of casing, including amounts of casing and cement used;

c. Description of formation and depth encountered;

d. Lithological description of drill cuttings collected every ten feet or at every formation change;

SPECIFIC CONDITIONS:

e. Description of work and type of testing accomplished including geophysical logging and pumping tests;

f. Description of any construction problems that develop and their status;

g. Copies of the driller's logs; and

h. Accurate records of the amount and type of any material used during construction to kill the flow of the wells.

15. No drilling operations shall begin without an approved disposal site for drill cuttings, fluids or waste. It shall be the Drilling Contractor's responsibility to obtain any necessary Department and local agency approval for disposal prior to the start of construction.

16. After completion of construction and testing, a final report shall be submitted to the Department and the TAC., with only the cover letter sent to USEPA. The Department and TAC addresses are as follows:

Underground Injection Control Program
Bureau of Water Facilities Regulation
Department of Environmental Protection
2600 Blair Stone Road, Mail Station #3530
Tallahassee, FL 32399-2400

Underground Injection Control Program
Department of Environmental Protection
South District Office
2295 Victoria Avenue, Ste 364
Ft Myers, FL 33902-2549

The report shall include, but not be limited to, all information and data collected under Sections 62-528.605, 62-528.610, 62-528.615 and 62-528.620, F.A.C., with appropriate interpretations. Mill certificates for the casing(s) shall be included in this report. The report shall be certified by a P.E. and P.G.

17. The permittee is reminded of the necessity to comply with the pertinent regulations of any other regulatory agency, as well as any county, municipal, and federal regulations applicable to the project. These regulations may include, but are not limited to, those of the Federal Emergency Management Agency in implementing flood control measures. This permit should not be construed to imply compliance with the rules and regulations of other regulatory agencies.

Note: In the event of an emergency the permittee shall contact the Department by calling Ph. (800) 320-0519. During normal business hours, the permittee shall call (239) 332-6975.

Issued this ___4_____ day of March 2008.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

I N T E N T

_____
Jon M. Iglehart
Director of District Management

JMI/DR /mc

APPENDIX H

SDWA Amendments

The enacted changes to the SDWA resulting from the June 1986 Amendments passed by Congress had a direct impact on the regulation, operation and expansion of the water transmission, distribution and treatment facilities that provide potable water to the City and associated areas. The regulatory requirements take the form of new additional regulated contaminants, more stringent permissible maximum contaminant levels, increased monitoring requirements and stricter enforcement penalties. This subsection will provide a brief summary of some of the directives contained in the SDWA Amendments of 1986 that will provide an understanding of the mandates established by Congress to guide the present and near future drinking water regulation program. The 1986 Amendments are discussed in detail in the March 1996 Master Plan performed by HAI. The significant directives of the SDWA Amendments of 1986 and the corresponding section numbers are summarized below:

- Section 1412(a)(1) directs that all previously promulgated National Interim Primary Drinking Water Regulations (NIPDWR) and revised primary drinking water regulations be deemed as National Primary Drinking Water Regulations (NPDWR).

- Section 1412(a)(2) requires that all recommended maximum contaminant levels (RMCL) previously published be treated as maximum contaminant level goals (MCLG).

- Section 1412(a)(3) requires that MCLG's be published simultaneously for any new NIPDWR which proposes a maximum contaminant level (MCL).

- Section 1412(b)(1) establishes a source list of 83 contaminants to be regulated and a time frame for these regulations to be enacted. These are summarized below:

    a. 9 contaminants within 12 months of enactment.
    b. 40 contaminants within 24 months of enactment.
    c. Remaining contaminants within 36 months of enactment.

- Section 1412(b)(2) allows the USEPA to substitute up to seven (7) contaminants onto the original list of 83, if they are more likely to be protective of public health.

- Section 1412(b)(3) directs USEPA to publish MCLG's and MCL's for each contaminant which may have an adverse effect upon the health of persons and is known or anticipated to occur in public drinking water systems. This list of additional contaminants was published on January 1, 1988 and republished in subsequent 3 year intervals. MCLG's and MCL's are to be published for 25 of these contaminants within 24 months of listing and for the remainder within 36 months.

- Section 1412(b)(4) provides for the setting of MCL's as close as is feasible to MCLG's which are to be set at a level at which no known or anticipated adverse health effects occur with an adequate margin of safety.

- Section 1412(b)(5) defines the term "feasible" based on the use of best available technology (BAT) and defines BAT for synthetic organic chemical (SOC) as the use of granular activated carbon.

- Section 1412(b)(6) requires that BAT be listed for each MCL established.

SDWA Amendments Implementation

The USEPA Office of Drinking Water is responsible for implementation of the regulations mandated by the 1986 SDWA Amendments. The Amendments followed the publication in 1982 and 1983 by USEPA of a list of 83 contaminants the USEPA believed should be controlled by setting MCL's. The 1986 Amendments directed the USEPA to establish MCL's for all 83 contaminants within 3 years and subsequently add an additional 25 contaminants every 3 years. This schedule of additional contaminant regulation every 3-years has been restructured in the 1996 Amendments (discussed further in the next paragraph) due to the lack of resources required to thoroughly investigate 25 contaminants every 3 years. Thus, the requirement that EPA regulate an additional 25 contaminants every 3 years has been eliminated. Instead, EPA has the flexibility to decide whether or not to regulate a contaminant after completing a required review of at least 5 contaminants every 5 years.

The SDWA Amendments of 1986 set an aggressive schedule for the establishment of new regulations. Numerous new regulations were proposed or promulgated each year from 1988 through 1994. This accelerated pace of establishing drinking water regulations has slowed considerably due to government shutdowns and resource limitations. As a result of these

substantial regulatory delays, the U.S. Congress and the USEPA realized that reform of the SDWA was necessary. This need for reform resulted in the U.S. House of Representatives passing bill H.R. 3392 in 1994 which set guidelines for SDWA reform. This legislative action was followed by the U.S. Senate passing bill S.1316 in 1995 which set guidelines for SDWA reauthorization. Due to major differences between the two (2) bills, a new bill had to be passed by the House to reconcile it with the Senate S.1316 bill. On June 26, 1996, the House passed a bipartisan SDWA reauthorization bill (H.R. 3604) which was similar enough with Senate Bill S.1316 that the SDWA was reauthorized in the 104th Congress.

As a result of this legislative action, on August 6, 1996, the President signed the SDWA amendments into law as Public Law (PL) 104-182. The new amendments made changes to the existing SDWA, created several new programs that will improve the protection of public health, and brings reason and good science to the regulatory process. The SDWA reauthorization also allocated more than $42 billion in federal funding for various drinking water programs and activities from fiscal year (FY) 1997 through FY 2003.

Florida Department of Environmental Protection

As mentioned above, the main chapters of the FAC which regulate water facilities in the State of Florida are Chapters 62-550, 62-551, 62-555, and 62-560. Each chapter is summarized below.

Chapter 62-550, Drinking Water Standards, Monitoring, and Reporting, FAC, set forth the water quality standards that must be met, the collection and analyses of water samples, monitoring frequency and reporting requirements. Table 4-1 compares EPA and FDEP requirements for regulated contaminants.

Chapter 62-551, Control of Lead and Copper, FAC, sets forth the tap monitoring requirements for lead and copper, a description of corrosion control treatment requirements and the monitoring requirements for lead and copper in source water. The Chapter also includes lead service line replacement requirements, public education requirements, and reporting requirements for activities outlined in this FAC Chapter. Some minor modifications were made to this rule in accordance with the 1996 SDWA Amendments.

Chapter 62-555, Permitting and Construction of Public Water Systems, FAC, establishes the requirements for permitting, construction, and operation and maintenance of a public works system from collection through treatment storage and distribution. In general, this rule

establishes setback requirements for water supply wells, number of water supply wells required, the method of construction of the water supply wells, requirements of water treatment, storage and distribution facilities, cross-connection control, and water, field and other samples required for permitting. In addition, this rule sets forth the requirements for permitting various types of raw water supply, treatment, storage and distribution systems.

Chapter 62-560, Requirements for Public Water Systems Out of Compliance, FAC, sets forth the acts that are prohibited and therefore considered violations, requirements for public notification and requirements for variances, exemptions and waivers. Rule 62-550 FAC includes the current monitoring requirements as mentioned in the previous subsection. The City of Naples is required to take 60 samples per month based on these requirements.

TABLE E-1

CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

USEPA and FDEP Drinking Water Standards

Contaminant	Regulation	Status	USEPA MCL (mg/l)	FDEP MCL (mg/l)	Strictest MCL Regulation
Organics					
Acrylamide	Phase II	Final	TT	TT	TT
Alachor	Phase II	Final	0.002	0.002	0.002
Atrazine	Phase II	Final	0.003	0.003	0.003
Benzene	Phase I	Final	0.005	0.001	0.001
Benzo (a) pyrene	Phase V	Final	0.0002	0.0002	0.0002
Carbofuran	Phase II	Final	0.04	0.04	0.04
Carbon tetrachloride	Phase I	Final	0.005	0.003	0.003
Chlordane	Phase II	Final	0.002	0.002	0.002
2,4-D	Phase II	Final	0.07	0.07	0.07
Dalapon	Phase V	Final	0.2	0.2	0.2
Di (2-ethylhexyl) adipate	Phase V	Final	0.4	0.4	0.4
Di (2-ethylhexyl) phthalate	Phase V	Final	0.006	0.006	0.006
Dibromochloropropane (DBCP)	Phase II	Final	0.0002	0.0002	0.0002
p-Dichlorobenzene	Phase I	Final	0.075	0.075	0.075
o-Dichlorobenzene	Phase II	Final	0.6	0.6	0.6
1,2-Dichloroethane	Phase I	Final	0.005	0.003	0.003
1,1-Dichloroethylene	Phase I	Final	0.007	0.007	0.007
cis-1,2-Dichloroethylene	Phase II	Final	0.07	0.07	0.07
trans-1,2-Dichloroethylene	Phase II	Final	0.1	0.1	0.1
Dichloromethane (methylene chloride)	Phase V	Final	0.005	0.005	0.005
1,2-Dichloropropane	Phase II	Final	0.005	0.005	0.005
Dinoseb	Phase V	Final	0.007	0.007	0.007
Diquat	Phase V	Final	0.02	0.02	0.02
Endothall	Phase V	Final	0.1	0.1	0.1
Endrin	Phase V	Final	0.002	0.002	0.002
Epichlorohydrin	Phase II	Final	TT	TT	TT

TABLE E-1

CITY OF NAPLES
INTEGRATED WATER RESOURCES PLAN

USEPA and FDEP Drinking Water Standards

Contaminant	Regulation	Status	USEPA MCL (mg/l)	FDEP MCL (mg/l)	Strictest MCL Regulation
Ethylbenzene	Phase II	Final	0.7	0.7	0.7
Ethylene dibromide (EDB)	Phase II	Final	0.00005	0.00002	0.00002
Glyphosate	Phase V	Final	0.7	0.7	0.7
Heptachlor	Phase II	Final	0.0004	0.0004	0.0004
Heptachlor epoxide	Phase II	Final	0.0002	0.0002	0.0002
Hexachlorobenzene	Phase V	Final	0.001	0.001	0.001
Hexachlorocyclopentadiene	Phase V	Final	0.05	0.05	0.05
Lindane	Phase II	Final	0.0002	0.0002	0.0002
Methoxychlor	Phase II	Final	0.04	0.04	0.04
Monochlorobenzene	Phase II	Final	0.1	0.1	0.1
Oxamyl(vydate)	Phase V	Final	0.2	0.2	0.2
Pentachlorophenol	Phase II	Final	0.001	0.001	0.001
Picloram	Phase V	Final	0.5	0.5	0.5
Polychlorinated byphenyls (PCBs)	Phase II	Final	0.0005	0.0005	0.0005
Simazine	Phase V	Final	0.004	0.004	0.004
Styrene	Phase II	Final	0.1	0.1	0.1
2,3,7,8-TCDD (dioxin)	Phase V	Final	3E-08	3E-08	3E-08
Tetrachloroethylene	Phase II	Final	0.005	0.003	0.003
Toluene	Phase II	Final	1.0	1.0	1.0
Toxaphene	Phase II	Final	0.003	0.003	0.003
2,4,5-TP (silvex)	Phase II	Final	0.05	0.05	0.05
1,2,4-Trichlorobenzene	Phase V	Final	0.07	0.07	0.07
1,1,1-Trichloroethane	Phase I	Final	0.2	0.2	0.2
1,1,2-Trichloroethane	Phase V	Final	0.005	0.005	0.005
Trichloroethylene	Phase I	Final	0.005	0.003	0.003
Total haloacetic acids	Phase II	Final	0.04	0.04	0.04
Total trihalomethanes	Phase II	Final	0.03	0.03	0.03
Vinyl chloride	Phase I	Final	0.002	0.001	0.001
Xylenes (total)	Phase II	Final	10	10	10
Inorganics					
Antimony	Phase V	Final	0.006	0.006	0.006
Arsenic	Final	Final	0.01(11)	0.05(11)	0.01(11)
Asbestos (fibers/1>µm)	Phase II	Final	7 MFL	7 MFL	7 MFL
Barium	Phase II	Final	2.0	2.0	2.0
Beryllium	Phase V	Final	0.004	0.004	0.004
Cadmium	Phase II	Final	0.005	0.005	0.005
Chromium (total)	Phase II	Final	0.1	0.1	0.1
Copper	Lead and Copper	Final	TT	TT	TT
Cyanide	Phase V	Final	0.2	0.2	0.2
Fluoride	Fluoride	Final	4.0	4.0	4.0
Lead	Lead and Copper	Final	TT	0.015	0.015
Mercury	Phase II	Final	0.002	0.002	0.002
Nickel	Phase V	Final	0.1	0.1	0.1
Nitrate (as N)	Phase II	Final	10	10	10
Nitrite (as N)	Phase II	Final	1.0	1.0	1.0
Nitrate + nitrite (both as N)	Phase II	Final	10	10	10

Selenium	Phase II	Final	0.05	0.05	0.05
Sodium	---	Final	---	160	160
Thallium	Phase V	Final	0.002	0.002	0.002
Microbials					
Giardia lamblia	SWTR	Final	TT	TT	TT
Legionella	SWTR	Final	TT	TT	TT
Standard plate count	SWTR	Final	TT	TT	TT
Total coliforms	TCR	Final	**	**	**
Turbidity	SWTR	Final	PS	PS	PS
Viruses	SWTR	Final	TT	TT	TT
Secondary Drinking Water Standards					
Aluminum	---	---	0.05-0.2	0.20	0.20
Chloride	---	---	250	250	250
Color	---	---	---	15 color units	15 color units
Copper	---	---	---	1.0	1.0
Corrosivity	---	---	---	Noncorrosive	Noncorrosive
Hardness, Total	---	---	---		
Alkalinity, Total	---	---	---		
Fluoride	---	---	2.0	2.0	2.0
Foaming Agents	---	---	0.50	0.50	0.50
Iron	---	---	0.30	0.30	0.30
Manganese	---	---	0.05	0.05	0.05
Odor, Threshold Units	---	---	3 TON	3 TON	3 TON
pH	---	---	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5
Silver	---	---	0.10	0.10	0.10
Sulfate	---	Final	250	500	250
Total Dissolved Solids	---	---	500	500	500
Zinc	---	---	5.0	5.0	5.0
TOC	Unregulated				
Hydrogen Sulfide	Unregulated				
Radionuclides					
Alpha Emitters (I)	Interim	Final	15 pCi/L	15	15 pCi/L
Beta Particle and Photon Emitters (I)	Interim	Final	4 mrem/yr	4	4 mrem/yr
Radon (P)	Proposed	With-drawn	300 pCi/L	---	300 pCi/L
Radium 226 & 228 (I)	Interim	Final	5 pCi/L	5	5 pCi/L
Radium 226 (P)	Proposed	Proposed	20 pCi/L	---	20 pCi/L
Radium 228 (P)	Proposed	Proposed	20 pCi/L	---	20 pCi/L
Uranium (P)	Proposed	Proposed	0.03	---	0.03
Interim (I) and Proposed (P) Standards for Disinfection/ Disinfection By-Products	Proposed				
Bromite (P)	Proposed	Proposed	0.10	---	0.10
Bromoacetic Acid (P)	Phase I	Proposed	See THAAs	---	See THAAs
Bromodichloromethane (P)	Phase I	Proposed	See TTHMs	---	See TTHMs
Bromoform (P)	Phase I	Proposed	See TTHMs	---	See TTHMs
Chlorine Dioxide (P)	Proposed	Proposed	0.8 (as $CL0_2$)	---	0.8 (as $CL0_2$)
Chloral Hydrate (P)	Proposed	Proposed	TT	---	TT
Chloroacetic Acid (P)	Phase I	Proposed	See THAAs	---	See THAAs
Chloroform (P)	Phase I	Proposed	See TTHMs	---	See TTHMs
Dibromoacetic Acid (P)	Phase I	Proposed	See TTHMs	---	See TTHMs
Dibromochloromethane (P)	Phase I	Proposed	See TTHMs	---	See TTHMs
Dichloroacetic Acid (P)	Phase I	Proposed	See TTHMs	---	See TTHMs

Trichloroacetic Acid (P)	Phase I	Proposed	See THAAs	---	See THAAs
THAA (Total Haloacetic Acids) (I)	Phase I	Proposed	0.06 (Stage I) 0.03 (Stage II)	0.10 (I)	0.06 (Stage I)[12] 0.06 (Stage II)
TTHM (Total Trihalomethanes) (I)	Phase I	Proposed	0.10 (I) 0.08 (Stage I) 0.04 (Stage II)	0.10 (I)	0.10 (I) 0.08 (Stage I)[12] 0.08 (Stage II)

Notes:

1. USEPA Drinking Water Standards published in AWWA Journal.
2. Turbidity Reported in NTU's.
3. Required level of treatment is associated with treatment technique (TT).
4. FF - Free From.
5. PS - Performance Standard 0.5 - 1.0 NTU.
6. ** - No more than five (5) percent of the samples per month may be positive.
7. ***- May be greater if no other maximum contaminant level is exceeded.
8. SWTR - Surface Water Treatment Rule. (Not applicable).
9. TCR - Total Coliform Rule.
10. BDL - Below Detection Limit.
11. The arsenic rule was recently changed
12. Likely to be based on locational averages.

CURRENT AND FUTURE SDWA REGULATIONS AND EFFECT ON CURRENT TREATMENT

The research and data associated with the rules covered in this section are referenced from material dated up to and including the year 2007.

D-DBP Rule

Development of this rule began in 1989 when USEPA developed a proposal outlining its initial posture on the rule. The initial rule set an MCL on total trihalomethanes (TTHMs) of 100 micrograms per liter with no MCL set for total haloacetic acids (THAAs). The initial rule was superseded in December 1998 based upon the mandates of the 1996 SDWA amendments. The revised rule was known as the Stage I Disinfection/Disinfection By-Product Rule (D/DBP). The Stage 1 D/DBP Rule applied to all community and nontransient noncommunity water systems that treat their water with a chemical disinfectant for either primary or residual treatment.

In the formation of this rule, EPA had to weigh the risks of cancer causing DBPs versus the risk presented by pathogens. The major changes to the rule included the lowering of the TTHM standard from 100 micrograms per liter to 80 micrograms per liter. In addition, a limit of 60 micrograms per liter was set for THAAs. A TOC removal was also set to require the removal of a certain percentage of DBP precursors from the raw water. Compliance with the Stage I regulations was required by January 2004 for the City of Naples.

Several years ago, it initially appeared that the Stage 2 DBPR regulations would lower the TTHM and THAA standard further from 80 and 60 micrograms per liter to 40 and 30 micrograms per liter respectively. The Stage 2 DBPR was published in January 2006 and does not contain the provision for lowering the standard any further; however, to ensure protection of the public without decreasing the standards, the EPA requires more stringent monitoring of suspected areas in the distribution system where DBPs may potentially be a problem. Studies are required to be performed to determine outer areas of the distribution system that may experience long chlorine contact times and thus the potential for higher DBPs.

With the rule remaining at the 80/60 level, judging by the existing TTHM data ***(no THAA data was available at the time of this report)***, the City should be able to meet the proposed Stage I standards. Due to the length of some of the customers from the WTP, areas such as the southern tip of Gordon Drive and other areas in the south portion of the City will likely control whether

DBPs will become an issue with the nee rule. In 2008, the City has initiated a sampling program in compliance with the Stage 2 DBPR requirements.

Groundwater Rule

The amended SDWA of 1986 mandates the USEPA to set disinfection requirements for all public water systems. The Surface Water Treatment Rule (SWTR) was the first enacted rule to govern these requirements. The SWTR set disinfection requirements for surface supply sources and those groundwater sources under the direct influence of surface water. A proposed Groundwater Disinfection Rule (GWDR) was expected to follow in June 1993. Due to resource shortages within the USEPA infrastructure this proposal has been delayed until the final rule was published in January of 2007. The Ground Water Rule (GWR) to addresses disinfection of source water, in particular ground water systems that are susceptible to fecal contamination, distribution system disinfection, qualification of operators, treatment technique requirements, MCLG's, natural disinfection allowance, monitoring and analysis requirements and provisions for variances and exemptions. The following bullet items present the major requirements of the rule:

- System sanitary surveys conducted by the State and identification of significant deficiencies
- Hydrogeologic sensitivity assessments for undisinfected systems
- Source water microbial monitoring by systems that do not disinfect and draw from hydrogeologically sensitive aquifers or have detected fecal indicators within the system's distribution system
- Corrective action by any system with significant deficiencies or positive microbial samples indicating fecal contamination
- Compliance monitoring for systems which disinfect to ensure that they reliably achieve 4-log (99.99 percent) inactivation or removal of viruses

The FDEP also requires in Section 62-555,(12)(b) that by no later than December 31, 2005, suppliers of water using ground water that is not under the direct influence of surface water but that is exposed during treatment to the open atmosphere and possible microbial contamination shall provide treatment that reliably achieves at least four-log inactivation or removal of viruses before or at the firstcustomer at all flow rates.

The City is using a combined chlorine residual of chlorine and ammonia to form chloramines for DBP control. This can greatly increase the required contact time to achieve 4-log removal depending on the amount of free chlorine treatment provided at the WTP. The City had a CT study performed in 2006 to determine if the water plant complies with these rules. Currently, the water plant is not in compliance and recommendations have been made for facility improvements.

Sulfate Rule

EPA is currently investigating whether to move sulfate from the secondary contaminant list to the primary list such that it will be federally enforceable. Currently the FAC standard for sulfates is set at 250 mg/L. The USEPA had originally agreed to schedule a proposal in August of 2001, but at this time it appears that the proposed rule will be delayd to gather additional comments from industry professionals. This rule would not be expected to have any impact on City operations.

Radon

Radon is a naturally-occurring radioactive gas that may cause cancer, and may be found in drinking water and indoor air. Some people who are exposed to radon in drinking water may have increased risk of getting cancer over the course of their lifetime, especially lung cancer. Radon in soil under homes is the biggest source of radon in indoor air, and presents a greater risk of lung cancer than radon in drinking water. As required by the Safe Drinking Water Act, EPA has developed a proposed regulation to reduce radon in drinking water that has a multimedia mitigation option to reduce radon in indoor air.

The unique multimedia framework for this proposed regulation is outlined in the Safe Drinking Water Act as amended in 1996:

- First Option: States can choose to develop enhanced state programs to address the health risks from radon in indoor air -- known as Multimedia Mitigation (MMM) programs -- while individual water systems reduce radon levels in drinking water to 4,000 pCi/L or lower (picoCuries per liter, a standard unit of radiation). EPA is encouraging States to adopt this option because it is the most cost-effective way to achieve the greatest radon risk reduction.

- Second Option: If a state chooses not to develop an MMM program, individual water systems in that state would be required to either reduce radon in their system's drinking water to 300 pCi/L or develop individual local MMM programs and reduce levels in drinking water to 4000 pCi/L. Water systems already at or below 300 pCi/L standard would not be required to treat their water for radon.

Obviously, if the State of Florida complies with EPA to develop the first option discussed above, the WTP will not have to comply with any additional radon rules. If the State of Florida does not comply with EPA's wishes, then the City would have to follow the mandates of the second option.

Arsenic Rule

In January 2001, the outgoing Clinton administration passed a proposed arsenic standard of 10 ppb. Upon entering office, the Bush administration temporarily suspended the proposed standard and kept it at 50 ppb until further studies could confirm the health risk of arsenic. In October of 2001, the Bush administration upheld the 10 ppb standard. This drastic reduction can be expected to be a great expense for a number of utilities around the country. The date by which systems needed to comply with the new standard was January 2006.

The City will need to continue to sample and test the finished water to determine if it will continue to meet the Arsenic Rule requirements. If additional treatment is required in the future due to increased arsenic from the source water, then the City may will need to examine alternative treatment technologies to reduce the levels of arsenic in the finished water. Common technologies to remove arsenic include precipitation, ion exchange and membrane treatment processes. The City's desire to lower color levels in the finished water by the use of membrane treatment will also have the benefit of reducing arsenic and other contaminants from the raw water supply.

Radionuclide Rule

EPA has updated its standards for radionuclides in drinking water. EPA also has set a new standard for uranium, as required by the 1986 amendments to the Safe Drinking Water Act. The standards are: combined radium 226/228 (5 pCi/L); beta emitters (4 mrems/yr); gross alpha standard (15 pCi/L); and uranium (30 µg/L). The rule went into effect in December of 2003.

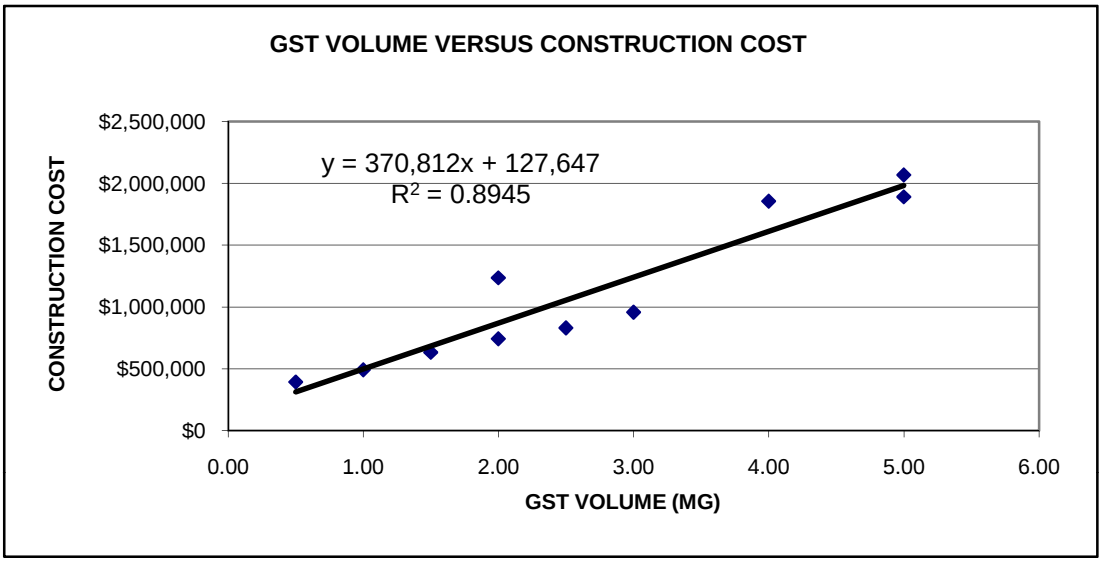
It was indicated in the previous master plan that testing for these contaminants was performed and that the samples were below the MCL levels. Thus, it could be anticipated that the City will not have to change any treatment process to comply with this rule; however, if the City is forced to draw water from alternative supplies, such as the Floridan aquifer, it is recommended that more sampling be performed to determine radionuclide levels.

APPENDIX I

COST CURVES
CITY OF NAPLES 20 YEAR INTEGRATED WATER RESOURCE PLAN
200-08516-08007

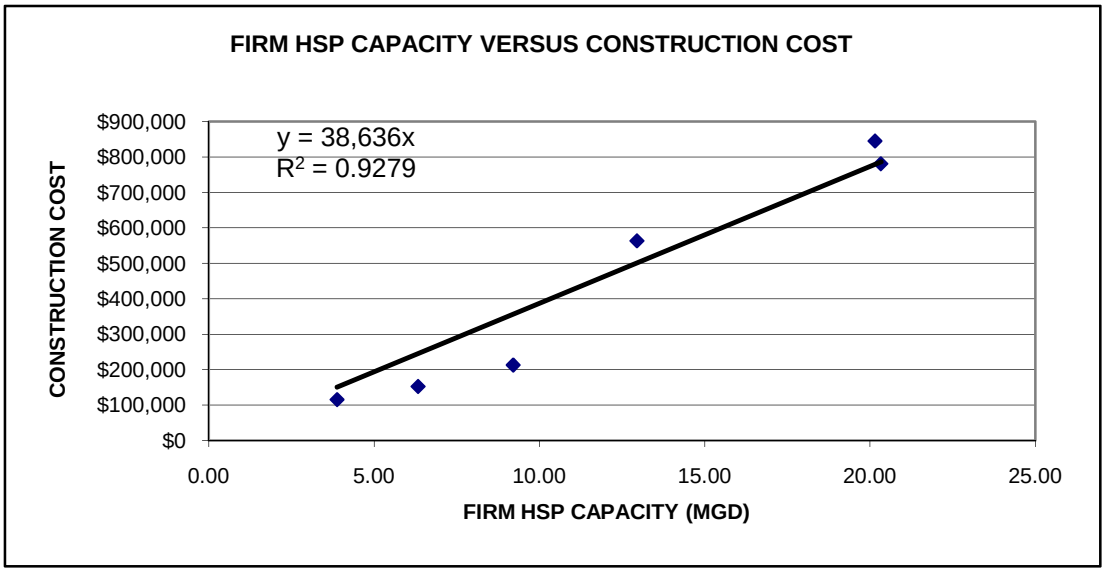
GROUND STORAGE TANK

Cost = 370,812Q + 127,647
Q = MGD



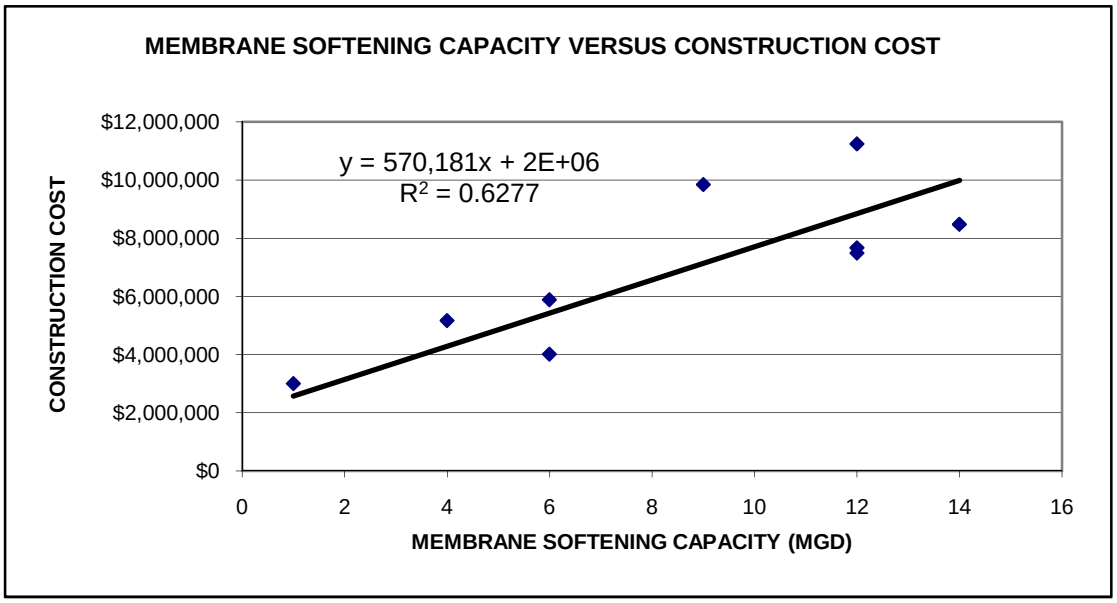
HIGH SERVICE PUMPING

Cost = 38,636Q
Q = MGD



NF SOFTENING

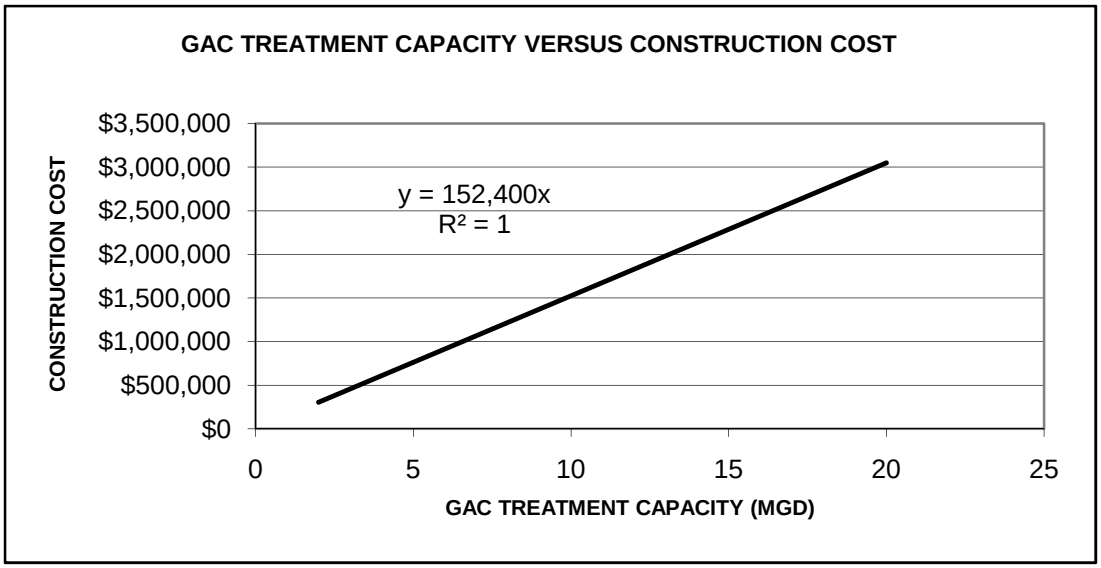
Cost = 570,181Q+2,000,000
Q = MGD



Note: Includes cartridge filters, membrane skids, high pressure pumps, pretreatment chemical pumps and day tanks, control system and process building costs.

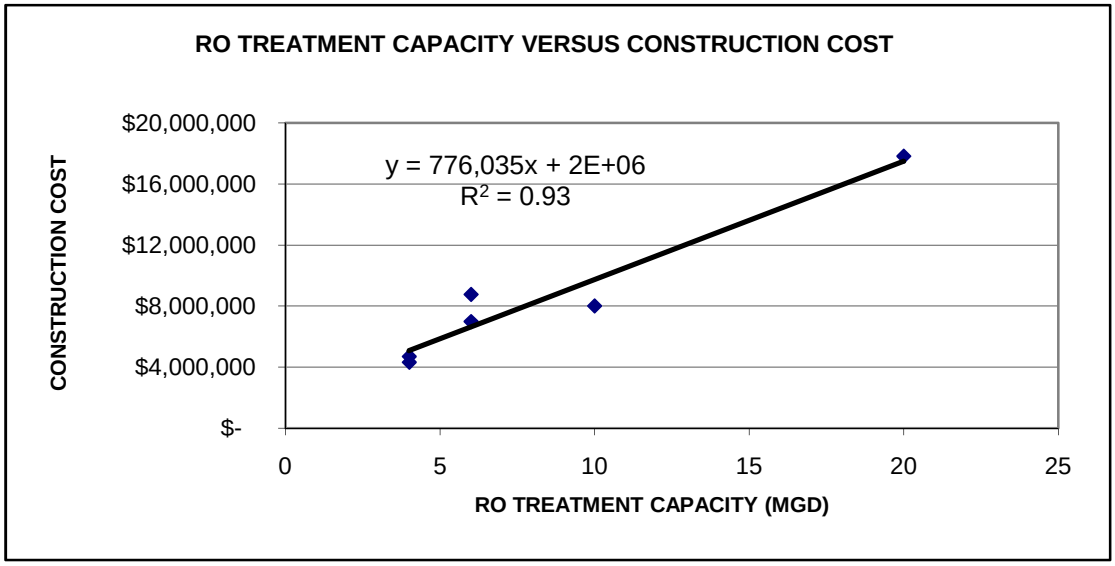
GRANULAR ACTIVATED CARBON (GAC)

Cost = 152,400Q
Q = Flow in MGD



REVERSE OSMOSIS

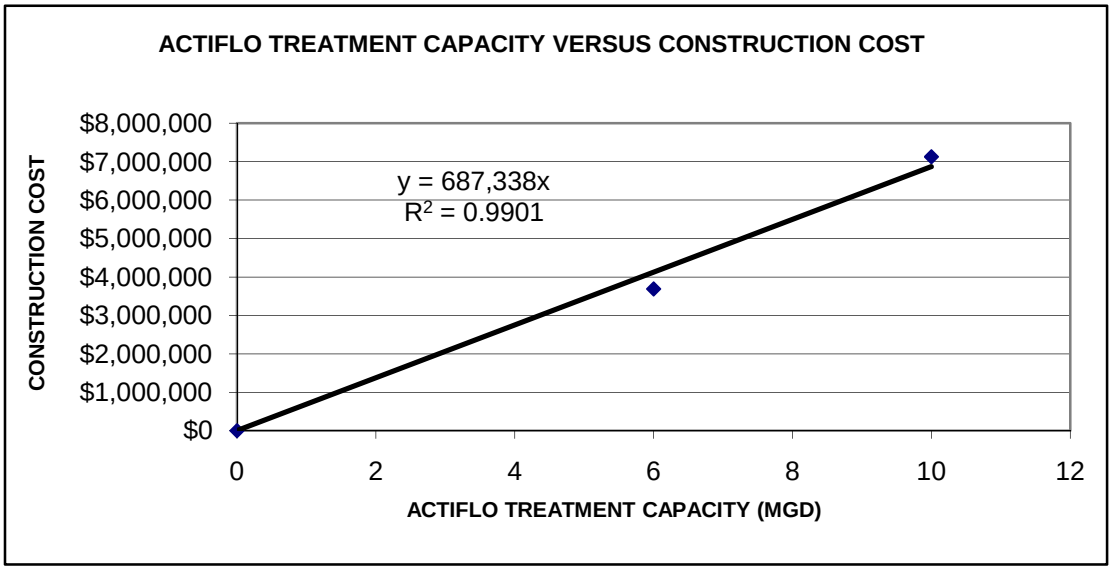
Cost = 776,035Q+2,000,000
Q = Flow in MGD



Note: Includes cartridge filters, membrane skids, high pressure pumps, pretreatment chemical pumps and day tanks, control system and process building costs.

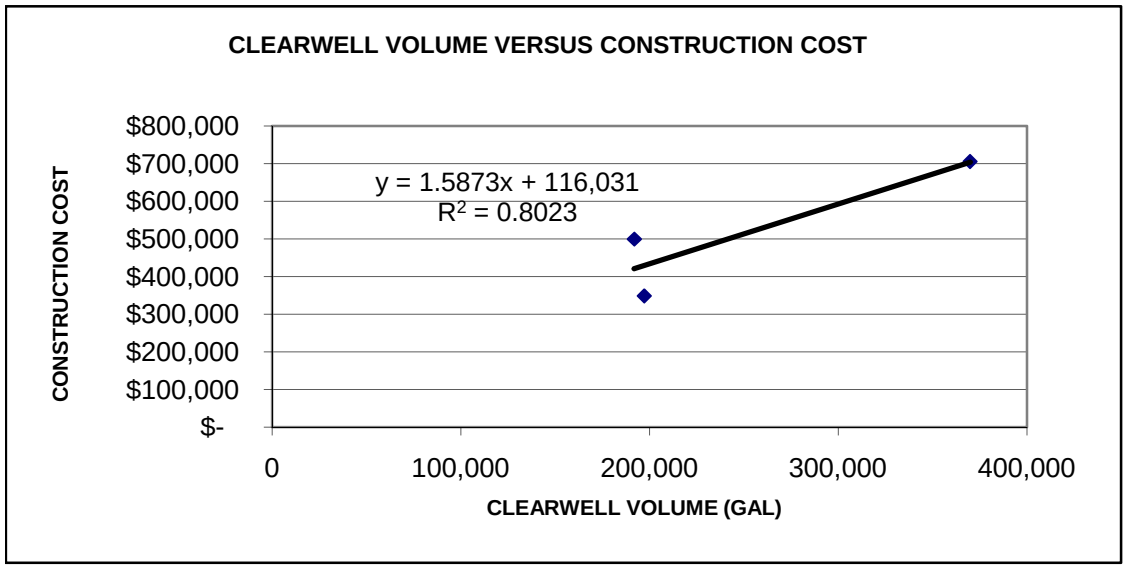
ACTIFLO

Cost = 687,338Q
Q = MGD



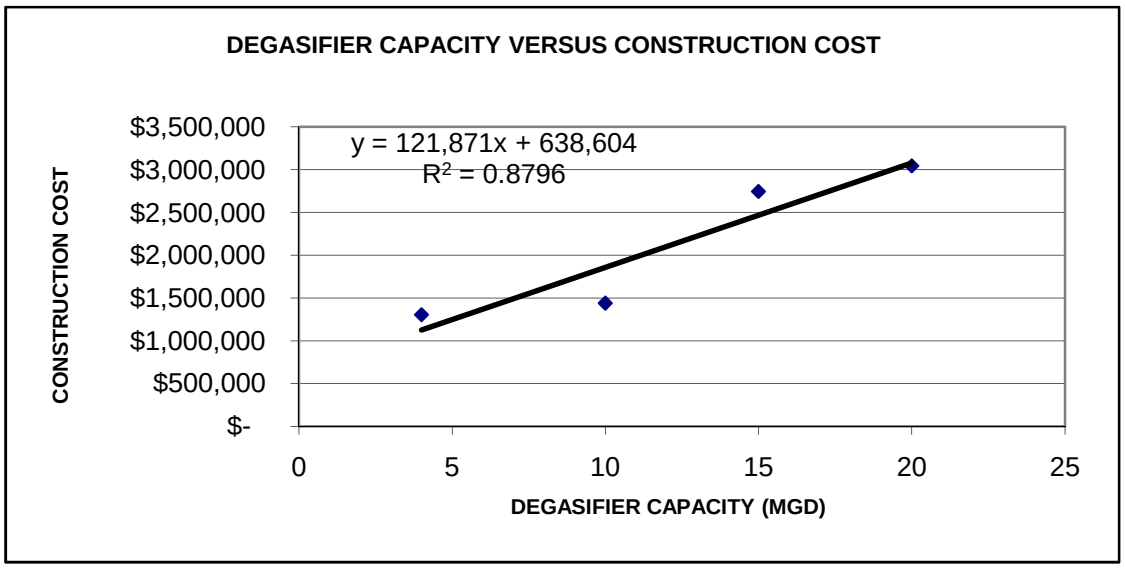
CLEARWELL

Cost = 1.59Q + 116,031
Q = GALLONS



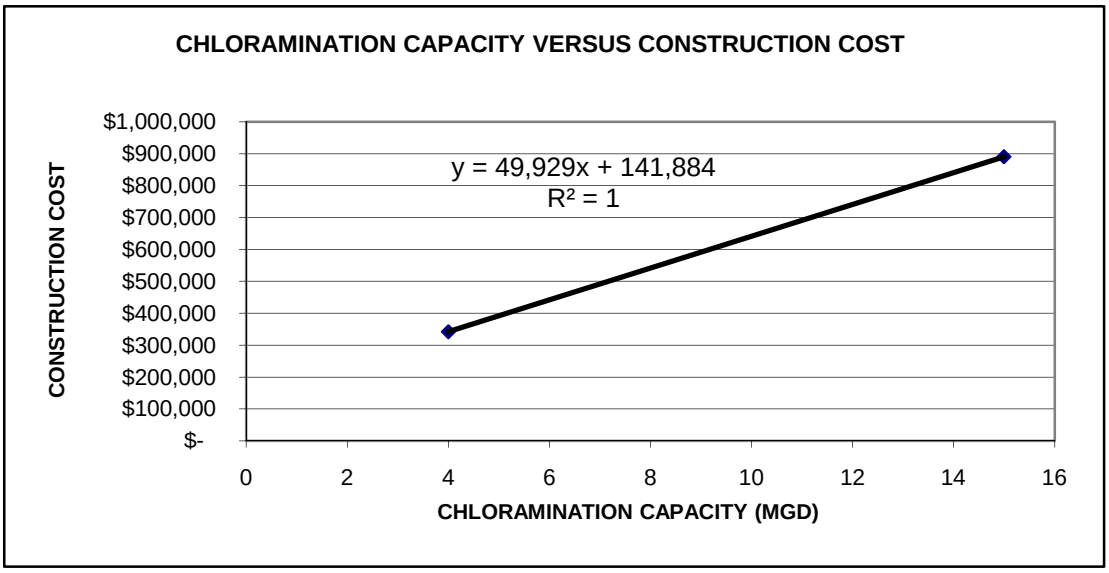
AERATION AND ODOR CONTROL W/CLEARWELL

Cost = 121,871Q + 638,604
Q = MGD



CHLORINE & AMMONIA

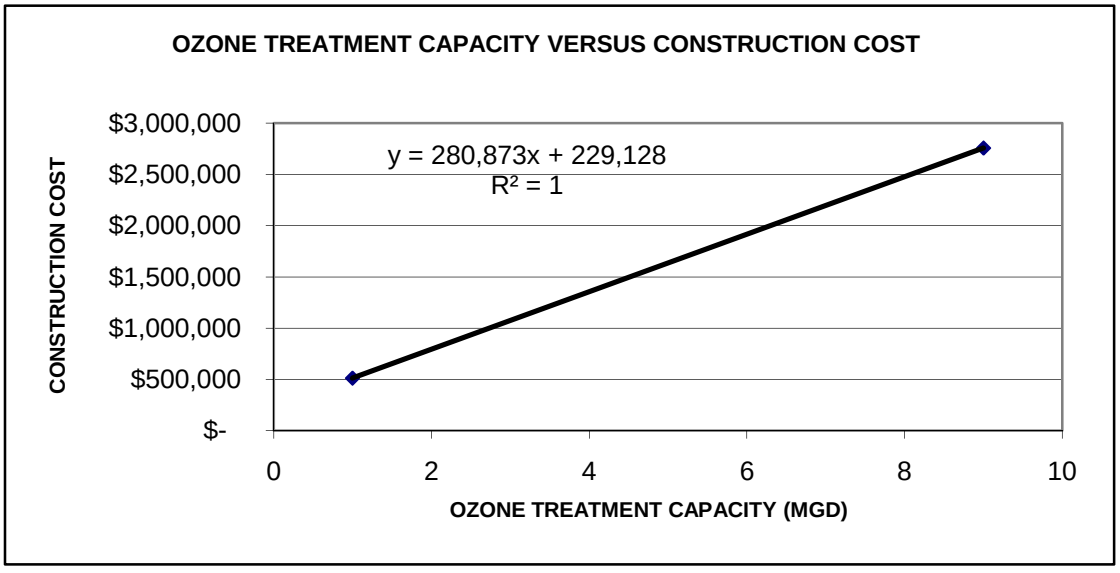
Cost = 49,929Q + 141,884
Q = MGD



Note: Costs based on sodium hypochlorite and anhydrous ammonia chemical feed systems and includes bulk and day storage, feed equipment and building costs.

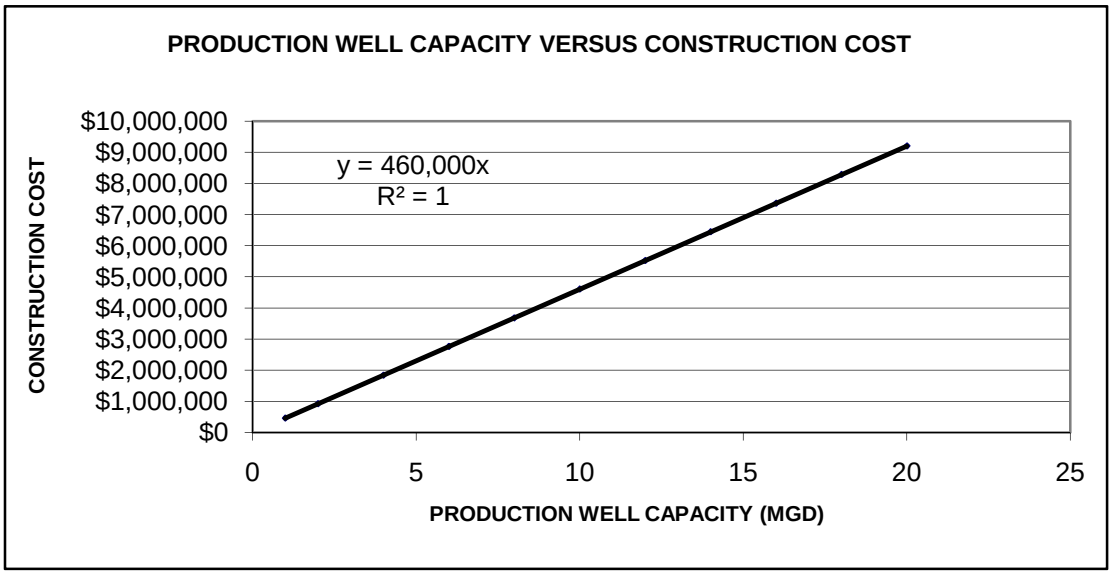
OZONE TREATMENT

Cost = 280,873Q + 229,128
Q = MGD



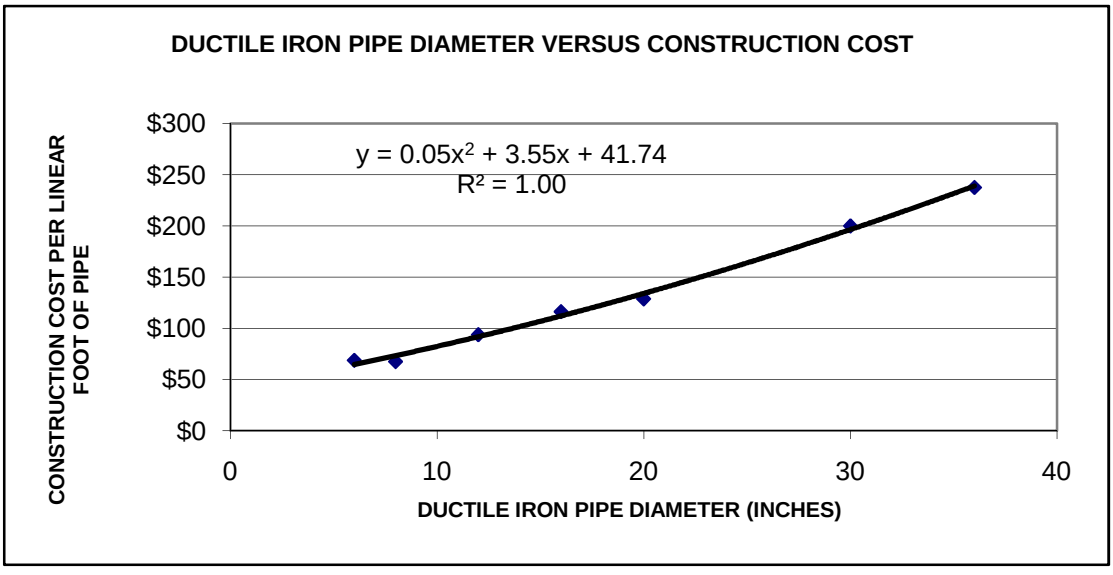
PRODUCTION WELL

Cost = 460,000Q
Q = MGD



DUCTILE IRON PIPE

Cost = 0.05D^2 + 3.55D+41.74
D = DIP size in inches



SEAWATER DESALINATION

Cost = 5,000,000Q + 4*10^7
Q = MGD