Appendix 3-5

Methodologies for Projected Demands for Each Use Sector

TECHNICAL MEMORANDUM

December 7, 2010

TO: Interested Parties

THROUGH: Kenneth R. Herd, Water Supply Program Director, Resource Projects Department KRH

FROM: Kathy F. Scott, Senior Water Conservation Analyst, Conservation and Water Use Outreach Section, Resource Projects Department KFS

SUBJECT: 2010 Regional Water Supply Plan: Agricultural Water Demand Projections

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Introduction

This memorandum is intended to replace the memorandum of the same title dated July 2009. The significant revisions to the memorandum are relative to the citrus acreage and demand projections. Such revisions are in response to stakeholder comments provided during the public review of the Draft 2010 Regional Water Supply Plan. Comments received suggested, particularly in the Heartland and Southern regions, that citrus projections were unrealistically low, and offered adequate reasoning to prompt staff's revisiting the projections. Except for corrections of a couple minor typos and inconsistencies, the other crop projections have not been adjusted.

Purpose

This technical memorandum summarizes the methods, data and results of the irrigated agricultural acreage and water use demand projections for 12 crop categories and for 16 counties in the District.

Background

The challenge for the District has historically been collecting accurate data relative to crop acreages. Hazen and Sawyer was selected in 2007 to assist with the agricultural demand projections; specifically the firm was tasked with verifying and, where necessary, revising the irrigated agricultural acreage projections of each county within the District's boundaries for the following crop categories:

- Citrus
- Cucumbers
- Field crops
- Melons
- Nurseries
- Other vegetables/row crops
- Pasture
- Potatoes
- Sod
- Strawberries
- Tomatoes
- Blueberries

Blueberries was added for the first time in an attempt to account for this relatively emergent crop within District boundaries; however, as the Hazen and Sawyer final report (October 2007) indicates, the crop is still a comparative novelty such that there is a lack of data upon which to project demands. It is recognized that blueberries could become a significant factor in agricultural water use, but without more than one year of collected data it is difficult to project the location and quantify the potential impact.

Hazen and Sawyer developed agricultural irrigated acreage projections based on a variety of available sources described in the final report, including the Florida Agricultural Statistics Service, the Florida Department of Agriculture and Consumer Services, county property appraiser offices, and water use permits. In the summer of 2007, 41 experts in crop production at the University of Florida Food and Resource Economics Department and at the Institute of Food and Agricultural Sciences Extension offices were asked to review the projections and eight responded with their opinions regarding the crop acreage projections and eight said they did not have the requisite knowledge at this time to comment on the projections. Two of the eight experts responding, Professor Tim Taylor and Professor Ed Hanlon of the University of Florida Institute of Food and Agricultural Sciences, said that the crop acreage projections appear to be reasonable at this time. The factors affecting agricultural production have not changed significantly since 2005 when the District's projections were developed. Other experts believed that for some crops and in some counties, the District's projections were either higher or lower than what the expert would expect. The District made revisions where appropriate.

Hazen and Sawyer provided their final report to the District in October 2007. In March 2009, a technical memorandum describing the agricultural demand projections was provided to members of the District's Agricultural Advisory Committee, and a presentation on the topic was provided to the group in May 2009. The committee members were requested to review and comment on the agricultural acreage and demand projections. Three provided comments during the subsequent months, which were addressed. When the full RWSP was provided for review in April 2010, additional comments on the citrus demands in particular prompted a reevaluation of that crop category.

Acreage Projections

The acreage projections of all crops except for citrus are contained in the Hazen and Sawyer memorandum, "Irrigated Agricultural Acreage and Projections by County" (October 2007). While there are methods described for citrus acreage in the memorandum, those figures have been revised as described in the following paragraphs.

As a starting point, the 20-year historical trend of the number of acres by county was derived from the Florida Agricultural Statistics Service (FASS) reports, *Florida Commercial Citrus Inventory*, (1988 – 2008). A best-line fit was used to determine the rate of increase or decrease over the 20-year period in order to account for the variation in acreage within each county over time.

The 2006 acreage was used as a surrogate for the 2005 base year for planning purposes since 2006 better reflects the current acreage moving forward, versus the much higher acreage for the more distant 2004. It was not believed to be reasonable to assume that the trend during the past 20 years is representative of the trend for the future, for many counties. Judgment was applied based on knowledge of agricultural activities and trends by staff working in the agricultural community. In general, the consensus was that across the District, citrus may see a slight decline since the core is moving south, but not a significant one since activities are expected to pick up as the economy improves. Some of the trends indicated by 20-year historical FASS data include significant reduction in acres (a 61 percent decrease in Hillsborough County, or a 48 percent decrease in Polk County, as examples) that are not anticipated to occur over the planning horizon. Therefore, the trends were flattened for more rural counties, or counties where areas of citrus concentration will be among those more affected by urbanization, once development begins again. Related indicators such as the

industry's focus on resolving the greening issue, as well as the lack of other viable land uses for many existing citrus acres, appear to support staff's rationale. For most counties, decreases and increases still exist but at less aggressive rates.

Demand Projections

Crop irrigation requirements were derived by multiplying projected irrigated acreage by the District's agricultural water use allocation program (AGMOD). Irrigation allocations were developed for each reporting category by using AGMOD and incorporating typical site-specific conditions for each crop, including location, climatology, soil type, irrigation system, and growing season(s). Planning level water use projections were developed through the year 2030 for average annual effective rainfall conditions and for a 2-in-10-drought year scenario. For those counties that are not located wholly within the District (*i.e.,* Levy, Lake, Marion, Charlotte, Highlands, and Polk), only the portion of the crop acreage located within the District was considered.

While a 1-in-10 (not a 2-in-10) scenario is required to be reported, a number of factors occurred that have precluded this from happening in time for this RWSP. The most significant is the unavailability of an appropriate version of AGMOD for water supply planning purposes, given recent rule changes. Staff is working on a more flexible and responsive solution in order to consistently fulfill reporting expectations.

Projected water uses associated with 'Miscellaneous' (*i.e.*, non- irrigated) agricultural operations include aquaculture, dairy, cattle, poultry, and others, and are not projected to neither increase nor decrease significantly. For planning purposes, the demands were held steady throughout the planning horizon.

For purposes of this analysis, the following assumptions were made with regard to crops included in the 'Vegetables, Melons, and Berries' category:

- All crops in the 'Vegetables, Melons, and Berries' category except for potatoes were assumed to be grown on plastic mulch. Although it is recognized that this is not entirely true for all operations in the planning regions (*e.g.*, some melon acreage), the impact of this assumption on the overall water use projections is not believed to be significant.

- Irrigation allocations for all crops grown on plastic mulch were calculated assuming zero effective rainfall. The result of this assumption is that projected water use needs for mulched crops are the same under both the 5-in-10 (average annual) and 1-in-10 drought year scenarios.

- Irrigation allocations for all crops grown on plastic mulch include quantities for crop establishment.

Tables and Figures

Tables 1 and 2 summarize irrigated acreage and water demand projections, respectively, through the year 2030 by county for all crop-reporting categories in the RWSP 2010. Table 3 summarizes the non-irrigated water use projections through 2030. Tables 4 through 19, attached to this memorandum in a separate format, provide more detail at the county level. Differences may occur between the summary and detail tables due to rounding.

Table 1. Irrigated Acreage Projections by County over the Planning Period

County	Base Year 2005	Irrigated Acreage				
		2010	2015	2020	2025	2030
Charlotte	8,261	10,041	10,143	10,181	10,220	10,266
Citrus	359	329	324	321	318	312
DeSoto	68,773	73,153	72,786	72,480	72,391	72,369
Hardee	51,195	50,039	49,593	49,542	49,577	49,556
Hernando	1,693	1,684	1,733	1,761	1,789	1,811
Highlands	37,621	36,783	36,783	36,783	36,783	36,678
Hillsborough	48,073	52,135	51,812	53,205	54,559	56,858
Lake	1,591	1,447	1,354	1,260	1,166	1,073
Levy	5,585	5,709	5,697	5,753	5,753	5,763
Manatee	46,512	47,067	46,203	44,782	43,888	43,828
Marion	3,552	3,544	3,620	3,696	3,773	3,876
Pasco	12,112	11,897	11,861	11,824	11,788	11,752
Pinellas	153	135	116	98	80	67
Polk	86,097	84,196	83,841	83,841	83,841	83,841
Sarasota	6,509	6,339	6,287	6,235	6,182	6,132
Sumter	2,115	2,233	2,376	2,520	2,663	2,663
Total	**380,201**	**386,732**	**384,529**	**384,282**	**384,771**	**386,846**

Table 2. Agricultural Demand Projections by County over the Planning Period (mgd)

County	Base Year 2005		2010		2015		2020		2025		2030	
	Avg	2-10	Avg	2-10	Avg	2-10	Avg	2-10	Avg	2-10	Avg	2-10
Charlotte	11.2	14.6	13.0	17.4	13.1	17.6	13.2	17.6	13.2	17.7	13.2	17.8
Citrus	0.4	0.6	0.4	0.6	0.4	0.6	0.4	0.6	0.4	0.5	0.4	0.5
DeSoto	60.2	89.7	64.1	95.3	63.8	94.8	63.5	94.3	63.5	94.2	63.4	94.2
Hardee	62.5	84.2	61.5	82.5	61.0	81.8	60.9	81.8	61.0	81.8	61.0	81.8
Hernando	2.3	2.8	2.3	2.8	2.4	2.9	2.4	3.0	2.4	3.0	2.4	3.0
Highlands	50.2	62.4	49.0	61.1	49.0	61.1	49.0	61.1	49.0	61.1	48.9	60.9
Hillsborough	48.0	72.8	50.7	78.1	49.9	77.4	51.0	79.3	52.1	81.2	53.9	84.3
Lake	1.9	2.6	1.7	2.3	1.6	2.1	1.4	2.0	1.3	1.8	1.2	1.7
Levy	4.8	8.1	4.9	8.3	4.9	8.2	4.9	8.3	4.9	8.3	4.9	8.3
Manatee	40.1	54.4	40.6	55.1	39.9	54.1	38.7	52.4	37.9	51.3	37.9	51.3
Marion	3.0	5.1	3.0	5.1	3.0	5.2	3.1	5.3	3.2	5.4	3.3	5.5
Pasco	13.0	18.3	12.8	18.0	12.7	18.0	12.7	17.9	12.7	17.9	12.6	17.8
Pinellas	0.4	0.5	0.3	0.4	0.3	0.4	0.3	0.4	0.3	0.3	0.3	0.3
Polk	89.6	122.2	87.4	120.4	87.0	119.9	87.0	119.9	87.0	119.9	87.0	119.9
Sarasota	6.3	8.8	6.1	8.5	6.0	8.5	6.0	8.4	5.9	8.4	5.9	8.3
Sumter	6.6	6.9	7.2	7.6	7.9	8.3	8.5	9.1	9.2	9.8	9.2	10.8
Total	**400.5**	**554.0**	**405.0**	**563.5**	**402.9**	**560.9**	**403.2**	**561.3**	**404.0**	**562.7**	**405.6**	**566.5**

Table 3. Summary of Non-irrigated Agricultural Water Use Projections over the Planning Horizon (mgd).

County	Base Year 2005	2010	2015	2020	2025	2030
Charlotte	0.1	0.1	0.1	0.1	0.1	0.1
Citrus	0.0	0.0	0.0	0.0	0.0	0.0
DeSoto	0.0	0.0	0.0	0.0	0.0	0.0
Hardee	0.0	0.0	0.0	0.0	0.0	0.0
Hernando	0.5	0.5	0.5	0.5	0.5	0.5
Highlands	0.0	0.0	0.0	0.0	0.0	0.0
Hillsborough	5.0	5.0	5.0	5.0	5.0	5.0
Lake	0.0	0.0	0.0	0.0	0.0	0.0
Levy	0.1	0.1	0.1	0.1	0.1	0.1
Manatee	0.8	0.8	0.8	0.8	0.8	0.8
Marion	0.0	0.0	0.0	0.0	0.0	0.0
Pasco	0.8	0.8	0.8	0.8	0.8	0.8
Pinellas	0.2	0.2	0.2	0.2	0.2	0.2
Polk	2.0	2.0	2.0	2.0	2.0	2.0
Sarasota	0.2	0.2	0.2	0.2	0.2	0.2
Sumter	2.0	2.0	2.0	2.0	2.0	2.0
Total	**11.7**	**11.7**	**11.7**	**11.7**	**11.7**	**11.7**

Attachments: Tables 4 through 19

References

Florida Agricultural Statistics Service (FASS), *Florida Commercial Citrus Inventory*. 1988, 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008.

Johns, Grace M. "Update of Irrigated Agricultural Acreage and Projections by County." Memorandum. Hazen and Sawyer, October 9, 2007.

TECHNICAL MEMORANDUM

May 26, 2010

TO: Interested Parties

THRU: Kathy F. Scott, Manager, Conservation Projects Section
Resource Projects Department

FROM: Carl P. Wright, Senior Water Conservation Analyst
Conservation Projects Section
Resource Projects Department

SUBJECT: 2010 Regional Water Supply Plan: Industrial/Commercial and Mining/Dewatering Water Demand Projections

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Introduction

Chapter 373, Florida Statutes (F.S.) sets forth the requirement for regional water supply planning. Under the provisions of this chapter, a Regional Water Supply Plan (RWSP) must be developed for those areas where available water supplies are not expected to meet projected demands over a 20-year planning horizon. Guidance for developing projections is contained in the publication Final Report: Development and Reporting of Water Demand Projections in Florida's Water Supply Planning Process (September 2001). This guidance document was produced by the Water Demand Projection Subcommittee of the Water Planning Coordination Group. This group includes representatives from the Florida Department of Environmental Protection (FDEP) and each of the five water management districts. Following a district-wide water supply assessment that identified water demands and existing sources, the Governing Board of the Southwest Florida Water Management District (SWFWMD or District) determined the need for a RWSP in the southern ten counties of the District, and the District produced its first RWSP in 2001. The statute requires that the determination of the need for a RWSP be made every five years. Accordingly, in 2003, the Governing Board determined the need for a RWSP existed in the same ten-county area. For the 2010 edition of the Regional Water Supply Plan, the Governing Board directed District staff to include demand projections for all sixteen (16) counties within the District.

Purpose

This memo details the methodology used to develop water demand projections for industrial/commercial (I/C) and mining/dewatering (M/D) interests within the SWFWMD. I/C uses include chemical manufacturing, food processing, power generation, and miscellaneous I/C uses. While diversified, much of the water used in food processing can be attributed to citrus and other agricultural crops. For the most part, chemical manufacturing is closely associated with phosphate mining and consists mainly of phosphate processing. A number of different products are mined within the District's boundaries, including phosphate, limestone, shell, and sand. For the purposes of the water supply planning process, thermoelectric power generation (PG) is separated out as an individual use category. While the Water Demand Projection Subcommittee (FDEP, 2001) identified 0.1 million gallons per day (mgd) as the mandatory reporting threshold for the I/C and M/D categories, the SWFWMD examined and included all permitted or reported uses, regardless of the quantity in projecting

demand. The decision to include all water use permits (WUPs), regardless of size, resulted from a belief that projection accuracy would be improved by capturing all available water use data.

Background

Prior editions of the RWSP addressed two planning regions, the Southern Water Use Caution Area (SWUCA) and Northern Tampa Bay (NTB). Although data is still available for these two areas, the 2010 RWSP will address four planning regions encompassing all 16 counties. The Southern Planning Region includes Manasota, Sarasota, DeSoto, and Charlotte Counties; the Heartland Planning Region includes Polk, Hardee, and Highlands Counties; and the Tampa Bay Planning Region includes Pasco, Pinellas, and Hillsborough Counties. The Northern Planning Region consists of those counties being included in the RWSP for the first time, specifically Hernando, Citrus, Levy, Sumter, Lake, and Marion Counties. For the 2010 RWSP, 2005 is the starting point, or baseline year, for the purpose of developing and reporting water demand projections. This is consistent with the methodology agreed upon by the Water Planning Coordination Group (FDEP, 2001). The data for the baseline year consist of reported and estimated usage for 2005, whereas data for the years 2010 through 2030 are projected demands (estimated needs).

Data Source

District rules require a water use permit (WUP) for uses where the withdrawal during any single day is one million (1,000,000) gallons, if the average annual daily withdrawal is equal to or greater than one hundred thousand (100,000) gpd, or if the withdrawal is from a well having an inside diameter of six-inches (6") or more. Because of the six-inch diameter provision, the reporting threshold of 0.1 mgd for I/C and M/D adopted by the Demand Projection Subcommittee is not equivalent to the District's permitting threshold. It is interesting to note that some I/C permittees with six-inch or larger wells are permitted for quantities as small as 100 gpd. On the other hand, a self-supplied water user with a well smaller than six-inches may withdraw thousands of gallons a day, yet be exempt from WUP requirements (if they withdraw less than 100,000 gpd). Since WUP information is contained in the District's regulatory data base, it was used to identify all water use permits which included any permitted quantities for use codes

indicating I/C or M/D operations in the sixteen (16) county planning area. A total of 426 individual I/C and M/D permits were identified. Some self-supplied small users are not issued WUPs (under 100,000 gpd or well diameter smaller than 6-inches), an undetermined amount of M/D and I/C use is not reported. Without a WUP, there is no practical way to identify small commercial operations which fall below the District's permitting threshold. For example, every fast food restaurant is actually a commercial operation, using a daily quantity of water that most likely falls below the District's permitting threshold. However, many of these small I/C operations are located in urban areas, obtain their water via the public supply system rather than wells, and will be accounted for under the demand projections for public supply.

Methodology

In gathering data for the initial RWSP in 2000 (published in 2001), a survey form was sent to all permit holders. The survey requested the permit holder supply information related to anticipated water needs at five-year intervals from 2000 to 2020, as well as existing or planned conservation measures. In addition, telephone contact was attempted with each permittee to explain the purpose of the survey. The data submitted by permittees was determined to be invalid (overinflated), and ultimately discarded. As a result, universal contact with permittees was not attempted for the 2005 update of the RWSP (published in 2006), and has not be attempted in any additional attempts at demand projection, including 2010. Projections for 2010 were developed by multiplying permitted quantity data extracted from the District's Water Management Information System (WMIS) on October 23, 2008 by the percentage of actual use for the I/C and M/D categories on a county-by-county basis. The percentage of permitted quantity used in each county was calculated by dividing total estimated county use by the county's permitted quantity in each category for the years 2001 through 2006, using data extracted from the District's yearly Estimated Water Use reports. During this six year period, 38.2 percent of M/D permitted quantities, and 42.1 percent of I/C permitted quantities were actually reported as used District-wide. However, the percentage of permitted quantity actually used in the I/C and M/D categories varies significantly from county-to-county. Table 1 displays the county-by-county percentages used to project demand in the I/C and M/D categories. When data was available, the percentage of permitted quantity actually used by each PG WUP holder was calculated and used to project water demand on a permit-by-permit basis. When individual power plant data was not available, the District-wide average use for PG was used to project water demand.

When the 2000 RWSP was completed, it was noted that "the District has experienced a tremendous amount of volatility in the number of I/C and M/D WUPs in a short period of time." Because current projections are based on all WUPs and not just those exceeding 100,000 gpd, and will include all 16 counties rather than the ten used in 2000 and in 2005, an examination of permit volatility could be misleading. Even though

they were not included in the 2005 RWSP, demand projections were developed for the northern six counties. A comparison of currently existing WUPs with those that existed when the 2005 demand projects were compiled indicates that permit volatility remains a significant factor. There were 426 WUPs as of October 23, 2008. This number includes 90 newly issued WUPs not in existence in 2005, 63 that were not captured in 2005, and 90 that existed in 2005 but have since been deleted. The total number of changes adds up to 243. This equates to a net change of 57 percent in total permits since data for the 2005 RWSP was compiled. Therefore, permit volatility must be considered when attempting to project water demand over a 20-year period. Because of permit volatility, it is conceivable, even probable, that new permits have been issued and others have been deleted or expired since October 23, 2008. Thus, the 2010 projections are based upon a "snapshot in time."

Review

The District has provided this technical memorandum and demand projection tables to water use permit staff and Industrial/Commercial, Mining/Dewatering sector stakeholders for review and comment, as each permitting staff and stakeholder may have a much more intimate understanding of the permits for which they are responsible. Upon receiving stakeholder comments, the District reviewed suggested changes and if appropriate included updates. It is important to note that as this is a long term planning effort, methodology changes based on short

term trends were not taken into account. Comments and suggested changes were only taken into consideration if they were justifiable, defensible, based on historical regression data and long term trends, and supported by complete documentation. It was during the review by regulatory staffs that questions related to entrainment quantities associated with some mining operations arose. Because mining operations generally continue whether the product being mined is saturated or relatively dry, it was decided that entrainment quantities, for the most part, were not necessary for the mining process to proceed and should therefore not be treated as a demand. Projections revised by regulatory staff are identified on Table 4: Water Demand Projections; Industrial/Commercial and Mining/Dewatering WUPs in the column labeled as *Source*. The projections were presented to and reviewed by the Industrial Advisory Committee (IAC).

The District understands and shares stakeholder's concerns of how critically important accurate demand projections are, however must comply with Chapter 373.0361, Florida Statutes (F.S.) which sets forth requirements for regional water supply planning.

Tables and Figures

Table 1 (Percentage of Permitted Quantity Used) details the percentage of water used in relation to the actual permitted quantity for the years 2001 through 2006 for both the I/C and M/D category. Pages 1 and 2 list the county-by-county data by use category for each year. Page 3 displays the six year average by county used to calculate the 2010 demand projections. Demand projections for the previous, that is, the 2005 edition of the RWSP utilized the percentage of water used in relation to the actual permitted quantity for the years 1998 through 2001. Because of permit volatility as well as changes in permitting practices and reporting requirements, it is believed that a short, recent historic use period will result in more accurate demand projections than one using more years which includes older use data.

Table 2 (Historic Usage and Water Demand Projections in 16 County Area) displays water use in the baseline year (2005), projected demand in 2010 and 2030, and the difference in water use in 2005 versus projected demand in 2030. Table 2 displays data both by use category and by planning region.

Table 3 (Correlative Data; Industrial/Commercial and Mining /Watering WUPs) lists the correlative data for all I/C, M/D, and PG water use permits for which water demand projections were developed.

Table 4 (Water Demand Projections; Industrial/Commercial and Mining/Dewatering WUPs) is closely related to Table 3, but contains 2005 usage data and water demand projections in five-year intervals from 2010 through 2030, rather than statistical data.

Figure 1 (Net Change from Baseline Year 2005 to 2030) is a map displaying the net change in water use from 2000-2025, by county.

Summary

It is expected that I/C and M/D water use will remain relatively constant or increase slightly over the twenty (20) year period from 2010 through 2030. The 5-year interval projections (2015, 2020, 2025, and 2030) assume a modest demand increase of 3 percent every five years. This projection methodology, based on percentage of permitted quantity actually used, was chosen because it proved to be more accurate in the 2000 RWSP (published in 2001) than projections based upon permittee supplied data. Also, it should be noted that development of new water sources will most likely not be needed to meet projected demand in the I/C and M/D use sector. Because this sector is currently using less than 50 percent of its permitted quantity, any increase in use would be available from already permitted quantities.

References

Final Report: Development and Reporting of Water Demand Projections in Florida's Water Supply Planning Process, Florida Department of Environmental Protection, September 2001,

Estimated Water Use reports 2002 – 2006, Southwest Florida Water Management District, July 2004, December 2006, and June 2007, July 2008, and

Water Management Information System - Regulatory Data Base, Southwest Florida Water Management District.

TECHNICAL MEMORANDUM

May 26, 2010

TO: Interested Parties

THRU: Kathy F. Scott, Manager, Conservation Projects Section
Resource Projects Department

FROM: Tammy B. Bader, Staff Water Conservation Analyst
Conservation ProjectsSection
Resource Projects Department

SUBJECT: 2010 Regional Water Supply Plan: Public Supply Water Demand Projections

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Introduction

Chapter 373, Florida Statutes (F.S.) sets forth the requirement for regional water supply planning. Under the provisions of this chapter, a Regional Water Supply Plan (RWSP) must be developed for those areas where available water supplies are not expected to meet projected demands over a 20-year planning horizon. Guidance for developing projections is contained in the publication Final Report: Development and Reporting of Water Demand Projections in Florida's Water Supply Planning Process (September 2001). This guidance document was produced by the Water Demand Projection Subcommittee of the Water Planning Coordination Group. This group includes representatives from the Florida Department of Environmental Protection (FDEP) and each of the five water management districts. Following a district-wide water supply assessment that identified water demands and existing sources, the Governing Board of the Southwest Florida Water Management District (SWFWMD or District) determined the need for a RWSP in the southern ten counties of the District, and the District produced its first RWSP in 2001. The statute requires that the determination of the need for a RWSP be made every five years. Accordingly, in 2003, the Governing Board determined the need for a RWSP existed in the same ten-county area. For the 2010 edition of the RWSP, the Governing Board directed District staff to include demand projections for all sixteen (16) counties within the District.

Purpose

This technical memorandum details those actions taken and methodologies utilized to develop the projections for the Public Supply component. The Public Supply sector includes water use associated with large water utilities (those with average annual withdrawals of 0.1 million gallons per day [mgd] or more), small water utilities (average annual withdrawal is less than 0.1 mgd), domestic self supply (residential dwellings system that are provided water from a dedicated, on-site well and are not connected to a central utility) and residential irrigation wells (these are

wells that serve the outdoor needs of individual residential dwellings that are connected to a central water utility system that serves indoor needs).

Background

Prior editions of the RWSP addressed two planning regions, the Southern Water Use Caution Area (SWUCA) and Northern Tampa Bay (NTB). Although data is still available for these two areas, the 2010 RWSP will address four planning regions encompassing all 16 counties. The Southern Planning Region includes Charlotte, DeSoto, Manasota, and Sarasota Counties; the Heartland Planning Region includes Hardee, Highlands, and Polk Counties; and the Tampa Bay Planning Region includes Hillsborough, Pasco, and Pinellas Counties. The Northern Planning Region consists of those counties being included in the RWSP for the first time, specifically Citrus, Hernando, Lake, Levy, Marion and Sumter. For the 2010 RWSP, 2005 is the starting point, or baseline year, for the purpose of developing and reporting water demand projections. This is consistent with the methodology agreed upon by the Water Planning Coordination Group. The data for the baseline year consist of reported and estimated usage for 2005, whereas data for the years 2010 through 2030 are projected demands (estimated needs).

Data and Information Sources

The methodology to develop public supply water demand projections utilizes many data sources. The District's Estimated Water Use reports (2003 – 2007) were used to gather base information for public supply water utility populations, water use, and per capita water use rates. The University of Florida's Bureau of Economic and Business Research (BEBR) publications (2006, 2008) were used to gather base year population and future county population projections. The District's geographic information system (GIS) model (GIS Associates, Inc., 2008, 2009) also incorporates a large amount of data gathered from stakeholders, enabling the District to project population at the utility service area level.

Methodology

<u>2005 Base Year Population Methods and Assumptions</u>
As a measure of consistency, all water management districts agreed that 2005 would be the base year from which projections are determined. Population and per capita water use information was obtained from historical data using previously reported data collected and analyzed by the District (described below), or from data provided as part of the parallel District effort within the RWSP process to determine the Public Supply water use projections through the year 2030. In order to project future water use it is first necessary to determine the water use for the 2005 base year or starting point. The 2005 base year population for each county was derived from the Estimated Water Use report (2005).

The large utility category contains the individual populations within the service areas of those utilities with an average daily permitted withdrawal quantity of 0.1 mgd or greater. Large utility populations were taken from the Estimated Water Use report (2005). This report is produced

using utility-supplied information, among other sources, for those utilities permitted for over 100,000 gallons per day (gpd). Table A-1 of the Estimated Water Use report (2005) contains the values used in this assessment. The values contained in Table A-1 were in some cases reported by the utility and, if not reported, developed by the District, based on past data and 2005 county population estimates from the BEBR.

Small utility populations are those populations contained in the Estimated Water Use report (2005) related to those utilities with a permitted average daily withdrawal of less than 0.1 mgd. In the Estimated Water Use report (2005), small utilities with a permitted annual average withdrawal quantity of less than 100,000 gpd are generally not reported individually. Utilities with permitted annual average withdrawal quantities of less than 100,000 gpd are typically not required to report pumpage to the District and, therefore, their service area population is estimated as described below.

Domestic self-supply is defined as that portion of the county population not serviced by either a large or small utility. County domestic self-supply populations are calculated as the difference in 2005 baseline total county population and the combined 2005 large and small utility service area populations.

For those counties not fully contained within the District boundaries, only that portion of the population within the District is included (see Table 2). The basis for population allocation is provided in Estimates of 2005 Census Populations by Political and Geographic Boundaries of the SWFWMD *(*GIS Associates, Inc., February 2008).

2005 Base Year Water Use

The 2005 Public Supply base year water use for each large utility is derived by multiplying the average 2003 – 2007 unadjusted gross per capita rate, as defined below, by the 2005 estimated population for each individual utility.

Base year water use for small utilities is derived by multiplying the average 2003 – 2007 unadjusted gross county-wide per capita rate, as defined below, by the 2005 estimated population for the additional estimated population associated with those non-reporting utilities, contained in Table 1 of the Estimated Water Use report (2005). For example, the base year water use for small utilities located within Charlotte County is derived by multiplying the average 2003 – 2007 unadjusted gross per capita rate for Charlotte County by the 2005 estimated population for small utilities.

Base year water use for domestic self-supply is calculated by multiplying the 2005 domestic self-supply population for each county by the average 2003 – 2007 residential county-wide per capita water use as defined below.

2003 – 2007 Average Per Capita Rate

The year 2001 was a relatively dry year and the year 2004 was a relatively wet year in terms of precipitation (with an annual average relative district-wide rainfall of 46.40" and 63.36"). The

relationship between public supply water use and annual precipitation amounts is typically inverse (less rain results in increased water use, largely due to outdoor water use). This is confirmed by a higher district-wide average per capita water use rate in 2001 of 126 gpd versus the district-wide average per capita water use rate of 114 gpd in 2004. Water use projections based on observed 2001 per capita rates would be higher than a reasonable average water use projection and water use projections based on observed 2004 per capita rates would be lower than a reasonable average water use projection. The per capita water use rate is the factor applied to projected population to project water demand (described below). Therefore, it is necessary for the base year per capita rate to represent water use in an average year. To address this situation, the District has calculated average five year per capita use rates for large utilities, small utilities, and domestic self-supply (using data provided in the Estimated Water Use reports (2003 – 2007), see Note 4 on Tables 3 through 18).

The unadjusted gross per capita rate used is calculated as Withdrawals + Imports – Exports – Treatment Losses divided by the Served Population. For large utilities, this information is provided in Table A-1 of the Estimated Water Use reports (2003 – 2007). For small utilities, this information is derived by dividing the sum of Withdrawals + Imports – Exports for small utilities listed in Table A-1 and Reported Water Use and Estimated Water Use in Table 1, divided by the sum of small utility population provided in Table A-1 and Additional Population provided in Table 1. Domestic self-supply per capita was taken from the county-wide residential per capita provided in Tables 2 and A-2 of the Estimated Water Use reports (2003 – 2007).

Population Projections

The District contracted with GIS Associates, Inc., to provide small-area population projections for the 16 counties entirely or partly within the SWFWMD.

The population projections made by BEBR are generally accepted as the standard throughout the state of Florida. However, these projections are made at the county level only. Accurately projecting future water demand requires more spatially precise data than the county level BEBR projections. The District projections are based on census block-level data, which is the smallest level of census geography. They are then disaggregated to land parcel data, which is the smallest area of geography possible for population studies.

MODEL OVERVIEW

This GIS based projection model used by the District projects future permanent population growth at the census block level, distributes that growth to parcels within each block, and normalizes those projections to BEBR county projections. First, a county-wide build-out model is developed from the base parcel dataset. Current permanent population is estimated and then the maximum population a county can grow is determined at the parcel level. Areas which cannot physically or lawfully sustain residential development (built-out areas, water bodies, public lands, commercial areas, etc.) are excluded from the county-wide build-out model. Conversely, the model identifies areas where growth is more likely to occur based on proximity to existing infrastructure.

Next, population growth is modeled between the current estimated population and the build-out population. Projections are based on a combination of historic growth trends and spatial constraints and influences, which restrict or direct growth.

Population growth calculations are limited by BEBR's projected growth for a particular year. BEBR develops three projections for each county: "low", "medium" and "high". The medium projection is BEBR's forecast, or most likely growth scenario. For this reason, the District's small area projections are controlled by BEBR's medium projection for each county.

The base year for the model is 2005, however an update to reflect 2008 parcel data was developed. Projections were made through the year 2030 in the following five-year increments: 2005 through 2010, 2010 through 2015, 2015 through 2020, 2020 through 2025, 2025 through 2030.

All estimates and projections coincide with April 1st of the year of the estimation or projection.

Finally, the parcel level projections are easily aggregated by any set of boundaries desired (utility service areas, municipalities, watersheds, etc.). For the District's planning efforts, parcel projections are summarized by Water Utility Retail Service Areas that the District maintains as a GIS layer.

Complete methodology, references, tables, and data sources can be found by referring to the published technical memorandums supporting the GIS Model: "The Small-Area Population Projection Methodology of The Southwest Florida Water Management District," September 29, 2008 and "Updates to The Southwest Florida Water Management District's Small-Area Population Projection Model," September 29, 2008 and April 17, 2009, GIS Associates, Inc.

COUNTY-WIDE BUILD-OUT MODELS

The County-wide Build-out Models are composed of multiple GIS data elements. Each model is based on the county's property appraiser GIS parcel database, including the associated tax roll information. Other elements incorporated into each build-out model include the 2000 U.S. Census block data, District wetland data, local government future land use (FLU) maps, and Development of Regional Impact (DRI) plans for the county of interest.

A. Parcels

GIS parcel layers and county tax roll databases were obtained from each county's property appraiser office. Parcel geometry was checked for irregular topology, particularly overlaps and fragments. Parcel tables were checked for errors, particularly non-unique parcel identifiers and missing values. Required tax roll table fields include actual year built, Florida Department of Revenue (DOR) land use code, and the total number of existing residential units for each unique parcel. In cases where values or even fields were missing, other information was extrapolated and used as a surrogate. For example, when dwelling unit information was absent,

records with the same subdivision header were tallied and applied to the existing dwelling unit count of a multi-family residential parcel.

B. 2000 U.S. Census Block Data

Some of the essential attribute information contained in the County-wide Build-out Models was derived from the 2000 Census data at the census block level of geography. Census blocks are the smallest geographic unit for which the Census Bureau tabulates data (as small as a city block in urban areas), but these entities are almost always larger than parcels. Existing and projected population occurring in parcels within a census block are assigned the average values of that block from the 2000 Census values. This census block data is utilized by the model to translate parcels to population includes total population, the average housing unit vacancy ratio, and average household size.

In cases where property appraiser data were missing or incomplete, census block-level data were used. For example, census block data includes the number of mobile homes within a block. The number of mobile homes within parcels identified as mobile home parks can then be estimated using block-level data.

C. 2000 U.S. Census Place Data

Each parcel in the county-wide build-out models was also attributed with the Incorporated Place or Census Designated Place (CDP) in which it is located. Incorporated Place includes cities or towns, and the CDP includes “a densely settled concentration of population that is not within an incorporated place, but is locally identified by a name” (U.S. Census Bureau Web Site 2007: p. http://www.census.gov/acs/www/UseData/geo.htm). These are from the U.S. Census Bureau, and they are used by the models primarily to aggregate parcels for density calculations by future land use code. (See the Average Density section below). They can also be used for quality assurance checks against population estimates from BEBR, as those are available by both County and Incorporated Place.

D. Water Management District Boundaries

Each parcel in the County-wide Build-out Models was also attributed with the SWFWMD boundaries, which enables the county-wide models for any counties split between two or more water management districts to be summarized by each water management district. Whenever shared counties are discussed, only the portion of the population within the SWFWMD is accounted for in the model.

E. Wetlands

Wetlands play a large role in modeling a county’s build-out. The District and FDEP, under the auspices of the U.S. Army Corps of Engineers, have a permit process by which wetlands can be destroyed for development. The county-wide build-out models consider the impact wetlands have on residential development. Due to its permitting authority, the District maintains detailed

GIS databases of wetland areas and wetland mitigation areas within its boundaries. These databases contains the location and spatial extent of the wetlands and wetland mitigation areas, as well as the specific types of wetlands as defined by the District's land use and land cover classification system. Certain wetland types were identified that would be difficult and expensive to convert to residential development. These areas were identified in the District's wetland database and applied to the build-out model. The wetland types include streams and waterways, lakes, marshy lakes, reservoirs, bays and estuaries, slough waters, wetland hardwood forests, mangrove swamp, mixed wetland hardwoods, cabbage palm wetland, cabbage palm hammock, wetland coniferous forest, cypress, pond pine, hydric pine flatwoods, wetland forested mixed, freshwater marshes, saltwater marshes, wet prairies, emergent aquatic vegetation, mixed scrub-shrub wetland, and non-vegetated wetland.

Using GIS techniques, wetland polygons exceeding one acre were removed from the net buildable area for parcels in the County-wide Build-out Models.

There were exceptions to this procedure. In some cases, parcels with little or no developable area were already developed, thus the wetland calculation was modified. In other cases, mapping inaccuracies of the wetlands map and/or property parcels led to modifications to the wetland calculations.

F. Future Land Use

Future Land Use (FLU) maps are essential elements of each county's build-out model, as they help guide where and at what density residential development will occur within a county. FLU maps are a part of the Local Government Comprehensive Plans required by Chapter 163, Part II, Florida Statutes. They are typically developed by the local government's planning department, or, in some cases, a regional planning council with guidance from the local government. The latest available FLU map was obtained and applied to the build-out model.

FLU classifications for residential land uses are assigned maximum dwelling unit densities (per acre) or density ranges. These ranges are intended to guide the type and density of development. However, development does not always occur at FLU guided densities. For example, a FLU classification targeted at five dwelling units per acre may only develop at 2.6 dwelling units per acre. For this reason, the build-out model reflects the 10-year average densities of the specific incorporated place or CDP instead of the FLU maximum density. The assumption is that densities over the last ten years will be a good indicator of future densities.

To allow for the accommodation of infrastructure needs such as access and water retention and detention the FLU classifications for residential land uses includes a reduction of the buildable area over five acres and under 25 acres by 10 percent and a reduction of the buildable area over 25 acres by 25 percent.

As an exception, some FLU and census place combinations have an insufficient sample size to create average density values. In these cases, the countywide average density was applied for

that FLU class. Vacant or open parcels less than one acre are considered single family residential and calculated with a population of one dwelling unit.

Each parcel feature in the build-out model received a FLU designation. In places where features overlapped multiple FLU areas, the feature was assigned the FLU class its center fell within. Build-out population was only modeled for residential FLU types. FLU classes including agricultural, low density residential, medium density residential, high density residential, and mixed use were assigned residential densities in the build-out models.

G. Build-out Density Calculation

For each county, the above data layers were overlaid with the parcel layer to assign attributes to the parcels and make the build-out calculations. For the purposes of this model, the build-out population represents the total permanent residential population (existing and future) that can inhabit a parcel. Permanent population is calculated by multiplying the parcel-level dwelling units by the census block's average persons per dwelling unit, and then multiplying that result by the census block's average housing unit occupancy.

For areas developed after the 2000 Census and where the 2000 average persons per dwelling unit may not represent the new development, the county's average persons per dwelling unit was used. An example of this is a largely undeveloped census block in 2000 that had perhaps one or two homes with an average of 4.8 persons per dwelling unit. If after 2000, a large multi-family development was built, the block-level average persons per dwelling unit would likely be too high. For this reason, the county's average persons per dwelling unit was used instead of the census block-based numbers.

H. Developments of Regional Impact

The final step in the development of the County-wide Build-out Models is adjusting build-out densities to coincide with approved Developments of Regional Impact (DRI), or other large development plans (where available). DRI plans are another component of Florida's growth management legislation required by Chapter 380, F.S. DRIs are defined by Section 380.06(1), F.S., as "any development that, because of its character, magnitude or location, would have a substantial effect on the health, safety or welfare of citizens in more than one county." The state annually updates population-based thresholds by county to determine when a development must undergo the DRI review process. For residential DRIs, dwelling unit thresholds range from 250 units (in counties with fewer than 25,000 people) to 3,000 units (in counties with more than 500,000 people). A DRI plan delineates the boundaries of a DRI, the number of dwelling units within the boundaries, and the projected timing of when these units will be built. Although DRIs often do not develop as originally planned by the developer, the total number of units planned (regardless of timing) is likely to be a more accurate control for the build-out of that DRI than the average historic densities. Therefore, in each of the build-out models, parcel features that are within a DRI are attributed with the name of the DRI. Parcels within a particular DRI are then controlled to the DRI development plan and the build-out population for that area is recalculated.

REGIONAL GROWTH DRIVERS MODEL

The Regional Growth Drivers Model is a raster (cell-based) dataset representing development potential. This model is a continuous surface of 10-meter cells containing relative values of 1-10, with 10 having the highest development potential and 1 having the lowest development potential. It influences the Population Projection Model by factoring in the attraction of certain spatial features, or growth drivers, have on development. These drivers are defined from transportation features and land use/cover types including:

1. Distance from roads grouped by four levels of use (with each road type modeled separately, additionally, one of the levels of use included limited access interchanges)(data is obtained from the Florida Department of Transportation (FDOT) Road Characteristics Inventory (RCI) Database),

2. Distance from existing residential development (data is obtained from County Property Appraiser Parcel Data),

3. Distance from existing commercial centers (selected from parcels with commercial land use codes deemed attractors to residential growth) (data is obtained from County Property Appraiser Parcel Data),

4. Distance from coastal and inland waters (data is obtained from the District's Land Cover Data), and the

5. Distance from active Developments of Regional Impact and Planned Unit Developments (PUD) (data is obtained from GIS Associates Compiled Data).

Each of the drivers listed above were used as independent variables in a logistic regression equation. Dependent variables included existing residential built after 1994 as the measure of "presence", and large undeveloped vacant parcels outside of DRIs or PUDs were used to measure "absence". The resulting equation could then be applied back to each of the regional grids resulting in a single regional grid with values of 0 through 1. These were scaled up to a range of 0 through 10 in the resulting grid, for which a value of 0 represented the lowest relative likelihood of development, and a value or 10 represented the highest relative likelihood of development.

This seamless, "regional" model covers all the counties all or partially within the District, plus a one-county buffer to eliminate "edge effects". In this case, the edge effects refer to the presence or absence of growth drivers outside the District that could influence growth within the District. This model was then used by the Population Projection Model to rank parcels in undeveloped census blocks based on their development potential.

POPULATION PROJECTION MODEL

The Population Projection Model integrates the County-wide Build-out Models and the Regional Growth Drivers Model with historic growth trends and county-level population controls from BEBR.

A. Historic Growth Trends

The historic growth trends are based on historic population estimates at the 2000 Census block level of geography. The population estimates for 1990 and 2000 are from the U.S. Census Bureau, and a 2008 estimate is derived from property parcel data summarized by census block. These estimates are used to produce six projection calculations using four different methods. The minimum and maximum calculations are discarded, and the remaining four are averaged.

The four methods utilized by the model include: Linear, Exponential, Share of Growth, and Shift Share. The Linear and Exponential techniques employ a “bottom-up” approach, extrapolating the historic growth trends of each census block with no consideration for the county’s overall growth. The Share of Growth and Shift Share techniques employ a “top-down” approach, allocating a portion of the total projected county growth to each census block based on that census block’s percentage of county growth over the historical period. Each of the four methods is a good predictor of growth in different situations and growth patterns, so an average of the four was the best way to avoid the largest possible errors resulting from the least appropriate techniques for each census block within the 16 county area.

This methodology is patterned after that used by BEBR, and is well suited for small area population projections. The details of the methods are as follows:

1. Linear Projection Method

The Linear Projection Method assumes that future population change for each census block will be the same as over the historic period. Two linear growth rate calculations were made, one from 1990 through 2008, and one from 2000 through 2008.

2. Exponential Projection Method

The Exponential Projection Method assumes that population will continue to change at the same annual growth rate as over the historic period.

3. Share of Growth Projection Method

The Share of Growth Projection Method assumes that each census block’s percentage of the county’s total growth will be the same as over the historic period. Two share of growth rate calculations were made, one from 1990 through 2008, and one from 2000 through 2008.

4. Shift Share Projection Method

The Shift Share Projection Method assumes that each census block's percentage of the county's total annual growth will change by the same annual amount as over the historic.

By their definitions, the "Share of Growth" and the "Shift Share" Methods will project census block population that will add up to the BEBR projected county totals.

5. Average of the Projection Extrapolations

The minimum and maximum of the six extrapolations are dropped to reduce errors resulting from the "worst" techniques for each census block. The four remaining extrapolations are then averaged to account for the considerable variation in growth rates and patterns over all of the census blocks within the 16 county area.

The averaging of the four remaining projection methods reduces the errors associated with using various techniques for each census block.

B. Growth Calculation Methodology

The methodology for calculating growth within the Population Model includes the following steps:

1. Apply census block-level average historical growth rate to parcels within that block.

2. Check growth projections against build-out population, and reduce any projections exceeding build-out to the build-out numbers.

3. After projecting growth for all census blocks within the particular county, summarize the resulting growth and compare against the County-wide BEBR target growth.

a. If the Model's projections exceed the BEBR target (which is unlikely), reduce the projected growth for all blocks by the percentage that the projections exceeded the BEBR target, and go on to the next time increment.

b. If the Model's projections are less than the BEBR target (which is typical due to high growth areas building out), continue growing the county using the Growth Drivers.

4. Select parcels in undeveloped census blocks with the highest Growth Driver value and develop them. (Note that most parcels are projected to completely build out in this step, which represents a five-year interval. However, some large parcels may require two or more five-year intervals to build out.) Summarize growth and check against build-out. Continue this process until the county growth target is reached.

NON-PERMANENT POPULATION PROJECTIONS

In addition to the permanent population projections generated by the Population Projection Model, projections of non-permanent population were also made. Those projections include peak seasonal population, permanent plus seasonal population (or functionalized seasonal population), tourist population and net commuter population. The methods derived by the District and implemented by GIS Associates for projecting those population types are described below. For a more detailed explanation of these methods, see the District's Water Use Permit Information Manual, Part D – Requirements for the Estimation of Permanent and Temporal Service Area Population.

A. Peak Population

Seasonal population is estimated using a combination of 2000 Census data (at the Zip Code Tabulation Area or ZCTA level) and hospital admissions data. Average 1999 - 2001 emergency room admissions data was utilized for a population cohort typical of seasonal residents (between the ages of 45 and 74).

A "Seasonal Resident Ratio" was calculated by ZCTA to estimate the proportion of peak (including seasonal) to permanent population. This 2000 Census era ratio is held constant over time when applied to future projections of population, but it will be updated with each decennial Census. The ratio was derived using the following generalized steps:

1. Subtract total 1999 – 2001 total third quarter (Q3, or July, August and September) hospital admissions from first quarter (Q1, or January, February and March) admissions.

2. Calculate the average annual difference between Q1 and Q3 by dividing above result by three.
3. Calculate a seasonal population estimate for ZCTA by dividing above difference by the general population's probability of being admitted to the emergency room.

4. Calculate the Seasonal Resident Ratio by adding the seasonal population to the permanent population and dividing that total by the permanent population.

This ratio can then be applied to future projections of permanent population to derive peak population projections.

B. Permanent plus Seasonal Population or Functionalized Seasonal Population

The functionalized seasonal population is the peak seasonal resident population adjusted downward to account for the percentage of the year seasonal residents typically reside elsewhere, and the lack of indoor water use during that time. It was calculated using the following generalized steps:

1. Determine the appropriate proportion of the year seasonal residents spend in Florida. This varies from beach destination counties (44.2%) to non-beach destination counties (56.7%).

2. Develop a seasonal resident adjustment based on average per capita water use.

a. The six-year (1996 – 2001) District-wide average per capita use is 132 gallons per person per day, and 69.3 (1999) is estimated indoor per capita use.

b. The adjustment factor is calculated using the following equation for "beach destination" counties (Charlotte, Manatee, Pinellas and Sarasota):

((0.442 x 132 gpd) + ((1 – 0.442) x (132 gpd – 69.3 gpd) / 132 gpd = 0.707

c. The adjustment factor is calculated using the following equation for "non-beach destination counties":

((0.567 x 132 gpd) + ((1 – 0.567) x (132 gpd – 69.3 gpd) / 132 gpd = 0.773

3. Calculate "functionalized" seasonal population by multiplying the seasonal population by the appropriate seasonal resident adjustment factor for the particular county (0.707 or 0.773).

4. Calculate total functional population by adding the functionalized seasonal population to the permanent population.

5. Calculate ratio of census era functional population to permanent population.

6. Apply above ratio to future projections of permanent population to derive functional population projections.

C. Tourist Population

The tourist population projections were based on 10 years (1998 – 2007) of county level lodging room data from the Florida Department of Business and Professional Regulation (DBPR). This data was used to extrapolate a linear trend for the increase in rooms by county. This linear trend was then applied to existing lodging facility locations. This projection on future rooms was then converted to tourist population by applying county level average unit occupancy and party size ratios developed by the District.

D. Net Commuter Population

The net commuter population projections were based on net commuter data from the 2000 Census at the tract level. A census era ratio was developed by tract of net commuters to permanent population. This ratio was then applied to future projections of permanent population to derive projections for net commuter population. That population was then "functionalized" with the following ratios:

1. 8 / 24 (typical working hours per day)
2. 5 / 7 (typical working days per week)

By applying both of these ratios to the net commuter population, the resulting functional net commuter population is 23.8% of the actual net commuter population. This functional number better reflects the water use that is expected for net commuters.

SUMMARIZE BY UTILITY SERVICE AREAS

The parcel-level results are then summarized by water utility retail service area boundaries for all utilities District-wide that average 0.1 mgd or greater of total water use. These boundaries, maintained by the District, are overlaid with each county's parcel-level results, and each parcel within a service area is assigned a unique identifier for that service area. The projected population can then be summarized by that identifier and joined to the District's potable service area database to produce tabular or GIS output.

Spatial Incongruity of Boundaries

Due to mapping errors, the service area boundaries do often bisect parcel boundaries. However, the error associated with this spatial incongruity at the parcel level is inconsequential. (This is one of the benefits of disaggregating census block-level data to the parcel level.) Parcels are deemed to be within a given service area if its center point (or "centroids") falls inside the service area boundary. The percentage of parcels erroneously attributed or excluded from a service area by this process is insignificant.

FINAL RESULTS

The final results are provided in tabular format (Microsoft Excel spreadsheet) and GIS format Environmental Research Systems Institute's (ESRI's file based geodatabase). The utility-level spreadsheets were distributed by District staff to utilities for comparison with their own and/or other projections for their service areas. If there are discrepancies, the spatial results (each county's parcel-level population layer) are useful in that they graphically depict projected patterns of future growth. The spatial data is available for download from GIS Associates' server via File Transfer Protocol (FTP).

The population projections detailed in Tables 3 – 19 are the sum of the functionalized seasonal population, the net commuter population and the tourist population. It should be noted that only positive net commuters were aggregated, service area with negative net commuters were not penalized.

There are some uncertainties with the model projections and in some instances the projections detailed in Tables 3 – 19 may not match the raw model output in the tabular format (Microsoft Excel spreadsheet) and the GIS format (ESRI's file based geodatabase). As the parcel level projections are summarized by water utility retail service area boundaries, if the service area is incorrect or includes domestic self supply population that is not delineated as self-served the aggregated population could be less than or greater than what the utility is actually projected to serve. Upon review and identification of such cases (including stakeholder input), the functional

population for such instances was revised to reflect the correct service area boundaries and/or reduction of domestic self supply.

Water Demand Projections

Water demand projections are calculated for the years 2010, 2015, 2020, 2025 and 2030. To develop these projections, the District used the 2003 – 2007 average per capita water use rate and applied it to the projected populations, described above. For example, in Pasco County (Table 14), the 2003 – 2007 average per capita rate for small utilities was 110 gpd. For future year water demand projections, the projected population for small utilities is multiplied by the 2003 - 2007 average per capita rate of 110. For example, in the year 2010, the service population of small utilities in Pasco County is projected to be 36,535; to develop the estimated demand for that same year and population, 36,535 is multiplied by 110, for an estimated small utility demand in the year 2010 of 4 mgd. (Rounding may account for nominal discrepancies.)

Water demand projections included in the attached tables are generally consistent with water use projections provided in the District's 2005 Regional Water Supply Plan. Of the 16 counties within the District, water demand projections in Sumter County reflect by far the largest change from the published 2005 RWSP Appendices projections. As provided in Table 18, the 2010 water use projection has changed from 17 mgd in the published 2005 RWSP Appendices to 23 mgd, or an increase of almost 37 percent in projected water demand. This is largely due to the significant and recent growth in areas such as The Villages and On Top of the World, as well as Wildwood. Other factors that have changed the projections in other counties such as Hillsborough can be attributed to the change in methodology for the per capita rate used, the change in methodology and threshold for the large utility category, and the general trend of decreases in per capita water use reported by permittees in Hillsborough County. For example, the City of Tampa's per capita water use rate was reported to be 139 gpd in the published 2005 RWSP (which uses 2000 as the base year and references utility-reported per capita water use rates from the Estimated Water Use report, 2001). Table 9, which reflects a five year average of the utility-reported per capita water use rates, provides the City of Tampa's 2003 – 2007 average per capita water use rate as 118 *gpd*. The City of Tampa's population comprises 54 percent of Hillsborough County's total population, so this decrease in per capita water use significantly impacts the county-wide projections.

This trend is consistently observed in all large utilities in Hillsborough County. The reduction in per capita water use in Hillsborough County may be attributed to a variety of factors, including indoor and outdoor conservation and source substitution. An example of source substitution is water users developing supplies separate from the utility's supply system. Such use is not reflected in the metered data submitted to the District and would usually take the form of private wells used for outdoor irrigation at residences that are connected to the central utility system for indoor water use.

1-in-10 Drought Event

The 1-in-10 "is an event that results in an increase in water demand of a magnitude that would have a 10 percent probability of occurring during any given year," (Final Report: 1-in-10-year Drought Requirement in Florida's Water Supply Planning Process, September 2001). The 1-in-10 year Drought Subcommittee of the Water Planning Coordination Group, as stated in their final report, determined that a six percent increase in demand will occur in such an event for public supply water use. Therefore, the 1-in-10 year water demand projections are the average year demands times 1.06.

Residential Irrigation Wells

These are defined as private wells smaller than 6", that do not require a District Water Use Permit, utilized for outdoor irrigation purposes at residences that are connected to and receive potable water service for indoor use from a central utility system and are addressed in a separate report titled "Southwest Florida Water Management District Irrigation Well Inventory," D.L. Smith and Associates, August 12, 2004. This report provides the estimated number of domestic irrigation wells within the District and their associated water demand. This information was updated and incorporated into the attached Public Supply demand projections, Table 21 attached. Currently the District estimates that approximately 300 gpd are used for each irrigation well. The District, in cooperation with the University of Florida, IFAS is currently undergoing a five year study to determine more accurately how much water is used for outdoor irrigation in the different regions of the District.

Review

This technical memorandum, including demand projection tables, was provided to Regulation staff and public use stakeholders for review. Comments were incorporated as appropriated. It is important to note that as this is a long term planning effort, and methodology changes based on short term trends were not incorporated, but considered as public supply population and water use is continually monitored. Comments and suggested changes were only taken into consideration if they were justifiable, defensible, based on historical regression data and long term trends, and supported by complete documentation.

The District understands and shares stakeholder's concerns of how critically important accurate demand projections are, however, the District must comply with Chapter 373.0361, Florida Statutes (F.S.) which sets forth requirements for regional water supply planning. *("Population projections used for determining public water supply needs must be based upon the best available data. In determining the best available data, the district shall consider the University of Florida's Bureau of Economic and Business Research (BEBR) medium population projections and any population projection data and analysis submitted by a local government pursuant to the public workshop described in subsection if the data and analysis support the local government's comprehensive plan.")*

Tables and Figures

Tables 1 and 2 provide permanent and functional future populations for each county. Tables 3 – 19 provide county population and public supply water demand estimates and projections on a

county-wide basis. Both average year demand and the one-in-ten drought year demands are reflected in these tables. Table 20 summarizes the information on a county-wide basis and provides public supply water demand information on the basis of SWUCA, NTB and District planning regions. Table 21 summarizes the existing irrigation wells and the exponential growth rate used to project future irrigation wells.

Summary

Overall, for the Public Supply sector, the District is expecting an increase in demand of 283 mgd by 2030 in the 16 county area. The 283 mgd increase by 2030 is distributed as follows; 72 mgd increase in the Northern Planning Region, 91 mgd increase in the Tampa Bay Planning Region, 75 mgd increase in the Heartland Planning Region, and 45 mgd in the Southern Planning Region. Even though the District is expecting an overall increase in the Public Supply sector, the projected demands have decreased from those projected in the previous 2005 RWSP. Reasons for this reduction include using a five year average per capita versus a one year per capita to project demand, more accurate utility level population projections using a GIS model that take into account growth and build out at the parcel level, and the reduction of the threshold for large utilities to 100,000 gpd permitted average versus the previous 500,000 gpd permitted average which allows for more accurate demand projections.

References

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TECHNICAL MEMORANDUM

September 8, 2009

TO: Interested Parties

THRU: Kathy F. Scott, Manager, Conservation Projects Section
Resource Projects Department

FROM: Scott D. McGookey, Staff Water Conservation Analyst
Conservation Projects Section
Resource Projects Department

SUBJECT: 2010 Regional Water Supply Plan: Recreational/Aesthetic Water Demands

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Introduction

Chapter 373, Florida Statutes (F.S.) sets forth the requirement for regional water supply planning. Under the provisions of this chapter, a Regional Water Supply Plan (RWSP) must be developed for those areas where available water supplies are not expected to meet projected demands over a 20-year planning horizon. Guidance for developing projections is contained in the publication Final Report: Development and Reporting of Water Demand Projections in Florida's Water Supply Planning Process (2001). This guidance document was produced by the Water Demand Projection Subcommittee of the Water Planning Coordination Group. This group includes representatives from the Florida Department of Environmental Protection and each of the five water management districts. Following a district-wide water supply assessment that identified water demands and existing sources, the Governing Board of the Southwest Florida Water Management District (District) determined the need for a RWSP in the southern ten counties of the District, and the District produced its first RWSP in 2001. The statute requires that the determination of the need for a RWSP be made every five years. Accordingly, in 2003, the Governing Board determined the need for a RWSP existed in the same ten-county area. For the 2010 edition of the Regional Water Supply Plan, the Governing Board directed District staff to include demand projections for all sixteen (16) counties within the District.

Purpose

The District's water use has been categorized as Agricultural, Recreation/Aesthetic, Public Supply, Industrial/Commercial, and Mining/Dewatering water uses. This memo details those actions taken and methodologies utilized to develop the projections for the Recreational/Aesthetic demand component of the RWSP. The Recreational/Aesthetic category includes the self-supplied freshwater used for the irrigation of golf courses, cemeteries, parks, and other large-scale landscapes. Golf courses are the major users within this category. The Water Demand Projection Subcommittee (2001) identified 0.5 million gallons per day (mgd) as the reporting threshold for all golf courses and others in the category. The threshold for the Recreational/Aesthetic category in this RWSP includes all permitted, reported, or otherwise identified uses because most golf courses and others in this category are below the identified 0.5 mgd threshold.

Background

Prior editions of the RWSP addressed two planning regions, the Southern Water Use Caution Area (SWUCA) and Northern Tampa Bay (NTB). Although data is still available for these two areas, the 2010 RWSP will address four planning regions encompassing all 16 counties. The Southern Planning Region includes Manasota, Sarasota, DeSoto, and Charlotte Counties; the Heartland Planning Region includes Polk, Hardee, and Highlands Counties; and the Tampa Bay Planning Region includes Pasco, Pinellas, and Hillsborough Counties. The Northern Planning Region consists of those counties being included in the RWSP for the first time, specifically Hernando, Citrus, Levy, Sumter, Lake, and Marion counties. For the 2010 RWSP, 2005 is the starting point, or baseline year, for the purpose of developing and reporting water demand projections. This is consistent with the methodology agreed upon by the Water Planning Coordination Group. The data for the baseline year consist of reported and estimated usage for 2005, whereas data for the years 2010 through 2030 are projected demands (estimated needs).

Data Sources

District rules require a water use permit (WUP) for uses where the withdrawal during any single day is one million (1,000,000) gallons, if the average annual daily withdrawal is equal to or greater than one hundred thousand (100,000) gallons per day (gpd), or if the withdrawal is from a well having an inside diameter of six inches (6") or more. WUPs are required for many of the golf courses. Information on these permitted golf courses comes from the Districts WUPs file of record. Annual golf course pumpage data is acquired from the WUPs database. Many golf courses do not meet the reporting criteria, so additional efforts were required to obtain data from other sources. These other sources include the National Golf Foundation (2007), the internet, and contacting the golf courses directly.

Sources for aesthetic use include water use data from the District's Estimated Water Use Reports (EWUR) for the years 2003 through 2007. Population data was obtained from the 2010 RWSP Public Supply Water Demand Projections Technical Memorandum (2009) and is based on the University of Florida's Bureau of Economic and Business Research (BEBR) medium population projections and any population projection data and analysis submitted by a local government.

Methodology

Golf Courses

Golf course demands are based on the average water use per golf course hole by county and a projection of golf course growth. The attached Table 1 uses the average golf course pumpage from 2003 through 2007, for permitted golf courses in the District, to calculate the average gallons per day per golf course hole. The pumpage was derived from the District's Regulatory database. The average annual pumpage per golf course hole is shown by golf course and by county. The county average was used to estimate future demand. Some pumpage data was not used due to inconsistencies in the data. A minimum of three years of good pumpage data was required to include the data from each golf course. The use of reclaimed water had an impact on the average use per golf course hole and was not used to calculate the average use. Permits using reclaimed water are highlighted in purple. Only the surface water and ground water pumpage was used to determine the average use per golf course hole for those golf courses that utilized reclaimed water. The historical number of golf course holes was derived from the National Golf Foundation database (2007), the internet and data in the District's permit

file of record (WMIS, 2006). Some golf courses' were contacted to verify information such as the year opened and number of current golf course holes. From this data, the historical growth of the number of existing golf course holes was used to forecast future growth. In order to forecast the average growth of golf course holes, a linear regression was performed using the historical golf course data in each county and that trend was used to project their growth to the year 2030. Although there are variations from year to year and from county to county, there is a general upward trend in the growth of golf course holes. The average annual use per hole by county was multiplied times the future growth in golf course holes to project future demands. The golf course water use growth projections by county, using the average gallons used per hole from Table 1, are shown in Table 2. This translates to a needed increase in supply of 27.8 mgd to meet the golf course irrigation needs out to 2030. This is the same method used in the 2005 Regional Water Supply Plan (published 2006). Changes made to improve the 2010 Demand estimates include an intensive effort to identify and gather data on the golf courses within the District. A master list has been created that has all the permitted and non-permitted golf courses found in the District. We feel that more comprehensive golf course data, using a five year average pumpage, an intensive review of the pumpage data, has improved the demand projections.

Aesthetic

Landscape water use includes irrigation for parks, medians, attractions, cemeteries and other large self-supply green areas. For each county, per capita water use (expressed in gallons per day per person) is obtained from a five year average (2003 to 2007) of the published estimated landscape water use from the District's EWUR. Estimates of population growth from 2005 to 2030 were obtained from the 2010 RWSP Public Supply Water Demand Projections Technical Memorandum (2009) and based on BEBR. These population projections were then multiplied times the per capita landscape water use to estimate aesthetic demand by county. The District's average per capita water use for green space irrigation is 6.7 gpd per person. Projections were made in five-year increments to the year 2030. The projected water use was estimated to be 50 million gallons day (mgd) for 2030 (Table 3). This translates to a needed increase in supply of 17.7 mgd to meet the landscape irrigation needs from 2005 to 2030.

1-in-10 Drought

The 1-in-10 drought event is an event that results in an increase in water demand of a magnitude that would have a 10 percent probability of occurring during any given year. The 1-in-10 year Drought Subcommittee of the Water Planning Coordination Group, as stated in their final report to the Florida Department of Environment Protection (2001), determined that, methodologies for estimating the 1-in-10 year demand high for recreational self supply are similar to methodologies used to estimate agricultural demand. The optimum irrigation requirements for the 1-in-10 year event, as opposed to the average year event, were 30 percent for golf courses and 26 percent for landscape irrigation (Table 4). The projected water use for an average year was multiplied by this percentage value to produce a projected water use for a 1-in-10 year rainfall as shown in the Summary Tables.

The 2009 demand estimates for recreational and aesthetic water have increased approximately 9 mgd from the published 2005 RWSP Report. The reasons for this increase include the following: (1) We now use more accurate information on the number of golf courses within the District. This increase in identified golf courses has resulted in more golf course holes and therefore more estimated use. (2) We have improved the quality of the pumpage information in the District's Regulatory Database. The gallons used per golf course hole are from a five year average rather than one year of data that may have been a wet or dry year. This increased the District use per golf course hole from 7,850 to 10,152 gpd. (3) The accuracy of the population

estimates continues to improved and show almost a million more people than were identified in the 2005 RWSP Report. (4) The gallons used per-capita for aesthetic use is calculated from a five year average rather than one year that may have been a wet or dry year. This increased the District per capita aesthetic use from 5.5 to 6.7 gpd. These changes have improved the quality of our estimates and portray a more accurate prediction of future demands.

Review

The District has provided this technical memorandum and demand projection tables to water use permit staff and recreational/aesthetic use sector stakeholders for review and comment, as each permitting staff and stakeholder may have a much more intimate understanding of the permits for which they are responsible. Upon receiving stakeholder comments, the District reviewed suggested changes and if appropriate included updates. It is important to note that as this is a long term planning effort, methodology changes based on short term trends were not taken into account. Comments and suggested changes were only taken into consideration if they were justifiable, defensible, based on historical regression data and long term trends, and supported by complete documentation.

The District understands and shares stakeholder's concerns of how critically important accurate demand projections are, however must comply with Chapter 373.0361, Florida Statutes (F.S.) which sets forth requirements for regional water supply planning.

Summary

The numbers of golf course holes seem to follow a moderately predictable growth rate, and when used with the average water use per golf course hole, provide a reasonable estimate of future water use. We can see that current economic conditions are having an effect on golf course growth and it is reflected by a reduced future growth rate when compared to the 2005 RWSP. The irrigation need for golf courses is considerable and it will continue to compete with other users of potable and non-potable supplies. Reclaimed water has made a definite impact on golf course water use and should continue into the future. The additional 2030 golf course demand is estimated to be 27.8 mgd. Estimated aesthetic water use, which is based on the average per capita population water use from the District's 2003 to 2007 EWURs, are projected based on population increases out to the year 2030. Aesthetic water use should continue to track changes in population. The additional 2030 aesthetic demand is estimated to be 17.7 mgd. Most Recreational/Aesthetic water use demands are close to major population centers which are good sources of reclaimed water to offset demands for potable water sources. This alternative source, which includes both wastewater and storm water reclaimed water, should be maximized to reduce demand on our potable supply. The additional 2030 Recreational/Aesthetic water use demands total 45.5 mgd.

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2010 Regional Water Supply Plan: Public Supply Water Demand Projections Technical Memorandum, 2009,

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Final Report: Development and Reporting of Water Demand Projections in Florida's Water Supply Planning Process for the 2005 Water Supply Plan. Prepared by Water Demand Projection Subcommittee and the 1-in-10 year Drought Subcommittee of the Water Planning Coordination Group; Florida Department of Environmental Protection; Northwest Florida Water Management District; South Florida Water Management District; Southwest Florida Water Management District; St. Johns River Water Management District; Suwannee River Water Management District, September 2001.