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LAKE COUNTY WATER SUPPLY PLAN EXECUTIVE FINAL REPORT

Lake County Water Supply Plan

Executive Final Report

Prepared for
Lake County Water Alliance

Prepared by
Water Resource Associates, Inc.

In association with
Biological Research Associates
SDII Global
Wendy Grey Planning

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ACRONYMS

AADF	Average Annual Daily Flow
AF	Absorption Fields
Alliance	Lake County Water Alliance
AWS	Alternative Water Supply
BMPs	Best Management Practices
CFCA	Central Florida Coordination Area
Committee	Alliance Management/Technical Committee
CUPs	Consumptive Use Permits
DWSP	2005 SJRWMD Water Supply Plan
ECF	East-Central Florida
EIS	Environmental Impact Statement
F.S.	Florida Statutes
GCI	Golf Course Irrigation
gpcd	Gallons Per Capital Per Day
gpd	Gallons Per Day
LCWA	Lake County Water Authority
LOR	Lower Ocklawaha River
MFLs	Minimum Flows and Levels
mgd	Million Gallons Per Day
NCFCA	North-Central Florida Coordination Area
OC	Other Crops
OPAA	Other Public Access Areas
OUC	Orlando Utilities Commission
PD	Preliminary Design
PDF	Preliminary Design Reports
Plan	Lake County Water Supply Plan
RI	Residential Irrigation
SJRWMD	St. Johns River Water Management District
SWUCA	Southern Water Use Caution Area
UORB	Upper Ocklawaha River Basin
WRA	Water Resource Associates
WRWSA	Withlacoochee Regional Water Supply Authority

I. Introduction

Water Resource Associates (WRA) was selected by the Lake County Water Alliance (Alliance) to develop the "Lake County Water Supply Plan (Plan)" for its member governments. The Alliance is constituted of the following jurisdictions: the Cities of Clermont, Eustis, Fruitland Park, Groveland, Howey-In-The-Hills, Lady Lake, Leesburg, Mascotte, Minneola, Montverde, Mount Dora, Tavares and Umatilla. Originally, Lake County and Astatula were members of the Alliance but withdrew during the Plan process. The City of Leesburg, acting as an administrative arm of the Alliance, contracted with WRA in May of 2006 to complete the Plan. The St. Johns River Water Management District (SJRWMD) provided funding to the Alliance for the study and has been an active participant in providing data to the study and review of work-product.

The Scope of Work outlined five objectives that must be met in order for the Plan to be successful. These included:

1. Estimating the sustainable groundwater yield;
2. Maximizing the use of Alliance member water resources;
3. Avoidance of unacceptable environmental impacts;
4. Identification of cost-effective water supply development projects; and
5. Identification of new traditional or alternative water supply development projects that will not conflict with other local government users.

The Scope of Work that WRA accomplished for the Plan was broken into three phases. Phase 1 involved project initiation and project management/administration throughout the duration of the project. Phase 2 involved the collection and assessment of existing data. Phase 3 included the identification of alternative water supply development projects, review of existing regional monitoring programs and final reporting. Groundwater modeling was originally considered as part of Phase 3 but was later cut from the scope based on consensus of the Alliance, SJRMWD and WRA.

This review and analysis resulted in the production of four (4) Technical Memorandums. Each Technical Memorandum was presented at the Alliance Management/Technical Committee (Committee) in a series of required workshops. The Committee is made up of utility directors and consultants from the Alliance members and representatives from the SJRWMD. The Technical Memorandums were also presented to the Alliance Board, which is constituted of elected officials from each of the Alliance member municipalities.

A project management system was utilized to give Alliance Committee and Board Members opportunities to review draft work product and information and data collected to base various analyses on. Utilizing this project management system, workshops and presentations the Alliance was able to give WRA input throughout the study process as Technical Memorandums were produced.

This final executive report is an overview of the analyses, findings, conclusions and recommendations from the Technical Memorandums. The Technical Memorandums are attached to the report summary as appendices. This will give the reader the ability to review the data and detailed analyses that went into the executive report, conclusions and recommendations.

1.0 Existing Plan Review

This task entailed surveying Lake County and the region's current water resource related documents. Although the Plan focuses on Lake County, surrounding counties, governments and initiatives will affect future water resource availability and development. Thus, it is essential to have an understanding of water supply development plans and initiatives in the areas surrounding Lake County and their potential influence on water supply projects currently underway or proposed for implementation. A review of existing water supply plans and other pertinent reports related to water needs and sources was carried out to fulfill this need. These reports were obtained from utilities, local governments, and water management districts directly or from their websites. Each paper was reviewed and summarized for this task. The background, objectives and conclusions of each report are detailed in each summary and included in Technical Memorandum #1 (attached).

2.0 Existing Water Use and Sources

The SJRWMD regulates water use under Chapter 373, Florida Statutes (F.S). The Plan presents an examination of existing Consumptive Use Permits (CUPs) and associated data in Lake County. This portion of the Plan does not address water demand for the County, but rather is an assessment of existing permitted or allocated quantities. These quantities are estimates of what users anticipate to be their average daily demands over the permit duration at the time of application for the permit. However, it is not uncommon for population growth to be above or below anticipated populations when permit applications were submitted, so actual water use can exceed or fall short of existing permitted quantities. Pumpage data was obtained and are presented in Technical Memorandum #2 in order to provide a general comparison between expected demand (allocated quantities) and actual demand. Allocated quantities assessed in this part of the Plan were used later (in Technical Memorandum #4) in estimating potential future groundwater availability.

Domestic self-supplied water use was not included in this analysis, as CUPs are not required for this use (although well construction is tracked by the SJRWMD). However, an analysis of demand associated with domestic self-supplied users will be presented later in the Plan along with existing and projected demand of other users in the County.

Specifically, the analysis of existing CUPs included an inventory of CUPs permitted for golf course irrigation, CUPs that include four (4) – inch wells[1], and CUPs permitted for 100,000 gallons per day (gpd) or greater. An analysis of these CUPs, including allocated quantities, spatial distribution, supply sources, use types, and pumpage data served to establish a baseline of existing permitted water use within the County and within the Alliance. Data used to complete these tasks were obtained from the SJRWMD. For more details on this component of the Plan, including spatial mapping and more detailed analyses of data and data limitations, refer to Technical Memorandum #2.

While water allocated to golf course (recreational) water uses is substantially lower in comparison to other water use categories on a countywide basis, it is useful to identify and categorize the allocated sources of water for this water use. Identification of potential opportunities for reuse water supply is a critical component of the overall water strategy. To

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[1] Since the SJRMWD does not provide allocated data by well, no analysis on water source, use type or pumpage would be representative of data directly associated with 4-inch wells. The location of 4-inch wells may be available through SJRWMD well construction permits.

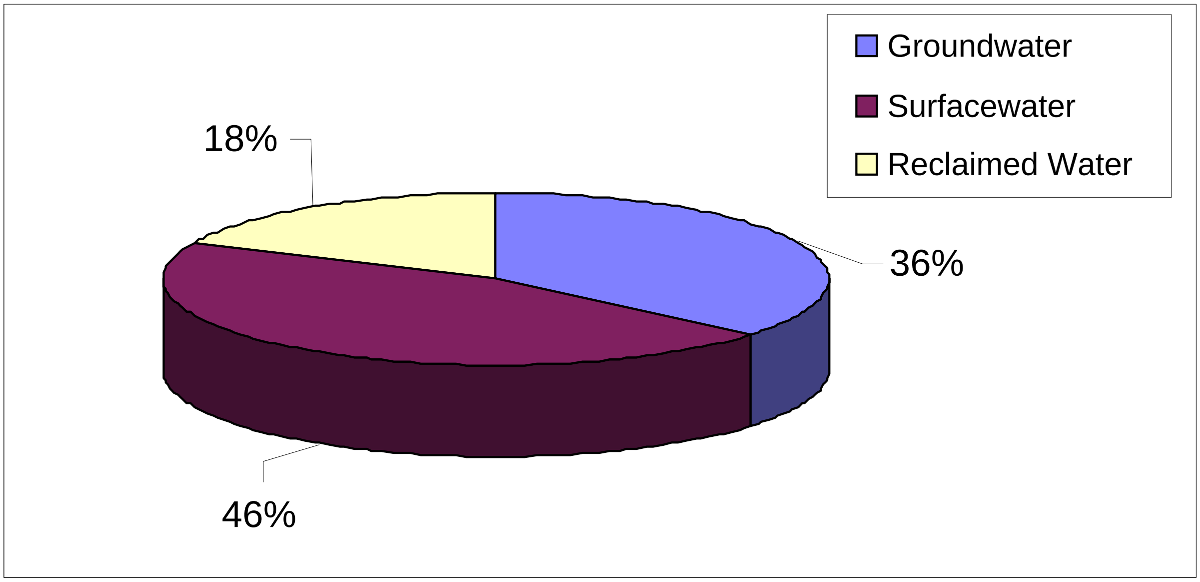
meet the needs of a growing population, the number of golf courses in the County is expected to grow over the years, and meeting these demands with reclaimed water would reduce stress on new groundwater supplies.

Approximately 5.4 mgd 36%) of allocated quantities for these permits are from groundwater sources, 6.9 mgd (46%) are from surfacewater and 2.7 mgd (18%) are from reclaimed water (Table 2-1, Figure 2-1).

Table 2-1 Lake County Golf Course CUP Allocations by Source

Source	Golf Course CUPs Allocated Quantities (mgd)	Percent
Groundwater	5.43	36.1%
Surfacewater	6.92	46.0%
Reclaimed water	2.70	17.9%
Total	**15.1**	**100.0%**

Figure 2-1 Lake County Golf Course CUP Allocations by Source



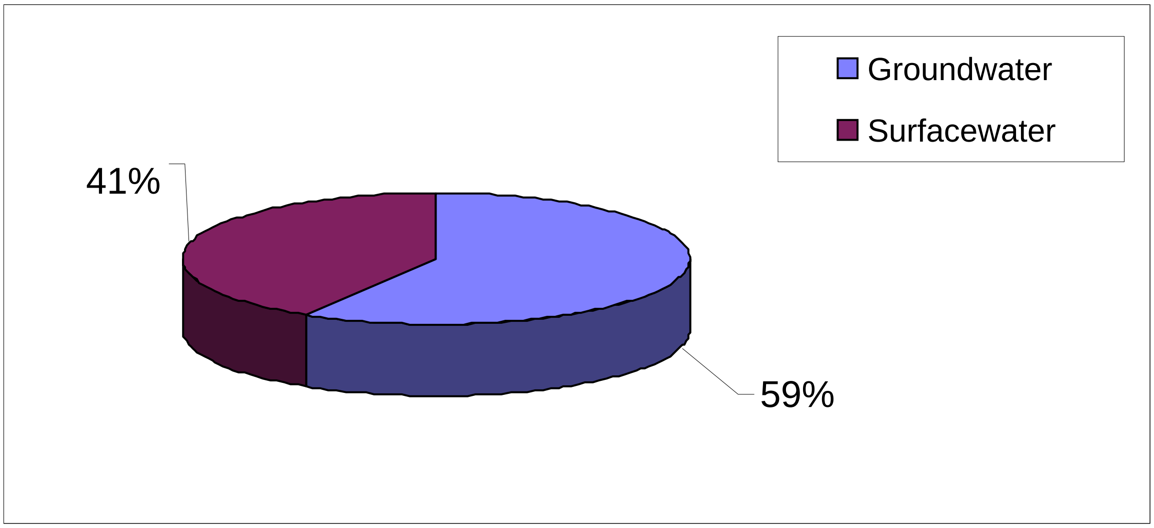
CUPs permitted for 100,000 gpd or greater are of primary interest due to the magnitude of withdrawals that could potentially impact groundwater and surfacewater supplies, water quality, environmental features and other legal water users. As previously stated, there is some overlap between 4-inch wells and golf course (recreational) permits within this data set.

Approximately 96.1 mgd (59%) of allocated quantities for these permits are from groundwater sources, and 67.9 mgd (41%) are from surfacewater (Table 2-2, Figure 2-2).

Table 2-2 Lake County Allocations for CUPs permitted for ≥100,000 gpd

Source	CUPs ≥100,000 gpd Allocated Quantities (mgd)	Percent
Groundwater	96.07	58.6%
Surfacewater*	67.9	41.4%
Total**	**164.0**	**100.0%**

Figure 2-2 Lake County Allocations for CUPs permitted for ≥100,000 gpd*,**



***Approximately 46 mgd of the mining/dewatering use is re-circulated surfacewater.**
**Does not include 0.8% public supply allocations attributed to small utilities that (allocated for <0.1 mgd public supply use type). Does not include reuse supplementation and surfacewater augmentation as these allocated quantities account for 1% of total allocated quantities.

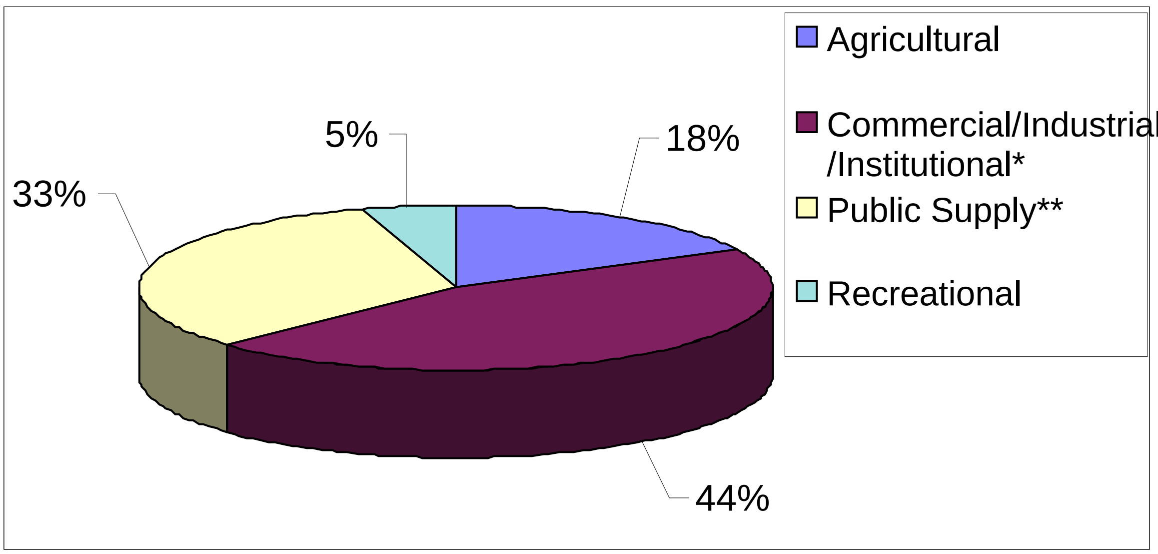
These CUPs permitted for 100,000 gpd or greater span all the water use categories, including: public supply, agricultural irrigation self-supply, recreational self-supply, commercial / industrial / institutional self-supply, and power generation self-supply. Of the total currently permitted use for these CUPs, approximately 53.5 mgd (33%) is public supply, 74.0 mgd (45%) is commercial/industrial/institutional, 7.6 mgd (5%) is recreational, and 28.8 mgd (17%) is agricultural irrigation (Table 2-3, Figure 2-3). There are no power generation CUPs in Lake County.

Of the 74 mgd for commercial/industrial/institutional, mining/dewatering surfacewater use is approximately 46 mgd. It should be noted that a majority of the water use associated with mining/dewatering is re-circulated and its use does not generally contribute to water resource limitations.

Table 2-3 Allocations by Use Type for CUPs permitted for ≥100,000 gpd

Use Type	CUPs ≥100,000 gpd Permitted Quantities (mgd)	Relative Percent
Agricultural	28.8	17.5%
Commercial/Industrial/Institutional*	74.0	45.1%
Public Supply**	53.5	32.6%
Recreational	7.6	4.7%
Total* **	**163.9**	**100.0%**

Figure 2-3 Allocations by Use Type for CUPs permitted for ≥100,000 gpd***



*Approximately 46 mgd of the mining/dewatering use is re-circulated surfacewater.

**Includes the following uses: household, essential, utility-supplied, and urban landscape irrigation.

***Does not include 0.8% public supply allocations attributed to small utilities that (allocated for <0.1 mgd public supply use type). Does not include reuse supplementation and surfacewater augmentation, as these allocated quantities account for 1% of total allocated quantities.

3.0 Potential Future Sources of Water

As was illustrated in Section 2.0, fresh groundwater, a traditional water source, is currently the main source of supply in the County, and surfacewater also provides significant quantities of water. In order to move towards identification of feasible Alternative Water Supply (AWS) projects for the Plan, it was necessary to identify and characterize both traditional and alternative future sources that may be viable to meet future demands throughout the County. These potential future sources include surfacewater, fresh groundwater, reclaimed water and brackish groundwater.

3.1 Groundwater

Groundwater, a traditional water source, is currently the main potable water supply source in the County, with fresh water from the Upper Floridan aquifer being the main source for public supply. The SJRWMD anticipates that the development of future groundwater projects will be minimal due to existing stresses on groundwater availability, which will cause a shift from traditional to alternative water supplies.

The Lower Floridan aquifer typically contains lower quality or brackish water, which does not meet potable standards due to its higher mineral content[2], although it is of higher quality in some areas of Lake County. The removal of dissolved solids to meet potable water standards results in relatively higher treatment costs than the costs of treating fresh groundwater to meet potable water standards, and thus will impose additional considerations to development as a future water supply due in part to concerns with disposal of the mineralized by-product or concentrate.

Based on the primary use of the Upper Floridan aquifer for water supply, the apparent absence of an effective confining layer between the Upper and Lower Floridan aquifers throughout much of Lake County indicates that Lower Floridan aquifer withdrawals would generally affect the potentiometric surface of the Upper Floridan aquifer. As a result, Lower Floridan aquifer withdrawals would have a similar impact to surfacewater features as Upper Floridan withdrawals and would contribute to pending groundwater resource limitations. Because of these factors, the Lower Floridan aquifer is not considered to be a viable water supply source. Additional discussion of the potential use of the Lower Floridan aquifer is provided in Technical Memorandum #3.

An estimate of groundwater availability is presented in Section 8.0.

3.2 Surfacewater

Surfacewater sources are not currently utilized for potable water supply in the County. Relative to groundwater supplies, utilization of surfacewaters for potable supply entails more sophisticated and costly means of treatment, management of variability in supply quantity and quality, and management of the associated environmental impacts to downstream ecology and water resources. However, as the County and the region continue to grow, and the use of groundwater becomes more restricted, the need for regional alternative surfacewater supplies will become an important element of the County's future growth. Refer to Technical Memorandum #2 (Section 2.8) for more information.

In addition to the these considerations, Minimum Flows and Levels (MFLs) will dictate the viability of water supply from surface water bodies and groundwater by imposing limits to withdrawals. Table 3-1 shows the surfacewater bodies that have already had MFLs adopted, and Table 3-2 shows the priority water bodies that are scheduled for MFLs. Refer to Technical Memorandum #2 for the locations of these water bodies.

[2]Chloride and sulfate concentrations greater than or equal to 250 milligrams per liter (mg/L), or total dissolved solids (TDS) greater than or equal to 500 mg/L.

Table 3-1 Adopted MFLs in Lake County

Water Body Type	Water Body Name
River	St. Johns River @ S.R. 44 near Deland
River	Wekiva River @ S.R. 46 Bridge
Spring	Messant Spring
Spring	Seminole Spring
River	Black Water Creek @ S.R. 44 Bridge
Lake	Apshawa North
Lake	Apshawa South
Wetland	Boggy Marsh
Lake	Cherry
Lake	Dorr
Lake	Emma
Lake	Louisa
Lake	Lucy
Lake	Minneola
Lake	Norris
Lake	Pine Island
Lake	Sunset

Table 3-2 Priority Water Bodies Scheduled for MFLs in Lake County

Proposed MFLs			
Water Body Type	**Water Body Name**	**Voluntary Peer Review**	**Year**
Lake	Dyches	Not Listed	2008
Lake	Mt. Plymouth	Not Listed	2008
Lake	Saunders	Not Listed	2008
Spring	Apopka Spring	Yes	2009
Spring	Bugg Spring	Yes	2009
River	Alexander Springs Creek	Yes	2011
Spring	Alexander Springs	Yes	2011
Spring	Silver Glen	Yes	2011

The three (3) principal surfacewater systems that were initially identified for the Plan as major potential water supply sources are the Ocklawaha River, St. Johns River, and the Withlacoochee River. Refer to Technical Memorandum #2 for the contextual data on these surfacewater bodies that were gathered as part of preliminary identification of potential surfacewater sources.

3.3 Reclaimed Water

Reclaimed (reuse) water is characterized in the Plan as a current and future non-potable alternative water source. The SJRWMD typically seeks to achieve a water resource benefit with reclaimed water by:

- Using readily available reclaimed water in place of higher quality water for uses that do not require higher quality, as required by SJRWMD permitting criteria; and
- Using reclaimed water to augment water supply sources (SJRWMD DWSP, 2006).

Reuse water can be applied in a number of ways to decrease reliance on traditional water supplies, including golf course irrigation; landscape / residential irrigation; industrial use, and others (Water Reuse Program, 2006). The relative desirability of reuse applications vary, however, in terms of their potable offset and groundwater recharge potential as shown in Table 3-3.

Table 3-3 Reuse Desirability (FDEP, 2003)

Category	Desirability: Beneficial Reuse or Recharge[3]
Aquifer recharge (e.g., rapid infiltration basin)[4]	↑ **HIGH**
Golf course and landscape/residential areas irrigation[5]	
Spray field irrigation[6]	↓ **LOW**

A total of twenty-six (26) wastewater facilities in Lake County with a capacity of 22.31 mgd are currently providing 100% of their 12.9 mgd flows for reuse applications. Of this reuse flow, 4.09 mgd (32%) is applied to aquifer recharge using RIBs. Approximately 2.95 mgd (23%) of the reuse flow is classified as beneficial (residential irrigation (RI), golf course irrigation (GCI), and other public access areas (OPAA)). The remaining 5.83 mgd of flows are distributed to sprayfields (absorption fields (AF) or other crops (OC) (Figure 3-1). Refer to Technical Memorandum #2 for more extensive details on existing wastewater/reuse data.

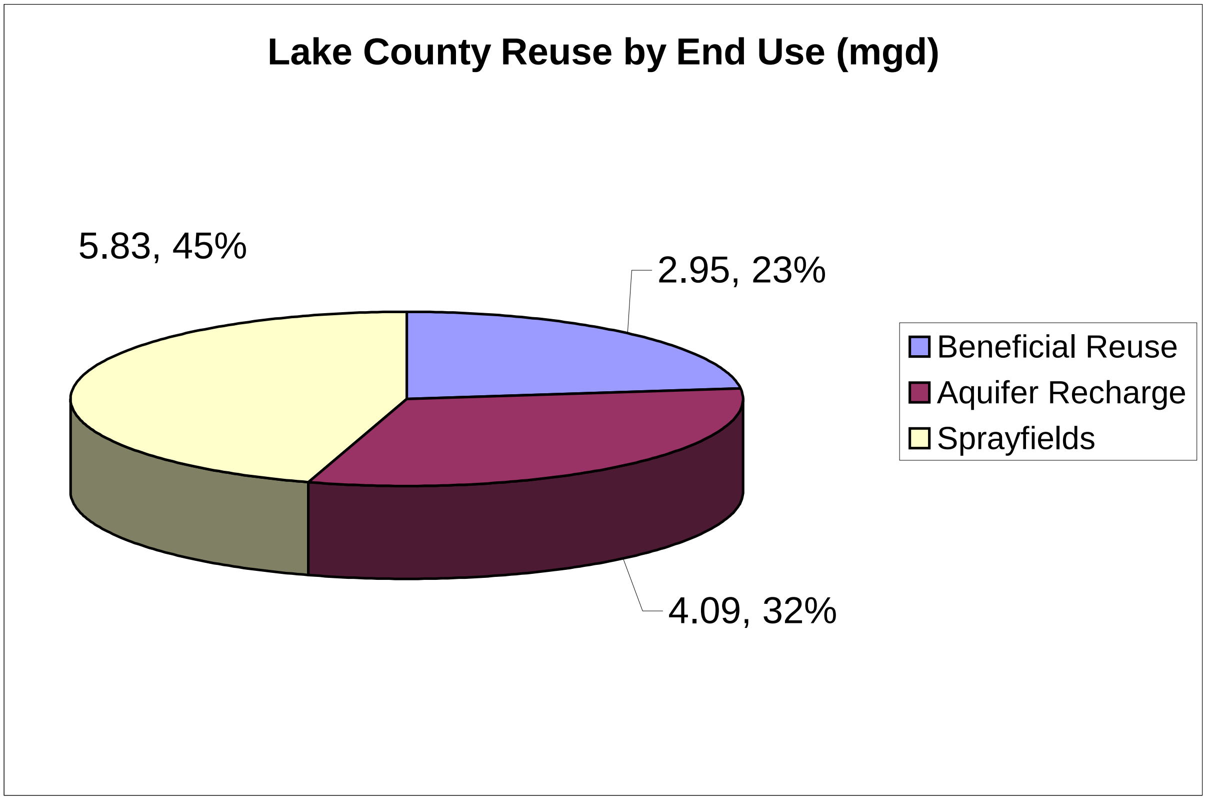
3 Florida Department of Environmental Protection, Water Reuse for Florida. 2003. “Strategies for Effective Use of Reclaimed Water”

4 Non-beneficial reuse, but considered potentially valuable by the FDEP and SJRWMD as recharge.

5 Beneficial reuse.

6 Non-beneficial reuse.

Figure 3-1 Lake County Reuse Distribution by End Use



Potential future sources for reuse water include increases in flows within existing utility service areas, the re-allocation of existing, non-beneficial reuse flows, and the new collection of wastewater from expansion of utility service. An inventory of readily available reuse projects, including those identified in the 2005 SJRWMD Water Supply Plan (DWSP), and those included in CUP technical staff reports was included in Technical Memorandum #2. The potential applicability of a more detailed infrastructural analysis of existing facilities and regional reuse projects was completed as part of Technical Memorandum #3 (also refer to Section 6.0).

3.4 Demand Reduction (Water Conservation)

Water conservation is an essential, cost effective element of water supply planning that allows for management of both existing and future water demands without requiring major capital outlays. Water conservation (demand reduction) is an important component of the Plan, in that it can extend availability of traditional and alternative future water supplies.

A myriad of conservation elements or Best Management Practices (BMP's) may be applied within a conservation program. These generally fall within the categories of watering restrictions, pricing incentives (inverted rate structures), metering, structural (plumbing and landscape) measures, and education. Watering restriction enforcement, inverted rate structures, education programs, and conservation coordinators are some of the broad, effective elements of a comprehensive conservation program for a municipality or community. Technical Memorandum #2 contains a more comprehensive description of these water conservation practices.

3.5 Stormwater

Stormwater as discussed in the context of the Plan is usually not identified as a water supply source per se, since water supply plans tend to focus on the larger supplies available in surfacewaters (e.g., SWFWMD, 2006; SJRWMD, 2006). However, stormwater is commonly utilized as a supplemental non-potable water supply source (FDEP, 2005), and additional stormwater supply projects are planned (SJRWMD, 2006; Hartman, 2006). Refer to Technical Memorandum #2 for a list of proposed reuse projects augmented by stormwater.

4.0 Potable Water Demand – Public Supply and Domestic Self- Supply

4.1 Population Projections

Population projections, and associated per capita water use rates, ultimately form the foundation for projecting future water demands. An examination of existing documents provided by the Alliance Members in addition to projections developed by the SJRWMD was performed. Population projections were not developed independently for the Plan.

Comparisons of Alliance Member demands to population estimates performed by the SJRWMD and Lake County are summarized in Table 4-1. The latest common projection year for each data source is 2025, so comparisons are made for projections in this year. A description of the population projections analyzed is contained in Technical Memorandum #3.

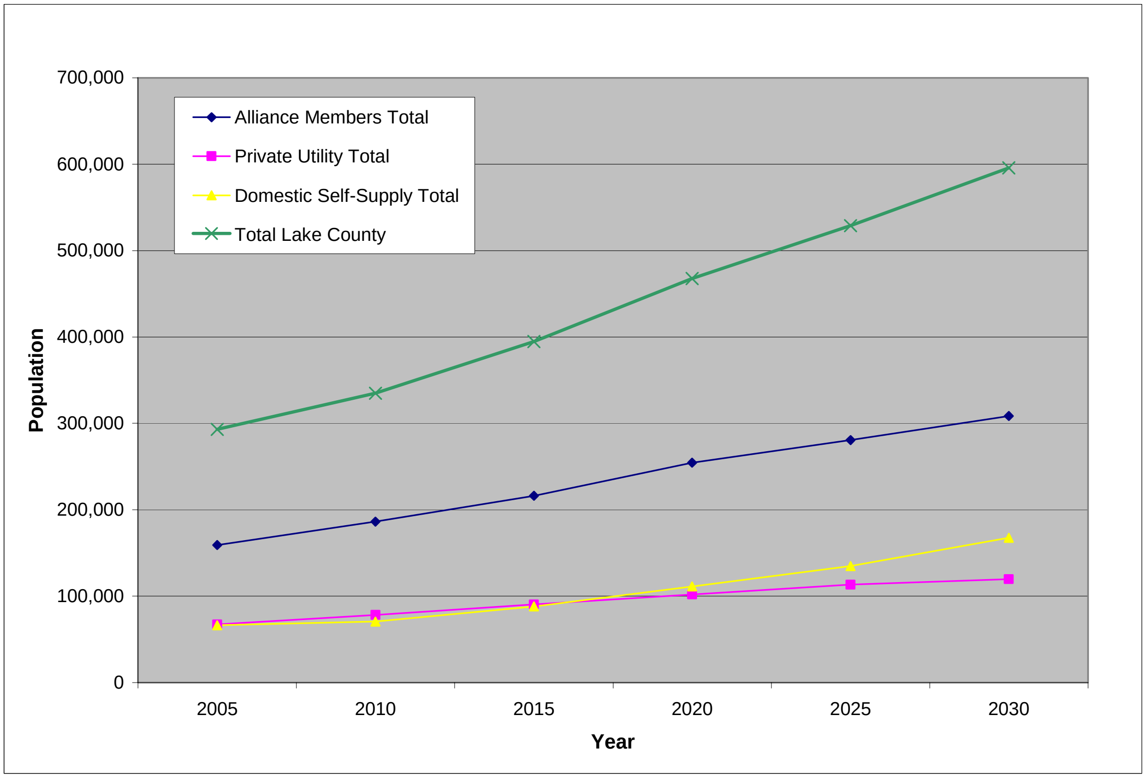
Table 4-1 Countywide Population Projections Comparison

Source	2025[7] Population Projections	Comments
SJRWMD Draft 2008 Water Supply Assessment	519,395	Based on 2007 BEBR Medium/High projections
Lake County Comprehensive Plan Update	463,500	Based on 2004 Medium/High BEBR projections and historical analysis of population growth
Lake County School Concurrency Projections	571,225	Based on individual projections prepared by each municipality – not normalized to a Countywide population projection.

The SJRWMD draft 2008 Water Supply Assessment population projections were used to develop water demand projections for the Plan. The population increase for Alliance Members over the 2005-2030 planning horizon is approximately 149,300 (a 94% increase). Private utility and domestic self-supply users were also analyzed in the Plan, as these groups are ultimately competing water users for Alliance Members. The total private utilities population is expected to increase by 52,226, and the domestic self-supplied population by 102,885. Therefore, the total non-Alliance population increase is projected to increase by 155,111, or by 132%. The total Lake County population is projected to increase by 304,411 (a 110% increase) (Figure 4-1).

[7] 2025 populations were used for comparative purposes, as it was the latest year common to all data sources.

Figure 4-1 Lake County Population Projections



Source: SJRWMD draft projections

4.2 Water Demand Projections

Public supply water demand projections were tabulated over the planning horizon from 2005-2030. Similar to population projections, these demand projections were determined by Alliance Member, private utilities, and domestic-self supply users. Independent methodologies for water demand projections were not developed for public supply water demands.

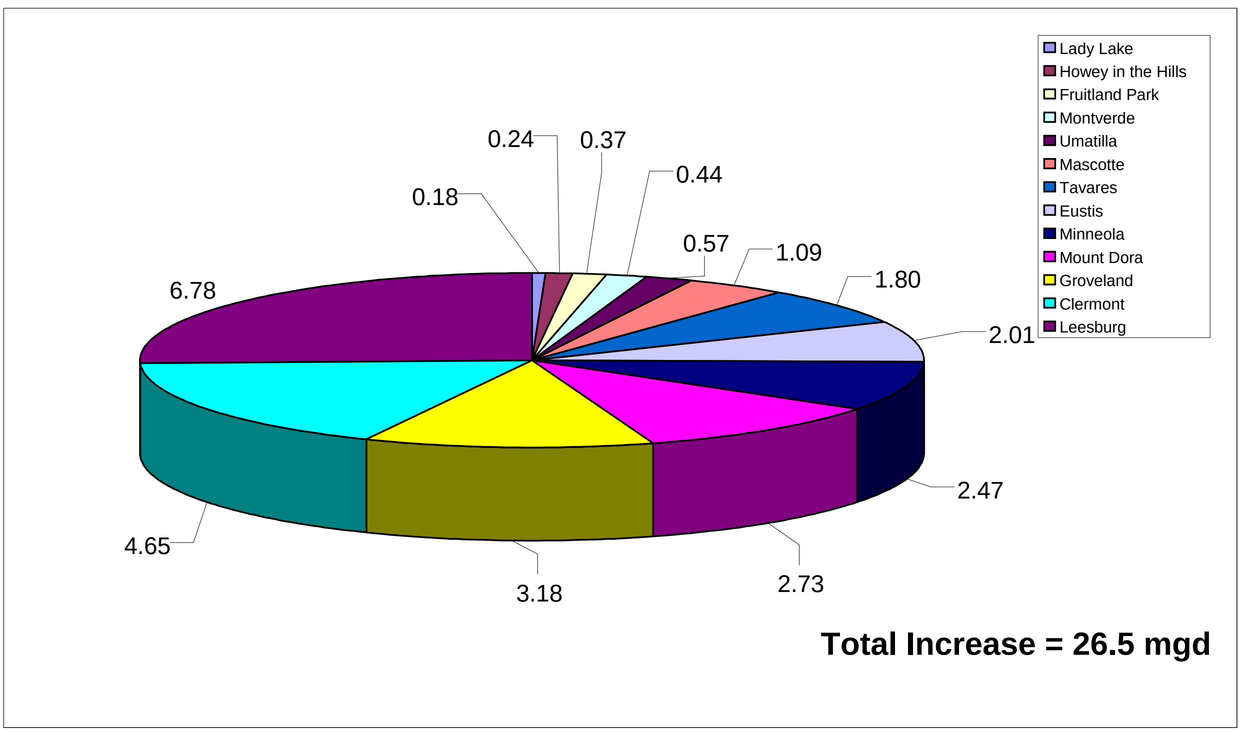
The draft demand projections developed for the SJRWMD 2008 Water Supply Assessment were determined to be the most appropriate projections available for use in the Plan. This data was selected in part due to the uniform approach employed by the SJRWMD for all Alliance Members, satisfying the need for a level playing field in terms of methodology. This "apples to apples" comparison of demands between Members is important for developing a consistent assessment for the Plan. Furthermore, projected water demands must be accepted by the SJRWMD in order to assign CUP allocations, so it is important that demand projections used in water supply planning efforts are generally consistent with demand projections developed by the SJRWMD.

While many demand projections were not independently provided by Alliance Members for the Plan, it is important to point out that some Alliance Members (e.g., Mount Dora, Minneola, and Montverde) have indicated that their demand projections are not generally consistent with the SJRWMD draft projections. A detailed review of each Member's demand projections was beyond the scope of this study, but differences in approaches to population projection calculations and methodologies for per capita rate determination are likely to contribute to these variations. In the context of the Plan, an Alliance-wide planning tool, these discrepancies do not affect the outcome to any significant degree. However, if used for other purposes, such as SJRWMD's review of future CUP applications, care should be taken and the source of these discrepancies distinguished before applying these demands on an individual Member basis.

The demand projections developed by the SJRWMD and used in the Plan do not include potential reductions in groundwater demand due to increased aggressiveness in water conservation by Alliance Members, additional groundwater offset by reuse water, or groundwater demand potentially supplied by agricultural water use shifting to potable supply water use (see discussions in sections 5.0, 6.0 and 7.0 for details on these estimates).

The total water demand increase for Alliance Members over the planning horizon is approximately 26.51 mgd (or 102%) (Figure 4-2). The total private utilities demands are expected to increase by 14.05 mgd (or 75%) and the domestic self-supply demands by 24.35 mgd (or 178%). The total non-Alliance demand increase is projected to increase by 38.40 mgd (or 118%). The total Lake County public supply and domestic self-supply demands are projected to increase by 64.91 mgd (or 111%).

Figure 4-2 Alliance Member Projected Unadjusted Demand Increases from 2005-2030 (mgd)



Source: SJRWMD draft projections

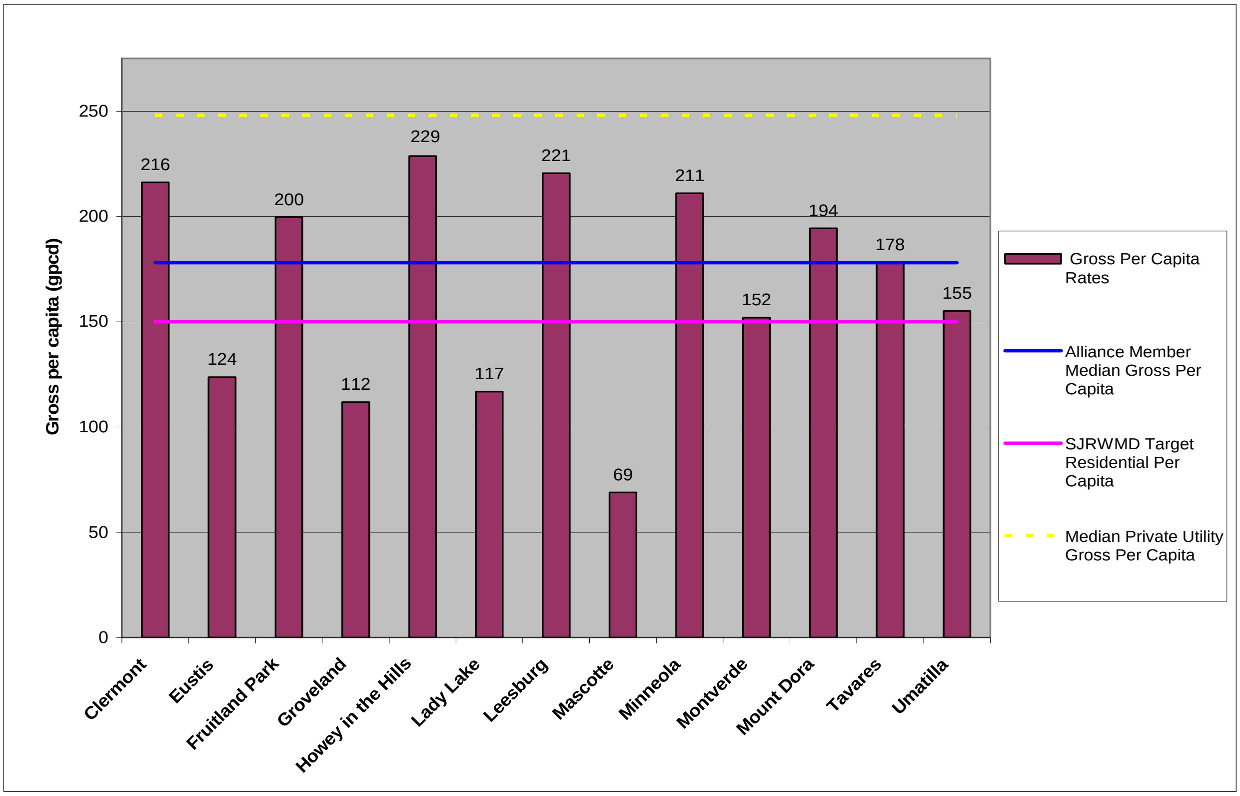
In order to determine the portion of total demand that could be met by lower quality sources, an estimate of utility irrigation demands was required based on information available from the Alliance Members. However, due to lack of data, irrigation requirements were estimated at 50% of public supply demand estimates, based on approximate estimates from the SJRWMD on irrigation water use (SJRWMD 2005). Based on this percentage, it was estimated that a 13.25 mgd (51%) increase in public supply irrigation will occur over the planning horizon for Alliance Members, a 7.02 mgd (37.5%) increase for private utilities will occur, and a 10.09 mgd (103%) increase will occur for domestic self supply. Therefore, the total estimated Lake County public supply irrigation increase over the planning horizon is 30.36 mgd. Projected reuse quantities developed for the plan (Section 6.0) could supply 50% of the total projected increase in irrigation quantities, based on the assumption that 50% of projected reuse flows will be applied beneficially. If the percent beneficial reuse rate is greater than 50%, or reuse is augmented by other sources, a greater share of these irrigation demands will be met by reuse water.

5.0 Water Conservation / Potable Water Demand Reduction

Water conservation is an essential, cost effective element of water supply planning that allows for management of water demands from existing users and new growth without requiring major capital outlays. Although water conservation applies to all water use sectors, it is particularly relevant in the residential sector, since the greatest potable water demand for water in Lake County falls under this category.

The unadjusted water demands presented in Section 4.0 - including those of Alliance Members, private utilities, and domestic self-supply users - do not include potential reductions in demand that can be realized through more aggressive conservation practices. Although individual per capita rates vary, viewing these rates from an Alliance-wide and Countywide perspective, the median gross per capita rate is a good indicator of water use trends (Figure 5-1). This rate is 178 gpcd, which is above the SJRWMD residential Districtwide goal of 150 gpcd (Hollingshead, email correspondence 6/8/2007). The removal of commercial use would show an Alliance-wide residential per capita rate closer to the SJRWMD target. However, additional conservation efforts can reduce usage below this level. A residential per capita rate of 120 to 130 gpcd is possible based on land use in Lake County comparable to other areas in Florida. The statewide residential average per capita is reported at 106 gpcd (Marella, 2004), and the SWFWMD residential average per capita is reported at 113 gpcd (Hazen and Sawyer, 2007).

Figure 5-1 Alliance Member Gross Per Capita Rates



The scope of water conservation program elements and water conservation best management practices (BMPs) employed by the Alliance Members differs by Member. A summary of the presence or absence of these BMP's is presented in Technical Memorandum #3. The effectiveness of these programs as a whole were assessed on the basis of comparing per capita rates of Alliance Members to the demands targeted by these programs. Most members have an opportunity to reduce per capita rates, and therefore water demands, through increasing the aggressiveness of existing BMPs or adding effective BMPs to their existing programs.

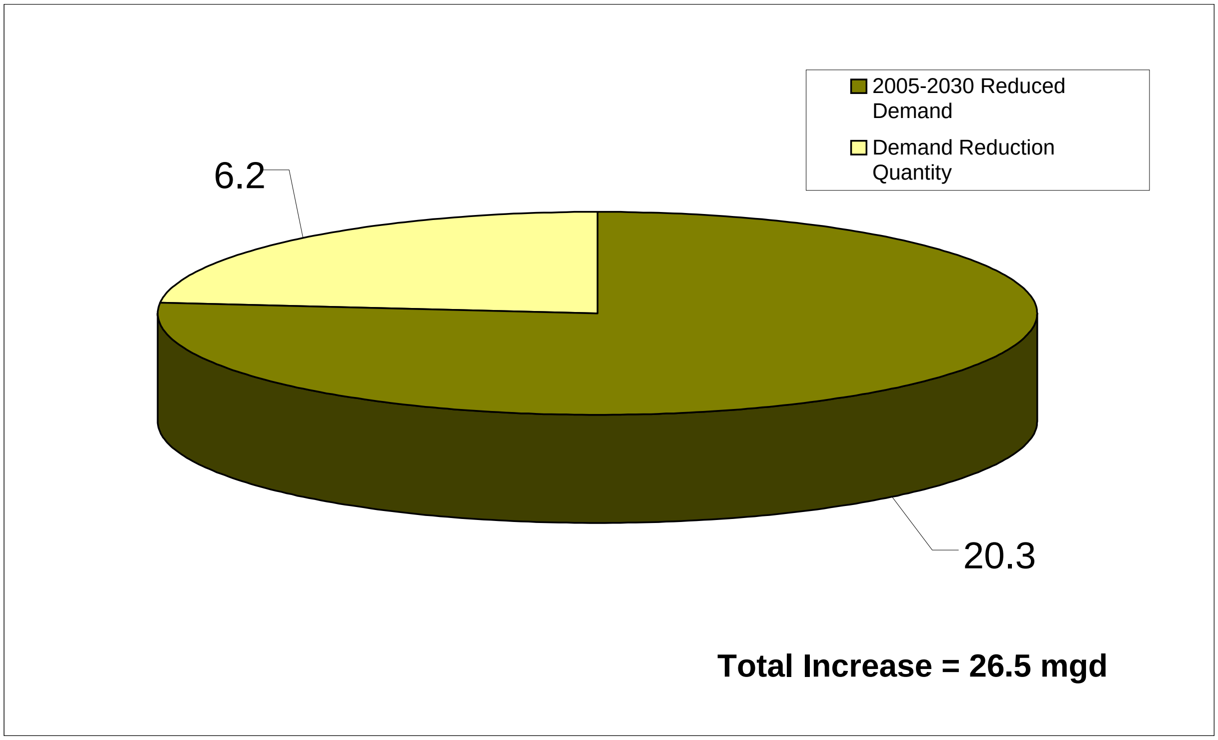
Technical Memorandum #3 includes a suite of conservation BMPs that are recommended for implementation if not already employed by a Member. However, aggressive inverted rate structures, wide-ranging education programs, dedicated water conservation staff, and watering restriction enforcement are highly effective BMPs that are emphasized and applicable to nearly all Alliance Members, as described further in Technical Memorandum #3.

A conservation review inventory was completed for Alliance Members, which is an assay of existing and proposed conservation practices. Options for expanding conservation practices in the County was completed for Technical Memorandum #2, and was compared with per capita rates and the conservation inventory to quantify potential demand reduction for Alliance Members.

The SJRWMD's Applicant Handbook (2006) for consumptive use permitting does not list reduction in per capita water consumption as a factor to be considered in determining the duration of a permit. However, aggressive inverted rate structures, wide-ranging education programs, dedicated water conservation staff, and watering restriction enforcement are highly effective BMP's that are emphasized and applicable to nearly all Alliance Members, as described in Section 2.3.1 – 2.3.3 of Technical Memorandum #3. Use of these tools can extend the length of time that groundwater is available to Alliance Members.

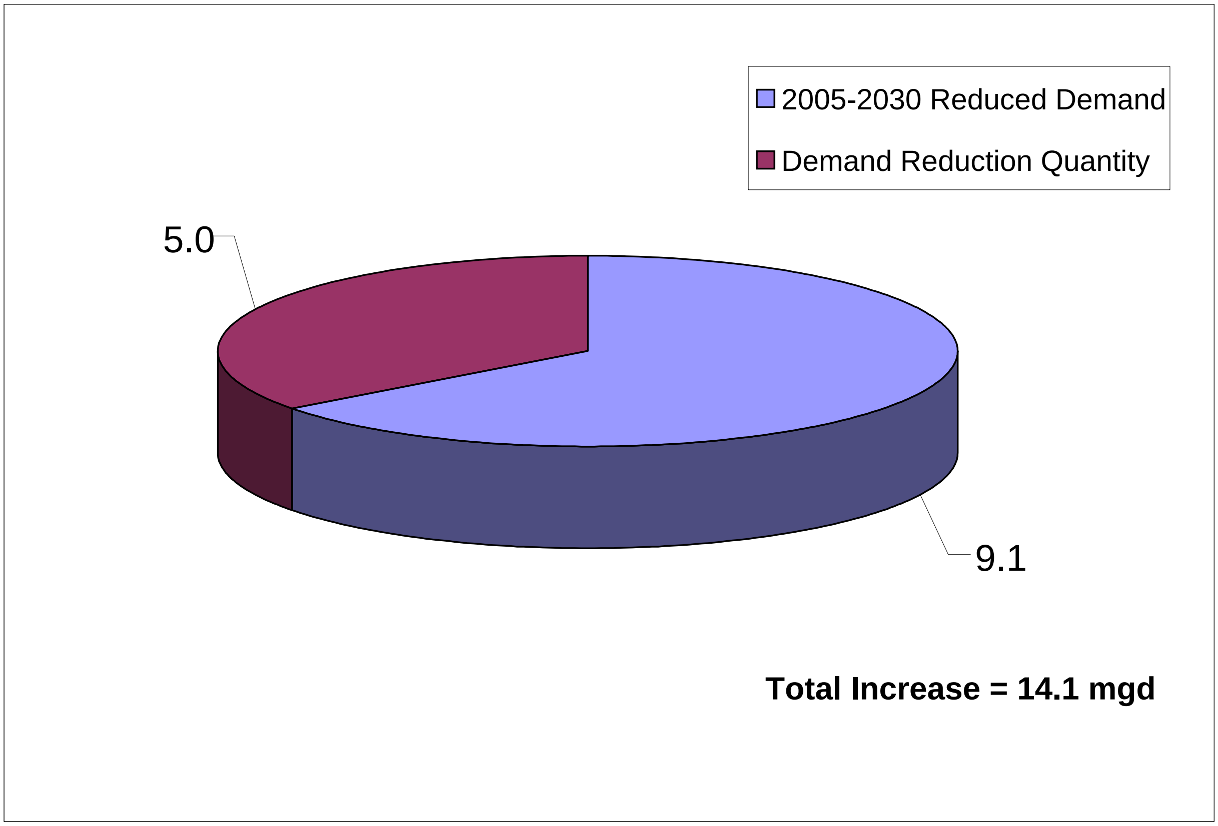
The Alliance Members can potentially reduce projected water demands by a total of 6.18 mgd over the planning horizon (Figure 5-2). This demand reduction reduces the total Alliance potable water demand over the planning horizon by 23%, from 26.5 mgd to 20.3 mgd. Section 2.4.3 of Technical Memorandum #3 details the methodology applied to calculate these potential potable water savings.

Figure 5-2 Potential Demand Reduction for Alliance Water Demands from 2005-2030 (mgd)



Private utilities can potentially reduce water demands by a total of 5.0 mgd over the planning horizon (Figure 5-3). This demand reduction reduces the total private utilities demand by 35%, from 14.1 mgd to 9.1 mgd.

Figure 5-3 Potential Water Demand Reduction for Private Utilities from 2005-2030 (mgd)



No demand reductions were established for the domestic self-supply water use category, primarily because pricing and regulatory incentives do not impact this user group. While watering restriction enforcement can be an effective conservation tool for domestic users, this user group is within the jurisdiction of the unincorporated County and the users do not fall under SJRWMD CUP regulations (although well construction is tracked). Since Lake County is not a member of the Alliance and the SJRWMD does not have regulatory jurisdiction, demand reductions are not anticipated for this user group.

6.0 Reuse Projections

Reuse applications within Lake County vary in terms of their potable water offset and groundwater recharge potential, as discussed in Technical Memorandum #2. Beneficial reuse is defined for water supply applications as reuse that replaces or offsets potable water use.[8] Since beneficial reuse replaces or offsets potable water use, it can serve future water demands.

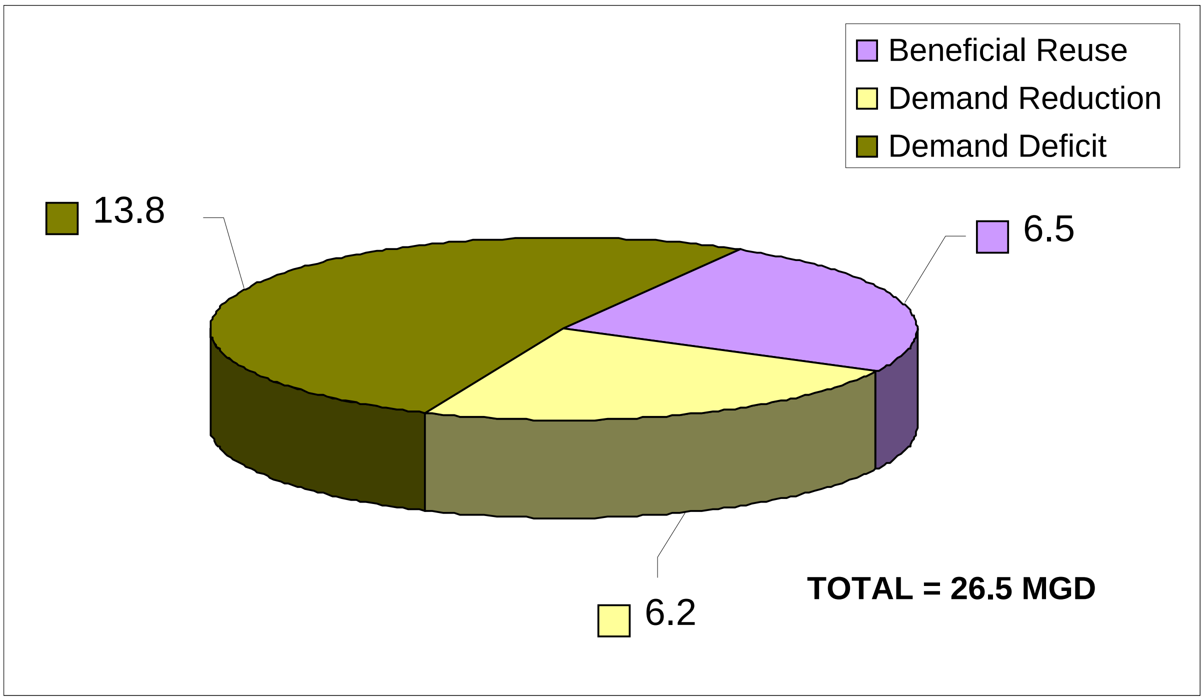
Technical Memorandum #3 developed average annual daily flow (AADF) projections to 2030 for centrally collected wastewater and associated reuse flows in Lake County. Existing reuse estimates were prepared for both beneficial and non-beneficial flows, in order to assess the amount of demand currently or proposed to be met by beneficial reuse. The existing reuse

[8] Golf course and landscape/residential irrigation are considered beneficial reuses, while aquifer recharge and sprayfield irrigation are not considered beneficial reuses.

estimates were compared with future projections to determine the beneficial reuse flows that are expected to be available to reduce or offset future potable water demands. On a Countywide basis, the beneficial reuse expected to be available was compared to the increase in future water demands to establish the outstanding supply requirement. Within the County, the outstanding supply requirement is expected to be met by a combination of groundwater and alternative water supplies.

The total projected beneficial reuse flow for the Alliance in 2030 is 10.61 mgd, which is an increase in beneficial reuse flow for the Alliance to 2030 of 6.51 mgd from 2005 (Figure 6-1). This available reuse water supply contribution would serve approximately 25% of the Alliance water demand increase from 2005 to 2030, assuming it is used as efficiently as po water. Refer to Technical Memorandum #3 for specific methodology used to calculate potential increases in beneficial reuse flows.

Figure 6-1 2005-2030 Projected Alliance Demand with Conservation and Reuse



In addition, reuse projections were developed for private utility facilities. Since many of the private utilities are much smaller than the Member facilities, their ability to treat wastewater to more costly public access standards and distribute to beneficial reuse applications is likely to be more limited.[9] Therefore, reuse distribution to beneficial applications is not anticipated for the projections unless the utility currently distributes reuse beneficially or their wastewater flow is projected to increase by more than 0.25 mgd. Total projected beneficial reuse flow for 2030 is 2.04 mgd. Total non-beneficial reuse flow is projected at 3.16 mgd. The total available increase in beneficial reuse flow to 2030 for Non-Alliance Members is projected at 1.01 mgd.

Potential Sub-Regional Cooperative Project Areas were also identified and assessed for the Plan as part of Technical Memorandum #3. Three (3) potential project areas were identified in the northeast, northwest, and southern areas of Lake County (Table 6-1). The project areas

[9] Reuse treatment requirements for different applications are summarized in Appendix B.

were developed on the basis of Member proximity to one another, and to the large surfacewater lakes in the County that may be viable supplemental sources. It was noted that stormwater can also serve as a supplemental source, particularly for project areas where lake withdrawals are not viable. However, as part of the detailed feasibility analysis completed for Technical Memorandum #4, these projects were not further reviewed due to lack of data on the potential yield of the lakes.

Table 6-1 Members Located in Cooperative Project Areas*

Northeast:	Northwest:	Southern:
Eustis	Leesburg	Mascotte
Mount Dora	Fruitland Park	Minneola
Umatilla	Lady Lake	Clermont
Tavares		Groveland

*Howey-in-the-Hills and Montverde do not have a central wastewater treatment facility and are not included in the cooperative project areas.

7.0 Agricultural Conversion

With total population growth increasing in Lake County by approximately 150% over the planning horizon, a portion of the existing agricultural land will be converted to residential or commercial/industrial land. A shift from agricultural water uses to public supply or domestic self-supply is likely to occur to help support this growth, with the procedural aspects of the shift to vary depending on the specific regulatory circumstances of the individual water users In general, this demand shift will affect future groundwater availability and could affect the water demand to be met by AWS.

In order to determine the amount of water that may be potentially available for use in other water use sectors, projections were necessary in order to approximate the quantity of water used in the agricultural sector that may be available due to the conversion from agricultural use to public supply and/or domestic self-supply use. This analysis involved an assessment of existing land within agricultural consumptive use permits (CUPs) and associated agricultural water use and allocations. Technical Memorandum #4 provides a detailed description of methodology and assumptions used in this analysis.

Three agricultural water quantity baselines were established to compute a range of potentially available groundwater from the water use shift. The actual amount of water that could be available is dependent on the extent to which public supply utilities could meet SJRWMD permitting requirements, and will also vary spatially within the County on an (Alliance) Member by Member basis. Scenario (1) assumes that the baseline quantity is the total existing water allocated to agricultural permits. Scenario (2) is based on the allocations of existing agricultural users using > 25% of their existing allocations. Scenario (3) is based on the pumped quantities only.[10] To obtain the potential groundwater quantities for each scenario, the 39% agricultural conversion factor[11] was applied, and the current proportion of groundwater (89.9%) in existing

[10] 2000-2005 average pumpage.
[11] Refer to Technical Memorandum #4

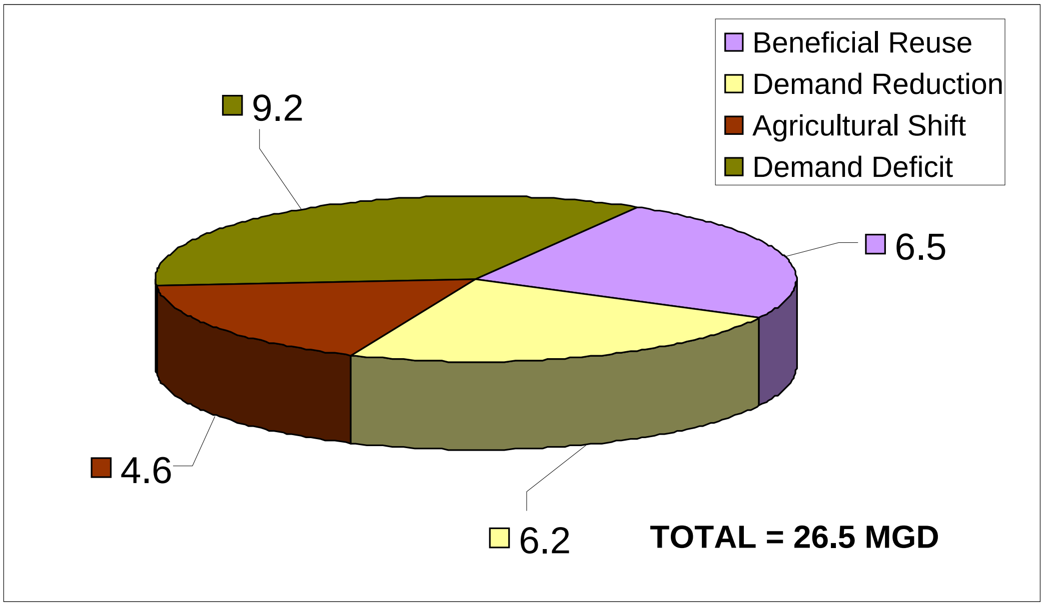
allocations was assumed to remain constant. Using this methodology, 12.09 mgd annual average is available in scenario 1, 8.47 mgd annual average in scenario 2, and 7.61 mgd annual average in scenario 3. These results are presented in Table 7-1.

Table 7-1 Agricultural Conversion Scenario Comparison

Agricultural Quantity Category Scenarios and Associated Potential Groundwater Shift			
	(1) Total Existing Agricultural Allocations (mgd)	**(2) "Active" Agricultural Allocations (mgd)**	**(3) Pumped Share of Total Agricultural Allocations (mgd)**
Baseline Quantity	34.65	24.28	21.81
Quantity with 39% Conversion Factor	13.52	9.47	8.50
Total Groundwater Potentially Available to Shift	**12.09**	**8.47**	**7.61**

Since Alliance Members account for approximately 60% of the total increase in water demand, 60% of the lower estimate or 4.6 mgd are expected to become available to Alliance Members. This estimate generally assumes that increases in water demand from private suppliers will involve expansion of their service areas to include former agricultural properties. Figure 7-1 shows the demand deficit when projected water conservation, reuse, and the conservative estimate for agricultural demand shift are considered. In contrast to conservation and reuse which are generally under the control of a single permit holder, public supply access to agricultural demand shift will require coordination between multiple permit holders under the umbrella of the SJRWMD's permitting program.

Figure 7-1 2005-2030 Projected Alliance Demand with Conservation, Reuse and Agricultural Conversion



8.0 Groundwater Availability

Section 4.0 presents the future unadjusted water demand for the Plan. However, before the feasibility of potential AWS projects could be evaluated, it was necessary to first determine amount of traditional groundwater available to meet estimated future water demands over the planning horizon (2005 – 2030). In addition to conservation, reuse, and agricultural conversion, this determination was made by exploring groundwater availability. Groundwater availability, as detailed in Technical Memorandum #4, refers to the development of an estimate of how much groundwater will be available for future use. The SJRWMD regulatory and geographic constraints and planning approaches lend different perspectives to the estimate of groundwater availability. This planning and regulatory dynamic affects the estimate of how much groundwater is essentially available for future use.

8.1 Public Supply and Domestic Self-Supply Groundwater Availability Analysis

The SJRWMD has identified 2013 as a date when groundwater sources will be regionally restricted in the Central Florida Coordination Area (CFCA). The CFCA is a region established by the South Florida, Southwest Florida, and St. Johns River WMDs to assure a coordinated and consistent approach for the areas with shared water management district boundaries. These include Polk, Orange, Osceola and Seminole counties, southern Lake County, and the City of Cocoa's public supply service area in Brevard County.

From a regulatory perspective within Lake County, the year 2013 applies to groundwater supply restrictions of Alliance Members within the CFCA (Clermont, Groveland, Mascotte and Minneola). The CFCA members cannot be supported by groundwater after 2013. This date, therefore, influences the CUP issuance for these CFCA Alliance Members. After 2013, groundwater restrictions for Alliance Members outside the CFCA (northern Alliance Members) are not directly controlled by this regulatory level. However, 2013 impact assessments using the East-Central Florida (ECF) modeling results may be applied on a case-by-case basis as a supplement in assessing the potential for harm from proposed groundwater withdrawals in addition to other factors set forth in the 40C-2 rule.

The SJRWMD's ECF groundwater model was used to establish 2013 as the date of regional groundwater restriction for the CFCA. Regional groundwater modeling will continue to play an important role in determining the groundwater availability in Lake County, but a regional limitation for Alliance Members outside of the CFCA has not yet been determined (see Technical Memorandum #4 for more detail).

It is appropriate to present data pertinent to the 2013 planning target date for all Alliance Members in the absence of a more defined regional limitation for northern Alliance Members (Eustis, Fruitland Park, Howey in the Hills, Lady Lake, Leesburg, Montverde, Mount Dora, Tavares, Umatilla). Within this defined planning framework it is also appropriate to recognize the regulatory data for each Alliance Member as applied by the SJRWMD regulatory staff, as this data used within the context of CUP processing will affect how much water individual Alliance Members will seek for alternative water supply development.

The groundwater estimates calculated here include analyses stemming from both the regulatory and planning positions. The distinctions between the two frameworks within the SJRWMD lead to a range of estimated future groundwater availability. A summary of these two approaches are summarized as follows:

> Planning: For planning purposes, AWS projects must be identified to meet the projected demands beyond 2013. In the absence of a more defined regional limitation for northern Alliance Members, 2013 is used as a basis of comparison. For purposes of water supply planning, the SJRWMD has determined 2013 to be the date after which no additional groundwater will be available in the CFCA, due to adverse impacts such withdrawals may cause.
>
> Regulatory: The Cities of Clermont, Groveland, Mascotte, and Minneola are subject to the 2013 groundwater availability constraint, as they are situated in the CFCA. The SJRWMD determined the CFCA to have regionally unacceptable groundwater impacts after 2013. Individual CUPs for the northern Alliance Members will be reviewed on a case-by-case basis, relative to potential adverse environmental impacts. Consequently, from a regulatory perspective, the current CUP allocations become an additional basis of comparison.

8.2 Lake County Groundwater Deficit Evaluation

Due to uncertainties and variation between planning, regulatory, and geographic perspectives on groundwater availability, groundwater deficits are calculated for each Alliance Member and private utility to reflect a range of potential values. The total deficit will ultimately depend on which basis is used and cannot be determined with reasonable certainty at this time.

Demand deficits (Table 8-1) were calculated on a demand basis (planning perspective) and from a CUP allocation basis (regulatory perspective). For each supplier group, demand deficits (from 2013 to 2030) were calculated based on a number of factors. Given the dualistic approach to viewing groundwater availability, two additional scenarios were developed, which are a mix of allocations and demand projections. Technical Memorandum #4 describes the methodology used to calculate these demand deficits.

Data is presented for non-Alliance or private water suppliers, because some of these suppliers are potential AWS partners to Alliance members and competing users for remaining groundwater supplies. Private utilities also tend to use more water, on a per capita basis, than do Alliance municipalities. The median gross per capita for private utilities in Lake County is 249 gallons per capita per day (gpcd), and the median gross per capita for Alliance Members is 178 gpcd. Data for domestic self-supply is also presented. Projections of these uses will influence estimates of resource availability to the public suppliers.

Table 8-1 Range of Projected 2030 Demand Deficits*

Supplier Group	Deficit by 2013 Demand Estimate (mgd)	Deficit by Current Allocation (mgd)	Low Aggregate Deficit (mgd)	High Aggregate Deficit (mgd)
Alliance Members	**16.6**	**19.7**	**13.99**	**22.31**
Private Suppliers (>0.1 mgd)	8.55	14.16	8.44	14.27
Total Public Supply	23.43	33.86	22.43	36.58
Domestic Self-Supply**	19.71	19.71	19.71	19.71
County-wide Deficit	43.14	53.57	42.14	56.29

*Does not include potential reductions in groundwater demand from conservation, reuse or agricultural demand shift.

**Domestic self-supply water use is not permitted, so the projected 2013 – 2030 deficit by demand is listed for each scenario.

As shown, if the aggregate of demand and allocation quantities are considered, the selection of a low aggregate demand deficit based on the most beneficial allocation will result in a lower public supply need for AWS. The selection of a high aggregate demand deficit based on the least beneficial allocation would result in a higher public supply need for AWS.

9.0 Readily Available Regional Alternative Water Supply

Surfacewater sources are not currently utilized for potable water supply in the County. Relative to groundwater supplies, utilization of surfacewaters for potable supply entails more sophisticated and costly means of treatment, management of variability in supply quantity and quality, and management of the associated environmental impacts to water resources due to withdrawal and potential disposal of byproducts from the treatment process. However, as the County and the region continue to grow, the need for regional alternative surfacewater supplies is likely to become an important element of the County's future growth.

9.1 Identification of Potential Alternative Water Supply (AWS) Projects

The County is in a unique location centered between three major river systems that provide the potential for significant surfacewater supply alternatives: the St. John's River to the east, the Ocklawaha River which transects the County (flowing north into Marion County), and the Withlacoochee River to the west. Initially, thirteen readily available regional alternative water supply (AWS) projects were identified along these rivers. As discussed in Technical

Memorandum #2, a preliminary screening step was performed which resulted in identification of the most viable alternatives for future consideration by the Alliance. These six projects include:

- St. Johns River Yankee Lake Project
- Lower Ocklawaha River (LOR) – (below confluence with Silver River)
- St. Johns River Near DeLand
- Lake Panasoffkee
- Withlacoochee River at Holder
- Withlacoochee River at Lake Rousseau

9.2 Development of AWS Demands

A water balance approach to evaluate the AWS project demands was developed based on the Alliance-wide 2030 demands and the potential resources to meet the demand deficit. The potential demand deficit is a variable based on the management and implementation of four key elements:

- Conservation;
- Reuse;
- Agricultural Conversion
- Groundwater Availability

Each of these elements will vary by utility, and management and implementation of each element will interface in different ways with the planning and regulatory functions of the SJRWMD.

The multiple variables that currently exist in the regional water supply planning process make it impossible to conduct a specific, detailed AWS evaluation that results in a recommendation of a single AWS project for the Alliance. Consequently, the intent is to develop an evaluation/decision matrix that will incorporate the many variables and uncertainties into a logical decision matrix that the Alliance Members can use to evaluate their individual water demands and determine which, if any, AWS projects are appropriate to a given member.

As presented in Technical Memorandum #4, there are a variety of methods to reduce the 2030 projected demand deficit in conjunction with future AWS projects. A summary of elements that can impact the demand deficit is provided as a guide. The AWS alternatives review follows.

Alliance 2005-2030 Total Unadjusted Water Demand Increase ----- 26.5 mgd

Potential Alternative Methods to Meet Demand Increase

a. Current Groundwater (Allocated) .... 7.3 mgd
b. Additional Groundwater (2013 Planning Number) .... 2.6 mgd
c. Conservation Demand Reduction .... 6.2 mgd
d. Projected Beneficial Reuse Supply .... 6.5 mgd
e. Agricultural to Residential Shift .... 4.6 mgd
Total Potential Deficit Reduction without AWS...............................27.2 mgd

9.3 Demand Projections for AWS Comparison

Recognizing the substantial variability related to the Alliance future water supply demands, each AWS was evaluated in Technical Memorandum #4 based on two levels of need:

- Demand Scenario 1 – assumes a moderate demand deficit projection of about 10 to 15 mgd. This range was selected based on assuming groundwater availability to Alliance members will be between the regulated and planning numbers discussed above, but no additional groundwater from agricultural to residential demand shift will be provided, and limited reduction from conservation and reuse will be realized.

- Demand Scenario 2 – assumes a high demand deficit projection of greater than 20 to 25 mgd. This range is based on groundwater availability to Alliance members based on current allocations (SJRWMD regulatory water use permit values) and no additional groundwater from agricultural to residential demand shift, conservation or reuse.

On an Alliance-wide basis, it should be noted that it is possible that through aggressive conservation, the projected contribution from reuse, and additional future groundwater allocations that no AWS demand will be present to 2030. However, eventually, AWS will be required to meet the growing water demands of the County.

9.4 AWS Project Evaluation

The AWS project evaluation is not only complicated by the range of potential demand deficits for the Alliance members, but also by the potential for a broad and diverse group of partners that may be interested in sharing the cost of AWS development and operation. The AWS options are evaluated based on <u>Alliance Member projected demands without regional partnerships,</u> such as Orange County or the Withlacoochee Regional Water Supply Authority (WRWSA), to create an equivalent comparison of AWS options to the Alliance. Discussion is added to summarize the anticipated benefits assuming multiple partners are found.

The Evaluation Criteria developed for this detailed AWS review includes seven (7) categories, which are described in Table 2-1 of Technical Memorandum #4. These categories include:

- Resource Availability, Reliability, and Longevity;
- Raw Water Quality;
- Permittability;
- Environmental Compatibility;
- Cost;
- Jurisdictional Complexity; and
- Location.

The feasibility for each AWS project development, using the qualitative evaluation criteria is summarized in Table 9-1. A detailed discussion of the ranking logic is included in Technical Memorandum #4. Summaries of the feasibility of each project are presented below.

9.4.1 St. Johns River Yankee Lake Project

Overall Grade

The Yankee Lake project gets high marks (B or higher) for 5 of the 7 evaluation criteria. Raw water quality and cost, however, are significant factors, which lower the overall ranking. Therefore the overall project score is C.

Grade: C

9.4.2 St. Johns River, near DeLand

Overall Grade

The DeLand AWS project gets high marks (B or higher) for 3 of the 7 evaluation criteria. The project was rated as C for the other categories, except for cost which it received a lower D score. Therefore, the overall project score is C-.

Grade: C-

9.4.3 Lower Ocklawaha River

Overall Grade

The LOR AWS project gets high marks (B or higher) for 6 of the 7 evaluation criteria. Environmental compatibility received the rating of C based on no MFLs currently established and a historical track record which is not favorable. Therefore, the overall project score is B.

Grade: B

9.4.4 Lake Panasoffkee

Overall Grade

The Lake Panasoffkee AWS project gets high marks (B or higher) for 4 of the 7 evaluation criteria when considering a lower demand projection (Demand Scenario 1). However, the high marks are reduced to 2 when considering Demand Scenario 2. In addition, permittability, environmental compatibility, and jurisdictional complexity are rated very low because of the characteristics of the lake. Therefore, the overall project score is C for Demand Scenario 1 and D for Demand Scenario 2.

Grade: C+ (Demand Scenario 1)
D (Demand Scenario 2)

9.4.5 Withlacoochee River at Holder

Overall Grade

The Withlacoochee at Holder AWS project gets high marks (B or higher) for 5 of the 7 evaluation criteria. However, cost and jurisdictional complexity are rated very low because of the need for a reservoir and crossing District boundaries. Therefore, the overall project score is C.

Grade: C

9.4.6 Lake Rousseau

Overall Grade

The Lake Rousseau AWS project gets high marks (B or higher) for 3 of the 7 evaluation criteria. However, cost, location, and jurisdictional complexity are rated very low. Therefore, the overall project score is similar to the project at Holder.

Grade: C

9.5 Alternative Water Supply Project Discussion

The considerable uncertainties involved in establishing an AWS demand, and the sheer number of possible partnership opportunities for a given AWS project, make selection of a specific AWS project difficult. A discussion of possible AWS alternatives is provided below.

Lower Ocklawaha River - The LOR AWS project appears to provide the most effective balance of evaluation criteria including resource availability, raw water quality, cost, jurisdictional complexity and location. This AWS project also is projected to be the least costly outside-County AWS project that will meet the high end of the demand range that the Alliance may experience over the planning horizon. This project also has the yield to serve long-term water needs in Lake County beyond the planning horizon. The primary weakness of the LOR project is its environmental compatibility, primarily based on the historic alterations to the river hydrology and the need to access the Ocala National Forest for transmission.

Upper Ocklawaha River Basin - In addition to the LOR AWS project, individual Alliance Members have access to several in-county lakes within the Upper Ocklawaha River Basin (UORB) which could serve as a local source of water supply. These lakes were identified in Technical Memorandum #2 as a potential AWS alternative. However, the in-county lakes were not further reviewed due to a lack of verifiable data regarding their yield.

The lakes could supply anywhere from upwards of 20 mgd to as low as 6 mgd. Actual yield determination would require hydro-biologic analyses and review of additional water use data. Clearly, the lakes could provide reuse augmentation and potentially could serve as a potable water supply. There are two significant concerns with development of the in-County lakes:

- Any yield from the lakes could be substantially reduced as upstream and downstream withdrawals are proposed and permitted. Water use in Florida is essentially “first come, first serve” as long as the use is reasonable and beneficial, does not interfere with existing legal users, and is consistent with the public interest. These three tests are unlikely to prevent upstream and downstream withdrawals from affecting available yield in the in-County lakes.

- The Lake County Water Authority (LCWA) has a relatively unique statutory authority over the in-County lakes. It includes "controlling and conserving the freshwater resources" of Lake County and improving the "streams, lakes and canals". However, the role and legal authority of the LCWA relative to water supply is unclear.

OUC Settlement Agreement - The Lake County settlement agreement approved in 2004 provides Lake County with the option to use up to 5 mgd of alternative water supply developed by OUC for the municipalities in Lake County. Since Lake County does not have a water utility, this agreement suggests that 5 mgd may become available to offset Alliance AWS demands. However, it is unclear if the Alliance has any formal standing relative to the agreement.

The Villages Settlement Agreement - The Villages settlement agreement approved in 2007 provides Lake County with a $250,000 cost-share contribution towards joint water supply planning efforts. It is unclear if the Alliance has any formal standing relative to the agreement. Additionally, the Villages has a large AWS requirement within the SWFWMD and WRWSA jurisdiction. This will complicate any joint planning efforts that are to be simultaneously funded by the SJRWMD.

Lake Panasoffkee - The Lake Panasoffkee AWS project scores well for three significant evaluation criteria: raw water quality, location and cost. This AWS project is projected to be the least costly outside-County AWS project that will meet the low end of the demand range that the Alliance may experience over the planning horizon. The primary weaknesses of this project to the Alliance are its resource availability and its location within the SWFWMD and WRWSA. This project does not have the yield to serve long-term water needs in Lake County beyond the planning horizon, and its yield could also be reduced by competing users within the WRWSA.

A graphical illustration of the viable water supply alternatives for the Alliance is shown as Figure 9-1. This illustration includes the AWS project options as well as two additional water supply options for the Alliance Members: the use of in-county lakes and the potential supply from the OUC/Lake County AWS agreement.

II. Conclusions

1. Future Demand

a. Overall unadjusted public supply water demand for the Lake County Water Alliance members will grow from 26.1 mgd to 52.6 mgd by the year 2030, an increase of 26.5 mgd. Additionally, water supply demand of other users (primarily domestic self-supply and private utilities) will continue to increase over time, creating additional competition for limited groundwater supply.

b. Domestic self-supply demand is a significant quantity of current groundwater use and will grow at a rate exceeding that of public supply. Current self-supply demand is 13.7 mgd and is expected to grow to 38.0 mgd by the year 2030. This demand is primarily within unincorporated Lake County.

c. Private utility unadjusted water demand in Lake County will increase 14.05 mgd from the year 2005 to the year 2030. Private utilities could be viable AWS partners to Alliance Members. Private utilities are also competing users for remaining groundwater supplies, and tend to use more water on a gross per capita basis than do Alliance Members. The median private utility gross per capita is 249 gpcd, and the median Alliance Member gross per capita is 178 gpcd.

d. Of the unadjusted 2030 water demand of Alliance members, the quantities required per municipality fall within widely differing ranges of need. Of the thirteen (13) municipalities of the Alliance three (3) fall below 0.5 mgd of future water demand; one (1) requires 0.57 mgd and the remaining nine (9) communities require 1.0 mgd or greater ranging up to 6.78 mgd.

2. Conservation and Reuse

a. On an Alliance-wide basis, beneficial reuse will continue to provide a significant contribution to water supply needs. The Plan estimates that beneficial reuse currently provides, or is proposed to provide, 4.1 mgd. Over time, the Plan estimates that an additional 6.5 mgd of beneficial reuse will become available.

b. On an Alliance-wide basis, there are significant opportunities for demand reduction due to increased conservation efforts beyond that currently required by the SJRWMD. The Plan estimates that a demand reduction of 6.2 mgd could be achieved by the year 2030. The primary tools that could be used to achieve this reduction include moderately aggressive conservation rate structures, moderately aggressive watering restriction enforcement, and increased education efforts.

c. Aggressive conservation and increasing the beneficial use of reclaimed water by member governments can significantly reduce future water demand quantities. These reductions could be used to lessen the short-term demand for alternative water supplies or to extend the time of groundwater availability by flattening the water demand curve.

3. Potential Future Sources of Water

Groundwater Availability

a. Groundwater is currently the main water supply source within Lake County making up approximately 58% of the total permitted capacity greater that 100,000 gpd. The remaining 42% is composed of surfacewater, much of which is used in recirculating mining applications and its use does not generally contribute to water resource limitations. The SJRWMD anticipates that additional groundwater development will be minimal due to existing stress on the groundwater system. However, groundwater is available to Alliance Members located outside of the CFCA, but the extent of its availability has not yet been determined.

b. There is also potential for a significant groundwater contribution to public supply as agricultural water uses convert to residential uses over time. The Plan estimates that 7.6 mgd of groundwater may become available to public supply by the year 2030. Public supply access to this groundwater will require coordination between multiple permit holders under the umbrella of the SJRWMD's permitting program.

Alternative Water Supplies

c. Surfacewater in and around Lake County appears to be a viable alternative to groundwater sources. However, due to seasonal flow and level fluctuations in the surfacewater system storage can be a major consideration in project development. Establishment of Minimum Flows and Levels by the Southwest and St. Johns River Water Management Districts can also constrain the availability of surfacewater. Surfacewater is also more difficult to treat due to higher concentrations of biological and organic contaminants.

d. Reclaimed water development and use can play a major role in reducing future water supply demands. Lake County governments are utilizing reclaimed water for water supply relatively effectively. However, there are opportunities for augmentation of existing reuse supplies and an increase in the supply of lower-quality water to serve non-potable demands.

4. Alternative Water Supply Development

a. With continued population growth in Lake County and pending resource limitations to traditional groundwater supplies, AWS will clearly be required in Lake County either within and/or beyond the planning horizon.

b. Large, regional-scale alternative water supply projects have been identified by the SJRWMD and conceptual designs have been prepared. Facilitation efforts are ongoing at the SJRWMD to identify a lead municipality and partners to prepare preliminary design reports (PDR) for these projects. The SJRWMD has prepared order-of-magnitude cost estimates for each project and developed a consistent methodology to distribute the costs associated with each project.

c. Large, regional-scale alternative water supply projects have been identified by the Withlacoochee Regional Water Supply Authority (WRWSA), which includes Citrus, Sumter, and Hernando Counties within the SWFWMD, and the City of Ocala. Conceptual designs for these projects are underway with facilitation efforts to follow in late 2007.

d. The process of developing AWS projects for municipalities within Lake County will be a complex and expensive process involving capture, storage, transmission and treatment costs. This impact is particularly great to the communities that are either close to build-out or have very low projected growth anticipated. Partnerships with other municipalities are highly significant factors in determining the actual cost of AWS development.

e. The approved Orlando Utilities Commission (OUC) and Villages settlement agreements with Lake County have significant potential to support or provide alternative water supply to Lake County Alliance Members.

f. The current CUP requirement for AWS participation per municipality varies. Of the thirteen (13) Alliance municipalities, four (4) are not currently required to participate in AWS planning efforts.

5. Water Supply Management

a. Present water supply strategies cannot be solely relied upon to meet the long-term water demand in Lake County. With continued population growth, development of water supply strategies both locally and regionally will be required to satisfy future water supply needs. These strategies will require integrated consideration of groundwater availability, conservation and reuse, and alternative water supply development.

b. The CFCA is an area established by the WMDs to assure a consistent planning and regulatory water supply approach for a multi-jurisdictional area that is rapidly approaching the limit of available groundwater. The Alliance Members located within the CFCA are Mascotte, Groveland, Clermont, and Minneola. As a result, water supply development for these Alliance Members may occur in a different planning and regulatory context than that of other Alliance Members.

c. A North-Central Florida Coordination Area (NCFCA) was recently proposed by the SWFWMD and the SJRWMD. The draft borders of the NCFCA encompass the Alliance Members not located within the CFCA. Since there are potential water supply partners that are geographically close to Alliance communities but are physically located in the SWFWMD jurisdiction, establishment of the NCFCA as a planning area could provide additional partners to Alliance Members for water supply development.

III. Recommendations

The development of the Plan is a watershed moment for municipalities in Lake County. Its production recognizes the pending resource limitations to traditional groundwater supplies. The Plan identifies an interrelated suite of technical, economic, and socio-political issues that must be effectively managed to ensure future water supply at reasonable cost.

The formation of the Alliance and the subsequent development of the Plan recognize that coordinated water supply planning can assist in managing the complex issues associated with future water supply. However, the Plan is only an initial step towards serving the future water supply needs of Lake County. Implementation of the Plan must be considered, with limited Member resources available with which to pursue water supply initiatives. The dual nature of the Alliance as a single planning entity composed of many independent Members increases the complexity of its implementation.

The complex issues associated with water supply development in Lake County acknowledge that multiple perspectives on a given water supply issue will be present, and that there is no simple, single way to meet future water supply needs. As such, the Plan recommendations are provided as a series of menu options: they are designed to merit consideration individually, and to serve as building blocks towards the development of an integrated water supply strategy or strategies on a municipality by municipality basis or on a regional basis with multiple partners.

The content of the Plan and the current status of water supply in Lake County call attention these general areas of consideration:

- Groundwater Availability
- Conservation and Reuse
- AWS Development
- Water Supply Management

The recommendations for the Plan are grouped as elements to these general areas. However, none of the general areas are independent of the others. An identified increase in groundwater availability to an Alliance Member will decrease the requirement for AWS. Conservation and reuse gains will both extend groundwater availability and reduce the requirement for AWS. Water supply management includes policy, planning, and managerial aspects that also have strong potential to affect water supply. These interrelationships necessitate an integrated approach to water supply planning and development.

As applicable, the recommendations for the Plan are identified as elements that could be implemented by individual or groups of Alliance Members. Due to the considerable complexity and uncertainty involved with parts of the Plan, these recommendations are anticipated to be considered on a case-by-case basis by Alliance Members.

Where applicable, the recommendations from the Plan that would require implementation and coordination by the Alliance as a single entity are also identified.

The Plan recommendations are provided below.

1. Groundwater Availability

a. Request that the SJRWMD accurately determine the safe, sustainable groundwater yield from the area in Lake County not located within the CFCA. Perform an independent review of this analysis by an expert familiar with the regional groundwater models used in north-central Florida.

b. Request that the SJRWMD determine a threshold within the CFCA at which continued groundwater development will be allowed for the long-term water supply for smaller or low future demand municipalities. This added groundwater development must still meet all District CUP rule criteria. It would also require the local government to assure the SJRWMD that all feasible water conservation and beneficial reuse was implemented to maximize water resource protection.

c. For individual CUP renewals, identify the consumptive use allocations held by Agricultural and agricultural-related Commercial/Industrial properties (e.g., citrus processors) in the vicinity of the community that are likely to be discontinued during the duration of the proposed CUP. Coordinate with the existing permit holder and the SJRWMD relative to the possible transfer of these allocations.

d. Request that the SJRWMD require more aggressive conservation practices among private utilities in Lake, and rescind private utility groundwater allocations that show excessive water use (as measured by gross per capita rates). Ensure that reduced private utility per capita water consumption rates are incorporated in regional groundwater modeling efforts. Rulemaking by the SJRWMD may be required to meet this request.

e. Monitor the results of the groundwater modeling simulations performed using the SWFWMD's Northern District model.

f. Request that the SJRWMD clarify, from planning and regulatory perspectives, how groundwater currently allocated for uses related to agriculture in Lake County could be used for other reasonable and beneficial purposes upon discontinuation of uses related to agriculture. Within the CFCA, this clarification will require coordination with regional groundwater modeling efforts.

g. Request that the SJRWMD retire inactive or underutilized (<25% of allocation typically used) Agricultural and Commercial/Industrial water uses, and eliminate their use in cumulative impact analyses.

2. Conservation and Reuse

<u>Conservation</u>

a. Utilize the Plan to determine existing and potential water conservation and reclaimed water opportunities for individual Members. Determine potential offsets effectuated by these opportunities for cost-benefit comparison to AWS water supplies.

b. Request that the SJRWMD's Applicant Handbook for consumptive use permitting be revised to list reduction in per capita water consumption as a factor to be considered in determining the duration of a permit. Prepare measurable conservation goals in CUP applications in exchange for longer duration permits.

c. Use the Plan to develop and coordinate aggressive, long-term conservation activities and programs with Lake County and other Members to support the progression of behavioral changes required for aggressive conservation.

d. Coordinate an improved and consistent planning methodology for the estimation of retail service area population for use in the calculation of per capita water consumption rates. Monitor the ongoing development of the SWFWMD Southern Water Use Caution Area (SWUCA) II population methodology and methodologies under consideration by other Florida WMDs.

e. Develop and implement more aggressive water conservation rate structures targeting medium and high-volume residential users. Individual utility rate studies will be required. Develop sources of cost-share funding for these studies.

f. Establish aggressive watering restriction enforcement programs based on the SJRWMD watering restrictions. Ensure that the programs are self-supporting through their violation fee schedules.

<u>Reuse</u>

g. Develop feasible surfacewater and stormwater withdrawals and storage to augment beneficial reuse production. Consider the use of mine facilities in the development of these opportunities.

h. Conduct a yield study to determine the safe, sustainable withdrawal from the Upper Ocklawaha River Basin (UORB). . The study must include an accurate determination of current and proposed surfacewater use within the UORB.

i. Encourage cost-share funding opportunities for construction of highly efficient reuse systems. Request that the SJRWMD establish a minimum beneficial reuse threshold for reuse funding that involves the potable offset provided by the proposed project.

3. AWS Development

a. Utilize the Plan to determine potential AWS opportunities for individual Alliance Members. Determine potential supplies effectuated by these opportunities for cost-benefit comparison to conservation and reuse opportunities.

<u>Outside-County AWS</u>

b. Actively pursue AWS development partnerships both among Alliance Members, with private utilities located in Lake County, and with public and private utilities located outside of Lake County, as appropriate.

c. Request that the SJRWMD include the cost of an Environmental Impact Statement (EIS) in the projected costs for preliminary design (PD) for the Lower Ocklawaha River project.

d. Participate in a preliminary design (PD) planning effort facilitated by the SJRWMD.

e. Submit a statement of interest to the WRWSA regarding partnerships for developing AWS.

f. Request that the SJRWMD include the costs of a deep well brine concentrate disposal option in the order-of-magnitude and PD costs for the St. Johns River AWS projects.

g. Develop a consistent Alliance position relative to both the Orlando Utilities Commission (OUC) and Villages agreements with Lake County for the development of AWS.

h. Develop Alliance-based water supply planning partnerships with entities located outside of Lake County, as appropriate.

Within-County AWS

i. Conduct a yield study to determine the safe, sustainable withdrawal from the Upper Ocklawaha River Basin (UORB). The study must include an accurate determination of current and proposed surfacewater use within the UORB.

j. Request that the SJRWMD include a project involving the UORB as an AWS in the 2008 District Water Supply Plan. The project configuration will be dependent on the results of a yield study.

k. Actively pursue AWS partnerships with private utilities in Lake County, as appropriate. Private utilities with established revenue sources, management structures, and CUP requirements comparable to Alliance Members are likely to offer superior AWS partnership opportunities when compared to agricultural or commercial/industrial users.

l. Identify a viable AWS project involving the UORB and seek cost-share funding for the project.

4. Water Supply Management

a. Submit a request to the SJRWMD and the SWFWMD to establish the North Central Florida Coordination Area (NCFCA) as a coordinated Planning area between the two WMDs.

b. At individual municipalities with proposed developments entering the development review process, identify the consumptive use allocations held by the former Agricultural and agricultural-related Commercial/Industrial properties (e.g., citrus processors) within the property proposed for development.

Within-County AWS

c. Request that the SJRWMD establish a scientifically-based minimum flow for Lake Griffin, Harris, Eustis and Dora unit.

d. Support a negotiated settlement to the Lake Apopka withdrawal challenge that more equitably distributes the effect of the withdrawal among the lake levels and discharge flows.

e. Support the ongoing restoration of the North Shore of Lake Apopka.

f. Extend utility service to unincorporated areas to ensure more efficient residential water use, by reducing uncontrolled groundwater withdrawals (domestic self supply).

Lake County Water Supply Planning Alliance

g. Develop a post-Plan framework for communication both among Members and their Elected Officials.

h. Develop a post-Plan funding source to Alliance-identified initiatives.

i. Update the Alliance Plan to maintain its relevance within a rapidly changing regional water supply context. Prepare minor updates annually and major updates every five years.

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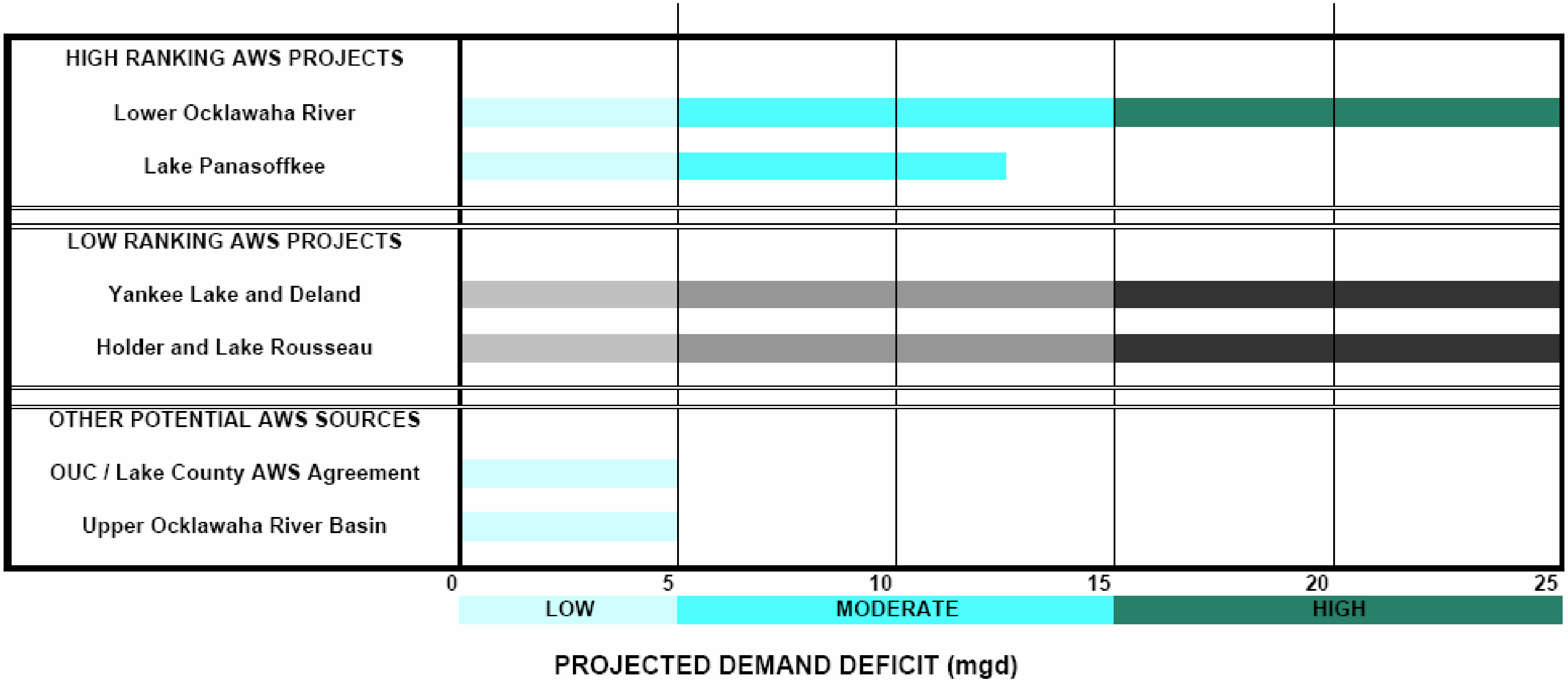
Table 9-1

Lake County AWS Comparison

General Characteristics	St John's River		Ocklawaha River	Withlacoochee River		
	Yankee Lake	Near Deland	Lower Reach - Silver Springs	Lake Panasoffkee	Near Holder	Lake Rousseau
Potential Surface Water Yield (MGD) [1]	116	94 - 127	100 - 107	9 - 19	52	87 - 98
Water Quality	Brackish	Brackish	Fresh	Fresh	Fresh	Fresh
Criteria Categories						
1. Resource Availability, Reliability, and Longevity	A	B	A	B/D [2]	B	A
2. Raw Water Quality	C	C	B	B	B	B
3. Permittability	B	C	B	C	B	B
4. Environmental Compatibility	B	C	C	C	B	B
5. Cost	D	D	B	A/D [2]	D	C
6. Jurisdictional Complexity	B	B	B	C	D	C
7. Location	B	B	B	A	B	C
OVERALL GRADE:	**C**	**C-**	**B**	**C+/D**	**C**	**C**

Notes: 1 Potential surface water yield may be reduced by future MFLs, environmental considerations, and detailed safe yield analyses.
2 Dual ranking is provided with with first ranking for Demand Scenario 1 and second ranking for Demand Scenario 2



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PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 9-1
Comparison of Demands and Water Supply Alternatives

ORIGINAL DATE: 08-31-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: N/A
GIS OPERATOR: DR

Prepared for: Lake County Technical/Management Committee
Prepared by: Water Resource Associates
Date: November 27, 2006
Re: Technical Memorandum Number 1 – Phase 2, Task 2 of the Lake County Water Supply Plan

This task entails surveying Lake County and the region's current water resource related documents. Although the Lake County Water Supply Plan focuses on Lake County, surrounding counties, governments and initiatives will affect future water resource availability and development. Thus, it is essential to have an understanding of water supply development plans and initiatives in the areas surrounding Lake County and their potential influence on water supply projects currently underway or proposed for implementation. A review of existing water supply plans and other pertinent reports related to water needs and sources was carried out fulfill this need. These reports were obtained from utilities, local governments, and water management districts directly or from their websites.

Generally, the documents of interest fall into the following categories: Water supply plans, alternative water supply planning, and surface and groundwater modeling. The following is a list of the projects reviewed:

- 2005 SJRWMD Water Supply Plan;
- 2003 SJRWMD Water Supply Assessment;
- District alternative water supply planning studies (such as surface water from the SJRWMD); and
- Central Florida Regional Reuse Plan (SFWMD, Ongoing);
- Western Orange County/Southern Lake County Sub-Regional Reuse Master Plan (SJRWMD, Planned);
- Lake Apopka Treatability Studies (SJRWMD, Planned);
- Central Florida Aquifer Recharge Enhancement Phase 1 Project (SJRWMD, Ongoing);
- Surface Water Availability Assessment (Tohopekaliga Water Authority and SFWMD, Ongoing);
- East Central Florida Water Supply Planning Initiative, Phase 3 (SJRWMD,

Ongoing);

- Lake County Water Resources Game Plan (Lake County);
- Demineralized Concentrate Management Project (SJRWMD);
- Seawater Desalination Project (SJRWMD, Ongoing);
- St. Johns River (Lake Monroe) Water Supply Project (SJRWMD);
- Aquifer Protection Program (SJRWMD, Ongoing);
- Aquifer Storage and Recovery Test Program (SJRWMD, Ongoing);
- Kissimmee Basin Water Supply Plan (SFWMD, Ongoing);
- East Central Florida Regional Transient Groundwater Modeling (SJRWMD and SFWMD, Ongoing); and
- Wekiva Basin Integrated Surface/Groundwater Modeling (SJRWMD).
- Marion County Water Resource Assessment and Management Study (Marion County)
- Withlacoochee River Water Management District Water Supply Plan Update – 2005 (WRWSA)

Note that many of these projects have multiple associated documents. The complete list of documents and their report numbers is attached.

Each paper was reviewed and summarized for this task. The background, objectives and conclusions of each report are detailed in each summary. These summaries can are attached and can also be accessed via the project management website at http://wraconsultants.updatelog.com.

SJ94-PP3
1994
Revised Spring Conductance Coefficients
Wekiva River Basin Ground Water Flow Model
By:
Ching-tzu Huang, Ph.D., P.E.

Background:

The St. Johns River Water Management District (SJRWMD) uses a numerical ground water flow model for the Wekiva River Basin (GeoTrans 1992) to predict ground water levels and associated springs discharge within the basin. Springs represent the major source of base flow to the Wekiva River. Springs discharges referenced in this paper refer to ground water discharges from areas of diffuse upward leakage and from actual springs. GeoTrans of Herndon, Virginia, developed the model for SJRWMD. The model is based on the three-dimensional finite difference MODFLOW code (McDonald and Harbaugh 1988) and represents the aquifer systems in a quasi three-dimensional form. The model grid is finest in the area of the springs. The model domain encompasses the entire Wekiva River Basin. The model boundaries were designed to coincide as much as possible with ground water flow boundaries.

Objective:

Because of a change in the requirements of the project for which the model was developed, SJRWMD has revised the spring conductance coefficients in the model to increase the precision with which the model simulates spring discharges. The description of the methods used to achieve the revisions and the results are presented in this professional paper.

Conclusion:

The revised spring conductance coefficients provided an improvement in the precision with which the model predicts springs discharges. The predictive capability of the Wekiva River Basin ground water flow model is enhanced by using the revised spring conductance coefficients. Using the revised values, the model simulates between 94.2 and 97.9 percent of observed 1988 (postdevelopment) spring discharges, compared to 87.5 and 95.9 percent using the unrevised spring conductance coefficients. The potentiometric head difference for 1988 postdevelopment conditions using the unrevised and revised spring conductance coefficients indicated that the revised spring conductance coefficients did not alter the potentiometric head contour distribution in the model area except in the close vicinity of several springs.

SJ96-SP4
April 1996
Water Supply Needs and Sources Assessment
Alternative Water Supply Strategies Investigation
Surface Water Withdrawal Sites
By:
CH2M Hill

Background:

St. Johns River Water Management District is evaluating surface water as one of several alternative water supply sources.

Objective:

The primary objective of this evaluation is determining the type and size of water supply facilities required to develop selected surface water sources for public supply, on a preliminary feasibility level. The first step of this procedure is completed, and provided an inventory of available information and established an evaluation procedure. The second step, which is documented in this TM, involves the selection of six candidate withdrawal sites for quantitative evaluation.

Conclusion:

The process used to select the withdrawal sites recommended in Step2 is as follows:

- Plot projected public supply demand increases by county or major demand center on a planning area base map. Counties included were Brevard, Lake, Orange, St. Johns, Seminole, and Volusia.
- On a similar base map, plot the approximate maximum developable surface water supply for each stream gauging station. Maximum developable yield is estimated as 20 percent of the mean annual streamflow.
- Identify candidate withdrawal sites by visual inspection of the relative geographic location of demand centers and the magnitude of the potential surface water yield.

Application of this procedure yielded the following candidate withdrawal sites:

- Lake Griffin (Haines Creek) in Lake County near Leesburg
- St. Johns River near Cocoa
- St. Johns River near Titusville
- St. Johns River at Sanford (Lake Monroe)
- St. Johns River at DeLand
- St. Johns River near Switzerland (northern St. Johns County)

St. Johns River Water Management District approval of the six candidate surface water withdrawal sites identified in this TM is recommended.

SJ97-SP4
1997
Water Supply Needs and Sources Assessment
Alternative Water Supply Strategies Investigation
A Tool for Assessing the Feasibility of Aquifer Storage Recovery
By:
CH2M Hill

Background:

The public water supply within the St. Johns River Water Management District is generally provided by high-quality ground water. Increasing ground water usage without incurring unacceptable environmental impacts is unlikely. SJRWMD has initiated an investigation of the feasibility of alternative water supply strategies. In recent years, aquifer storage recovery (ASR) has been developed as an alternate means of water storage. ASR is defined as storing water in a suitable aquifer through a well during times when water is available, and recovering the water from the same well during times when it is needed..

Objective:

This technical memorandum has provided a tool to assist the SJRWMD and utilities in determining whether ASR would be a feasible alternative in solving a utility's water supply needs. The primary objective for this report is to store water for potable and agricultural use in the study area. It must be determined from the technical, economic, and regulatory perspective whether ASR can replace traditional surface reservoirs and tanks.

Conclusion:

Obstacles in public perception and regulation must be overcome. To date, No Florida ASR system permit has been challenged by the public in such a way as to restrict or delay permitting. Considerable sensitivity exists regarding any existing or proposed activity related to injection wells. Basic education about ASR systems can greatly lessen the potential for such challenges and achieve public approval. Before ASR, regulations were passed to control industrial wastewater injection and to protect drinking water supplies from this waste. The regulations are now realizing the possibility of storing relatively clean water into USDWs and recovering that water for public consumption.

The following rule modifications were provided to FDEP by CH2M HILL (Pyne, 1994) in hopes of adopting distinct rules for ASR technology in order to separate it from existing injection well constraints that impede ASR implementation:

- Remove the requirement for a renewable operating permit for ASR wells that store treated drinking water.

- For ASR wells that store high-quality water that does not fully meet all PDWS, the existing regulations provide a process for issuance of a major or minor aquifer exemption. The aquifer exemption is not really a suitable objective, since it removes protection of the high-quality stored water from potential contamination by other adjacent water users. As a result, the existing regulatory process may have the effect of stunting logical extension of ASR technology from current storage of treated water to future storage of high-quality, but non-potable, water from various sources. An alternative to the existing UIC process, or an alternative track within the UIC process, which applies to ASR wells that store high-quality water that does not quite meet all PDWS, is needed.
- Consolidate ASR permitting regulations in a subsection of Chapter 62-528 F.A.C. pertaining to Class V, Group 7 wells. Divide this subsection into three parts; a) recharge with water that meets PDWS and SDWS; b) recharge with high-quality water that does not quite meet PDWS and SDWS due to exceedance of a selected list of benign parameters such as sodium, chloride, TDS, color, turbidity, corrosivity, and coliforms, and c) recharge with water that is poorer in quality than category b).
- For recharge waters that meet all DWS, regulations would delineate procedures and standards appropriate for such wells. Reflecting the substantially lower degree of risk, such requirements would not include typical Class I well requirements such as mechanical integrity testing 0.5-inch minimum casing thickness and extensive geophysical logging. The requirements would be more closely aligned with requirements for typical municipal production wells.
- For high-quality recharge water that does not quite meet all DWS, the regulations would provide for a permitting track that does not require a UIC aquifer exemption for each site. The preferred approach is a regional water quality exemption, regional USDW variance, or a regional, or site-specific ZOD.

ASR is becoming an integral part of water supply and resource management throughout Florida. ASR practicability extends to other areas of resources management, such as regional aquifer recharge with surface water to augment distant future water supplies, wetland management, drainage control, and others.

SJ97-SP7
1997
Water Supply Needs and Sources Assessment
Alternative Water Supply Strategies Investigation
Surface Water Availability and Yield Analysis
By:
CH2M Hill

Background:

St. Johns River Water Management District is evaluating surface water as one of several alternative water supply sources to help meet municipal water supply needs within the St. Johns River Water Management District. The first surface water supply TM addressed data availability and development of the methodology to be used in the feasibility evaluation. The second TM addressed selection of six candidate surface water withdrawal sites for quantitative analysis.

Objective:

The six candidate sites include Lake Griffin on Haines Creek, in Lake County, and five sites located on the main stem of the St. Johns River from Cocoa downstream to Jacksonville. This TM presents the results of the quantitative water supply availability and yield analysis.

Conclusion:

A similar series of analyses was conducted for each of the six candidate withdrawal sites. The maximum reliable municipal water supply yield for each of the six candidate withdrawal sites is summarized below:

- Lake Griffin (Haines Creek) 28 mgd
- St. John River near Cocoa 108 mgd
- St. Johns River near Titusville 143 mgd
- St. Johns River at Sanford (Lake Monroe) 279 mgd
- St. Johns River near DeLand 351 mgd
- St. Johns River above Jacksonville 419 mgd

The maximum water supply yield estimates are based on application of the previously established surface water evaluation methodology. However, because planned SJRWMD minimum flows and levels analysis for Lake Griffin may result in different, and possibly more restrictive, withdrawal criteria, only 50 percent of the calculated maximum yield, or 14 mgd, will be considered in subsequent areawide alternative water supply evaluations.

Maximum reliable yields for the Lake Griffin and St. Johns River sites are independent hydrologic systems. Water supply development on Lake Griffin will not affect the potential for water supply development on the St. Johns River. However, the maximum yield values for the individual St. John Rivers sites are not independent and represent the cumulative amount for each individual site and all upstream sites. For example, if a 100-mgd reliable water supply were developed near Titusville, then the maximum reliable yield at DeLand (or another downstream site) would be reduced by 100 mgd.

Facilities required include a river diversion structure, an off-line raw water reservoir, a water treatment plant, and an aquifer storage recovery system and will vary by location. Lake Griffin is the only true freshwater site; the St. Johns River sites will require some desalting facilities. The most downstream site, the St. Johns River above Jacksonville, is tidal, has poor water quality characteristics, is classified as saline and would require extensive desalting facilities generating large quantities of waste concentrate.

Five of the six water supply withdrawal sites are technically viable. They include Lake Griffin and the four upstream sites located on the main stem of the St. Johns River, from near Cocoa to near DeLand. The most downstream site, the St. Johns River above Jacksonville, does not provide a viable municipal water supply source and should not be considered further.

SJ97-SP16
1997
Water Supply Needs and Sources Assessment
Alternative Water Supply Strategies Investigation
Aquifer Storage and Recovery Utility Evaluations
By:
CH2M Hill

Background:

The public water supply within the St. Johns River Water Management District is generally provided by high-quality ground water. Increasing ground water usage without incurring unacceptable environmental impacts is unlikely. SJRWMD has initiated an investigation of the feasibility of alternative water supply strategies. In recent years, aquifer storage recovery (ASR) has been developed as an alternate means of water storage. ASR is defined as storing water in a suitable aquifer through a well during times when water is available, and recovering the water from the same well during times when it is needed..

Objective:

The primary objective is to apply the ASR feasibility tool previously outlined to specific utilities within SJRWMD. The primary focus of this application is on potable water storage; however, during the review of utility data it became apparent that other ASR application, such as raw surface and ground water storage and reclaimed water storage for eventual irrigation could be applicable in some situations. This evaluation addressed the feasibility of using ASR to satisfy potable water storage needs from technical, economic, and regulatory perspectives and to determine if ASR should be further considered by the selected utilities.

Conclusion:

In consultation with CH2M HILL, the District selected five utilities for trial application of the ASR screening tool: the City of Melbourne Water and Sewer Division; the City of New Smyrna Beach Utilities Commission; the City of Port Orange Public Utilities; the City of Titusville Water Resources Department; and the St. Johns County Utilities Department. Each of the utilities was visited by project staff, including a water resources engineer and hydrogeologist, between October 4 and October 29, 1996. The purpose of the site visits was to develop an understanding of the utilities; operations and needs, and to gather information required for application of the ASR screening tool. Site history, existing problems, water use projections, anticipated water supply development issues, and acquisition of available data were discussed during the visits.

In each case, it was found that ASR is technically feasible and potentially useful, based on currently available information. Neither cost nor regulatory aspects would affect the feasibility of using ASR at each utility.

The screening evaluation identified several options for using ASR at the five utilities. CH2M Hill makes the following recommendations:

- Each utility should evaluate the possibility of incorporating ASR into its long-term plan. This evaluation will include goals specific to each utility in meeting future water demands.
- Before proceeding with additional hydrogeologic data collection, the use of ASR to address wetland impacts should be undertaken. If this evaluation demonstrates that ASR could effectively address wetland impacts, the District and the utilities may want to consider ASR in review of future CUP applications.
- Once a utility has decided that ASR warrants further investigation, an ASR test plan for the facility should be developed, launching the Phase II portion of the ASR implementation procedure.

SJ98-SP11
1998
Central Florida Artificial Recharge Demonstration Program:
Alternative Water Supply Strategies in the St. John River Water Management District
By:
CH2M HILL

Background:

The St. Johns River Water Management District (SJRWMD) previously evaluated the potential impacts of increased ground water withdrawal through the year 2010 (Vergara 1994). Based on this evaluation, SJRWMD identified areas, known as Priority Water Resource Caution Areas (PWRCAs), where water supply problems are now critical or will become critical. In these area, future public water supply needs may not be fully met by the increased use of ground water resources without incurring unacceptable environmental impacts, which include wetlands dehydration, reduced springflows, and the increased potential for saltwater intrusion. New water supply alternatives will be needed to supplement existing supplies to avoid potential problems.

Objective:

SJRWMD is investigating the feasibility of several alternative water supply strategies, including artificial recharge of the Floridan aquifer. The purpose of this report is identify an artificial recharge demonstration program for central Florida that will answer the questions that have been identified related to the appropriate use of artificial recharge wells, including the efficacy of the current regulatory approach.

Conclusion:

There is considerable interest among local governments, SJRWMD, and FDEP in conducting the research necessary to objectively evaluate current drainage well management policy. Local governments interested in participating in the Central Florida Artificial Recharge Demonstration Program include the City of Altamonte Springs, the City of Orlando, and Orange County. Each has identified a demonstration project for inclusion in the program. The individual demonstration projects are:

- Lake Orienta project—A 135-acre urban lake with a 916-acre tributary watershed. It is completely landlocked and is served by two existing drainage wells owned by the City of Altamonte Springs. Adjacent urban lands are subject to periodic and chronic flooding. The Lake Orienta artificial recharge demonstration project would involve construction of an additional lake level control well and several monitoring wells. The objectives are to monitor the fate of pollutants, including total coliform bacteria, entering the aquifer from a new lake level control well; investigate the necessity and feasibility of recharge water disinfection; and provide much needed relief from flooding without diminishing aquifer recharge. A site is available to construct the new well, appropriate monitoring wells, and a recharge water treatment facility, if necessary.

- Mills Avenue Street Drainage Treatment Project—The City of Orlando owns and operates approximately 80 street or urban drainage wells, most of which are located in downtown Orlando. The proposed demonstration project at Mills Avenue and Minnesota Street would abandon in place the existing street drainage well and redirect the stormwater runoff to an adjacent residential lot. The lot, which is for sale, would be purchased, the existing structure demolished and an appropriate passive stormwater treatment facility would be constructed. The treated stormwater runoff would then be directed to a new recharge well constructed adjacent to the treatment facility. This demonstration project would not increase recharge volume, but would reduce aquifer pollutant loads, resulting in a net benefit to the aquifer.
- Lake Sherwood Project—Lake Sherwood is a 119-acre lake with a direct tributary area of 1,240 acres, for a total basin area of 1,359 acres. During flood condition, the lake will receive inflow from four upstream lakes, increasing the total maximum tributary area to 5,450 acres. The lake is served by one Lake level control well owned by Orange County. The well operates only during extreme hydrologic conditions. Orange County is preparing a comprehensive watershed management plan for the Lake Sherwood basin. One of the issues being investigated is lowering the existing lake level control well inflow elevation to provide the necessary increase in flood protection. Hydrologic analyses are being performed to quantify the relationship between inflow control elevation and level of flood protection provided, and the total recharge volume emplaced. Watershed planning is also quantifying the relationship between additional stormwater treatment provided and improvements in recharge water quality. The objective of this analysis is to identify the combination of inlet elevation and additional stormwater treatment that will increase flood protection and aquifer recharge without increasing pollutant loads to the aquifer. This project will demonstrate the concept of net benefits to the aquifer in the context of comprehensive watershed planning and water resource management.

The proposed Central Florida Artificial Recharge Demonstration Program would provide important and useful information for water resources management decision making. Program results should provide insight into the fate and transport of bacteria, including total coliform, in the upper Floridan aquifer. The program should also quantify the cost of bacteria removal as a function of the level of control provided.

Aquifer recharge wells should be an available water resource management option. Like other water management alternatives, this technology has benefits and risks, and should be used when the benefits, including flood control and additional water supply, outweigh the risks. The Central Florida Artificial Recharge Demonstration Program would help quantify the risks and costs associated with artificial recharge wells in central Florida.

SJ2003-SP1
September 2003
Demineralization Concentrate Management Plan
Investigation of Demineralization Concentrate Management—FINAL REPORT
By
Reiss Environmental, Inc.
Subconsultants
Parsons, Brinckerhoff, Quade and Douglas
and Malcolm Pirnie

Background:

St. Johns River Water Management District (SJRWMD) has identified brackish groundwater, brackish surface water and seawater as potentially significant alternative sources of supply to meet projected 2020 demands. The use of these mineralized water sources requires management of the concentrate that is a by-product of the demineralization. These technologies are primarily pressure driven membrane processes that include reverse osmosis and nanofiltration. During this process, minerals in the source water, including salt, are removed producing potable water as well as a by-product known as demineralization concentrate.

Objective:

The relative suitability of various demineralization concentrate management alternatives was evaluated for the 19-county SJRWMD area. From this assessment it was determined that the Florida Department of Environmental Protection (FDEP) regulations, which govern demineralization concentrate, largely determine the viability of a given project. In addition, there is a perception in the municipal demineralization community that current regulations present a challenge that is potentially inconsistent with the characteristics associated with demineralization concentrate. FDEP is actively working with affected parties to evaluate this issue.

Conclusion:

Review of existing demineralization concentrate management projects in SJRWMD revealed a history of permitting challenges. These permitting challenges appear to have occurred mainly because existing regulations were not designed to address demineralization concentrate but were designed to deal with domestic and industrial wastewater discharges. Demineralization concentrate has water quality characteristics dissimilar to those commonly associated with domestic and industrial wastewater. Key issues related to demineralization concentrate were identified as part of this Demineralization Concentrate Management Plan (DCMP).

The assessment of demineralization concentrate management alternatives, which is described in this document, considered various factors that affect the relative suitability of a given application. The approach included consideration of the location and characteristics of the alternative source waters including brackish groundwater, brackish surface water and seawater and the characteristics of potential receiving waters.

SJ2004-2
2004
Middle St. Johns River Minimum Flows and Levels
Hydrologic Methods Report
By:
C. Price Robison, P.E.

Background:

The middle St. Johns River (MSJR) is being considered as a possible alternative water supply source to help meet the projected future increased demand for water in the St. Johns River Water Management District (SJRWMD). Minimum flows and levels (MFLs) will provide the initial limits to surface water withdrawals from the MSJR, although, other factors may ultimately be more limiting.

Objective:

The purpose of this report is to describe and document the development of the models used in assessing MFLs for the MSJR. Also included in this report are five examples of hypothetical MSJR surface water withdrawal alternatives as they relate to MFLs.

Conclusion:

Modeling results indicate that all three adopted MFLs are being met on the MSJR under existing conditions Depending on withdrawal criteria, the models indicate that between 143 and 175 million gallons per day of water are available from the river before the MFLs cease to be met. Additional analyses will be performed as part of a comprehensive investigation of the potential water supply yield of the MSJR, given the proposed MFLs.

SJ2004-3
2004
Status and Trends in Water Quality at Selected Sites in the St. Johns River Water Management District
By:
Steve Winkler and Aisa Ceric

Background:

The St. Johns River Water Management District (SJRWMD) is one of five legislatively established water management districts in Florida. SJRWMD's mission is to manage water resources to ensure their continued availability while maximizing environmental and economic benefits. The current population of 3.5 million is expected to exceed 5 million by 2020 (Vergara 2000). Most of the population is concentrated in the major urban areas, such as Jacksonville, Orlando, Gainesville, Ocala, and a string of cities along he coast from St. Augustine to Vero Beach.

Objective:

Water quality districtwide was last assessed in 2000 as part of the *District Water Management Plan* (Vergara 2000). This assessment is a continuation of that effort and was undertaken to characterize the current status of and trends in water quality for water bodies districtwide. Characterization of these water bodies will allow SJRWMD to identify problem areas and to evaluate the success of remedial or mitigation efforts.

Conclusion:

One hundred fifty-eight water quality monitoring sites located in lakes, estuaries, streams and springs were selected to represent ambient water quality conditions for the assessment. Ambient water quality data were compiled and analyzed in order to evaluate status and trends. Status results indicate whether water quality is improving or degrading. Springs and stream sites were evaluated using a water quality index; lake and estuarine sties were evaluated using a trophic state index. The water quality index incorporates nutrients, physical constituents, and bacteria, while the trophic state index incorporates nutrients and chlorophyll. Most of the sites in SJRWMD exhibited good or fair water quality, although some sites were degrading. Forty percent of the sites assessed districtwide had good water quality, 42% had fair quality, and 18% had poor quality. Thirty-seven percent did not have enough data to calculate a trend, while 42% had a statistically insignificant trend. More sites were degrading (13%) than were improving (8%). This study did not consider what factors were responsible for the trends found.

SJ2004-SP4
2003
East-Central Florida Water Supply Planning Initiative Phase II
Annual Report of Activities and Accomplishments

Background:

The east-central Florida area, which includes Brevard, Orange, Volusia and Seminole counties and portions of Lake Marion, Polk, Sumter, Osceola and Flagler counties, has been the subject of a major water supple planning initiative since 2002. The East-Central Florida Water Supply Planning Initiative is designed to assist in meeting future water supply needs, while protecting the water resources and related natural systems. The Initiative resulted from two regionwide water summits held in early 2002 where local government officials, water supply utilities, and the St. John River, South Florida and Southwest Florida water management districts began working together to develop solutions to their collective future water supply issues. Representatives from all ten counties in the east-central Florida area were invited to participate in Phase I of the Initiative. The Phase I process resulted in the East-Central Florida Water Agenda, which identifies six key water supply issue areas, 17 recommendations and 32 strategies developed by the Initiative Phase I participants. The six areas identified in the Agenda are:

- Enhance intergovernmental coordination
- Develop new water supply
- Link land use planning and water supply planning
- Increase use of reclaimed water
- Enhance aquifer recharge using reclaimed water
- Increase water conservation

Objective:

Phase II of the Initiative is designed to build upon the results of Phase I with the development of action plans and identification of specific projects to implement the Agenda recommendations and strategies. The St. Johns River Water Management District is managing the Phase II effort in coordination with the South and Southwest Florida water management districts. Initiative activities in 2003 were focused in six counties of the 10-county east-central Florida region – Volusia, Brevard, Orange, Seminole, Lake and Osceola counties. Marion County was not included in the focus area, but their representatives were invited to participate in Initiative meetings.

Conclusion:

The 2003 Initiative Phase II process included many workshops with east-central Florida water supply utilities and local government elected officials for the exchange of information and ideas. One of the major goals of these workshops was to identify potential water supply development projects of interest to the local communities that could be incorporated into a 2004 interim update to DWSP.

2003 Initiative activities included:

- Encouraging intergovernmental coordination through Initiative group meetings, one-on-one meetings with elected officials, presentations to related water resource organizations and heightened communications with the public and media
- Educating local government elected officials, planning staffs and water supply utilities on new requirements to develop a 10-year water supply facilities work plan
- Developing and implementing a “Potable Water Availability” worksheet that will help local governments in the comprehensive plan amendment process to identify water supply availability considering both infrastructure and permitted allocation under consumptive use permits
- Assisting ongoing efforts to develop and implement areawide reuse of reclaimed water plans
- Assisting ongoing efforts to evaluate the feasibility and benefits of enhanced recharge using reclaimed water
- Developing model landscape ordinance language to be used as a guideline for local communities

Recommendations for 2004 Initial Phase II activities include developing countywide/intercounty water supply plans and partnerships between suppliers in each county, continuing on-going county/intercounty facilitation, amending DWSP to include potential projects identified during 2003, prioritizing potential projects, initiating feasibility investigations as appropriate, assisting local governments in development of water supply facilities work plans, assisting on-going efforts in development of areawide reuse plans and development of artificial recharge projects, and finalizing model landscape ordinance and initiating a pilot incentive program in Lake County.

SJ2004-SP6
January 23, 2004
Final Report on Five Potential Seawater Demineralization Project Sites – Task C.5
For the
Seawater Demineralization Feasibility Investigation
By
R. W. Beck, Inc.

Background:

As part of the St. Johns River Water Management District (SJRWMD) Water Resource Development Program, seawater demineralization is being examined as a potential means to provide future water supply within SJRWMD. SJRWMD retained R. W. Beck to perform a feasibility analysis of seawater demineralization.

Objective:

Five sites were identified for development of conceptual designs and costs within SJRWMD for seawater demineralization. R. W. Beck and SJRWMD identified these sites based upon the analysis described in the report titled "Identification of Favorable Sites for Feasible Seawater Demineralization – Task C.4," dated September 11, 2003 and other preferred features and water needs.

The five sites include:

1. Indian River Power Plant (Owner: Reliant Energy Indian River, LLC)
2. Cape Canaveral Power Plant (Owner: Florida Power & Light – FPL)
3. Daytona Beach/Bethune Point Wastewater Treatment Plant (Owner: City of Daytona Beach)
4. W. E. Swoope Generating Station Power Plant (Owner: City of New Smyrna Beach)
5. Northside Power Plant (Owner: Jacksonville Electric Authority – JEA)

One of the screening and scoring factors that affects a site ranking is the location of the site within ten miles of a SJRWMD priority water resource caution area. Following completion of the Task C.4 report dated September 11, 2003, which did not include the Northside Power Plant site, the proposed priority water resource caution areas were being redefined by SJRWMD in portions of Duval and St. Johns counties. Because of the potential for the Northside Power Plant site to be within ten files of a SJRWMD priority water resource caution area, it became a candidate for consideration as a favorable site for collocating a desalination facility. Additionally, and of greater significance, the Northside Power Plant has similar preferred site characteristics as the highly ranked Cape Canaveral Power Plant site and the Indian River Power Plant site. For these reasons, SJRWMD requested that the Northside Power Plant in Duval County be included in the five sites for conceptual design and costing. At the present time, based on subsequent evaluations, SJRWMD does not propose to identify the Duval

County area as a priority water resource caution area in its 2003 water supply assessment.

Conclusion:

This report summarizes the findings of Task C.5 of the SJRWMD contract with R. W. Beck, Inc., for the Seawater Demineralization Feasibility Investigation which involved the development of comparative-level cost estimates and concept designs for the five preferred sites for seawater demineralization.

Each design incorporates the following features:

- Influent pumping
- Pretreatment consisting of sand filtration and cartridge filtration
- Pretreatment chemical addition
- Demineralization consisting of reverse osmosis membranes
- Post treatment
- Concentrate management by a various methods appropriate to the specific site
- Ground storage
- Product water conveyance

The comparative project cost estimate elements include:

1. Construction
2. Land
3. Non-construction capital cost
4. Total Capital Cost (inclusive of items 1+2+3)
5. Annual O&M Cost at design capacity in $/year
6. Equivalent annual cost ($/year)
7. Unit production cost ($/kgal)

Summary of Costs			
Indian River Power Plant			
Treatment Capacity (mgd)	10	20	30
Cost/ 1,000 Gallons	$3.06	$2.80	$2.69
Cape Canaveral Power Plant			
Treatment Capacity (mgd)	10	20	30
Cost/ 1,000 Gallons	$3.06	$2.77	$2.63
Daytona Beach/Bethune Point Wastewater Treatment Plant			
Treatment Capacity (mgd)	5	10	15
Cost/ 1,000 Gallons	$3.93	$3.32	$3.11
W. E. Swoope Generating Station			
Treatment Capacity (mgd)	5	10	15
Cost/ 1,000 Gallons	$4.93	$3.90	$3.53
Northside Power Plant			
Treatment Capacity (mgd)	10	20	30
Cost/ 1,000 Gallons	$3.12	$2.76	$2.57

SJ2004-SP7
December 31, 2002
Technical Memorandum B.7 Demineralization Treatment Technologies
for the
Seawater Demineralization Feasibility Investigation
By
R. W. Beck, Inc.

Background:

Desalination, or demineralization is a treatment process that removes salt and other minerals from brackish water and seawater to produce high quality drinking water. Various desalination technologies have been in practice for more than 50 years, with nearly 1500 facilities worldwide, according to the International Desalination Association (IDA).

Due to concerns over continued population growth and depletion of our nation's water resources, finding alternative drinking water sources has been a problem faced by many water utility companies, municipalities and water management districts. This is especially true in states with the greatest population growth. Traditional groundwater and surface water sources have been over-pumped and are showing signs of environmental stress or have experienced salt-water intrusion into groundwater supplies.

Objective:

The St. Johns River Water Management District is proactively addressing the water supply needs in the northeast region of Florida to:

- Increase available water supplies and maximize overall water use efficiency to meet identified existing and future needs;
- Minimize damage from flooding, using non-structural approaches where feasible;
- Protect and restore floodplain functions;
- Protect and improve surface water quality;
- Protect and improve groundwater quality;
- Maintain the integrity and functions of water resources and related natural systems;
- Restore degraded water resources and related natural systems to a naturally functioning condition; and
- Ensure proper use of tax and other public revenue by focusing on priorities that further the District's mission and by maintaining a high level of organizational efficiency.

This technical memorandum is prepared to provide SJRWMD with information on current desalination technologies and an update on advancements in the industry.

Conclusion:
The most common desalination technologies that have experienced commercial success are:

Thermal
- Multi-stage Flash Distillation (MSF)
- Multiple-Effect Distillation (MED)
- Vapor Compression (VC)

Membrane
- Electrodialysis (ED)
- Reverse Osmosis (RO)

There are several emerging technologies that appear to have potential for significant advancements in the desalination field. These advancements relate to evaporation of concentrate to a dry salt for commercial use or disposal, and increased membrane sizes to improve the economies of scale for larger membrane plants.

Based on the water supply needs in SJRWMD, the following conclusions and recommendations are provided for consideration in the feasibility investigation of demineralization on the northeast coast of Florida

1. Brackish water desalination using ED or RO may prove to be a viable alternative for this coastal region.

2. Seawater desalination using RO can be cost-effective for larger municipal water supplies (>5mgd).

3. Co-location with power generation facilities should be considered for dilution of concentrate from the desalination process. The possibility for negotiated-lower energy rates should also be investigated.

4. Continue to monitor the development of emerging technologies for advancements related to evaporation technologies for producing a dry salt from the RO concentrate.

5. Continue to monitor the development of pretreatment system improvements, particularly microfiltration, and other processes for the ability to handle fluctuating raw water qualities with high turbidities.

6. Consider new, proven technologies that have been demonstrated at a commercial scale. Some new technologies, which claim less energy or greater product water recovery, must be proven in full-scale, operational facility, where treatment effectiveness, energy efficiency and costs can be proven. Some emerging technologies currently in development may prove to be great advancements in the desalination field; others may not.

SJ2004-SP8
December 31, 2002
Criteria for Preliminary Screening of Areas for Potential Seawater Demineralization Facilities Task C.1.
For the
Seawater Demineralization Feasibility Investigation
By
R.W. Beck, Inc.

Background:

As part of the St. Johns River Water Management District (SJRWMD) Water Resource Development Program, seawater demineralization is being examined as a potential means to provide future water supply within SJRWMD.

Objective:

The purpose of Task C.1 is to develop criteria suitable for use as a preliminary (macro level) screening measure within the coastal areas of the SJRWMD for siting seawater demineralization facilities. The criteria provide a rational way to perform a preliminary screening to identify up to twenty preferred sites for further consideration for a potential demineralization plant siting. This document identifies the macro screening criteria and presents the rationale for their application to the various potential sites. This step does not include a “ranking” of the sites but rather identifies whether a site has preferred features or not

Conclusion:

To identify potential sites, identification of the presence of preferred features is applied. The five primary preferred features are:

1. **Adequate Access to an Ample Seawater Source**
    - Availability of high quality seawater source. Class 1, 2 and 3 waters are preferred, with Class 1 being the most acceptable.
    - Located within five miles of an existing seawater intake of a once-through cooled power generating plan
    - Located within five miles to the sea shoreline

2. **Access to an Adequate Energy Source**
    - Location within 2 miles of a major power generation facility
    - Location within 2 miles of urban areas

3. **Proximate Access to a Water Transmission Site**
    - Site location within twenty miles of the water demand

4. **Areas of Projected Deficit**
    - A water system with a projected deficit between 2 and 20 mgd

5. **Acceptable Means for Demineralization Concentrate Management**
    - Disposal to existing suitable injection wells or areas defined as suitable for injection wells (within ten miles)
    - Within ten files of the coast (potential for new ocean outfall). Consideration of the length of the outfall may preclude this option
    - Access to an existing permitted wastewater outfall within ten miles
    - Blending with an existing high volume cooling water outfall from a power generating plant with once-through cooling within ten miles

SJ2004-SP9
November 20, 2002
Task B.6 Applicable Rules and Regulations for Seawater Demineralization
for the
Seawater Demineralization Feasibility Investigation
By
R. W. Beck, Inc.

Background:

St. Johns River Water Management District (SJRWMD) has identified brackish groundwater, brackish surface water and seawater as potentially significant alternative sources of supply to meet projected 2020 demands.

Objective:

The purpose of this task is to present rules and regulations applicable to the permitting of seawater demineralization plants in the St. Johns River Water Management District in Florida. These rules, regulations and permit requirements are important to an understanding of some of the restraints and schedule considerations associated with a seawater demineralization facility.

The Applicable rules, regulations and permit requirements were reviewed and summarized into this technical memorandum and it includes a discussion of permitting actions.

Conclusion:

There are federal, state, regional, and local regulatory agencies and other entities that have rules, regulations and permitting requirements that would pertain to the construction and operation of a Seawater Demineralization Facility.

Federal
United States Environmental Protection Agency Region IV
United States Army Corps of Engineers
United States Coast Guard
United States Fish and Wildlife Service
National Marine Fisheries Service
Occupational Safety and Health Administration

State
Florida Department of Environmental Protection (Primary Agency)
Florida Department of Transportation
Florida Fish and Wildlife Conservation Commission

Regional

St. Johns River Water Management District

Local
Environmental Resource Management or Natural Resource Management Departments
City / County Building Departments
City County Engineering Departments
City / County Planning or Zoning Departments

Other Entities
CSX Railroad Corporation
Public Service Commission
Florida Inland Water Navigation District
Power companies

The components of a seawater demineralization facility can be generally broken down into the following five physical project elements:

1. Raw water intake;
2. Water pretreatment;
3. Plant facility;
4. Concentrate disposal; and
5. Product water conveyance.

Various rules regulations and permits are applicable to each element of the facility but may differ depending upon the final chosen configuration for a particular facility.

The most significant permit requirements for the construction and operation of a demineralization facility include:

- NPDES permit for the concentrate discharge
    - Primary issues of concern:
        - Alterations of natural salinity patterns and water quality in the surface water receiving the concentrate discharge;
        - Impacts of increased salinity on benthos and other marine organisms;
        - Entrainment and impingement of marine organisms in the raw water intake structure; and
        - Secondary impacts to the West Indian Manatee if co-located on an electric generating power plant with once-through cooling using coastal waters.

- Federal 404 dredge and fill permit for construction of the facility and associated infrastructure (e.g., pipelines)
    - Primary issues of concern:
        - Wetland impacts from the construction of the facility and related infrastructure; and

        - Secondary impacts to the West Indian Manatee if co-located on an electric generating power plant with once-through cooling using coastal waters.

- Environmental Resource Permit for construction of the facility and associated infrastructure (e.g., pipelines)
    - Primary issues of concern:
        - Storm water treatment and management from the facility;
        - Wetland impacts from the construction of the facility and related infrastructure; and
        - Secondary impacts to the West Indian Manatee if co-located on an electric generating power plant with once-through cooling using coastal waters.

SJ2004-SP11
September 17, 2003
Identification of Favorable Sites for Feasible Seawater Demineralization – Task C.4
For the
Seawater Demineralization Feasibility Investigation
By
R. W. Beck, Inc.

Background:

As part of the St. Johns River Water Management District (SJRWMD) Water Resource Development Program, seawater demineralization is being examined as a potential means to provide future water supply within SJRWMD. Recently, seawater demineralization has proven to be economically feasible when co-located with other facilities such as power plants. Within SJRWMD, sites have been identified that may offer potential co-location opportunities. SJRWMD wants to examine potential sites and identify up to five preferred sites for seawater demineralization.

Objective:

Discuss the methodology applied to develop the list of five preferred sites and include the results of the intermediate screening steps and identify the five preferred sites.

Preferred site identification is a multi-step process consisting of data gathering, screening to at least 20 potential sites, and subsequent ranking of those sites. Data gathering includes qualitative and site-specific data useful in developing the screening and ranking criteria.

Site-specific date includes information pertinent to identifying site features affecting the siting of a seawater demineralization facility.

Application of macro screening criteria to site-specific data was used to develop a list of potentially viable sites.

Conclusion:

Of the original 56 sites being considered, 21 sites met the macro screening criteria. A ranking matrix was used to identify the five most preferred sites. Generally the ranking criteria represent a subset of the major criteria developed under the macro screening with the addition of criteria for resource constraints (such as habitats etc). The ranking matrix combines specific criteria with various weighting to derive a weighted score. A higher weighted score represents a more desirable site.

The ranking resulted in the following sites being identified as the most promising:

1. Indian River Power Plant (Owner: Reliant, Inc)

2. Cape Canaveral Power Plant (Owner: FPL)
3. Daytona Beach/Bethune Point Waste Water Treatment Plant (Owner: City of Daytona Beach)
4. BCUD/South Beaches Waste Water Treatment Plant (Owner: Brevard County)
5. W. E. Swoope Generating Station Power Plant (Owner: City of New Symrna Beach)
6. BCUD/Sykes Creek Regional Waste Water Treatment Facility (Owner: Brevard County)

Though the report was to identify the top 5 most preferred sites, sites 5 and 6 had equal scoring and are both presented here.

SJ2004-SP13
January 2002
Task B.5 Applicable Rules and Regulations for Concentrate Management
Investigation of Demineralization Concentrate Management
By
Reiss Environmental, Inc.

Background:

St. Johns River Water Management District (SJRWMD) has identified brackish groundwater, brackish surface water and seawater as potentially significant alternative sources of supply to meet projected 2020 demands. The use of these mineralized water sources requires management of the concentrate that is a by-product of the demineralization. These technologies are primarily pressure driven membrane processes that include reverse osmosis and nanofiltration. During this process, minerals in the source water, including salt, are removed producing potable water as well as a by-product known as demineralization concentrate.

The Demineralization Concentrate Management Plan will outline environmentally acceptable options for concentrate management which currently include deep well injection, land spreading, discharge to surface waters, discharge to domestic wastewater treatment facilities, and various forms of reuse (including blending with reclaimed water). Prior to development of the plan or implementation of the concentrate management alternative mentioned, it is important to have an understanding of applicable rules and regulations governing concentrate management.

Objective:

The purpose of this technical memorandum is to identify and summarize relevant demineralization concentrate management rules and regulations. This topic is very important since demineralization concentrate management and the associated regulations are primary considerations associated with the development of demineralization facilities within SJRWMD. Recommendations are provided regarding potential action to support an environmentally sound, logical and clear regulatory process.

This technical memorandum was prepared by identifying agencies that have direct or indirect impact on permitting of demineralization concentrate management, followed by the collecting and summarizing of rules and regulations. Information was obtained through a literature search and by contacting regulatory agency officials, other experts in the field, and utilities currently using demineralization processes.

Conclusion:

The Florida Department of Environmental Regulation is the primary agency responsible for the review and issuance of permits for demineralization concentrate management.

There are a number of agencies that would be considered “secondary,” as their review is related to ancillary facilities for concentrate disposal, such as pipelines and outfall structures. Agencies potentially requiring permits, approvals or authorization for demineralization concentrate management projects are:

Federal
U.S. Environmental Protection Agency, Region IV
U.S. Army Corps of Engineers
Occupational Safety and Health Administration
U.S. Geological Survey
U.S. Fish and Wildlife Service
National Marine Fisheries Service

State
Florida Department of Environmental Protection (Primary Agency)
St. Johns River Water Management District
Florida Department of Transportation
Florida Fish and Wildlife Conservation Commission

Local
Health Department
Local Pollution Control
Environmental Resource Management Department or Natural Resource Management Department
City/County Building and/or Zoning Departments
CSX Railroad Corporation

As seen above, a large number of agencies could directly or indirectly affect permitting of demineralization concentrate management. However, the requirements of the EPA and the FDEP are the most pertinent to demineralization concentrate management and represent the critical test of the viability of any demineralization concentrate management project.

SJ2004-SP14
October 2001
Demineralization Technologies Annotated Bibliography and Database
In Support of Task C.1 and C.2
For the
Investigation of Demineralization Concentrate Management Project
By
Reiss Environmental and Subconsultant, Malcolm Pirnie

This annotated bibliography is part of the overall scope of the Investigation of Demineralization Concentrate Management Project. It is an annotated bibliography and subject matrix representing the body of knowledge concerning demineralization technology and the environmental and cultural impacts of demineralization concentrate management.

The bibliography is the result of literature survey and a review of existing reports, articles, and other literature specifically related to demineralization technology and environmental and cultural impacts of demineralization concentrate management. The information in those reports and publications has been entered into an electronic database that allows a search of the documents through various listings and tables. This database lists documents that will be used to prepare the final Demineralization Concentrate Management Plan and also lists documents that may not specifically be used in preparing the plan but which contain information of related interest. A data field showing “Reference used in TM” with a yes/no entry in the field, will be used to identify whether the reference was used in the final plan.

For presentation purposes, the database is alphabetized by author, as is the standard for reference formats. Multiple author listings are further arranged by publication date.

SJ2004-SP15
October 2001
Geological Annotated Bibliography and Database
In Support of Task C.1 and C.2
For the
Investigation of Demineralization Concentrate Management Project
By
Reiss Environmental and Subconsultant, Parsons, Brinckerhoff, Quade and Douglas

This annotated bibliography is part of the overall scope of the Investigation of Demineralization Concentrate Management Project. It is an annotated bibliography and subject matrix representing the body of knowledge concerning the feasibility of subsurface injection as a means of demineralization concentrate management with the study area.

The bibliography covers four areas of hydrogeologic interest:

- Potential for Deep Well Injection
- Potential Concentrate Discharge Regimes
- Potential Source Regimes
- Potentially Acceptable Discharge Options

The bibliography is the result of literature survey and a review of publications specifically related to investigations of the surface and groundwater waters of the St. Johns River Water Management District and of the hydrologic, geologic, and quality parameters associated with those waters. The information in those reports and publications has been entered into an electronic database that allows a search of the documents through various listings and tables. The database lists documents that will be used to prepare the final Demineralization Concentrate Management Plan and also lists documents that may not specifically be used in preparing the plan but which contain information of related interest. A data field showing "Reference used in TM" with a yes/no entry in the field, will be used to identify if the reference was used in the final plan.

For presentation purposes, the database is alphabetized by author, as is the standard for reference formats. Multiple author listings are further arranged by publication date.

SJ2004-SP16
January 2002
Task B.2 and Task B.3 Demineralization Concentrate Database and GIS Data Layers
For the
Investigation of Demineralization Concentrate Management Project
By
Reiss Environmental and Subconsultants, Mickley and Associates and Malcolm Pirnie

The Demineralization Concentrate Database and GIS Data Layers a part of the overall scope of the St. Johns River Water Management District's Investigation of Demineralization Concentrate Management Project and are provided in fulfillment of the requirements of Task B.2 and Task B.3. The tasks require preparation of a relational database of information concerning demineralization concentrate management for demineralization plants greater than 0.1 million gallons per day (mgd) in Florida and development of GIS Data Layers (point coverage or shapefile) representing each category of location data identified from the demineralization plant database.

This document provides the following information to support the database and GIS deliverables:

- Methodology
- Content of database and GIS layers
- User's Guide
- References

The database was populated based on a survey of and collection of information from multiple sources throughout the state of Florida:

- Past surveys
- Florida Department of Environmental Protection (FDEP) district offices
- Membrane plant contacts
- Other

Past Surveys
The information collection process began with the development of a tentative list of water utility plants that utilize demineralization technologies. The initial list was compiled from past survey efforts (Mickley et al., 1993; Mickley 2001), which included a total of 73 plants and some background information available for many of these plants. This initial plant list was refined through interaction with FDEP and the individual demineralization plants.

A total of 22 plants were eliminated from further consideration due to one of the following reasons:

- Plant has been taken out of service (11 plants)

- Plant size is below the 0.1 mgd cutoff (8 plants)
- Plant was never built (3 plants)

In addition, a total of five plants not on the original list were added during the course of the project. Therefore, the final plant list has 51 operating plants, 2 stand-by plants, and 3 plants under construction, for a total of 56 plants.

Florida Department of Environmental Protection and Water Management Districts
Communications and data collection from FDEP were focused on the FDEP district offices. The first purpose for interaction with the FDEP district offices was to review and modify the initial plant list. Later interactions focused on obtaining copies of the concentrate disposal permits and discussing individual plant disposal issues with FDEP personnel. The water management districts (WMDs) were approached as part of the source water data collection effort. Source water information included production well depths, diameters, and well locations. Florida demineralization drinking water plants greater than 0.1 mgd are located in three of the five WMDs.

Membrane Plant Contact and Other Sources
After obtaining information from FDEP offices and the WMDs, the information compilation effort focused on the individual demineralization plants and other sources. 80% of the effort expended in information collection involved interactions with the plants. As for other sources, it was determined that Palm Beach County had developed GIS data for production wells in their county, but after contacting the Department of Health, they indicated that policy had been reviewed after September 11, 2001, and it had been decided that data should be collected directly from the demineralization plants.

In summary, the Access database includes a total of 56 individual demineralization plant summary reports, and the GIS data files include three Data Layers for the demineralization plant locations, plant source water locations and plant discharge regime locations. The access database and GIS Data Layers are linked.

SJ2004-SP20
February 2004
Surface Water Treatability and Demineralization Study
For
St. Johns River Water Management District
By
CH2M Hill, Inc.

Background:

The St. Johns River Water Management District (SJRWMD) and CH2M Hill conducted and extensive pilot study involving the use of integrated membrane systems to produce potable water from the St. Johns River. The study identified treatment processes and costs involved in using the St. Johns River as an alternative water supply. This source is one alternative being evaluated to offset a large water supply deficit projected in eastern central Florida.

Objective:

The purpose of this study is to demonstrate the treatability of the source water, identify the appropriate technology and basic design parameters for treatment, and determine both the capital and operational costs for a potential facility. The intent is that the information in this report will assist an entity in implementing a surface water treatment facility to be located in the reach between Titusville and DeLand on the St. Johns River and facilitate the next step for a water supply project of this type.

Conclusion:

A preliminary raw water characterization study was conducted to evaluate pretreatment technologies that would sufficiently reduce the organic and turbidity levels in the water (e.g., coagulation, clarification, and filtration) so that effective salt removal could be conducted with RO membranes. The first step of the pilot program was to meet with the stakeholders for the project and select the treatment processes for the study. The pilot plant design was developed based on the treatment alternatives selected. Based on the pilot testing, the pretreatment alternatives tested were able to sufficiently treat the St. Johns River water to meet potable standards as well as pretreat the water to allow the use of RO membranes for desalting. These treatment alternatives are as follows:

- Actiflo ballasted sand clarifier followed by dual media filtration
- SuperP blanket clarifier followed by dual media filtration
- Zenon ultrafilter operating in direct filtration mode (coagulation in tank)
- Zenon ultrafilter operating as a filter after high-rate clarification
- Memcor microfilter operating as a filter after high-rate clarification

The following RO membrane types recommended for desalting this pretreated source water based on the pilot study are:

- Filmtec BW30FR

- TriSep X-20

Considering the use of the MF/UF membrane used for either direct filtration or filtration after clarification, as well as the percentage of desalting with RO membranes, the following six potential treatment combinations can be recommended for treating this water based on the pilot results:

1. Zenon ZW-500-C (direct filtration) with 100 percent RO treatment
2. Zenon ZW-500-C (direct filtration) with 75 percent RO treatment
3. Actiflo/Granular Media Filtration with 75 percent RO treatment
4. SuperP/Granular Media Filtration with 75 percent RO treatment
5. Actiflo/Memcor CMF-S or Zenon 1000 with 100 percent RO treatment
6. Super-P/Memcor CMF-S or Zenon 1000 with 100 percent RO treatment

The study found that these are all feasible water treatment technologies, with each having a unique set of benefits and corresponding costs.

SJ2004-SP22
May 2002 Final Issued
Technical Memorandum Preliminary Raw Water Characterization
St. Johns River Water Supply Project
Surface Water Treatability and Demineralization Study
By
CH2M Hill

Background:

The purpose of this technical memorandum (TM) is to provide the preliminary raw water characterization for the St. Johns River Water Supply Project Surface Water Treatability and Demineralization Study. The study is being conducted to identify the treatment requirements for the St. Johns River water for a potential treatment facility to be located in the reach between Titusville and De Land.

Objective:

This TM was developed to review the raw water characteristics of the St. Johns River. These data are being summarized for use in the evaluation and selection of appropriate treatment processes for the pilot program. The initial water quality characterization presented in this TM will define the expected range of raw water quality parameters sufficiently to assist in the selection of appropriate water treatment process for testing. Additional analysis will be performed as additional data are collected and become available.

Conclusion:

The St. Johns River water is a slightly brackish surface water. The water has a low turbidity, high TOC, high hardness, and high TDS. TDS concentrations range from 1,118 mg/L to 645 mg/L. Hardness in the river ranges from 411 mg/L to 233mg/L and is primarily noncarbonate hardness due to the low alkalinity levels in the St. John River. Average TOC values range from approximately 25 mg/L at the southern monitoring stations to less than 20 mg/L at the northern monitoring stations. This initial water quality characterization summary will help facilitate the selection of pilot treatment technologies to be tested.

Throughout the course of this study, additional data will be collected and summarized for inclusion in the final report. After the pilot study, these raw water data will be used to quantify any differences in treatment levels that may be necessary due to changes in raw water quality along the river between Cocoa and De Land.

SJ2004-SP25
November 2003
Surface Water Treatment Plant Siting Study
Level 2 Analysis: Preliminary Site-Specific Screening
East Central Florida Water Supply Initiative
St. Johns River Water Supply Project
By
HDR Engineering, Inc.

Background:

The St. Johns River Water Management District (SJRWMD) implemented an interactive program with utilities, citizens and other interested parties to develop the District's Water Supply Plan (DWSP) through the Water 2020 planning process.
The need for alternative water supplies from the traditional use of groundwater became apparent through this process. Three projects, the Surface Water Treatment Plant Siting Study, the St. Johns River Treatability Study, and the Demand Projection and Affordability Study, will help to facilitate design, location, and costing of a complete surface water treatment facility, intake structure and connecting pipelines on a reach of the St. Johns River between the southern end of Lake Monroe and DeLand, Florida.

Objective:

The purpose of this technical memorandum is to present the methods, analysis, and results of the Level 1 and Level 2 Siting Analysis phases of the Surface Water Treatment Plant Siting Study. A final state of analysis will be conducted as a part of this siting study in the Level 3 Analysis.

Conclusion:

The Level 1 Analysis of The St. Johns River Water Project Water Treatment Plant Siting Study consisted of conducting a preliminary screening for water treatment plant sites through a GIS analysis. The screening included evaluating the study area, defined as the reach of the St. Johns River between the southern end of Lake Monroe in Sanford and DeLand extending five miles on each side of the river, for potential sites using a series of GIS overlays.

A suitability analysis was conducted using datasets. This suitability analysis included assigning each of the constraint factors a "High", "Moderate" or "Low" suitability class. Following the development of the environmental factors and assignment of suitability classes, the factors were combined utilizing GIS into five factor-specific suitability or overlay maps:

- Wetlands and Hydric Soils
- Floodplains
- Floral and Faunal Habitat

- Land Use/Land Cover
- Hazardous Material Sites

Each of these overlays showed areas of no/low constraints, moderate constraints, and high constraints. A combined overlay map was generated and levels of constraint were determined based on combined suitability classes that were developed and coded from one to five, where one represents an area with very low constraints; five represents an area that is severely constrained; and two, three, and four represent an area with varying combinations of moderate constraints.

The areas represented as those with low constraints (a suitability code of one) were then further screened based on size and distance to the St. Johns River. Size criteria were entered into the GIS model to identify areas with 50 or more acres available for a water treatment plant and its ancillary facilities. A distance criteria of less than three miles from the St. Johns River was treated as the most desirable condition and three to six miles was treated in the model as an acceptable condition.

A windshield survey of the identified areas was then conducted to field verify the GIS data and to select 11 potentially feasible areas for further evaluation.

The Level 2 Analysis was a preliminary site-specific screening analysis that included additional data collection and impact quantification for the eleven (11) sites identified through the Level 1 preliminary study screening process. Level 2 analysis also included environmental site assessment, hazardous material site screening, evaluation of land owner information, site boundary refinement, intake locations, pipeline routing analysis, and concentrate disposal.

At the conclusion of the Level 2 Analysis the sites were each scored based on the siting criteria. Weighting factors were developed for each criterion as compared to another criterion. The raw score for each criterion was multiplied by the corresponding weighting factor. The resultants were then summed to create a total weighted score for each site. The weighted totals were used to rank the sites as they compared to one another. The five sites with the highest weighted scores are those being carried forward to the Level 3 Analysis for further evaluation.

SJ2004-SP26
February 2004
Surface Water Treatment Plant Siting Study
Level 3 Analysis: Detailed Site-Specific Screening
East Central Florida Water Supply Initiative
St. Johns River Water Supply Project
By
HDR Engineering, Inc.

Background:

The St. Johns River Water Management District (SJRWMD) implemented an interactive program with utilities, citizens and other interested parties to develop the District's Water Supply Plan (DWSP) through the Water 2020 planning process.
The need for alternative water supplies from the traditional use of groundwater became apparent through this process. Three projects, the Surface Water Treatment Plant Siting Study, the St. Johns River Treatability Study, and the Demand Projection and Affordability Study, will help to facilitate design, location, and costing of a complete surface water treatment facility, intake structure and connecting pipelines on a reach of the St. Johns River between the southern end of Lake Monroe and DeLand, Florida.

Objective:

In the Level 1 Analysis, a preliminary screening of the study areas was conducted to identify potential areas for the development of a water treatment plant and eleven potential areas were identified. In the Level 2 Analysis, a preliminary site-specific screening of these areas was conducted to refine the areas boundaries into smaller site boundaries and to identify the five most feasible locations for a water treatment plant. The purpose of this technical memorandum is to present the methods, analysis, and results of the Level 3 Analysis, Detailed Site Specific Screening. The Level 3 Analysis included conducting more detailed site-specific evaluation of the treatment plant sites, the proposed river intake locations, the inter-connecting pipelines and concentrate management options.

Conclusion:

In the Level 3 Analysis, a more detailed analysis of the five water treatment plants sites short-listed through the Level 2 Analysis was conducted. The purpose of this more detailed analysis was to refine the data obtained through the GIS databases on field and aerial reviews of the sites.

Level 3 Analysis included:

1. Property Owner Coordination
    - Further attempts made to contact and coordinate with the property owners identified through property appraiser information

- Follow-up attempts to contact property owners via telephone to explain project and obtain permission for access to property

2. Environmental Assessment
    - Site reviews conducted to characterize each site and identify any substantial constraints such as protected species, habitat, potential contamination or on-site hazardous materials, and land use
3. Land use/Zoning Evaluation
    - Future land use and existing zoning classifications were evaluated
4. Land Valuation
    - A land valuation process was conducted
    - Evaluation of land use and zoning and parcel size
    - Evaluation of comparable land sales
    - Per acre land cost development for the sites in Seminole, Volusia and Lake Counties
    - Per acre costs applied to the five sites to develop potential land acquisition costs
5. Pipeline Routes
    - The pipeline routes previously identified were reviewed and revised as necessary to reflect more feasible pipeline corridors.
6. Intake Sites
    - Potential intake sites were identified
    - Consideration was given to potential environmental and social impacts as well as proximity to the proposed water treatment plant sites
    - Site reviews were completed to characterize each site and identify any substantial constraints such as protected species, habitat, potential contamination or on-site hazardous materials, and land use.
7. Concentrate Management Options
    A. Due to the close proximity to the source water, the St. Johns River, discharging the concentrate from the surface water treatment into the river was one of the concentrate management options
    B. Discharge to wastewater treatment facilities- Two Options:
        - The introduction of the concentrate to the influent of an existing wastewater treatment facility, whether into the collection system or at the headworks of the plant
        - The introduction of the concentrate to the effluent of an existing facility for surface discharge, subsurface injection, or reuse.

    C. Deep Well Injection

Based on the Level 3 Analysis, the five shortlisted water treatment plant sites appear to be feasible for the development of a surface water treatment plant that will treat water from the St. Johns River. The alternative combinations of raw water intakes, water treatment plant sites and finished water deliver points developed in this report correspond to those being evaluated in both the St. Johns River Treatability and Demineralized Concentrate Management Study and the Demand Projection and Affordability Study.

SJ2004-SP42
2004
East-Central Florida Water Supply Planning Initiative Phase II
Annual Report of Activities and Accomplishments

Background:

The east-central Florida area, which includes Brevard, Orange, Volusia and Seminole counties and portions of Lake Marion, Polk, Sumter, Osceola and Flagler counties, has been the subject of a major water supple planning initiative since 2002. The East-Central Florida Water Supply Planning Initiative is designed to assist in meeting future water supply needs, while protecting the water resources and related natural systems. The Initiative resulted from two regionwide water summits held in early 2002 where local government officials, water supply utilities, and the St. John River, South Florida and Southwest Florida water management districts began working together to develop solutions to their collective future water supply issues. Representatives from all ten counties in the east-central Florida area were invited to participate in Phase I of the Initiative. The Phase I process resulted in the East-Central Florida Water Agenda, which identifies six key water supply issue areas, 17 recommendations and 32 strategies developed by the Initiative Phase I participants. The six areas identified in the Agenda are:

- Enhance intergovernmental coordination
- Develop new water supply
- Link land use planning and water supply planning
- Increase use of reclaimed water
- Enhance aquifer recharge using reclaimed water
- Increase water conservation

Objective:

Phase II of the Initiative is designed to build upon the results of Phase I with the development of action plans and identification of specific projects to implement the Agenda recommendations and strategies. The St. Johns River Water Management District is managing the Phase II effort in coordination with the South and Southwest Florida water management districts. Initiative activities in 2003 were focused in six counties of the 10-county east-central Florida region – Volusia, Brevard, Orange, Seminole, Lake and Osceola counties. Marion County was not included in the focus area, but their representatives were invited to participate in Initiative meetings.

Initiative activities in 2004 were focused in seven counties of the 10-county east-central Florida region, Volusia, Brevard, Orange, Seminole, Lake, Flagler and Osceola.

Conclusion:

Enhance Intergovernmental Coordination
To better facilitate development of cooperative solutions, the focus shifted to facilitation at both the county level and at the project level. Facilitation efforts initiated in 2004are:

County-Level Activities

- Brevard County—District staff continued liaison with the Brevard Water Supply Board.
- Countywide Water Supply Plans—The District focused much of its attention in 2004 on securing local government interlocal agreements to support development of countywide water supply plans.

Project-Level Activities

- CROT Integrated Water Supply Alternative Study—The city of Cocoa, the Reedy Creek Improvement District, Orange County, and the Toho Water Authority (CROT) worked cooperatively during 2004 to identify possible joint alternative water supply projects, which, if implemented, could delay the need for more costly projects. The focus was on reclaimed water and stormwater projects.
- Taylor Creek Reservoir/St. Johns River Expansion Project—This project was identified as a water supply development project (Taylor Creek Reservoir Expansion Project) in the 2004 DWSP Interim Update. Emerging as the highest priority project for development because it is likely the least costly of the identified alternative water supply development projects for the east-central Florida area.
- The North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Study—The District cooperatively funded this study, and District consultants facilitated and administered the effort.

General Activities

- Initiative and water supply issue information continues to be provided to elected officials, water supply utilities, the public, and the media through public meetings, one-on-one meetings, direct mail, the District's quarterly magazine (*Streamlines*), the District's monthly local government newsletter (WaterWatch), media interviews, and the District's Web site (*sjrwmd.com*).

Communication tools were developed to inform Initiative participants, the media, and the public of water supply issues and Initiative activities. Current tools include an updated project fact sheet, a project Web site, an Agenda summary, annual reports of activities and accomplishments, an upcoming meeting schedule, and a database of elected officials, water supply utilities, and other interested parties.

Develop New Water Supply
Water Supply Projects
One of the goals of the Initiative is to expand and enhance the findings of the DWSP, including further investigations of potential alternative water supply sources and identification of additional water supply development projects that could be implemented to develop these sources to help meet future east-central Florida water supply needs.

Projects originally identified in the 2000 DWSP include:

- Eastern I-4 Corridor Project
    - St. Johns River water supply facility component
    - Eastern Orange and Seminole counties regional reuse component
    - City of Apopka reuse component
- Strategic water conservation assistance project
- Strategic reclaimed water assistance project

In 2003, potential water supply development projects were identified and evaluated by Initiative participants to help meet future water supply needs in east-central Florida. Of those identified, 11 were added to the list of water supply development projects identified in DWSP with the publication of Special Publication SJ2004-SP28, *2004 Interim Update to Special Publication SJ2000-SP1, District Water Supply Plan*.

Link Land Use Planning and Water Supply Planning

2004 Initiative Activities continued work begun in 2003 regarding the implementation of the requirement that local governments consider the water management district's regional water supply plans in their comprehensive plans.

Water Supply Facilities Work Plans

In 2004, District staff activities included the following:

- Coordinated with DCA to determine the completion deadlines for work plans for all local governments in the District
- Developed a fact sheet providing basic information regarding the schedule and requirements for completing the work plans
- Distributed the fact sheet to all local governments
- Made the fact sheet available on the District Web site
- Provided some form of assistance to about half of the 48 local governments in east-central Florida that now have 2006 deadlines
- Reviewed and commented on four work plans submitted to DCA by local governments

Comprehensive Plan Amendments

In 2004, District staff activities included the following:

- Distributed the "Potable Water Availability" worksheet developed in 2003 to all local governments
- Implemented an interactive approach with local governments to obtain the information requested on the worksheet
- Provided comments to DCA regarding potable water availability and related water resource issues
- Assisted local governments with their responses to DCA concerns relative to water availability and related water resource issues

Increase Use of Reclaimed Water

Efforts, which were already under way prior to the start of the Initiative, continued along with new projects resulting from Initiative-funded efforts.

- Northwest Cities Reuse Interconnect Project

- Western Orange Reuse Plan
- Brevard County Barrier Island Reuse Plan

The North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Study, performed cooperatively by Seminole County and the cities of Sanford and Lake Mary (“Tri-Party”), with a 50% match from the District, was completed this year.

Enhance Aquifer Recharge Using Reclaimed Water
A draft report is under review regarding the evaluation of recharge benefits associated with the Conserv II project.

The CFARE2 study to identify recharge projects in the Orange County area, including those using reclaimed water, was completed this year. A screening process was developed by which other recharge projects identified in the future could be evaluated for feasibility.

The North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Study is a project that addresses the issue area of enhance aquifer recharge using reclaimed water as well as the issue area of increase use of reclaimed water.

The District will monitor a cooperative effort between Orange County and the U.S. Geological Survey to investigate the removal of nitrate in reclaimed water application sites in west Orange County.

Increase Water Conservation
2004 Initiative Activities included:

- Continuing to coordinate with the model landscape ordinance committee to develop an acceptable east-central Florida model landscape ordinance
- Continuing with ongoing regulatory/permitting and incentive programs
- Assessing the amount of reduction in water demand that can be reasonably expected through specific water conservation programs and practices (Coordinated with the Florida Department of Environmental Protection)

Recommendations for 2005 Phase II Initiative Activities
Enhance Intergovernmental Coordination

- Continue intergovernmental coordination among governments
- Continue the focus on developing countywide water supply plans and partnerships between suppliers
- Begin to identify additional opportunities to develop intercounty water supply plans and partnerships
- Continue ongoing county-level facilitation in Lake, Seminole, Flagler and Orange counties
- Provide appropriate water supply plan development support to Marion County
- Continue to support WAV

- Continue ongoing intercounty facilitation
- Continue to educate local government, state and federal elected officials, and the public on water supply issues and potential solutions
- Continue to coordinate Initiative activities with the South and Southwest Florida water management districts, FDEP, and DCA
- Continue to use existing water resource, planning, and business organizations to improve communications and coordination with other organizations
- Improve communications with the business community concerning water issues by identifying and contacting organizations to present information on Initiative activities
- Prepare funding request packages for programs and projects developed through the Phase II process

Develop New Water Supply

- Continue work with interested parties to accomplish TCR/SJR Expansion project
- Facilitate, as necessary, the planning for and development of other new projects listed in the 2004 DWSP update
- Evaluate other water supply projects, as appropriate
- Continue to support WAV

Link Land Use Planning and Water Supply Planning

- Continue to educate local governments about, provide support for, and assist in coordinating the development of their water supply facilities work plans
- Continue to educate local governments about water supply availability and related water resource issues relative to comprehensive plan amendments

Increase Use of Reclaimed Water

- Provide assistance to and monitor the progress of regional reuse projects
- Provide assistance to and monitor the plans of utilities to augment reclaimed water systems with alternative water supplies
- Continue to seek funding for regional reuse projects through the federal State and Tribal Assistance Grant Program, the Florida Forever Program and the District's Alternative Water Supply Cost-Share Program
- Continue to work with local governments to increase the beneficial use of reclaimed water to the extent economically, environmentally, and technically feasible, as a means of reducing per capita water use of potable water

Enhance Aquifer Recharge Using Reclaimed Water

- Report on the results of the Conserv II project analysis and develop the next steps for coordination between the water management districts and FDEP
- Provide assistance to and monitor the progress of the CFARE2 project

Increase Water Conservation

- Continue with ongoing regulatory/permitting and incentive programs

- Finalize the east-central Florida model landscape ordinance and initiate a pilot incentive program in Lake County
- Encourage local government and water supply utility participation in coordinated water conservation public awareness programs

SJ2005-SP12
2005
Aquifer Storage and Recovery Issues and Concepts
By:
R. David G. Pyne, P.E.
ASR Systems LLC

Background:

ASR wells have been operating in Florida since 1983. At least 65 ASR wells in 13 ASR wellfields are in operation, and more than 25 other ASR wellfields are in various states of development. During the past several years, concerns have been expressed by several public interest groups regarding whether ASR technology has been adequately proven in Florida, in the sense of whether proposed applications for storage of drinking water, treated surface water, reclaimed water, and fresh groundwater in Florida's brackish aquifers may create unacceptable water quality and environmental problems. Concerns have focused on potential leaching of metals such as arsenic, mercury, and uranium from the limestone into the recovered water or into the surrounding aquifer; potential contamination of the aquifer with disinfection byproducts (DBPs); potential contamination with pathogenic microbiota such as bacteria, viruses, and protozoa; and mixing with surrounding brackish water so that recovery efficiency is reduced to below acceptable levels.

Objective:

The St. Johns River Water Management District (SJRWMD) has prepared this paper to inform elected officials and other interested citizens regarding the scientific information that is available to support the decision-making process as it relates to the implementation of aquifer storage and recovery (ASR) technology.

Conclusion:

Scientific literature is substantial and consistent in showing that, under hydrogeologic conditions prevalent in Florida and almost all other ASR sites nationwide, DBP constituents are reduced or eliminated rapidly through natural processes during ASR storage, if these constituents are present in the recharge water. The principal mechanism for the reduction in the DBPs is microbial degradation. Several proven approaches are currently used at various Florida water treatment plants to control or eliminate the presence of DBPs in the recharge water, if needed. As such, DBPs should not be an issue for Florida ASR sites.

Metals occur naturally at low concentrations in the limestone of the Floridan aquifer. During ASR storage, these metals may tend to dissolve out of the limestone and create elevated concentrations in the recovered water. Elevated concentrations may also occur in the ASR storage zone. Metal concentrations typically decline with time, with distance from the ASR well, and with successive operating cycles. No long-term operating ASR sites in Florida are known to have elevated concentrations of metals such as arsenic, uranium, or mercury, although metals data are sparse in most of the data sets, particularly those for the older facilities. Typically, it is anticipated that after four to eight ASR cycles at the same storage volume, arsenic concentrations should subside to acceptable levels. This anticipated decline in arsenic is based upon testing and operational experience at 13 ASR wellfields in Florida that have been in operation for up to 21 years. There have been no documented instances of water exceeding metal standards having been distributed to the public through drinking water distribution systems from Florida ASR wells.

Pathogenic microbiota are not present in recharge water to ASR wells in Florida, reflecting state and federal regulations and policies by FDEP and SJRWMD to recharge only water that meets drinking water standards for storage in our brackish aquifers. Scientific laboratory investigations and, to a lesser degree, field investigations in Florida, have shown that bacteria, viruses, and some protozoa attenuate naturally and rapidly during ASR storage and under controlled conditions approximating ASR storage. This natural attenuation serves as an additional barrier to protect groundwater quality and public health. No Florida data are currently available regarding the fate of Cryptosporidium and algal toxins during ASR storage; however, such data are available from sources outside Florida. This is not an issue for recharge water meeting drinking water standards.

Recovery efficiency is an indication of how much mixing occurs between the stored water and the native water in the aquifer system. Generally, for storage in Florida's brackish aquifers, efficiency starts out low and improves with successive operating cycles due to freshening of the storage zone around an ASR well. A majority of the ASR wells that have been operating for more than 5 years have reached acceptable and economically viable levels of recovery efficiency. The acceptable level of recovery efficiency varies amount individual water users and is generally in the range of 70% to 100%, with higher levels accomplished in less brackish aquifers and lower levels in highly saline or seawater aquifers.

The use of ASR as a water management tool, in conformance with state and federal regulations, has proven to be both scientifically sound and environmentally responsible. Emerging policies of FDEP continue to steer the development and implementation of ASR. ASR is a site-specific technology that is still evolving, and there is much to learn regarding its application in the different geological setting of Florida.

SJ2005-SP19
November 2005
East-Central Florida Water Supply Planning Initiative
Final Report

Background:

The east-central Florida area, which includes Brevard, Orange, Volusia and Seminole counties and portions of Lake Marion, Polk, Sumter, Osceola and Flagler counties, has been the subject of a major water supple planning initiative since 2002. The East-Central Florida Water Supply Planning Initiative is designed to assist in meeting future water supply needs, while protecting the water resources and related natural systems. The Initiative resulted from two regionwide water summits held in early 2002 where local government officials, water supply utilities, and the St. John River, South Florida and Southwest Florida water management districts began working together to develop solutions to their collective future water supply issues. Representatives from all ten counties in the east-central Florida area were invited to participate in Phase I of the Initiative. The Phase I process resulted in the East-Central Florida Water Agenda, which identifies six key water supply issue areas, 17 recommendations and 32 strategies developed by the Initiative Phase I participants. The six areas identified in the Agenda are:

- Enhance intergovernmental coordination
- Develop new water supply
- Link land use planning and water supply planning
- Increase use of reclaimed water
- Enhance aquifer recharge using reclaimed water
- Increase water conservation

Objective:

Phase II of the Initiative is designed to build upon the results of Phase I with the development of action plans and identification of specific projects to implement the Agenda recommendations and strategies. The St. Johns River Water Management District is managing the Phase II effort in coordination with the South and Southwest Florida water management districts. Initiative activities in 2003 were focused in six counties of the 10-county east-central Florida region – Volusia, Brevard, Orange, Seminole, Lake and Osceola counties. Marion County was not included in the focus area, but their representatives were invited to participate in Initiative meetings.

Initiative activities in 2004 were focused in seven counties of the 10-county east-central Florida region, Volusia, Brevard, Orange, Seminole, Lake, Flagler and Osceola.

2005 Initiative activities in 2005 were focused in eight counties of the 10-county east-central Florida region, Volusia, Brevard, Orange, Seminole, Lake, Marion, Flagler, and Osceola.

Conclusion:

Enhance Intergovernmental Coordination
To better facilitate development of cooperative solutions, the focus shifted to facilitation at both the county level and at the project level. Facilitation efforts initiated in 2004and continued in 2005 are:

County-Level Activities

- Brevard County—District staff continued liaison with the Brevard Water Supply Board.
- Countywide Water Supply Plans—The District focused much of its attention in 2005 on securing local government interlocal agreements to support development of county-level water supply plans.

Project-Level Activities

- CROT Integrated Water Supply Alternative Study—The city of Cocoa, the Reedy Creek Improvement District, Orange County, and the Toho Water Authority (CROT) worked cooperatively during 2004 to identify possible joint alternative water supply projects, which, if implemented, could delay the need for more costly projects. The focus was on reclaimed water and stormwater projects. An integrated water supply alternatives study began in FY 2005 and is expected to be complete in FY 2007.
- Taylor Creek Reservoir/St. Johns River Expansion Project—This project was identified as a water supply development project (Taylor Creek Reservoir Expansion Project) in the 2004 DWSP Interim Update. Emerging as the highest priority project for development because it is likely the least costly of the identified alternative water supply development projects for the east-central Florida area. Facilitated discussions held during 2004 and 2005 resulted in a proposed Memorandum of Agreement among six SUPPLIERS plus the St. Johns District and the South Florida District.
- The Lower Ocklawaha River in Putnam County Water Supply Evaluation—In response to a request from the Putnam County Commission, the District began the process to further evaluate the development of the Lower Ocklawaha River in Putnam County as a source of potable water supply.

General Activities

- Initiative and water supply issue information continued to be provided to elected officials, water supply utilities, the public, and the media through public meetings, one-on-one meetings, direct mail, the District's quarterly magazine (*Streamlines*), the District's monthly local government newsletter (WaterWatch), media interviews, and the District's Web site (*sjrwmd.com*).
- Communication tools were developed to inform Initiative participants, the media, and the public of water supply issues and Initiative activities. Current tools include an updated project fact sheet, a project Web site, an Agenda summary, annual reports of activities and accomplishments, an upcoming meeting

schedule, and a database of elected officials, water supply utilities, and other interested parties.

Develop New Water Supply
The 2005 Initiative Phase II work continued with efforts undertaken during the 2003-2004 period. In addition, the work was influenced by new legislation passed during the 2005 Florida legislative session.

2005 Legislative Actions
The Florida Water Protection and Sustainability Program (WPSP) was created through passage of Senate bills 360 and 444 during the 2005 legislative session and their subsequent signing into law by Gov. Jeb Bush. The purpose of this program is to provide cost-share funding for construction of alternative water supply projects. The legislative actions also included the requirement for local governments in priority water resource caution areas, such as east-central Florida, to select water supply development projects adequate to meet their demands within 18 months of adoption of the DWSP.

Water Supply Projects

- During 2005 the District prepared a draft 2005 DWSP. The document identified additional water supply development projects for the east-central Florida area.

Project Implementation

- St. Johns River/Taylor Creek Reservoir Water Supply Project—Project implementation began in November 2005 when the city of Cocoa, on behalf of the project partners, advertised for consultant services to accomplish a preliminary design report and Environmental Information Document for the water supply project.
- The Upper St. Johns River Basin Project—The District is investigating ways to optimize the Upper St. Johns River Basin Project to maintain flood control and environmental restoration goals while maximizing the amount of water available for public water supply.
- The status of implementation of reclaimed water projects is included in the section of this document titled Increase Use of Reclaimed Water.

Link Land Use Planning and Water Supply Planning
The 2005 Initiative activities focused on the review of local government comprehensive plan amendments and implementation of 2005 legislative changes regarding water supply requirements in local government comprehensive plans, including the development of water supply facilities work plans.

Water Supply Requirements in Comprehensive Plans
The District's efforts in 2005 focused on helping local governments understand their responsibilities relative to the cumulative legislative changes made in 2002, 2004, and 2005 regarding water supply requirements in comprehensive plans
In 2005, District staff activities included the following:

- Assisted with the development of frequently asked questions regarding water supply issues in comprehensive plans to post on the Department of Community Affair's (DCA's) Web page
- Assisted with the development of the water supply portion of DCA-sponsored regional workshops regarding implementation of SB 360 and delivered the presentation at the East Central Florida Regional Planning Council workshop held in Maitland
- Updated the District's comprehensive planning web page to provide useful information and links
- Worked with DCA, the Florida Department of Environmental Protection, and the other water management districts to draft changes to DCA's comprehensive plan amendment guidelines relative to water supply plans
- Provided assistance to local governments in the comprehensive plan evaluation and appraisal process

Comprehensive Plan Amendments
In 2005, District staff activities included the following:

- Continued to encourage the use of the District's "Potable Water Availability" worksheet when submitting comprehensive plan amendments
- Continued to work interactively with local governments to obtain the information requested on the worksheets
- Reviewed and commented on three amendments related to water supply facilities work plans
- Continued to provide comments to DCA regarding potable water availability and related water resource issues
- Continued to assist local governments with their responses to DCA concerns relative to water availability and related water resource issues
- Provided assistance to local governments in the comprehensive plan evaluation and appraisal process

Increase Use of Reclaimed Water
Identification of New Projects

- The West Melbourne Reclaimed Water Storage Project—This project was identified as an important project for the Brevard County Area.

Project Implementation

- City of Orlando Eastern Orange and Seminole Counties Regional Reuse Project
- The North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project
- DeLand Reclaimed Water and Surface Water Augmentation Project
- Lake Apopka Reuse Augmentation Project
- Leesburg Reclaimed Water Reuse Project
- Minneola Reclaimed Water Reuse Project
- New Smyrna Beach Utilities Commission Reclaimed Water Wet Weather Storage Pond Project

- Ormond Beach North Peninsula Reclaimed Water Storage Project
- Port Orange Reclaimed Water Reservoir and Recharge Basin Project
- Lake Apopka Basin Water Resource Development Project

Implementation of these reclaimed projects, with the exception of the Lake Apopka Water Resource Development Project, is expected to result in the use of about 26 mgd of reclaimed water to achieve a water resource benefit. The Lake Apopka Water Resource Development Project is expected to support the development of additional quantities of water to augment reclaimed water systems. These projects should decrease the projected 2025 groundwater deficit in east-central Florida

Enhance Aquifer Recharge Using Reclaimed Water
2005 Initiative Activities included:

- Staff prepared a final draft report titled *Estimates of Upper Floridan Aquifer Recharge Augmentation Based on Hydraulic and Water-Quality Data (1986-2002) from the Conserv II RIB Systems, Orange County, Florida* by Michael Merrit and David J. Toth.
- Central Florida Aquifer Recharge Enhancement (CFARE) project implementation began
- The North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Study, which is described under Increase Use of Reclaimed Water, is a project that addresses enhanced aquifer recharge using reclaimed water and increased use of reclaimed water

Increase Water Conservation
2005 Initiative Activities included:

- Completed model landscape ordinance with the cooperation of a committee made up of state and local governments, and landscape and irrigation professionals
- Began participation in statewide irrigation standards group
- Continued with cooperative public information campaign. The goal of the 2005 Water Conservation Public Awareness Campaign was to educate the public on proper lawn and landscape irrigation techniques, to inform the public on the District's proposed rule amendments limiting landscape irrigation to no more than two days a week and to encourage public participation in the rule-making process

Recommendations for 2005 Phase II Initiative Activities

- The recent passage of Senate bills 444 and 360 and their subsequent signing into law by Gov. Jeb Bush have established new mechanisms for project identification and implementation. These new mechanisms reasonably assure that water suppliers in east-central Florida will proactively pursue alternative water supplies to meet future demands in a manner consistent with DWSP.

The new water supply framework in east-central Florida is supported largely by:

- New water supply planning and funding provisions, and local comprehensive planning provision of *Florida Statutes*
- Proactive interest on the part of water suppliers to develop alternative water supplies
- Commitment to identification of environmentally acceptable water supply projects by local-government partners working together at the county level
- Rule-based approach to water conservation

The new framework should successfully support the development of environmentally acceptable water supplies in east-central Florida without the continuation of the Initiative.

Therefore, the Initiative, as a separate effort, should be discontinued. The status of the following efforts should be annually reported to the Governing Board:

- Water supply development project identification through county-level planning efforts
- Water supply development project implementation
- District activities related to the new provisions of *Florida Statutes* and local comprehensive plan review

Deviations from the planned schedules for these efforts should be reported quarterly to the Governing Board.

SJ2006-1
2003 Water Supply Assessment SJRWMD

Background:

Water Supply Assessment (WSA) 2003 was performed to satisfy SJRWMD's purposes and to meet the requirements of Subparagraph 373.036(2)(b)4, *Florida Statutes* (F.S.), as follows:

A districtwide water supply assessment, to be completed no later than July 1, 1998, which determines for each water supply planning region

a. Existing legal uses, reasonably anticipated future needs, and existing and reasonably anticipated sources of water and conservation efforts; and
b. Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for all existing legal uses and reasonably anticipated future needs and to sustain the water resources and related natural systems.

WSA 2003 was a required component of the District Water Management Plan (Subsection 373.036(2), F.S.). Because SJRWMD identified its entire jurisdictional area as one water supply planning region pursuant to the requirements of Subparagraph 373.036(2)(b)2. F.S., WSA 2003 is organized with a districtwide perspective. The assessment is based on a planning period extending through 2025 and is the first 5-year update to the initial *Florida Statutes* mandated assessment in association with updates to the District Water Management Plan.

The SJRWMD approach to addressing these requirements consists of the following:

- Defining the limits of water resource impacts beyond which an unacceptable water resource-related condition could occur (water resource constraints)
- Projecting the water resource impacts that could occur in 2025 as a result of projected changes in water use
- Identifying priority water resource caution areas (PWRCAs)

SJRWMD assessed water resource impacts in two primary categories:

- Impacts to natural systems
- Impacts to groundwater quality (saltwater intrusion)

Objective:

The St. Johns River Water Management District (SJRWMD) prepares water supply assessments for the purposes of:

- Identifying future water supply needs
- Identifying areas where those needs cannot be met by the water supply plans of major water users without unacceptable impacts to water resources and related natural systems (priority water resources caution areas)

SJRWMD also develops and implements water supply plans to assure that adequate and sustainable water supplies are available to meet projected future water supply needs without unacceptable impacts in priority water resource caution areas (PWRCAs).

Conclusion:

A major conclusion of the 2003 districtwide water supply assessment is that the SJRWMD 2005 water supply plan development process should focus on identifying water supply strategies that will assure that adequate and sustainable water supplies are available to meet projected future water supply needs without unacceptable impacts in the east-central Florida area including all or parts of Brevard, Flagler, Lake, Marion, Orange, Osceola, and Seminole counties.

SJ2006-2
2005 Water Supply Plan SJRWMD

Background:

Total water use for SJRWMD is projected to increase from about 1.36 billion gallons per day in 1995 to about 1.79 billion gallons per day in 2025, and from about 1.49 billion gallons per day in 2000 to 1.79 billion gallons per day in 2025, based on water use projections developed during the WSA 2003 development process. The projected increase from 1995 to 2025 of approximately 400 million gallons per day (mgd) and the projected increase from 2000 to 2025 of approximately 300 mgd represent total districtwide increases in water use of approximately 30% and 20% respectively. Public supply increases account for about 90% of these total projected changes.

Objective:

This 2005 District Water Supply Plan (DWSP 2005) addresses current and future water use and traditional and alternative water sources and water conservation required to meet 2025 water supply needs while sustaining water quality and protecting wetland and aquatic systems. DWSP 2005 is designed to meet the requirements of the water supply planning provisions of Section 373, *Florida Statutes* (F.S.), and is based on a planning horizon extending through 2025. It includes the following components:

- A water supply development component
- A water resource development component
- A minimum flows and levels component

Approximately 39% of SJRWMD is identified as priority water resource caution areas (PWRCAs) (WSA 2003). These are areas where existing and reasonably anticipated sources of water and water conservation efforts may not be adequate (1) to supply water for all existing legal uses and anticipated future needs and (2) to sustain the water resources and related natural systems. PWRCAs are the focus of DWSP 2005.

Conclusion:

DWSP 2005 identifies water supply development project options and water resource development projects that will meet future water supply needs while sustaining water quality and protecting wetland and aquatic systems. For portions of SJRWMD not designated as PWRCAs, existing water supply sources and water supply development plans are considered reasonably adequate to meet projected needs while sustaining water quality and protecting wetland and aquatic systems.

Identified water supply source options include

- Naturally occurring sources
    - o Fresh groundwater

- Brackish groundwater
- Surface water
- Seawater

- Management techniques
  - Water resource development
    - Artificial recharge
    - Aquifer storage and recovery
    - Avoidance of the impacts of groundwater withdrawal through hydration
    - Water supply systems interconnections
  - Demand management (water conservation)
  - Use of reclaimed water

SJ2006-SP1
August 2005
Demineralization Concentrate Ocean Outfall Feasibility Study: Evaluation of Additional Information Needs
For
St. Johns River Water Management District
By
CH2M Hill, Inc.
With Input From
Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration

Background:

The District Water Supply Plan (DWSP) completed by St. Johns River Water Management District (SJRWMD) in 2000 identified alternative strategies for meeting projected 2020 water supply demands for municipal, agricultural, and industrial uses. High levels of interest exist regarding potential application of demineralization treatment technologies for potable water production with concentrate disposal via ocean outfalls, particularly for the utilities located in planning areas along the coast.

Objective:

To better define the feasibility of ocean outfall disposal of concentrate. And to help utilities understand relevant outfall implementation issues. SJRWMD designed the subject investigations in collaboration with the Atlantic Oceanographic and Meteorological Laboratory (AOML) of the National Oceanographic and Atmospheric Administration. AOML was retained to conduct these studies focused on understanding oceanographic conditions that might either favor or preclude ocean outfall feasibility.

Conclusion:

The information summarized in this technical memorandum represents the synthesis of input from AOML's information inventory and literature review, and the interagency discussions to date regarding the concept of demineralization concentrate ocean outfalls offshore of SJRWMD. The AOML investigation confirmed that while some relevant data exist for the study area, the information available is considered sparse at best, and AOML's conclusion is that additional field studies are needed to truly position SJRWMD for assisting utilities in evaluating whether demineralization technologies should be integral elements of their long-term water supply plans. On the basis of the information presented in this document, and the collective input form AOML, CH2M HILL, SJRWMD, and FDEP representatives, the following recommendations for management action are offered:

1. SJRWMD should proceed with having detailed scopes of work prepared for proposed Phases 2a and 2b as separate planning documents. The scopes of

work should be designed to produce a field study sampling plan as well as task definition for the other proposed Phase 2 study elements.

2. The Phase 2b sampling plan should be designed with input from FDEP and other agency participants. It should contain detailed text and tabular summaries providing clear definition of as a minimum, the following:
    - Study zones and stations within each zone, where applicable
    - Targeted data to be generated and rationale for each set of parameters (e.g., physical, chemical, and biological oceanographic information)
    - Instrumentation to be used and associated programming (if applicable)
    - Standard operating procedures for all field activities
    - Field and analytical quality control measures
    - Frequency of sampling/field surveys
    - Data management plans
    - Data interpretation and documentation schedules, including plans for adaptively managing field study scope elements an schedule

    The sampling plan should include, as appendices, candidate vendor information and detailed cost estimates for each field study element. Costing information corresponding to the conceptual study elements will be needed for SJRWMD to determine what elements are to be incorporated into Phase 2b.

3. The scopes of work for the other Phase 2 activities outlined in the TM should be prepared to the level of detail needed for SJRWMD management review and determination regarding which of these activities can be included under Phase 2a.

SJ2006-SP2
August 2005
Summary of AOML Oceanographic Information Inventory and Literature Review
Supporting a Demineralization Concentrate Ocean Outfall Feasibility Study
For
St. Johns River Water Management District
By
CH2M Hill, Inc.

Background:

The St. Johns River Water Management District (SJRWMD) is in the process of guiding long-term water supply planning within its jurisdictional boundaries, and in 2000, completed the District Water Supply Plan (DWSP) addressing alternative approaches to meeting water supply demands projected through the year 2020. The DWSP addresses a number of water supply management strategies, and one of them is support for emerging potable water treatment technologies. Demineralization methods produce a wastewater concentrate that bears elevated concentrations of minerals. Identifying an environmentally approvable concentrate disposal method is the primary impediment to gaining necessary regulatory approvals for demineralization treatment plant installation and operation. Discharge of concentrate to surface waters through ocean outfall is an option, but concerns exist regarding technical, regulatory, and economic feasibility.

Objective:

In the interest of better defining the feasibility of ocean outfall disposal of concentrate from water treatment plants located along the Atlantic Ocean coastline within its jurisdiction, SJRWMD initiated a phased investigation designed to help utilities understand the relevant issues as they prepare and subsequently implement their respective long-term water supply plans.

Conclusion:

This Technical Memorandum presents a summary of key physical oceanographic information presented in the AOML deliverable relevant to addressing concentrate ocean outfall feasibility.

The AOML information inventory and literature review focused on physical oceanographic characteristics considered relevant to determining how a concentrate discharged through an ocean outfall would be dispersed in the receiving water body. AOML’s experience with ocean outfall studies and modeling of effluent plumes led it to focus in on the following types of parameters:

- Bathymetry

- Water column temperature and salinity profiles (for calculation of density profiles)
- Current velocity and direction as a function of depth within the water column
- Effects of inlets or coastline variations impacting nearshore physical conditions (currents and waves)

The AOML information inventory and literature review leads to the conclusion that detailed, long-term physical oceanographic datasets focused on ambient current velocity and direction records, and water column profiles of density-related parameters are not available for much, if not most, of the Northeast and Central Florida Atlantic coastal waters. As originally envisioned, Phase 2 of this overall investigation was intended to include focused field data gathering to supplement the results of this information inventory and literature review. Field investigation concepts are being developed by AOML for SJRWMD's review and approval, and to promote further discussions with FDEP and perhaps other stakeholder regarding how, where and when to conduct those field investigations.

Activities underway are leading in the direction of development of specific research proposals for up to three candidate sites along the Atlantic coast of SJRWMD, and depending on the interaction of factors including scope, locations, schedule, funding availability, and the interest of prospective stakeholder partners, final decisions regarding those field investigations will be made in the future. In the interim, the following recommendations are offered for SJRWMD's review and consideration:

1. SJRWMD should proceed with further discussions with FDEP regarding policy and rule constraints on the permitabilty of new ocean outfalls within coastal ocean waters (within 3 miles from shore)
2. SJRWMD should continue dialogue with federal and state agencies, or with academic/research institutions or consulting firms working on behalf of such agencies, to determine the availability of additional physical oceanographic datasets for areas north of Cape Canaveral.
3. SJRWMD should consider alternative funding mechanisms for prospective modeling or field investigations that are likely to be included in the set of recommendations being developed regarding Phase 2 project activities. On the basis of preliminary project discussions, it is clear that these activities likely to be proposed as element s of the Phase 2 investigations are going to require funding allocations well in excess of those envisioned at the onset of Phase 1.

It seems clear that demineralization processes will likely need to be a part of the long-term water supply strategy for achieving sustainable development within SJRWMD, and perhaps statewide. It is important to continue to investigate what engineering and environmental strategies are needed to identify administratively approvable infrastructure that supports achieving this long-term goal.

SJ2006-SP5
November 2002
East-Central Florida Water Supply Planning Initiative
East-Central Florida Water Agenda:
A Report on the Water Supply Planning Initiative Process

Background:

Water supply is a critical issue in the east-central Florida region. The Floridan aquifer which provides almost all of the region's existing public water supply and a large part of the agricultural water irrigation supply, will likely not be able to meet all future withdrawal requests without unacceptable impacts to wetlands, lake levels, spring flows and groundwater quality. Alternative water supply source options and management techniques must be developed to meet projected economic growth and increased water demands.

Objective:

In January and February 2002, two meetings convened among elected officials and other stakeholders to discuss the water supply situation in east-central Florida. For the purposes of this Initiative, elected officials and other stakeholders from all or portions of Brevard, Orange, Osceola, Volusia, Seminole, Lake, Polk, Flagler, Marion and Sumter counties were invited. Following the second summit, assessment meetings and interviews with elected officials and other stakeholders around the region were conducted, followed by a series of subregional workshops on several issues of interest and concern to the participants and a regionwide Forum on October 17, 2002 to review the Phase I results and discuss the interest in and design for Phase II.

Conclusion:

The following overall goal of the initiative was reviewed and refined by participants during the two rounds of workshops:

To develop a "East-Central Florida Water Supply Agenda" that seeks to over time:

- Ensure that new, sustainable water supplies are developed in ways that maximize the benefits and minimize harm to natural resources in the region;
- Preserve the economic vitality of the region;
- Draw linkages, as appropriate, to land use plans; and
- Identify cooperative, affordable and equitable solutions that minimize costs and avoid competition for remaining inexpensive water resources.

The Phase I process resulted in the East-Central Florida Water Agenda, which identifies six key water supply issue areas, 17 recommendations and 32 strategies developed by the Initiative Phase I participants. The six areas identified and the recommendations in the Agenda are:

1. Enhance intergovernmental coordination
   - Regional and subregional forums
   - Build on existing association forms
2. Develop new water supply
   - Identify specific alternative water supply projects
   - Seek alternative funding to equitably distribute costs
   - Provide incentives for alternative water supply projects
3. Link land use planning and water supply planning
   - Develop recommended approaches
   - Coordinate planning schedules
4. Increase use of reclaimed water
   - Develop areawide reuse plans
   - Provide incentives for development and implementation of areawide reuse plans
   - Seek additional funding to equitably distribute costs
5. Enhance aquifer recharge using reclaimed water
   - Coordinate regulatory policies and programs
   - Seek areawide support for studying recharge opportunities
   - Education on enhanced recharge as part of the overall reuse strategy
6. Increase water conservation
   - Implement water conservation practices
   - Adopt landscape ordinances
   - Coordinate water conservation programs
   - Determine conservation effectiveness and perform cost-effectiveness analysis

Phase II should commence and conclude in 2003 and seek to:
- Identify water supply partnerships
- Clarify roles and responsibilities for those partners and other interest stakeholders
- Identify and prioritize water supply partnerships projects in the region
- Identify and select funding options
- Develop legislative recommendations necessary for implementation of the Phase I and/or Phase II recommendations
- Consider appropriate revisions to the district's regional water supply plans

Phase II Approaches
1. Develop and support a regional coordination framework
2. Select regional and subregional approaches
      - o Subregional Planning Forums. Convening a public form, with invited representation from the range of suppliers and other stakeholders in the subregion, that would meet regularly in order to develop a common base of information and address concerns
      - o Pilot Partnership Projects. Joint development by suppliers and other stakeholders of partnership projects that will provide the building blocks

and establish trust for the broader collaboration on water supply in the region. Such efforts should seek to implement partnership projects to advance the East-Central Water Supply Agenda.

3. Collaborate with the Districts in 2003 and 2004 in the Update of the Regional Water Supply Plan

April 2001
Middle St. Johns River Basin Final Reconnaissance Report
Prepared for St. Johns River Water Management District
Prepared by URS

Background:

Rapid urbanization and natural constraints affect the balances within the Florida ecosystem. The effects of impacting these balances in the middle basin include degraded water quality of lakes and streams; aquifer levels and wetland systems adversely affected; flood problem areas, and ecosystems strained because of encroachments, channelized streams and decreased wildlife habitat areas.

Objective:

The middle basin reconnaissance report provides a general inventory of existing conditions. It provides a summary of the challenges and activities that exist within the basin, and the strategies needed to address them. The challenges result from an assessment of the gaps and deficiencies within the five planning units of the middle basin. The elements addressed are water quality, water quantity (such as stream flow and flood protection), ecosystems, and water supply.

Conclusion:

In the middle basin, the following challenges require attention:

- Development of a basin-wide comprehensive management action plan,
- Development of an integrated water quality assessment program,
- Stormwater master planning,
- Refining and enforcing stormwater management regulations, and
- Implementing stormwater retrofit programs to meet current standards to the maximum extent practicable.

The following strategies are recommended to address challenges and expand ongoing activities in the middle basin.

Water Quality

- Develop a SWIM plan
- Seek funding for regional water quality improvement projects
- Develop public outreach for awareness of water quality issues
- Expand water quality modeling
- Implement a basin-wide geographic database for water quality information
- Implement integrated water resource monitoring network to measure existing conditions and effectiveness of projects

Stormwater Retrofit and Non Point Source Pollution

- Expand compliance monitoring of permitted systems
- Prioritize stormwater retrofit programs for older developments
- Seek funding for stormwater retrofit projects consistent with master plans
- Standardize criteria for stormwater master planning
- Develop land acquisition plan for multi-use opportunities

Response to Regulatory Changes
- Commit resources and funding to meet requirements of NPDES and TMDL regulations
- Investigate land development rule changes to improve watershed protection

Water Conservation
- Promote water conservation on both the demand and supply sides
- Develop alternative sources of drinking water to reduce reliance on groundwater

Flood Protection
- Prepare master plans to address problem areas
- Update flood level information through new basin-wide contoured aerial mapping
- Increase participation in the FEMA Community Rating System (CRS) program
- Address closed basin flooding and drainwell management

Land Acquisition and Management
- Implement land acquisition plan for preservation of environmentally sensitive lands
- Expand land management programs to include recreational uses
- Acquire and manage lands for multiple uses consistent with basin goals

By developing the above strategies and initiating the SWIM priority planning process, a comprehensive basin management plan will be written with the consensus of government and the public. The reconnaissance report sets the stage for the development of a management action plan that will establish the long-term vision and basin goals needed to renew the middle basin.

Lake Monroe Sediment Accumulation and Past Water Quality
Final Report to:
St. Johns River Water Management District

W. T. Anderson, L. J. Scinto, E. E. Gaiser, B. Carroll, A. Quillen, and J. Haberer
Southeast Environmental Research Center, Florida International University, Miami, FL

Background:

The St. Johns River Water Management District (SJRWMD) required an assessment of the nutrients associated with the sediments in Lake Monroe to properly evaluate and facilitate water quality restoration measures.

Objective:

The primary goal of this sediment composition study was to quantitatively estimate nutrient dynamics and sedimentation rates in Lake Monroe.

Conclusion:

Sediment and floc thickness were characterized at 60 randomly chosen locations using metal rod and short cores. Results indicated that Lake Monroe has mean floc thickness of 15 cm and sediment thickness values ranging from 3 cm to 20 cm. From the original 60 locations, an additional 20 sites were cored using a piston corer. Recovered cores varied in length from 15 cm to 72 cm. Three main sediment types were identified: gyttja, peat, and sands/clays/grey mud (SCM). The different sediment types' organic matter content, total nitrogen, total phosphorus, were analyzed and characterized and various conclusions drawn on the likelihood of reasons for these parameters' values. Radiometric dating, stable isotope analysis and diatom stratigraphy were also carried out. Raidometric dating indicated that sedimentation rates were low and that the last 100 yrs was represented by the upper 15cm of organic rich gyttja. All the peates from the lower units of the cores dated older than 14,000 years before present. Diatom taxonomic analysis from the dated cores confirm a shift from predominantly surface-associated productivity by oligo- to mesotrophic taxa to planktonic productivity by eutrophic taxa. Sediment nutrient analyses also supports the diatom data showing increases in phosphorus accumulation over the same period, with maximum rates occurring in the 1990's.

Minimum and Guidance Levels for Big Gant Lake
in Sumter County, Florida
Ecologic Evaluation Section
Resource Conservation and Development Department
Draft - September 2006

Background:
State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels (MFLs) for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm, however, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; j) and navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into the Water Levels and Rates of Flow Rule (Chapter 40D-8, F.A.C.). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress wetlands 0.5 acres or greater in size and for those without fringing cypress wetlands 0.5 acres or greater in size. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes

with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lake shore residents and local governments, or to aid in the management or control of adjustable water level structures.

Objective:
Typically two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

> The Ten Year Flood Guidance Level is provided as an advisory guideline for lake shore development. It is the level of flooding expected on a frequency of not less than the ten year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.
>
> The High Guidance Level is provided as an advisory guideline for construction of lake shore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time (P50) on a long-term basis.
>
> The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lake shore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time (P90) on a long-term basis.

Conclusion:
In accordance with Chapter 40D-8, F.A.C., Minimum and Guidance Levels were developed for Big Gant Lake (Table 1), a Category 1 Lake located in Sumter County, Florida. The levels were established using best available information, including field data that were obtained specifically for the purpose of Minimum

Levels development. Data and analyses used for development of the Minimum and Guidance Levels are described in the remainder of this report.

Table 1. Minimum and Guidance Levels for Big Gant Lake.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	77.6
High Guidance Level	76.1
High Minimum Lake Level	76.3
Minimum Lake Level	74.9
Low Guidance Level	73.4

Proposed Minimum and Guidance Levels for Fort Cooper Lake in Citrus County, Florida
September 28, 2006
Draft

Ecologic Evaluation Section
Resource Conservation and Development Department
Southwest Florida Water Management District
Brooksville, Florida 34604-6899

Background:

State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm. However, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; and j) navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into its Water Level and Rates of Flow Rule (Chapter 40D-8, F.A.C). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress-dominated wetlands greater than 0.5 acre in size, and for those without fringing cypress wetlands. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lakeshore residents and local governments, or to aid in the management or control of adjustable water level structures.

Objectives:
Typically, two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

> The Ten Year Flood Guidance Level is provided as an advisory guideline for lakeshore development. It is the level of flooding expected on a frequency of not less than the ten-year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.
>
> The High Guidance Level is provided as an advisory guideline for construction of lakeshore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time on a long-term basis.
>
> The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis.
>
> The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time on a long-term basis.
>
> The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lakeshore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time on a long-term basis.

Conclusion:
In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Fort Cooper Lake, a Category 3 Lake located in Citrus County, Florida. Levels were established using best available information, including data that were obtained specifically for the purpose of minimum levels development. The data and analyses used for development of the proposed levels are described in the remainder of this report.

Table 2. Proposed minimum and guidance levels for Fort Cooper Lake in Citrus County, Florida.

Level	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	35.4
High Guidance Level	30.9
High Minimum Lake Level	30.1
Minimum Lake Level	28.7
Low Guidance Level	26.7

Minimum and Guidance Levels for Lake Deaton
in Sumter County, Florida
Ecologic Evaluation Section
Resource Conservation and Development Department
Draft - September 2006

Background:
State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels (MFLs) for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm, however, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; j) and navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into the Water Levels and Rates of Flow Rule (Chapter 40D-8, F.A.C.). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress wetlands 0.5 acres or greater in size and for those without fringing cypress wetlands 0.5 acres or greater in size. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes

with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lake shore residents and local governments, or to aid in the management or control of adjustable water level structures.

Objective:
Typically two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

> The Ten Year Flood Guidance Level is provided as an advisory guideline for lake shore development. It is the level of flooding expected on a frequency of not less than the ten year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.
>
> The High Guidance Level is provided as an advisory guideline for construction of lake shore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time (P50) on a long-term basis.
>
> The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lake shore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time (P90) on a long-term basis.

Conclusion:
In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Lake Deaton (Table 1), a Category 3 Lake located in Sumter County, Florida. The levels were established using best available information, including field data that were obtained specifically for the purpose of Minimum Levels development. Data and analyses used for development of the

proposed Minimum and Guidance Levels are described in the remainder of this report.

Table 1. Proposed Minimum and Guidance Levels for Lake Deaton.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	65.8
High Guidance Level	65.2
High Minimum Lake Level	64.8
Minimum Lake Level	63.2
Low Guidance Level	62.2

Proposed Minimum and Guidance Levels for
Lake Marion in Levy County, Florida
September 29, 2006
Draft
Ecologic Evaluation Section
Resource Conservation and Development Department
Southwest Florida Water Management District
Brooksville, Florida 34604-6899

Background:
State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm. However, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; and j) navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into its Water Level and Rates of Flow Rule (Chapter 40D-8, F.A.C). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress-dominated wetlands greater than 0.5 acre in size, and for those without fringing cypress wetlands. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lakeshore residents and local governments, or to aid in the management or control of adjustable water level structures.

Objective:
Typically, two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter
40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

The Ten Year Flood Guidance Level is provided as an advisory guideline for lakeshore development. It is the level of flooding expected on a frequency of not less than the ten-year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.

The High Guidance Level is provided as an advisory guideline for construction of lakeshore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time on a long-term basis.

The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis.

The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time on a long-term basis.

The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lakeshore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time on a long-term basis.

Conclusion:
In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Lake Marion, a Category 3 Lake located in Levy County, Florida. Levels were established using best available information, including data that were obtained specifically for the purpose of minimum levels development. The data and analyses used for development of the proposed levels are described in the remainder of this report.

Table 1. Proposed Minimum and Guidance Levels for Lake Marion.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	56.6
High Guidance Level	55.3
High Minimum Lake Level	54.6
Minimum Lake Level	50.7
Low Guidance Level	47.7

Minimum and Guidance Levels for
Lake Miona and Black Lake
in Sumter County, Florida
Ecologic Evaluation Section
Resource Conservation and Development Department
Draft - September 2006

Background:
State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels (MFLs) for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm, however, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; j) and navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into the Water Levels and Rates of Flow Rule (Chapter 40D-8, F.A.C.). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress wetlands 0.5 acres or greater in size and for those without fringing cypress wetlands 0.5 acres or greater in size. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lake shore residents and local governments, or to aid in the management or control of adjustable water level structures.

Objective:
Typically two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

> The Ten Year Flood Guidance Level is provided as an advisory guideline for lake shore development. It is the level of flooding expected on a frequency of not less than the ten year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.
>
> The High Guidance Level is provided as an advisory guideline for construction of lake shore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time (P50) on a long-term basis.
>
> The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lake shore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time (P90) on a long-term basis.

Conclusion:
In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Lake Miona and Black Lake (Table 1), a Category 3 Lake system located in Sumter County, Florida. The levels were established using best available information, including field data that were obtained

specifically for the purpose of Minimum Levels development. Data and analyses used for development of the proposed Minimum and Guidance Levels are described in the remainder of this report.

Table 1. Proposed Minimum and Guidance Levels for Lake Miona and Black Lake.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	57.5
High Guidance Level	54.7
High Minimum Lake Level	53.9
Minimum Lake Level	51.3
Low Guidance Level	49.6

Minimum and Guidance Levels for Lake Okahumpka in Sumter County, Florida

Ecologic Evaluation Section
Resource Conservation and Development Department
Draft – September 2006

Background:

State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels (MFLs) for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm, however, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; j) and navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into the Water Levels and Rates of Flow Rule (Chapter 40D-8, F.A.C.). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress wetlands 0.5 acres or greater in size and for those without fringing cypress wetlands 0.5 acres or greater in size. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes

with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lake shore residents and local governments, or to aid in the management or control of adjustable water level structures.

Objective:
Typically two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

> The Ten Year Flood Guidance Level is provided as an advisory guideline for lake shore development. It is the level of flooding expected on a frequency of not less than the ten year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.
>
> The High Guidance Level is provided as an advisory guideline for construction of lake shore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The High Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed ten percent of the time (P10) on a long-term basis.
>
> The Minimum Lake Level is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time (P50) on a long-term basis.
>
> The Low Guidance Level is provided as an advisory guideline for water dependent structures, information for lake shore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time (P90) on a long-term basis.

Conclusion:
In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Lake Okahumpka (Table 1), a Category 1 Lake located in Sumter County, Florida. The levels were established using best available information, including field data that were obtained specifically for the purpose of Minimum Levels development. Data and analyses used for

development of the proposed Minimum and Guidance Levels are described in the remainder of this report.

Table 1. Proposed Minimum and Guidance Levels for Lake Okahumpka.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	59.9
High Guidance Level	58.1
High Minimum Lake Level	58.1
Minimum Lake Level	56.7
Low Guidance Level	55.0

Minimum and Guidance Levels for Lake Panasoffkee in Sumter County, Florida

Ecologic Evaluation Section
Resource Conservation and Development Department
Draft – September 2006

Background:

State law (Section 373.042, Florida Statutes; hereafter F.S.) directs the Department of Environmental Protection or the water management districts to establish minimum flows and levels (MFLs) for lakes, wetlands, rivers and aquifers. As currently defined by statute, the minimum level of an aquifer or surface water body is "the level of groundwater in the aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area". Adoption of a minimum water level does not necessarily protect a water body from significant harm, however, protection, recovery or regulatory compliance can be gauged once a standard has been established.

Minimum flows and levels are to be established based upon the best available information and shall be developed with consideration of "…changes and structural alterations to watersheds, surface waters and aquifers, and the effects such changes or alterations have had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer…", with the caveat that these considerations shall not allow significant harm caused by withdrawals (Section 373.0421, F.S.). Additional guidance for the establishment of minimum flows and levels is provided in the Florida Water Resources Implementation Rule (Chapter 62-40.473, Florida Administrative Code; hereafter F.A.C.), which requires that "consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows, and environmental values associated with coastal, estuarine, aquatic and wetland ecology, including: a) recreation in and on the water; b) fish and wildlife habitats and the passage of fish; c) estuarine resources; d) transfer of detrital material; e) maintenance of freshwater storage and supply; f) aesthetic and scenic attributes; g) filtration and absorption of nutrients and other pollutants; h) sediment loads; i) water quality; j) and navigation."

To address this legislative mandate within its jurisdictional boundaries, the Southwest Florida Water Management District (District or SWFWMD) has developed specific methodologies for establishing minimum flows or levels for lakes, wetlands, rivers and aquifers, and adopted them into the Water Levels and Rates of Flow Rule (Chapter 40D-8, F.A.C.). For lakes, methodologies have been developed for establishing Minimum Levels for systems with fringing cypress wetlands 0.5 acres or greater in size and for those without fringing cypress wetlands 0.5 acres or greater in size. Lakes with fringing cypress wetlands where water levels currently rise to an elevation expected to fully maintain the integrity of the wetlands are classified as Category 1 Lakes. Lakes

with fringing cypress wetlands that have been structurally altered such that lake water levels do not rise to former levels are classified as Category 2 Lakes. Lakes without fringing cypress wetlands are classified as Category 3 Lakes. Chapter 40D-8, F.A.C. also provides for the establishment of Guidance Levels, which serve as advisory information for the District, lake shore residents and local governments, or to aid in the management or control of adjustable water level structures.

Objective:

Typically two Minimum Levels and three Guidance Levels are established for lakes, and upon adoption by the District Governing Board, are incorporated into Chapter 40D-8, F.A.C. The levels, which are expressed as elevations in feet above the National Geodetic Vertical Datum of 1929 (NGVD), are described below.

The **Ten Year Flood Guidance Level** is provided as an advisory guideline for lake shore development. It is the level of flooding expected on a frequency of not less than the ten year recurring interval, or on a frequency of not greater than a ten percent probability of occurrence in any given year.

The **High Guidance Level** is provided as an advisory guideline for construction of lake shore development, water dependent structures, and operation of water management structures. The High Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ten percent of the time (P10) on a long-term basis.

The **High Minimum Lake Level** is the elevation that a lake's water levels are required to equal or exceed ten percent of the time (P10) on a long-term basis.

The **Minimum Lake Level** is the elevation that a lake's water levels are required to equal or exceed fifty percent of the time (P50) on a long-term basis.

The **Low Guidance Level** is provided as an advisory guideline for water dependent structures, information for lake shore residents and operation of water management structures. The Low Guidance Level is the elevation that a lake's water levels are expected to equal or exceed ninety percent of the time (P90) on a long-term basis.

Conclusion:

In accordance with Chapter 40D-8, F.A.C., proposed Minimum and Guidance Levels were developed for Lake Panasoffkee (Table 1), a Category 1 Lake located in Sumter County, Florida. The levels were established using best available information, including field data that were obtained specifically for the purpose of Minimum Levels development. Data and analyses used for development of the proposed Minimum and Guidance Levels are described in the remainder of this report.

Table 1. Proposed Minimum and Guidance Levels for Lake Panasoffkee.

Minimum and Guidance Levels	Elevation (feet above NGVD)
Ten Year Flood Guidance Level	42.8
High Guidance Level	40.5
High Minimum Lake Level	40.8
Minimum Lake Level	39.4
Low Guidance Level	38.9

January 2003
Middle St. Johns River Basin Surface Water Improvement and Management Plan

Background:

Under the Surface Water Improvement and Management (SWIM) Act of 1987, water management districts prioritize water bodies based on their need for protection and/or restoration. The St. Johns River Water Management District (SJRWMD) ranked the Middle St. Johns River Basin (MSJRB) as the 5th priority SWIM Program.

Objective:

The purpose of the MSJRB SWIM Plan is to set forth a realistic course of action, identifying the projects and the effort needed to accomplish them, consistent with the levels and trends of SWIM funding.

Conclusion:

The Middle Basin consists of five major planning units that contain 104 watersheds. The planning units are the Econlockhatchee River, Deep Creek, Lake Jesup, Lake Monroe, and the Wekiva River. The restoration plan focuses on four primary initiatives and a number of strategies and associated action steps developed to fulfill these initiatives.

1. <u>Water quality</u> enhancement, with emphasis on nutrient loading reduction and lake protection.
   - Design and implement an integrated water quality monitoring network
   - Water quality modeling
   - Prioritization of surface water to implement water quality enhancement opportunities

2. <u>Watershed master planning</u> with emphasis on completing hydrologic models of sub-basins.
   - Examine existing watershed master plan coverage and determine where gaps exist
   - Assist in the development and design of master plans and hydrologic models where gaps exist
   - Partner with local governments to implement existing plans

3. <u>Stormwater retrofitting</u> of areas built prior to 1983.
   - Prioritized stormwater retrofit program

4. <u>Compliance and rule enforcement</u> of existing permitted stormwater systems.
   - Implement compliance monitoring programs
   - Assess and manage resources and funding to support the requirements of current and emerging National Pollution Discharge Elimination System

(NPDES) and Total Maximum Daily Load (TMDL) regulations and Pollution Load Reduction Goals (PLRGs)

Local government has a role in maintaining water quality in the MSJRB through the improvement and maintenance of project s under their jurisdiction.

The successful implementation of this plan is going to require staff resources and dedicated funding. To accomplish all of the action steps, it is estimated that it will cost $97.8 million over the next five years to complete.

January 2004
Wekiva Area Water Budget
University of Central Florida Stormwater Management Academy
Martin Wanielista, Ewoud Hulstein, Yuan Li and Gour-Tsyh Yeh

Background/Objective

Development pressure in the Wekiva Watershed and Springshed may cause changes in the water quantity and quality of both the Springs and the River. Presented in this report are the results from hydrologicdata analysis that were used to document River flow, Springflow, groundwater and watershed conditions. Used for the analyses were five Spring discharge gauging stations, four rain gauging stations, twenty-six stream gauging stations, and seven wells located in the Wekiva Springshed.

Conclusion

Based on the data analysis and the modeling, it is recommended to maintain a water budget for the Wekiva Springshed that would allow for maintenance of infiltration and percolation of waters to meet pre conditions. Using or controlling the runoff from precipitation through a stormwater management program can do this efficiently and cost-effectively. Such a program could implement stormwater reuse through irrigation, rainwater harvesting through rooftop catchments, maintenance of open spaces, groundwater infiltration through constructed wetlands or pervious pavement, green roof programs, retention infiltration basins, swales, and etcetera.

The quantity and quality of water entering the aquifer Springshed must be maintained in order to preserve Springflow quantity and quality in the Wekiva River area. Off-site and on-site stormwater management methods can be used throughout the Springshed area to maintain the pre-development water budget in post-development. Besides maintaining Wekiva Springflow, a stormwater management program that maintains a water budget also will preserve potable water sources.

December 2002
Surface Water Quality Monitoring in the Middle St. Johns River Basin
Prepared by Maria Martinez

Background:

Water quality enhancement is the first of four initiatives listed under the Surface Water Improvement and Management Plan (SWIM) for restoring, protecting, and managing surface water resources of the Middle St. Johns River Basin (MSJRB). The first step in the process of improving water quality is to assess the status of water quality monitoring and use this information to assist in the design and implementation of an integrated water quality monitoring network.

Objective:

The purpose of this Water Quality Monitoring Network report is to identify current programs by federal and state agencies and local governments that monitor surface water quality, and to propose a complementary SJRWMD water-quality monitoring network for the Middle Basin that will provide useful information for developing water quality improvement goals and for verifying remedial actions.

Conclusion:

Applicable federal and state agencies and local governments were contacted for information about their water quality monitoring programs. These included City of Orlando, City of Maitland, Florida Department of Environmental Protection (FDEP), Florida LAKEWATCH, Lake County, Orange County, Seminole County, Volusia County, United States Geological Survey (USGS), and other working groups within the St. Johns River Water Management District (SJRWMD).

The report lists 158 water quality stations and 36 stations proposed for sampling beginning in FY 02-03 as part of the District's new MSJRB SWIM program. Of the 158, 102 are active. The information requested included frequency of sampling, date of sampling, list of parameters being sampled, and quality assurance procedures for field sampling and lab analysis followed by each agency.

The information collected in this report will be used to coordinate with other agencies in the design of a complementary water quality monitoring network to be implemented by the District beginning in FY 02-03 in cooperation with other agencies.

THE MSJRB SWIM Plan, completed in January 2002, was used as a guide in developing the MSJRB Water Quality Monitoring Network.

Withlacoochee Regional Water Supply Authority
Water Supply Plan Update – 2005
November 2006
Water Resource Associates

Background:
The Withlacoochee Regional Water Supply Authority (WRWSA) Regional Water Supply Plan Update – 2005 (RWSPU) is an update to the 1996 WRWSA Regional Water Supply Master Plan. In broad terms, the RWSPU delineates existing demands and provides a general pathway for the WRWSA to meet projected water demands for the region. The RWSPU responds to the WRWSA as it plans for the water supply needs of a growing region.

Objective:
Ultimately, the RWSPU presents options of traditional and non-traditional water supplies as a means to meet future water needs. The process of identifying water supply options combined a suite of analyses, includes water demand estimation, groundwater and surface water resource analyses, alternative water supply characterization, and project feasibility evaluation and ranking.

Conclusion:

While water demand for all users was considered, public supply water demand increases will top all use categories in both total quantity and percentage increase of usage. Public supply water use accounts for 69% of the total WRWSA demand increase over the planning horizon. These public supply demand increases will necessitate the development of water supply sources other than groundwater to protect environmental attributes of the region.

To 2025, the areas most likely to be restricted due to predicted groundwater impacts from future development of groundwater supplies are northeast and central Sumter County and central to southwest Hernando County. In addition to groundwater impacts, coastal Hernando County and Citrus County must also consider the potential for saltwater intrusion in their use of groundwater, by positioning future wellfields away from the brackish groundwater transition zones.

Future surface water supply development in the River Basin is likely to be directed primarily by the proximity of demand areas to major water bodies. The Withlacoochee River and the major water bodies along its reaches, including Lake Panasoffkee, Rainbow River, and Lake Rousseau, have available "safe" yield for future water supply development to 2025. However, potential withdrawals upstream of the Wysong-Coogler Water Conservation Structure will be limited at times, due to variations in seasonal and inter-annual flows. As with groundwater, surface water withdrawals to meet future water supply demands may be limited by MFL's. Additionally, the major surface water bodies within the Withlacoochee River Basin also have recreational and aesthetic functions that will require consideration during water supply development.

The potential alternative water supplies evaluated in this study included offshore springs, seawater desalination, brackish groundwater, stormwater, reclaimed water, and conservation (demand reduction). As groundwater sources become limited, alternative water supplies will play a large role in meeting future water demand within the WRWSA.

Lake County Water Supply Plan

Technical Memorandum #2

July 2007

FINAL

Chapter 1 - Existing Water Use and Sources

Chapter 2 - Potential Future Sources of Water

Chapter 3 - Identification of Readily Available Regional Alternative Water Supply Development Projects

Chapter 4 - Readily Available Reuse Projects

Prepared by

Water Resource Associates

Lake County Water Supply Plan

1.0 Existing Water Use and Sources

Task 3 of the Lake County Water Supply Plan (Plan) – Data Collection, Compilation and Reduction – is an examination of existing Consumptive Use Permits (CUPs) and associated data in Lake County. Specifically, the analysis includes an inventory and analysis of CUPs permitted for golf course irrigation, CUPs that include four (4) – inch wells, and CUPs permitted for 100,000 gallons per day (gpd) or greater. An analysis of these CUPs, including allocated quantities, spatial distribution, supply sources, use types, and pumpage data serve to establish a baseline of existing permitted water use within the County and within the Lake County Water Alliance (Alliance). Data used to complete Task 3 were obtained from the St. Johns River Water Management District (SJRWMD).

Tech Memo 2 does not address actual water demand for the County, but rather is an assessment of permitted or allocated quantities. These quantities are estimates of what users anticipate to be their average daily demands over the permit duration at the time of application for the permit. However, it is not uncommon for population growth to be above or below populations anticipated when permit applications were submitted, so water use can exceed or fall short of existing permitted quantities. In addition, permittees and the SJRWMD use various methods to arrive at allocation quantities. Pumpage data was obtained and are presented in the sections that follow in order to provide a general comparison between expected demand (allocated quantities) and actual demand.

Domestic self-supplied water use is not included in this analysis, as CUPs are not required for this use. However, an analysis of demand associated with domestic self-supplied users will be presented later in the study along with existing and projected demand of other users in the County.

1.1 Golf Course CUPs

The Alliance identified golf course water use as a useful analysis for the Plan. While water allocated to golf course (recreational) water uses is substantially lower in comparison to other water use categories on a countywide basis, it is useful to identify and categorize the allocated sources of water for this water use.

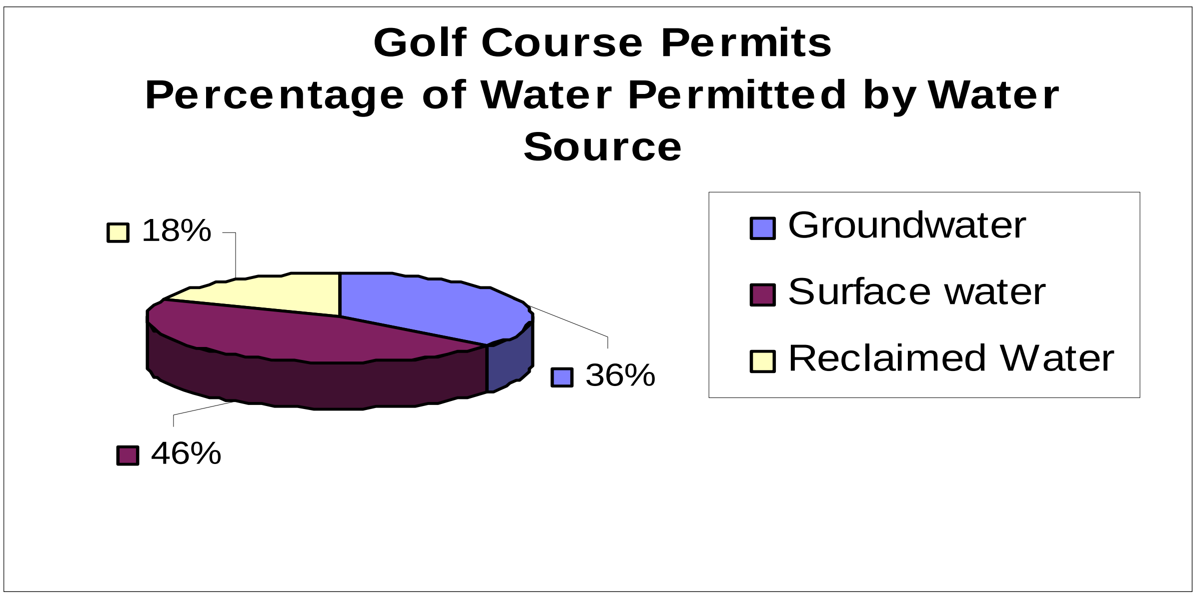
Identification of potential opportunities for reuse water augmentation using reclaimed water is a critical component of the overall water strategy. To meet the needs of a growing population, the number of golf courses in the County is expected to grow in number over the years, and meeting these demands with reuse water would reduce stress on new potable water supplies.

Golf course CUPs (30 in total) were identified from the SJRWMD Geographic Information Systems (GIS) database (SJRWMD 2006). Of the allocation quantities, approximately 2.70 mgd (18%) are irrigated with reclaimed water, with about 5.4 mgd (36%) irrigated with groundwater and 6.9 mgd (46%) by surfacewater (Table 1-1, Figure 1-1).

Table 1-1 – Lake County Golf Course CUP Allocations by Source

Source	Golf Course CUPs Allocated Quantities (mgd)	Percent
Groundwater	5.43	36.1%
Surface water	6.92	46.0%
Reclaimed water	2.70	17.9%
Total	**15.1**	**100.0%**

Figure 1-1 – Lake County Golf Course CUP Allocations by Source



The location of permitted golf course CUPs are mapped and shown on Figures 1-2 through Figure 1-5. SJRWMD staff provided all golf courses CUP allocated quantities, issue dates, expiration dates, and water source information (SJRWMD 2006/2007). Table 1-2 is a tabulation of golf course CUP data. In cases where golf course permits have multiple independent water sources, the allocated amount for each source is listed separately. A separate column lists the total quantity allocated from all sources for the permit.

In addition to allocated quantities, actual pumpage data was supplied by the SJRWMD for the years 2002 through 2005, with a few exceptions as noted on Table 1-2. In general, having an accurate comparison between pumpage trends and allocated quantities will indicate permittees that may need to increase or decrease their existing allocation quantities. These quantities are presented as an average over this time period and serve as a useful tool for comparing the allocation quantities to actual withdrawals made by permittees. On average, golf course permit holders used 100% of their allocated water from 2002 to 2005, or about 15.1 mgd.

1.2 Permitted 4-inch wells

CUPs that include wells of a four (4)–inch casing diameter (4” wells) were also specified by the Alliance for investigation. For reasons specified in the following discussion, there is some overlap between these CUPs, golf course CUPs and CUPs equal to or greater than 100,000 gpd. In addition, CUPs analyzed under this category often include six (6) – inch wells (6” wells) or larger.

Allocations for 4” wells are not permitted unless they meet permitting threshold criteria. That is, unless a well is capable of withdrawing 1 million gallons per day (mgd), or is permitted to withdraw 100,000 gpd or more, a permit is not required. Usually, a single 4” well does not “trip” the permitting threshold unless supplemented by a surfacewater source. However, if the following conditions are met, a user must permit a 4” well:

- If a user has multiple wells including a 4” well, it must be permitted regardless of withdrawal quantity.
- If multiple 4” wells together are permitted to withdraw greater than 100,000 gpd, a CUP is required.

Data on CUPs that include at least one 4” well were collected from the SJRWMD GIS database (SJRWMD 2006). 4” well CUPs span water use categories, including public supply (household use and residential landscape irrigation), agricultural (including freeze protection, livestock, and nursery applications), recreational (golf course irrigation and common areas), commercial/industrial (operations that are not self-supplied), and mining/dewatering.

For CUPs that include 4” wells, allocated quantities, CUP issue dates, CUP expiration dates, and water source information was provided by SJRWMD staff (SJRWMD 2006). For permits having multiple independent water sources and/or use types, the allocated amount for each source is itemized (Table 1-3). A separate column lists the total allocated amount from all sources for the permit. See Figures 1-6 to 1-9 for locations of these CUPs within Lake County.

Since the SJRMWD does not provide allocated data by well, no analysis on water source, use type or pumpage would be representative of data directly associated with 4” wells. The location of 4” wells may be available through SJRWMD well construction permits. If available, this information will be included in the final Plan as an Appendix.

1.3 CUPs permitted for 100,000 gpd or Greater

CUPs allocated for 100,000 gallons per day (gpd) or greater are also included in the CUP analysis for this Technical Memorandum. These CUPs were identified, tabulated, and depicted spatially. These CUPs contain wells that are typically six (6) – inches (in.) in diameter or greater. All uses over 100,000 gpd must be permitted through a CUP, as this quantity is one of the permitting thresholds. These permits are of interest due to withdrawals that could potentially impact groundwater and surface water supplies, water quality, environmental features and other legal water users. As previously stated, there is some overlap between 4 in. wells and golf course (recreational) permits within this data set.

Approximately 96.1 mgd (59%) of allocated quantities for these permits are from groundwater sources, and 67.9 mgd (41%) are from surface water (Table 1-4, Figure 1-10).

Table 1-4 – Lake County Allocations for CUPs permitted for ≥100,000 gpd

Source	CUPs ≥100,000 gpd Allocated Quantities (mgd)	Percent
Groundwater	96.07	58.6%
Surface water	67.9	41.4%
Total*	**164.0**	**100.0%**

*Does not include 0.8% public supply allocations attributed to small utilities (allocated for <0.1 mgd public supply use type).

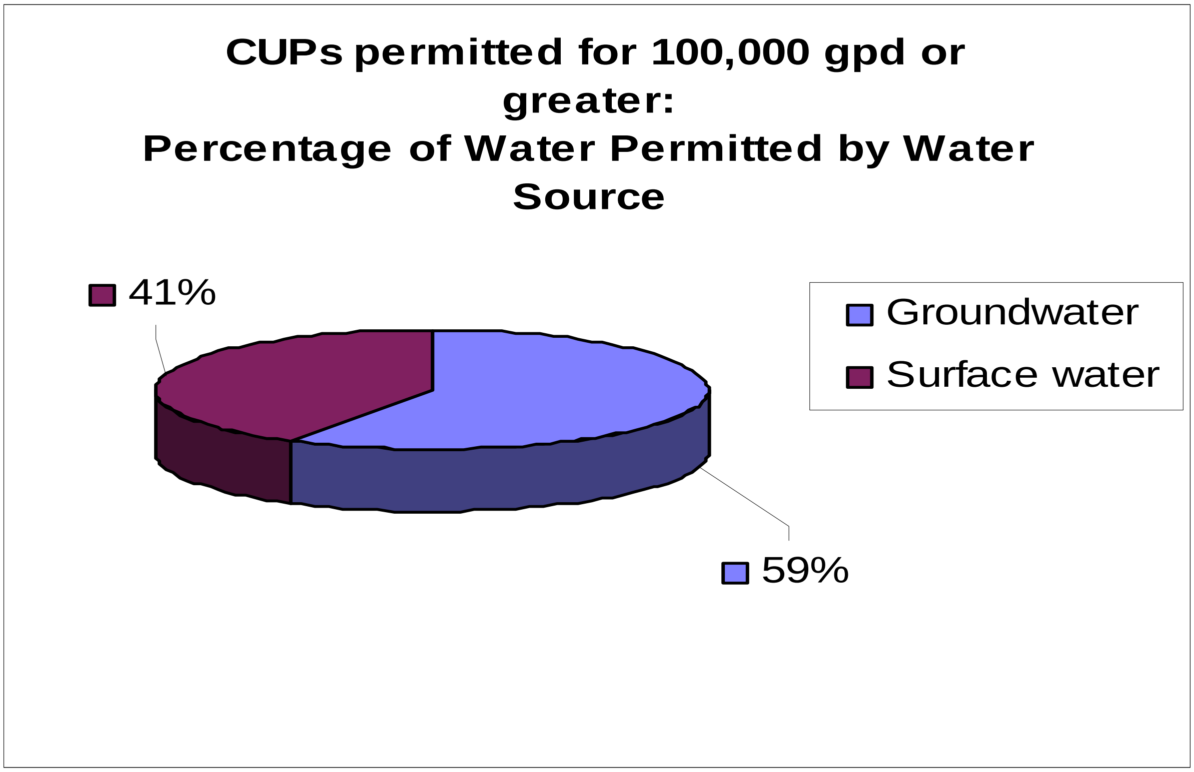


Figure 1-10 Lake County Allocations for CUPs permitted for ≥100,000 gpd

These CUPs span all the water use categories, including public supply, agricultural, irrigation self-supply, recreational self-supply, commercial/industrial/institutional self-supply, and power generation self-supply. Of the total currently permitted use for these CUPs, approximately 53.5 mgd (33%) is public supply, 74.0 mgd (45%) is commercial/industrial/institutional, 7.6 mgd (5%) is recreational, and 28.8 mgd (17%) is agricultural irrigation (Table 1-5, Figure 1-11). There are no power generation CUPs in Lake County.

Of the 74 mgd for commercial/industrial/instituitional, mining/dewatering surface water use is approximately 50 mgd.

Table 1-5 – Allocations by Use Type for CUPs permitted for ≥100,000 gpd

Use Type	CUPs ≥100,000 gpd Permitted Quantities (mgd)	Relative Percent
Agricultural	28.8	17.5%
Commercial/Industrial/Institutional	74.0	45.1%
Power Generation	0.0	0.0%
Public Supply	53.5	32.6%
Recreational	7.6	4.7%
Total	**163.9**	**100.0%**

1. Does not include 0.8% public supply allocations attributed to small utilities that (allocated for <0.1 mgd public supply use type).
2. Does not include reuse supplementation and surface water augmentation as these allocated quantities account for 1% of total allocated quantities.

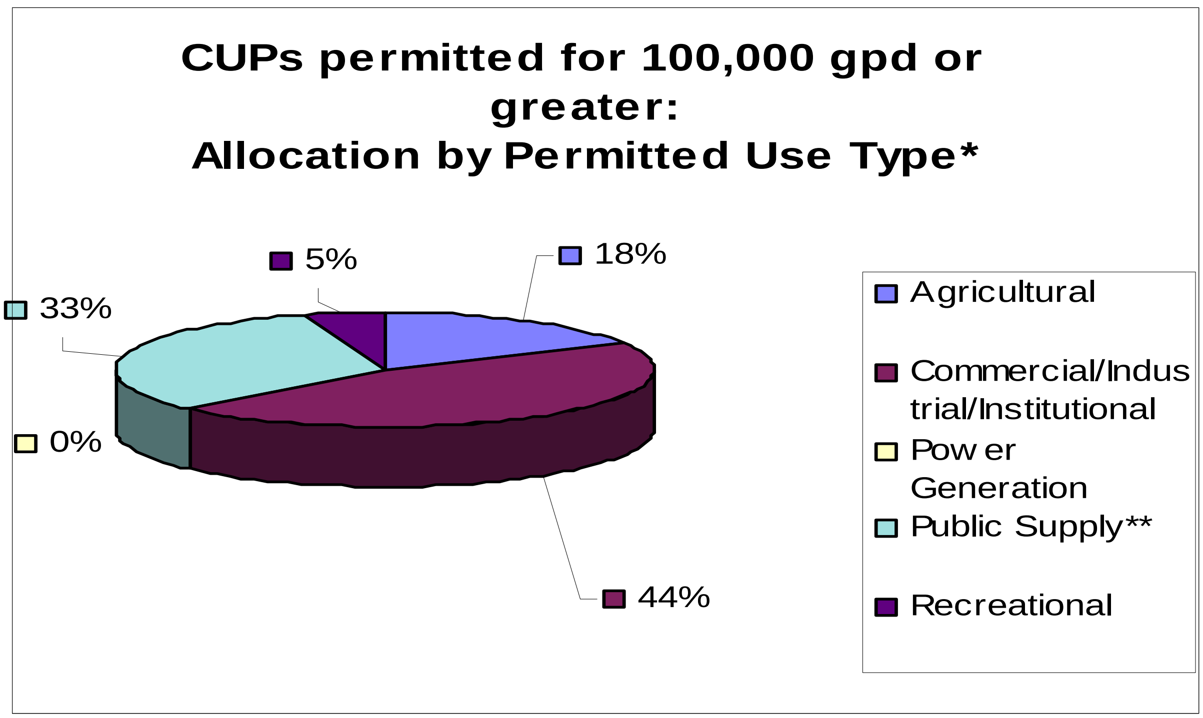


Figure-1-11 – Allocations by Use Type for CUPs permitted for ≥100,000 gpd[1]

CUPs in Lake County having allocated quantities of greater than or equal to 100,000 gpd were determined using the SJRWMD GIS database (SJRWMD 2006/2007). See Figures 1-12 to 1-18 for locations of these CUPs. Additionally, SJRWMD staff provided data associated with CUP allocation quantities, issue dates, expiration dates, and water sources (Table 1-6). In cases where CUPs have multiple water sources, the allocated amount for each source is listed separately. For permits with different water sources and/or use types, the allocated amount for each source is listed separately. A separate column lists the total quantity allocated for all sources for those CUPs with multiple sources.

In addition to allocated quantities, SJRWMD provided all actual pumpage from 2000 to 2005 on a permit-by-permit basis. These quantities were not broken up by source or use type. On average, 100,000 gpd permit holders pumped 94.5 mgd (56.8%) of their allocated water from 2000 to 2005. Of the total 170 users, 29 pumped over 100% on average of their permitted quantities. This overpumpage is being verified by SJRWMD to ensure accuracy and validity of the overpumpage estimate. When overpumping occurs, it can be because of drought year conditions or increases in population beyond what was anticipated at the time of allocation.

Table 1-2 Golf Course CUPs Tabulation

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2002-2005)	Permit Amount (mgy)	Water Source	Revision Number
100	Green Valley Country Club	09/16/97	09/16/07	82.24		Floridan Aquifer	2
100	Green Valley Country Club	09/16/97	09/16/07	47.40	137.22	Surface/Reclaimed Water	2
279	Harbor Hills	04/12/05	04/12/07	131.1 *	150.94	Lake Griffin	6
2484	Links at Village Green	07/01/99	07/01/19	42.18	48.78	Lake Diane	3
2492	MOUNT PLYMOUTH GOLF CLUB	10/27/00	10/27/20	78.59	95.7	Floridan Aquifer	3
2629	Monarch Golf Club at Royal Highlands	12/16/02	07/24/06		106.71	Floridan Aquifer	5
2629	Monarch Golf Club at Royal Highlands	12/16/02	07/24/06	151.16	106.71	Storm Water	5
2662	Las Colinas	04/11/00	04/10/20		80.2	Floridan Aquifer	8
2662	Las Colinas	04/11/00	04/10/20	162.42	154.4	Surface/Reclaimed Water	8
2729	Silver Lake Golf Course	06/06/06	05/15/11	62.86	59.73	Floridan Aquifer	5
2843	Bella Vista Golf & Yacht Club Inc	03/08/04	03/08/09	37.9 *	90.5	Lake Harris	4
2900	Hillcrest Country Club	05/08/07	06/13/07	73.5 *	133.81	Floridan Aquifer	6
2983	Blackbear Golf Course	12/16/98	12/16/18	66.51	150.00	Blackbear Lale	4
2991	King Ridge	05/08/07		387.45 *	332.92	Floridan Aquifer	
2991	King Ridge	05/08/07		307.56 *	351.98	SW	4
2991	King Ridge	05/08/07		491.48 *	499.98	Reclaimed	
4535	Mt Dora Golf Assoc	09/14/06	04/26/25	2.95 *	7.30	Floridan Aquifer	2
4535	Mt Dora Golf Assoc	09/14/06	04/26/25	6.11 *	40.00	Reclaimed	
6320	Deer Island Country Club	08/01/01	08/01/21	98.28	126.04	PUMPS 1 & 2	5
6398	Clerbrook Resort	03/13/02	03/13/07		AUG	Floridan Aquifer	5
6398	Clerbrook Resort	03/13/02	03/13/07	31.34	42.3	Surface Water	5
6455	Pine Meadows Golf Club	12/02/98	12/02/18	43.81	91.6	Floridan Aquifer	3
50048	Country Club of Mount Dora	12/01/06	11/01/11	103.48	134.23	Floridan Aquifer	4
50135	Palisades Golf Course	03/12/02	08/11/18		AUG	Floridan Aquifer	9
50135	Palisades Golf Course	03/12/02	08/11/18	115.65 *	300.00	Lake Minneola and Spring Lake	9
50186	Swiss Fairways	07/17/02	06/07/09	42.52	52.4	Floridan Aquifer	3
50186	Swiss Fairways	07/17/02	06/07/09	74.66	85.19	Golf Course Pond	3
50280	VLS Irrigation	08/09/05	10/10/20	195.40	169.8	Floridan Aquifer	7
50280	VLS Irrigation	08/09/05	10/10/20	427.37	164.3	Lined Ponds 11,11A	7
50280	VLS Irrigation	08/09/05	10/10/20	372.90	115.00	Reclaimed	7
50807	Diamond Club	07/07/04	07/07/09	131.23 *	134.00	Floridan Aquifer	2

Data Source: St.Johns River Water Management District; GIS Development; "Consumptive Use Permit Well"; Downloaded May 2007
ftp://sjr.state.fl.us/disk/regulatory/cupdata/cupstations.zip

Table 1-2 Golf Course CUPs Tabulation

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2002-2005)	Permit Amount (mgy)	Water Source	Revision Number
50807	Diamond Club			143.81 *	None	Surface Water	
63048	Stonybrook West Golf Course	07/09/02	07/09/22	69.88	12.6	Floridan Aquifer	3
63048	Stonybrook West Golf Course	07/09/02	07/09/22	88.47	126.1	Reclaimed Water	3
63669	Sunset Landing	06/14/00	06/14/20		3.58	Floridan Aquifer	1
63669	Sunset Landing	06/14/00	06/14/20	1.1 *	7.85	Surface Water	1
64455	The Legends	03/12/02	06/15/18	437.80	329.08	Floridan Aquifer	7
64455	The Legends	03/12/02	06/15/18	312.92	329.08	Surface Water	
65616	The Lakes	07/30/01	07/30/06	49.93	71	Floridan Aquifer AUG	1
65616	The Lakes	07/30/01	07/30/06	67.20	78.97	Surface Water	1
81906	Heathrow Country Estates	08/13/03	08/13/23		15.3	Floridan Aquifer	1
81906	Heathrow Country Estates	08/13/03	08/13/23	102 *	93.2	City of Eustis	1
83231	Eagle Dunes Golf Club	06/10/04	06/28/22	0.00	18.54	Floridan Aquifer	3
83231	Eagle Dunes Golf Club	06/10/04	06/28/22	117.66 *	112.8	City of Eustis Reclaimed Water System	3
88103	Pennbrooke Fairways Golf Course	02/18/05	11/17/10		10.95	Floridan Aquifer AUG	2
88103	Pennbrooke Fairways Golf Course	02/18/05	11/17/10	26.22 *	65.7	Storm Water	2
94701	Sugarloaf Mountain Development - Irrigation	12/13/05	12/13/25		0	City of Minneola WWTF	1
94701	Sugarloaf Mountain Development - Irrigation	12/13/05	12/13/25		0	Lined Pond	1
94701	Sugarloaf Mountain Development - Irrigation	12/13/05	12/13/25	-	29.73	Floridan Aquifer	1
95654	Water Oaks Golf Course	04/19/05	04/19/10		0	Reclaimed Water	1
95654	Water Oaks Golf Course	04/19/05	04/19/10	69.53 *	52.00	Floridan Aquifer	1
104559	Plantation Residents Golf Club Inc	03/27/06	08/13/22	226.10	268.91	Surface Water / Reclaimed	1
					987.08	Reclaimed Water	
					1982.6887	Floridan Aquifer	
					2525.2113	Surface Water	
TOTALS				**3,335.42**	**5495**		

Average Actual Pumpage based on reported four year annual pumpage records

* Average values based on less than 4 years data record

Data Source: St.Johns River Water Management District; GIS Development; "Consumptive Use Permit Well"; Downloaded May 2007
ftp://sjr.state.fl.us/disk/regulatory/cupdata/cupstations.zip

Table 1-3 4 - Inch Well CUPs Tabulation*

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Official Name	Revision Number
289	Harbor Oaks	01/19/06	11/11/25		19.98		Household	Floridan Aquifer	5
289	Harbor Oaks	01/19/06	11/11/25		0.50		Urban landscape irrigation	Floridan Aquifer	5
289	Harbor Oaks	01/19/06	11/11/25	16.30	2.28	22.76	Water utility	Floridan Aquifer	5
971	Troy Masters	10/30/98	10/30/18		79.30		Agricultural (Misc.)	Floridan Aquifer	5
971	Troy Masters	10/30/98	10/30/18		48.30		Agricultural (Potatoes)	Floridan Aquifer	5
971	Troy Masters	10/30/98	10/30/18	22.58	0.32	127.92	Commercial and industrial process	Floridan Aquifer	5
1669	SERVICE ICE COMPANY	08/29/06	06/09/26	25.31	44.00	44.00	Commercial and industrial process	Floridan Aquifer	2
2387	474 Sand Mine	03/07/06	03/07/26		0.00		Mining	Mine Pit	10
2387	474 Sand Mine	03/07/06	03/07/26		0.00		Mining	Surficial Aquifer	10
2387	474 Sand Mine	03/07/06	03/07/26		175.52		Mining	Floridan Aquifer	10
2387	474 Sand Mine	03/07/06	03/07/26		4,005.54		Mining	Mine Pit	10
2387	474 Sand Mine	03/07/06	03/07/26		5,890.50		Mining	Mine Pit	10
2387	474 Sand Mine	03/07/06	03/07/26		0.00		Household	Mine Pit	10
2387	474 Sand Mine	03/07/06	03/07/26		0.75		Household	Surficial Aquifer	10
2387	474 Sand Mine	03/07/06	03/07/26		1.12		Household	Floridan Aquifer	10
2387	474 Sand Mine	03/07/06	03/07/26		0.00		Urban landscape irrigation	Floridan Aquifer	10
2387	474 Sand Mine	03/07/06	03/07/26		0.00		Urban landscape irrigation	Mine Pit	10
2387	474 Sand Mine	03/07/06	03/07/26	5,894.84	0.34	9,898.24	Urban landscape irrigation	Surficial Aquifer	10
2391	Florida Rock Industries Inc	03/07/06	11/08/20		10.00		Mining	Floridan Aquifer	9
2391	Florida Rock Industries Inc	03/07/06	11/08/20		1,414.38		Mining	dredge lake #3	9
2391	Florida Rock Industries Inc	03/07/06	11/08/20		0.00		Household	dredge lake #3	9
2391	Florida Rock Industries Inc	03/07/06	11/08/20	3.31	0.30	1,424.68	Household	Floridan Aquifer	9
2403	Winn Dixie Scout Reservation	04/28/99	04/28/19	5.86	7.30	7.30	Household	Floridan Aquifer	4
2410	Live Oaks Ranch & Nursery	05/14/02	05/14/22		13.58		Agricultural (Pasture)	Floridan Aquifer	3
2410	Live Oaks Ranch & Nursery	05/14/02	05/14/22		0.22		Livestock	Floridan Aquifer	3
2410	Live Oaks Ranch & Nursery	05/14/02	05/14/22	21.29	2.85	16.65	Nursery (Misc.)	Floridan Aquifer	3
2436	Ridge Grove	02/18/03	02/18/23		36.01		Agricultural (Citrus)	Floridan Aquifer	3
2436	Ridge Grove	02/18/03	02/18/23	14.40	10.72	46.73	Freeze protection (Citrus)	Floridan Aquifer	3
2440	Merry Gro Farms	10/11/05	10/11/10		15.21		Freeze protection (Misc.)	Floridan Aquifer	6
2440	Merry Gro Farms	10/11/05	10/11/10	242.94	183.29	198.50	Nursery (Misc.)	Floridan Aquifer	6
2454	Sunlakes Estates	09/19/06	08/30/26	97.63	57.70	57.70	Household	Floridan Aquifer	3
2492	MOUNT PLYMOUTH GOLF CLUB	10/27/00	10/27/20	127.96	95.70	95.70	Golf course	Floridan Aquifer	3
2580	Hartle Groves	09/04/01	09/04/21		8.23		Agricultural (Citrus)	Floridan Aquifer	3
2580	Hartle Groves	09/04/01	09/04/21	0.00	0.13	8.36	Livestock	Floridan Aquifer	3
2589	Fiddlers Green	01/13/00	01/13/20		0.29		Essential	Floridan Aquifer	3
2589	Fiddlers Green	01/13/00	01/13/20		0.66		Household	Floridan Aquifer	3
2589	Fiddlers Green	01/13/00	01/13/20	none reported	0.09	1.03	Livestock	Floridan Aquifer	3
2594	Cherry Lake Tree Farm, Inc.	06/13/06	06/13/26		0.00		Agricultural (Citrus)	Floridan Aquifer	12
2594	Cherry Lake Tree Farm, Inc.	06/13/06	06/13/26		0.00		Freeze protection (Citrus)	Floridan Aquifer	12
2594	Cherry Lake Tree Farm, Inc.	06/13/06	06/13/26	941.64	0.00	0.00	Nursery (Misc.)	Floridan Aquifer	12
2637	Carl Smith	03/04/03	03/04/23		9.60		Agricultural (Citrus)	Floridan Aquifer	4
2637	Carl Smith	03/04/03	03/04/23		2.86		Freeze protection (Citrus)	Floridan Aquifer	4
2637	Carl Smith	03/04/03	03/04/23	0.60	0.04	12.50	Livestock	Floridan Aquifer	4
2650	Cassia Fern	11/22/00	11/22/20	2.67	18.60	18.60	Nursery (Fern)	Owens Pond	3
2668	Robert Sullivan	10/10/03	10/10/23	0.19	4.75	4.75	Urban landscape irrigation	Floridan Aquifer	5

Table 1-3 4 - Inch Well CUPs Tabulation*

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Official Name	Revision Number
2688	Heritage	01/19/06	01/19/26	9.91	11.95	11.95	Nursery (Misc.)	Floridan Aquifer	5
2700	Lake Utility Services Inc.	04/11/06	04/12/11		73.00		Commercial and industrial process	Floridan Aquifer	23
2700	Lake Utility Services Inc.	04/11/06	04/12/11		1,112.89		Household	Floridan Aquifer	23
2700	Lake Utility Services Inc.	04/11/06	04/12/11		53.66		Urban landscape irrigation	Floridan Aquifer	23
2700	Lake Utility Services Inc.	04/11/06	04/12/11	604.67	138.70	1,378.24	Water utility	Floridan Aquifer	23
2704	Greenacres Fernery & Citrus	07/18/01	07/18/21		3.60		Agricultural (Citrus)	Floridan Aquifer	10
2704	Greenacres Fernery & Citrus	07/18/01	07/18/21		5.07		Freeze protection (Fern)	Floridan Aquifer	10
2704	Greenacres Fernery & Citrus	07/18/01	07/18/21	48.19	16.08	24.75	Nursery (Fern)	Floridan Aquifer	10
2706	Floral Trace	08/13/01	08/13/21		4.00		Nursery (Misc.)	Floridan Aquifer	3
2706	Floral Trace	08/13/01	08/13/21	0.61	3.70	7.70	Urban landscape irrigation	Floridan Aquifer	3
2716	Benjamin O Benham	03/24/03	03/02/20		73.20		Agricultural (Misc.)	Floridan Aquifer	5
2716	Benjamin O Benham	03/24/03	03/02/20	11.00	1.10	74.30	Livestock	Floridan Aquifer	5
2753	May and Whitaker	08/11/00	06/21/21		0.00		Livestock	unnamed lagoon	4
2753	May and Whitaker	08/11/00	06/21/21	0.07	13.61	13.61	Livestock	Floridan Aquifer	4
2754	Pine Ridge Dairy Inc	11/16/00	11/16/20		14.79		Agricultural (Pasture)	Floridan Aquifer	4
2754	Pine Ridge Dairy Inc	11/16/00	11/16/20	289.54	54.75	69.54	Livestock	Floridan Aquifer	4
2758	Florida Made Door	03/30/00	03/30/20		1.44		Essential	Floridan Aquifer	3
2758	Florida Made Door	03/30/00	03/30/20		0.00		Household	Floridan Aquifer	3
2758	Florida Made Door	03/30/00	03/30/20	1.62	1.42	2.86	Urban landscape irrigation	Floridan Aquifer	3
2763	Senninger Irrigation	06/28/02	06/28/22		72.84		Commercial and industrial process	Floridan Aquifer	3
2763	Senninger Irrigation	06/28/02	06/28/22		2.16		Essential	Floridan Aquifer	3
2763	Senninger Irrigation	06/28/02	06/28/22	43.45	0.27	75.27	Household	Floridan Aquifer	3
2766	Pastime Fernery, Inc.	12/03/02	12/03/22		7.20		Agricultural (Citrus)	Floridan Aquifer	5
2766	Pastime Fernery, Inc.	12/03/02	12/03/22		2.14		Freeze protection (Citrus)	Floridan Aquifer	5
2766	Pastime Fernery, Inc.	12/03/02	12/03/22		1.93		Freeze protection (Fern)	Floridan Aquifer	5
2766	Pastime Fernery, Inc.	12/03/02	12/03/22	none reported	6.13	17.40	Nursery (Fern)	Floridan Aquifer	5
2774	Jack Strickland	10/12/01	10/12/21		10.80		Agricultural (Citrus)	Floridan Aquifer	3
2774	Jack Strickland	10/12/01	10/12/21		3.22		Freeze protection (Citrus)	Floridan Aquifer	3
2774	Jack Strickland	10/12/01	10/12/21	5.66	0.09	14.11	Livestock	Floridan Aquifer	3
2776	Classic Manufacturing Inc	10/23/00	10/23/20	0.90	2.16	2.16	Essential	Floridan Aquifer	3
2782	Raintree Harbor	02/16/98	02/16/08		0.92		Essential	Floridan Aquifer	4
2782	Raintree Harbor	02/16/98	02/16/08		16.46		Household	Floridan Aquifer	4
2782	Raintree Harbor	02/16/98	02/16/08	19.40	2.23	19.61	Urban landscape irrigation	Floridan Aquifer	4
2790	Simpson Training Center	09/04/01	09/04/21		1.44		Essential	Floridan Aquifer	3
2790	Simpson Training Center	09/04/01	09/04/21		0.90		Household	Floridan Aquifer	3
2790	Simpson Training Center	09/04/01	09/04/21	29.50	0.45	2.79	Livestock	Floridan Aquifer	3
2794	MOORMAN GROVE	01/09/96	01/09/03		14.40		Agricultural (Citrus)	Floridan Aquifer	2
2794	MOORMAN GROVE	01/09/96	01/09/03		4.29		Freeze protection (Citrus)	Floridan Aquifer	2
2794	MOORMAN GROVE	01/09/96	01/09/03	none reported	0.44	19.13	Household	Floridan Aquifer	2
2810	Lake Griffin Isles	04/15/03	04/15/08		43.71		Household	Floridan Aquifer	3
2810	Lake Griffin Isles	04/15/03	04/15/08		4.86		Unaccounted-for	Floridan Aquifer	3
2810	Lake Griffin Isles	04/15/03	04/15/08	34.84	0.02	48.59	Urban landscape irrigation	Floridan Aquifer	3
2816	Clermont Ready-Mixed Concrete Plant	03/10/03	03/10/23		11.96		Commercial and industrial process	Floridan Aquifer	3
2816	Clermont Ready-Mixed Concrete Plant	03/10/03	03/10/23	4.12	0.04	12.00	Household	Floridan Aquifer	3

Table 1-3 4 - Inch Well CUPs Tabulation*

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2817	Lakeridge	12/02/97	12/02/07		23.50		Agricultural (Misc.)	Floridan Aquifer	3
2817	Lakeridge	12/02/97	12/02/07		0.86		Essential	Floridan Aquifer	3
2817	Lakeridge	12/02/97	12/02/07	28.41	1.90	26.26	Urban landscape irrigation	Floridan Aquifer	3
2823	Seminole Springs Elementary	07/01/03	07/01/23		2.82		Household	Floridan Aquifer	4
2823	Seminole Springs Elementary	07/01/03	07/01/23	10.66	8.58	11.40	Urban landscape irrigation	Floridan Aquifer	4
2827	Crosland Britt	05/11/04	05/11/24		0.00		Nursery (Misc.)	Mount Dora James P. Snell WWTP	6
2827	Crosland Britt	05/11/04	05/11/24		78.00		Nursery (Misc.)	Stormwater	6
2827	Crosland Britt	05/11/04	05/11/24	190.37	150.84	228.84	Nursery (Misc.)	Floridan Aquifer	6
2849	Clermont West Sand Mine	09/10/02	09/10/05		0.00		Dewatering	Artificial Pond	3
2849	Clermont West Sand Mine	09/10/02	09/10/05		0.00		Dewatering	Floridan Aquifer	3
2849	Clermont West Sand Mine	09/10/02	09/10/05	508.34	1,030.00	1,030.00	Dewatering	Perimeter Ditch	3
2852	Stone Mountain Nursery	03/06/03	03/06/23		19.20		Agricultural (Citrus)	Floridan Aquifer	5
2852	Stone Mountain Nursery	03/06/03	03/06/23		5.72		Freeze protection (Citrus)	Floridan Aquifer	5
2852	Stone Mountain Nursery	03/06/03	03/06/23	33.85	56.70	81.62	Nursery (Misc.)	Floridan Aquifer	5
2855	CAMILLA GROVE	03/05/97	03/05/12		10.00		Agricultural (Citrus)	Lake Erie	2
2855	CAMILLA GROVE	03/05/97	03/05/12	8.34	5.72	15.72	Freeze protection (Citrus)	Lake Erie	2
2859	GOOD SHEPHERD FARMS	02/19/97	02/19/07	22.13	11.40	11.40	Nursery (Fern)	Floridan Aquifer	2
2860	Hawthorne at Leesburg	06/13/06	07/25/07		20.00		Commercial and industrial process	unnamed lake	4
2860	Hawthorne at Leesburg	06/13/06	07/25/07		124.70		Household	Floridan Aquifer	4
2860	Hawthorne at Leesburg	06/13/06	07/25/07		24.00		Recreation area	Floridan Aquifer	4
2860	Hawthorne at Leesburg	06/13/06	07/25/07		14.60		Urban landscape irrigation	Floridan Aquifer	4
2860	Hawthorne at Leesburg	06/13/06	07/25/07	470.37	2.70	186.00	Water utility	Floridan Aquifer	4
2863	BONFIRE COOP	09/16/97	09/16/12		4.32		Dewatering	Lake Tammi	3
2863	BONFIRE COOP	09/16/97	09/16/12		20.08		Household	Floridan Aquifer	3
2863	BONFIRE COOP	09/16/97	09/16/12	18.38	4.54	28.94	Urban landscape irrigation	Floridan Aquifer	3
2867	Country Squire	06/15/05	05/12/15	6.43	10.13	10.13	Household	Floridan Aquifer	4
2888	Mid Florida Lakes	10/10/03	10/10/08		10.95		Commercial and industrial process	Floridan Aquifer	3
2888	Mid Florida Lakes	10/10/03	10/10/08		131.40		Household	Floridan Aquifer	3
2888	Mid Florida Lakes	10/10/03	10/10/08		0.37		Unaccounted-for	Floridan Aquifer	3
2888	Mid Florida Lakes	10/10/03	10/10/08		7.30		Urban landscape irrigation	Floridan Aquifer	3
2888	Mid Florida Lakes	10/10/03	10/10/08	106.41	7.30	157.32	Water utility	Floridan Aquifer	3
2894	United Methodist Church Camp	11/05/99	11/05/19		33.84		Household	Floridan Aquifer	2
2894	United Methodist Church Camp	11/05/99	11/05/19	15.80	2.35	36.19	Urban landscape irrigation	Floridan Aquifer	2
2918	Mahon's Citrus Nursery	04/11/95	04/11/02		15.23		Agricultural (Citrus)	Mud Lake	2
2918	Mahon's Citrus Nursery	04/11/95	04/11/02	none reported	3.99	19.22	Freeze protection (Citrus)	Mud Lake	2
2923	Dura-Stress Inc.	05/31/01	05/31/21		80.25		Commercial and industrial process	Floridan Aquifer	2
2923	Dura-Stress Inc.	05/31/01	05/31/21		1.82		Household	Floridan Aquifer	2
2923	Dura-Stress Inc.	05/31/01	05/31/21	25.50	3.00	85.07	Urban landscape irrigation	Floridan Aquifer	2
2933	Grass Roots Nurseries, Inc.	03/03/00	03/03/20		3.00		Freeze protection (Misc.)	Floridan Aquifer	2
2933	Grass Roots Nurseries, Inc.	03/03/00	03/03/20	21.31	20.30	23.30	Nursery (Misc.)	Floridan Aquifer	2
2944	Williams Grove	01/19/06	11/14/25		5.76		Agricultural (Citrus)	Floridan Aquifer	3
2944	Williams Grove	01/19/06	11/14/25	1.76	1.72	7.48	Freeze protection (Citrus)	Floridan Aquifer	3
2946	C & C Peat Mine	10/11/05	10/11/11		377.00		Dewatering	surficial aquifer	3
2946	C & C Peat Mine	10/11/05	10/11/11	379.19	0.00	377.00	Household	surficial aquifer	3

Table 1-3 4 - Inch Well CUPs Tabulation*

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2950	Sand Hill Ferns	05/17/01	05/17/21		6.70		Freeze protection (Fern)	Unnamed Pond	2
2950	Sand Hill Ferns	05/17/01	05/17/21	8.90	8.30	15.00	Nursery (Fern)	Unnamed Pond	2
2955	Bryan Ferns	04/15/03	04/15/23		4.80		Agricultural (Citrus)	Floridan Aquifer	6
2955	Bryan Ferns	04/15/03	04/15/23		0.00		Freeze protection (Citrus)	unnamed pond	6
2955	Bryan Ferns	04/15/03	04/15/23		12.04		Freeze protection (Fern)	Floridan Aquifer	6
2955	Bryan Ferns	04/15/03	04/15/23	320.57	38.18	55.02	Nursery (Fern)	Floridan Aquifer	6
2958	Turnpike Sand Plant	09/12/06	03/08/25		0.00		Commercial and industrial process	Floridan Aquifer	2
2958	Turnpike Sand Plant	09/12/06	03/08/25	0.00	0.16	0.16	Household	Floridan Aquifer	2
2959	Upson Downs	10/12/04	10/12/24		29.43		Household	Floridan Aquifer	4
2959	Upson Downs	10/12/04	10/12/24	28.55	136.19	165.62	Household	Onsite Lake	4
2973	The Lakes of Lady Lake	11/21/05	09/26/15	42.26	12.94	12.94	Household	Floridan Aquifer	5
2974	Sargent Grove	08/27/02	08/27/22		0.00		Agricultural (Citrus)	Floridan Aquifer	3
2974	Sargent Grove	08/27/02	08/27/22		24.87		Agricultural (Pasture)	Floridan Aquifer	3
2974	Sargent Grove	08/27/02	08/27/22		0.00		Freeze protection (Citrus)	Floridan Aquifer	3
2974	Sargent Grove	08/27/02	08/27/22	19.07	0.05	24.92	Livestock	Floridan Aquifer	3
2977	Wilkinson Auction	05/14/02	05/14/22		1.73		Essential	Floridan Aquifer	2
2977	Wilkinson Auction	05/14/02	05/14/22		0.31		Household	Floridan Aquifer	2
2977	Wilkinson Auction	05/14/02	05/14/22	none reported	1.47	3.51	Urban landscape irrigation	Floridan Aquifer	2
2984	Whitney Baptist Church	09/23/02	09/23/22		0.72		Essential	Floridan Aquifer	2
2984	Whitney Baptist Church	09/23/02	09/23/22	2.09	0.03	0.75	Household	Floridan Aquifer	2
2992	Oak Haven Strawberries	09/22/03	09/22/23		3.17		Agricultural (Misc.)	Floridan Aquifer	2
2992	Oak Haven Strawberries	09/22/03	09/22/23	3.64	1.33	4.50	Freeze protection (Misc.)	Floridan Aquifer	2
3123	Harbor View Elementary	09/03/99	09/03/19		4.80		Household	Floridan Aquifer	2
3123	Harbor View Elementary	09/03/99	09/03/19	4.73	1.60	6.40	Urban landscape irrigation	Floridan Aquifer	2
4483	Givens Farm	11/01/96	11/01/06	0.04	13.84	13.84	Livestock	UNKNOWN (REMOVE)	3
4505	BECSEK GROVE	07/03/96	07/03/06	0.68	0.95	0.95	Urban landscape irrigation	Retention Pond	2
4522	Lester Coggins Trucking Inc	10/23/06	08/03/26		0.18		Commercial and industrial process	Floridan Aquifer	2
4522	Lester Coggins Trucking Inc	10/23/06	08/03/26		2.92		Household	Floridan Aquifer	2
4522	Lester Coggins Trucking Inc	10/23/06	08/03/26	0.72	0.00	3.10	Urban landscape irrigation	Floridan Aquifer	2
4533	Goney's Nursery	06/16/04	06/16/24		4.75		Freeze protection (Misc.)	Floridan Aquifer	4
4533	Goney's Nursery	06/16/04	06/16/24	6.28	14.40	19.15	Nursery (Misc.)	Floridan Aquifer	4
6292	Leesburg Plant	09/07/99	09/07/19		4.15		Commercial and industrial process	Floridan Aquifer	4
6292	Leesburg Plant	09/07/99	09/07/19	10.12	12.49	16.64	Urban landscape irrigation	Floridan Aquifer	4
6398	Clerbrook Resort	03/13/02	03/13/07	30.22	53.40	53.40	Household	Floridan Aquifer	5
10377	Rowe Groves	08/11/00	08/11/20		31.21		Agricultural (Citrus)	Floridan Aquifer	6
10377	Rowe Groves	08/11/00	08/11/20	13.55	9.30	40.51	Freeze protection (Citrus)	Floridan Aquifer	6
10846	Barrington Estates Wells	08/14/06	05/23/22		17.82		Household	Floridan Aquifer	6
10846	Barrington Estates Wells	08/14/06	05/23/22		1.04		Urban landscape irrigation	Floridan Aquifer	6
10846	Barrington Estates Wells	08/14/06	05/23/22	30.82	1.84	20.70	Water utility	Floridan Aquifer	6
11146	Groveland Estates	11/30/01	11/09/18		29.33		Urban landscape irrigation	Floridan Aquifer	4
11146	Groveland Estates	11/30/01	11/09/18	10.55	29.33	29.33	Urban landscape irrigation	Lake Lucy	4
50109	RL Ferns	12/05/97	12/04/12		10.14		Freeze protection (Fern)	Lake Yale	5
50109	RL Ferns	12/05/97	12/04/12	5.21	12.38	22.52	Nursery (Fern)	Floridan Aquifer	5

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50113	SMP Ranch	04/17/01	04/17/11		28.00		Agricultural (Citrus)	Floridan Aquifer	4
50113	SMP Ranch	04/17/01	04/17/11		9.30		Freeze protection (Citrus)	Floridan Aquifer	4
50113	SMP Ranch	04/17/01	04/17/11	0.00	1.20	38.50	Livestock	Floridan Aquifer	4
50115	Pine Island PUD	06/10/03	06/10/08		0.00		Household	Pine Lake	12
50115	Pine Island PUD	06/10/03	06/10/08		184.10		Household	Floridan Aquifer	12
50115	Pine Island PUD	06/10/03	06/10/08	6.70	186.85	370.95	Urban landscape irrigation	Floridan Aquifer	12
50135	Palisades Golf Course	03/12/02	08/11/18		0.00		Golf course	Floridan Aquifer	9
50135	Palisades Golf Course	03/12/02	08/11/18		0.00		Golf course	Lake Minneola	9
50135	Palisades Golf Course	03/12/02	08/11/18	118.10	0.00	0.00	Golf course	Spring Lake	9
50207	Tulley Dura-Rock	10/11/06	10/11/16	28.57	36.79	36.79	Commercial and industrial process	Floridan Aquifer	3
50220	Jon's Nursery	02/10/98	02/10/13		3.00		Freeze protection (Fern)	Wholly owned pond	6
50220	Jon's Nursery	02/10/98	02/10/13		2.20		Household	Floridan Aquifer	6
50220	Jon's Nursery	02/10/98	02/10/13	566.66	210.00	215.20	Nursery (Fern)	Floridan Aquifer	6
50277	Spring Creek Elementary	06/11/98	06/11/08		0.28		Agricultural (Misc.)	Floridan Aquifer	2
50277	Spring Creek Elementary	06/11/98	06/11/08		5.00		Household	Floridan Aquifer	2
50277	Spring Creek Elementary	06/11/98	06/11/08		0.26		Livestock	Floridan Aquifer	2
50277	Spring Creek Elementary	06/11/98	06/11/08	2.66	12.00	17.54	Urban landscape irrigation	Floridan Aquifer	2
50318	Lake Kirkland Nursery	03/07/00	03/07/20		84.02		Agricultural (Citrus)	Floridan Aquifer	4
50318	Lake Kirkland Nursery	03/07/00	03/07/20		25.02		Freeze protection (Citrus)	Kirkland Lake	4
50318	Lake Kirkland Nursery	03/07/00	03/07/20	13.04	47.80	156.84	Nursery (Misc.)	Floridan Aquifer	4
50334	Park At Wolf Branch Oaks	03/14/06	01/19/26		37.05		Household	Floridan Aquifer	2
50334	Park At Wolf Branch Oaks	03/14/06	01/19/26		0.36		Unaccounted-for	Floridan Aquifer	2
50334	Park At Wolf Branch Oaks	03/14/06	01/19/26		11.97		Urban landscape irrigation	Floridan Aquifer	2
50334	Park At Wolf Branch Oaks	03/14/06	01/19/26	11.42	0.73	50.11	Water utility	Floridan Aquifer	2
50720	Astatula Elementary School	01/21/99	01/21/19		3.12		Household	Floridan Aquifer	1
50720	Astatula Elementary School	01/21/99	01/21/19	1.21	1.32	4.44	Urban landscape irrigation	Floridan Aquifer	1
62666	Round Lake Elementary	12/07/99	12/07/19		0.99		Household	Floridan Aquifer	1
62666	Round Lake Elementary	12/07/99	12/07/19	7.94	12.66	13.65	Urban landscape irrigation	Floridan Aquifer	1
64152	CSR Rinker Leesburg	06/20/00	06/20/20	210.44	14.60	14.60	Commercial and industrial process	Floridan Aquifer	1
65277	Reier Enterprises	11/16/00	11/16/20		0.86		Essential	Lake Gibson	1
65277	Reier Enterprises	11/16/00	11/16/20		1.90		Freeze protection (Fern)	Lake Gibson	1
65277	Reier Enterprises	11/16/00	11/16/20	2.21	5.02	7.78	Nursery (Fern)	Lake Gibson	1
81093	East Ridge High School	12/31/01	12/31/06	19.84	82.42	82.42	Urban landscape irrigation	Floridan Aquifer	1
TOTALS				**11,895.04**	**17,633.11**				

Data Source: St. Johns River Water Management District; GIS Development; "Consumptive Use Permit Well"; downloaded June 2006;
ftp://sjr.state.fl.us/disk1/regulatory/cupdata/cupstations.zip

*CUPs that include at least one 4 - inch well

Table 1-6 Consumptive Use Permits ≥ 100,000 gpd Tabulation

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
88	Flowertree Nursery	6/6/1997	6/6/2007	68.45	87.23	87.23	Nursery (Misc.)	Floridan Aquifer
94	City of Leesburg Public Supply	06/10/03	07/10/04		1,416.20		Commercial/Industrial	Floridan Aquifer
94	City of Leesburg Public Supply	06/10/03	07/10/04		1,847.00		Household	Floridan Aquifer
94	City of Leesburg Public Supply	06/10/03	07/10/04		47.50		Urban landscape irrigation	Floridan Aquifer
94	City of Leesburg Public Supply	06/10/03	07/10/04	2,100.07	22.00	3,332.70	Water utility	Floridan Aquifer
100	Green Valley Country Club	9/16/1997	9/16/2007	129.63	137.22	137.22	Golf course	Surface/Reclaimed
271	Laviance	9/6/2006	1/8/2008		42.13		Freeze Protection	Floridan Aquifer
271	Laviance	9/6/2006	1/8/2008	49.60	49.60	91.73	Freeze Protection	Surface
279	Harbor Hills	04/12/05	04/12/07		151.84		Golf course	Lake Griffin
279	Harbor Hills	04/12/05	04/12/07	359.37	181.98	333.82	Household	Floridan Aquifer
282	Water Oak	04/19/05	04/19/10		90.20		Household	Floridan Aquifer
282	Water Oak	04/19/05	04/19/10		1.90		Recreation area	Floridan Aquifer
282	Water Oak	04/19/05	04/19/10		10.60		Unaccounted-for	Floridan Aquifer
282	Water Oak	04/19/05	04/19/10		2.90		Urban landscape irrigation	Floridan Aquifer
282	Water Oak	04/19/05	04/19/10	81.60	0.64	106.24	Water utility	Floridan Aquifer
286	Lake County	11/18/2005	9/3/2007	42.02	69.16	69.16	Freeze protection (Citrus)	Floridan Aquifer
1665	S. T. BROWN NURSERY	10/9/1998	10/9/2008	none reported	48.79	48.79	Freeze protection (Citrus)	Ground
2387	474 Sand Mine	03/07/06	03/07/26		175.52		Mining	Floridan Aquifer
2387	474 Sand Mine	03/07/06	03/07/26		4,005.54		Mining	Mine Pit
2387	474 Sand Mine	03/07/06	03/07/26		5,890.50		Mining	Mine Pit
2387	474 Sand Mine	03/07/06	03/07/26		0.75		Household	Surficial Aquifer
2387	474 Sand Mine	03/07/06	03/07/26		1.12		Household	Floridan Aquifer
2387	474 Sand Mine	03/07/06	03/07/26	5,894.84	0.34	10,073.76	Urban landscape irrigation	Surficial Aquifer
2391	Florida Rock Industries Inc	03/07/06	11/08/20		10.00		Mining	Floridan Aquifer
2391	Florida Rock Industries Inc	03/07/06	11/08/20		2,828.76		Mining	dredge lake #2
2391	Florida Rock Industries Inc	03/07/06	11/08/20	3.31	0.30	2,839.06	Household	Floridan Aquifer
2392	Southlake Utilities	01/30/04	01/30/07	377.31	919.80	919.80	Utility Supplied	Floridan Aquifer
2394	Lake Pretty	12/4/2006	8/26/2018	48.73	120.61	120.61	Agricultural (Citrus)	Floridan Aquifer
2416	Oak Springs MHP	7/7/2004	7/7/2024		2.15		Commercial/Industrial	Floridan Aquifer
2416	Oak Springs MHP	7/7/2004	7/7/2024		38.83		Household	Floridan Aquifer
2416	Oak Springs MHP	7/7/2004	7/7/2024	68.45	4.78	45.76	Water utility	Floridan Aquifer
2419	Silver Springs Citrus	05/07/02	05/07/22		292.00		Commercial/Industrial	Floridan Aquifer
2419	Silver Springs Citrus	05/07/02	05/07/22	161.73	1,445.40	1,737.40	Essential	Floridan Aquifer
2433	Green Swamp Groves	04/16/01	04/16/21		93.62		Agricultural (Citrus)	Floridan Aquifer
2433	Green Swamp Groves	04/16/01	04/16/21	24.74	22.16	115.78	Freeze protection (Citrus)	Floridan Aquifer
2436	Ridge Grove	2/18/2003	2/18/2023	14.40	46.73	46.73	Agricultural (Citrus)	Floridan Aquifer
2440	Merry Gro Farms	10/11/05	10/11/10		15.21		Freeze protection (Misc.)	Floridan Aquifer
2440	Merry Gro Farms	10/11/05	10/11/10	242.94	183.29	198.50	Nursery (Misc.)	Floridan Aquifer

Table 1-6 Consumptive Use Permits > 100,000 gpd Tabulation

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
2445	Florida Food Products	11/10/1998	11/10/2018	33.10	233.71	233.71	Commercial/Industrial	Floridan Aquifer
2453	City of Mascotte			125.80	133.6	133.6	household/utility	Floridan Aquifer
2454	Sunlakes Estates	09/19/06	08/30/26	97.63	112.40	112.40	Household	Floridan Aquifer
2460	7L Howey-in-the-Hills	2/3/2006	5/19/2018	0.00	14.40	14.40	Agricultural (Citrus)	
2462	Villa City	4/23/2001	4/23/2021	31.22	69.13	69.13	Agricultural (Citrus)	Floridan Aquifer
2464	Citrus World	3/25/2004	2/9/2009	255.69	800	800	Agricultural (Citrus)	Surface
2475	Liner Source Inc	4/16/2002	4/16/2022	41.39	97.76	97.76	Nursery	Ground
2478	City of Clermont	09/10/02	09/10/22		775.26		Utility Supplied	Floridan Aquifer
2478	City of Clermont	09/10/02	09/10/22	1,268.35	1,917.71	2,692.97	Utility Supplied	Floridan Aquifer
2482	City of Fruitland Park	06/13/06	06/13/08	179.40	288.35	288.35	Household	Floridan Aquifer
2484	Links at Village Green	7/1/1999	7/1/2019	115.33	79.50	79.50	Golf course	Lake Diane
2485	Gorgeous Groves	04/15/03	04/15/23		77.77		Agricultural (Citrus)	Floridan Aquifer
2485	Gorgeous Groves	04/15/03	04/15/23		5.30		Agricultural (Pasture)	Floridan Aquifer
2485	Gorgeous Groves	04/15/03	04/15/23	8.57	0.18	83.25	Livestock	Floridan Aquifer
2487	Hlochee WMA - Riddick Trust Grove	04/23/01	04/23/21		93.62		Agricultural (Citrus)	Floridan Aquifer
2487	Hlochee WMA - Riddick Trust Grove	04/23/01	04/23/21	0.00	27.88	121.50	Freeze protection (Citrus)	Floridan Aquifer
2489	Lake Fern Inc	11/9/1998	11/9/2018	40.00	75.4	75.4	Nursery	Ground
2492	MOUNT PLYMOUTH GOLF CLUB	10/27/2000	10/27/2020	78.5 *	95.70	95.70	Golf course	Floridan Aquifer
2502	Holloway Tree	02/24/99	02/24/19	33.21	149.30	149.30	Nursery (Misc.)	Floridan Aquifer
2504	Water Conserv II Reuse Facilities	09/13/05	09/13/15		568.70		Freeze protection (Citrus)	Floridan Aquifer
2504	Water Conserv II Reuse Facilities	09/13/05	09/13/15	119.96	131.40	700.10	Reuse Supplementation	Floridan Aquifer
2527	Central Fla Nursery & Landscaping Inc.	9/23/2002	9/23/2022	47.12	65.64	65.64	Nursery	Ground
2531	Thousand Trails	8/2/2006	8/2/2026	35.81	54.75	54.75	Household	Ground
2537	Gissy Groves	7/25/2003	7/25/2023	15.37	43.61	43.61	Agricultural (Citrus)	Ground
2560	Dye/Cooper Block	3/24/2003	3/24/2023	15.95	53.59	53.59	Agricultural (Citrus)	Ground
2567	Loma Linda Corp	11/30/01	11/30/21		29.60		Agricultural (Citrus)	Floridan Aquifer
2567	Loma Linda Corp	11/30/01	11/30/21		72.02		Agricultural (Citrus)	Floridan Aquifer
2567	Loma Linda Corp	11/30/01	11/30/21		16.18		Agricultural (Misc.)	Floridan Aquifer
2567	Loma Linda Corp	11/30/01	11/30/21		3.43		Freeze protection (Citrus)	Floridan Aquifer
2567	Loma Linda Corp	11/30/01	11/30/21		7.15		Freeze protection (Citrus)	Floridan Aquifer
2567	Loma Linda Corp	11/30/01	11/30/21	61.80	1.50	129.88	Livestock	Floridan Aquifer
2571	Howey Block	5/31/2001	5/31/2021	29.00	59.19	59.19	Agricultural (Citrus)	Ground
2574	Hygrade Timber	8/1/2003	7/3/2006		46.00	46.00	Commercial/Industrial	Surface
2576	Location-3-40	4/23/1999	4/23/2019	24.37	37.38	37.38	Agricultural (Citrus)	Surface
2581	Marian Gardens	09/07/04	09/07/24	715.64	1,215.00	1,215.00	Nursery (Misc.)	Floridan Aquifer
2623	JOHN BECK	3/18/1997	3/18/2012	13.41	36.97	36.97	Agricultural (Citrus)	Ground
2629	Monarch Golf Club at Royal Highlands	12/16/02	07/24/06	644.71	106.71	106.71	Golf course	Floridan Aquifer
2631	Lust Farms	12/29/2005	6/13/2015	0.00	145.19	145.19	Nursery	Ground

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CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
2632	Aqua Utilities Florida - Valencia Terr	11/30/2006	8/11/2020	28.32	41.08	41.08	Household	Ground
2634	City of Eustis	3/13/2007	3/13/2012		33.81		Urban landscape irrigation	Ground
2634	City of Eustis	3/13/2007	3/13/2012	1021.90	1,353.30	1,387.11	Household	Ground
2640	Tuscanooga Lakes LLC	10/31/2005	11/16/2021	1.06	37.05	37.05	Agricultural (Citrus/Freeze Protection, Pasture)	Ground
2644	Silver Lakes/Western Shores	05/09/06	05/09/11	288.58	251.08	251.08	Utility Supplied	Floridan Aquifer
2646	Umatilla Municipal Water System	09/11/01	02/13/06	142.53	193.82	193.82	Household	Floridan Aquifer
2651	Serenby	12/21/2006	8/27/2022	2.96	72	72	Agricultural (Citrus/Freeze Protection,Nursery)	Ground
2653	Maguire 455	8/13/2001	8/13/2021	39.67	87.23	87.23	Agricultural (Citrus)	Ground
2655	Moon Lake	9/2/1998	9/2/2008	11.01	38.63	38.63		Surface
2662	Las Colinas	04/11/00	04/10/20		80.20		Golf course	Floridan Aquifer
2662	Las Colinas	04/11/00	04/10/20		154.40		Golf course	Lake #4
2662	Las Colinas	04/11/00	04/10/20	162.42 *	29.40	264.00	Household	Floridan Aquifer
2664	Coleman Cline	10/12/01	10/12/21		125.78		Agricultural (Citrus)	Lake Harris
2664	Coleman Cline	10/12/01	10/12/21	41.48	37.47	163.25	Freeze protection (Citrus)	Floridan Aquifer
2665	Drake Point	7/17/2001	7/17/2021	16.33	43.62	43.62	Agricultural (Citrus)	Surface
2670	L & E Grove	9/20/2004	9/20/2024	2.35	41.03	41.03	Agricultural (Citrus)	Ground
2671	Town of Montverde	2/8/2007	2/8/2009	125.25	127.91	127.91	Household	Ground
2672	Parker	6/15/2005	3/24/2025	0.52	76.15	76.15	Agricultural (Citrus)	Ground
2678	Oak Grove Fernery	11/16/2001	11/16/2021	0.00	37.0	37.0	Agricultural (Citrus)	Ground
2700	Lake Utility Services Inc.	04/11/06	04/12/11		73.00		Commercial/Industrial	Floridan Aquifer
2700	Lake Utility Services Inc.	04/11/06	04/12/11		1,112.89		Household	Floridan Aquifer
2700	Lake Utility Services Inc.	04/11/06	04/12/11		53.66		Urban landscape irrigation	Floridan Aquifer
2700	Lake Utility Services Inc.	04/11/06	04/12/11	604.67	138.70	1,378.24	Water utility	Floridan Aquifer
2701	Kings Cove Subdivision	4/21/2006	4/21/2026	29.10	49.75	49.75	Household	Ground
2704	Greenacres Fernery & Citrus	7/18/2001	7/18/2021	48.19	37.49	37.49	Agricultural (Citrus/Nursery)	Ground
2714	Sunset Hill Groves Partnership	9/23/2002	9/23/2022	33.63	48.6	48.6	Agricultural	Ground
2716	Benjamin O Benham	6/22/2004	3/24/2008	10.93	74.3	74.3	Agricultural (sod)	Ground
2717	Pennbrooke Utilities Inc	09/14/05	09/14/25		7.67		Commercial/Industrial	Floridan Aquifer
2717	Pennbrooke Utilities Inc	09/14/05	09/14/25		136.15		Household	Floridan Aquifer
2717	Pennbrooke Utilities Inc	09/14/05	09/14/25		10.95		Urban landscape irrigation	Floridan Aquifer
2717	Pennbrooke Utilities Inc	09/14/05	09/14/25	101.76	10.95	165.72	Water utility	Floridan Aquifer
2718	Plantation at Leesburg	04/08/03	08/13/22		8.60		Commercial/Industrial	Floridan Aquifer
2718	Plantation at Leesburg	04/08/03	08/13/22		383.04		Household	Floridan Aquifer

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CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
2718	Plantation at Leesburg	04/08/03	08/13/22		31.54		Unaccounted-for	Floridan Aquifer
2718	Plantation at Leesburg	04/08/03	08/13/22		131.88		Urban landscape irrigation	Floridan Aquifer
2718	Plantation at Leesburg	04/08/03	08/13/22	71.93	18.35	573.41	Water utility	Floridan Aquifer
2728	Record Buck Farms	6/4/2002	11/30/2021	24.49	87.12	87.12	Nursery	Ground
2729	Silver Lake Golf Course	6/6/2006	5/15/2011	62.86 *	59.73	59.73	Golf course	Ground
2742	Wekiva Falls Resort @ Mastodon Springs	5/12/2004	5/12/2024	none reported	36.5	36.5	Commercial/industrial, household, recreational area, urban landscape irrigation, and fire protection.	Ground
2754	Pine Ridge Dairy Inc	11/16/2000	11/16/2020	289.54	69.54	69.54	Agricultural (livestock/pasture)	Ground
2757	Malibu Ferns	5/17/2001	5/17/2021	117.34	43.1	43.1	Nursery	Ground
2763	Senninger Irrigation	06/28/02	06/28/22		47.39		Commercial/Industrial	Floridan Aquifer
2763	Senninger Irrigation	06/28/02	06/28/22		72.84		Commercial/Industrial	Floridan Aquifer
2763	Senninger Irrigation	06/28/02	06/28/22		2.16		Essential	Floridan Aquifer
2763	Senninger Irrigation	06/28/02	06/28/22	43.45	0.27	122.66	Household	Floridan Aquifer
2765	City of Tavares Public Water Supply	02/08/05	10/07/10		193.88		Commercial/Industrial	Floridan Aquifer
2765	City of Tavares Public Water Supply	02/08/05	10/07/10		753.98		Household	Floridan Aquifer
2765	City of Tavares Public Water Supply	02/08/05	10/07/10		75.40		Unaccounted-for	Floridan Aquifer
2765	City of Tavares Public Water Supply	02/08/05	10/07/10		32.31		Urban landscape irrigation	Floridan Aquifer
2765	City of Tavares Public Water Supply	02/08/05	10/07/10	641.90	21.54	1,077.11	Water utility	Floridan Aquifer
2771	Lakeview Terrace	12/8/2005	2/14/2020	14.33	41.2	41.2	Household	Ground
2780	Clermont East Sand Mine	10/09/01	10/09/21		725.00		Mining	Floridan Aquifer
2780	Clermont East Sand Mine	10/09/01	10/09/21	1,011.81	1,672.00	2,397.00	Mining	Mine Lake
2791	Eagles Landing	11/18/2005	2/8/2022	107.28	93.46	93.46	Agricultural (Citrus)	Ground
2793	Crothall Laundry Services	4/29/2004	7/25/2023	25.72	40.52	40.52	Industrial, Potable and Irrigation	Ground
2798	Pine Lakes	09/08/87	09/08/94		48.20		Freeze protection (Fern)	Floridan Aquifer
2798	Pine Lakes	09/08/87	09/08/94	408.64	58.80	107.00	Nursery (Fern)	Floridan Aquifer
2810	Lake Griffin Isles	4/15/2003	4/15/2008	34.84	48.59	48.59	Public supply	Ground
2826	Twin Lakes	3/4/2003	3/4/2023	30.15	81.01	81.01	Agricultural (Citrus)	Ground
2827	Crosland Britt	05/11/04	05/11/24		78.00		Nursery (Misc.)	Retention Ponds
2827	Crosland Britt	05/11/04	05/11/24	190.37	150.84	228.84	Nursery (Misc.)	Floridan Aquifer
2834	Lake County Resource Recovery	09/19/03	09/19/23	100.84	125.00	125.00	Commercial/Industrial	Floridan Aquifer
2840	Woodland Heritage M.H.P.	4/28/2004	7/10/2023		2.66		Water utility	Ground
2840	Woodland Heritage M.H.P.	4/28/2004	7/10/2023	19.90	33.23	35.89	Household	Ground
2843	Crescendo Management Inc	7/26/2006	3/8/2009	11.19	90.5	90.5	Commercial/Industrial	Surface

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2849	Clermont West Sand Mine	09/10/02	09/10/05	508.34	1,030.00	1,030.00	Dewatering	Perimeter Ditch
2850	Beck Grove	6/23/2004	6/23/2024	18.33	59.19	59.19	Agricultural (Citrus)	Ground
2852	Stone Mountain Nursery	3/6/2003	3/6/2023	37.31	81.62	81.62	Nursery	Ground
2860	Hawthorne at Leesburg	06/13/06	07/25/07		2.10		Commercial/Industrial	Floridan Aquifer
2860	Hawthorne at Leesburg	06/13/06	07/25/07		20.00		Commercial/Industrial	unnamed lake
2860	Hawthorne at Leesburg	06/13/06	07/25/07		124.70		Household	Floridan Aquifer
2860	Hawthorne at Leesburg	06/13/06	07/25/07		24.00		Recreation area	Floridan Aquifer
2860	Hawthorne at Leesburg	06/13/06	07/25/07		14.60		Urban landscape irrigation	Floridan Aquifer
2860	Hawthorne at Leesburg	06/13/06	07/25/07	470.37	2.70	188.10	Water utility	Floridan Aquifer
2886	City of Minneola - Public Supply	09/22/05	02/09/10	388.77	916.15	916.15	Household	Floridan Aquifer
2888	Mid Florida Lakes	10/10/03	10/10/08		10.95		Commercial/Industrial	Floridan Aquifer
2888	Mid Florida Lakes	10/10/03	10/10/08		131.40		Household	Floridan Aquifer
2888	Mid Florida Lakes	10/10/03	10/10/08		0.37		Unaccounted-for	Floridan Aquifer
2888	Mid Florida Lakes	10/10/03	10/10/08		7.30		Urban landscape irrigation	Floridan Aquifer
2888	Mid Florida Lakes	10/10/03	10/10/08	106.41	7.30	157.32	Water utility	Floridan Aquifer
2898	Lake Correctional Institution	11/16/2000	11/16/2020		2.69		Agricultural (Misc.)	Ground
2898	Lake Correctional Institution	11/16/2000	11/16/2020		2.50		Urban landscape irrigation	Ground
2898	Lake Correctional Institution	11/16/2000	11/16/2020	68.45	61.32	66.51	Household	Ground
2921	Good Earth	10/05/00	10/05/20		47.30		Freeze protection (Fern)	Floridan Aquifer
2921	Good Earth	10/05/00	10/05/20	4.64	57.80	105.10	Nursery (Fern)	Floridan Aquifer
2923	Dura-Stress Inc.	5/31/2001	5/31/2021	25.50	85.07	85.07	Commercial/industrial, household and urban landscape irrigation	Ground
2930	Fakih Grove	8/11/2000	8/11/2020	105.25	49.85	49.85	Agricultural (Citrus)	Ground
2939	Tuscanooga Lakes LLC	10/31/2005	11/16/2020	13.45	57.61	57.61	Agricultural (Citrus)	Ground
2941	Dockery Farms	11/15/00	11/15/20		4.80		Agricultural (Citrus)	Floridan Aquifer
2941	Dockery Farms	11/15/00	11/15/20		95.09		Agricultural (Pasture)	Floridan Aquifer
2941	Dockery Farms	11/15/00	11/15/20		1.43		Freeze protection (Citrus)	Floridan Aquifer
2941	Dockery Farms	11/15/00	11/15/20	5.60	0.88	102.20	Livestock	Floridan Aquifer
2955	Bryan Ferns	4/15/2003	4/15/2023	322.85	55.02	55.02	Nursery (Fern)	Ground
2958	Turnpike Sand Plant	9/12/2006	3/8/2025		105.95		Commercial/Industrial	Ground
2958	Turnpike Sand Plant	9/12/2006	3/8/2025	0.00	3333.66	3439.61	Commercial/Industrial	Surface
2959	Upson Downs	10/12/04	10/12/24		29.43		Household	Floridan Aquifer
2959	Upson Downs	10/12/04	10/12/24	28.55	136.19	165.62	Household	Onsite Lake
2978	IGOU	6/25/2002	6/25/2022	19.75	46.73	46.73	Agricultural (Citrus)	Ground
2983	Blackbear Golf Course	12/16/98	12/16/18	53.91	150.00	150.00	Golf course	Blackbear Lale
2991	Kings Ridge	5/8/2007	5/8/2027		261.78		Golf course	Surface

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CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
2991	Kings Ridge	5/8/2007	5/8/2027	886.05	260.84	522.62	Urban landscape irrigation	Ground
3312	Long and Scott Farm	1/12/1999	1/12/2019		50.00	50.00	Agricultural (Citrus)	Surface
3312	Long and Scott Farm	1/12/1999	1/12/2019	858.20	1869.37	1919.37	Household	Ground
4486	Crabb Grove	6/6/2006	5/31/2026	4.54	49.85	49.85	Agricultural (Citrus)	Ground
4501	Banyan Construction	11/21/2005	9/20/2006	0.55	155.74	155.74	Agricultural (Citrus)	Ground
4517	OSGOOD GROVE	7/29/1996	7/29/2011	3.80	47.00	47.00	Agricultural (Citrus)	Ground
4535	Mt Dora Golf Assoc	9/14/2006	4/26/2025	9.06 *	40.00	40.00	Golf course	Surface
4536	Taylor Home Grove	11/1/1996	11/1/2006	7.38	36.74	36.74	Agricultural (Citrus/pasture/landscape/livestock)	Ground
4542	Journey Circle M Ranch	4/4/2007	4/4/2027	12.79	83.63	83.63	Agricultural (Citrus)	Ground
5709	Silver Springs Citrus	02/24/04	02/24/07	56.54	136.00	136.00	Commercial/Industrial	Floridan Aquifer
5965	Groveland Inc.	01/18/00	01/18/20		21.94		Agricultural (Citrus)	Conserv 2
5965	Groveland Inc.	01/18/00	01/18/20		127.24		Agricultural (Citrus)	Conserv 2
5965	Groveland Inc.	01/18/00	01/18/20		7.60		Freeze protection (Citrus)	Conserv 2
5965	Groveland Inc.	01/18/00	01/18/20	0.00	37.90	194.68	Freeze protection (Citrus)	Conserv 2
6207	Cutrale Citrus Juices USA, Inc.	11/11/03	11/11/23	224.47	475.00	475.00	Commercial/Industrial	Floridan Aquifer
6254	Southern Lake Co Acreage	09/10/96	09/10/06		240.07		Agricultural (Citrus)	CONSERV II
6254	Southern Lake Co Acreage	09/10/96	09/10/06	0.00	85.80	325.87	Freeze protection (Citrus)	Floridan Aquifer
6398	Clerbrook Resort	3/13/2002	3/13/2007		42.3		Golf course	Surface
6398	Clerbrook Resort	3/13/2002	3/13/2007	40.51	53.4	53.4	Household	Ground
6455	Pine Meadows Golf Course	12/2/1998	12/2/2018	43.81 *	91.6	91.6	Golf course	Ground
6543	Morgan Lanier	2/24/1999	2/24/2019	25.67	43.1	43.1	Nursery (Fern)/freeze protection	Surface
10377	Rowe Groves	8/11/2000	8/11/2020	13.55	40.51	40.51	Irrigation/Freeze Protection (Citrus)	Ground
10846	Barrington Estates Wells	8/14/2006	8/14/2011		32.72		Household	Ground
10846	Barrington Estates Wells	8/14/2006	8/14/2011		1.90		Urban landscape irrigation	Ground
10846	Barrington Estates Wells	8/14/2006	8/14/2011	30.82	3.34	37.96	Water utility	Ground
50048	Country Club of Mount Dora	12/01/06	11/01/11	139.20	134.23	134.23	Golf course	Floridan Aquifer
50049	Town of Lady Lake	07/11/06	07/11/26	167.31	250.78	250.78	Household	Floridan Aquifer
50081	Chris Blanton	09/25/98	09/25/03		109.70		Agricultural (Citrus)	Floridan Aquifer
50081	Chris Blanton	09/25/98	09/25/03	2.19	38.00	147.70	Freeze protection (Citrus)	Floridan Aquifer
50113	Jeff Boykin	12/1/2006	4/17/2011	0.00	38.5	38.5	Agricultural (Citrus/livestock)	Ground
50115	Pine Island PUD	06/10/03	06/10/08		184.10		Household	Floridan Aquifer
50115	Pine Island PUD	06/10/03	06/10/08	6.70	186.85	370.95	Urban landscape irrigation	Floridan Aquifer
50128	Bartlett Groves	6/11/1998	6/11/2018	3.22	68.53	68.53	Agricultural (Citrus)	Ground

Table 1-6 Consumptive Use Permits ≥ 100,000 gpd Tabulation

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
50145	Groveland Grove	8/10/2004	8/10/2024	7.89	52.97	52.97	Agricultural (Citrus)	Ground
50147	City of Mount Dora	12/13/05	12/13/25		116.22		Commercial/Industrial	Floridan Aquifer
50147	City of Mount Dora	12/13/05	12/13/25		1,007.27		Household	Floridan Aquifer
50147	City of Mount Dora	12/13/05	12/13/25		38.74		Unaccounted-for	Floridan Aquifer
50147	City of Mount Dora	12/13/05	12/13/25	947.34	129.14	1,291.37	Urban landscape irrigation	Floridan Aquifer
50152	Wedgewood Homeowners Ass., Inc	8/29/2003	8/29/2023	56.11	66.806	66.806		Ground
50159	Hi Acres Nursery	06/06/06	03/31/26	13.19	116.00	116.00	Nursery (Misc.)	Floridan Aquifer
50176	WFR Lake Jem	12/30/1997	2/29/2012	13.58	38.6	38.6	Nursery (Misc.)	Ground
50178	Astor-Astor Park Water Assoc.	05/07/98	05/07/13	108.05	133.50	133.50	Household	Floridan Aquifer
50183	Park Place	8/10/2004	8/12/2018	100.67	67.8	67.8	Irrigation	Ground
50186	Swiss Fairways	7/17/2002	6/7/2009		52.4	52.4	Golf course	Ground
50186	Swiss Fairways	7/17/2002	6/7/2009	85.63	85.19	85.19	Golf course	Surface
50207	Tulley Dura-Rock	10/11/2006	10/11/2016	28.57	61.32	61.32	Commercial/Industrial	Ground
50214	McKinnon Groves	3/13/1998	3/13/2018		39.08	39.08	Agricultural (Citrus)	Ground
50214	McKinnon Groves	3/13/1998	3/13/2018	3.33	73.87	73.87	Agricultural (Citrus)	Surface
50220	Jon's Nursery	02/10/98	02/10/13		3.00		Freeze protection (Fern)	Wholly owned pond
50220	Jon's Nursery	02/10/98	02/10/13		2.20		Household	Floridan Aquifer
50220	Jon's Nursery	02/10/98	02/10/13	566.66	210.00	215.20	Nursery (Fern)	Floridan Aquifer
50226	Simpson Fruit Co.	2/17/1998	2/17/2008	210.59	157.44	157.44	Agricultural (Citrus)	Ground
50238	Robert Hart	9/24/1998	9/24/2018	20.50	37.54	37.54	Agricultural (Citrus)	Ground
50239	Lake Trimbey Groves	5/13/1998	5/13/2018	5.47	67.96	67.96	Nursery (Misc.)	Ground
50243	Hickory Point	6/7/1999	6/7/2019	315.29	62.00	62.00	Recreation area	Surface
50273	Lake Hermosa Village	5/4/2005	2/22/2021	26.35	66.05	66.05	Agricultural (Citrus)	Ground
50279	Village Center Community Development District	07/12/05	07/12/25		169.00		Commercial/Industrial	Floridan Aquifer
50279	Village Center Community Development District	07/12/05	07/12/25		1,281.88		Household	Floridan Aquifer
50279	Village Center Community Development District	07/12/05	07/12/25		158.78		Unaccounted-for	Floridan Aquifer
50279	Village Center Community Development District	07/12/05	07/12/25		137.97		Urban landscape irrigation	Floridan Aquifer
50279	Village Center Community Development District	07/12/05	07/12/25	3,047.10	8.03	1,755.65	Water utility	Floridan Aquifer
50280	VLS Irrigation	08/09/05	06/13/20		66.93		Golf course	Lined Ponds 6,6A,6B
50280	VLS Irrigation	08/09/05	06/13/20		115.00		Golf course	VCCDD WWTP
50280	VLS Irrigation	08/09/05	06/13/20	1,702.32	133.30	315.23	Golf course	Floridan Aquifer
50291	Home Grove	6/6/1998	6/6/2018	21.98	43.6	43.6	Agricultural (Citrus)	Ground
50318	Lake Kirkland Nursery	03/07/00	03/07/20		84.02		Agricultural (Citrus)	Floridan Aquifer

Table 1-6 Consumptive Use Permits ≥ 100,000 gpd Tabulation

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
50318	Lake Kirkland Nursery	03/07/00	03/07/20		25.02		Freeze protection (Citrus)	Kirkland Lake
50318	Lake Kirkland Nursery	03/07/00	03/07/20		39.11		Nursery (Misc.)	unnamed canal
50318	Lake Kirkland Nursery	03/07/00	03/07/20	13.04	47.80	195.95	Nursery (Misc.)	Floridan Aquifer
50334	Park At Wolf Branch Oaks	3/14/2006	1/19/2026	11.42	50.11	50.11	Public Supply/Irrigation	Ground
50598	Alan Bradley	9/24/1998	9/24/2018	0.00	48.33	48.33	Agricultural (Pasture/livestock)	Ground
50736	O'Brien 1-6	09/12/00	09/12/20		146.42		Agricultural (Citrus)	Floridan Aquifer
50736	O'Brien 1-6	09/12/00	09/12/20		2.93		Essential	Floridan Aquifer
50736	O'Brien 1-6	09/12/00	09/12/20		34.90		Freeze protection (Citrus)	Floridan Aquifer
50736	O'Brien 1-6	09/12/00	09/12/20	44.55	5.91	190.16	Urban landscape irrigation	Floridan Aquifer
50807	Diamond Club	07/07/04	07/07/09	131.23 *	134.00	134.00	Golf course	Floridan Aquifer
62724	Fairways at Mt. Plymouth	10/4/2005	4/28/2010	18.17	37.86	37.86	Household	Ground
63398	Hudson Tree Farm	1/18/2000	1/18/2020	6.06	56.58	56.58	Nursery (Misc.)	Ground
64455	The Legends	03/12/02	01/08/05		170.41		Golf course	Pond
64455	The Legends	03/12/02	01/08/05	531.37	158.67	329.08	Urban landscape irrigation	Pond
65573	Hurley Peat Mine	04/11/06	11/16/20		84.00		Agricultural (Sod)	Apopka/Beauclair
65573	Hurley Peat Mine	04/11/06	11/16/20	38.21	676.00	760.00	Mining Dewatering	Ground
66695	Hancock Park	10/23/2000	10/23/2020	24.64	42.744	42.744	Urban landscape irrigation	Ground
81093	East Ridge High School	12/31/2001	12/31/2006	19.84	82.42	82.42	Landscape/Recreation irrigation	Ground
81906	Heathrow Country Estates	08/13/03	08/13/23		15.30		Golf course	Lake 3
81906	Heathrow Country Estates	08/13/03	08/13/23	160.99	139.38	154.68	Golf course	Reclaimed
83231	Eagle Dunes Golf Club	06/10/04	06/28/22		0.76		Commercial/Industrial	Floridan Aquifer
83231	Eagle Dunes Golf Club	06/10/04	06/28/22		2.30		Essential	City of Eustis Reclaimed Water System
83231	Eagle Dunes Golf Club	06/10/04	06/28/22	172.86	112.80	115.86	Golf course	City of Eustis Reclaimed Water System
85182	Far Reach Ranch	12/18/2003	12/18/2023	7.19	71.54	71.54	Agricultural - blueberries	Surface
85195	Heathrow Country Estates	07/02/03	07/02/09	10.85	100.38	100.38	Household	Floridan Aquifer
86742	Hyponex Peat Mine	07/12/05	04/08/09	158.75	363.82	363.82	Mining Dewatering and Processing	Schoolhouse Pond
87418	Sleepy Hollow Recreation Facility	5/12/2003	3/24/2023	36.11	44.00	44.00	Irrigation (Recreational Turf)	Ground
88103	Pennbrooke Fairways	2/18/2005	11/17/2010	50.03	65.7	65.7	Golf course	Surface
91867	DOT Clay LLC	06/07/05	06/08/12	none reported	936.00	936.00	Commercial/Industrial	Ditch Pond
93176	Lake Cogen	03/08/05	03/08/25	142.30	400.00	400.00	Commercial/Industrial	Floridan Aquifer
94701	Sugarloaf Mountain Development - Irrigation	12/13/05	12/13/25	none reported	29.73	29.73	Golf course	Floridan Aquifer

Table 1-6 Consumptive Use Permits ≥ 100,000 gpd Tabulation

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgy) (2000-2005)	Permit Amount by Source (mgy)	Total Permitted Amount (mgy)	Water Usage Type	Water Source Name
95654	Water Oaks Golf Course	4/19/2005	4/19/2010	79.70	52.00	52.00	Golf course	Ground
100086	Clearwater Reserve	10/23/2006	8/29/2026	none reported	58.72	58.72	Urban landscape irrigation	Ground
102732	Lakes of Mount Dora	06/06/06	05/22/08	none reported	175.96	175.96	Urban landscape irrigation	Man-made Lakes
103264	Youth Camp Peat Mine	2/13/2007	2/13/2017	none reported	998.4	998.4	Mining Dewatering	Surface
104559	Plantation Residents Golf Club Inc	3/27/2006	8/13/2022		89.63	89.63	Golf course	Ground
104559	Plantation Residents Golf Club Inc	3/27/2006	8/13/2022		89.63	89.63	Golf course	Surface
104559	Plantation Residents Golf Club Inc	3/27/2006	8/13/2022	258.04	89.65	89.65	Golf course	Surficial
105467	Cascades at Groveland	1/25/2007	1/30/2010	none reported	82.00	82.00	Urban landscape irrigation	Ground
TOTALS				**33,039.65**	**60,724.78**			

* Average values based on less than 6 year record

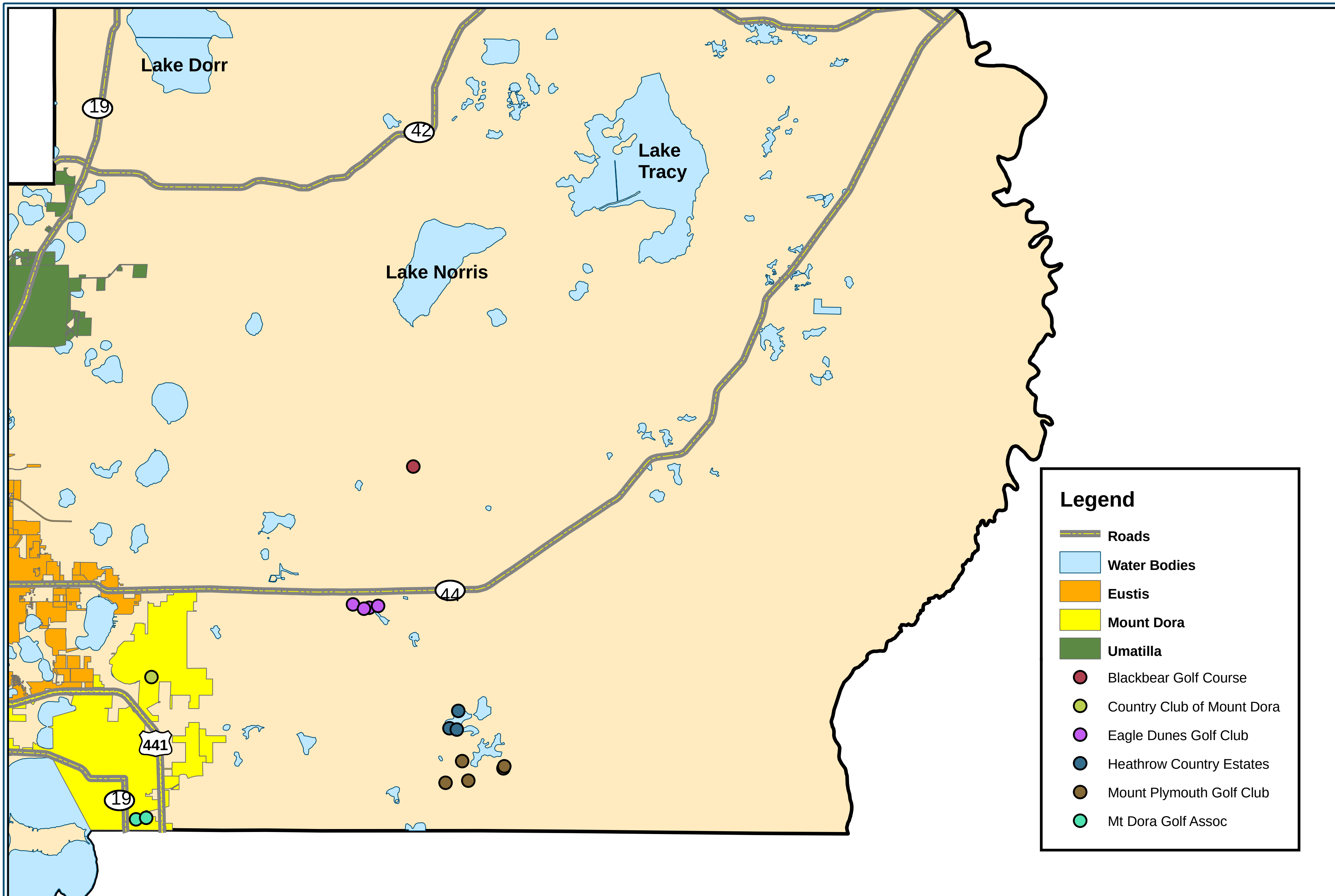

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Figure 1-2
Northeastern Lake County
Golf Course Consumptive Use Permits

ORIGINAL DATE: 05-04-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_Golf Course CUPs...
GIS OPERATOR: DR

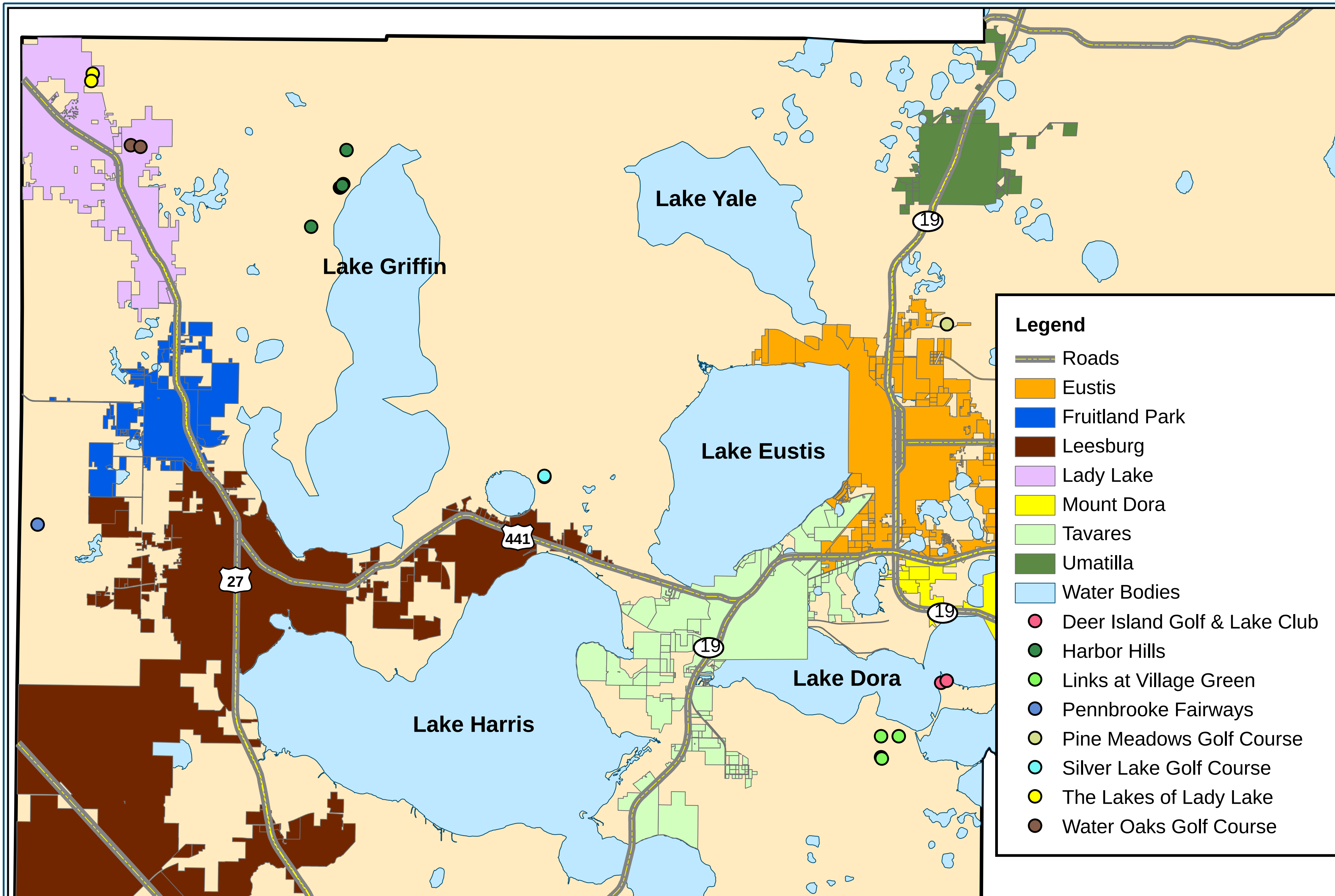

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Figure 1-3
Northern Lake County
Golf Course Consumptive Use Permits

ORIGINAL DATE: 05-04-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_Gof Course Cups...
GIS OPERATOR: DR

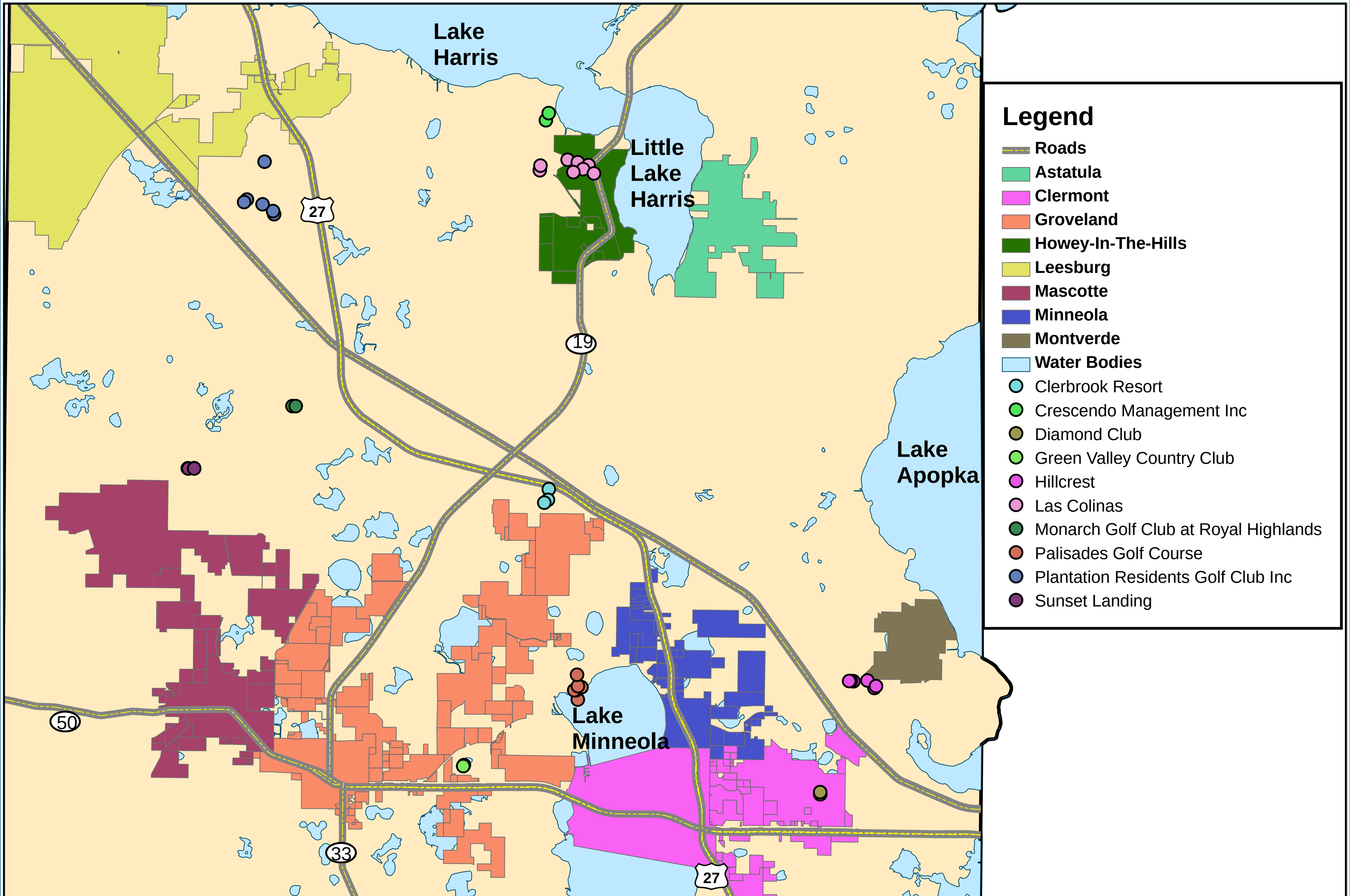

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Figure 1-4
Central Lake County
Golf Course Consumptive Use Permits

ORIGINAL DATE: 05-04-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0404_Golf Course CUPs...
GIS OPERATOR: DR

N
W E
S
1 Inch = 2.5 Miles

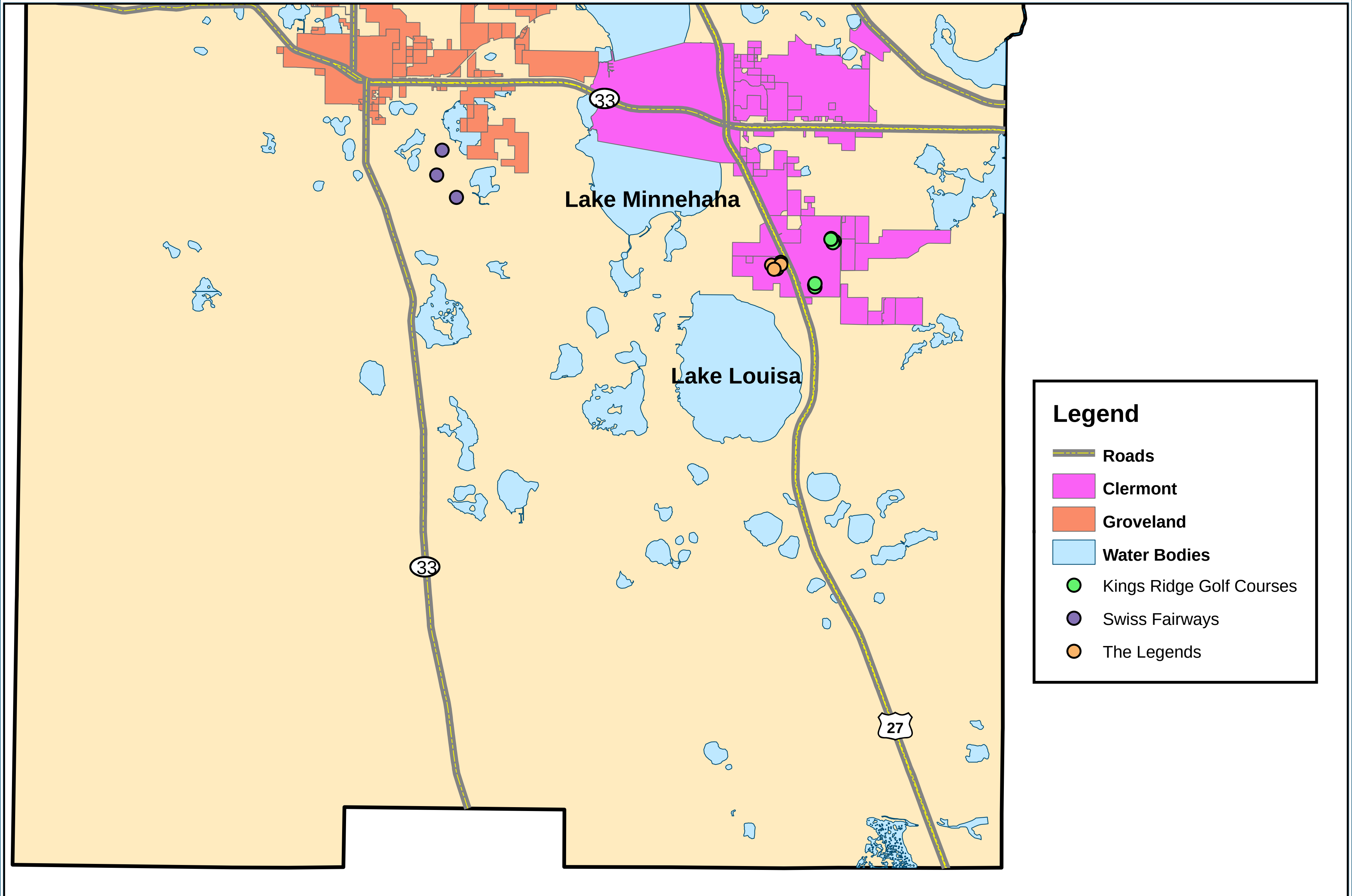

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Figure 1-5
Southern Lake County
Golf Course Consumptive Use Permits

ORIGINAL DATE: 05-04-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_Golf Course CUPs...
GIS OPERATOR: DR

N
W E
S
1 Inch = 2.5 Miles

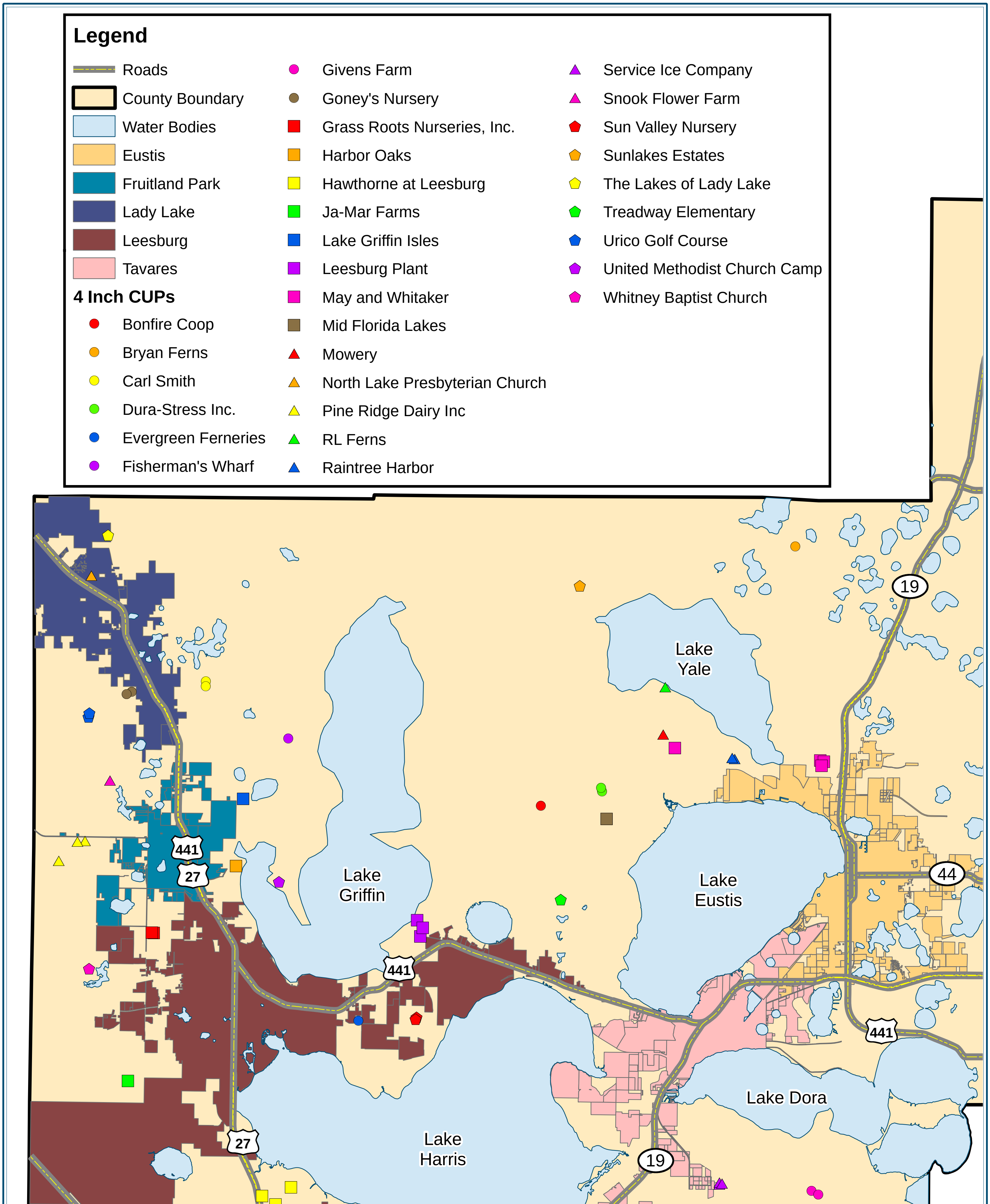

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Figure 1-6
Northern Lake County 4-Inch Wells
Consumptive Use Permits

ORIGINAL DATE: 04-27-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_4 Inch CUPs NW...
GIS OPERATOR: DFB

N W E S
1 Inch = 2.5 Miles

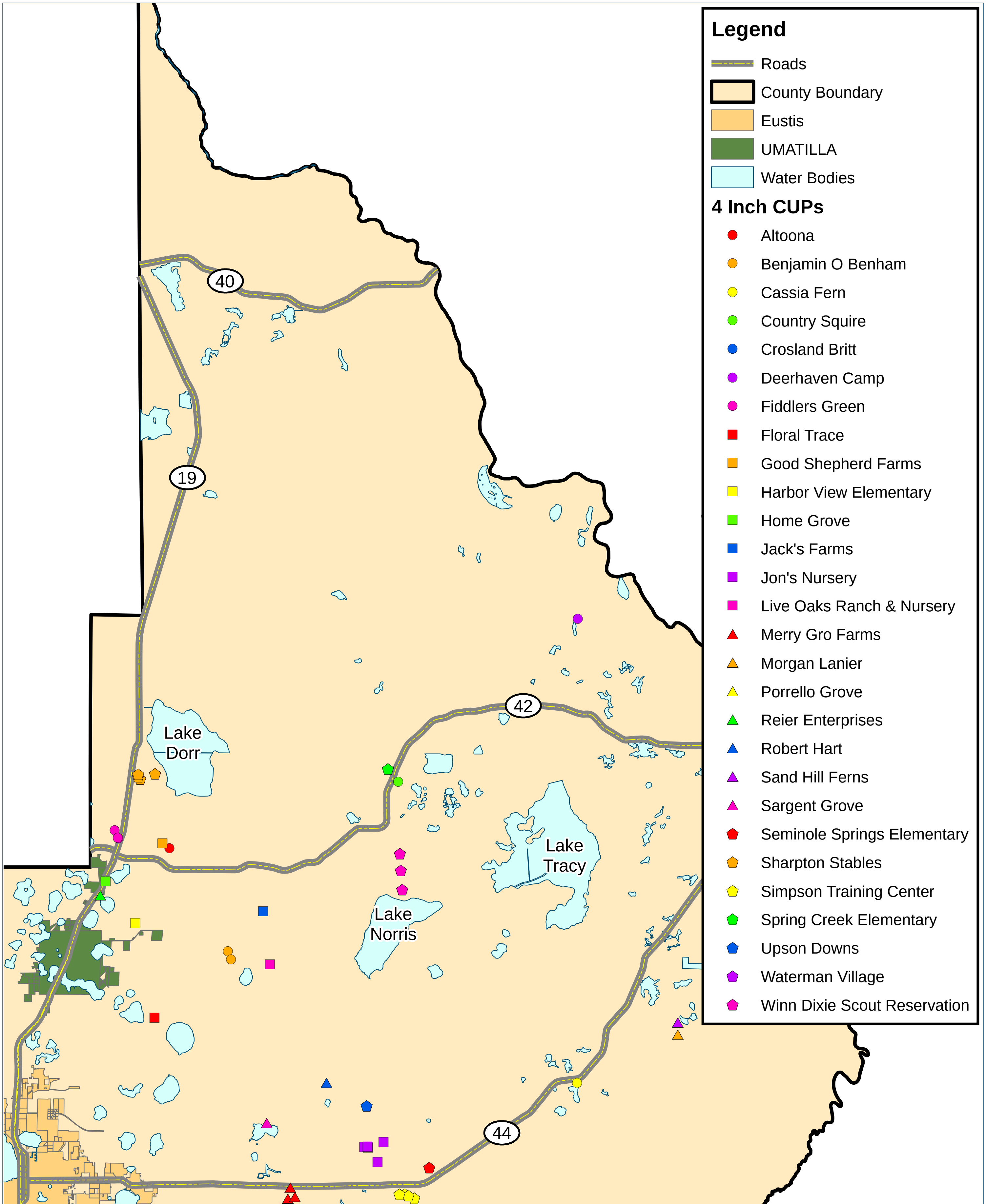

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Figure 1-7
Northeastern Lake County 4-Inch Wells
Consumptive Use Permits

ORIGINAL DATE: 04-27-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_4 Inch CUPs NE...
GIS OPERATOR: DFB

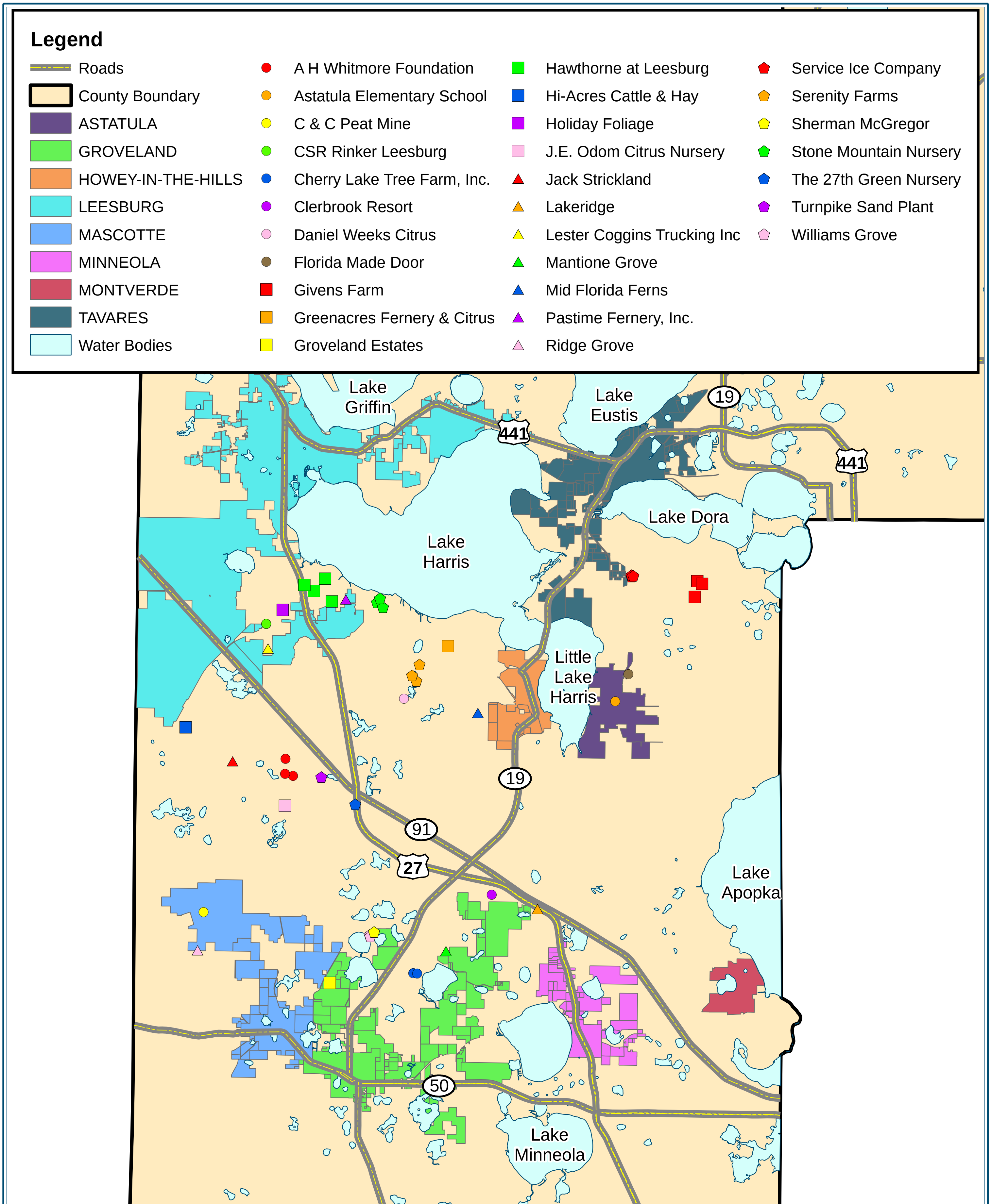

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Figure 1-8
Central Lake County 4-Inch Wells
Consumptive Use Permits

ORIGINAL DATE: 04-27-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_4 Inch CUPs Centr...
GIS OPERATOR: DFB

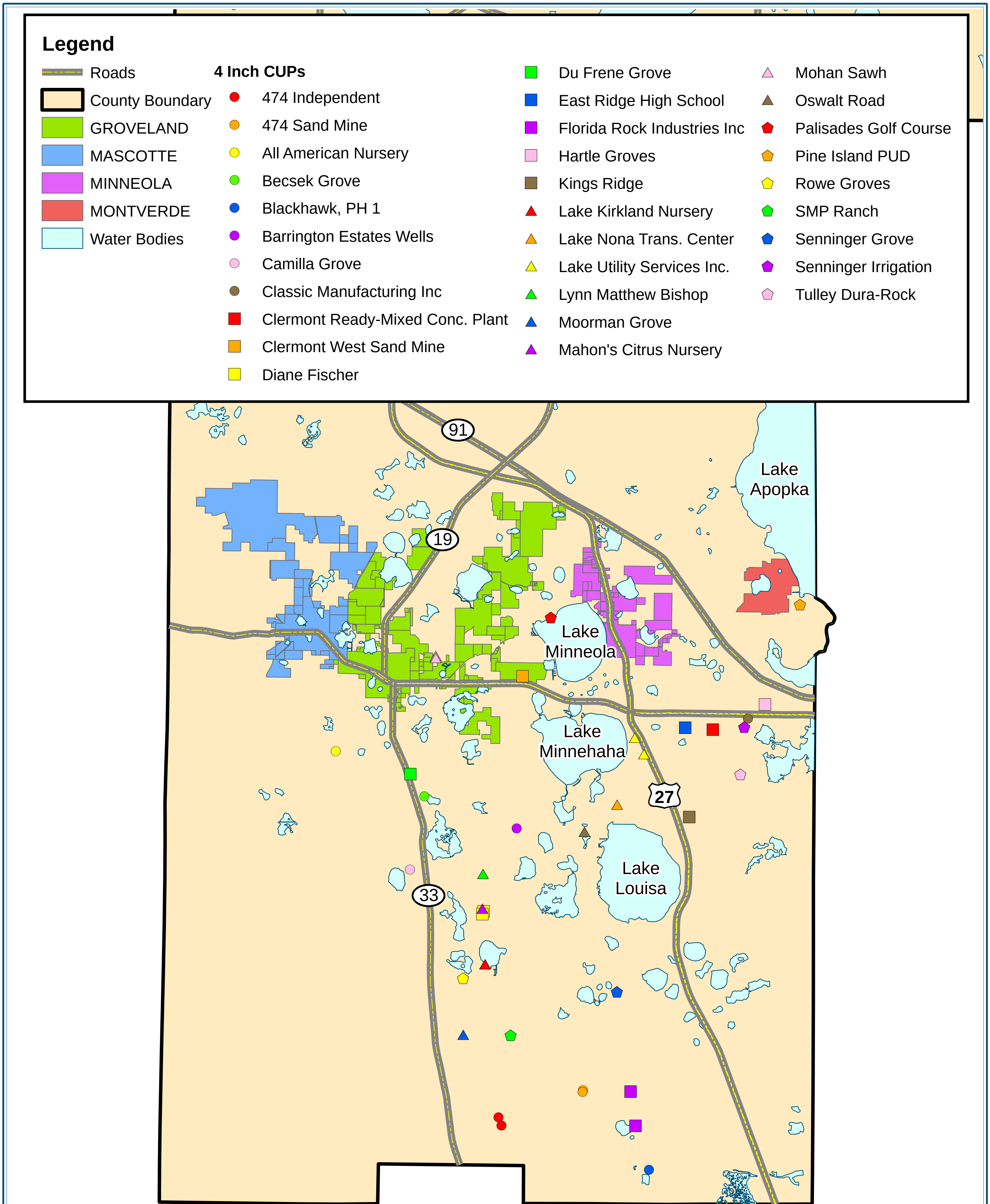

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Figure 1-9
Southern Lake County 4-Inch Wells
Consumptive Use Permits

ORIGINAL DATE: 04-27-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_4 Inch CUPs S.mxd
GIS OPERATOR: DFB

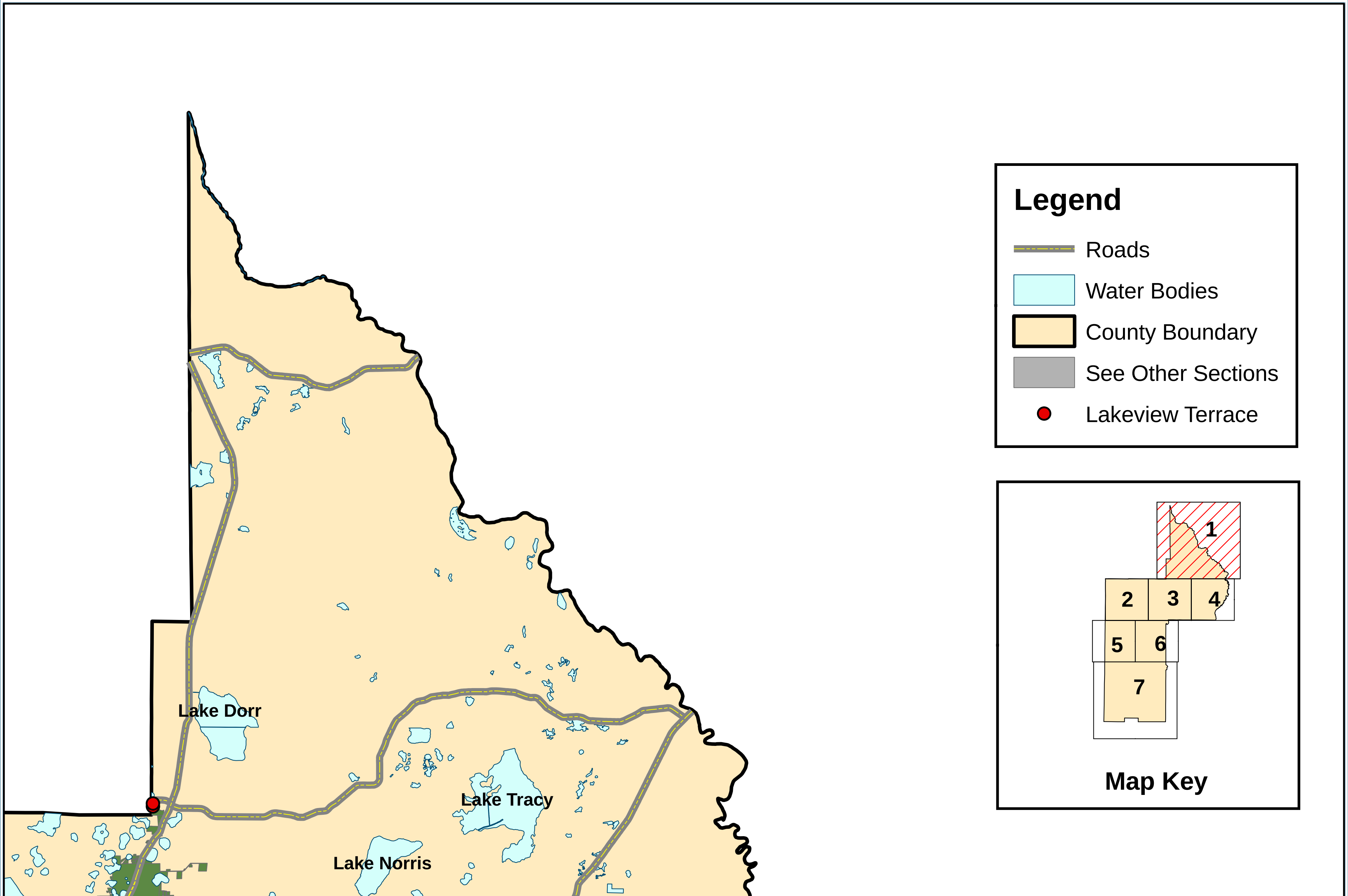

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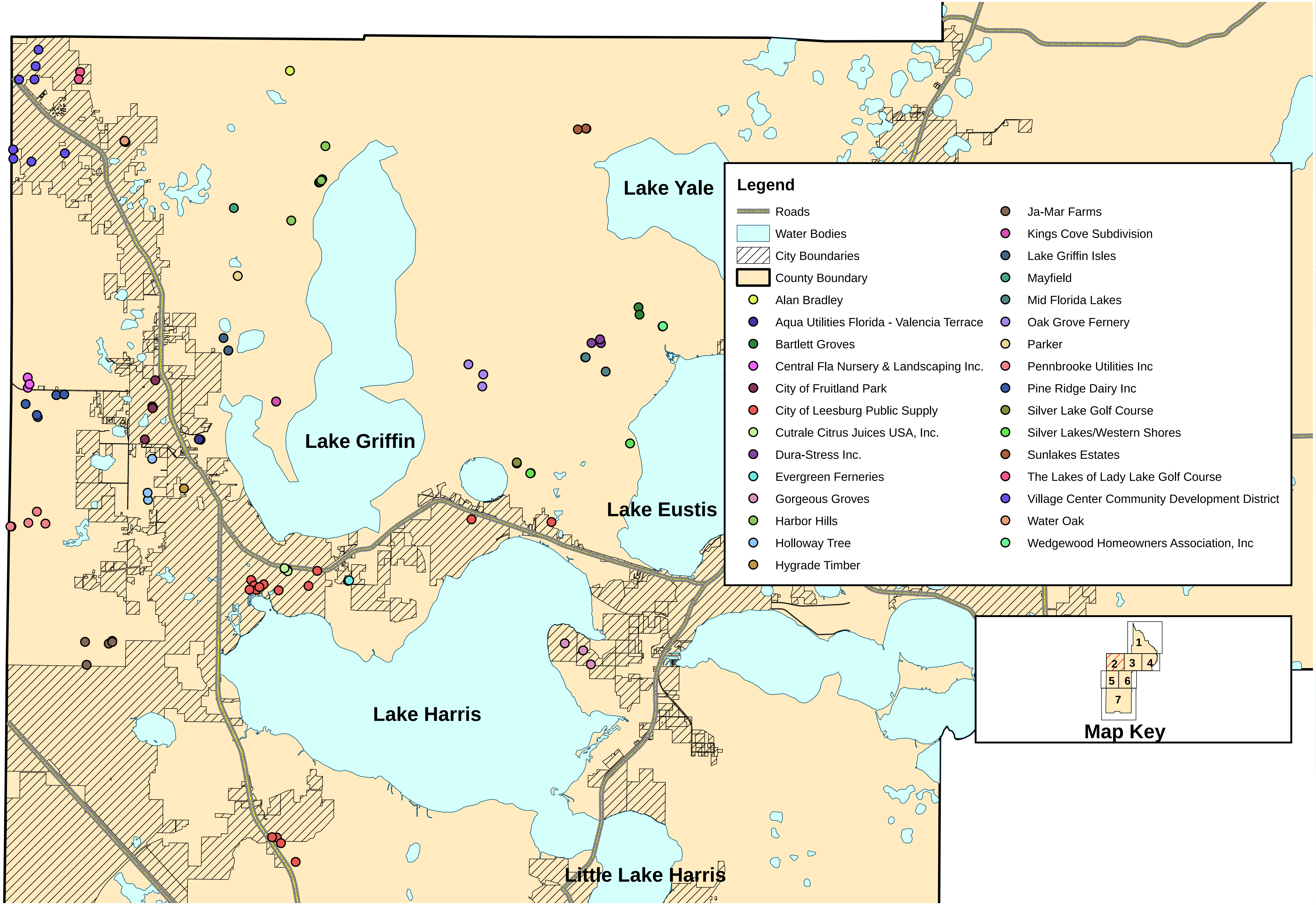
Figure 1-12
100,000 GPD
Consumptive Use Permits

ORIGINAL DATE: 05-09-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_10000CUPs...mxd
GIS OPERATOR: DR

N
W
E
S

1 Inch = 4 Miles



ORIGINAL DATE: 05-24-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_1000CUPs...mxd
GIS OPERATOR: DR

PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 1-13
100,000 GPD
Consumptive Use Permits

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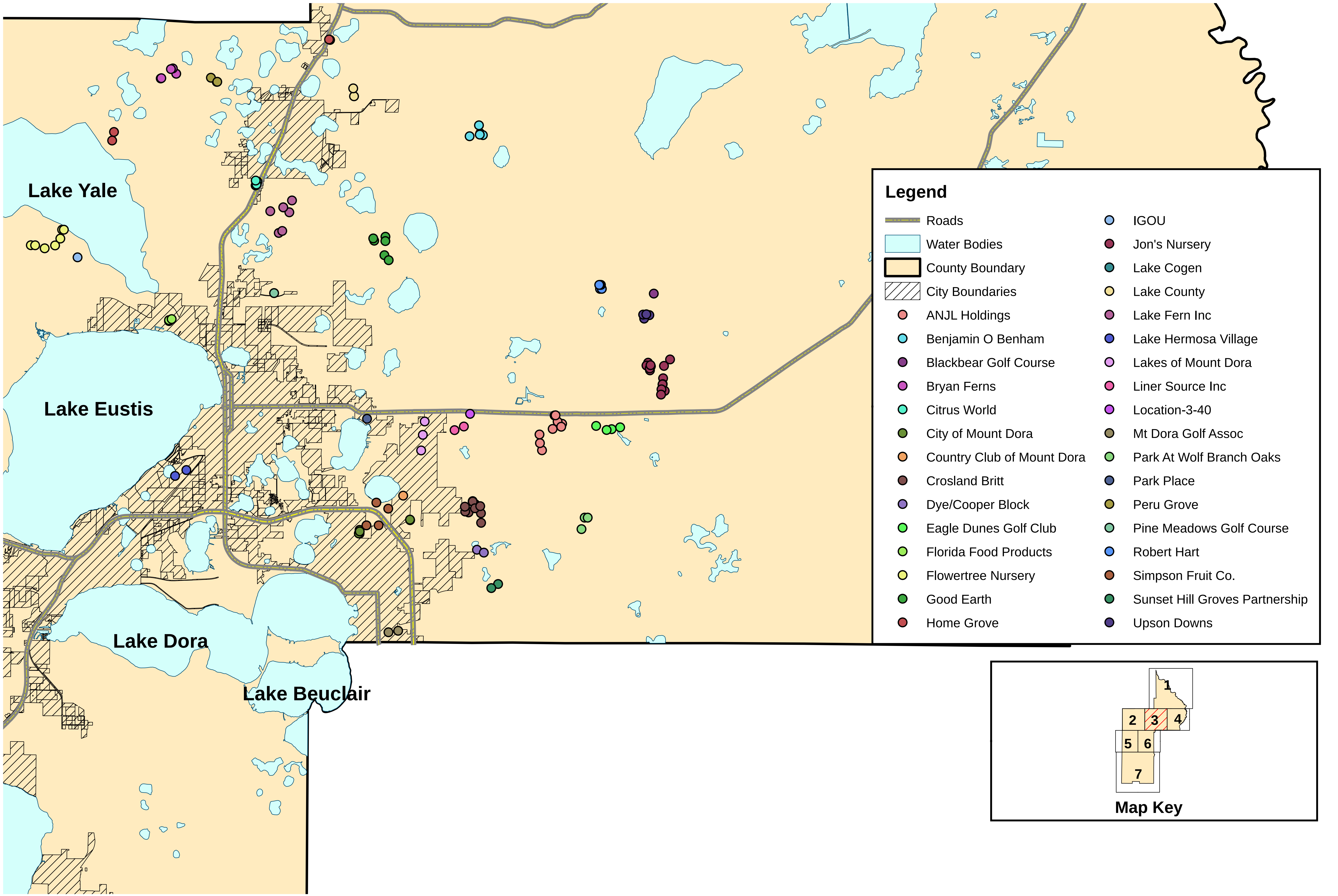

1 inch = 2.75 Miles

ORIGINAL DATE: 05-24-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_1000CUPs...mxd
GIS OPERATOR: DR

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Figure 1-14
100,000 GPD
Consumptive Use Permits

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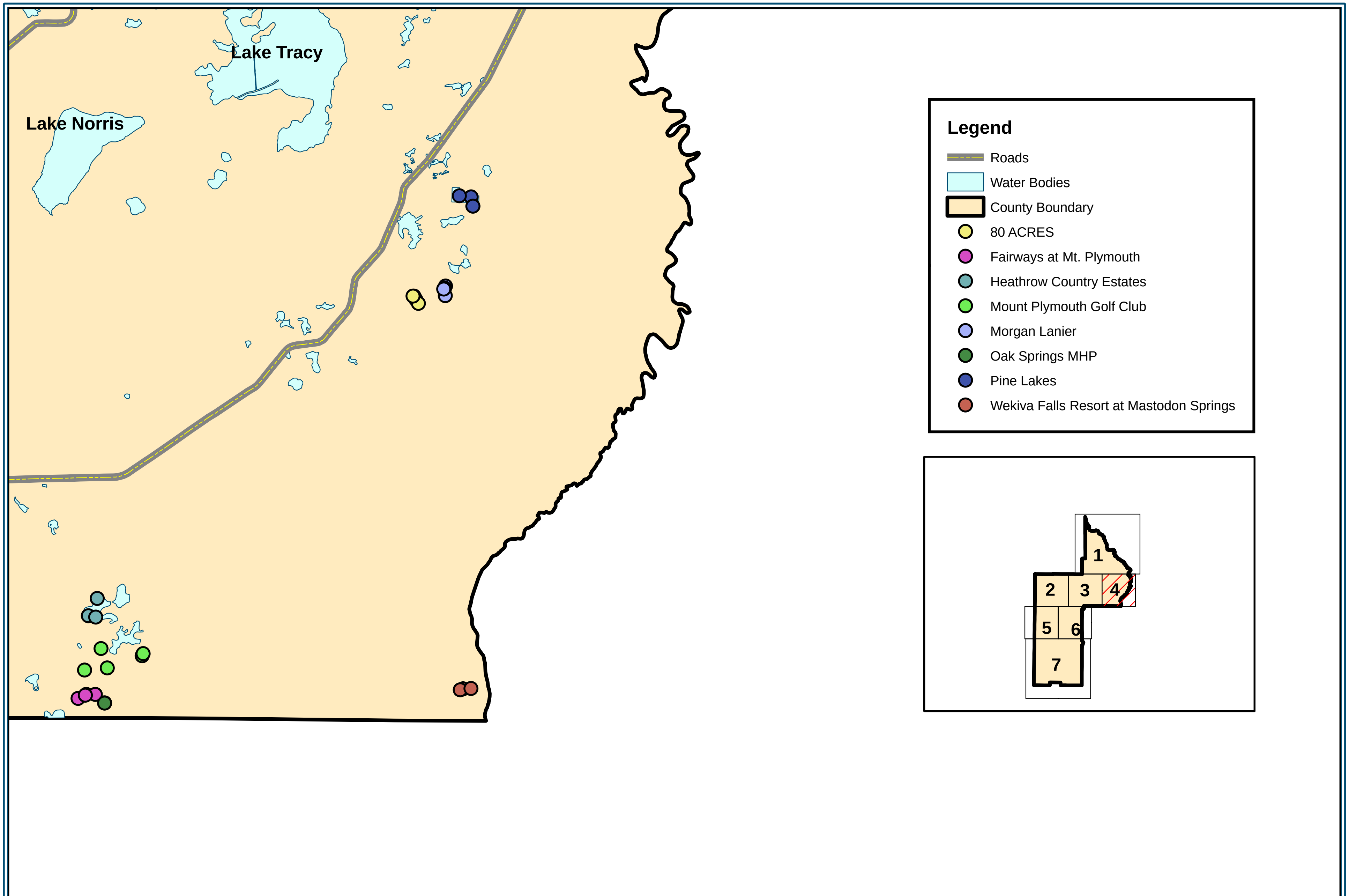

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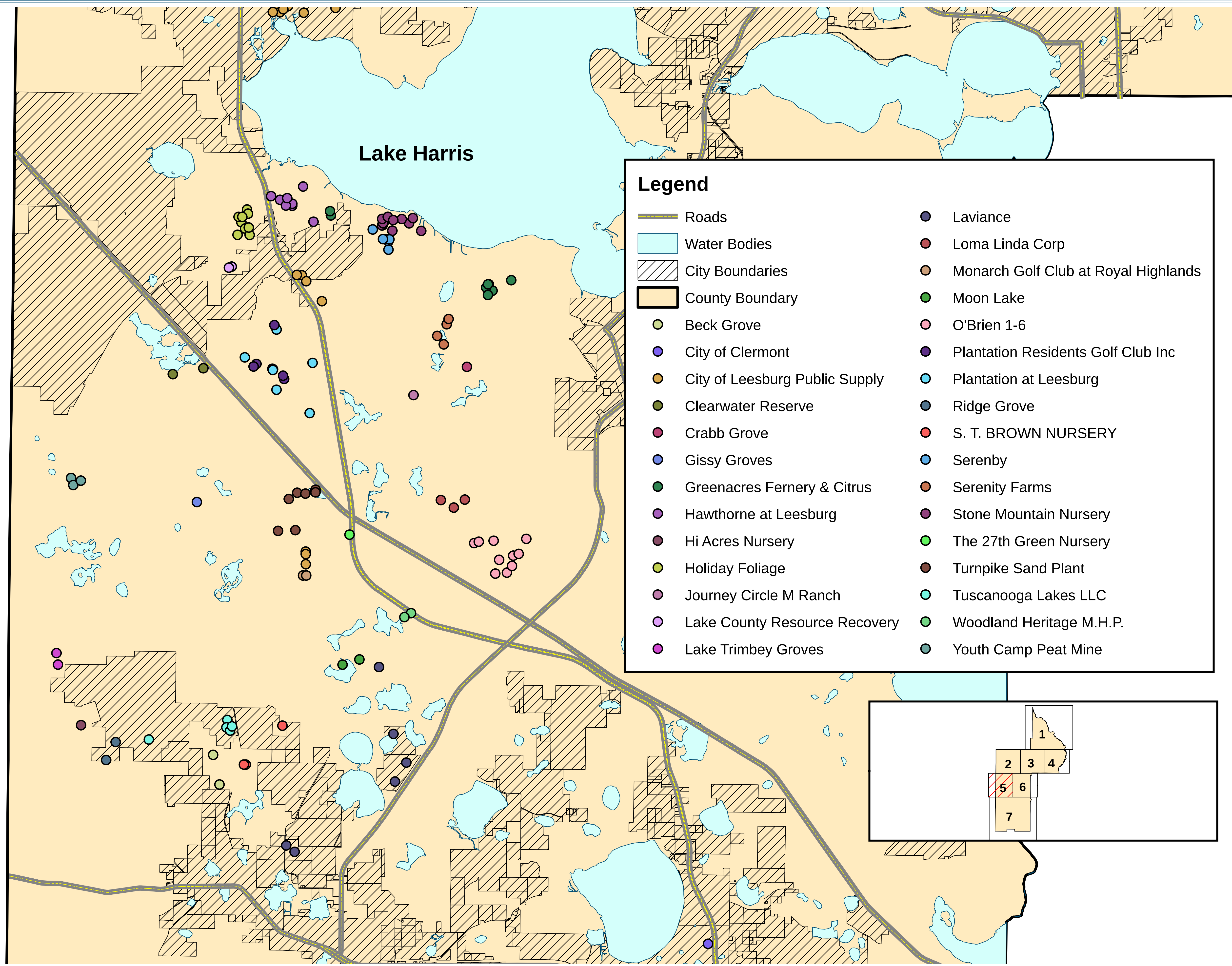
Figure 1-15
100,000 GPD
Consumptive Use Permits

ORIGINAL DATE: 05-09-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_10000CUPs...mxd
GIS OPERATOR: DR

N
W E
S
1 Inch = 2.5 Miles



N
W
E
S
1 Inch = 2.75 Miles

ORIGINAL DATE: 05-24-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_1000CUPs...mxd
DR

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Figure 1-16
100,000 GPD
Consumptive Use Permits

Water Resource Associates, Inc.
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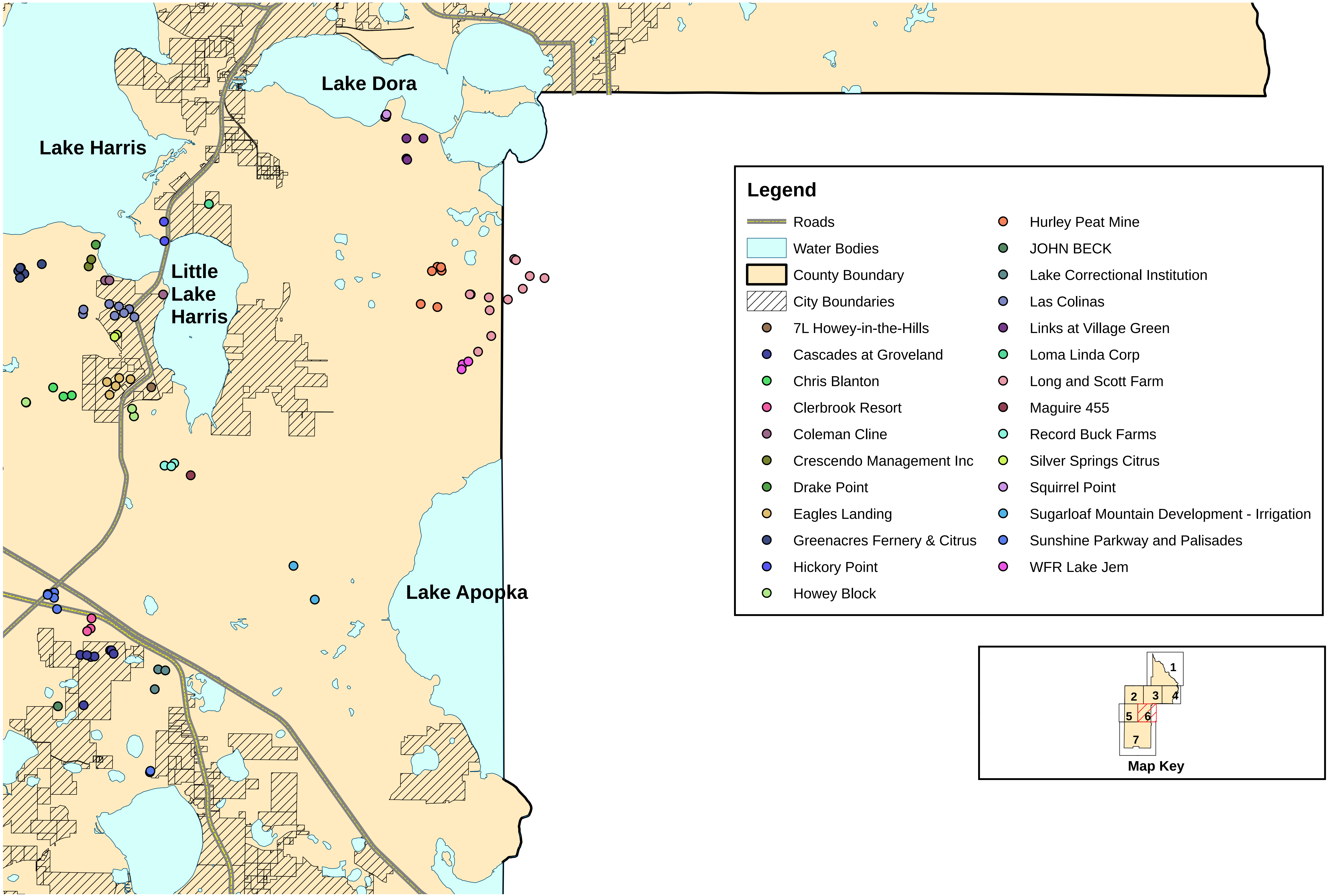

ORIGINAL DATE: 05-24-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_1000CUPs...mxd
GIS OPERATOR: DR

PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 1-17
100,000 GPD
Consumptive Use Permits

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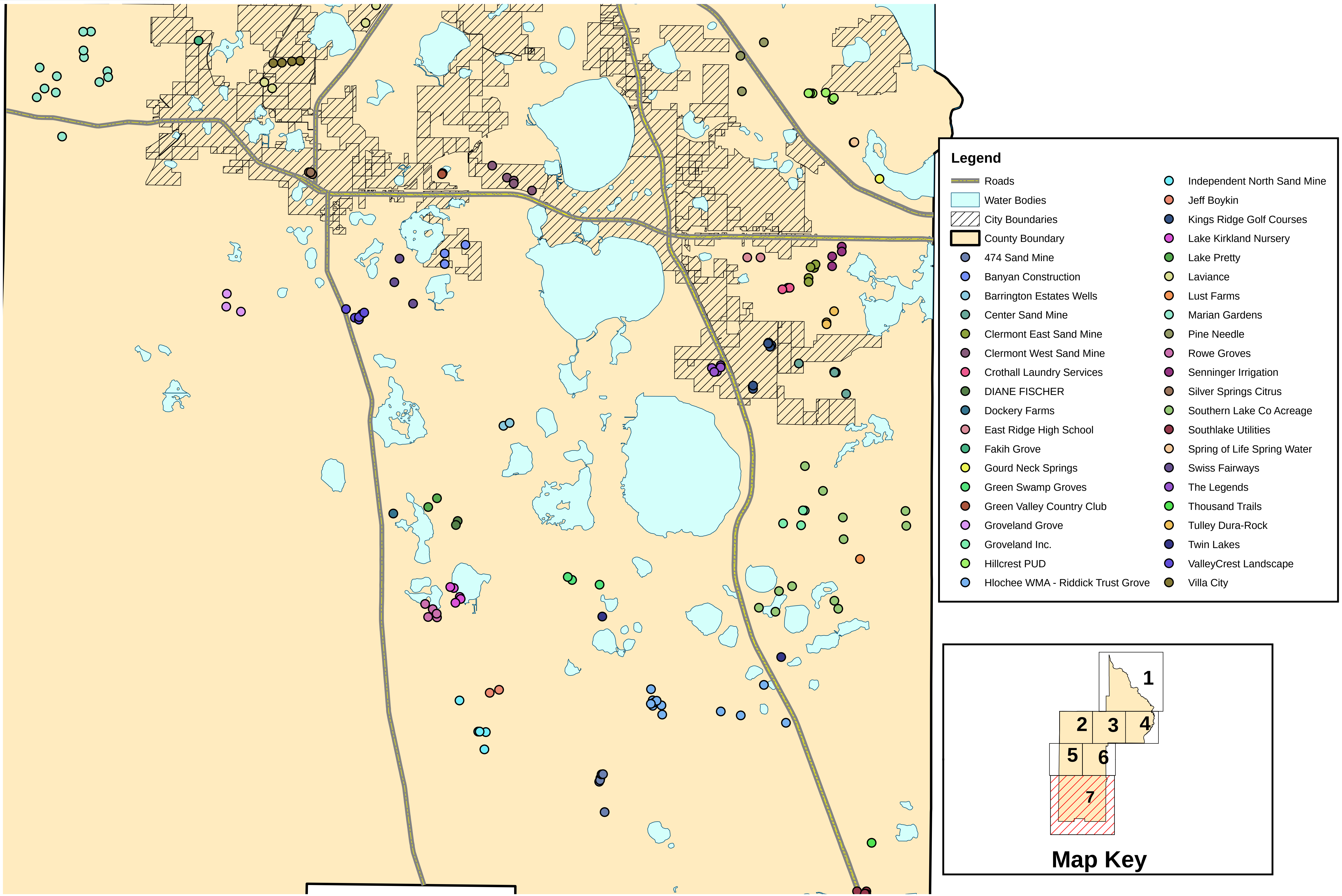

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1 Inch = 2.75 Miles

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PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 1-18
100,000 GPD
Consumptive Use Permits

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2.0 Potential Future Sources of Water

Chapter 1.0 characterized the existing CUP allocation quantities and the sources of water utilized. Fresh groundwater, a traditional water source, is currently the main source of supply in the County (see Chapter 1.0 for approximate %), and surface water also provides significant quantities of water.

This Chapter characterizes both traditional and alternative future sources that may be viable to meet future demands throughout the County. These potential future sources include surface water, fresh groundwater, and brackish groundwater.

Alternative water supplies are defined in Chapter 373.019, Florida Statutes, as:

> *"salt water; brackish surface and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface or groundwater, water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; stormwater; and any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan"*

Relative to water supplies proximate to Lake County, surface water, reclaimed water, and brackish groundwater are considered alternative water supplies in the statute.

No other water supply sources have been designated as alternative by SJRWMD in the SJRWMD's DWSP 2005. Projects using these alternative water supplies are expected to compete successfully for external funding, particularly when developed by regional partnerships or multi-jurisdictional water supply entities.

Conservation is considered a demand management technique, as it reduces reliance on new water sources (SJRWMD 2006).

SJRWMD anticipates limiting withdrawals of groundwater in the region which will necessitate the development of alternative sources for Lake County water users.

2.1 Lake County Hydrogeology and Physiography

Lake County falls within the Middle St. Johns (MSJ) groundwater basin, except for the southeastern portion of the County, which is within the Upper St. Johns groundwater basin (Figure 2-1). A ground water basin is characterized by a ground water flow system that encompasses recharge areas and the associated discharge areas. The MSJ ground water basin is one of five ground water basins in the SJRWMD. The MSJ ground water basin is located almost entirely within Lake, Seminole, Marion, and northern Orange counties (SJRWMD 1990).

The MSJ groundwater basin is characterized by karst topography (an irregular, pitted land surface formed by the dissolution of limestone), valleys, and ridges. The abundance of surface water features in Lake County can be attributed to these features. Karst topography is characterized by high relief, circular lakes, sinkholes, and caves at land surface. The two major ridges within the MSJ groundwater basin extend across Lake County. The ridge areas are characterized by deep lakes, low water tables, and subsurface drainage. Lake Wales Ridge, the higher of the two, with elevations of 200 to 300 ft National Geodetic Vertical Datum (NGVD), is the most prominent physiographic feature in the basin (Figure 2-2), and is located predominantly in Lake County. The second ridge, Mount Dora Ridge, is predominantly located in Marion, Lake, and Orange counties. Both ridges parallel the Atlantic coastline, implying a coastal origin (SJRWMD 1990). Three aquifers are present in Lake County: the surficial; intermediate; and the Floridan aquifer systems.

The surficial aquifer is composed of sands, shells, and some clays. It varies in thickness throughout the County, and is directly replenished by rainfall. Flow in the surficial aquifer usually follows the topography of the land. In the MSJ groundwater basin, the surficial aquifer is an important source of water for domestic self-supply wells and for small-scale irrigation (SJRWMD 1990). Land use, vegetation, topography and local rainfall affect recharge to the surficial aquifer.

The intermediate aquifer lies between the surficial and Floridan aquifers, and occurs sporadically throughout the MSJ basin and Lake County. It is composed of clays, sand, shell, and limestone, and is usually found within the confining unit above the Floridan aquifer. This aquifer is present at 60-100 feet (ft) below the surficial aquifer, and can be a source of potable water where the Floridan aquifer contains lower or marginal water quality (SJRWMD 1990).

The Floridan aquifer in the SJRWMD is generally an artesian aquifer (groundwater under pressure greater than the atmospheric pressure) composed of limestone and dolomite. The Floridan aquifer is recharged by the surficial aquifer in areas where the potentiometric surface of the Floridan aquifer is lower than the water levels in the surficial aquifer. The Lake Wales and Mount Dora ridges have high potential for recharge to the Floridan aquifer in the MSJ groundwater basin. The entire County is characterized by regions of high to moderate recharge and discharge for the Floridan aquifer system (SJRWMD 1990).

2.2 Groundwater

Groundwater, a traditional water source, is currently the main potable water supply source in the County, with fresh water from the Upper Floridan aquifer being the main source for public supply. The SJRWMD anticipates that the development of future groundwater projects will be minimal due to existing stresses on groundwater availability, which will cause a shift from traditional to alternative water supplies.

Although the County is inland from the sea and bordered on the west by the peninsular divide, there are some areas where salt water[1] exists in the Floridan aquifer (Figure 2-2). This region is in the northeastern region of the County around the St Johns River, where lenses of relict brackish water exist in the Floridan aquifer, and concentrations of chloride can exceed 1000 mg/L (SJRWMD 1990). Two relatively small pockets containing sulfate concentrations exceeding 250 mg/L are present in the northeastern region of the County.

The Lower Floridan aquifer typically contains lower quality or brackish water, which does not meet potable standards due to its higher mineral content[2]. The removal of dissolved solids to meet potable water standards results in relatively higher treatment costs than the costs of treating fresh groundwater to meet potable water standards, and thus will impose additional considerations to development as a future water supply due in part to concerns with disposal of the mineralized by-product.

Potential future demands will be assessed to determine the extent to which future water supply needs will be met by groundwater (yield). Existing and projected demands, water quality, availability of alternative sources, impacts from uses outside the County and a suite of other factors will all impact the determination of the extent to which this source will be further utilized.

2.3 Surface Water

Surface water includes water present in lakes, rivers, streams, creeks and wetlands. Surface water is currently used in Lake County for non-potable uses, mainly for commercial and industrial purposes.

Surface water generally is more difficult to treat and capture for potable use than fresh groundwater due to variability in flows and water quality (SJRWMD 2006). Economic factors such as treatment, storage and distribution costs can dictate the feasibility of developing surface water supplies. Surface water quality is often more variable, typically having higher concentrations of biological contaminants, organic materials, and pollutants than groundwater; rendering treatment costs that are higher than fresh groundwater treatment costs. Surface water supplies are subject to fluctuations mainly due to fluctuations in rainfall. Anthropogenic factors within contributing watersheds can also affect available yields. Therefore, storage (i.e., reservoirs) may be necessary and add additional capital costs. Since major surface water locations may not be located near customers, the distribution of treated surface water may significantly increase supply costs.

In addition to the these considerations, minimum flows and levels (MFLs) will dictate the viability of water supply from potential surface water bodies by imposing limits to withdrawals. These withdrawal limits also may impact groundwater availability, therefore MFLs are relevant to both surface and groundwater withdrawals. Florida law (Chapter

[1] Connate salt water is remnants of the retreating sea remaining in cavities of the Floridan aquifer.
[2] Chloride and sulfate concentrations greater than or equal to 250 milligrams per liter (mg/L), or total dissolved solids (TDS) greater than or equal to 500 mg/L.

373, *Florida Statutes* [F.S.]*)* requires Florida's water management districts to establish MFLs to protect priority water bodies, watercourses, springs, and associated wetlands, and aquifers from significant harm caused by groundwater or surface water withdrawals (SJRWMD 2005). SJRWMD's surface water hydrologic regime for lakes is based on a set of up to five MFLs or levels:

- Minimum Infrequent High
- Minimum Frequent High
- Minimum Average
- Minimum Frequent Low
- Minimum Infrequent Low

Minimum Infrequent High – This flow or level floods the riparian wetlands at a frequency sufficient to support important ecological processes such as floodplain maintenance functions and the transport of sediment, detritus, nutrients, and biological propagules.

Minimum Frequent High – This flow or level inundates the floodplain habitat sufficiently to allow surface water biota access for feeding, reproduction, and refugia. Flooding should be of sufficient magnitude, duration, and frequency to maintain the floodplain plant community structure and composition adapted to periodic inundation. This level and flow should occur annually or biannually for several weeks.

Minimum Frequent Low – This is the minimum that should occur during mild droughts. When this water level and flow does not occur too frequently or for too great a duration, there is no significant harm to lotic and floodplain communities because this level provides the drawdown condition required for regeneration by many floodplain plant species. This level may limit some recreational potential of the stream or lake.

Minimum Infrequent Low – This is a very low and infrequent flow or level that may occur for short durations during more extreme droughts.

Table 2-1 shows the surface water bodies that have already had MFLs adopted, and Table 2-2 shows the priority water bodies that are scheduled for MFLs. Refer to Figure 2-3 for the locations of these water bodies.

Table 2-1 Adopted MFLs in Lake County

Water Body Type	Water Body Name
River	Wekiva River @ S.R. 46 Bridge
Spring	Messant Spring
Spring	Seminole Spring
River	Black Water Creek @ S.R. 44 Bridge
Lake	Apshawa North
Lake	Apshawa South
Wetland	Boggy Marsh
Lake	Cherry
Lake	Dorr
Lake	Emma
Lake	Louisa
Lake	Lucy
Lake	Minneola
Lake	Norris
Lake	Pine Island
Lake	Sunset

Table 2-2 Priority Water Bodies Scheduled for MFLs in Lake County

Proposed MFLs			
Water Body Type	Water Body Name	Voluntary Peer Review	Year
Lake	Dyches	Not Listed	2008
Lake	Mt. Plymouth	Not Listed	2008
Lake	Saunders	Not Listed	2008
Spring	Apopka Spring	Yes	2009
Spring	Bugg Spring	Yes	2009
River	Alexander Springs Creek	Yes	2011
Spring	Alexander Springs	Yes	2011
Spring	Silver Glen	Yes	2011

A number of the large and small lakes in the County are potential future sources for communities in the Alliance. However, due to the high level of treatment required for potable use of surface water and resource availability limitations, these lakes would likely serve primarily to augment reuse water or other non-potable projects. Evaluation of lakes that could serve to offset localized, non-potable Alliance Member demands will be included when demand, conservation, and reuse baseline data and projections are completed in later tasks.

The three (3) principal surface water systems that been identified as major potential sources for potable water and reuse water supplementation are the Ocklawaha River, St. Johns River, and the Withlacoochee River. The watershed basins for each river are shown in Figure 2-4. A general discussion of the water supply considerations of these water bodies follows. More detail on their respective locations and potential projects is provided in Chapter 3.0.

2.3.1 The St. Johns River

The 2005 SJRWMD District Water Supply Plan (2005 DWSP) reviewed the water availability, reliability, and quality of the St John's River to determine the feasibility of withdrawing surface water to meet future needs for the entire District. In the 2005 DWSP, the District established that the St. John's River can supply a large quantity of raw water, that will vary in water quality and quantity based on the selected withdrawal locations and established MFLs for the river segment.

During low-flow periods, water in the St. Johns River adjacent to Lake County is slightly to moderately brackish. Flow diverted during these times would require partial demineralization and associated demineralization concentrate management. SJRWMD anticipates that the brine discharge would likely be discharged to the river downstream of the withdrawal.

In addition to brackish water quality, disinfection byproducts are of potential concern. Ozone disinfection leads to accumulation of bromate byproducts that would necessitate removal of the contaminant to meet water quality standards. Further, the river experiences blue-green algae blooms, which generate toxins under certain conditions. These additional factors will influence the cost of developing the river as a potable source.

2.3.2 The Ocklawaha River

The Ocklawaha River transects the County (flowing north into Marion County) and has been identified in two studies as a potential regional water source. The 2005 DWSP identified two candidate locations for alternative surface water supply: the upper basin and the lower basin in the vicinity of the Rodman Reservoir. The WRAMS included the middle reach of the river as a third potential source, and reservoir storage may be required there. These three alternatives are considered potential alternate water supply sources for Lake County, although potential yield is limited in the upper basin.

Within the Ocklawaha, the river's confluence with the Silver River is the first location north of Lake County with good water quality, strong yield, and resource reliability, due primarily to the influx of large groundwater-based flows emanating from the Silver Spring's discharge to the Silver River.

The rivers and lakes in the Upper Ocklawaha River Basin (UORB) have exhibited drastic declines in water quality due to agricultural activity in the UORB and loss of marsh and river habitat due to changes resulting from canal and dam construction over the last century. Additionally, wetland areas on the floodplains of major lakes have been adversely impacted because high water stages have been reduced by flood control activities (SJRWMD 2005). The SJRWMD and citizen groups have developed the Upper Ocklawaha River Basin Initiative to help restore the basin to its former state. While the projects under this initiative target water quality, they will also require water allocations from surface water bodies within the basin, including the Ocklawaha River and Lake Apopka (SJRWMD Initiative 2006). These allocations may affect future withdrawals from the upper basin, but may help improve the reliability of the middle reach.

2.3.3 The Withlacoochee River

The Withlacoochee Regional Water Supply Authority (WRWSA) Regional Water Supply Plan Update – 2005 (RWSPU) characterizes and assesses the Withlacoochee River and its associated water bodies, including Lake Panasoffkee, Rainbow River, and Lake Rousseau, using a review of surface water flow and level records compared with the SWFWMD regulatory constraints. Although surface water source development may be limited somewhat by the establishment of MFL's, significant water supply yield is available in the major surface waters of the Withlacoochee River Basin, particularly downstream of the Wysong-Coogler water conservation structure (just north of Lake Panasoffkee).

The Withlacoochee River Basin includes portions of Pasco, Sumter, Hernando, Citrus, Marion, and Levy counties. The Withlacoochee River and its associated water bodies are the dominant surface water features in the region, and contain numerous physiographic, hydrologic, sociocultural, and biological characteristics relevant to water supply development.

The headwaters of the Withlacoochee River originate in the Green Swamp of central Florida. The river generally flows northwest, functioning as a political and physical boundary within the basin, until it terminates at the Gulf of Mexico in Levy County. The potentiometric surface of the Floridan aquifer is high in the basin and the Upper Floridan aquifer contributes much of the Withlacoochee's flow (USFWS, 2005), though the river accepts substantial surface water inputs as well. Generally, the Withlacoochee River has moderately elevated nutrient, dissolved oxygen, and coliform levels, and portions of each reach within the river are considered impaired (FDEP, 2005). Other principal surface water features, from south to northwest within the Withlacoochee River Basin, include Lake Panasoffkee, the Tsala Apopka Chain of Lakes, Rainbow River, and Lake Rousseau.

2.4 Reclaimed Water

Water reuse, or reclaimed water, has become an important component of water resource management in Florida. Florida has been recognized as the national leader (along with California) in water reuse (Water Reuse Program, 2006). Reclaimed water is defined by the Florida Department of Environmental Protection (FDEP) as water that is beneficially reused after being treated to at least secondary wastewater treatment standards by a domestic wastewater treatment plant (WWTP). Beneficial reuse is generally defined for water supply applications as reuse that replaces or offsets potable water uses. The SJRWMD typically seeks to achieve a water resource benefit with reclaimed water by:

- Using reclaimed water in place of higher quality water for uses that do not require higher quality, and;
- Using reclaimed water to augment water supply sources, typically by groundwater recharge (SJRWMD 2006)

Reuse water can be applied in a number of ways to decrease reliance on traditional water supplies, including golf course irrigation; recharge of groundwater supplies; landscape / residential irrigation; industrial use, and others (Water Reuse Program, 2006).

The relative desirability of reuse applications vary, however, in terms of their potable offset and groundwater recharge potential as shown in Table 2-3. In particular, spray field irrigation is not considered beneficial reuse for the purposes of this planning effort since it does not offset potable use. However, reuse desirability is defined as a water supply characterization and does not account for the fact that spray field irrigation can have water quality improvement benefits when compared to direct recharge, depending on the level of wastewater treatment.

The use of rapid infiltration basins (RIBs) to recharge high-quality reclaimed water to the surficial aquifer is a well-established and accepted practice in the SJRWMD. Irrigation of public access areas will also be considered as a potential beneficial use when reuse evaluations are completed in later tasks, as this use provides a significant potable water offset. The targeting of aquifer recharge or potable offset as the water supply goal for reuse project evaluations will be determined on a case-by-case basis.

Table 2-3 Reuse Desirability (FDEP, 2003)

Category	Desirability: Beneficial Reuse or Recharge[3]
Aquifer recharge (e.g., rapid infiltration basin)[4]	↑ **HIGH**
Golf course and landscape/residential areas irrigation[5]	↕
Spray field irrigation[6]	↓ **LOW**

Existing wastewater and reuse data is presented in Table 2-4 and locations of wastewater facilities are shown in Figure 2-5. A total of twenty-six (26) wastewater facilities with a capacity of 22.31 mgd are currently providing 100% of their 12.9 mgd flows for reuse applications.

Of this reuse flow, 4.09 mgd (32%) is applied to aquifer recharge using RIBs. This flow provides a substantial recharge benefit, but does not offset potable use.

Approximately 2.95 mgd (23%) of the reuse flow is classified as beneficial (residential irrigation (RI), golf course irrigation (GCI), and other public access areas (OPAA)). This flow offsets potable use, but has a limited recharge benefit as a portion of the applied flows are subject to evapotranspiration and evaporation.

The remaining 5.83 mgd of flows are distributed to sprayfields (absorption fields (AF) or other crops (OC)). This flow does not offset potable use and has a limited recharge benefit, as a portion of the applied flows are subject to evapotranspiration and evaporation. As a result, sprayfields are considered undesirable reuse applications from the water supply perspective.

See Figure 2-6 for the distribution of reuse flows.

3 Florida Department of Environmental Protection, Water Reuse for Florida. 2003. "Strategies for Effective Use of Reclaimed Water"

4 Non-beneficial reuse, but considered potentially valuable by the FDEP and SJRWMD as recharge.

5 Beneficial reuse.

6 Non-beneficial reuse.

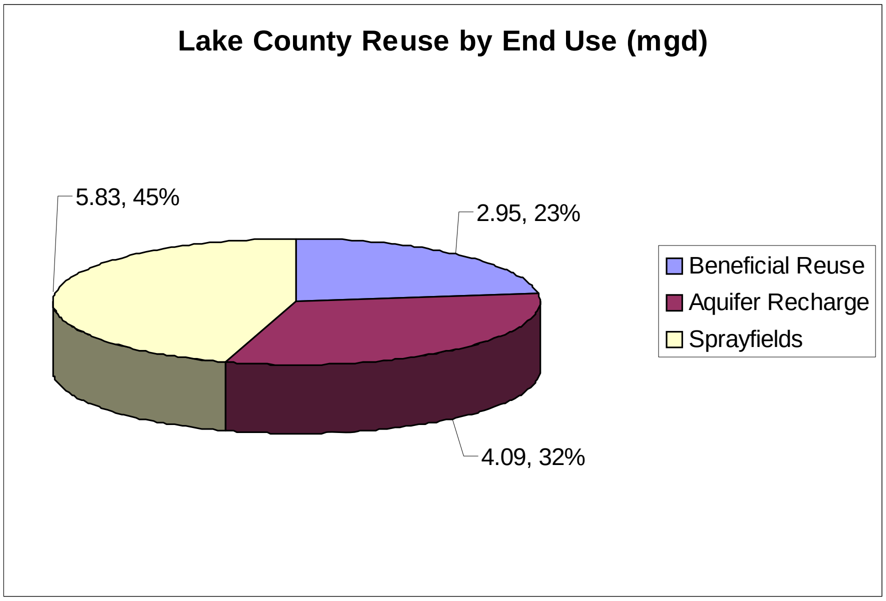


Figure 2-6 Lake County Reuse Distribution by End Use

Potential future sources for reuse water include increases in flows within existing utility service areas, the re-allocation of existing, non-beneficial reuse flows, and the new collection of wastewater from expansion of utility service. An inventory of potential reuse projects is evaluated in Chapter 4, with further analysis to be completed in future tasks.

A total of five WWTFs permitted for 100,000 gpd or greater are located or discharge reuse water within the Wekiva Study Area. These existing facilities may have to enhance treatment to reduce total nitrogen as N to 10 mg/L, and new systems in the Wekiva Study Area will be required to meet this standard (FDEP, 2004).

2.5 Demand Reduction (Water Conservation)

Water conservation is an extremely important component of Florida's overall water management program. Water conservation is an essential, cost effective element of water supply planning that allows for management of both existing and future water demands without requiring major capital outlays. Although water conservation applies to all water use sectors, it is particularly relevant in the public supply and commercial / industrial sectors, since the greatest demand for water in Lake County falls under these categories. A conservation inventory analysis of existing and proposed conservation practices and options for expanding conservation practices in the County will be presented in Technical Memorandum 4.

A myriad of conservation elements or Best Management Practices (BMP's) may be applied within a conservation program. These generally fall within the categories of watering restrictions, pricing incentives (inverted rate structures), metering, structural (plumbing and landscape) measures, and education. Watering restriction enforcement, inverted rate structures, education programs, and conservation coordinators are some of the broad, effective elements of a comprehensive conservation program for a municipality or community.

A common water usage restriction in Florida is the limiting of lawn watering to specific days and times. For example, houses with addresses ending in an even number may be allowed to water on two specific days, and houses with addresses ending in an odd number are allowed to water on two different days. Watering is typically not allowed during the hottest part of the day, in an effort to reduce water loss due to evaporation. Lawn watering restrictions can be an effective best management practice, particularly when enforcement programs are in place (Davis, 1996; TBW, 1999).

Inverted or conservation rate structures are one of the most effective conservation BMP's. With inverted rate structures, the price per unit increases as consumption increases. Decreases in water usage due to increases in price are predictable and statistically valid, and price-induced changes in water use also vary with property value. Customers residing in more expensive homes tend to use more water, but price increases reduce their use by a higher amount than customers in less expensive homes because they use more water for discretionary purposes, such as landscaping. Access to substitute water sources, such as irrigation wells, also affects the amount of demand reduction accomplished by pricing (Whitcomb, 2005).

Public education is critical to achieving public acceptance of conservation BMP's. For example, when lawn watering restrictions or inverted rate structures are utilized, it is necessary to educate the public about these measures. However, education is usually combined with other conservation measures and it is difficult to assess how effective education is. When used alone, education is not typically very effective, but the most effective conservation programs always contain an educational component. It appears that education alone can add an additional 4-8% to the overall per capita reduction rate (Irvine Ranch Water District, 2004; Rocky Mountain Institute, 1991; SWFWMD, 2001). Education can take the form of media releases, billing inserts, announcements on television, placards, display ads, efforts in schools, and other outreach activities.

2.6 Stormwater

Stormwater is defined as water that accumulates on land as a result of storms and can include runoff from urban areas such as roads and roofs (www.water-technology.net, 2006). Stormwater as discussed here is usually not identified as a water supply source per se, since water supply plans tend to focus on the larger supplies available in surface waters (e.g., SWFWMD, 2006; SJRWMD, 2006). However, stormwater is commonly utilized as a supplemental non-potable water supply source (FDEP, 2005), and additional stormwater supply projects are planned (SJRWMD, 2006; Hartman, 2006).

In a water supply context, stormwater can be distinguished from surface water in that stormwater is of shorter duration, presents smaller quantities of water, and is related to specific rainfall events. Surface water, on the other hand, collects and integrates larger groundwater flows and runoff volumes over longer periods in natural bodies such as rivers and lakes. When a site is developed, stormwater is collected, conveyed, stored, and discharged from a permitted surface water management system, to protect the site from flooding.

The Central Florida Aquifer Recharge Enhancement Program is investigating the effects of aquifer recharge by means of reducing or delaying the development of alternative water supplies. Recharge, via reuse water to RIBs or stormwater to recharge wells, increases available groundwater supplies and can be achieved by enhancing natural recharge or by providing artificial recharge using infiltration basins or recharge wells. Recharge enhancement can be integrated with stormwater management systems to provide needed drainage and flood control as well as increased water supply.

Although stormwater in the SJRWMD has historically been managed via lake level control mechanisms, controversy and subsequent lack of permitting has led local governments to rely on diversion of stormwater into rivers to avoid flooding issues, which has resulted in a loss of aquifer recharge (SJRWMD 2006). Table 2-5 lists proposed reuse projects augmented by stormwater.

2.7 Potable Water Standards

Following the adoption of the “Safe Drinking Water Act” by the U.S. Congress in 1974, the U.S. Environmental Protection Agency (EPA) established a set of national standards to ensure water quality and water management improvements. Further amendments were made to the Safe Drinking Water Act in 1986 and 1996, rendering the standards stricter. The Florida Legislature enacted similar guidelines in their Safe Drinking Water Act, reflected in Sections 403.850 - 403.864, Florida Statutes (F.S.) This act enables the Department of Environmental Protection (FDEP) to formulate and enforce drinking water rules. These rules adopt the national primary and secondary drinking water standards of the Federal Government and create additional rules to fulfill state requirements. They are contained in Chapters 62-550, 62-555, and 62-560, Florida Administrative Code (F.A.C.) (FDEP 2007).

Drinking (potable) water standards are set according to the maximum contaminant levels (MCLs) permitted by Chapter 62-550, F.A.C. The two types of drinking water standards are primary and secondary. Primary standards protect public health by limiting the levels of contaminants in drinking water. Secondary standards regulate contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) (EPA 2007). Primary and secondary drinking water standards are presented in Appendix 1. Primary drinking water standards set contaminant levels for inorganic contaminants, volatile organic contaminants, synthetic organic contaminants, radionuclides, microbiological contaminants, and other miscellaneous contaminants. Secondary drinking water standards are also listed in Appendix 1.

In addition to the above standards, adherence to the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) is necessary. This rule’s purpose is to reduce illness linked with the contaminant *Cryptosporidium* and other pathogenic microorganisms in drinking water. The LT2ESWTR supplements existing regulations by targeting additional *Cryptosporidium* treatment requirements to systems that draw from surface water sources.

Cryptosporidium is a significant concern in drinking water because it can cause serious gastrointestinal illness. This microorganism contaminates most surface waters used as drinking water sources and is resistant to chlorine and other disinfectants.

The LT2ESWTR rule also contains provisions to reduce risks from uncovered finished water reservoirs and provisions to ensure that water distribution systems maintain microbial protection when they take steps to decrease the formation of disinfection byproducts (DBPs). DBPs result from the reaction between disinfectant chemicals (e.g., chlorine) with source water constituents such as organic matter.

Current regulations require filtered water systems to reduce source water *Cryptosporidium* levels by 2-log (99 percent). Recent data on *Cryptosporidium* infectivity and occurrence indicate that this treatment requirement is sufficient for most systems, but additional treatment is necessary for certain higher risk surface water systems. These higher risk systems include filtered water systems with high levels of Cryptosporidium in their water sources and all unfiltered surface water systems, which do not already treat for *Cryptosporidium*. If the average source water Cryptosporidium level exceeds a certain threshold, the unfiltered PWS must provide at least 3-log (i.e., 99.9 percent) inactivation of Cryptosporidium. Further, under the LT2ESWTR, unfiltered public water systems (PWSs) must achieve their overall inactivation requirements (including *Giardia lamblia* and virus inactivation as established by earlier regulations) using a minimum of two disinfectants. (FDEP, 2006).

The LT2ESWTR is being promulgated simultaneously with the Stage 2 Disinfection Byproduct Rule to address concerns about risk tradeoffs between pathogens and DBPs.

2.8 Potable Water Treatment Requirements/Processes

Drinking water must be treated to meet the primary MCLs under Chapter 62-550, F.A.C. to protect public health. Additionally, water treatment systems are typically designed to meet the secondary MCLs under Chapter 62-550, to ensure the product water is aesthetically and cosmetically acceptable to the public. Meeting these goals requires different treatment processes and incurs different costs, depending on the characteristics of the water source.

2.8.1 Fresh Groundwater

Fresh groundwater is the traditional source of water supply in Lake County and is relatively easy to treat. Since fresh groundwater from the Upper Floridan aquifer is relatively free of contaminants and organic material, filtering to remove those constituents has not historically been required. The traditional treatment method is to remove mineral hardness (expressed as a calcium carbonate, or $CaCO_{3,}$ equivalent), as necessary, in the raw water through lime softening. This can be accompanied by aeration to remove volatile constituents such as sulfide. With good quality groundwater, the lime softening process can generate highly desirable product water.

A recent trend in groundwater treatment is the use of membranes in lieu of the lime softening process. Membranes can remove hardness and the dissolved solids associated with degradation of water quality. As membrane costs have fallen and many utilities have noticed declines in their groundwater quality, low-pressure membrane softening processes (reverse osmosis and nanofiltration) have supplanted lime softening as the groundwater treatment method of choice. Membranes are generally proprietary and the selection of the membrane manufacturer will drive the design process (MWH, 2005).

2.8.2 Surface water

Surface water is a conventional source of water supply, though it is not currently used for potable supply in Lake County. Relative to groundwater, the use of surface water entails more sophisticated and costly means of treatment. The specific elements of a given surface water treatment process vary substantially depending on the characteristics of the raw water. The treatment process design requires significant water quality data to adequately capture daily, seasonal, and interannual fluctuations in raw water quality. Where an existing water treatment facility using the same source is available for comparison, the process design can benefit tremendously from the experience of the existing facility.

A complete or conventional filtration process is often used for surface water treatment. This entails pre-screening for large particle removal, rapid mixing of added chemicals, coagulation or flocculation using chemicals for particle aggregation, and sedimentation and/or filtration for final particle removal. For raw water with particularly high levels of organic material or color, high-rate settling processes may be required. These unit processes remove greater fractions of source constituents than conventional designs, and can also serve to reduce a given facility's footprint. Some high-rate settling processes are proprietary (e.g., ballasted sedimentation), but others are not (e.g., dissolved air flotation) (MWH, 2005). Membranes can also be added to the conventional filtration process to enhance removal of undesirable constituents.

2.8.3 Salt or brackish water

Salt or brackish waters with total dissolved solids (TDS) concentrations exceeding the potable threshold of 500 mg/L (250 mg/L as chloride) also require membrane treatment. The removal of mineral solids such as chloride and sulfate from water is known as demineralization, of which a common example is seawater desalination. Seawater has a TDS of about 35,000 mg/L and is generally treated through medium pressure reverse osmosis in Florida. The desalination process involves pressurization of the water and its forced application in multiple passes through the membrane. Removal of other constituents prior to the membrane may also be required to reduce fouling. Chemical addition is required after the membrane passes, since the process generates extremely pure water unsuitable for direct consumption. For more brackish waters (including groundwaters) with TDS concentration below about 10,000 mg/L, low pressure RO may be used. In comparison with medium pressure RO, this reduces costs substantially and can indicate a threshold for feasibility.

2.9 Disinfection and Distribution

All source waters for potable use must receive disinfection. Traditionally, disinfection has been accomplished through the addition of chlorine (as chlorine gas, hypochlorite, chlorine dioxide, or chloramine) at the downstream end of the treatment process just prior to distribution. However, the identification and acknowledgment of DBPs as a public health concern, and the role of chlorine as the disinfectant that forms the greatest variety of known byproducts, has limited its role in new applications.

Ozone (O_3) is a frequently used disinfectant and is also extremely effective at removing color, taste, and odor. Although ozonation does form DBPs, ozone DBPs are thought to be less adverse than those produced with chlorination (except for DBPs from brackish source waters or those containing bromide). Ozone is sparingly soluble in water and adequate mixing is a challenge in process design. Ozonation is also more expensive than chlorination.

Ultraviolet light (UV) is electromagnetic radiation having a wavelength between 100 and 400 nanometers (nm), a slightly shorter wavelength than that of the visible spectrum. The intense energy in UV light's "germicidal range" of 200 to 300 nm can damage the DNA and RNA in pathogenic microorganisms, rendering them inactive. UV does not generate DBPs. UV is less effective for disinfection of viruses and *Cryptosporidium* than chlorination and has received limited application in water treatment to date, but advances in UV lamp technology are beginning to reduce costs and improve its treatment effectiveness.

Community public water supplies are required to provide adequate disinfection of the finished/treated water and to provide a disinfectant residual in the water distribution system. The disinfectant residual maintains the potable water quality as the water travels from the treatment plant to the consumer's faucet. While chlorine, ozone, and UV light can all be effective disinfectants, chlorine maintains the most persistent residual. As a result, multiple disinfection processes may be used in a given treatment train, particularly for surface waters subject to the LT2ESWTR.

2.10 Water Treatment Overview

Several water treatment technologies are likely employed by the water treatment facilities in Lake County, or will be employed in the construction of new facilities. An overview of several common water treatment unit processes that may be employed in a given water treatment train follows.

Conventional Treatment Processes

- Lime softening treatment systems are designed primarily to soften hard water and reduce color through the addition of lime (CaO). They are often used for groundwater treatment.

- Aeration is used to remove volatile organic or mineral contaminants, such as sulfide. In most water treatment aeration process applications, air is brought into contact with water in order to remove a substance from the water, a process referred to as desorption or stripping. This can be accomplished through packed towers, diffused aeration, or tray aerators. Aeration is often combined with lime or membrane softening.

- Coagulation involves the addition of chemicals such as alum ($Al_2(SO_4)_3$), ferric chloride ($FeCl_3$) or polymer to enjoin and precipitate particles for subsequent removal. It generally involves adding a coagulant chemical at the beginning of a treatment train to neutralize electric charge and help create a larger effective particle size for flocculation or sedimentation.

- Mixing is a critical part of water treatment process design. It involves circulating chemicals or particles for even dispersion in coagulation or flocculation processes. It is often applied just downstream of coagulation. Common terms for the unit process are rapid mixing or “flash” mixing.

- Flocculation involves the actual aggregation of coagulated particles into larger particles to facilitate removal. Whereas coagulation occurs in less than a minute, flocculation typically occurs after coagulation over a time of 20 to 45 minutes.

- Sedimentation is the process of removal of the suspended material from the water. It typically occurs with time in a large, calm settling basin after coagulation and/or flocculation. Facilities that include sedimentation can have a relatively large land footprint.

High-rate settling processes

High rate settling processes have been developed to replace conventional sedimentation in applications where greater removal fractions are required, or where land is a limiting factor in process design. Ballasted sedimentation involves the addition of ballast (commonly small sands) to flocculated water to improve the floc’s rate of settling. Dissolved air flotation involves adding small bubbles to flocculated water to float the floc to the surface for removal.

Filtration

Filtration involves the use of granular media such as sand or activated carbon to provide final collection of small amounts of suspended material in the water. In a conventional process, it is applied after coagulation, flocculation, and sedimentation, but it can be applied in a variety of configurations depending on the water quality. Use of granular activated carbon in filtration can remove recalcitrant compounds such as pesticides and improve taste and odor.

Membrane Processes

Membrane processes are essentially filtration techniques that can remove a wide variety of materials. They can remove dissolved salts, organic materials, provide softening, and assist with disinfection. Several membrane technologies are used to treat drinking water: reverse osmosis (RO), nanofiltration, ultrafiltration, and microfiltration. Each membrane has a different effective pore size that filters the water, and each has a different ability in processing drinking water.

- Reverse osmosis involves the removal of dissolved solids such as sodium, chloride, and organic material from water via diffusion through a membrane. It can be applied to full seawater at medium pressures or to other sources at lower pressures, and can also remove specific contaminants such as pesticides and arsenic. Pretreatment is usually required to prevent scaling and minimize membrane fouling, and chlorine is often applied for disinfection.

- Nanofiltration is similar to reverse osmosis but removes smaller diameter solids, including the calcium and magnesium that causes hardness. Nanofiltration membranes are used for softening, removal of organic material, and to freshen brackish waters.

- Ultrafiltration is a pressure driven processes that removes nonionic matter, higher molecular weight substances and colloids. Colloids are extremely fine sized suspended materials that will not settle out of the water column. Ultrafiltration will remove most pathogenic organisms.

- Microfiltration is also a pressure driven process but it removes coarser materials than ultrafiltration. Although this membrane type removes micrometer and submicrometer particles it allows dissolved substances to pass through. Microfiltration will remove large pathogenic organisms such as *Giardia* and *Cryptosporidium*.

2.11 Reuse/Wastewater Standards

Standards for wastewater, relating to water quality, are structured around protection of surface and groundwaters. Section 403.021(2), F.S., established that no wastes are to be discharged to any waters of the state without first being given the degree of treatment necessary to protect the beneficial uses of such water. Toward this end, Sections 403.085 and 403.086, F.S., set forth requirements for the treatment and reuse or disposal of domestic wastewater.

Chapter 62-600, F.A.C., titled "Domestic Wastewater Facilities", provides minimum standards for the design of domestic wastewater facilities and establishes minimum treatment and disinfection requirements for the operation of domestic wastewater facilities (CITE F.A.C.). Since domestic wastewater utilities in Lake County provide reuse, discussion of surface water disposal is omitted. Refer to Chapter 62-600.420 for more information regarding surface water disposal.

All domestic wastewater facilities are required, at a minimum, to provide secondary treatment of wastewater. New facilities and modifications of existing facilities' effluent after disinfection must have no more than 20 milligrams/liter (mg/L) of carbonaceous biochemical oxygen demand ($CBOD_5$) and 20 mg/L total suspended solids (TSS), or 90% removal of each of these pollutants from the wastewater influent, whichever is more stringent. All facilities shall be operated to achieve, at a minimum, the specified effluent limitations (20 mg/L). Appropriate disinfection and pH control of effluents shall also be required.

Chapter 62-610, F.A.C., entitled "Reuse of Reclaimed Water and Land Application" details the regulations governing reuse activities in Florida. The chapter was established in 1989, but has had revisions since then, the latest revision occurring in 2006.

All wastewater facilities in Lake County currently dispose of all effluent via reuse activities, so further discussion of treatment requirements as they pertain to reuse follows.

The following types of reuse projects are addressed in Chapter 62-610, F.A.C.:

1. Slow rate systems (typically spray irrigation) having restricted public access to the irrigation sites [Part II].
2. Slow-rate systems irrigating sites having unrestricted public access [Part III].
3. Rapid-rate systems (typically rapid-infiltration basins) for ground water recharge [Part IV].
4. Ground water recharge and indirect potable reuse [Part V].
5. Industrial uses of reclaimed water [Part VII].

Treatment requirements specific to reuse applications are presented in Appendix 2.

2.12 Reuse/Wastewater Treatment Processes

Up to three treatment stages (primary, secondary, and tertiary) are involved in domestic wastewater treatment. These processes involve removing physical, chemical and biological contaminants to produce treated effluent and a solid waste, or sludge, suitable for discharge back into the environment.

Primary treatment is typically physical treatment operations which remove solids from the incoming waste stream. An overview of several common physical treatment processes that may be used in a wastewater treatment facility follows.

<u>Screening</u>

Typically the first treatment component, mechanical screening is used to retain and remove coarse solids in the influent waste stream that can damage subsequent process equipment, and reduce overall treatment reliability and effectiveness. The screening component may consist of parallel bars, rods, grating, wire mesh, or perforated plates. Fine screens may follow coarse screens to remove additional solids that may cause clogging problems in trickling filters.

<u>Primary Sedimentation</u>

Almost all treatment plants use mechanically cleaned sedimentation tanks to remove from 50 to 70 percent of the suspended solids and a substantial portion of the organic solids (25 to 40 percent of the BOD loading). Commonly called primary clarifiers, the tanks are large enough to allow the sewage to pass slowly through the tanks and allow solids to settle. Oils and grease are allowed to rise to the surface and be skimmed off.

<u>Secondary Treatment</u>

Secondary treatment is designed to degrade the biological content of the sewage derived from human waste, food waste, soaps and detergents. Three typical processes include:

- <u>Activated Sludge</u>- The most common option uses microorganisms in the treatment process to break down organic material with aeration and agitation, then allows solids to settle out. Bacteria-containing “activated sludge” is continually recirculated back to the aeration basin to increase the rate of organic decomposition.
- <u>Trickling Filters</u>- These are beds of coarse media (often stones or plastic) 3-10 ft. deep. Wastewater is sprayed into the air (aeration), and then allowed to trickle through the media. Microorganisms attached to and growing on the media, break down organic material in the wastewater. Trickling filters drain at the bottom; the wastewater is collected and then undergoes sedimentation.
- <u>Lagoons</u>- These are slow, inexpensive, and relatively inefficient, but can be used for various types of wastewater. They rely on the interaction of sunlight, algae, microorganisms, and oxygen (sometimes aerated). They require a larger land footprint than other secondary treatment methods.

Tertiary Treatment

Tertiary treatment is the final (often optional) stage to raise the effluent quality before release into the receiving environment. Tertiary treatment may include processes to remove nutrients such as nitrogen and phosphorus, and carbon adsorption to remove chemicals. These processes can be physical, biological, or chemical.

Disinfection

After primary and secondary treatment, wastewater is disinfected typically using chlorine, ozone, or ultraviolet light. The purpose of disinfection is to reduce the number of microorganisms to be discharge back into the environment.

Sludge Treatment and Removal

Waste water treatment processes create a sludge that must also be treated and disposed of. Digesters are designed to reduce the organic matter and micro-organisms in the solids so the sludge can be safely disposed. Common treatment options include anaerobic digesters, aerobic digesters, and composting. The final step is generally dewatering of the sludge to reduce the volume for off-site disposal.

2.13 Estimated Source Costs

Costs for developing a water supply source are dependent on a variety of factors, including the proximity to demand areas, the source water, and economies of scale. Tables 2-6(a) and 2-6 (b) provide a survey of unit production costs for water supply projects using various sources across the state. This survey enables a comparison between costs incurred by different project types and indicates a range of expected costs for similar projects that may be recommended for implementation by Alliance members, after reuse and surface water analyses are completed in future tasks.

2.13.1 Cost Methodology

To develop a range of production costs that will appropriately describe the potential projects, various water supply development entities and other water supply literature were surveyed. These include:

- SWFWMD
- SJRWMD
- SRWMD
- NWFWMD
- Tampa Bay Water (TBW)
- Water Supply Literature

The unit production costs collected in the survey include capital costs, and operation and maintenance costs associated with water supply and conservation (demand reduction). They include planning costs estimated for future projects that are identified in the Regional Water Supply Plans (RWSPs) of the Water Management Districts, and final production costs for finished projects, where published data was available.

The Florida Water Management Districts are heavily involved in the funding and/or construction of water supply projects, and the SJRWMD is expected to continue their cost-share assistance to water utilities. Therefore, the planning costs published by the Districts are expected to reflect the range of costs that may be incurred by the Alliance Members during implementation.

In order to develop a range of possible costs, the costs acquired during the survey are grouped into project source areas – groundwater, surface water, reuse, and conservation (demand reduction). Seawater desalination is also provided for comparison. Since survey costs were developed at different times, all costs were escalated to 2007 dollars using a 3% escalation rate.

2.13.2 Regional Assumptions

Projects in other regions of Florida may reflect treatment technologies, infrastructure, and project designs that may not be applicable to water supply development in Lake County. Therefore, care is taken in the cost survey to select projects appropriate to water supply development in Lake County.

Those projects that are primarily aquifer storage and recovery (ASR) or aquifer recharge and recovery (ARR) are excluded from the cost survey, since this technology is expected to have limited applicability to the sporadically confined hydrogeology of the Lake County region. ASR will be investigated in future phases of work and costs may be provided at a later date. However, surface water reservoir projects that also use ASR are included in the cost survey, because reservoirs are a major cost component that will be applicable to Lake County. The surface water / stormwater projects specified for irrigation supply in the District RWSPs are excluded from the surface water categorization (but are included in the stormwater categorization below), since surface water projects as characterized for this Chapter are expected to provide potable supply. Brackish groundwater costs, which often include blending with fresh groundwater, are included in the cost survey, because this may reflect an approach applicable to the Lake County (as additional Lower Floridan aquifer system water data is gathered).

For non-potable projects, reuse initiatives that are primarily interconnects between adjacent urban reuse systems are excluded from the cost survey, because opportunities for reuse interconnects may be more limited in the lower-density Lake County. However, reuse projects that involve expansion of distribution systems and interconnects are included, because expansion of distribution systems are a major cost component that will be applicable to Lake County. Stormwater and blended non-potable projects that utilize reservoirs are included in the cost survey since reservoirs are a major cost component that may be applicable to Lake County.

2.13.3 Costs

2.13.3.1 Groundwater, Surface Water, and Seawater Desalination Source Projects

Traditional groundwater, surface water, and brackish groundwater may provide potable water to Lake County users. Potable product water has distinct health and aesthetic requirements that drive the selection of water treatment processes and their associated costs. As the result, the range of costs anticipated for each of these sources is comparable to one another and can be used a basis for comparison between sources. Seawater desalination is also shown for comparison.

Figure 2-7 shows the mean and range of costs (95% confidence interval) for the project areas. As shown, seawater desalination is the most expensive source, while traditional groundwater is the least expensive source. Surface water and brackish groundwater are intermediate in cost, but highly variable: the most expensive projects can reach the costs of seawater desalination, while the least expensive projects can approach the costs of traditional groundwater. For surface water projects, the size and need for associated reservoirs is a key component of variability, while brackish groundwater projects are sensitive to their raw water quality. Table 2-6(a) shows the survey results for traditional groundwater, brackish groundwater, surface water, seawater desalination, and blended potable projects.

2.13.3.2 Reuse, Stormwater and Blended Non-Potable

Reuse water and stormwater may be a future supply source and blending of different sources for non-potable use, such as stormwater with reuse, may be an effective means to manage source variability. Any reuse, stormwater, and blended non-potable projects that are ultimately implemented are expected to provide non-potable product water to Lake County users. As a result, the range of costs anticipated for each of these sources is comparable to one another and can be used a basis for comparison between the sources.

Reuse and stormwater project implementation will incur a range of production costs relative to the extent of the distribution system, availability of storage, relative cost of potable water (for residential demand) and other considerations. However, treatment requirements for these sources are not a significantly variable cost component. Reuse waters are required to undergo secondary treatment and disinfection by the providing utility. Since wastewater treatment is already required, the treatment costs for reuse are not included in the survey costs. Stormwater projects often use intake screens and anti-fouling compounds to reduce clogging of the irrigation systems. These costs are expected to be relatively consistent among stormwater projects.

Figure 2-8 shows the mean and range of costs (95% confidence interval) for the reuse and blended non-potable projects. As shown, reuse is generally a less expensive source than blended non-potable waters. Blended non-potable costs are more variable than reuse, however, due to the use of reservoirs in blended projects. Stormwater irrigation costs are not shown on the figure, because available data involved reservoir projects dissimilar from the recommended residential uses of stormwater. Table 2-6 (b) shows the survey results for reuse, blended non-potable, and stormwater irrigation projects.

Table 2-4 - Existing and Projected Wastewater and Reuse Capacities and Flows

	2005 WWTF		2005 Reuse		
Facility Name	Capacity (mgd)	Flow (mgd)	Reuse Type	Capacity (mgd)	Flow (mgd)
Clerbrook RV Resorts	0.12	0.05	AF	0.12	0.05
			GCI	0.8	0.21
			ATP	0	0.04
			RI	2	0.5
Clermont East	2	1.2	RIB	2	0.45
			RIB	0.75	0.17
Clermont West	0.75	0.79	OC	0.75	0.62
			GCI	0.6	0.48
			OPAA	0.18	0.08
Eustis	2.4	1.41	OC	2.56	0.85
Eustis Eastern	0.3	0.02	RIB	0.3	0.02
Groveland	0.25	0.15	AF	0.25	0.15
Lake Correctional Institution	0.18	0.13	OC	0.18	0.13
Lake Groves Utilities STP	0.5	0.31	RIB	0.5	0.31
Leesburg - Canal Street	3.5	2.3			
Leesburg - Turnpike	3	1.1	OC	3.5	3.4
Mid-Florida Lakes	0.18	0.16	OC	0.18	0.16
			GCI	0.47	0.03
			RI	0	0.12
			OPAA	0.4	0.08
			RIB	0.2	0.15
			AF	0.26	0.27
Mount Dora	1.5	0.99	ATP	0	0.34
			ATP	1	0
Mount Dora #2 (Snell)	1	0.03	OPAA	1	0.03
Oak Springs MHP	0.15	0.04	RIB	0.15	0.04
			GCI	0.18	0.09
Pennbrooke WWTF	0.18	0.09	RIB	0.03	0
			GCI	0.37	0.16
Plantation @ Leesburg	0.37	0.2	RIB	0.23	0.04
Quail Valley WWTP	0.16	0.03	RIB	0.16	0.03
Southlake Community	0.3	0.56	RIB	0.6	0.56
St. Johns - Astor Park	0.3	0.11	RIB	0.3	0.11
Sunshine Parkway	0.15	0.08	RIB	0.15	0.08
Tavares/Caroline St.	0.75	0.44	RIB	0.75	0.44
Tavares/Woodlea Rd.	1.99	0.95	RIB	1.99	0.95
Thousand Trails	0.14	0.02	RIB	0.14	0.02
			RIB	0.1	0.06
Umatilla	0.3	0.2	AF	0.2	0.14
			OPAA	0.42	0.04
			GCI	2.83	0.78
Villages	1.64	1.48	RIB	0.75	0.66
Water Oak Estates	0.2	0.06	OC	0.2	0.06
COUNTY TOTAL	**22.31**	**12.9**		**27.55**	**12.9**

Table 2-5 Water Reuse and Augmentation Alternatives

Primary User	Description	Capacity (mgd)	Estimated Costs: Construction ($M)	Total Capital ($M)	O&M ($M/yr)	Unit Production ($/1000 gallons)	Status	Reference
Clermont	Lake Apopka - Reclaimed Water Augmentation	NA						SJWMD DWSP 2005
Clermont	Reclaimed and Stormwater System Expansion Project	5.10	$18.77	$22.68	0.923	$1.28	Engineering (2005 - 2007) Permitting (2006 - 2007) Construction (2007 - 2008)	SJWMD DWSP 2005
Clermont	Clermont Western WWTF (Option 1) – Conversion to Reuse Production						Unknown	SJRWMD TSR 2002
Clermont	Clermont Western WWTF (Option 2) – Flow Diversion to Eastern WWTF						Unknown	SJRWMD TSR 2002
Eustis	Reclaimed Water System Expansion and Augmentation Project	1.10	$1.87	$2.26	0.096	$0.60	Engineering (2006 - 2008) Permitting (2007 - 2009) Construction (2009 - 2012)	SJWMD DWSP 2005
Groveland	Groveland Expansion of Existing WWTF and addition of New WWTFs							Walker, L. 2007
Lady Lake	Phase II Reclaimed Water System Project	0.50	$2.00	$2.20	0.229	$2.05	Engineering (2006) Permitting (2007 - 2008) Construction (2008 - 2009)	SJWMD DWSP 2005
Lake Utility Service	Lake Groves WWTP Reclaimed Water System Expansion	1.00	$3.60	$4.35	0.219	$1.43	Engineering (2005 - 2006) Permitting (2006) Construction (2006 - 2007)	SJWMD DWSP 2005
Leesburg	Reclaimed Water Reuse Project	7.05	$23.02	$27.82	0.334	$0.88	Permitting (2006) Construction (2006 - 2007)	SJWMD DWSP 2005
Minneola	Reclaimed Water Reuse Project	1.00	$7.78	$11.46	0.140	$1.01	Construction (2005 - 2006)	SJWMD DWSP 2005
Mount Dora	Country Club Golf Course Reclaimed Water Project	0.26	$0.33	$0.40	0.021	$0.49	Planning (Complete)	SJWMD DWSP 2005
Mount Dora	Mount Dora Reuse Expansion Project							SJRWMD TSR 2005
Taveres	Reclaimed Water System Expansion Project	0.60	$4.71	$5.69	0.048	$1.86	Engineering (2007) Permitting (2007) Construction (2008)	SJWMD DWSP 2005
Cherry Lake	Tree Farm Withdrawl for Agricultural Use	0.77	$0.68	$0.82	0.062	$0.42	Engineering (2006) Permitting (2006) Construction (2007)	SJWMD DWSP 2006
Holloway Farms	Agricultural Rainwater Collection System Project	0.08	$1.29	$1.55	0.002	$3.66	Not Scheduled	SJWMD DWSP 2007
Total[1]		**17.46**	**$64.05**	**$79.23**	**$2.07**	**$13.68**		

[1] Includes totals from SJRWMD DWSP 2005 only. These totals may need revision to include latest plans.

Table 2-6(a) New Supply Capture Unit Production Costs

Project Name	Capacity (mgd)	Capital Cost $(Thousands)	O & M $(Thousands)	Unit Cost $/1,000 gallons	Description	Data Source/ Footnote
Blended Potable						
Charlie Creek (Aquifer conveyance)	12	51,010	2,594	$1.56	Off-stream reservoir, AR	*2*
Joshua Creek, TBD (Aquifer Conveyance)	3.8	29,985	1,449	2.83	Off-stream reservoir, AR	*2*
Joshua Creek, TBD (Piped to Joshua Water Control District)	3.8	32,596	1,818	3.25	Off-stream reservoir	*2*
Myakka River TBD	19.1	109,539	7,113	2.32	Off-stream reservoir, AR	*2*
Peace River Unitary Rate	n/a	n/a	n/a	2.78		
Prairie Creek, TBD (Aquifer conveyance)	12	65,669	3,298	2.00	Off-stream reservoir, AR	*2*
Tampa Bay Water Unitary Rate	n/a	n/a	n/a	2.27		
Tatum Sawgrass area-Peace River TBD	40	170,609	8,404	1.55	Off-Stream Reservoir	*2*
Upper Horse Creek	1.4	15,150	493	3.42	Off-stream reservoir, AR	*2*
Brackish Groundwater						
Brackish expansion Jupiter	n/a	n/a	n/a	$0.88		*3*
Charlotte County Brackish groundwater	5	142,824	n/a	2.71		*2*
Dunes Community Devolopment Brackish Groundwater Project	1	10,712	188	2.73		*1*
East Putnam Regional Water Supply Project	0.6	11,557	412	5.55	None listed	*1*
Melbourne Reverse Osmosis Plant Expansion	2.5	5,974	2,912	3.65		*1*
Mid-Pinellas Brackish Water Desalination Project	5	43,291	2,917	3.56		*2*
Ormond Beach Water Treatment Plant Expansion	2	12,381	440	0.71		*1*
St. Augustine WSP	5	15,141	2,039	1.74	None listed	*1*
St. Johns County WSP	6.66	22,660	2,060	1.56	None listed	*1*
Desalination						
Anclote Power Plant , Tampa Bay Water	25	187,975	10,485	$3.29		*2*
Big Bend Expansion, Tampa Bay Water	10	25,068	5,658	3.29		*2*
Indian River Lagoon FP&L	15	144,200	7,735	3.53	Includes ASR	*1*
Indian River Lagoon Reliant Energy	15	145,230	8,343	3.68	Includes ASR	*1*
Intracoastal Waterway at New Smyrna Beach	15	173,040	9,105	4.17	Includes ASR	*1*
Port Manatee Desalination (10 mgd)	10	79,447	5,393	4.17		*2*
Port Manatee Desalination (20 mgd)	20	162,014	20,970	4.75		*2*
Port Manatee Desalination (5 mgd)	5	46,855	3,094	4.88		*2*
Potable Water with Reverse Osmosis (general)	n/a	n/a	n/a	3.27		*4*
Singapore Desalination plant	36	n/a	n/a	1.78		*8*
Venice Desalination (10 mgd)	10	72,353	5,380	3.94		*2*
Venice Desalination (20 mgd)	20	157,514	20,929	4.69		*2*
Venice Desalination (5 mgd)	5	43,811	3,082	4.72		*2*

Table 2-6(a) New Supply Capture Unit Production Costs

Project Name	Capacity (mgd)	Capital Cost $(Thousands)	O & M $(Thousands)	Unit Cost $/1,000 gallons	Description	Data Source/ Footnote
Groundwater						
Horizontal well: Cemetery Lawn Irrigation	0.1	743	16	$2.58	Horizontal well, storage pond	*2*
Crystals International, Tampa Bay Water	5	25,251	1,238	1.85		*2*
Planning estimate for wellfield, WTP and Pipeline from Western Osceola County	40	n/a	n/a	0.98		*5*
Planning estimate for wellfield, WTP and Pipeline from Western Osceola County	20	n/a	n/a	1.34		*5*
Planning estimate for wellfield, WTP and Pipeline from Western Osceola County	10	n/a	n/a	1.62		*5*
Potable Water with Disinfection (general)	n/a	n/a	n/a	1.24		*4*
Potable Water with Lime Softening or Hydrogen sulfide removal (general)	n/a	n/a	n/a	1.85		*4*
River Bank Filtration	25	91,261	3,655	0.85	Ground Storage tank	*6*
Surfacewater						
Bullfrog Creek, Tampa Bay Water	2.4	43,754	2,163	$6.43	Off-Stream reservoir, ASR	*2*
Channel A, Hillsborough county Water Resource Services, Tampa Bay Water	1	16,892	597	5.46	Off-Stream reservoir, ASR	*2*
City of Tampa Water	n/a	0	0	1.66		*7*
Conventional Average	n/a	0	0	2.32		*3*
Cow Pen Slough	5	51,500	845	2.80	Off-stream reservoir, ASR	*2*
Cow Pen Slough, PR/MRWSA	4.3	34,024	855	2.34	Borrow pit reservoir, ASR	*2*
Cypress Creek, Tampa Bay Water	4	47,625	2,338	4.01	Off-Stream reservoir	*2*
Frog Creek (Stormwater) PR/MRWSA	1	1,295	1,892	5.47	Off-stream reservoir, ASR	*2*
Josephine Creek	3	29,210	no data	2.79		*2*
Kissimmee River Polk County	35	280	no data	2.17		*2*
Kissimmee River Potable Supply	25	285,310	6,623	2.22		*2*
Lake Seminole Pinellas County Utilities	1	4,718	238	1.07	Off-Stream, ASR	*2*
Lower Ocklawaha River in Putnam County	20	273,980	5,964	3.25	None listed	*1*
Manatee River, PR/MRWSA	2.3	21,124	1,445	3.80	Off-stream reservoir	*2*
Myakka River PR/MRWSA	19.1	85,125	7,386	2.07	Off-stream reservoir	*2*
Myakkahatchee Creek Public Supply	2	20,600	309	2.76	Canal storage	*2*
Peace Creek Canal Offstream Reservoir	8.5	89,239	1,624	2.70	Off-stream reservoir, AR	*2*
Peace River	24.4	251,320	2,884	2.66	Off-stream reservoir, ASR	*2*
Peace River, PR/MRWSA	45.3	292,412	8,869	2.00	Off-stream reservoir, ASR	*2*
Potable Water with Coagulation/Filtration (general)	n/a	n/a	n/a	1.86		*4*
Shell Creek Public Supply	10	103,000	1,545	2.76	Reservoir	*2*
Shell Creek, PR/MRWSA	8	64,622	no data	3.32	Off-Stream reservoir, ASR	*2*

Table 2-6(a) New Supply Capture Unit Production Costs

Project Name	Capacity (mgd)	Capital Cost $(Thousands)	O & M $(Thousands)	Unit Cost $/1,000 gallons	Description	Data Source/ Footnote
Shoal River direct intake	25	57,489	3,163	0.64	Direct intake, no reservoir	*6*
Shoal River intake to Bear Creek Storage	25	87,442	3,739	0.84	In-line reservoir	*6*
Shoal River intake to Pond Creek Storage	25	212,872	30,660	1.56	In-line reservoir	*6*
Shoal River intake to West Dog Storage	25	88,744	4,107	0.90	In-line reservoir	*6*
St. Johns River DeLand	20	246,706	8,835	3.50	Off-Line Storage, ASR	*1*
St. Johns River Lk George	33	414,060	14,080	3.49	Off-Line Storage, ASR	*1*
St. Johns River Lk Monroe	50	520,850	21,633	3.13	Off-Line Storage, ASR	*1*
St. Johns River SR 50	10	97,850	4,481	3.10	Off-Line Storage, ASR	*1*
St. Johns River Taylor Creek Reservoir	40	221,450	12,185	1.93	Off-Line Storage, ASR	*1*
Tampa Bay Water, Phase A and B, Downstream Enhancements	25	214,584	5,665	2.28	Off-Stream Reservoir	*2*
Tatum sawgrass area-Peace River PR/MRWSA	40	289,842	8,445	2.22	Off-stream reservoir, ASR	*2*
Upper Myakka River Public Supply	10	103,000	1,854	2.84	Off-stream reservoir	*2*
Upper Peace River Aquifer Recharge	10	71,869	6,654	3.45		*2*
Upper Peace River Polk County	4.1	42,302	no data	2.68		*2*

Notes: 1) SJRWMD 2005 District Water Supply Plan Addendum 10/10/06

2) SWFWMD Regional Water Supply Plan 12/01/2006

3) U. S. Water News Online, 12/1998

4) Jay Yingling, SWFWMD, Tampabay Water

5) SFWMD: Alternative Water Supply Conceptual Design and Cost Estimation

6) NWFWMD Conceptual Alternative Water Supply Development Projects 10/2006

7) Mark Hobbs, City of Tampa Water

8) *Civil Engineering* , January 2007

Table 2-6(b) Reuse, Stormwater, and Blended Non-Potable Costs

Project Name	Capacity (mgd)	Capital Cost $Thousands	O & M $Thousands	Unit Cost $/1,000 gallons	Description	Data Source/ Footnote
Blended Irrigation						
Charlie Creek (Piped to Ag)	12	49,477	2,791	1.58	Off-stream reservoir	*2*
Cherry Lake Tree Farm Lake, Lake Withdrawal	0.77	845	64	0.43	Direct intake	*1*
Frog Creek (Stormwater) Manatee County	1	1,024	1,498	4.34	Off-stream reservoir	*2*
Gamble Creek, Manatee County	3.9	35,486	1,590	3.18	Off-stream reservoir, ASR	*2*
Holloway Farm Rainwater Collection	0.08	1,597	2	3.77		*1*
Peace River near Zolfo Springs	40	206,124	15,572	2.24	Off-stream reservoir	*2*
Prairie Creek, TBD (Piped to Ag)	12	60,416	3,621	1.97	Off-stream reservoir	*2*
S. Prong of Alafia River, Tampa Bay Water	3.3	4,833	5,196	4.50	Phosphate settling pits, ASR	*2*
Tatum Sawgrass area-Upper Myakka River, TBD	8.4	108,998	1,963	3.58	Off-stream reservoir, AR	*2*
Reuse						
Agric/Lg Rec/Aes Reuse (general)	n/a	n/a	n/a	0.57		*4*
Bradenton Agricultural Reuse and Natural System Restoration	4.80	4,913	1,483	0.25	Sys Expan	*2, 9*
Rotunda Long Marsh Golf Expansion	0.40	474	124	0.32	Trans	*2, 9*
IMC/MARS Augmentation	15.00	21,626	4,635	0.47	Storage/Aug	*2, 9*
Wood Memorial Hospital	0.11	366	34	0.66	Sys Expan	*2, 9*
Reuse Expan Rice Creek 2011-2025, Rice Cr. Util	0.04	133	12	0.66	Sys. Expan NSR	*2, 9*
Plant City Wetland, Plant City	1.50	4,996	464	0.66	Rehyd./Wetland/NSR	*2, 9*
Plant City Hardee Board Trans., Plant City	0.35	1,164	108	0.66	Trans.	*2, 9*
Reuse Expan in Zolfo Springs WWTP 2011-2025, Town of Zolfo Springs	0.14	466	43	0.66	Sys. Expan. Ag.	*2, 9*
Reuse Expan in Bowling Green WWTP 2011-2025, City of Bowling Green	0.05	167	15	0.66	Sys. Expan.	*2, 9*
Reuse Expan in Wauchula WWTP 2011-2025, City of Wauchula	0.08	266	25	0.66	Sys. Expan.	*2, 9*
Lakeland Wetland-Hwy 60 Industrial Reuse, City of Lakeland	2.00	6,654	618	0.66	Trans.	*2, 9*
Reuse Expan in Bartow WWTP 2011-2025, City of Bartow	0.54	1,796	167	0.66	Sys. Expan.	*2, 9*
Reuse Expan in Avon Park Correctional WWTP 2011-2025, FL Dept. of Corrections	0.52	1,730	161	0.66	Sys. Expan. Toilet Flushing/Laundry	*2, 9*
Reuse Expan in Polk Co. Correctional WWTP 2011-2025, FL Dept. of Corrections	0.23	765	7	0.66	Sys. Expan. Toilet Flushing/Laundry	*2, 9*
Pinellas Reclaimed Supplemental Supply with Lake Tarpon, Pinellas Co.	0.50	1,030	155	0.68	Supplemental Supply/Aug.	*2, 9*
Lakeland Zero Liquid Discharge-Power, City of Lakeland Electric or Water Util.	2.00	7,725	618	0.76	Trans./Treatment	*2, 9*
Arcadia Ag. Reuse Expan	0.37	1,236	115	0.87	Sys Expan	*2, 9*
Lakeland Cleveland Heights Golf, City of Lakeland	0.50	1,664	153	0.87	Trans.	*2, 9*
Sebring Agricultural Reuse, City of Sebring	1.25	4,159	387	0.88	Sys./Ag. Reuse	*2, 9*
Winter Haven Plant III Reuse, City of Winter Haven	3.00	9,981	927	0.88	Ag. Reuse	*2, 9*
Plant City Trans. Expan. I, Plant City	1.00	3,327	309	1.03	Trans.	*2, 9*
Celery Fields Reuse Augmentation	1.00	3,327	309	1.09	Augment	*2, 9*
Manatee River Downstream Aug	1.00	3,327	309	1.09	Streamflow	*2, 9*
Reuse Expan in Tampa/Curren WWTP 2011-2025, Tampa	26.98	89,765	8,338	1.09	Sys. Expan.	*2, 9*
N.W. Hills Trans. Expan. I, Hills. Co.	1.00	3,327	297	1.09	Trans.	*2, 9*

AR - Aquifer Recharge   ASR - Aquifer Storage and Recovery

Table 2-6(b) Reuse, Stormwater, and Blended Non-Potable Costs

Project Name	Capacity (mgd)	Capital Cost $Thousands	O & M $Thousands	Unit Cost $/1,000 gallons	Description	Data Source/ Footnote
Plant City Walden Lakes, Plant City	1.00	3,327	309	1.09	Trans.	*2, 9*
Reuse Expansion Estimates for SWFWMD	1.00	3,327	309	1.09	Sys. Expan.	*2, 9*
Pasco County Wet Weather Reclaimed Water Reservoirs II (Future Expansion of H305), Pasco Co.	6.00	19,961	1,854	1.09	Storage/NSR	*2, 9*
Downstream Augmentation of Alafia River, TBW	15.50	103,000	4,790	1.31	Streamflow	*2, 9*
Aloha Utilities (K016)	0.63	6,188	195	2.60	Transmission	
Pinellas County (K831)	0.32	1,833	99	2.26	Trans, Pump, Storage	*2, 9*
City of Clearwater (K213)	0.30	5,008	93	6.58	Trans, Pump, Storage	*2, 9*
City of Clearwater (K392)	1.20	2,266	371	0.91	Trans, Pump	*2, 9*
City of Clearwater (K426)	0.27	876	83	0.87	Transmission	*2, 9*
City of Clearwater (K513)	0.55	8,166	170	2.56	Trans, Storage	*2, 9*
City of Clearwater (K686)	0.68	2,673	210	1.55	Transmission	*2, 9*
City of Clearwater (K833)	0.41	2,472	127	2.21	Transmission	*2, 9*
Dunedin (K033)	0.43	882	133	1.02	Transmission	*2, 9*
Dunedin (K201)	0.27	934	83	1.32	Trans, Pump, Storage	*2, 9*
Dunedin (K312)	0.37	1,813	114	1.87	Trans, Pump, Storage	*2, 9*
Dunedin (K552)	0.43	2,291	133	2.05	Transmission	*2, 9*
Dunedin (K834)	0.03	226	9	4.45	Transmission	*2, 9*
Largo (K186)	0.75	1,269	232	1.00	Transmission	*2, 9*
Largo (K427)	0.13	234	40	1.14	Transmission	*2, 9*
Largo (K503)	0.46	2,060	142	1.94	Transmission	*2, 9*
Largo (K674)	0.12	515	37	1.69	Transmission	*2, 9*
Oldsmar (K347)	0.30	453	93	0.60	Transmission	*2, 9*
Oldsmar (K514)	0.32	309	99	0.46	Transmission	*2, 9*
Oldsmar (K515)	0.07	206	22	1.02	Transmission	*2, 9*
Oldsmar (K826)	0.18	680	56	1.49	Trans, Distribution	*2, 9*
Pinellas Park (K516)	0.40	1,305	124	1.94	Transmission	*2, 9*
Pinellas Park (K661)	0.86	2,812	266	1.04	Transmission	*2, 9*
Pinellas Park (K694)	0.84	3,867	260	1.81	Trans, Distribution	*2, 9*
Tampa (K655)	5.00	33,681	1,545	2.38	Trans, Pump, Storage	*2, 9*
Polk County (K079)	1.00	2,954	309	1.03	Trans, Pump, Storage	*2, 9*
City of Wauchula (K430)	1.00	5,515	309	1.09	Trans, Pump, Storage	*2, 9*
Sarasota County (FA24)	0.60	2,287	185	1.26	Trans, Pump, Storage	*2, 9*
Zephyrhills (K794)	0.08	487	25	1.60	Transmission	*2, 9*
Polk County (K300)	2.00	4,960	618	0.81	Trans, Pump, Storage	*2, 9*
Alafaya Reclaimed Water Storage	0.41	2,513	34	1.29		*1*
Altamonte Springs & Apopka Project RENEW APRICOT	6.63	13,926	201	0.47		*1*
Apopka & Winter Garden Reuse Partnership Project	3.00	5,366	73	0.39		*1*
Belleview & Spruce Creek Golf Course Reclaimed Expansion	1.00	2,441	33	0.57		*1*

AR - Aquifer Recharge   ASR - Aquifer Storage and Recovery

Table 2-6(b) Reuse, Stormwater, and Blended Non-Potable Costs

Project Name	Capacity (mgd)	Capital Cost $Thousands	O & M $Thousands	Unit Cost $/1,000 gallons	Description	Data Source/ Footnote
Beverly Beach Intergrated Reclaimed Water Phase II	0.50	2,719	50	1.32		*1*
City of Live Oak, range of values (upper)	0.50	n/a	n/a	3.11		*6*
City of Live Oak-range of values (lower)	0.50	n/a	n/a	1.25		*6*
Clermont Reclaimed and Stormwater Expansion	5.10	23,360	951	1.32		*1*
Cocoa/Rockledge Reclaimed Water Line Connection	0.25	1,329	22	1.17		*1*
Daytona Beach Reclaimed Water Line Connection	26.00	26,172	1,881	0.37		*1*
DeLand Reclaimed Water and Surface Water Augmentation	1.70	5,717	338	1.18	Off-Line Storage, AR	*1*
Eastern Orange & Seminole Counties Regional Reuse Project	20.00	29,808	375	0.33	none listed	*1*
Eustis Reclaimed Water System Expansion and Augmentation	1.10	2,328	99	0.62		*1*
Flagler County Bulow Reclaimed Water Project	1.70	2,204	191	0.55		*1*
Gold Kist Reuse	0.50	n/a	n/a	2.99		*6*
Holly Hill Reuse System to Ormond Beach	0.60	505	49	0.37		*1*
Lady Lakes Phase II Reclaimed	0.50	2,266	236	2.11		*1*
Lake Apopka Reuse Augmentation Project	1.00	9,054	117	2.05	Off-Line Storage	*1*
Lake Utility Services - Lake Groves WWTF	1.00	4,481	226	1.47		*1*
Large Industrial/Commercial Reuse (general)	n/a	n/a	n/a	0.90		*4*
Leesburg Reclaimed Water Reuse Project	7.05	28,655	344	0.91	none listed	*1*
Melbourne Reclaimed Water System Expansion	1.50	5,016	384	1.34		*1*
Minneola Reclaimed Water Reuse Project	1.00	11,804	144	1.04	AR	*1*
Monticello Reclaimed water	0.50	n/a	n/a	0.74		*6*
Mount Dora County Club GC	0.26	412	22	0.50		*1*
North Seminole Regional Reclaimed Water Expansion and Optimization	7.76	10,609	520	0.44	Off-Line Storage, AR	*1*
Ocoee Reuse System Expansion	0.35	2,771	1	1.37		*1*
Orange County Northwest Reclaimed Water Storage	3.00	10,558	309	0.90		*1*
Orange County Southeastern Reclaimed Water System Expansion	12.50	13,606	362	0.28		*1*
Orlando Utilities Project RENEW	9.20	64,633	1,660	1.71		*1*
Ormond Beach North Peninsula Reclaimed Water Storage Project	0.49	3,059	146	2.00	Off-Line Storage	*1*
Ormond Beach South Peninsula Reuse Improvement	2.13	10,207	200	1.09		*1*
Palm Coast Reclaimed Water System Expansion	8.23	17,108	1,269	0.79		*1*
Port Orange Airport Road Reclaimed Transmission Main	1.00	1,988	82	0.58		*1*
Port Orange Pioneer Trail Storage and Pumping Facility	2.00	2,915	188	0.52		*1*
Port Orange Reclaimed Water Reservoir and Recharge Basin Project	2.70	10,362	110	0.84	Off-Line Storage, AR	*1*
Res/Com Reclaimed rates (general)	n/a	n/a	n/a	1.27		*4*
Rockledge Reclaimed Water Storage Project	0.16	2,091	13	2.43		*1*
Seminole County Yankee Lk Reclaimed and Augmentation	10.00	32,301	3,251	1.47		*1*
South Daytona Reclaimed Water Expansion Project	0.14	896	11	1.36		*1*
Tavares Reclaimed Treatment and Expansion	0.60	5,861	49	1.92		*1*
University of Central Florida Reclaimed Water and Stormwater Intergratation	0.41	1,092	54	0.82		*1*
Volusia County Southwest Reclaimed Water System	0.20	1,473	16	1.50		*1*

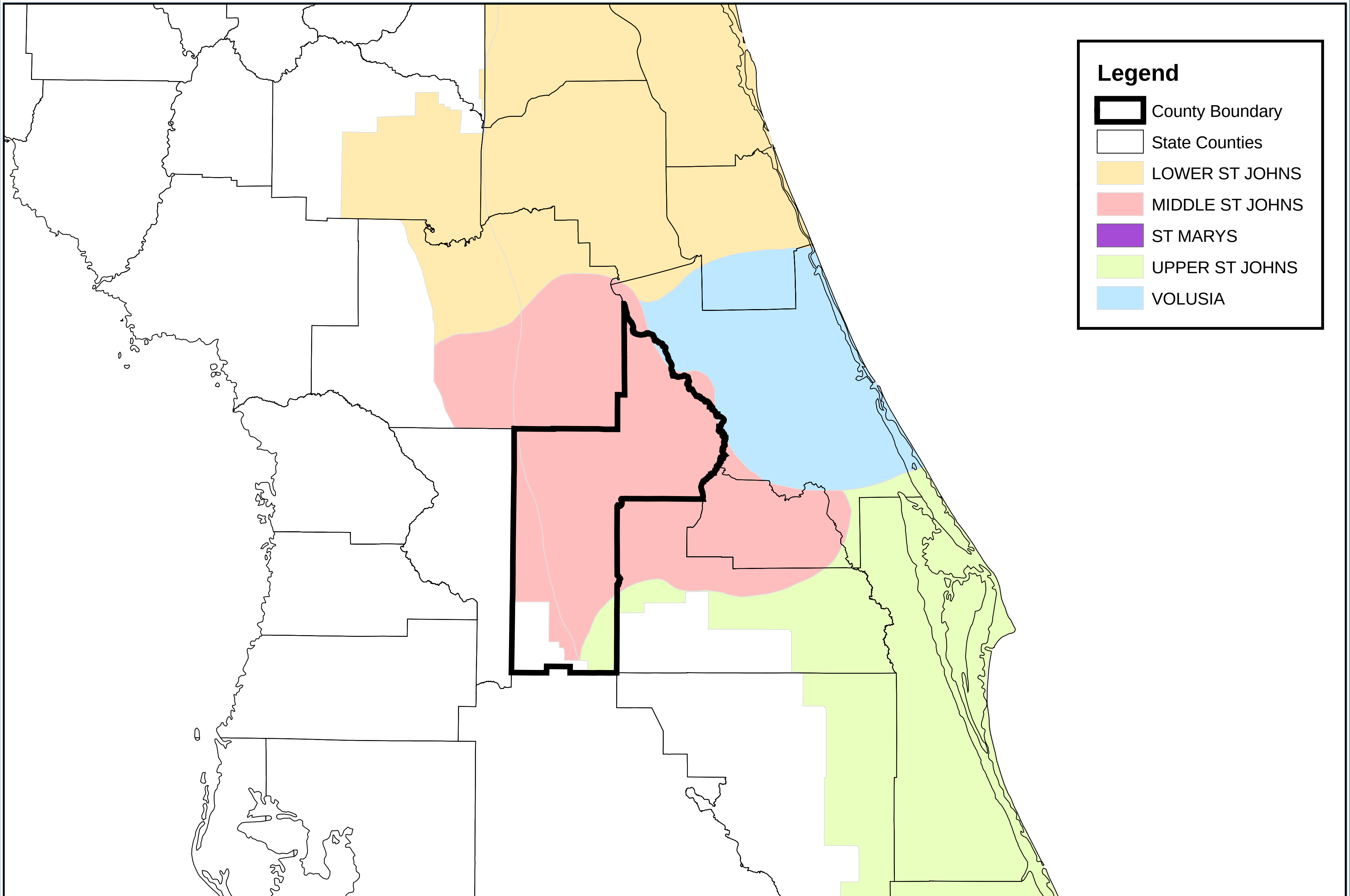
AR - Aquifer Recharge   ASR - Aquifer Storage and Recovery

Table 2-6(b) Reuse, Stormwater, and Blended Non-Potable Costs

Project Name	Capacity (mgd)	Capital Cost $Thousands	O & M $Thousands	Unit Cost $/1,000 gallons	Description	Data Source/ Footnote
West Melbourne Above Ground Reclaimed Water Storage	2.48	2,843	103	0.32		*1*
Winter Garden Reclaimed Water Pumping and Transmission	4.00	17,922	511	1.12		*1*
Winter Park Windsong Stormwater Reuse Demonstration	0.10	536	31	1.77		*1*
Winter Springs - Lake Jessup Reclaimed Water Augmentation	2.25	6,901	155	0.77		*1*
Stormwater						
Celery Fields (stormwater), Sarasota County	2	21,696	999	2.55	Off-stream reservoir, ASR	*2*
Storm water - Onsite Water Supply Local governments	0.41	1,432	46,242	3.13	Stormwater Detention	*2*
Zephyr Creek, Tampa Bay Water, City of Zephyrhills	0.2	4,057	65	5.58	Stormwater Detention & ASR	*2*

Notes: 1) SJRWMD 2005 District Water Supply Plan Addendum 10/10/06
2) SWFWMD Regional Water Supply Plan 12/01/2006
3) U. S. Water News Online, 12/1998
4) Jay Yingling, SWFWMD, Tampabay Water
5) SFWMD: Alternative Water Supply Conceptual Design and Cost Estimation
6) Suwannee RWMD Alternative water supply development Five year plan 3/2006
7) Mark Hobbs, City of Tampa Water
8) *Civil Engineering* , January 2007
9) O&M calculated using SWFWMD average rate of $0.30 per 1000 gal

AR - Aquifer Recharge   ASR - Aquifer Storage and Recovery



Water Resource Associates, Inc.
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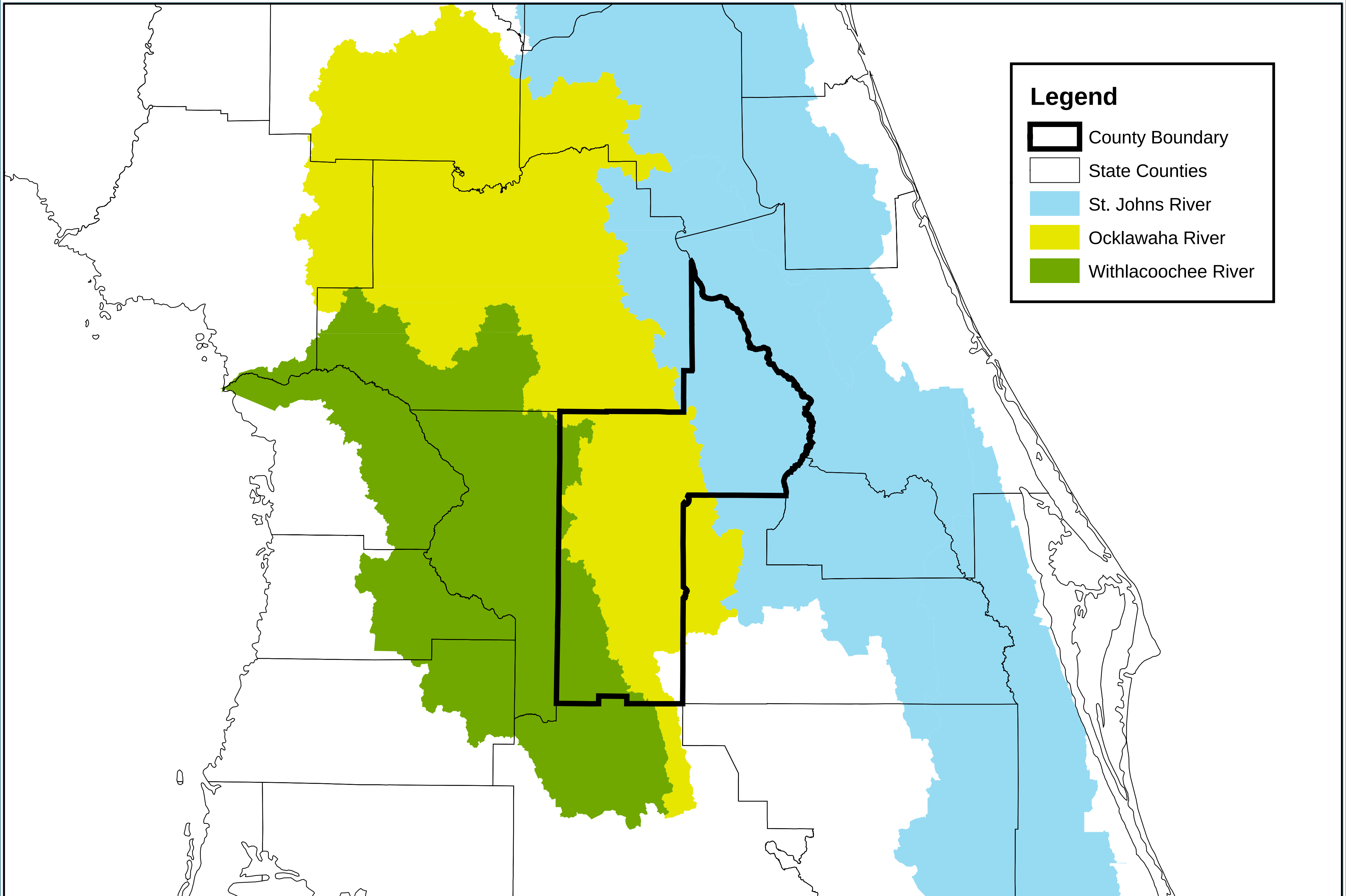
4260 West Linebaugh Avenue
Phone: 813-265-3130
Fax: 813-265-6610
www.wraconsultants.com

PROJECT: 0407 - Lake County Water Supply Development

Figure 2-1
Groundwater Basins In Lake County

ORIGINAL DATE: 05-02-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_watershed...mxd
GIS OPERATOR: DR



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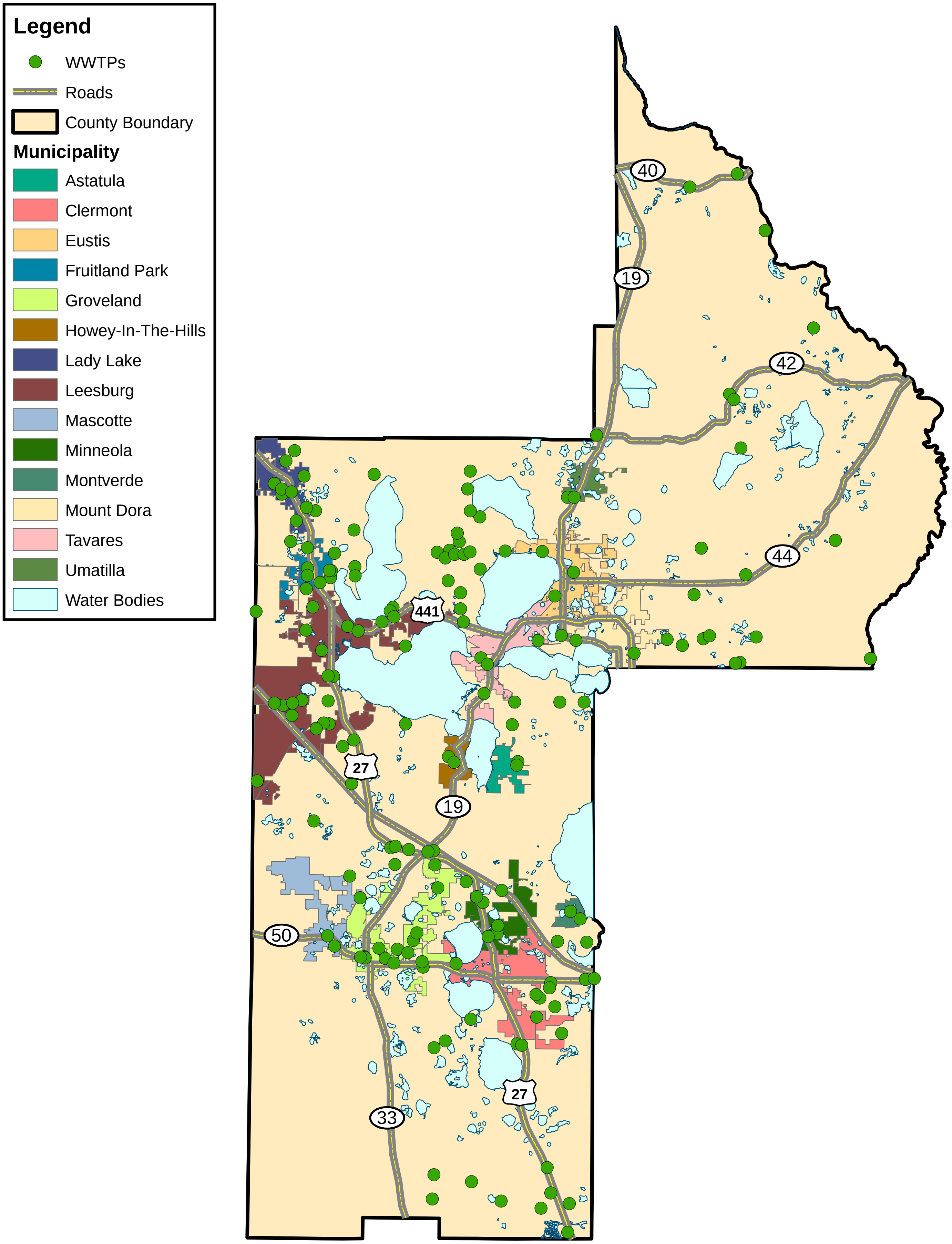
PROJECT: 0407 - Lake County Water Supply Development

Figure 2-4
Watershed Basins
In and Around Lake County

ORIGINAL DATE: 05-02-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_watershed...mxd
GIS OPERATOR: DR



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PROJECT: 0407 - Lake County Water Supply Development

Figure 2-5
Lake County
Wastewater Treatment Plants

ORIGINAL DATE: 10-27-05
REVISION DATE: 04-26-07
JOB NUMBER: 0407
FILE NAME: 0407 - Lake County WW...
GIS OPERATOR: DFB

N W E S
1 Inch = 7 Miles

Figure 2-7 Unit Production Costs

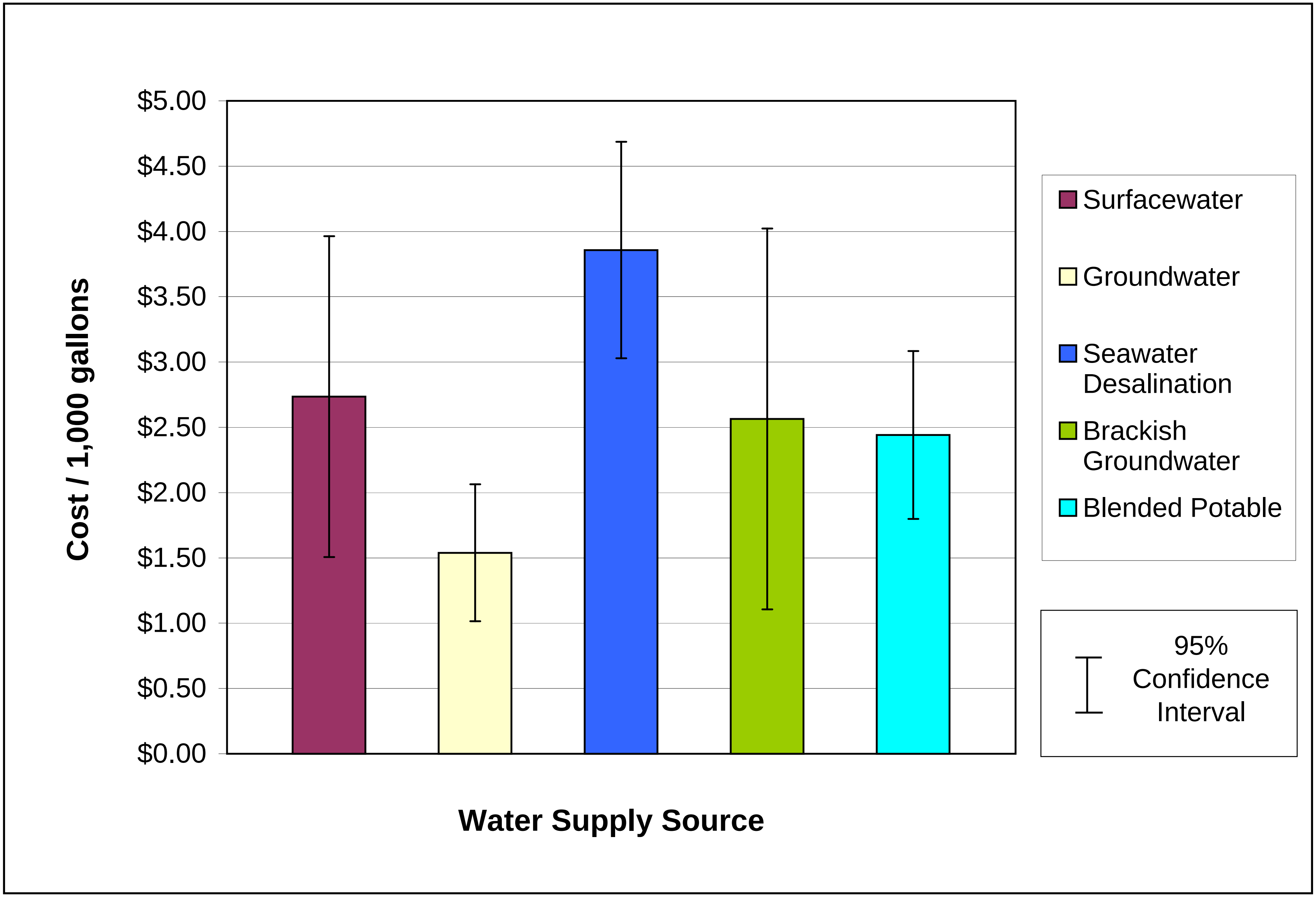
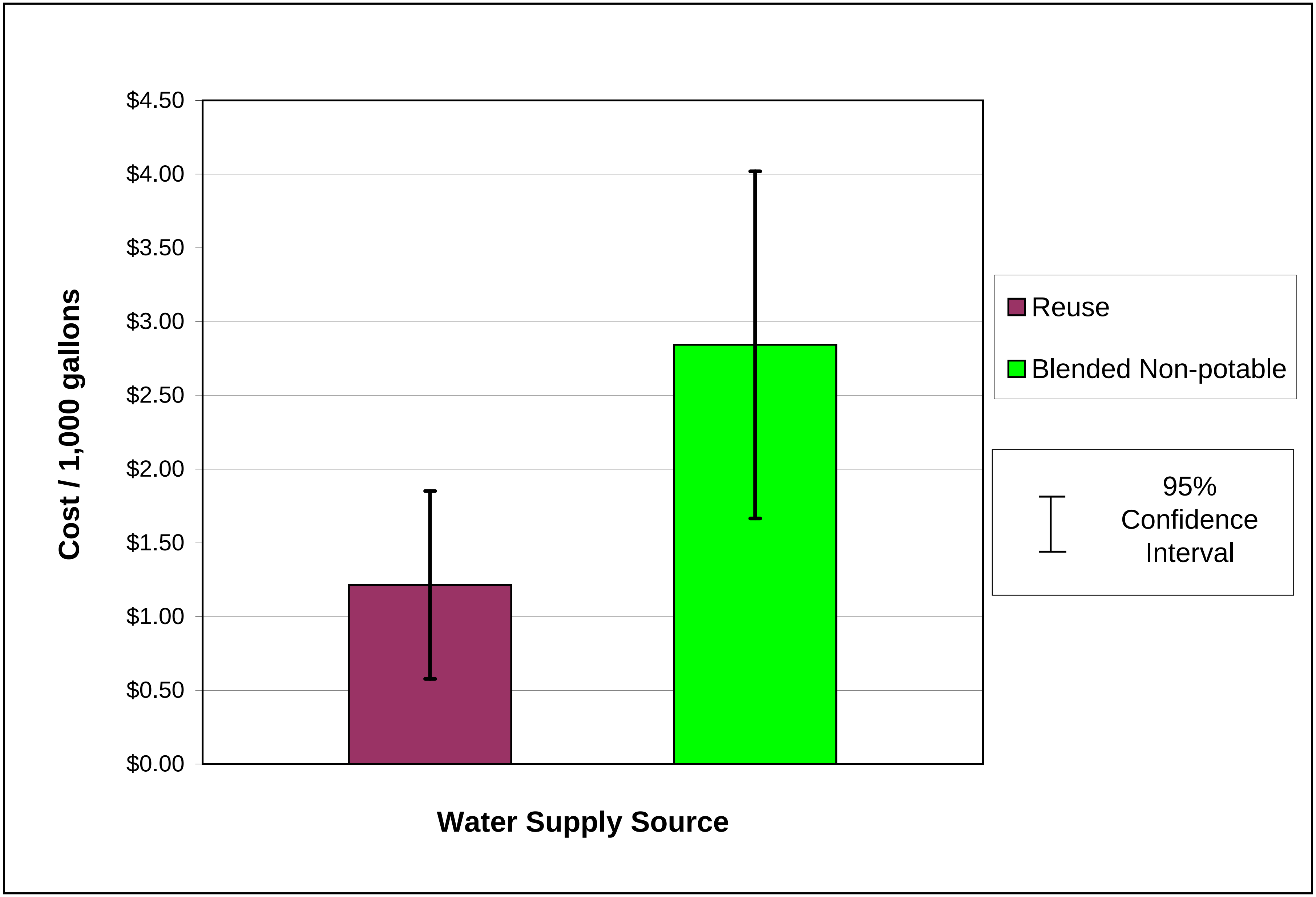


Figure 2-8 Unit Production Costs for Reuse and Blended Non-potable Projects



3.0 Identification of Readily Available Regional Alternative Water Supply Development Projects

Surface water sources are not currently utilized for potable water supply in the County. Relative to groundwater supplies, utilization of surface waters for potable supply entails more sophisticated and costly means of treatment, management of variability in supply quantity and quality, and management of the associated environmental impacts to downstream ecology and water resources. However, as the County and the region continue to grow, the need for regional alternative surface water supplies becomes an important element of the County's future growth.

This Chapter identifies potential regional alternative surface water supply development projects that are readily available and/or currently in an implementation or conceptual phase of development in the County and surrounding Counties which may provide alternatives for the County.

Thirteen surface water projects were identified. A brief summary of each identified alternative surface water supply development project is provided. This discussion includes the benefits of these alternative sources and their potential effectiveness to offset future water supply demands. The potential for cooperative regional water supply development is also addressed.

A preliminary screening step (tier-one screening) was developed and conducted resulting in identification of the most viable alternatives for future consideration by the Alliance. This screening step used a suite of screening criteria, including resource availability, reliability and longevity; raw water quality; permittability; environmental compatibility; cost; additional funding; compatibility with cooperative regional water supply development, and project location. A preliminary order-of-magnitude cost analysis of the alternative projects that passed the screening step is provided as a means to further clarify the relative comparison of alternatives. This screening effort is a comparative tool to evaluate each alternative, resulting in a more focused and likely alternative surface water supply candidate list for future detailed analysis.

The primary information used in the identification of the regional alternate surface water projects includes the following key sources.

- The SJRWMD District Water Supply Plan (DWSP) 2005 provides a District-wide summary of potential alternative water supply projects. More recently, the SJRWMD has refined the DWSP 2005 and has prepared a series of presentations outlining these projects, including projects that may provide options to the County.
- The Withlacoochee Regional Water Supply Authority (WRWSA) Regional Water Supply Plan Update – 2005 outlines key regional projects located along the Withlacoochee River that warranted further study for its members. These projects were reviewed for applicability to supply alternate surface water to the County.

- Marion County Water Resource Assessment and Management Study (WRAMS) initiated a review of potential surface water source areas to meet the County's needs. This study included initial identification of alternative surface water supplies to meet future water demands. These projects were reviewed for applicability to supply alternate surface water to County.

3.1 Surface Water Alternative Water Supply Projects

The County is in a unique location centered between three major river systems that provide the potential for significant surface water supply alternatives: the St. John's River to the east, the Ocklawaha River which transects the County (flowing north into Marion County), and the Withlacoochee River to the west. Additionally, the projected regional water demand deficits in the next 20 years for surrounding Counties make these river basins a primary focus for cooperative water supply development opportunities by the SJRWMD, SWFWMD, the Withlacoochee Regional Water Supply Authority (WRWSA), Marion County, and others.

The Lake County Alliance members have demand needs over the next 20 years that are currently being quantified. These needs can be met in part by utilization of reclaimed water, reuse of storm water, and conservation. However, it is anticipated an alternate surface water supply will be needed to support the County's future growth.

3.1.1 St. John's River

The SJRWMD District Water Supply Plan (2005) reviewed the water availability, reliability, and quality of the St John's River to determine the feasibility of withdrawing surface water to meet future needs in identified priority water resource caution areas. Through this on-going alternative source development program, the District has established that the St. John's River can supply a large quantity of raw water, that will vary in water quality and quantity based on the selected withdrawal locations and established MFLs for various river segments.

While the water quantity is significant, surface water sources typically have more variability in both quantity and quality then groundwater sources. As stated in the DWSP (2005) "surface waters tend to contain silts and suspended sediments, algae, dissolved organic matter from topsoil, and chemical and microbiological contaminants from municipal wastewater discharges, stormwater runoff, and industrial and agricultural activities. The quality of surface water may vary seasonally with variation in flow rates or water levels." Therefore, the treatment costs for a potable surface water supply are significantly higher than groundwater. In addition, the St John's River water quality during low flow periods is slightly–to–moderately brackish. Consequently, the typical fresh surface water treatment methods are even more elaborate (i.e. membrane technology and concentrate management) than a fresh surface water source and treatment costs can increase by 75% to 100% over conventional surface water processes.

The SJRWMD DWSP (2005) identified five surface water alternative locations along the St John's River. Figure 3-1 shows the general location of each of these projects listed below.

- St. Johns River Near SR 50 Project
- St. Johns River Near Lake Monroe Project (Yankee Lake)
- St. Johns River Near DeLand Project
- St. Johns River Near Lake George Project
- St. Johns River/Taylor Creek Reservoir Water Supply Project

In addition, the SJRWMD has approved a four-party agreement that calls for the commitment of OUC and Orange County to develop at least 15 million gallons per day (gpd) of alternate water supply in their service area. The County, as part of this agreement, has the option to use 5 mgd of alternative water supply developed by OUC for the municipalities in the County.

3.1.1.1 St. Johns River near SR 50 Project

The SJR SR 50 Project located in eastern Orange County would include a raw water intake, off-line storage reservoir, and conventional surface water treatment with membrane treatment for brackish water. The available water supply is estimated at 94 to 127 mgd.

This alternative has been characterized by the SJRWMD as the following:

- Potentially Available Water Quantity – 94 to 127 mgd (Does not consider existing St Johns River allocations for the City of Melbourne and Cocoa Beach)
- Water quality – poor with costly treatment for brackish water needed
- Intake location near the St. Johns River and State Road 50
- Off-line storage reservoir needed
- Length of Transmission lines required to make water available to the County is excessive – over 50 miles
- Key Cost Elements:
    - Treatment Capital and O&M Cost High – Conventional surface water plus membrane treatment
    - Transmission System Capital Cost Extremely High

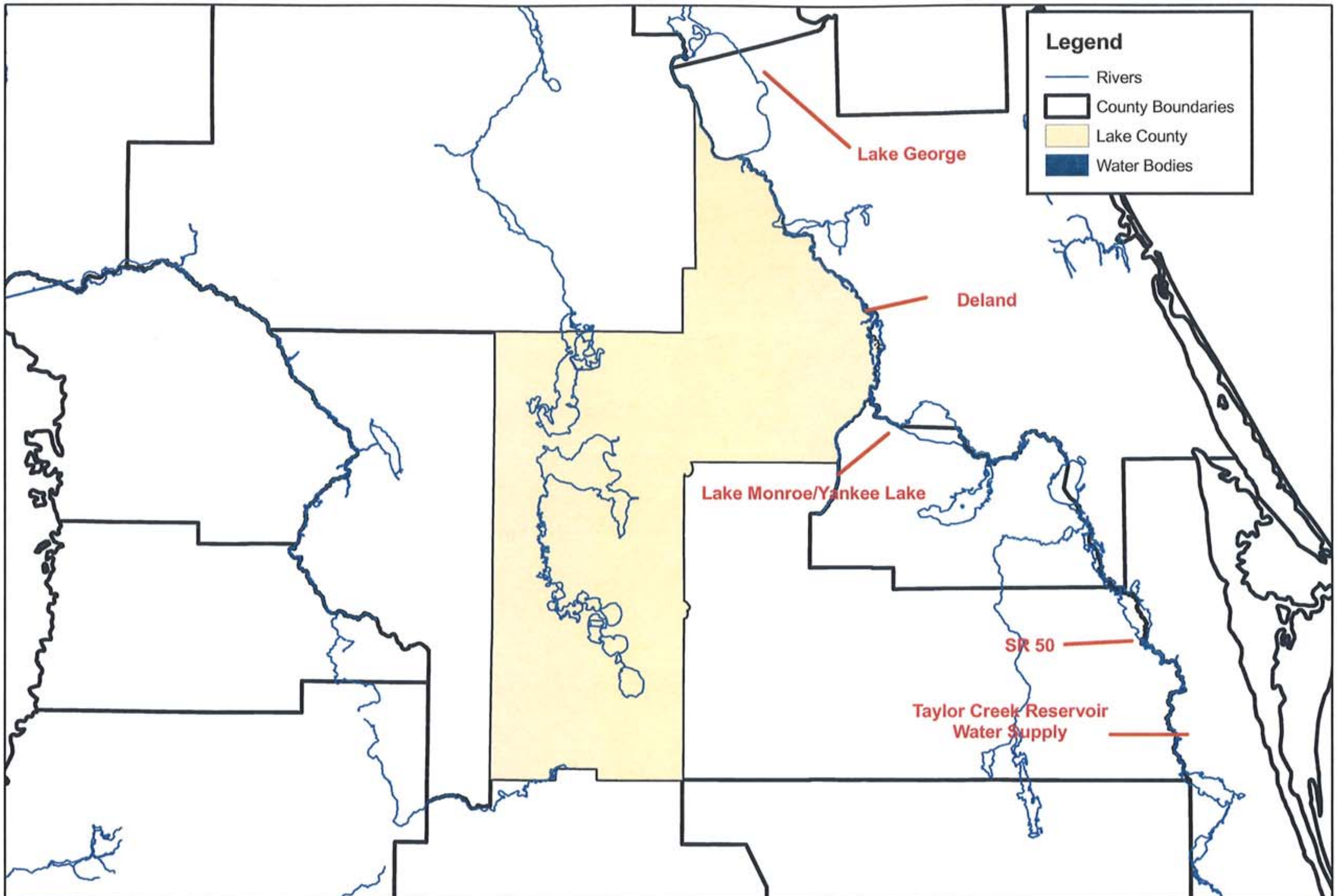


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Figure 3 - 1
St. Johns River Potential Alternative
Water Supply Projects

ORIGINAL DATE: 04-24-07
REVISION DATE: N/A
JOB NUMBER: 0306
FILE NAME: Surfacewater Projects.mxd
GIS OPERATOR: DR

3.1.1.2 St. Johns River Yankee Lake Project

The SJR Yankee Lake Project is being developed in two phases. Phase I includes construction of a river intake, raw water pump station, and a pipeline to convey the raw water from the St. Johns River to a new treatment facility which will supply about 10 mgd of water to augment Seminole County's reuse program. However, the raw water intake is being constructed for a capacity of 45 mgd to allow for future expansion.

Phase II includes development of a 30 mgd potable water treatment capacity and an additional 5 mgd of reclaimed water treatment capacity. The development program includes the potential to expand the potable water treatment facility for a future capacity of 45 mgd to meet the regions potable needs.

It is anticipated by the SJRWMD that this water supply will be available for Seminole County, Lake County, and Orange County. SJRWMD has generated some comparative costs for development of these water supplies by the County only and as a cooperative regional partnership. While these costs are only order-of-magnitude estimates based on some basic treatment and distribution system assumptions, they do allow a screening level comparison of alternatives.

This alternative has been characterized by the SJRWMD as the following:

- Potentially Available Water Quantity – 116 mgd (Does not consider existing St Johns River allocations for the City of Melbourne and Cocoa Beach)
- Water quality – poor with costly treatment for brackish water needed
- Intake location established at Yankee Lake
- No off-line storage reservoir needed
- Transmission lines could run from Intake to a point east of Mt Dora (11 shared miles), where the main line would split, with the western line supplying central Lake County and the southern line feeding Orange County and southern Lake County (22 shared miles). Depending on the partners for this regional supply, the total distribution system could range from approximately 94 to 106 miles.
- Key Cost Elements:
  - Treatment Capital and O&M Cost High – Conventional plus Membrane treatment
  - Transmission System Capital Cost Moderate
    - SJRWMD projected Total Unit Production Costs for the County will generally be reduced as more communities are added to the partnership for development.

3.1.1.3 St. Johns River, near Deland

The SJRWMD DeLand alternative has been characterized as an alternate water source for the County only. This alternative would include construction of a river intake, raw water pump station, off-line storage reservoir, and a pipeline to convey the raw water from the St. Johns River to a new treatment facility, which would supply the County with potable water needs.

This alternative has been characterized by the SJRWMD as the following:

- Potentially Available Water Quantity – 94 to 127 mgd (Does not consider existing St Johns River allocations for the City of Melbourne and Cocoa Beach)
- Water quality – poor with costly treatment for brackish water needed
- Intake location in area of Deland (northeast Lake County boundary)
- Off-line storage reservoir needed
- Transmission lines could run from Intake to Mt Dora (about 18 miles) and then to the County's distribution system (total distribution system approximately 74 miles)
- Key Cost Elements:
    - Treatment Capital and O&M Cost High – Conventional surface water plus membrane treatment
    - Transmission System Capital Cost Moderate

3.1.1.4 St. Johns River near Lake George Project

The SJR Lake George Project would include a raw water intake, off-line storage reservoir, and conventional surface water treatment with membrane treatment for brackish water. The available water supply is estimated at 33 mgd.

This alternative has been characterized by the SJRWMD as the following:

- Potentially Available Water Quantity – 33 mgd (Does not consider existing St Johns River allocations for the City of Melbourne and Cocoa Beach)
- Water quality – poor with costly treatment for brackish water needed
- Intake location near the St. Johns River and State Road 50
- Off-line storage reservoir needed
- Length of Transmission lines required to make water available to the County is significant (over 30 miles) in relation to other SJR projects
- Key Cost Elements:
    - Treatment Capital and O&M Cost High – Conventional surface water plus membrane treatment
    - Transmission System Capital Cost High

3.1.1.5 St. Johns River/Taylor Creek Reservoir Water Supply Project

The SJR Taylor Creek Reservoir is located in Orange and Osceola counties near the St. Johns River and State Road 520. The City of Cocoa began using the reservoir for water supply in 1999, withdrawing approximately 10 mgd from the reservoir to supplement its groundwater sources. The conceptual plan includes construction of a complete water supply system, including diversion facilities, such as a pumping station and pipeline, so that water withdrawn from the St. Johns River can be transported to the reservoir. Only freshwater will be diverted from the river, therefore, only conventional surface water treatment facilities will be required. Approximately 25 to 40 mgd is envisioned for water supply.

This alternative has been characterized as the following:

- Available Water Quantity – 25 to 40 mgd
- Water quality – fresh with conventional surface water treatment facilities
- Reservoir location near the St. Johns River and State Road 520 (existing)
- Length of Transmission lines required to make water available to the County is excessive – over 60 miles
- Key Cost Elements:
    - Treatment Capital and O&M Cost High – Conventional surface water plus membrane treatment
    - Transmission System Capital Cost Extremely High

3.1.2 Ocklawaha River Basin

The Ocklawaha River Basin transects the County, with its headwaters in the County. The River flows north into Marion County and has been mentioned in two studies as a potential regional water source. The SJRWMD DWSP (2005) identified two candidate locations for alternative surface water supply: the upper basin and the lower basin. The on-going Marion County Water Resource Assessment and Management Study (WRAMS) also includes the Lower Ocklawaha River below the confluence with Silver River as a potential source.

These two alternatives are considered potential alternate water supply sources for the County. Figure 3-2 shows the general location of each of these projects listed below.

- Upper Ocklawaha River (reach within the County Boundary)
- Lower Ocklawaha River (Silver River confluence to Rodman Reservoir)

3.1.2.1 Upper Ocklawaha River – Lake County

The SJRWMD has identified a potential water supply yield of 14 mgd estimated for the Upper Ocklawaha River Basin (DWSP 2005). The raw water is a fresh water supply and there would be considerable flexibility in the location of the actual water supply withdrawal points. However, the SJRWMD has identified the Upper Ocklawaha River as a likely source of water to supplement reclaimed water supplying reuse, but not as a viable potable water supply. The SJRWMD has also indicated that due to current Consumptive Use Permit applications, this capacity may not be available in the future.

Evaluation of the County's CUPs supports the assessment that the Upper Ocklawaha River, within the County, is a likely source for reuse to supplement non-potable needs; but it is not considered a viable potable water source for the County. Therefore, it will be included as part of the future evaluation of Conservation and Reuse for the County, and not considered further as a potable alternate surface water supply.

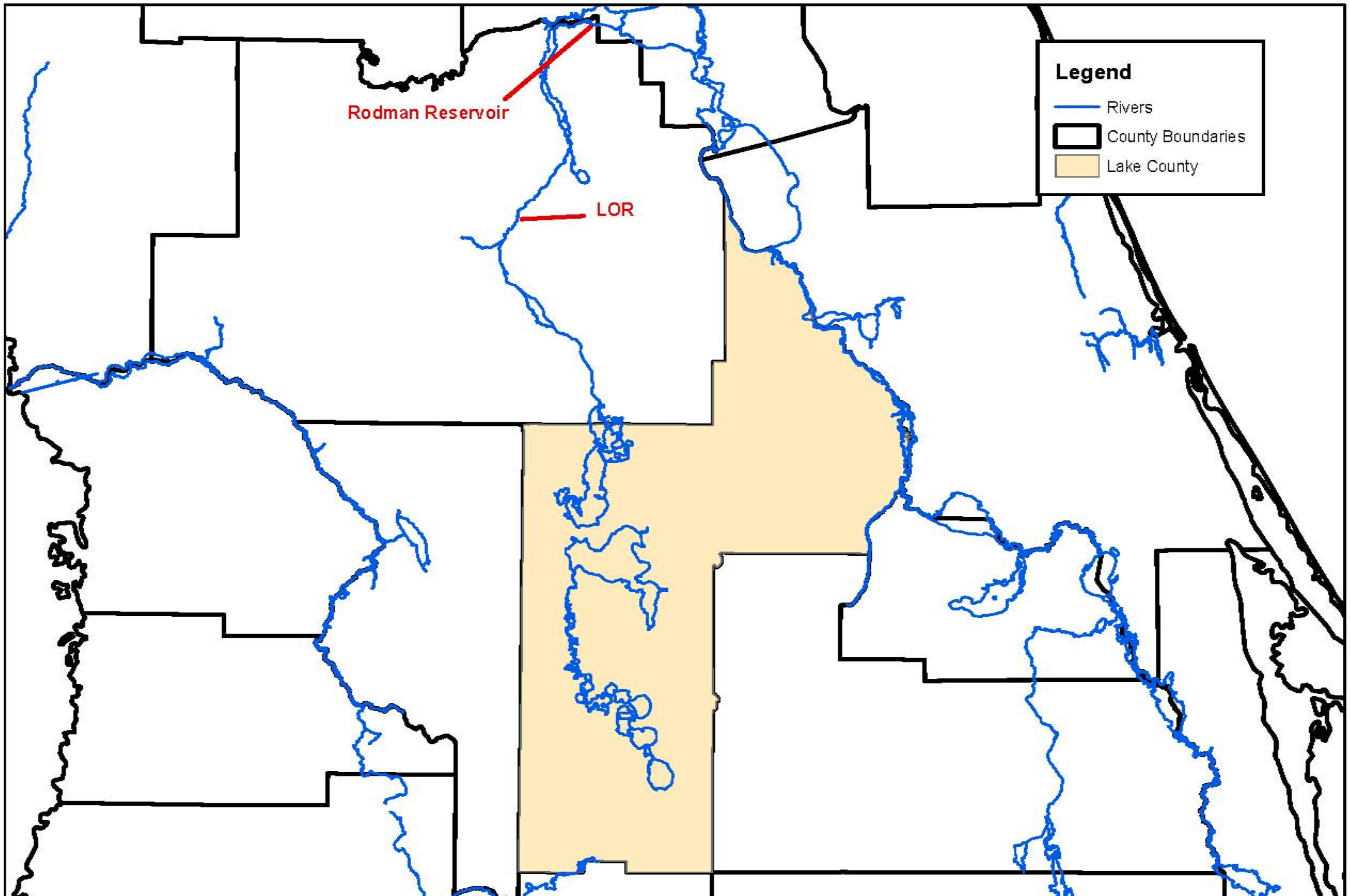

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Figure 3 - 2
Ocklawaha River Potential Alternate Water Supply Projects

ORIGINAL DATE: 04-24-07
REVISION DATE: N/A
JOB NUMBER: 0306
FILE NAME: Surfacewater Ockla.mxd
GIS OPERATOR: DR

N W E S
1 Inch = 65,000 Feet

3.1.2.3 Lower Ocklawaha River

The SJRWMD and WRAMS studies identified a potential high-water supply yield from this source. The SJRWMD suggested a yield of 100 to 107 mgd estimated for the Lower Ocklawaha River Basin (DWSP 2005). The WRAMS indicated a conservative range of 70 to 100 mgd. Both the SJRWMD and the WRAMS indicated the high potential for an alternate surface water supply below the confluence with Silver River. As stated in the DWSP 2005, Silver Springs is the largest spring in SJRWMD, with a long-term average discharge of about 876 mgd. It accounts for about 93% of spring discharge in the Ocklawaha River watershed and about 60% of the total outflow from Rodman Reservoir, located just upstream of the St. Johns River.

The water quality of the lower Ocklawaha River (LOR) is very good, due in large part to the substantial fresh groundwater contribution of Silver Springs. The water is always fresh and would require only conventional surface water treatment prior to transport and distribution. The combination of good raw water quality and significant base flow makes this an attractive candidate site for regional alternative surface water supply development. Neither expensive membrane treatment nor raw or finished water storage facilities would be required.

This alternative has been characterized by the SJRWMD as the following:

- Available Water Quantity – potentially 100 -107 mgd
- Water quality – good fresh water supply
- Intake location downstream of confluence with Silver River
- No off-line storage reservoir needed
- Transmission lines could run from Intake south into northern Lake County (about 28 miles) and then to major usage points within the County. Depending on the partners for this regional supply, the total distribution system could range from approximately 83 miles if developed by the County only to over 138 miles if Orange and/or Marion County joined as a partner.
- Key Cost Elements:
    - Treatment Capital and O&M Cost Low – Conventional Treatment
    - Transmission System Capital Cost Moderate
        - Total Unit Production Costs for the County will generally be reduced as more communities are added to the partnership for development.

3.1.3 Withlacoochee River Basin

The Withlacoochee Regional Water Supply Authority (WRWSA) Regional Water Supply Plan Update – 2005 (RWSPU) was recently completed. As part of this study, the RWSPU presented options for alternative water supplies as a means to meet future water needs.

The RWSPU characterizes and assesses the Withlacoochee River and its associated water bodies, including Lake Panasoffkee, Rainbow River, and Lake Rousseau, using a review of surface water flow and level records compared with the SWFWMD regulatory constraints. Although surface water source development may be limited somewhat by the establishment of MFL's, significant water supply yield is available in the major surface waters of the Withlacoochee River Basin.

The RWSPU highlights certain surface water supply projects. Five projects were reviewed for applicability for the County surface water supply. Figure 3-3 shows the general location of each of these projects listed below.

- Withlacoochee River at Trilby
- Lake Panasoffkee
- Withlacoochee River at Holder
- Rainbow River
- Lake Rousseau

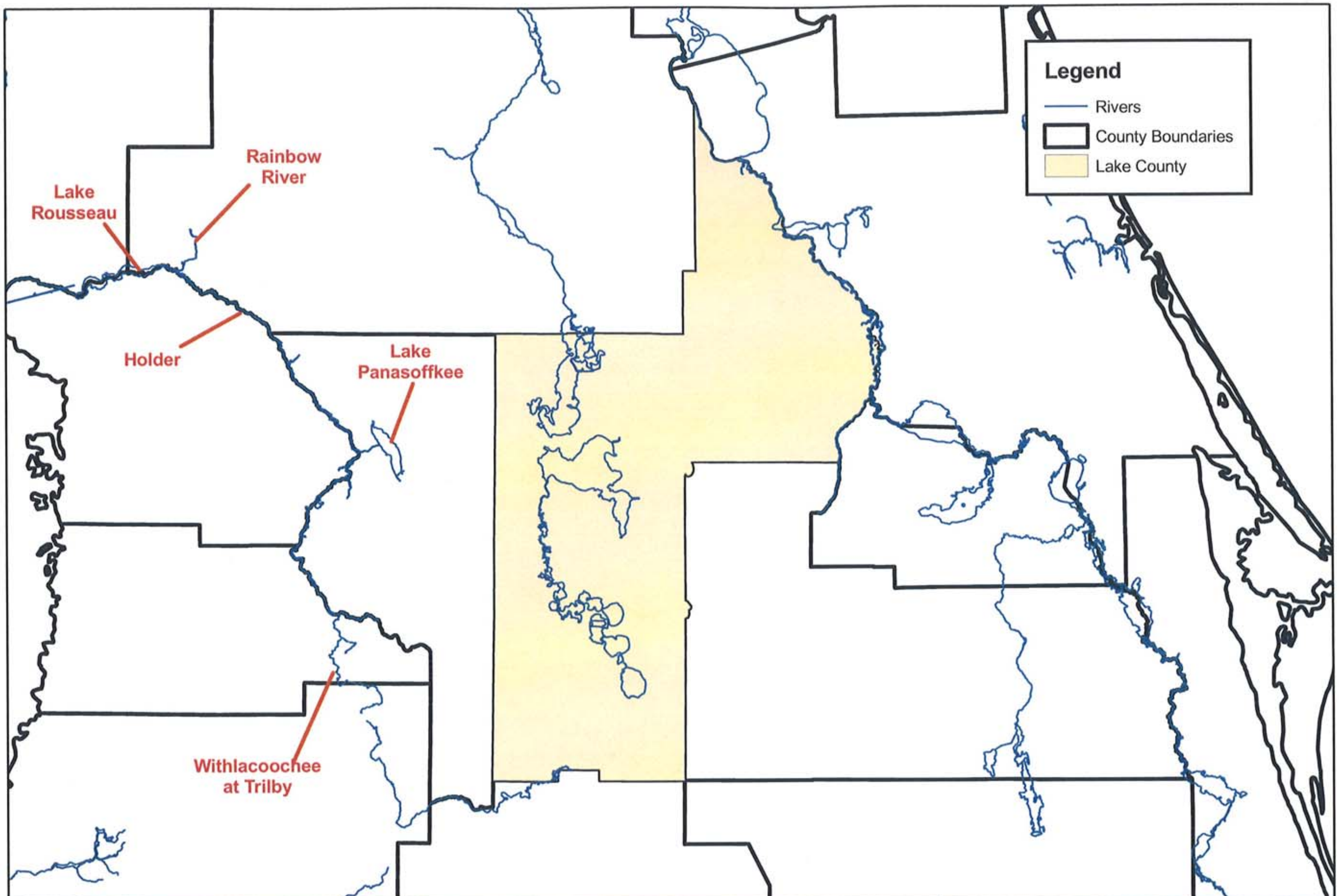
3.1.3.1 Withlacoochee River at Trilby

The Withlacoochee at Trilby has an estimated annual potentially available yield of 20 mgd, based on SWFWMD planning criteria. The historical flow distribution is skewed and extended low flow periods (covering both wet and dry seasons) are present. A carefully designed off-stream reservoir or blending with other sources will be needed to ensure the source's reliability. As such, the resource is available, but its reliability is questionable. MFLs scheduled for 2009 on the Upper Withlacoochee could change a potential withdrawal regime that is developed in the interim.

Development of the source is expected to require enhanced conventional treatment, an off-stream storage facility for reliability related to seasonal supply fluctuations, and potentially supplementation with other sources for reliability related to annual supply fluctuations. A transmission main approximately 40 miles long connecting to a countywide distribution system would also be needed.

This alternative has been characterized by the WRWSA as the following:

- Available Water Quantity – potentially 20 mgd
- Water quality – fresh water supply; high organic material loading and color due to extensive wetlands in basin
- Intake location near Trilby
- Off-line storage reservoir needed
- Transmission lines would run from Intake east into south-central Lake County (about 40 miles) and then to major usage points within the County.



Water Resource Associates, Inc. *Engineering ~ Planning ~ Environmental Science* 4260 West Linebaugh Avenue Phone: 813-265-3130 Fax: 813-265-6610 www.wraconsultants.com	PROJECT: 0407 - Lake County Water Alliance Figure 3 - 3 Withlacoochee Potential Alternative Water Supply Projects	ORIGINAL DATE: 04-24-07 REVISION DATE: N/A JOB NUMBER: 0306 FILE NAME: Srfc_Proj_Wthlcchee.mxd GIS OPERATOR: DR

N W E S

1 Inch = 65,000 Feet

- Key Cost Elements:
    - Treatment Capital and O&M Cost Moderate – Conventional Treatment
    - Distribution System Capital Cost Moderate

3.1.3.2 Lake Panasoffkee

Lake Panasoffkee represents the Withlacoochee River surface water location closest to the demand area in the County. Lake Panasoffkee is also anticipated to have superior raw water quality. Lake Panasoffkee has an estimated annual potentially available yield of 9 to 19 mgd. Future withdrawals may be dependent on a withdrawal schedule that may be connected to Lake Panasoffkee's adopted MFLs.

Both resource availability and reliability are questionable subject to more detailed analysis of the historic record and hydraulic relationships relative to MFLs. The source will probably require conventional treatment, but costs may increase if off-stream storage is required due to a restrictive withdrawal schedule. A transmission main approximately 13 miles long connecting to a countywide distribution system would also be needed.

This alternative has been characterized by the WRWSA as the following:

- Available Water Quantity – potentially 9 to 19 mgd; subject to MFLs
- Water quality – good fresh water supply
- Intake location closest to the County's demands
- Off-line storage reservoir not anticipated
- Transmission lines would run from Intake (assumed eastern side of Lake) into central Lake County (about 13 miles) and then to major usage points within the County.
- Key Cost Elements:
    - Treatment Capital and O&M Cost Low – Conventional Treatment
    - Distribution System Capital Cost Moderate

3.1.3.3 Withlacoochee River at Holder

The Withlacoochee River at Holder represents the river (i.e., USGS hydrologic gage) location closest to the demand area and existing infrastructure in northeast Citrus County. A transmission main approximately 40 miles long connecting to a countywide distribution system would also be needed.

The Withlacoochee at Holder has an estimated annual potentially available yield of 52 mgd based on SWFWMD planning criteria, and its middle location in the Withlacoochee Basin means a more even flow distribution. This potential yield far exceeds projected local demands, and flow does not appear to have ceased at Holder in the historical record. Although an off-stream reservoir or blending with other sources may be needed, resource availability and reliability are both present, and modern regulatory constraints on water supply development should maintain significant yield. An MFL scheduled for 2009 for the Middle Withlacoochee could alter a potential withdrawal regime that is developed in the interim.

This alternative has been characterized by the WRWSA as the following:

- Available Water Quantity – potentially 52 mgd
- Water quality – good fresh water supply
- Intake location near Holder
- Of-line storage reservoir may be needed
- Transmission lines would run from Intake east into northern Lake County (about 40 miles) and then to major usage points within the County. The total distribution system to support the County is approximately 95 miles.
- Key Cost Elements:
    - Treatment Capital and O&M Cost Low – Conventional Treatment
    - Distribution System Capital Cost Moderate
        - Total Unit Production Costs for the County will generally be reduced as more communities are added to the partnership for development.

3.1.3.4 Rainbow River

Rainbow River represents the Withlacoochee Basin (i.e., USGS hydrologic gage) location with the best raw water quality (similar to groundwater). Rainbow River has an estimated annual potentially available safe yield of 40 mgd based on SWFWMD planning criteria. This exceeds projected local demands, and the Rainbow River also has a very even flow distribution due to its groundwater source from Rainbow Springs. Resource availability and reliability are both present, and modern regulatory constraints on water supply development should maintain its yield. MFL's scheduled for 2008 may affect yield from the spring run.

Rainbow River offers strong resource availability and a good quality supply. Significant obstacles to its development for WRWSA and the County users will be its distance from demand areas, and permitting / siting issues associated with its exceptional scenic and recreational value. A transmission main approximately 50 miles long connecting to a countywide distribution system would also be needed.

This alternative has been characterized by the WRWSA as the following:

- Available Water Quantity – potentially 40 mgd
- Water quality – good fresh water supply
- Intake location near Rainbow River
- No off-line storage reservoir needed
- Transmission lines would run from Intake east into northern Lake County (about 50 miles) and then to major usage points within the County. The total distribution system to support the County is approximately 105 miles.
- Key Cost Elements:
    - Treatment Capital and O&M Cost Low – Conventional Treatment

  - Distribution System Capital Cost Moderate
    - Total Unit Production Costs for the County will generally be reduced as more communities are added to the partnership for development.

3.1.3.5 Lake Rousseau

Lake Rousseau represents the Withlacoochee Basin (i.e., USGS hydrologic gage) location with the highest available yield. It is also somewhat proximate to the demand area in northeast Citrus County. A transmission main approximately 50 miles long connecting to a countywide distribution system would also be needed.

Lake Rousseau has an estimated potentially available yield ranging from 87 to 98 mgd, far in excess of projected local demands. A slight reduction in yield could occur with environmental studies to return freshwater to the Lower Withlacoochee. However, resource availability, reliability, and longevity are present. Development of the source is expected to require enhanced conventional treatment.

This alternative has been characterized by the WRWSA as the following:

- Available Water Quantity – potentially 87 to 98 mgd
- Water quality – good fresh water supply
- Intake location near Rainbow River
- No off-line storage reservoir needed
- Transmission lines would run from Intake east into northern Lake County (about 50 miles) and then to major usage points within the County. The total distribution system to support the County is approximately 105 miles.
- Key Cost Elements:
  - Treatment Capital and O&M Cost Low – Conventional Treatment
  - Distribution System Capital Cost Moderate
    - Total Unit Production Costs for the County will generally be reduced as more communities are added to the partnership for development.

3.2 Lake County Alternative Surface Water Supply Screening

The future water supply source identification process requires an evaluation of potential sources to prioritize and focus future water supply development. A preliminary screening of the readily identifiable surface water supply alternatives has been conducted. This screening process compares in broad terms the 11 alternative supply options against eight (8) categories, with the intent of eliminating from further consideration those options that do not have a high probability of value for the County. Figure 3-4 shows the location of the 11 projects considered feasible for Lake County.

These new source projects are graded relative to their general feasibility for supply development, using a qualitative evaluation matrix. This feasibility evaluation matrix contains eight (8) categories, which are described in detail in Table 3-1. These categories include:

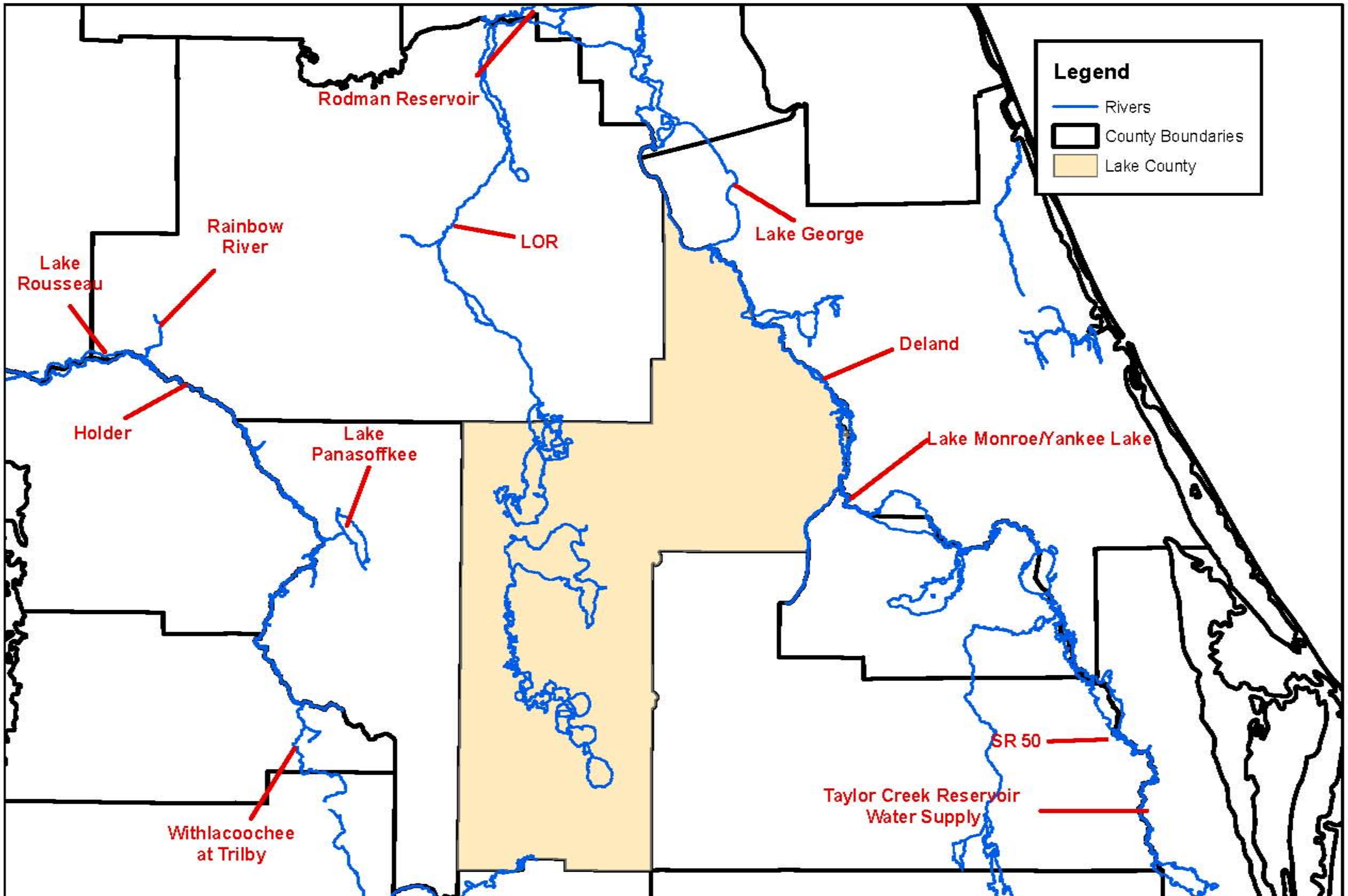


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Figure 3 - 4
Lake County Potential Alternative Water Supply Projects

ORIGINAL DATE: 04-24-07
REVISION DATE: N/A
JOB NUMBER: 0306
FILE NAME: All Surfwater projects.mxd
GIS OPERATOR: DR

Table 3-1

Lake County Surface Water Supply Evaluation Criteria

Evaluation Information	
Criteria Categories	**Grading Explanation**
1. Resource Availability, Reliability, and Longevity - This criterion relates to the quantity of water available for treatment, relative to projected demands. It includes the probability of long term availability without resulting in system or withdrawal termination. It considers the characteristics of the hydrogeology and/or surface water resources.	C - Significant negative water quantity or supply variability issues B - Few negative water quantity or supply variability issues A - No negative water quantity, variability, or resource issues
2. Raw Water Quality- This criterion is based on assessment of the raw water quality and the level of treatment expected for the intended water use. It also considers the compatibility for treatment for use in a blended system, and the potential for long-term degradation of source water quality.	C - Enhanced conventional-type treatment likely (e.g. high rate clarification, brackish reverse osmosis), or a reasonable possibility of future source degradation B - Conventional-type treatment likely (e.g. complete filtration, membrane softening) A - Limited treatment likely (e.g. lime softening)
3. Permittability - This criterion assesses the probability of complying with current rules and regulations of the applicable agencies, including permits for water use and environmental resources. It also includes the probability of being compatible with other existing legal users of water, and compatibility with minimum flows and levels.	C - Difficult to permit due to various regulatory reasons or local government opinion B - Permitting will follow normal permitting course with few issues A - Permitting will follow normal permitting course and likely will be supported by local governments and the WMDs
4. Environmental Compatibility - This criterion considers the potential environmental impacts or benefits of developing the supply at the given location, including disposal of wastes generated in the treatment process. It includes the impacts to the environment, groundwater, surface water flows, and downstream resources. Minimum flows and levels and stressed lakes will be considered. This criterion does not include environmental impacts from a specific construction footprint.	C - Reasonable likelihood of significant adverse environmental impacts B - Low likelihood of significant adverse environmental impacts A - No likelihood of significant adverse environmental impacts
5. Cost - This criterion includes evaluation of the facility's anticipated design, treatment, and storage requirements. It also includes construction time, need for transmission lines and interconnections, waste disposal needs, and facility operations and maintenance. It is relative to other new supply alternatives under consideration.	D - Very high anticipated costs from alternative treatment technologies (e.g., brackish water) and transmission needs C - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and transmission needs B - Moderate anticipated costs resulting from conventional treatment or transmission needs A - Low anticipated costs due to good source quality and limited transmission needs

Table 3-1 Lake County Surface Water Supply Evaluation Criteria	
Evaluation Information	
Criteria Categories	**Grading Explanation**
6. Additional Funding - This criterion includes expected project eligibility for acquiring funding from sources other than the Lake County Alliance or its members (primarily the Florida Water Protection and Sustainability Program).	C - Low chance of gaining outside funding B - Reasonable chance of gaining outside funding A - High chance of gaining outside funding
7. Compatibility with Cooperative Regional Water Supply Development - This criterion includes an evaluation of the project relative to regional water supply viability and potential for partnerships	C - Generally uncompatible with Regional Water Supply Development due to a number of factors (capacity, usage variability) B - Somewhat compatible with Regional Water Supply Development, Partners outside Lake County not identified A - Compatible with Regional Water Supply Development, Potential Partners outside Lake County identified
8. Location - This criterion assesses the proximity of the anticipated project area to water demand area(s).	C - Project area is significantly distant from Lake County demand areas (greater than 40 miles) B - Project area is reasonably proximate to demand areas, but not ideally located (between 10 and 40 miles) A - Project area is in close proximity to demand areas (less than 10 miles)
OVERALL GRADE:	C - Project is not recommended for further consideration B - Project is recommended for further consideration with qualifications A - Project is recommended for further consideration

1. Resource Availability, Reliability, and Longevity;
2. Raw Water Quality;
3. Permittability;
4. Environmental Compatibility;
5. Cost;
6. Additional Funding;
7. Compatibility with Cooperative Regional Water Supply Development; and
8. Location.

The results of the preliminary screening process are illustrated on Table 3-2 and Figure 3-5. Two alternatives scored an overall Grade A and four additional alternatives were scored as Grade B. These six alternatives are considered the most probable viable sources of alternate surface water for the County. Consequently, a more detailed evaluation of these alternatives will be conducted during the next phase of work. The six projects include:

- St. Johns River Yankee Lake Project
- Lower Ocklawaha River (LOR) – (below confluence with Silver River)
- St. Johns River Near DeLand
- Lake Panasoffkee
- Withlacoochee River at Holder
- Withlacoochee River at Lake Rousseau

The remaining five alternative projects are not proposed for more detailed evaluation. Two St. Johns River projects were eliminated due to the significant distance and associated cost for transmission lines to convey treated surface water to the County (Grade D). The remaining alternatives with a Grade C were eliminated since there appears to be more viable alternatives within each of the River basins, when compared to these options.

3.3 Preliminary Order-of-Magnitude Cost Comparison

The SJRWMD has previously identified three of the six surface water alternative projects that passed the initial screening step as viable for the County: SJR Yankee Lake, SJR DeLand, and the Lower Ocklawaha River. The SJRWMD has further evaluated (second tier screening) these three alternatives and has prepared planning level cost estimates to better quantify the relative Unit Production Cost (cost per 1000 gallons) delivered. The planning level costs included both order-of-magnitude total capital cost (includes construction costs for treatment and transmission mains, non-construction capital costs, land costs, and land acquisition costs), operation and maintenance cost, equivalent annual cost, and unit production cost. The basis for these planning level estimates is documented in the SJRWMD DWSP 2005.

Table 3-2

Lake County Surface Water Supply Alternatives

	St John's River					Ocklawaha River	Withlacoochee River				
General Characteristics	Near SR 50	Yankee Lake	Near Deland	Near Lake George	Taylor Creek Reservoir	Lower Reach - Below Confliuence with Silver River	Near Trilby	Lake Panasoffkee	Near Holder	Rainbow River	Lake Rousseau
Available Water Quantity (MGD)	94 - 127	116	94 - 127	33	25 -40	100 - 107	20	9 - 19	52	40	87 - 98
Water Quality	Brackish	Brackish	Brackish	Brackish	Fresh	Fresh	Fresh	Fresh	Fresh	Fresh	Fresh
Criteria Categories											
1. Resource Availability, Reliability, and Longevity	B	A	B	C	B	A	B	C	A	A	A
2. Raw Water Quality	C	C	C	C	B	A	C	B	B	A	B
3. Permittability	B	A	B	C	A	A	B	C	A	C	B
4. Environmental Compatibility	B	B	B	B	A	A	B	B	B	B	B
5. Cost	D	B	B	C	D	B	C	A	B	B	C
6. Additional Funding	B	A	B	B	A	A	B	B	A	C	B
7. Compatibility with Cooperative Regional Water Supply Development	B	A	B	B	B	A	C	B	A	B	A
8. Location	C	A	B	C	C	B	B	B	B	C	C
OVERALL GRADE:	**D**	**A**	**B**	**C**	**D**	**A**	**C**	**B**	**B**	**C**	**B**

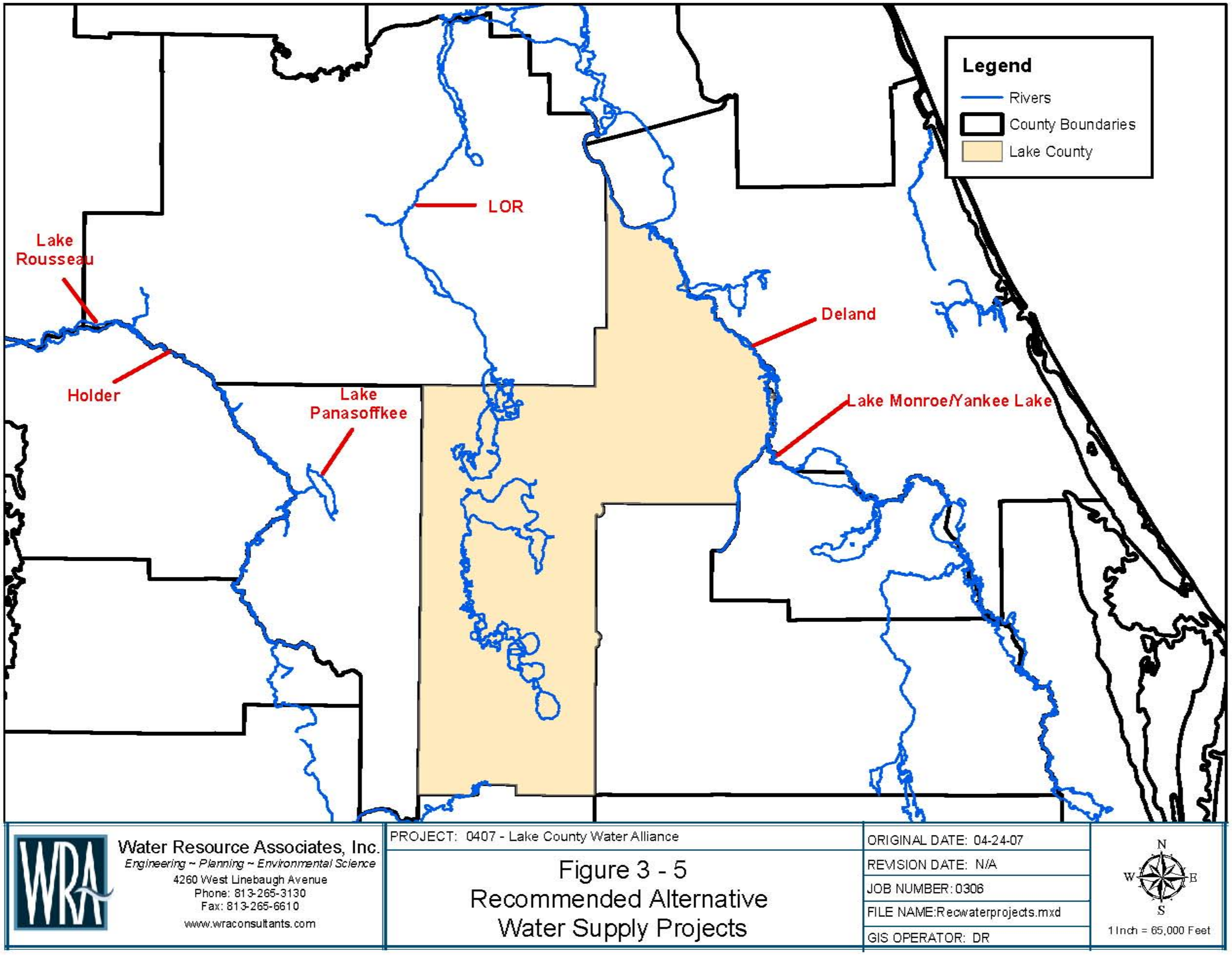


Figure 3 - 5
Recommended Alternative
Water Supply Projects

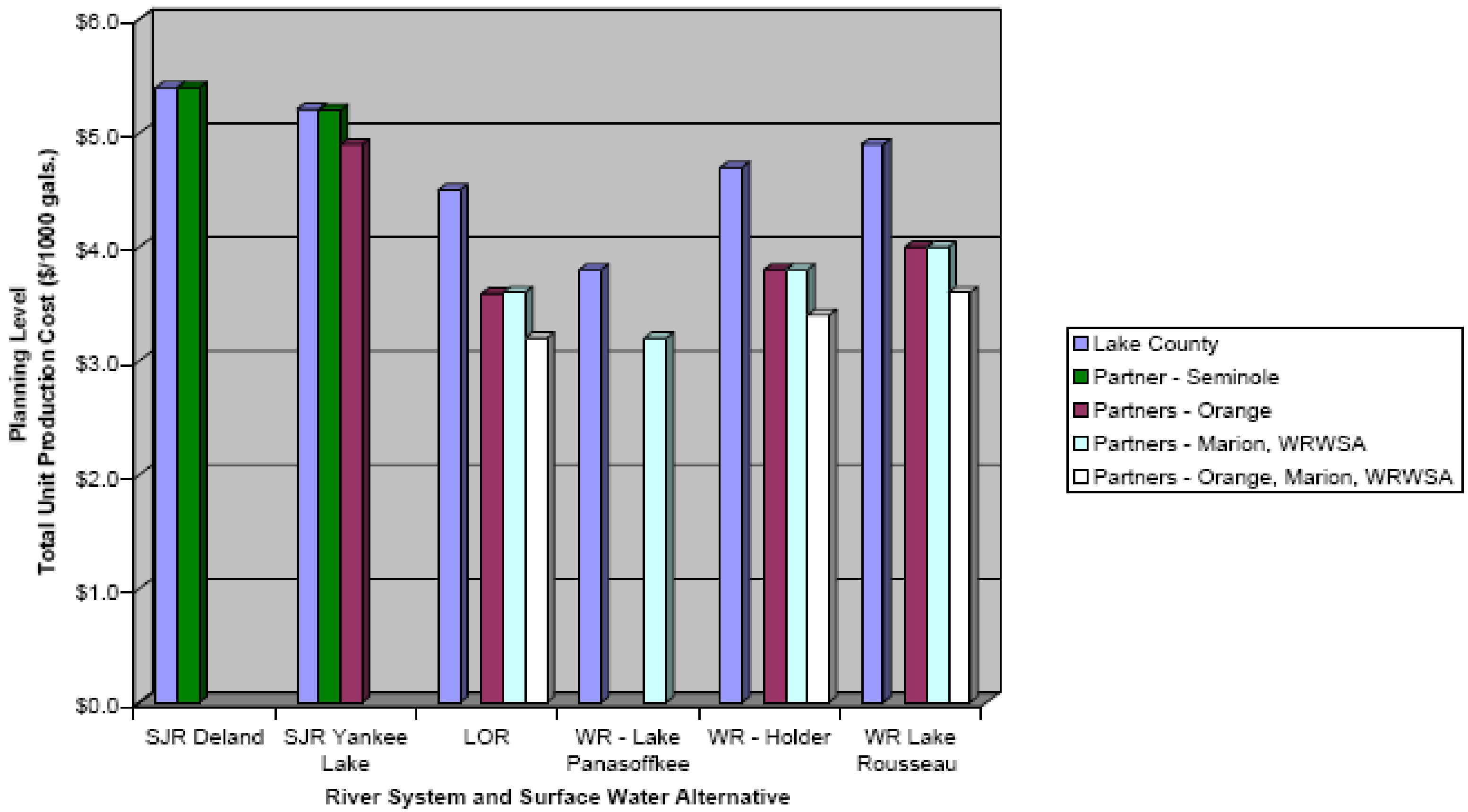
More recently, the SJRWMD has updated the cost factor (using Engineering News Record escalation indices) to provide the alternative source comparison in 2006 dollars. The SJRWMD also expanded the analysis to include partnership options with Lake County and Orange County. Presentations made by the SJRWMD to the Lake County Alliance have illustrated these 2006 order-of-magnitude cost comparisons.

In order to provide a direct means of comparison between the Yankee Lake, DeLand, and Lower Ocklawaha projects identified by the SJRWMD with the three alternative projects identified along the Withlacoochee River, similar planning level estimates have been generated. Within the context of the broad assumptions made by the SJRWMD in development of the order-of-magnitude estimates, the Total Unit Production costs for the Withlacoochee River Alternative Surface Water Supply options have been generated. The regional development concept has also been adopted, with both Marion County and the WRWSA being added to Orange County as potential partnering members. For this comparison, it is assumed that the County would develop the SJR DeLand alternative without partners; the SJR Yankee Lake project could include Orange County, Lake Panasoffkee could include both the WRWSA and Lake County; and the remaining Lower Ocklawaha River and Withlacoochee River alternatives could include Orange County, Marion County, and the WRWSA. Figure 3-6 graphically displays the comparison of each alternative and the impact of developing partnerships in the development of these surface water alternatives.

It is emphasized that these order-of-magnitude planning estimates only provide a means to understand the general development costs for the treatment process and transmission lines on the overall Unit Production Cost and, more importantly, the impact of partnerships. Recognizing the broad assumptions used result in order-of-magnitude cost comparisons, there are some important concepts that do emerge for the County based on this data.

- Treatment costs for a fresh water supply (Lower Ocklawaha and Withlacoochee Rivers) is much more efficient than a brackish water supply
- The length of transmission line to convey treated water to the areas of need is an important component of the overall capital cost
- The overall unit production cost to the Lake County Alliance is reduced as the number of partners to share the burden of cost is increased

Figure 3-6
Lake County Alternatives
Preliminary Comparison of Unit Production Costs



4.0 Readily Available Reuse Projects

As the population in Lake County increases, so does the opportunity for applying reuse water to offset traditional water supplies. There are many planned projects for reclaimed water facilities in the County identified in the SJRWMD DWMP. Refer to Table 2-5 for a summary on these projects. In addition to the projects listed in the DWSP, communication with Alliance members or data included in the SJRWMD CUP Technical Staff Reports (TSR) were included where it appears that this information was not part of the SJRWMD DWSP. Since these projects were compiled from a variety of sources, they may not reflect current capital improvement plans. Therefore, it is essential that all these projects be reviewed by Alliance Members to ensure accuracy and completeness before proceeding to the more detailed infrastructural analysis of existing facilities and identification of potential regional reuse projects. Below is a brief description of each of these projects that was compiled from the Program Overview (SJRWMD Water Protection 2006), DWSP, and communication with Alliance Members.

- <u>Clermont Reclaimed and Stormwater System Expansion Project</u>

  This project will provide cost-share funding for three subprojects. The first subproject will transfer flow to the East Side Water Resource Facility and increase the supply of reclaimed water available to area customers. The reclaimed water demand is projected to increase to 3.4 mgd by 2010 (SJRWMD Water Protection 2006).

- <u>Clermont Western WWTF – Conversion to Reuse Production</u>

  This project is one option that would convert the WWTF to a reclaimed water production facility which would produce effluent treated to public access standards and supply irrigation water to the Green Valley Country Club golf course 3 miles west of the City (Clermont CUP TSR, 2002).

- <u>Clermont Western WWTF – Flow Diversion to Eastern WWTF</u>

  This project is the second option for the Western WWTF, and involves abandoning the plant and sending all wastewater flows to the East WWTF which is being expanded (Clermont CUP TSR, 2002).

- <u>Clermont and City of Orlando Partnership</u>

  The City is continuing to work with the City of Orlando and Orange County to bring excess reclaimed water from the Conserv II project for irrigation to customers within the City service area (Clermont CUP TSR, 2002).

- Eustis Reclaimed Water System Expansion and Augmentation Project

  This project will provide cost-share funding to increase the reuse capacity of the Eastern Wastewater Treatment Plant and to provide transmission lines to proposed developments (SJRWMD Water Protection 2006).

- Groveland Expansion of Existing WWTF and addition of New WWTFs

  Two new plants going on line in the coming weeks. Both the Northern and Southern WWTFs will serve residential customers. Plant expansion of existing WWTF is planned and will serve a subdivision once complete (Walker, 2007).

- Lady Lake Reclaimed Water System Project, Phase II

  This project will provide cost-share funding to the City of Lady Lake that will manage construction of the project. This project will include installing a reclaimed water transmission main and effluent filtration at the WWTP (SJRWMD Water Protection 2006). Reuse lines will be extended along the commercial corridor (State Road 466). Projections from Lady Lake indicate it will produce approximately 0.5 mgd gpd of public access reuse beginning in 2008, which will increase to 3.6 mgd by 2026 (Keough 2007).

- Lake Utility Services Lake Groves WWTF Reclaimed Water System Expansion

  This project will provide cost-share funding to Lake Utility Services for the construction of upgrades to expand the Lake Groves wastewater treatment facility (WWTF). The upgrade will produce the capacity of 1 mgd and will provide for facilities to store and pump the effluent (SJRWMD Water Protection 2006).

- Leesburg Reclaimed Water Reuse Project

  This project will provide cost-share funding to the city of Leesburg that will manage construction of the project, which will improve wastewater treatment and expand the reclaimed water facilities. The reclaimed water system will have a capacity of 6.5 mgd. The wastewater treatment upgrades at the Canal Street (at a capacity of 3.5 mgd) and Turnpike (at a capacity of 3.0 mgd) wastewater treatment facilities are those needed to achieve the reclaimed-water level of treatment (SJRWMD Water Protection 2006).

- Minneola Reclaimed Water Reuse Project

  This project will provide cost-share funding to the city of Minneola that will manage construction of the project, which will provide for 0.5 mgd (expansion capacity to 1 mgd). The project will include the reclaimed water treatment system at the WWTP, on-site rapid infiltration basins, and about 14,000 linear feet of reclaimed water transmission main, valves, and accessories (SJRWMD Water Protection 2006).

- Mount Dora Reuse Expansion Project

  A future reuse plant is to be completed in the city's expansion area within Orange County. Planned reuse connections for common areas will remove approximately 61 acres from the potable landscape irrigation water demand from 2005 to 2009 (Mount Dora CUP TSR 2005).

- Country Club Golf Course Reclaimed Water Project

  No narrative description of this project was found. Associated planning details are listed in Table 2-4.

- Tavares Reclaimed Water System Expansion Project

  This project will provide cost-share funding to expand a transmission line to extend water service to Lake Harris Reserve, Lane Park Ridge, Foxborough, Martin's Grove, and Oak Bend (SJRWMD Water Protection 2006). Irrigation will be supplied for 10 acres of turf grass at the Woodlea Road Sports Complex (Tavares CUP TSR 2004).

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Appendix 1

62-550.310 Primary Drinking Water Standards: Maximum Contaminant Levels and Maximum Residual Disinfectant Levels.

(These standards may also apply as ground water quality standards as referenced in Chapter 62-520, F.A.C.)

(1) INORGANICS – Except for nitrate and nitrite, which apply to all public water systems, this subsection applies to community water systems and non-transient non-community water systems only.

(a) The maximum contaminant levels for the inorganic contaminants are listed in Table 1, which is incorporated herein and appears at the end of this chapter.

(b) The maximum contaminant level for nitrate (as N) applicable to transient non-community water systems is 10 milligrams per liter. The Department or Approved County Health Department shall allow a contaminant level for nitrate (as N) of up to 20 milligrams per liter upon a showing by the supplier of water that the following conditions are met:

1. The water distributed by the water system is not available to children under 6 months of age or to lactating mothers, and

2. There is continuous public notification of what the nitrate level (as N) is and what the potential health effects of such exposure are.

3. The Department shall require monitoring every 3 months as long as the maximum contaminant level is exceeded. Should adverse health effects occur, the Department shall require immediate compliance with the maximum contaminant level for nitrate (as N).

(c) The revised maximum contaminant level of 0.010 mg/L for arsenic becomes effective January 1, 2005. All community and non-transient non-community water systems shall demonstrate compliance with the revised maximum contaminant level by December 31, 2007.

(2) DISINFECTANT RESIDUALS – Except for the chlorine dioxide maximum residual disinfectant level, which applies to all public water systems using chlorine dioxide as a disinfectant or oxidant, this subsection applies only to community or non-transient non-community water systems adding a chemical disinfectant to the water in any part of the drinking water treatment process. Maximum residual disinfectant levels (MRDLs) are listed in Table 2, which is incorporated herein and appears at the end of this chapter.

(3) DISINFECTION BYPRODUCTS – This subsection applies to all community or non-transient non-community water systems adding a chemical disinfectant to the water in any part of the drinking water treatment process. The Stage 1 maximum contaminant levels (MCLs) for disinfection byproducts are listed in Table 3, which is incorporated herein and appears at the end of this chapter.

(4) ORGANICS – This subsection applies only to community water systems and non-transient non-community water systems.

(a) The maximum contaminant levels for the volatile organic contaminants (VOCs) are listed in Table 4, which is incorporated herein and appears at the end of this chapter. The regulatory detection limit (RDL) for all VOCs is 0.0005 mg/L.

(b) The maximum contaminant levels and the regulatory detection limits (RDLs) for the synthetic organic contaminants (SOCs) are listed in Table 5, which is incorporated herein and appears at the end of this chapter.

(5) MICROBIOLOGICAL – This subsection applies to all public water systems. Monitoring requirements to demonstrate compliance with this subsection are defined in Rule 62-550.518, F.A.C.

(a) The maximum contaminant level is based on the presence or absence of total coliforms in a sample, rather than coliform density. For the purposes of the public notice requirements in Rule 62-560.410, F.A.C., a violation of the standards in this paragraph poses a non-acute risk to health.

1. For a system which collects at least 40 samples per month, if no more than 5.0 percent of the samples collected during a month are total coliform-positive, the system is in compliance with the maximum contaminant level for total coliforms.

2. For a system which collects fewer than 40 samples per month, if no more than one sample collected during a month is total coliform-positive, the system is in compliance with the maximum contaminant level for total coliforms.

(b) Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or *E. coli*-positive routine sample is a violation of the maximum contaminant level for total coliforms. For the purposes of the public notification requirements in Rule 62-560.410, F.A.C., this is a violation that poses an acute risk to health.

(c) A public water system shall determine compliance with the maximum contaminant level for total coliforms in paragraphs (a) and (b) of this subsection for each month (or quarter for transient non-community water systems that use only ground water not under the direct influence of surface water and that serve 1,000 or fewer persons) in which it is required to monitor for total coliforms.

(6) RADIONUCLIDES – This subsection applies only to community water systems. The following are the maximum contaminant levels (MCLs) and regulatory detection limits (RDLs) for radionuclides:

(a) Naturally occurring radionuclides:

MAXIMUM CONTAMINANT LEVELS
FOR RADIONUCLIDES

CONTAMINANT	MAXIMUM CONTAMINANT LEVEL
Combined radium226 and radium228	5 pCi/L
Gross alpha particle activity including radium226 but excluding radon and uranium	15 pCi/L
Uranium	30 ug/L

pCi/L = picoCuries per liter
ug/L = micrograms per liter

(b) Man-made radionuclides:

1. The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the body or any internal organ greater than 4 millirem/year.

2. Except for those radionuclides listed below, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data list in "Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure," NBS Handbook 69 as amended August 1963, U. S. Department of Commerce.

Average Annual Concentration Assumed to Produce
an Exposure of 4 millirem/year:

RADIONUCLIDE	CRITICAL ORGAN	pCi/L
Tritium	total body	20,000
Strontium90	bone marrow	8

pCi/L = picoCuries per liter

3. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 millirem/year.

(c) For the purposes of monitoring for gross alpha particle activity, radium-226, radium-228, uranium, and beta particle and photon radioactivity in drinking water, the following regulatory detection limits shall be used:

CONTAMINANT	REGULATORY DETECTION LIMIT
Gross alpha particle activity	3 pCi/L
Radium-226	1 pCi/L
Radium-228	1 pCi/L
Uranium	1 ug/L
Tritium	1,000 pCi/L
Strontium-89	10 pCi/L
Strontium-90	2 pCi/L
Iodine-131	1 pCi/L
Cesium-134	10 pCi/L
Gross beta	4 pCi/L
Other radionuclides	1/10 of the applicable limit

pCi/L = picoCuries per liter
ug/L = micrograms per liter

Specific Authority 403.861(9) FS. Law Implemented 403.852(12), 403.853(1) FS. History–New 11-19-87, Formerly 17-22.210, Amended 1-18-89, 5-7-90, 1-3-91, 1-1-93, 1-26-93, 7-4-93, Formerly 17-550.310, Amended 9-7-94, 8-1-00, 11-27-01, 4-14-03, 4-25-03, 11-28-04.

Secondary Drinking Water Standards

No adverse health effects are generally associated with the secondary drinking water contaminants. At considerably higher concentrations than those listed in the standards, health implications may exist as well as aesthetic degradation.

Contaminant	**Allowed Level**
Aluminum	0.2 mg/L
Chloride	250 mg/L
Copper	1 mg/L
Flouride	2.0 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Silver	0.1 mg/L
Sulfate	250 mg/L
Zinc	5 mg/L
Color	15 color units
Odor	3 (threshold odor number)
pH	6.5 – 8.5
Total Dissolved Solids	500 mg/L
Foaming Agents	0.5 mg/L

Appendix 2

62-610.410 Waste Treatment and Disinfection.
(1) For all slow-rate systems involving irrigation of sod farms, forests, fodder crops, pasture land, or similar areas where it is intended that public access shall be restricted, preapplication waste treatment shall result in reclaimed water meeting, at a minimum, secondary treatment and basic disinfection levels before the land application.
(2) Systems using subsurface application systems shall be subject to the following additional limitation on TSS.
The reclaimed water shall contain not more than 10 mg/L of TSS at all times, unless the application system has been designed top rovide specific flexibility and reliability in operation and maintenance of the system. The Department shall approve alternatives to the specified TSS limitation if the applicant provides reasonable assurances in the engineering report that the alternative control measures will ensure non-clogging of the system.

62-610.460 Waste Treatment and Disinfection.
(1) Preapplication waste treatment shall result in a reclaimed water that meets, at a minimum, secondary treatment and high-level disinfection. The reclaimed water shall not contain more than 5.0 milligrams per liter of suspended solids before the application of the disinfectant.

62-610.610 Waste Treatment and Disinfection.
(2) Preapplication treatment processes shall produce an effluent prior to discharge to holding ponds or to the application/distribution system containing not more than 40-60 mg/L of CBOD5 and 40-60 mg/L of TSS, and meeting the low-level disinfection criteria of 2400 fecal coliforms per 100 mL. Additional treatment may also be required as a result of the hydraulic loading rate, and surface runoff control provisions contained below.

62-600.420 Minimum Treatment Standards - Technology Based Effluent Limitations (TBELs).
(1) Secondary Treatment.
(a) Surface water disposal (excluding ocean outfalls).
All domestic wastewater facilities are required, at a minimum, to provide secondary treatment of wastewater. New facilities and modifications of existing facilities shall be designed to achieve an effluent after disinfection containing not more than 20 mg/L CBOD5 and 20 mg/L TSS, or 90% removal of each of these pollutants from the wastewater influent, whichever is more stringent. All facilities shall be operated to achieve, at a minimum, the specified effluent limitations (20 mg/L). All facilities shall be subject to provisions of Rule 62-600.110, F.A.C., regarding the applicability of the above requirements, and Rules 62-600.440, 62-600.445 and 62-600.740, F.A.C., regarding compliance with these requirements. Appropriate disinfection and pH control of effluents shall also be required.

62-600.740 Reporting, Compliance, and Enforcement.
(1) Operational Criteria.
- 465
(a) General.
1. The Department may establish facility compliance, or noncompliance, with the waste treatment standards of this rule using the information submitted pursuant to self-monitoring operational reports required by Chapter 62-601, F.A.C. For such evaluations, the appropriate reclaimed water or effluent compliance concentrations contained in paragraph 62-600.740(1)(b), F.A.C., shall be applicable. Whenever the Department uses the results of a year's operational reports, the annual reclaimed water or effluent compliance concentrations given in paragraph 62-600.740(1)(b), F.A.C., shall be used for compliance determinations. The annual concentrations obtained from self-monitoring operational reports shall be the average of data from consecutive reporting periods (whether daily, monthly, quarterly, or any other basis) which collectively comprise one year; additional compliance determinations may be made for each successive sampling period.
a. For pollutants which are required to be sampled on a semimonthly or more frequent basis (per Chapter 62-601, F.A.C.), all reclaimed water or effluent compliance concentrations shall be applicable. The semimonthly evaluation shall be based upon the concentration limitation specified for a weekly determination.

b. For pollutants which are required to be sampled on a monthly, quarterly (or less frequent basis), the monthly concentration limitation shall be used as the compliance standard. The annual (as established in subparagraph 62-600.740(1)(a)1., F.A.C.) and maximum-permissible levels shall also be applicable.
2. The Department may also take enforcement action based on its own sample collection activities using any of the annual, monthly, weekly, or maximum-permissible operating criteria specified in paragraph 62-600.740(1)(b), F.A.C. Use of such data shall not preclude enforcement action pursuant to the provisions of this or any other chapter of the Florida Administrative Code. The use of grab or composite samples for evaluating annual, monthly or weekly compliance shall be generally consistent with grab or composite sampling technique (as opposed to sample scheduling) requirements of Chapter 62-601, F.A.C., for the specific permitted capacity of the treatment plant at issue. Maximum-permissible concentrations shall be established by grab sampling due to the transient nature of maximum concentrations; it is expected that such samples will be collected during periods of minimal treatment plant pollutant removal efficiencies or maximum organic loading in the reclaimed water or effluent. Maximum-permissible concentrations are not intended to be representative of average daily conditions of the treatment plant effluent or reclaimed water; grab samples need not be taken at any set time or flow, but the actual time and flow conditions during which such samples are taken shall be recorded.
3. Nothing in this or any other rules of the Florida Administrative Code shall preclude the use, by the Department, of additional or more representative sampling data in establishing compliance status.
(b) Reclaimed Water or Effluent Compliance Concentrations. The applicability of the reclaimed water or effluent compliance concentrations contained below to all facilities shall depend on the treatment requirements referenced, pursuant to Rule 62-600.110, F.A.C.
1. In order to determine compliance of a domestic wastewater facility with the secondary treatment standards specified in paragraph 62-600.420(1)(a), F.A.C., the following operational criteria shall be applicable.
a. The arithmetic mean of the CBOD5 or TSS values for the reclaimed water or effluent samples collected (whether grab or composite technique is used) during an annual period, as described in this section, shall not exceed 20 mg/L.
b. The arithmetic mean of the CBOD5 or TSS values for a minimum of four reclaimed water or effluent samples each collected (whether grab or composite technique is used) on a separate day during a period of 30 consecutive days (monthly) shall not exceed 30 mg/L.
c. The arithmetic mean of the CBOD5 or TSS values for a minimum of two reclaimed water or effluent samples each collected (whether grab or composite technique is used) on a separate day during a period of 7 consecutive days (weekly) shall not exceed 45 mg/L.
d. Maximum-permissible concentrations of CBOD5 or TSS values in any reclaimed water or effluent grab sample at any time shall not exceed 60 mg/L.
2. In order to determine compliance

Lake County Water Supply Plan

Technical Memorandum #3

September 2007

FINAL

Prepared by

Water Resource Associates

1.0 Potable Water Demand – Public Supply and Domestic Self-Supply

1.1 Population Projections Introduction

With the burgeoning population growth throughout Lake County and the surrounding region, meeting demand for potable water becomes a challenging prospect. Population projections, and associated per capita water use rates, ultimately form the foundation for projected water demands. This technical memorandum explores projected populations, per capita rates, and water demand estimates. It also offers information on cost effective techniques to potentially reduce water demands through more aggressive conservation practices, and the use of reuse water to offset potable water used for irrigation purposes.

The population projections that were gathered and reviewed are from various sources, developed for specific purposes. This task required an examination of existing documents provided by the Alliance Members in addition to projections developed by the SJRWMD. Population projections were not developed independently for this Technical Memorandum. The review that follows includes evaluations that:

- Determine and assess methods used in the population projections;
- Assess differences in methodologies;
- Explain differences in population projections based on the available data;
- Address any shortcomings in projections; and
- Assess safety factors used in estimates (bracket potential range of projections).

1.2 Comparison of Municipal and Countywide Projections

Comparisons of Alliance Member demands to population estimates performed by the SJRWMD and Lake County are summarized in Tables 1-1 and 1-2 and Figure 1-1. The latest common projection year is 2025, so comparisons are made for projections in this year. A description of the population projections analyzed is as follows:

GIS Associates prepared population projections for purposes of updating the draft 2008 St. Johns Water Management District (SJRWMD) Water Supply Assessment. These projections were developed using a site specific analysis that included existing land use, future land use designations, and some site development constraints, among other factors. The population was allocated based on the total 2007 county-wide population of 519,395, which is consistent within 1% of the BEBR average medium-high 2025 projections.

<u>Lake County Comprehensive Plan</u>
Lake County prepared population projections for the update of the Comprehensive Plan. These projections addressed unincorporated Lake County and the municipalities. Lake County noted that the Lake-Sumter Metropolitan Planning Organization (MPO) used the same projections for the Long Range Transportation Plan. Unincorporated Lake County projections were based on the University of Florida's Bureau of Economic and Business Research (BEBR) 2004 medium-high projections. Lake County determined that these projections closely paralleled the County's own projections, which were based primarily on development order activity. The projections

were reviewed and approved by the Florida Department of Community Affairs in 2005. The Comprehensive Plan population projections calculated municipal population growth for two four-year periods: 1999 – 2003 and 2000 – 2004. The County took the average of those two calculations. It assumed that for the years 2005-2010, the growth rate for each city would remain the same as the average. For the period from 2015-2025, the County assumed that the growth rate for each city would be reduced by 50%.

Lake County School Concurrency Program / Municipal Projections
Lake County prepared a set of population projections for a countywide school concurrency program. Each municipality provided Lake County with its own population projections. Lake County provided some information on the source of the municipal projections. However, detailed information was not provided. For the unincorporated area, Lake County used the Comprehensive Plan update projections. This data was prepared in 2006.

Individual Municipal Projections for Water Supply Planning
Some municipalities provided population projections based on water supply planning. These are assumed to be relatively consistent with those provided to Lake County for the School Concurrency Program.

Table 1-1 Countywide Population Projections Comparison

SOURCE	2025[1] POPULATION PROJECTIONS	COMMENTS
SJRWMD Draft 2008 Water Supply Assessment	519,395	Based on 2007 BEBR Medium/High projections
Lake County Comprehensive Plan Update	463,500	Based on 2004 Medium/High BEBR projections and historical analysis of population growth
Lake County School Concurrency Projections	571,225	Based on individual projections prepared by each municipality – not normalized to a Countywide population projection

1.3 Analysis of Available Population Projections

The Lake County Comprehensive Plan projections were based on 2004 BEBR data and estimated historical municipality growth rates. Since the draft populations developed for the SJRWMD 2008 Water Supply Assessment use the most recent (2007) BEBR projections, historical growth trends, detailed parcel level information on future growth constraints, and accurate service areas, this data is more comprehensive than the Comprehensive Plan or School Concurrency data.

The Comprehensive Plan normalized population growth, both for municipalities and unincorporated Lake County, to the 2004 BEBR medium-high population projections of 460,103 for 2025. The SJRWMD used the more recent, 2007 BEBR medium-high population projections which total 519,335 for 2025. This difference in itself renders the SJRWMD more suitable for planning purposes. The Comprehensive Plan population projection methodology, used an

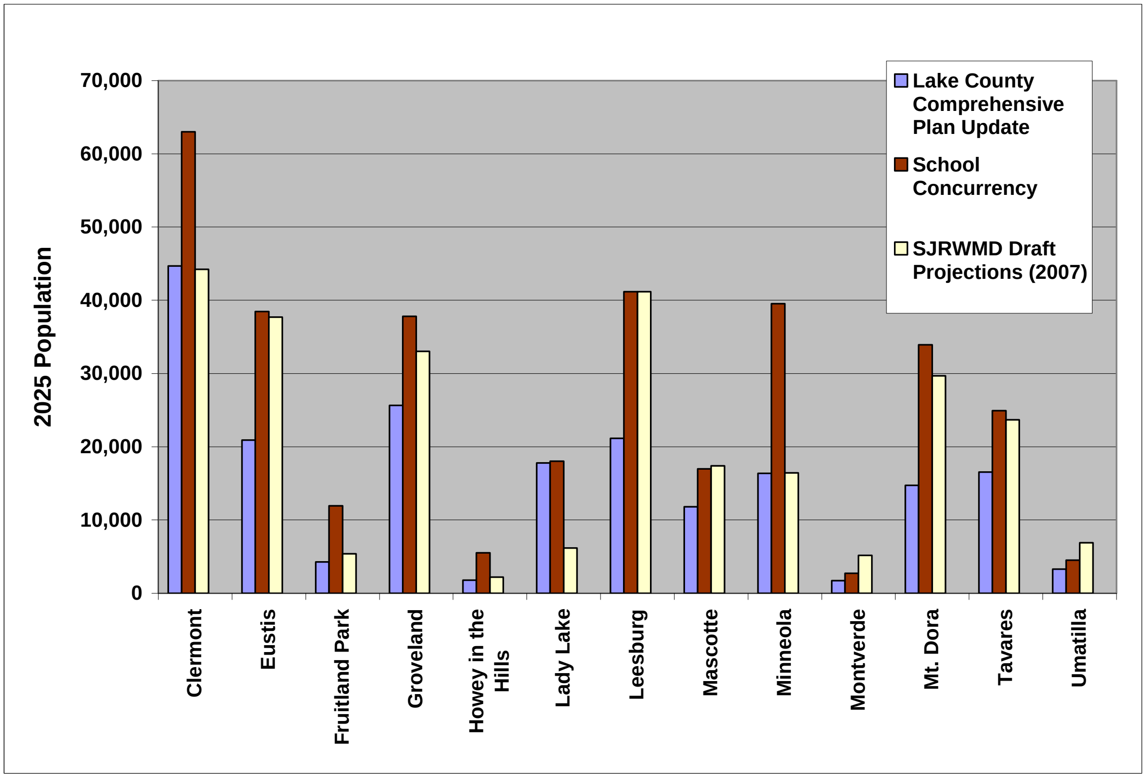
[1] 2025 populations were used for comparative purposes, as it was the latest year common to all data sources.

extrapolation of past population trends on a municipality-wide basis, rather than the site-specific SJRWMD analysis based on both historic and future growth drivers and constraints.

The School Concurrency projections were not normalized to a projected countywide population. Additionally, each municipality made independent decisions about future growth, including, presumably, annexations. Also, it appears that some projections were based on estimated future service areas and some on city limits, rather than existing service areas or known future service areas. These numbers are, therefore, the least reliable for planning purposes.

For the reasons listed, the SJRWMD population projections were used in this Technical Memorandum to develop demand projections. The results of these population projections are presented in Section 1.4.

Figure 1-1 2025 Alliance Member Population Projection Comparison



Refer to section 1-2 for description of Sources for Figure 1-1

1.4 Population Projection Results

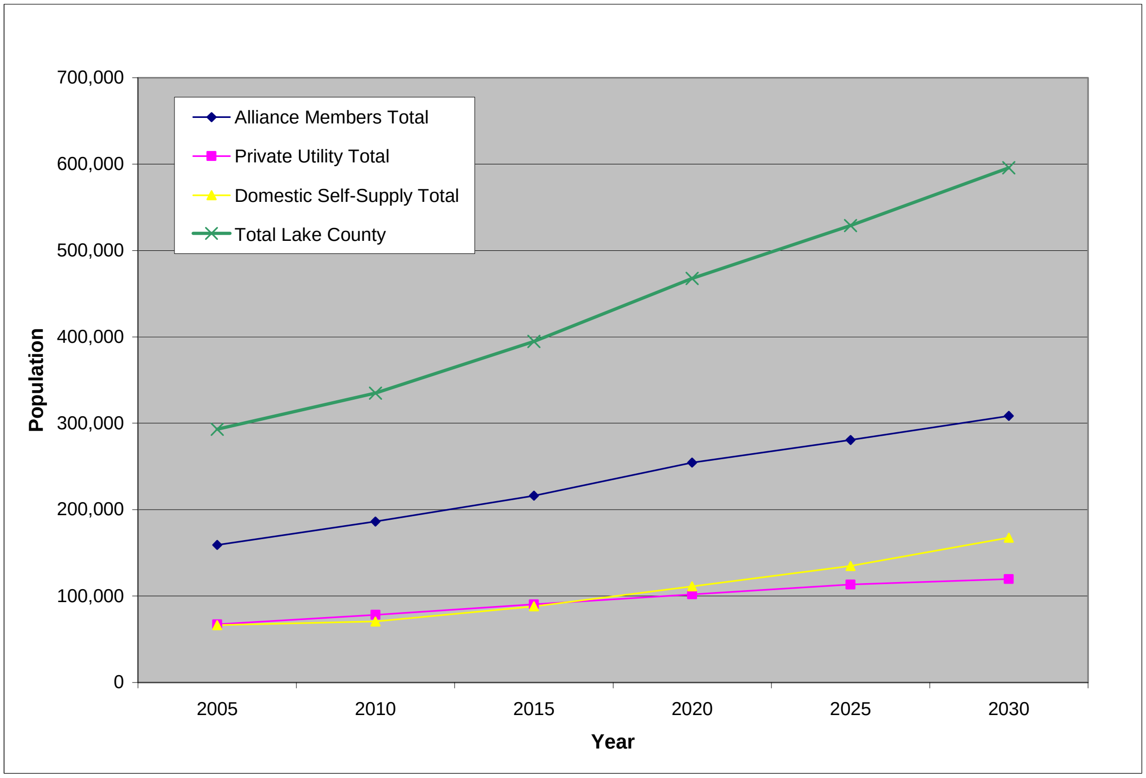
The population growth in Lake County was calculated for the SJRWMD by utility. For the purposes of this Technical Memorandum, populations are grouped into the following three categories:

- Alliance Members: Populations within the Alliance Member existing and projected service areas (Figure 1-2).
- Private Utilities: Populations for private utilities, located throughout unincorporated Lake County (Figure 1-2).

- Domestic Self-Supplied Lake County: Unincorporated populations that are self-supplied water users.

The population increase for Alliance Members over the 2005-2030 planning horizon is approximately 149,300 people (a 94% increase). The total private utilities population is expected to increase by 52,226, and the domestic self-supplied population by 102,885. Therefore, the total non-Alliance population increase is projected to increase by 155,111, or by 132%. The total Lake County population is projected to increase by 304,411 (a 110% increase) (Table 1-3, Figure 1-3, Figure 1-4). Private utility populations are ultimately competing water users for Alliance Members. Therefore, the following section discusses per capita rates and water demands for Alliance Members and private utilities within Lake County alike.

Figure 1-3 Lake County Population Projections



Source: SJRWMD draft projections

1.5 Water Demand Projections

Public supply water demand projections were calculated over the planning horizon from 2005-2030. Similar to population projections, these demand projections were assessed by Alliance Member, private utilities, and domestic-self supply users. The analysis that follows centers around Alliance Member demands. Some discussion of private utility and domestic self-supply users is also significant as these users ultimately are vying with the Alliance to meet their water supply needs.

The scope of this task does not require that independent methodologies be developed for public supply water demand projection quantities, but rather that data be collected from Alliance Members. This review included evaluations to:

- Determine and assess methods used in the water demand projections;
- Assess differences in methodologies between utilities;
- Address any shortcomings in projections; and
- Assess safety factors used in estimates (bracket potential range of projections).

In addition to demand projections produced by Alliance Members, draft demand projections developed by the SJRWMD were reviewed for this task and compared with those provided by Alliance Members.

1.6 Comparison and Analysis of Water Demand Projections

Some water demand projections calculated by Alliance Members were provided in the form of CUP applications, spreadsheets, water audits and water supply studies. Methodologies accompanying municipal projections were not provided in many cases. In some instances, municipalities provided a range of data from different studies. It is apparent from the descriptions of methodologies and sources used as a basis for developing demand projections that there is a wide variation of methodologies employed by each municipality. Differences in approaches to population projection calculations (noted in Section 1.3) and methodologies for per capita rate determination (discussed below) contribute to these variations. Some projections were simply outdated or were not projected past 2010 or 2015. Additionally, these demands were usually based on peak capacity needs and not annual average demand.

The draft demand projections developed by the SJRWMD were determined to be the most appropriate projections available for use in the Plan. This data was selected in part due to the uniform approach employed by the SJRWMD for all Alliance Members, satisfying the need for a level playing field in terms of methodology. This “apples to apples” comparison of demands between Members is important for developing a consistent assessment for the Plan. Furthermore, projected water demands must be accepted by the SJRWMD in order to assign CUP allocations, so it is important that demand projections used in water supply planning efforts are generally consistent with demand projections developed by the SJRWMD.

While many demand projections were not independently provided by Alliance Members for the Plan, it is important to point out that some Alliance Members (e.g., Mount Dora, Minneola, and Montverde) have indicated that their demand projections are not generally consistent with the SJRWMD draft projections. A detailed review of each Member’s demand projections was beyond the scope of this study, but differences in approaches to population projection calculations and methodologies for per capita rate determination are likely to contribute to these variations. In the context of the Plan, an Alliance-wide planning tool, these discrepancies do not affect the outcome to any significant degree. However, if used for other purposes, such as SJRWMD’s review of future CUP applications, care should be taken and the source of these discrepancies distinguished before applying these demands on an individual Member basis.

1.7 Gross Per Capita Rate Analysis

Aside from the aforementioned differences in population projections among Alliance Members and the SJRWMD, differences in per capita rate calculations form the basis of the divergence in demand projection calculations. The SJRWMD projected demands by applying a gross per capita rate to projected populations for each service area. In order to analyze per capita rates in a manner suitable for water supply planning purposes, the SJRWMD averaged the historical 11-year record (from 1995 to 2005) of per capita rates for each service area. This average per capita rate was then held constant over the planning horizon and did not consider the potential reductions from water conservation. The SJRWMD average per capita calculations may differ from those used by Alliance Members for their consumptive use permit applications or other planning purposes. The most likely reasons for this are as follows[2]:

- Different time periods for calculating per capita use. If utilities use their last 5 very wet years only, Alliance Member projections will be lower than the SJRWMD average;

- Alliance Members are not basing their future per capita use solely on historical data, or they are adjusting their per capita downward to account for recent and more aggressive reuse and conservation programs; and

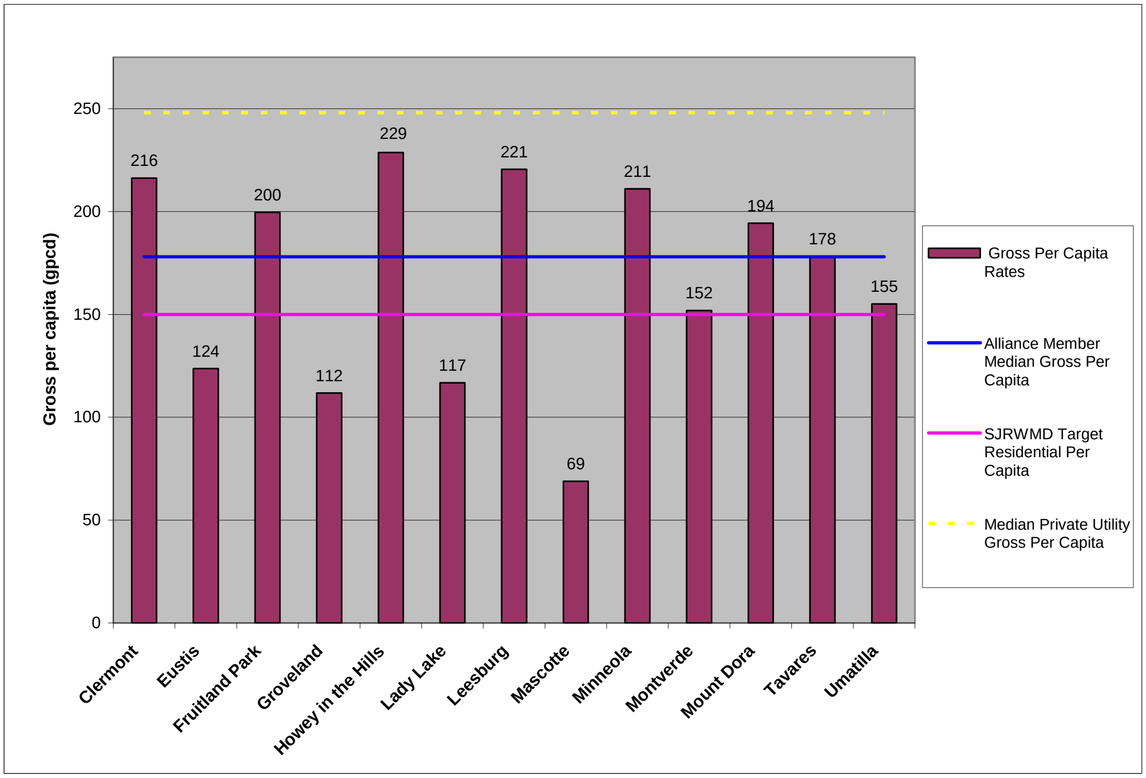
- Newly expanded service areas in Lake County often contain self-supplied populations, which in some cases may be in Alliance Member projections (resulting in lower per capita rates) but not in the SJRWMD projections.

Because of these discrepancies, the draft gross per capita rates calculated by the SJRWMD were selected as the best available data.

The gross per capita rates developed by SJRMWD were applied to Alliance Member populations and private utility populations to estimate projected water demands (Figure 1-5). Gross per capita rates represent total water demand within a service area divided by the total service area population. Gross per capita rates, therefore, encompass small commercial and industrial water users supplied by a utility. Additionally, using the 11-years of historical gross per capita rates includes higher water use rates due to drought-year conditions, so these conditions, which will likely reoccur, are carried forth in projections. Any recent gross per capita rate reductions within a service area are not fully reflected since they are averaged with historical rates.

[2] Correspondence with GIS Associates, 2007

Figure 1-5 Alliance Member Gross Per Capita Rates



Source: SJRWMD draft projections

The per capita rate for the population served by domestic self-supply was under development by the SJRWMD at the time of publication of the Plan, so is not included in the analysis.

It is important to recognize that because per capita rates are held constant over the planning horizon, reduction due to increased conservation practices are not considered in demand projections. This will be discussed further in Chapter 2 with respect to potential demand reduction opportunities.

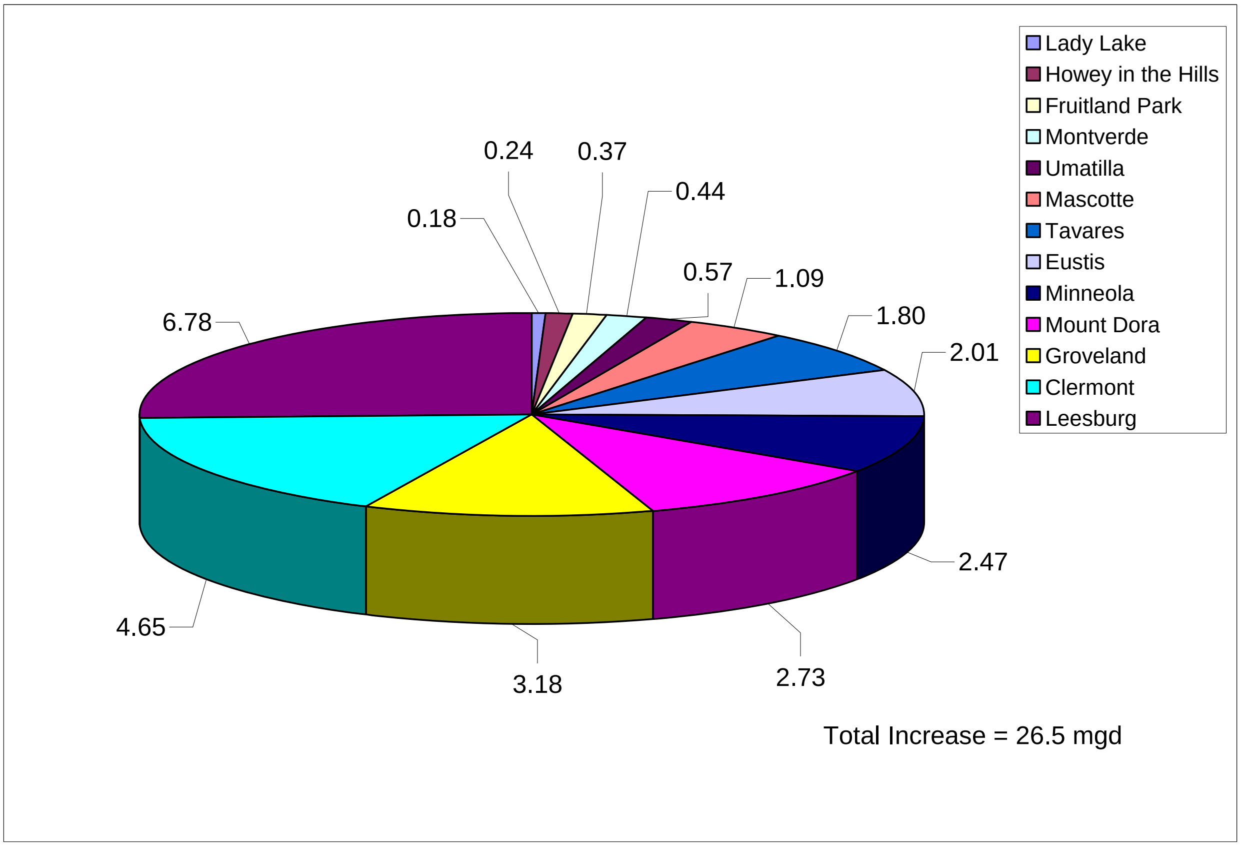
1.8 Demand Projection Results

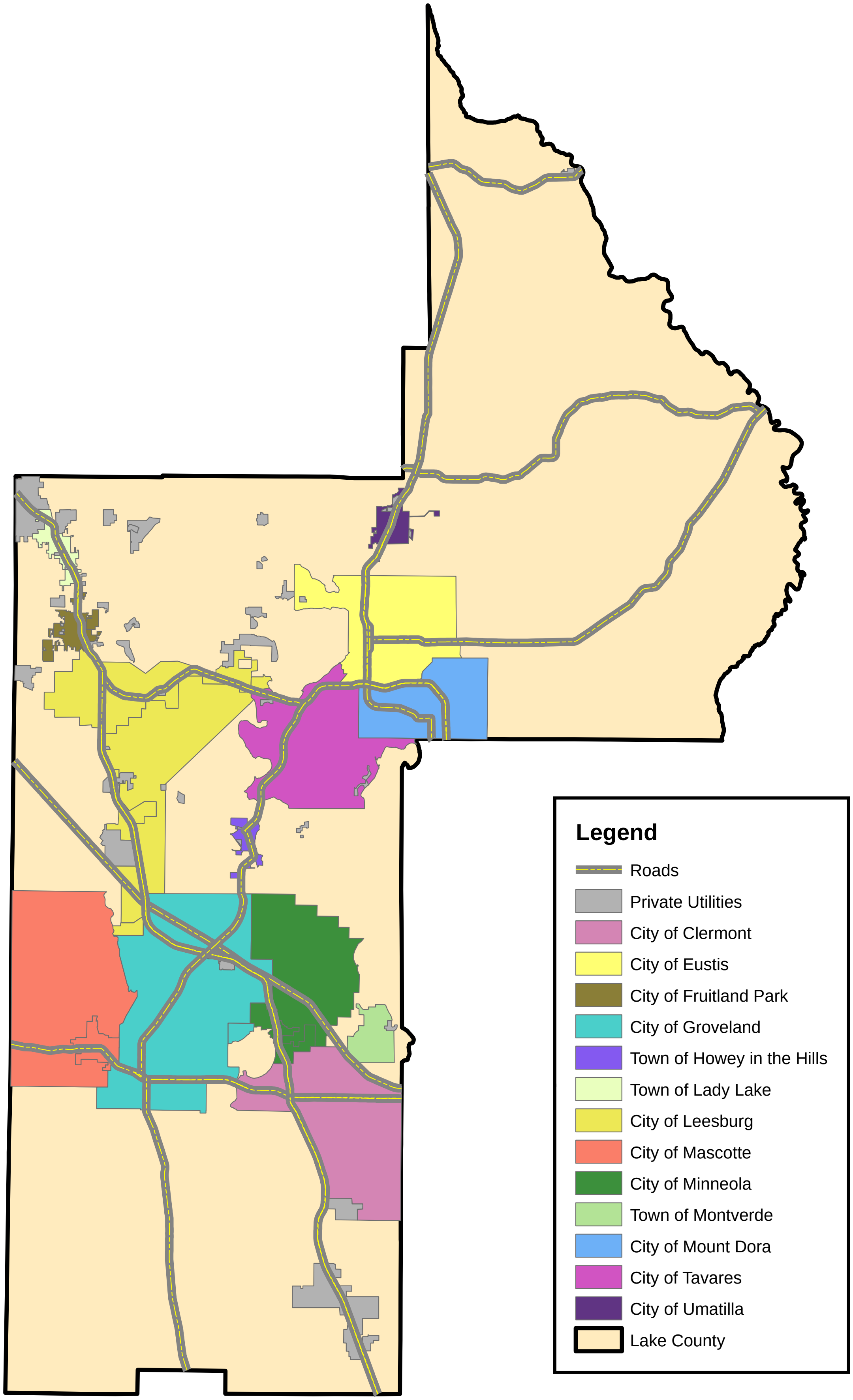
As with population projections, water demands were estimated for Alliance Members, private utilities, and populations served by domestic-self supply (Table 1-4).

The total water demand increase for Alliance Members over the planning horizon is approximately 26.51 mgd (or 102%) (Figure 1-6). The total private utilities demands are expected to increase by 14.05 mgd (or 75%) and the domestic self-supply demands by 24.35 mgd (or 178%). The total non-Alliance demand increase is projected to increase by 38.40 mgd (or 118%). The total Lake County public supply and domestic self-supply demands are projected to increase by 64.91 mgd (or 111%).

These demands do not include potential reductions in demand that can be realized through more aggressive conservation practices. The unadjusted water demands presented - including those of Alliance Members, private utilities, and domestic self-supply users - do not include potential reductions in demand that can be realized through more aggressive conservation practices. The most powerful demand reduction techniques – watering restriction enforcement, dedicated water conservation staff, education, and aggressive potable water rate structures – are currently limited in their application or effectiveness for Alliance Members. These water demand reduction techniques are discussed in detail in Chapter 2.

Figure 1-6 Alliance Member Projected Demand Increases from 2005-2030 (mgd)





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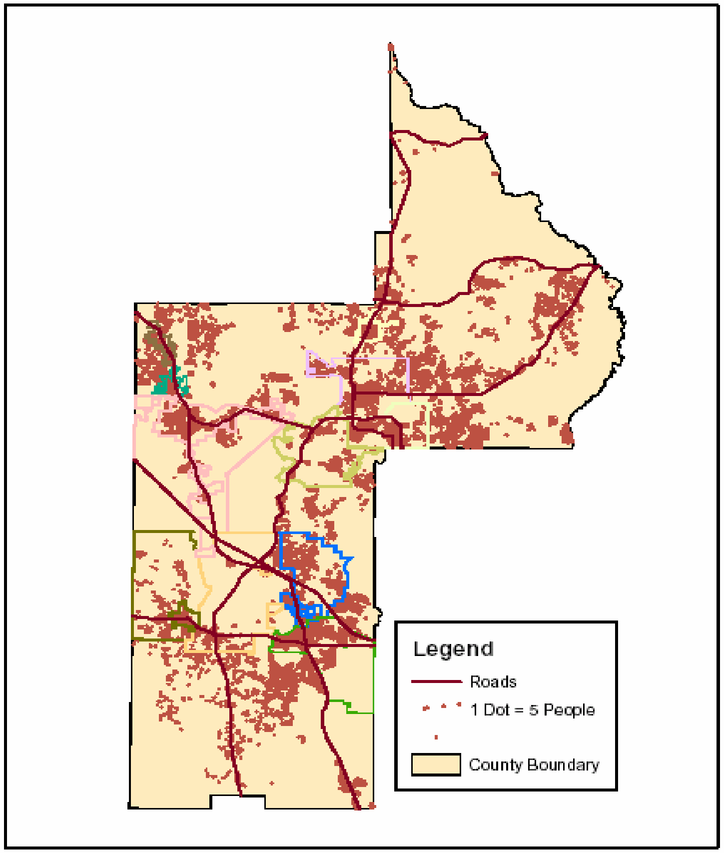
PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 1-2
Lake County Alliance Members and Private Utilities Service Area Map

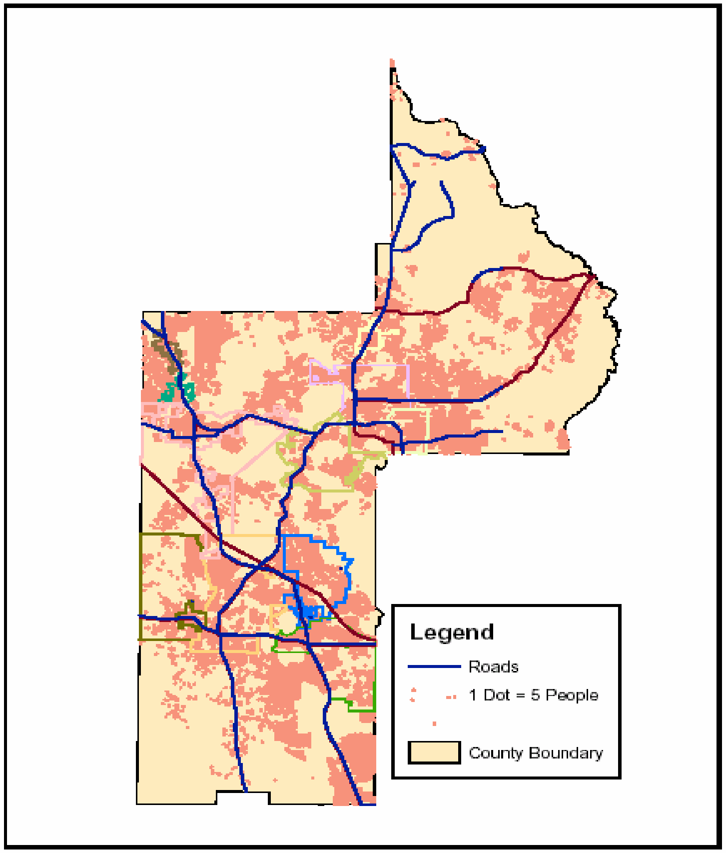
ORIGINAL DATE: 08-01-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME:Alliance and Private...mxd
GIS OPERATOR: DR

N W E S
1 Inch = 7 Miles

2005 Population Distribution



2030 Population Distribution



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PROJECT: Lake County Water Alliance

Figure 1-4
Lake County Approximate 2005 and 2030 Population Distribution

ORIGINAL DATE: 07-27-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_Population_Dot...
GIS OPERATOR: LEF

N W E S

Table 1-2 - Comparison of Population Projections

JURISDICTION	PROJECTION SOURCE	PROJECTION FOR 2025	COMMENTS
Countywide	Lake County Projection for Comprehensive Plan Update (2005)	**463,500**	Lake County Comp Plan Update and the LRTP relied on BEBR medium high estimates (2004 data). Lake County analyzed building permit activity to project population growth. These projections closely followed BEBR medium high projections.
	Lake County Projection for School Concurrency Planning (2006)	**571,225**	Unincorporated projections same as Comp Plan projections. Projections for municipalities provided by municipalities and described further in the municipal projections that follow.
	Draft SJWMD 2008 Water Supply Assessment	**519,395**	Projections are based on 2007 BEBR medium projections. The district-wide population is allocated within the County per the District's methodology.
All municipalities	Lake County Estimate for Comprehensive Plan Update (2005)	**200,991**	To allocate population within the municipalities the County determined the historic growth rates for each city over a five year increment beginning in 1999. Those rates were projected were to continue through 2010. For 2015 to 2025, the rates were reduced by 50%.
	Lake County Population Projections for School Concurrency (2006)	**340,003**	Each municipality provided population projections. The methodology used by the municipality is described below.
	Draft SJWMD 2008 Water Supply Assessment	**280,683**	Based on service area population developed using parcel-level population growth analyses.

Table 1-2 - Comparison of Population Projections

JURISDICTION	PROJECTION SOURCE	PROJECTION FOR 2025	COMMENTS
Clermont	Lake County Estimate for Comprehensive Plan Update (2005)	**44,696**	Lake County assumed 51% growth rate to 2010 and a 25% growth rate for each five year period from 2010 to 2025.
	Lake County Population Projections for School Concurrency (2006)	**62,988**	Municipal estimate
	GIS Associates Draft Projections (2007)	**44,222**	Based on service area population developed using parcel-level population growth analyses.
Eustis	Lake County Estimate for Comprehensive Plan Update (2005):	**20,904**	Lake County assumed 10% growth rate to 2010 and a 5% growth rate for each five year period from 2010 to 2025.
	Lake County Population Projections for School Concurrency (2006)	**38,473**	Assumed 4% annual growth rate.
	Consumptive Use Permit Application Projections for 2025 (2005):	**63,450**	Linear growth in current service area, new area projections based on DRIs and plan amendments.
	GIS Associates Draft Projections (2007)	**37,683**	Based on service area population developed using parcel-level population growth analyses.

Table 1-2 - Comparison of Population Projections

JURISDICTION	PROJECTION SOURCE	PROJECTION FOR 2025	COMMENTS
Fruitland Park	Lake County Estimate for Comprehensive Plan Update (2005)	**4,283**	Lake County assumed 10% growth rate to 2010 and a 5% growth rate for each five year period from 2010 to 2025.
	Lake County Population Projections for School Concurrency (2006)	**11,929**	Lake County estimate. Basis for estimate not provided.
	GIS Associates Draft Projections (2007)	**5,382**	Based on service area population developed using parcel-level population growth analyses.
Groveland	Lake County Estimate for Comprehensive Plan Update (2005)	**25,633**	Lake County assumed 76% growth rate to 2010 and a 38% growth rate for each five year period from 2010 to 2025.
	Lake County Population Projections for School Concurrency (2006)	**37,808**	Municipal estimate. Basis of estimate not provided.
	GIS Associates Draft Projections (2007)	**33,032**	

Table 1-2 - Comparison of Population Projections

JURISDICTION	PROJECTION SOURCE	PROJECTION FOR 2025	COMMENTS
Howey in the Hills	Lake County Estimate for Comprehensive Plan Update (2005)	**1,803**	Lake County assumed 19% growth rate to 2010 and a 10% growth rate for each five year period from 2010 to 2025.
	Lake County Population Projections for School Concurrency (2006)	**5,507**	Lake County estimate. Basis for estimate not provided.
	GIS Associates Draft Projections (2007)	**2,202**	Based on service area population developed using parcel-level population growth analyses.
Lady Lake	Lake County Estimate for Comprehensive Plan Update (2005)	**17,791**	Lake County assumed 11% growth rate to 2010 and a 6% growth rate for each five year period from 2010 to 2025.
	Lake County Population Projections for School Concurrency (2006)	**18,044**	Combination of County estimates and town comp plan.Basis of estimate not provided.
	Service Area estimates	**6,308**	Includes portions of The Villages in Sumter County. Basis of estimate not provided.
	GIS Associates Draft Projections (2007)	**6,185**	Based on service area population developed using parcel-level population growth analyses.

Table 1-2 - Comparison of Population Projections

JURISDICTION	PROJECTION SOURCE	PROJECTION FOR 2025	COMMENTS
Leesburg	Lake County Estimate for Comprehensive Plan Update (2005)	**21,145**	Lake County estimate. Basis for estimate not provided.
	Estimate for Lake County Population Projections for School Concurrency (2006)	**41,163**	Municipal estimates. Basis of estimate not provided.
	GIS Associates Draft Projections (2007)	**41,163**	Based on service area population developed using parcel-level population growth analyses.
Mascotte	Lake County Estimate for Comprehensive Plan Update (2005)	**11,804**	Lake County assumed 45% growth rate to 2010 and a 22% growth rate for each five year period from 2010 to 2025.
	Estimate for Lake County Population Projections for School Concurrency (2006)	**16,991**	Lake County estimate
	GIS Associates Draft Projections (2007)	**17,407**	Based on service area population developed using parcel-level population growth analyses.
Minneola	Lake County Estimate for Comprehensive Plan Update (2005)	**16,390**	Lake County assumed 26% growth rate to 2010 and a 13% growth rate for each five year period from 2010 to 2025.
	Estimate for Lake County Population Projections for School Concurrency (2006)	**39,530**	Green Consulting estimate. Basis of estimate not provided.
	GIS Associates Draft Projections (2007)	**16,427**	Based on service area population developed using parcel-level population growth analyses.

Table 1-2 - Comparison of Population Projections

JURISDICTION	PROJECTION SOURCE	PROJECTION FOR 2025	COMMENTS
Montverde	Lake County Estimate for Comprehensive Plan Update (2005)	**1,705**	Lake County assumed 16% growth rate to 2010 and a 8% growth rate for each five year period from 2010 to 2025.
Estimate correlates with domestic water supply estimate.	Estimate for Lake County Population Projections for School Concurrency (2006)	**2,737**	Green Consulting estimate. Basis of estimate not provided.
	GIS Associates Draft Projections (2007)	**5,169**	Based on service area population developed using parcel-level population growth analyses.
Mt. Dora	Lake County Estimate for Comprehensive Plan Update (2005)	**14,727**	Lake County assumed 14% growth rate to 2010 and a 7% growth rate for each five year period from 2010 to 2025.
	Estimate for Lake County Population Projections for School Concurrency (2006)	**33,909**	From the Mount Dora Comprehensive Plan (2015). Basis of estimate not provided.
	Mt. Dora and Lake County Eastern Service Area Population Projections (2006)	**24,925**	Projections do not include Joint Planning area to west of City. Basis of estimate not provided.
	GIS Associates Draft Projections (2007)	**29,685**	Based on service area population developed using parcel-level population growth analyses.

Table 1-2 - Comparison of Population Projections

JURISDICTION	PROJECTION SOURCE	PROJECTION FOR 2025	COMMENTS
Tavares	Lake County Estimate for Comprehensive Plan Update (2005)	**16,544**	Lake County assumed 16% growth rate to 2010 and a 8% growth rate for each five year period from 2010 to 2025.
	Estimate for Lake County Population Projections for School Concurrency (2006)	**24,925**	City estimate assuming 4% annual increase
	GIS Associates Draft Projections (2007)	**23,690**	Based on service area population developed using parcel-level population growth analyses.
Umatilla	Lake County Estimate for Comprehensive Plan Update (2005)	**3,293**	Lake County assumed 13% growth rate to 2010 and a 7% growth rate for each five year period from 2010 to 2025.
	Estimate for Lake County Population Projections for School Concurrency (2006)	**4,509**	Lake County Estimate. Basis of estimate not provided.
	GIS Associates Draft Projections (2007)	**6,906**	Based on service area population developed using parcel-level population growth analyses.

Table 1-3.
Lake County Population Projections

Service Provider	Population Projections[1]							
	2005	2010	2015	2020	2025	2030	2005 - 2030 increase	2005 - 2030 increase (%)
Clermont	32,554	37,575	41,118	42,840	44,222	45,582	13,029	40%
Eustis	24,919	27,038	30,591	34,942	37,683	41,146	16,227	65%
Fruitland Park	3,657	3,884	4,648	5,057	5,382	5,498	1,842	50%
Groveland	10,928	14,864	20,787	26,610	33,032	39,388	28,460	260%
Howey in the Hills	1,213	1,350	1,896	1,954	2,202	2,283	1,069	88%
Lady Lake	4,734	5,402	5,862	5,973	6,185	6,263	1,528	32%
Leesburg	27,646	34,334	39,010	49,497	52,692	56,575	28,929	105%
Mascotte	5,933	7,060	10,144	13,964	17,407	21,680	15,748	265%
Minneola	7,050	9,784	10,530	14,776	16,427	18,776	11,727	166%
Montverde	2,397	3,202	4,169	4,663	5,169	5,318	2,921	122%
Mount Dora	19,221	20,628	23,160	26,567	29,685	33,291	14,071	73%
Tavares	15,315	16,907	19,214	21,602	23,690	25,411	10,096	66%
Umatilla	3,673	4,167	5,108	6,173	6,906	7,327	3,654	99%
Alliance Members Total	**159,239**	**186,195**	**216,239**	**254,618**	**280,683**	**308,538**	**149,300**	**94%**
Private Utility Total	67,342	78,221	90,363	101,794	113,421	119,569	52,226	78%
Domestic Self-Supply Total	49,961	58,799	78,177	100,231	125,231	152,846	102,885	206%
Total Non-Alliance	**117,304**	**137,019**	**168,540**	**202,025**	**238,652**	**272,415**	**155,111**	**132%**
Lake County Total	**276,542**	**323,214**	**384,779**	**456,643**	**519,335**	**580,953**	**304,411**	**110%**

All data extracted from SJRWMD 2007 draft projections for the SJRMWD 2008 Water Supply Assessment

(1) Draft projections based on 2007 BEBR medium-high projections, and aggregated to the parcel level using modeling techniques. All populations reflect total served population (except in the domestic self-supply category). Some Alliance Members (e.g., Mount Dora, Minneola, and Montverde) have indicated that their population projections are not generally consistent with the SJRWMD draft projections. In the context of the Lake County Water Supply Plan, an Alliance-wide planning tool, these discrepancies do not affect the outcome to any significant degree. However, if used for other purposes, such as SJRWMD's review of future CUP applications, care should be taken and the source of these discrepancies distinguished before applying these demands on an individual Member basis.

Table 1-4.
Lake County Projected Potable Water Demands

Service Provider	Gross Per Capita[1] (gpcd)	Public Supply Water Demand Projections [2] (mgd)							
		2005	2010	2015	2020	2025	2030	2005 - 2030 increase	2005 - 2030 increase (%)
Clermont	216	5.21	8.13	8.89	9.26	9.56	9.86	4.65	89%
Eustis	124	3.08	3.34	3.78	4.32	4.66	5.09	2.01	65%
Fruitland Park	200	0.73	0.78	0.93	1.01	1.07	1.10	0.37	51%
Groveland	112	1.22	1.66	2.32	2.97	3.69	4.40	3.18	260%
Howey in the Hills	229	0.28	0.31	0.43	0.45	0.50	0.52	0.24	88%
Lady Lake	117	0.55	0.63	0.68	0.70	0.72	0.73	0.18	32%
Leesburg	221	5.69	7.57	8.60	10.92	11.62	12.48	6.78	119%
Mascotte	69	0.41	0.49	0.70	0.96	1.20	1.49	1.09	265%
Minneola	211	1.49	2.06	2.22	3.12	3.47	3.96	2.47	166%
Montverde	152	0.36	0.49	0.63	0.71	0.79	0.81	0.44	122%
Mount Dora	194	3.74	4.01	4.50	5.16	5.77	6.47	2.73	73%
Tavares	178	2.73	3.01	3.42	3.85	4.22	4.53	1.80	66%
Umatilla	155	0.57	0.65	0.79	0.96	1.07	1.14	0.57	99%
Alliance Members Total	N/A	**26.06**	**33.12**	**37.92**	**44.39**	**48.35**	**52.57**	**26.51**	**102%**
Private Utility Total	N/A	18.86	22.31	25.32	28.23	31.31	32.91	14.05	75%
Domestic Self-Supply Total	N/A	13.65	15.73	19.99	25.48	31.38	38.00	24.35	178%
Total Non-Alliance	N/A	**32.51**	**38.05**	**45.31**	**53.71**	**62.68**	**70.91**	**38.40**	**118%**
Lake County Total	N/A	**58.57**	**71.17**	**83.23**	**98.10**	**111.03**	**123.48**	**64.91**	**111%**

All data extracted from SJRWMD 2007 draft projections for the SJRMWD 2008 Water Supply Assessment

(1) Gross per capita rate = total water demand/population served. Values shown are an average of gross per capita rates from 1995 to 2005. Clermont and Leesburg per capita rates increase from 2005 to 2010 (2010 to 2030 per capita shown for these cities). Domestic self-supplied household per capita is was under development by the SJRWMD at the time of publication of the Lake County Water Supply Plan, so is not listed in the table.

(2) Public Supply Demand projections = Gross per capita x Population for each 5-year increment. Some Alliance Members (e.g., Mount Dora, Minneola, and Montverde) have indicated that their demand projections are not generally consistent with the SJRWMD draft projections. In the context of the Lake County Water Supply Plan, an Alliance-wide planning tool, these discrepancies do not affect the outcome to any significant degree. However, if used for other purposes, such as SJRWMD's review of future CUP applications, care should be taken and the source of these discrepancies distinguished before applying these demands on an individual Member basis.

2.0 Water Conservation / Potable Water Demand Reduction

2.1 Conservation Best Management Practices

Water conservation is an important part of Florida's overall water management strategy. Water conservation is an essential, cost effective element of water supply planning that allows for management of water demands from existing users and new growth without requiring major capital outlays. Although water conservation applies to all water use sectors, it is particularly relevant in the residential sector, since the greatest potable water demand for water in Lake County falls under this category. Demand reduction due to conservation beyond the borders of Lake County is also significant since water use in surrounding areas ultimately affects availability of water for the County. For example, conservation efforts in Marion, Sumter, and Orange Counties are ongoing and being developed as a significant part of water supply planning efforts in those counties.

These conservation tools are considered best management practices, or BMP's. For the purposes of the Lake County Water Supply Plan, BMP's are analyzed and categorized under regulation, education, and incentives. A summary of the presence or absence of these BMP's is presented in Table 2-1. Note that these BMP's, though a comprehensive list, are not all-inclusive, so other conservation tools should not be excluded from incorporation into local governments' conservation plans. An explanation of various applications that fall under these categories follows:

Regulation

- Watering restrictions – The SJRWMD's water conservation measures for irrigation are in effect year-round, except where stricter measures have been imposed by local governments. These restrictions specify days and times when lawn irrigation is allowed.
- Inverted rate structures – The more water consumed, the more money is charged. Inverted rate structures can reduce water use and maintain revenues for water utilities. In general, water use decreases with increases in water price.
- Water efficient landscape measures – Efficient use and protection of water quality. Some local governments have ordinances requiring certain principles (such as drought tolerant plants and efficient irrigation systems) be applied within both existing and new communities.
- Mandatory dual lines for new developments – Separate lines for potable and reuse water. Governments can require dual line installation for developments served by a central water system, even if reuse is not yet available.
- Water audits – Compares water sales and other metered and accounted for usage to water pumpage data to determine if system leakage is a significant source of lost potable water.

Public Education

- Citizen awareness groups – These groups can be local to a municipality or county-wide, and raise awareness on water conservation issues by holding meetings, distributing information at public events, etc.
- Bill stuffers – Pamphlets mailed to water utility customers on a regular basis with useful data and tips on how to effectively conserve water.

- Education programs – Programs organized by local governments and to inform citizens about water conservation.
- Dedicated staff – Staff hired specifically for implementing and disseminating water conservation information to its citizens by organizing and coordinating educational programs.

  Incentives

- Metering programs – Programs implemented by local governments to monitor and detect plumbing leaks by detecting abnormal water usage through meter readings.
- Toilet rebates – An incentive for replacing old, high-volume toilets with new low volume models.
- Leak detection and repair – Systematic search for leaks within a utility's distribution system, using electronic equipment to identify leak sounds and to pinpoint the precise locations of underground leaks (Wright, 2005).
- Water efficient plumbing retrofit kits – Kits provided to residents that include low flow shower heads, low-volume toilets, sink aerators, water displacement bags for toilet tanks, and toilet leak detection dye tabs.
- Rain sensors – Sensors installed on irrigation systems that prevent the system from functioning when a certain amount of rain is collected.
- Pressure monitoring and control – Method of ensuring water pressure in a system is maintained such that water loss through leaks and high flow rates is avoided.

The above list of conservation programs describes the various BMP's that were inventoried for the Lake County Water Supply Plan. A more detailed analysis of existing conservation practices currently employed by Alliance Members and often embedded in Member CUPs is attached in Appendix A. It is critical that the selection of BMP's within a conservation program carefully considers consumers and applies the BMP's most likely to reduce demands for the target end use.

2.3 Alliance Member Conservation Program Analysis

The unadjusted water demands presented in Chapter 1 - including those of Alliance Members, private utilities, and domestic self-supply users - do not include potential reductions in demand that can be realized through more aggressive conservation practices. Although individual per capita rates vary, viewing these rates from an Alliance-wide and Countywide perspective, the median gross per capita rate is a good indicator of water use trends. This rate is 178 gpcd, which is above the SJRWMD residential Districtwide goal of 150 gpcd (Hollingshead, email correspondence 6/8/2007). The removal of commercial use would show an Alliance-wide residential per capita rate closer to the SJRWMD target. However, additional conservation efforts can reduce usage below this level. A residential per capita rate of 120 to 130 gpcd is possible based on land use in Lake County comparable to other areas in Florida. The statewide residential average per capita is reported at 106 gpcd (Marella, 2004), and the SWFWMD residential average per capita is reported at 113 gpcd (Hazen and Sawyer, 2007).

The scope of conservation program elements and BMPs employed by the Alliance Members differs by member. The effectiveness of these programs as a whole were assessed on the basis of comparing per capita rates of Alliance Members to the demands targeted by these programs. Most members have an opportunity to reduce per capita rates, and therefore water demands, through increasing the aggressiveness of existing BMPs or adding effective BMPs to their existing programs. The SJRWMD's Applicant Handbook (2006) for consumptive use permitting does not list reduction in per capita water consumption as a factor to be considered in determining the duration of a permit. However, aggressive inverted rate structures, wide-ranging education programs, dedicated water conservation staff, and watering restriction enforcement are highly effective BMP's that are emphasized and applicable to nearly all Alliance Members, as described in Section 2.3.1 – 2.3.3.

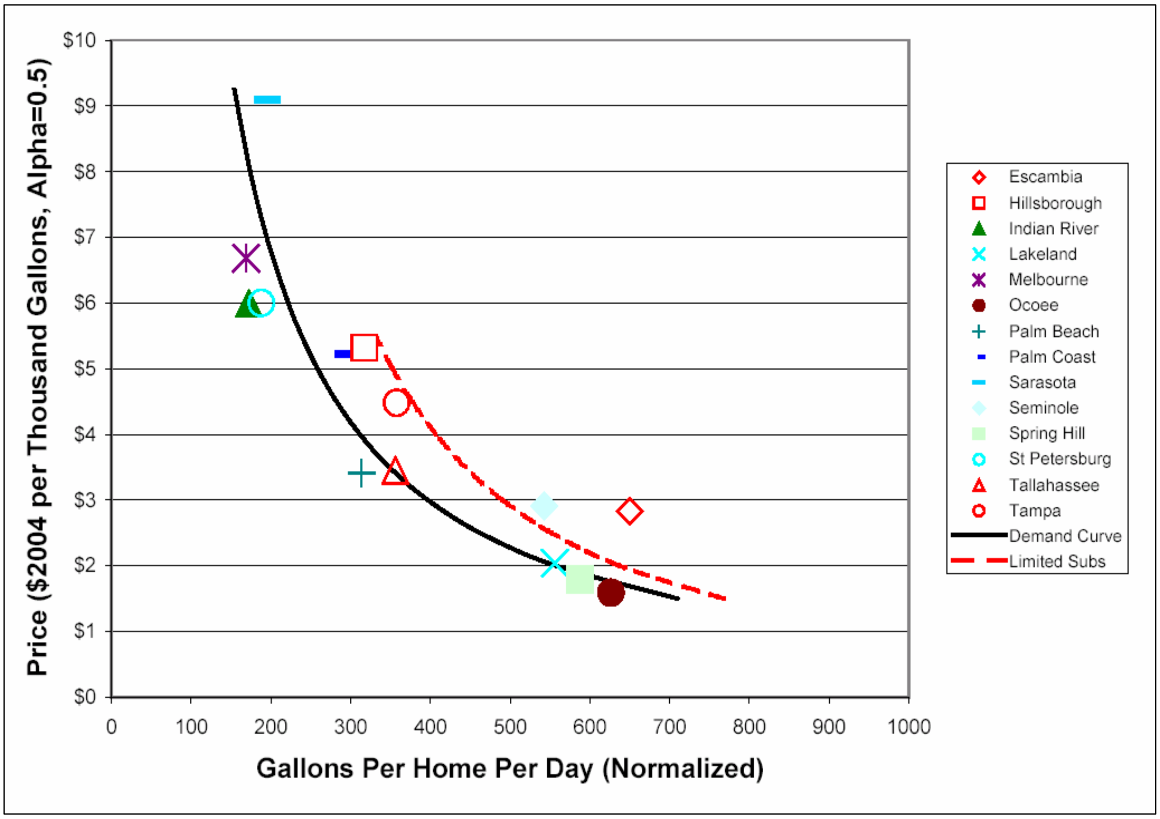
The potential demand reductions will not be realized immediately after strengthening or implementing these programs / BMPs. The nature of the conservation programs emphasized in the following sections is such that a cultural shift of sorts must occur in residential customers for long-term demand reduction achievement. Continual monitoring of these programs is crucial for the most effective demand reductions to be achieved and maintained.

2.3.1 Inverted Rate Structures

Inverted or conservation rate structures are one of the most effective conservation BMP's. With inverted rate structures, price per unit increases as consumption increases. This BMP targets high and medium volume residential users. Decreases in water usage due to increases in price are predictable and statistically valid, and price-induced changes in water use also vary with property value. Customers residing in more expensive homes tend to use more water, but price increases reduce their use by a higher amount than customers in less expensive homes because they use more water for discretionary purposes, such as landscaping. Access to substitute water sources, such as irrigation wells, also affects the amount of demand reduction accomplished by pricing (Whitcomb, 2005). As a result, changes to pricing structures must be accompanied by ordinances restricting access to substitute sources. Devising and implementing rate structures must be a long-term commitment on the part of utilities, in order to track the effectiveness and customer responsiveness as part of an ongoing cultural shift.

Figure 2-1 depicts the existing rate structures for Alliance Members. As can be seen in this graphic, Alliance Members taken as a group cluster in the $2.00/1,000 gallons to $3.00/1,000 gallons range. Compared to other proven effective rate structures, such as Seminole County, Orange County Utilities, the City of Ocala, and others, these rates are considerably low. These rates barely begin to realize the benefits of reduced water consumption, as can be see in Figure 2-2. As shown, for a typical household, the noticeable declines in water use are caused by rates beginning at about $3.00/1,000 gallons, with a stronger water use decline occurring above that rate. Figure 2-2 also illustrates that allowing source substitution causes the water use curve to shift towards greater water consumption at the same charge.

Figure 2-2 Water Demand Curve and Rate Structure Effectiveness



Source: Yingling G. and Whitcomb, J. "Rate Structure and Single Family Residential Water Use in Florida" (2005).

2.3.2 Education Programs/ Dedicated Conservation Staff

Public education is critical to achieving public acceptance of conservation BMP's and to facilitate the shift in thinking towards reducing water consumption. For example, when lawn watering restrictions or inverted rate structures are utilized, it is necessary to educate the public about these measures. When used alone, education is not typically very effective, but the most effective conservation programs always contain a strong educational component. It appears that education alone can add an additional 4%-8% to the overall per capita reduction rate (Irvine Ranch Water District, 2004; Rocky Mountain Institute, 1991; SWFWMD, 2001).

Alliance members have some educational elements within their existing conservation programs. In many cases, Alliance Members have existing or proposed a customer and employee water conservation education program that meet District criteria. For Alliance Members as a whole, there is potential to improve these programs beyond established criteria, particularly with respect to the frequency and scope of educational outreach.

Dedicated water conservation staff are essential for coordinating, overseeing and implementing educational programs and activities related to interfacing between the utility and public on water conservation awareness. Dedicated conservation staff positions can be integrated to either a planning department or a utility department. A major advantage of embedding staff into a utility department is that water conservation educational material can be sent out in conjunction with monthly bills. The cost of dedicated staff will vary with the size of the customer base and the size and extent of the proposed programs for which the staff member will be responsible. The only Alliance Members currently employing full-time water conservation coordinators are the Cities of Clermont and Mount Dora.

2.3.3 Residential Lawn Irrigation Restriction Enforcement

A common water usage restriction in Florida is the limiting of lawn watering to specific days and times. For example, houses with addresses ending in an even number may be allowed to water on two specific days, and houses with addresses ending in an odd number are allowed to water on two different days. Watering is typically not allowed during the hottest part of the day, in an effort to reduce water loss due to evaporation.

Lawn watering restrictions can be an effective best management practice, particularly when enforcement programs are in place (Davis, 1996; TBW, 1999). The SJRWMD has established watering restrictions, and all the Alliance Members have watering restriction ordinances that follow the SJRWMD rules. Currently, the Cities of Mount Dora and Clermont, enforce watering restrictions. As with the other recommended BMP's, ensuring customer adherence to watering restrictions is an ongoing effort that must help ensure the shift in customer water use patterns occurs.

The enforcement of watering restrictions begins with appropriate code and ordinance adoption. This is typically accomplished in-house using existing staff. The means of watering restriction enforcement will vary with the size of the local government and may range from the use of existing staff during working hours to the use of existing staff at overtime rates. Therefore, costs associated with such a recommended violation enforcement system are tied to internal staffing considerations. Often, the salary of officers assigned the duty of enforcing water restriction rules are paid by the fines collected associated with violations.

2.4 Potable Water Demand Reduction Calculations

2.4.1 Introduction

Demand projections made by the SJRWMD were based on an average of historical per capita rates. Inherent in this calculation, therefore, is the potential to lower future per capita rates to achieve significant demand reductions through implementation of more aggressive conservation BMP's. The previous section provided a brief outline and discussion of existing BMP's and highlighted areas that could be improved. In particular, aggressive rate structures, watering restriction enforcement, and increased educational programs, including dedicated conservation staff could have a great effect on reducing future potable water demands.

2.4.2 Potable Water Demand Reduction Methodology

Potential water savings associated with implementing or improving these conservation elements are difficult to quantify. In an effort to estimate potential water savings for both Alliance Members and private utilities, the following methodology and assumptions were used (Table 2-2):

- The percent of permitted household and commercial use were ascertained from Technical Staff Reports on existing permits. Where Technical Staff Reports (TSRs) were not available or no breakdown of use types were specified, 100% of allocated quantities were assumed to be residential, as most of the cities not having detailed TSRs were small, and therefore assumed to be without a significant commercial/industrial constituent. This percentage was assumed to remain constant over the planning horizon.

- The percent of water currently allocated for residential use was applied to projected demands for each utility, yielding projected residential quantities to which demand reductions were applied. Commercial/industrial uses were excluded from this analysis because the public-supply commercial water use in Alliance Members is significantly less than the residential, and residential water users are more likely to be less efficient users.

- Existing conservation measures and practices were evaluated by utility and a range of potential percent demand reductions was assigned according to the existing conservation practices and the 11-year average per capita rate.

- For planning purposes, the potential demand reduction percentage was selected from the established range of reductions. Often this percentage fell in the mid-range. However, if the per capita rate was high for a given utility, or if few conservation practices were currently employed, this potential percent was selected towards the upper end of the range.

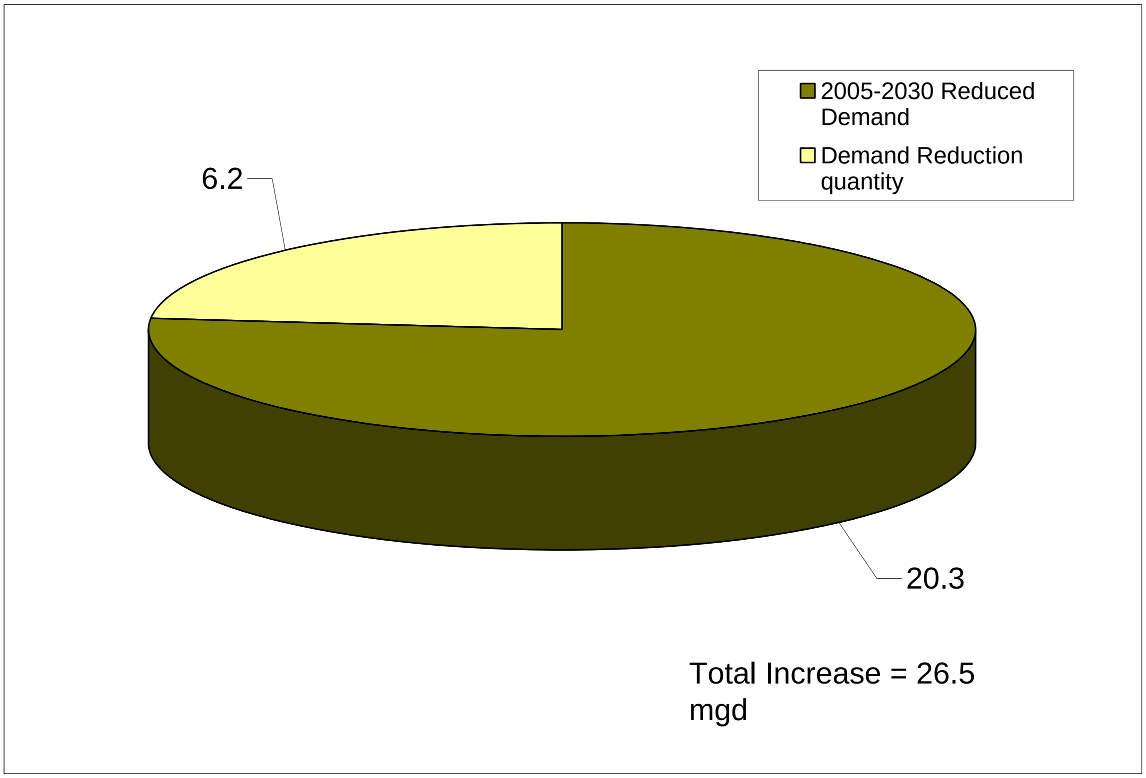
- The above-cited percentages were applied to each utility's projected 2030 residential demand. 2005 water demands were subtracted from the 2030 reduced demands to calculate a 2005-2030 water demand increase incorporating more aggressive water conservation practices.

No demand reductions were established for the domestic self-supply water use category, primarily because pricing and regulatory incentives do not reach this user group. While watering restriction enforcement can be an effective conservation tool for domestic users, this user group is within the jurisdiction of the unincorporated County and the users do not fall under SJRWMD CUP regulations. Since Lake County is not a member of the Alliance and the SJRWMD does not have regulatory jurisdiction, demand reductions are not anticipated for this user group.

2.4.3 Water Demand Reduction Results

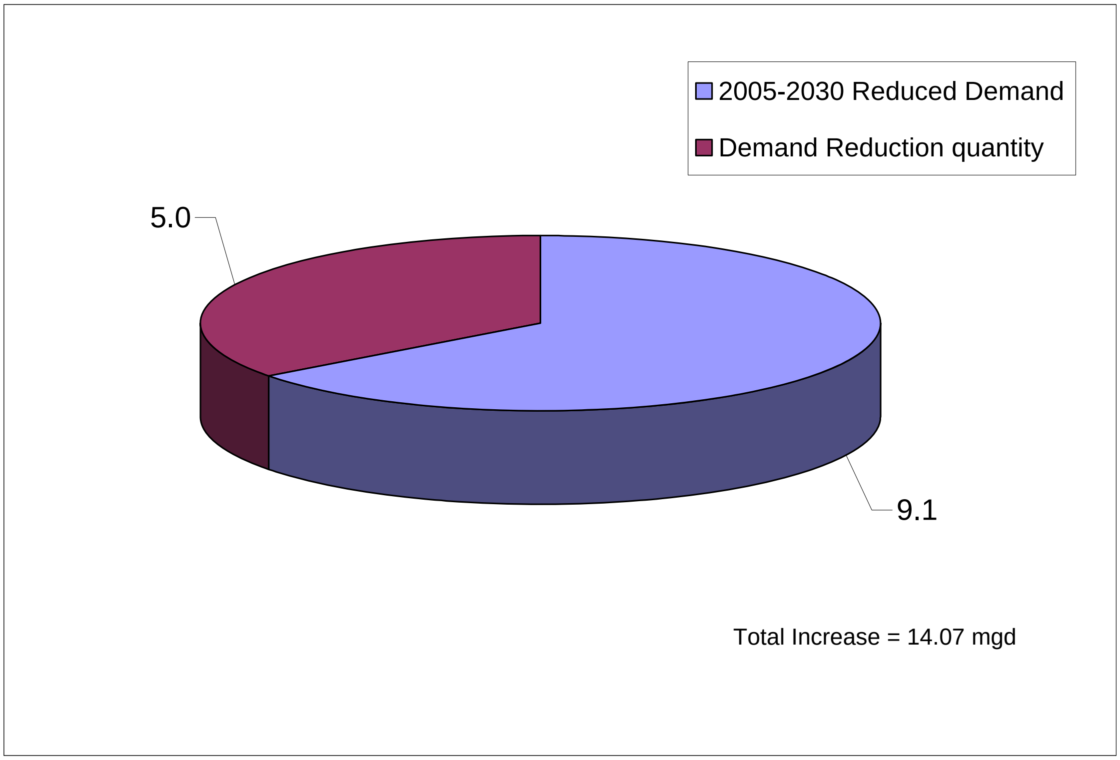
The Alliance Members can potentially reduce projected water demands by a total of 6.18 mgd over the planning horizon (Table 2-2, Figure 2-3). This demand reduction reduces the total Alliance potable water demand over the planning horizon by 23%, from 26.5 mgd to 20.3 mgd.

Figure 2-3 Potential Demand Reduction for Alliance Water Demands from 2005-2030 (mgd)



Private utilities can potentially reduce water demands by a total of 4.98 mgd over the planning horizon (Table 2-3, Figure 2-4). This demand reduction reduces the total private utilities demand by 35%, from 14.07 mgd to 9.09 mgd.

Figure 2-4 Potential Water Demand Reduction for Private Utilities from 2005-2030 (mgd)



While this is a significant reduction in the draft demand projections developed by the SJRWMD, there is currently little incentive for Alliance Members to reduce demands projected by the SJRWMD further, as decreased water use can translate to reduced CUP allocations granted by the SJRWMD.

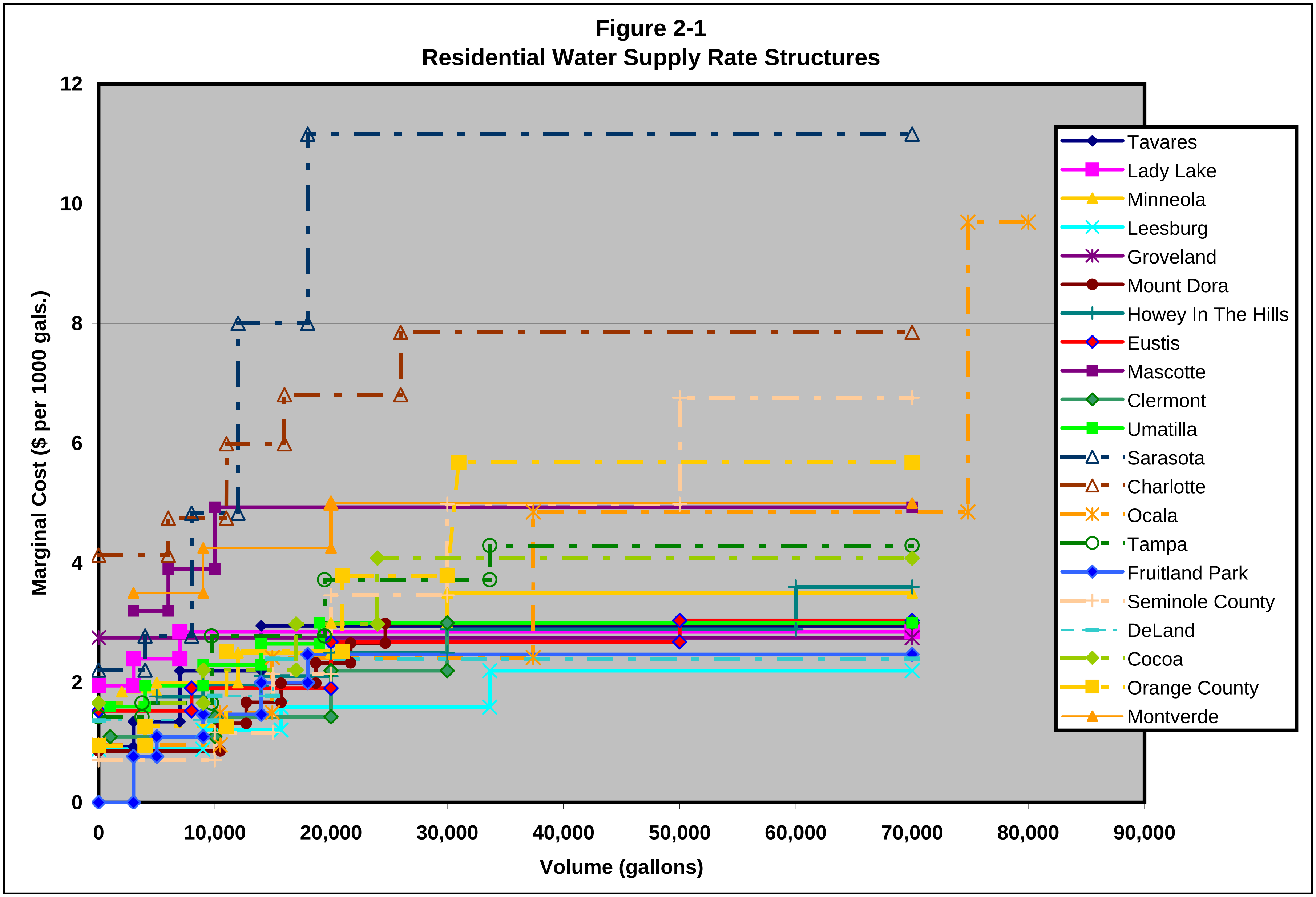


Figure 2-1
Residential Water Supply Rate Structures
Marginal Cost ($ per 1000 gals.)
Volume (gallons)
0
2
4
6
8
10
12
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
Tavares
Lady Lake
Minneola
Leesburg
Groveland
Mount Dora
Howey In The Hills
Eustis
Mascotte
Clermont
Umatilla
Sarasota
Charlotte
Ocala
Tampa
Fruitland Park
Seminole County
DeLand
Cocoa
Orange County
Montverde

Table 2-1
Existing and Proposed Conservation Measures Inventory

Alliance Member	Projected Gross Per Capita Rate [1] (gpcd)	REGULATION					EDUCATION			INCENTIVES					
		Watering Restriction Enforcement	Inverted Rate Structure	Mandatory Dual Lines for New Development	Distribution System Water Audits	Landscape Ordinances/ Florida Friendly Landscaping	Dedicated Staff	Bill Stuffers, Door Hangers and other readily available literature	Education Programs	Metering Programs	Leak detection, Prevention, and repair	Toilet Rebates	Pressure Monitoring and Control	Rain Sensors for Automatic Irrigation Systems	Retrofit Packages (Aerators, Toilet Dams, Shower Heads, etc.)
Clermont	**216**	Y	Y	Y[2]		Y	Y	Y	Y	Y					
Eustis	**124**		Y	Y	Y	Y				Y	Y				
Fruitland Park	**200**		Y		Y	Y[3]		Y	Y	Y					
Groveland	**112**		N		Y				Y						
Howey in the Hills	**229**		Y		Y			Y							
Lady Lake	**117**		Y[4]		Y	Y			Y						
Leesburg	**220**		Y	Y	Y	Y		Y	Y	Y	Y			Y	
Mascotte	**69**		Y												
Minneola	**81**		Y	Y	Y	Y		Y	Y	Y				Y	
Montverde	**152**		Y		Y	Y		Y			Y				
Mount Dora	**194**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y
Tavares	**178**		Y	Y[5]	Y	Y		Y	Y		Y		Y	Y	
Umatilla	**155**		Y					Y	Y					Y	

(1) Draft 2007 SJRMWD projection Gross per capita rate = total water demand/population served. Values shown are an average of gross per capita rates from 1995 to 2005. Clermont and Leesburg per capita rates increase from 2005 to 2010 (2010 to 2030 per capita shown for these cities

(2) East Service Area

(3) Proposed in 4/28/06 CUP Technical Staff Report (TSR)

(4) Where potable water is used for irrigation, it is charged at the highest block rate.

(5) New urban developments within the reuse service area have been requried to install reclaimed water distribution lines. 12/14/04 CUP TSR

Table 2-2.
Allaince Member Potential Demand Reductions

Utility	Gross Per Capita[1]	Public Supply Water Demand Projections[2] (mgd)						Existing Residential Allocation[3]		2030 Residential Demand[4]	Increase 2005- 2030 (mgd)		2030 Demand Reduction Percentage Range[5]		2030 Demand Reduction[6] (mgd)	2030 Reduced Demand (mgd)	2005-2030 Increase with Demand Reduction
		2005	2010	2015	2020	2025	2030	Residential Allocation mgd	% of Total Allocation		Total	Residential	Lower	Upper			
Clermont	216	5.21	8.13	8.89	9.26	9.56	9.86	7.37	78%	7.69	4.65	3.62	15%	25%	1.54	8.32	3.11
Eustis	124	3.08	3.34	3.78	4.32	4.66	5.09	3.70	55%	2.82	2.01	1.11	5%	5%	0.14	4.95	1.87
Fruitland Park	200	0.73	0.78	0.93	1.01	1.07	1.10	0.79	100%	1.10	0.37	0.37	15%	25%	0.27	0.82	0.09
Groveland	112	1.22	1.66	2.32	2.97	3.69	4.40	3.18	100%	4.40	3.18	3.18	5%	15%	0.22	4.18	2.96
Howey in the Hills	229	0.28	0.31	0.43	0.45	0.50	0.52	0.24	100%	0.52	0.24	0.24	15%	25%	0.13	0.39	0.11
Lady Lake	117	0.55	0.63	0.68	0.70	0.72	0.73	0.69	100%	0.73	0.18	0.18	5%	15%	0.04	0.70	0.14
Leesburg	221	5.69	7.57	8.60	10.92	11.62	12.48	5.06	55%	6.91	6.78	3.76	15%	25%	1.73	10.75	5.06
Mascotte	69	0.41	0.49	0.70	0.96	1.20	1.49	1.09	100%	1.49	1.09	1.09	5%	10%	0.07	1.42	1.01
Minneola	211	1.49	2.06	2.22	3.12	3.47	3.96	2.51	100%	3.96	2.47	2.47	5%	15%	0.20	3.76	2.28
Montverde	152	0.36	0.49	0.63	0.71	0.79	0.81	0.35	100%	0.81	0.44	0.44	5%	15%	0.08	0.73	0.36
Mount Dora	194	3.74	4.01	4.50	5.16	5.77	6.47	2.76	78%	5.04	2.73	2.13	15%	25%	1.01	5.46	1.73
Tavares	178	2.73	3.01	3.42	3.85	4.22	4.53	2.07	70%	3.18	1.80	1.26	15%	25%	0.64	3.89	1.16
Umatilla	155	0.57	0.65	0.79	0.96	1.07	1.14	0.53	100%	1.14	0.57	0.57	5%	15%	0.11	1.02	0.45
Alliance Members Total		26.06	33.12	37.92	44.39	48.35	52.57			39.80	26.51	15.70			**6.18**	**46.39**	**20.33**

(1) Extracted from SJRWMD 2007 draft projections for the SJRMWD 2008 Water Supply Assessment. Gross per capita rate = total water demand/population served. Values shown are an average of gross per capita rates from 1995 to 2005. Clermont and Leesburg per capita rates increase from 2005 to 2010 (2010 to 2030 per capita shown for these cities).

(2) Extracted from SJRWMD 2007 draft projections for the SJRMWD 2008 Water Supply Assessment. Calculated as the 2007 BEBR medium-high population projections multiplied by gross per capita rate. Some Alliance Members (e.g., Mount Dora, Minneola, and Montverde) have indicated that their demand projections are not generally consistent with the SJRWMD draft projections. In the context of the Plan, an Alliance-wide planning tool, these discrepancies do not affect the outcome to any significant degree. However, if used for other purposes, such as SJRWMD's review of future CUP applications, care should be taken and the source of these discrepancies distinguished before applying these demands on an individual Member basis.

(3) Demand increases in residential component determined by holding existing permitted household quanities constant through 2030. Existing household permitted amounts obtained from SJRWMD regulatory staff. Where data was not available, 100% was assumed to be residential for smaller communities. Eustis and Clermont residential percentages were estimated as less than 100% as they are larger cities having significant commercial constituents. Estimated Lady Lake, Mascotte, Minneola, Montverde allocation distribution.

(4) Only estimated residential demand reduced. Reduced according to (5).

(5) Percentages assigned according to per capita rates and existing and planned conservation elements.

(6) Optimized using percentage reduction that was the most appropriate within the range in (5), based on projected demands, the extent and effectiveness of existing and projected conservation programs as determined by per capita rates.

Figure 2-3.
Private Utilities Potential Demand Reductions

Utility	Gross Per Capita[1]	Public Supply Water Demand Projections[2] (mgd)						Increase 2005- 2030[3] (mgd)	Optimal 2030 Demand Reduction[4] (mgd)	Optimal 2030 Reduced Demand (mgd)	2005-2030 Increase with Optimal Demand Reduction
		2005	2010	2015	2020	2025	2030				
Aqua Source Inc	185	0.12	0.12	0.12	0.12	0.12	0.13	0.01	0.02	0.11	-0.01
Aqua Utilities Florida	132	0.76	1.19	1.26	1.28	1.37	1.37	0.61	0.21	1.17	0.41
Astor Park Water Assoc	128	0.31	0.37	0.41	0.44	0.47	0.48	0.17	0.07	0.41	0.10
Clerbrook Golf & Rv Resort	107	0.20	0.20	0.20	0.20	0.20	0.20	0.00	0.03	0.17	-0.03
Florida Water Services	1958	1.49	1.66	1.78	1.82	1.84	1.84	0.34	0.28	1.56	0.07
Harbor Hills Utilities	857	0.81	0.87	0.91	0.96	1.21	1.26	0.46	0.19	1.07	0.27
Hawthorne At Leesburg	260	0.48	0.48	0.49	0.49	0.50	0.50	0.02	0.08	0.43	-0.05
Lake Griffin Isles	691	0.12	0.12	0.12	0.12	0.12	0.12	0.00	0.02	0.11	-0.02
Lake Utility Services Inc	248	5.39	6.84	8.38	9.83	11.12	11.87	6.48	1.78	10.09	4.70
Mid Florida Lakes	250	0.42	0.43	0.44	0.45	0.45	0.46	0.04	0.07	0.39	-0.03
Montverde Mobile Home Assoc	91	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.01	0.05	0.00
Oak Springs Mhp	226	0.08	0.08	0.10	0.10	0.10	0.10	0.02	0.02	0.09	0.01
Orange Lake Mhp	558	0.12	0.12	0.12	0.12	0.12	0.12	0.00	0.02	0.10	-0.02
Plantation At Leesburg	47	0.16	0.17	0.18	0.19	0.19	0.19	0.03	0.03	0.16	0.00
Southlake Utilities	258	1.53	2.16	3.25	4.54	5.80	6.53	5.00	0.98	5.55	4.02
Springs Park Area Inc	207	0.08	0.08	0.10	0.11	0.11	0.11	0.03	0.02	0.09	0.01
Sunlake Estates	668	0.52	0.52	0.52	0.52	0.52	0.52	0.00	0.08	0.44	-0.08
Utilities Inc Of Pennbrooke	101	0.27	0.28	0.28	0.29	0.29	0.29	0.02	0.04	0.25	-0.03
Villages Of Lake Sumter	559	5.55	6.17	6.19	6.20	6.28	6.30	0.75	0.94	5.35	-0.19
Water Oaks Estates	357	0.46	0.46	0.46	0.48	0.51	0.53	0.06	0.08	0.45	-0.02
Wedgewood	227	0.20	0.21	0.21	0.21	0.21	0.22	0.02	0.03	0.19	-0.01
Private Utilities Total	N/A	19.13	22.59	25.60	28.52	31.59	33.20	14.07	**4.98**	**28.22**	**9.09**

All data extracted from SJRWMD 2007 draft projections for the SJRMWD 2008 Water Supply Assessment

(1) Gross per capita rate = total water demand/population served. Values shown are an average of gross per capita rates from 1995 to 2005.

(2) 2007 BEBR medium-high population projections multiplied by gross per capita rate.

(3) Residential demand assumed to be 100% of total existing allocation. 2030 demand was reduced by 15% for each private utility.

(4) Assumed 15% demand reduction for each private utility

3.0 Reuse Projections

Technical Memorandum 2 characterized the existing wastewater and reuse flows in Lake County. All of the centrally collected wastewater flows in the County are treated and provided to non-potable reuse applications. The reuse flows in the County are primarily distributed to golf course and landscape/residential irrigation, aquifer recharge, and sprayfield irrigation (see Technical Memorandum 2 for approximate %).

Reuse applications within Lake County vary in terms of their potable water offset and groundwater recharge potential, as discussed in Technical Memorandum 2. Beneficial reuse is defined for water supply applications as reuse that replaces or offsets potable water use.[3] Since beneficial reuse replaces or offsets potable water use, it can serve future water demands.

Reuse systems often use a mix of beneficial and non-beneficial application options. Since irrigation demand decreases significantly during the wet season while reuse supply generally remains steady,[4] reuse flows are often disposed of non-beneficially during the wet season while dry season flows are distributed beneficially. Matching variable irrigation demands to steadier reuse supplies is essential to the planning of beneficial reuse applications.

This Chapter develops average annual daily flow (AADF) projections to 2030 for centrally collected wastewater and associated reuse flows in Lake County. Existing reuse estimates are prepared for both beneficial and non-beneficial flows, in order to assess the amount of demand currently or proposed to be met by beneficial reuse. The existing reuse estimates are compared with future projections to determine the beneficial reuse flows that are expected to be available to reduce or offset future potable water demands. On a County-wide basis, the beneficial reuse expected to be available is compared to the increase in future water demands to establish the outstanding supply requirement. Within the County, the outstanding supply requirement is expected to be met by a combination of groundwater and alternative water supplies.

GIS mapping of reuse and potable water lines is also included in this Chapter.

3.1 Data Sources

Data for the wastewater and reuse flow projections were compiled and obtained from the following sources:

- WRA's Reuse Survey of Alliance Members;
- The Florida Department of Environmental Protection's (FDEP's) 2005 Reuse Inventory;
- FDEP Domestic Wastewater Permits for individual Alliance Member Facilities, and;
- Water and Wastewater Masterplans for individual Alliance Members.

[3] Golf course and landscape/residential irrigation are considered beneficial reuses, while aquifer recharge and sprayfield irrigation are not considered beneficial reuses.
[4] Irrigation demands and wastewater flows also fluctuate on a daily basis. Wastewater flows can also fluctuate seasonally, due to seasonal population increases and infiltration/inflow (I&I).

The GIS maps of reuse and potable water lines are based on data from Alliance Members, where it was provided. GIS maps of reuse lines are provided as Figures 3-1 through 3-3. GIS maps of potable water lines are provided as Figures 3-4 through 3-6.

3.2 Wastewater Flow Projections

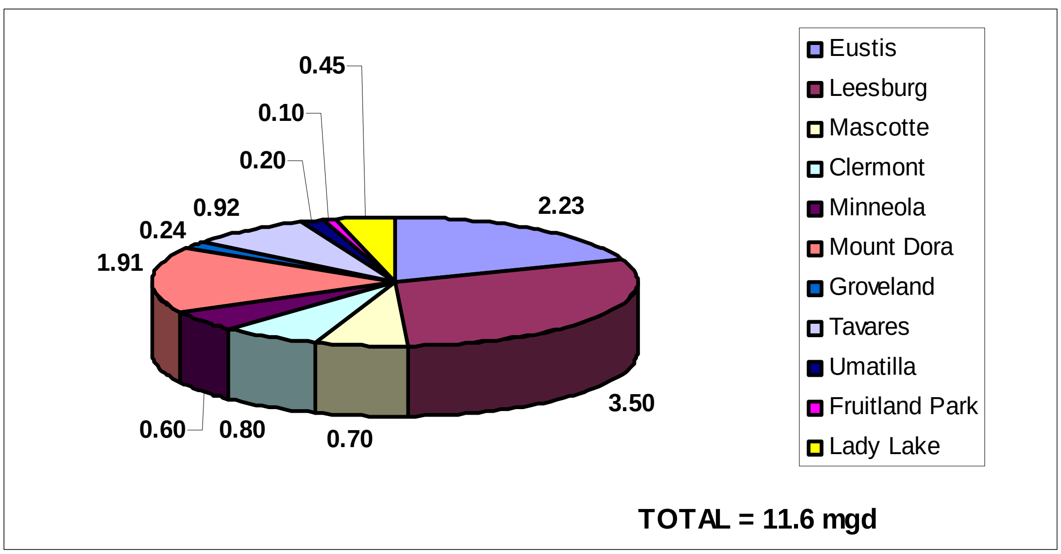
Existing wastewater flow estimates in 2005 and future wastewater flow projections to 2030 are developed for each permitted domestic wastewater facility within Lake County. Since all centrally collected wastewater is treated and provided to reuse applications in Lake County, wastewater flow projections are the basis for reuse flow projections.

Existing wastewater flows are estimated from FDEP's 2005 Reuse Inventory or individual Alliance Member Masterplan data (where available). Projected wastewater flows are calculated by multiplying existing flows by the percent increase in served population[5] from 2005 to 2030 (see Chapter 1 for population projections). All wastewater flows are annual average daily flows.

Where Alliance Member wastewater flow projections were available, the projected wastewater flows are calculated by multiplying the date of the Member projection by the percent increase in served population from that date to 2030. No Member projection extended beyond 2025.

Current wastewater flow estimates and future wastewater flow projections are shown for Alliance Members in Table 3-1. As shown, total existing flows for the Alliance are estimated in 2005 at 9.58 mgd. Total Alliance flows are projected in 2030 at 21.23 mgd, an increase of 11.65 mgd or about 122%. Figure 3-7 shows the increase in wastewater flows for each Member from 2005 to 2030.

Figure 3-7 Projected Member Increases in Wastewater Flow, 2005 – 2030



Current wastewater flow estimates and future wastewater flow projections are shown for private utilities in Table 3-2. As shown, total current flows for private utilities are estimated in 2005 at

[5] Water utility service areas were used and were considered best available information. Population projections by wastewater service areas were not available at the time of the analysis.

3.21 mgd. Total private utility flows are projected in 2030 at 5.20 mgd, an increase of 1.99 mgd or about 62%.

3.3 Reuse Flow Projections

3.3.1 Current Estimates

Current (2005) reuse flow estimates are compiled for each permitted domestic wastewater facility within Lake County. Where an Alliance Member has more than one wastewater facility, the flows from each facility are totaled for the Member analyses.

All reuse flows are designated as either beneficial or non-beneficial based on their application method, as previously described. The existing reuse application methods for various flows from each facility were gathered from FDEP's 2005 Reuse Inventory or from individual Alliance Member Masterplan data (where available).

In some cases, near term individual Member commitments to significantly increase flows to beneficial reuse applications were identified.[6] This generally involved in-progress upgrades to wastewater facilities, establishment of interconnects between wastewater facilities, and/or dry line installation to serve existing demands with pending increases in wastewater flow. Since these proposed beneficial reuse flows would serve existing demands and would not be available to serve future demands, the proposed commitments were incorporated into the current reuse estimates.

Existing and proposed reuse flow estimates are shown for Members in Table 3-1. As shown, total current and proposed beneficial reuse flow for the Alliance is estimated in 2005 at 4.11 mgd. Total non-beneficial reuse flow is estimated in 2005 at 6.13 mgd. Beneficial reuse comprises or is proposed to comprise approximately 40% of the total Alliance reuse flow in 2005.

Current reuse flow estimates are shown for private utilities in Table 3-2. As shown, total current beneficial reuse flow for private utilities is estimated in 2005 at 1.03 mgd.[7] Total non-beneficial reuse flow is estimated in 2005 at 2.18 mgd. Beneficial reuse comprises approximately 32% of the total private reuse flow in 2005.

3.3.2 Reuse Flow Projections

Future reuse flow projections to 2030 are developed for each permitted domestic wastewater facility within Lake County. Where an Alliance Member has more than one wastewater facility, the flows from each facility are totaled for each Member.

Since irrigation demands decrease significantly during the wet season, wet season reuse flows are often distributed to non-beneficial applications while dry season reuse flows are distributed to beneficial applications. A common planning target is 50% distribution of total AADF to beneficial reuse and often represents a cost feasibility limitation for individual facilities.[8] This is due to the cost of storage that would be required to effectively serve the seasonal variation in

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[6] Mount Dora, Leesburg, Lady Lake, Mascotte and Tavares.
[7] Near term (proposed) private utility commitments to increase beneficial reuse flow were not identified.
[8] The SJRWMD's regulatory goal is 100% beneficial reuse (J. Hollingshead, email communication 7/17/07). The SWFWMD requires 50% beneficial reuse for eligibility for cost-share funding of reuse projects.

irrigation demand. Since water supply economies of scale (such as large storage volumes) that may be available with regional cooperation are not considered, this analysis is non-regional in scope.

The projected beneficial reuse flow for each Member is calculated by multiplying its projected wastewater flow by 50%, based on the common cost feasibility limitation for individual facilities. However, detailed analyses of individual facilities are not conducted here, so this method does not necessarily assume that 50% beneficial reuse is feasible for any given wastewater facility. Rather, the projections reflect a County-wide planning goal that is expected to be reached (on average) in 2030 by the wastewater facilities in Lake County.

The projected non-beneficial reuse flow for each facility is calculated by subtracting the projected beneficial reuse flow from the projected wastewater flow. This assumes that all centrally collected wastewater will continue to be provided to reuse applications.

Beneficial reuse flow projections are shown for Members in Table 3-1. As shown, total projected beneficial reuse flow for the Alliance in 2030 is 10.61 mgd. Total non-beneficial reuse flows are projected at 10.61 mgd. The projected available increase in beneficial reuse flow is calculated by subtracting the existing and proposed beneficial reuse flow estimate from the projected beneficial reuse flow. As shown, the total available increase in beneficial reuse flow for the Alliance to 2030 is 6.51 mgd.

Reuse flow projections to 2030 are shown for private utilities in Table 3-2. Since many of the private utilities are much smaller than the Member facilities, their ability to treat wastewater to more costly public access standards and distribute to beneficial reuse applications is likely to be more limited.[9] Therefore, reuse distribution to beneficial applications is not anticipated for the projections unless the utility currently distributes reuse beneficially or their wastewater flow is projected to increase by more than 0.25 mgd. As shown, total projected beneficial reuse flow for 2030 is 2.04 mgd. Total non-beneficial reuse flow is projected at 3.16 mgd. The total available increase in beneficial reuse flow to 2030 for Non-Alliance Members is projected at 1.01 mgd.

3.4 Projected Water Supply Contribution

Since beneficial reuse replaces or offsets potable water use, it can serve future water demands. Until recently, reuse applications in Florida were considered to be treated wastewater disposal options that were more environmentally friendly than treated wastewater discharges to surfacewaters (FDEP, 2003).

The emphasis on reuse as a disposal method has led to inefficient water supply applications even when used beneficially, since some utility suppliers have offered incentives to end users to accept reuse water. Landscape/residential irrigation use of water can increase four-fold when unrestricted reuse supply is made available at no cost to the consumer.[10],[11] In some cases, incentive low-charge cost structures are embedded in long-term residential/landscape reuse supply agreements that have precluded the efficient water supply use of the resource.

[9] Reuse treatment requirements for different applications are summarized in Appendix B.
[10] SWFWMD (2002).
[11] However, golf courses are typically considered to be efficient reuse water users due to water management practices already in place.

As traditional groundwater supplies become limited with increasing demand, more costly alternative water supplies must be developed. Reuse is now considered a valuable water resource and an essential component of an integrated water resource management strategy.

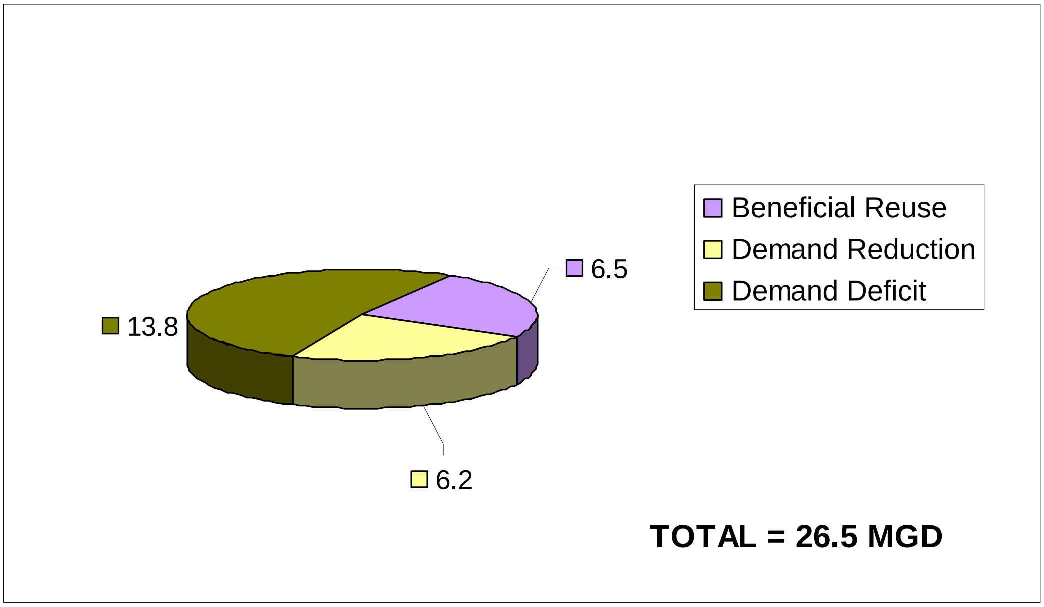
The recent emphasis on reuse as a water supply source requires its efficient water supply application when used beneficially. Conservation practices currently employed by Alliance Members are discussed in Chapter 2. Key conservation elements applicable to residential/landscape irrigation use include:

- Metering
- Volume-based Charges
- Enforcement of Watering Restrictions
- Use of Irrigation Timers and Moisture Sensors

With sufficient reuse efficiency measures, it is expected that beneficial reuse flows available from 2005 to 2030 will be used as efficiently as potable water (for irrigation purposes). Therefore, the water supply benefit from available beneficial reuse is projected to be equivalent to that from potable water supply, since potable water is currently used for irrigation in Lake County.

The projected Alliance water supply contribution from the available reuse projections is shown on Figure 3-8. As shown, the available increase in beneficial reuse flows is 6.5 mgd and would serve approximately 25% of the Alliance water demand increase from 2005 to 2030.

Figure 3-8 2005-2030 Projected Alliance Demand with Conservation and Reuse



As previously discussed, this projected supply contribution does not necessarily assume any specific contribution from a given wastewater facility. The projected contribution reflects a combined beneficial reuse supply that is expected to be available to 2030 from the municipal wastewater facilities in Lake County.

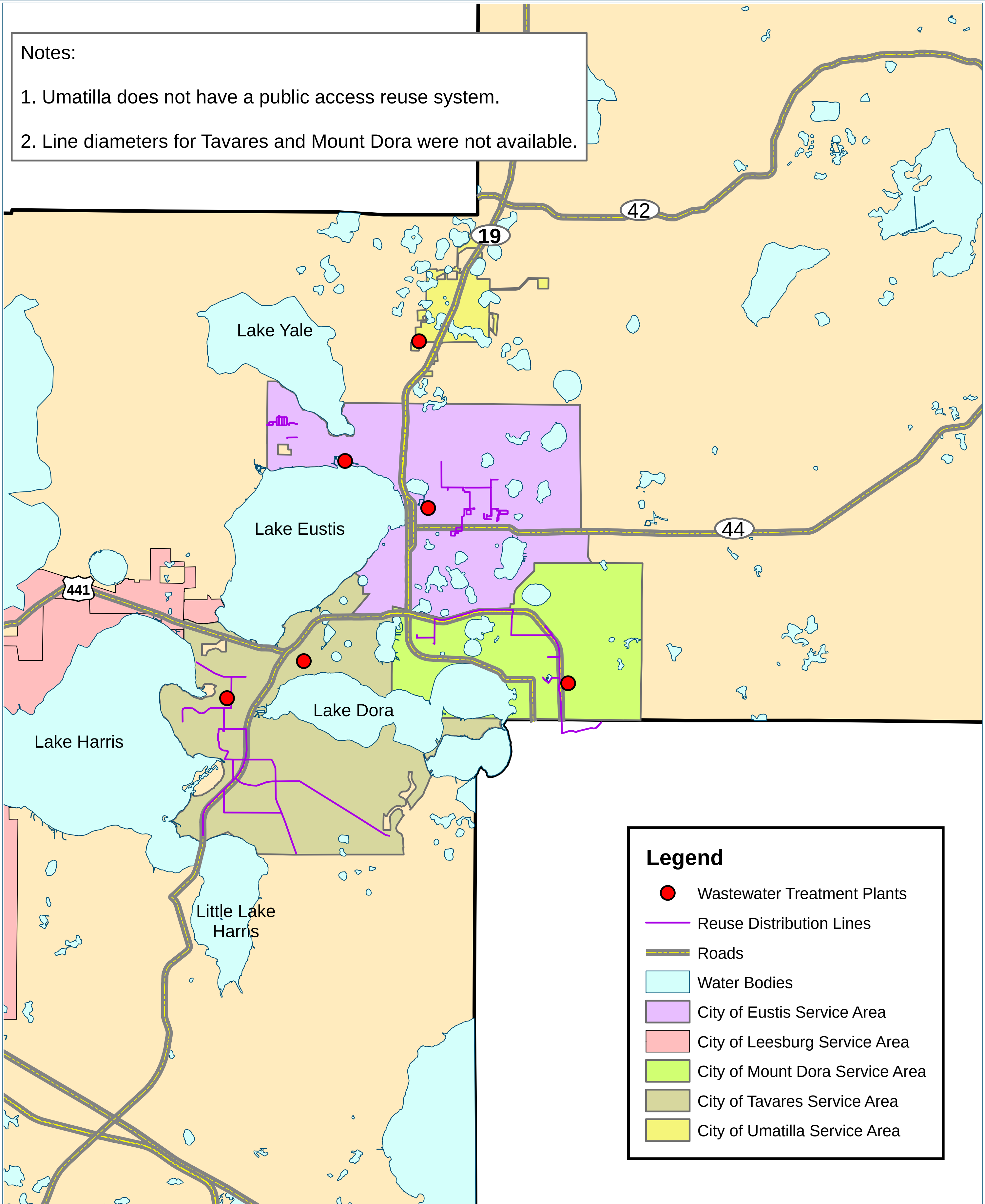


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Figure 3-1
Northeast Lake County
Reuse Distribution Systems

ORIGINAL DATE: 05-30-07
REVISION DATE: 07-26-07
JOB NUMBER: 0407
FILE NAME:0407_Region 1 Reuse.mxd
GIS OPERATOR: JAC

N
W E
S

1 Inch = 3 Miles

Notes:

1. Reuse lines were not available for Leesburg.

2. Fruitland Park does not have a public access reuse system.

3. Diameter of water line for Lady Lake were not available.

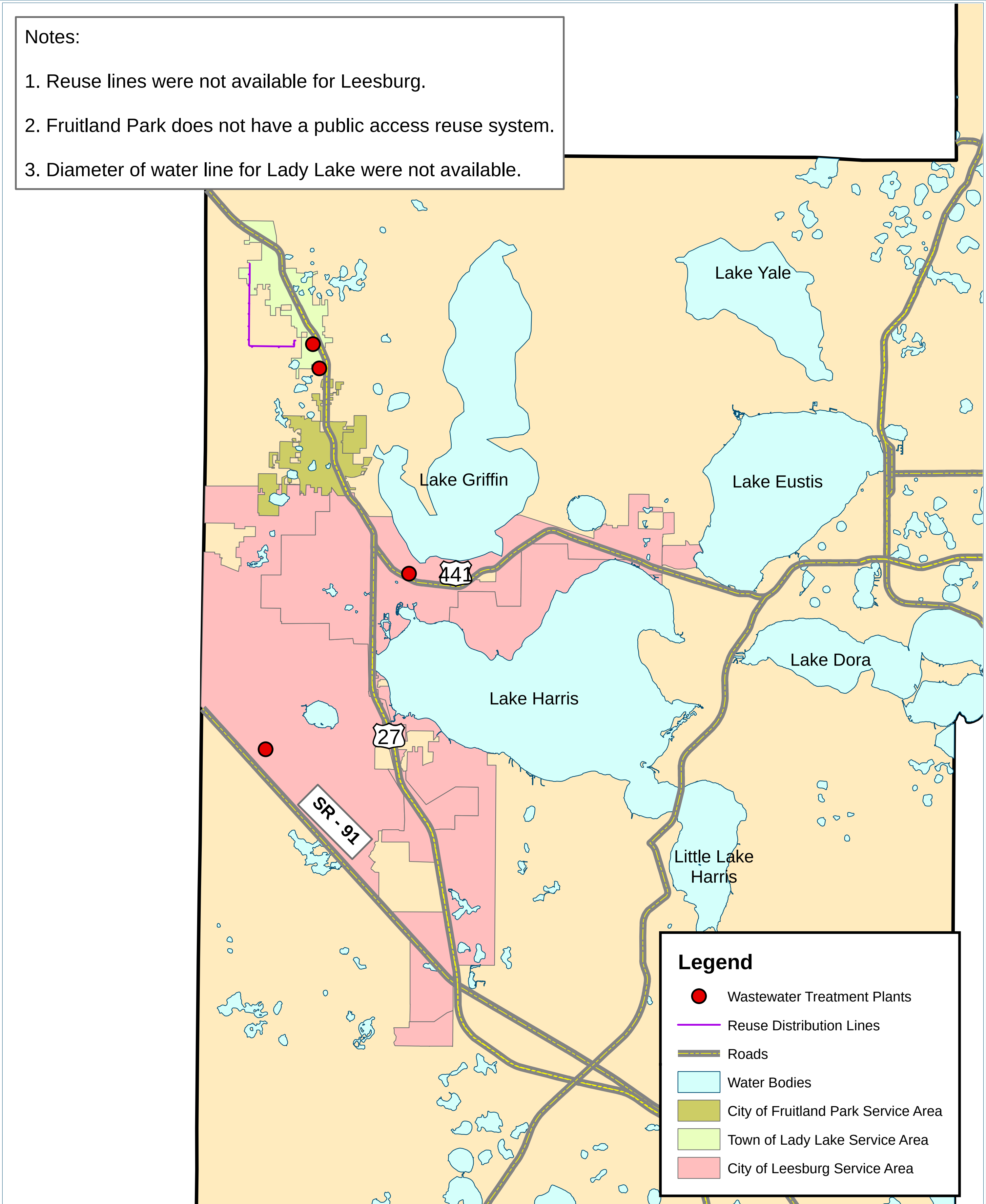

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Figure 3-2
Northwest Lake County
Reuse Distribution Systems

ORIGINAL DATE: 05-30-07
REVISION DATE: 07-26-07
JOB NUMBER: 0407
FILE NAME:0407_Region 2 Reuse.mxd
GIS OPERATOR: DR

N W E S

1 Inch = 3 Miles

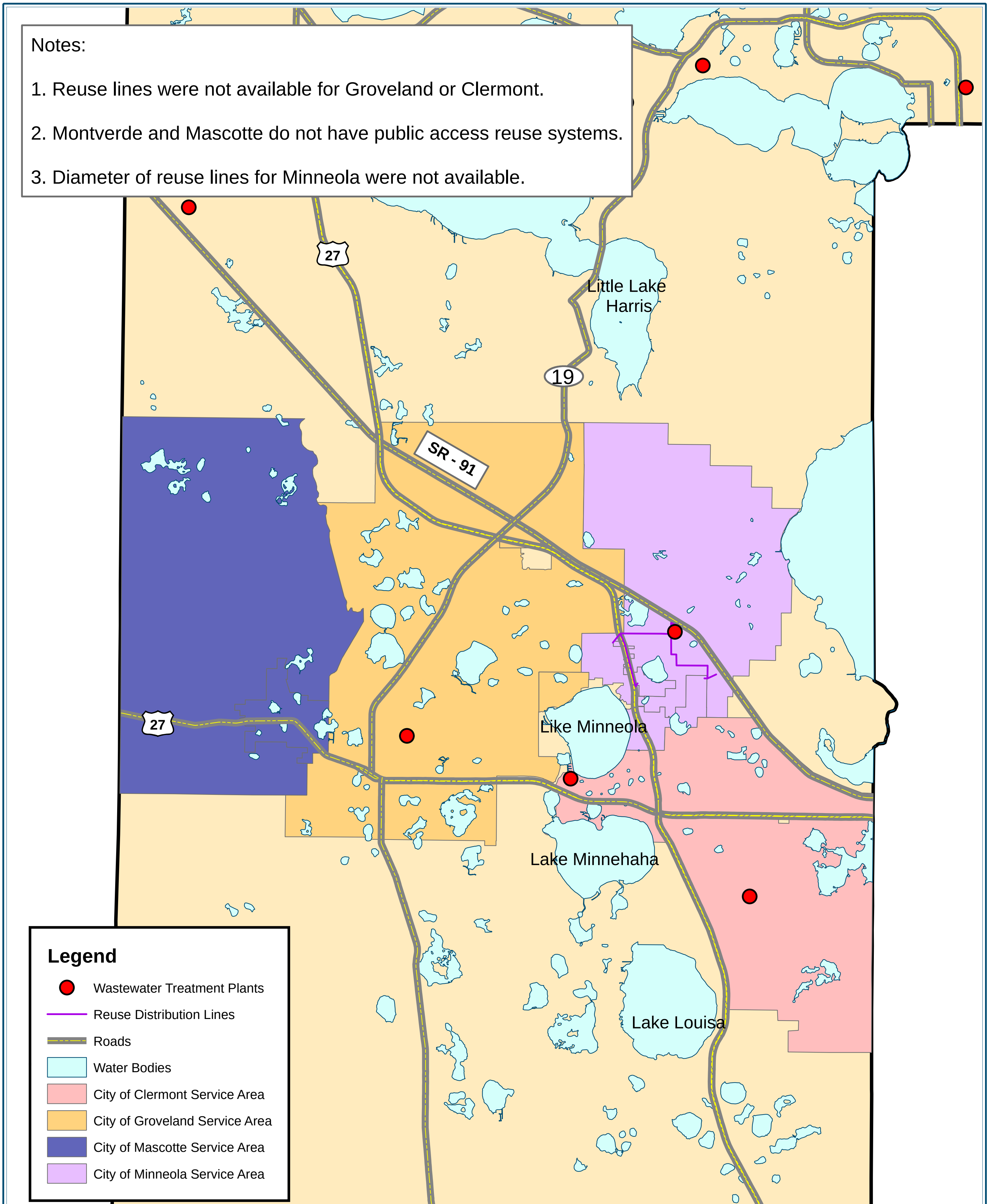

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Figure 3-3
Southern Lake County
Reuse Distribution Systems

ORIGINAL DATE: 05-30-07
REVISION DATE: 07-26-07
JOB NUMBER: 0407
FILE NAME:0407_Region 3 Reuse.mxd
GIS OPERATOR: DR

Notes:

1. Water line locations were not available for Leesburg, Umatilla, and Howey in the Hills.

2. Diameters of water lines shown for Mt. Dora are 12" and greater.

3. Diameters of water lines for Tavares were not available.

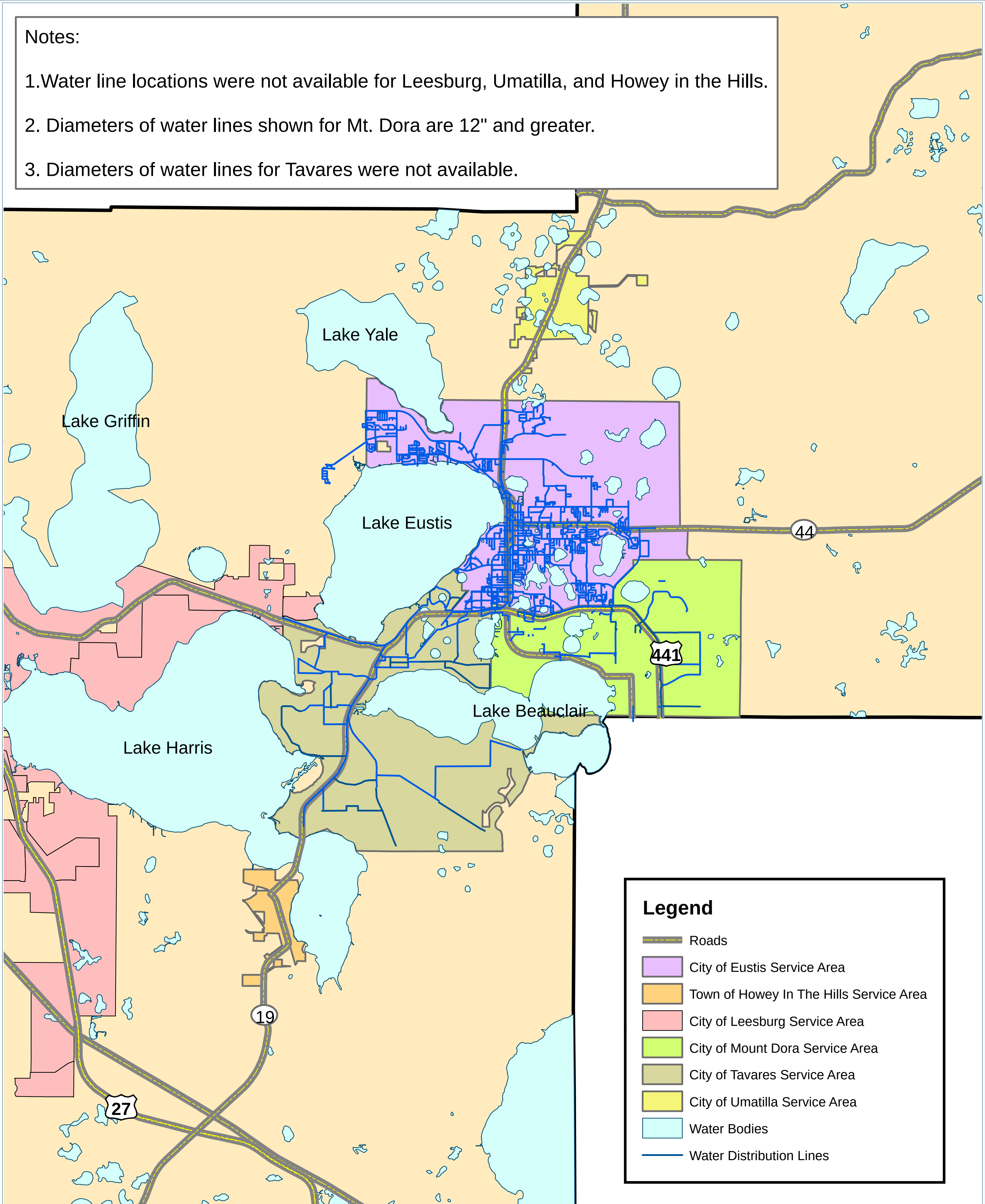

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Figure 3-4

Northeast Lake County

Water Distribution Systems

ORIGINAL DATE: 05-30-07

REVISION DATE: 07-26-07

JOB NUMBER: 0407

FILE NAME:0407_Region 1 .mxd

GIS OPERATOR: DR

N W E S

1 Inch = 3 Miles

Notes:

1. Water line locations were not available for Leesburg.

2. Diameter of water lines shown for Fruitland Park are 8" and greater.

3. Diameter of water lines shown for Lady Lake varies.

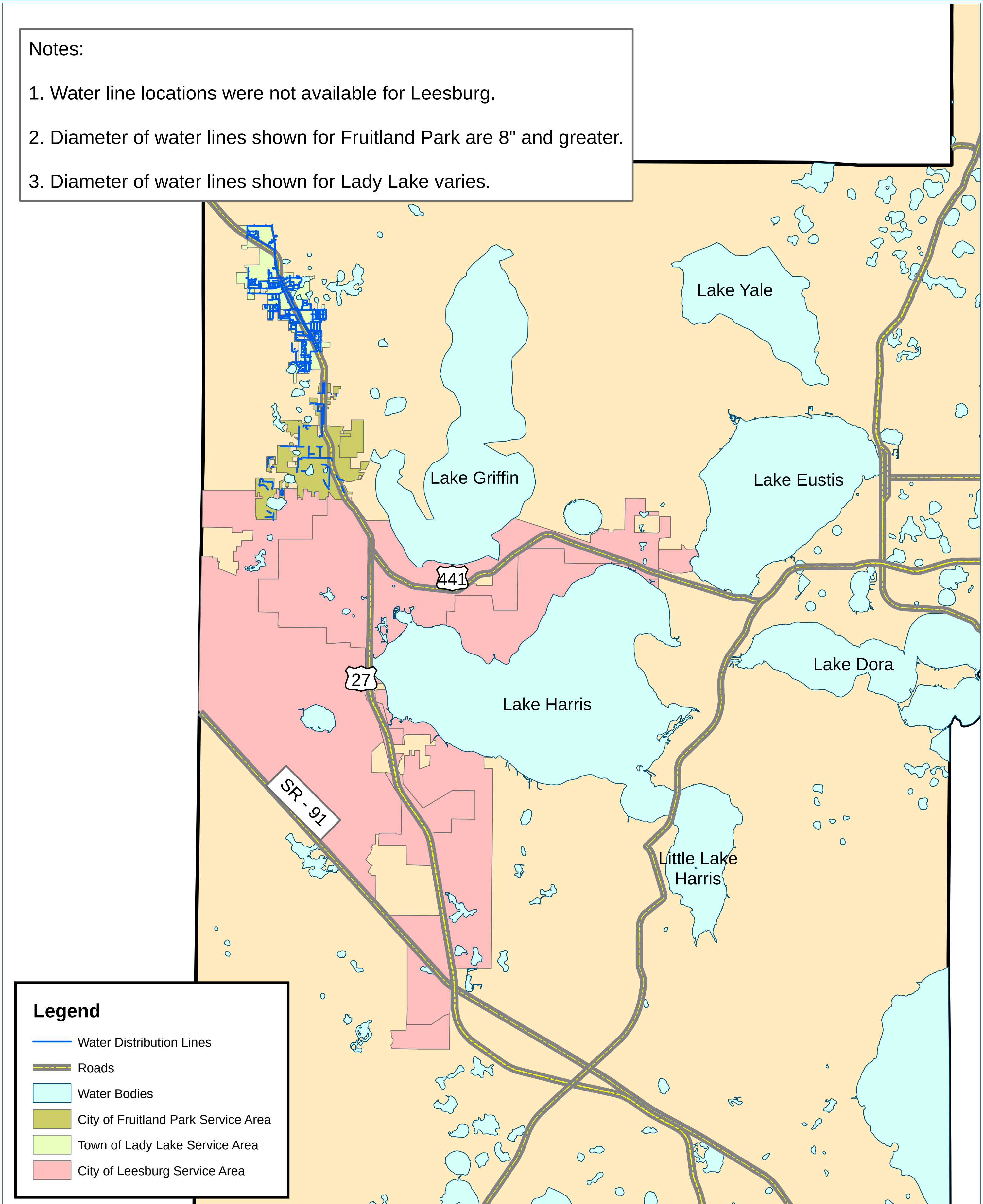

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Figure 3-5
Northwest Lake County Water Distribution Systems

ORIGINAL DATE: 05-30-07
REVISION DATE: 07-26-07
JOB NUMBER: 0407
FILE NAME:0407_Region 2.mxd
GIS OPERATOR: DR

N W E S

1 Inch = 3 Miles

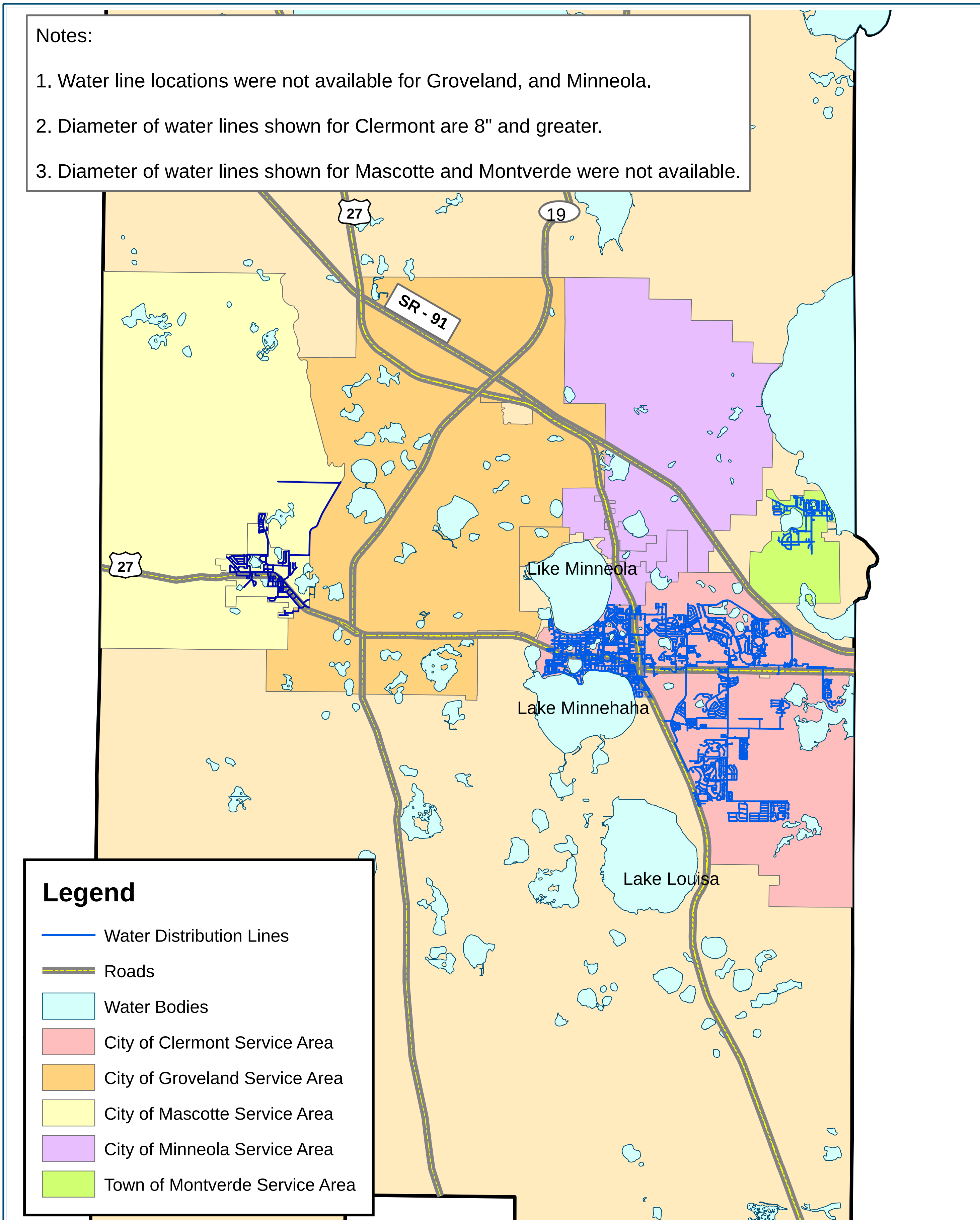

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Figure 3-6
Southern Lake County
Water Distribution Systems

ORIGINAL DATE: 05-30-07
REVISION DATE: 07-26-07
JOB NUMBER: 0407
FILE NAME:0407_Region 3.mxd
GIS OPERATOR: DR

N W E S
1 Inch = 3 Miles

Table 3-1. Alliance Current and Projected Reuse and Non-Potable Flows

	Current and Projected Wastewater Flow			Current or Proposed Reuse Flow and Distribution[(1), (2)]			Projected Reuse Flow and Distribution[(3)]				Regionalized AWS Scenario: Potential Non-Potable Water Flows and Distribution						
	2005	2030	2005 to 2030	2005	2005	2005	2030	2030	2030	2005 to 2030	2030	2030	2030	2030	2005 to 2030	2030	2005 to 2030
Municipality / Utility	Estimated Wastewater Flow (mgd)	Projected Wastewater Flow (mgd)	Increase in Wastewater Flow (mgd)	Estimated Non-Beneficial Reuse Flow (mgd)	Estimated Beneficial Reuse Flow[(4)] (mgd)	Reuse Beneficial Utilization (%)	Projected Non-Beneficial Reuse Flow (mgd)	Projected Beneficial Reuse Flow (mgd)	Reuse Beneficial Utilization (%)	Available Increase in Beneficial Reuse Flow (mgd)	Projected Non-Beneficial Reuse Flow (mgd)	Projected Beneficial Reuse Flow (mgd)	Reuse Beneficial Utilization (%)	Suppl. Surface Water Flow (mgd)	Increase in Beneficial Reuse Flow (mgd)	Projected Beneficial Non-Potable Flow (mgd)	Increase in Beneficial Non-Potable Flow (mgd)
Clermont[(a)]	1.99	2.79	0.80	0.99	1.00	50%	1.39	1.39	50%	0.39	0.70	2.09	75%	0.69	1.09	2.78	1.78
Eustis[(b)]	1.26	3.49	2.23	0.70	0.56	44%	1.75	1.75	50%	1.19	0.87	2.62	75%	0.86	2.06	3.48	2.92
Groveland[(c)]	0.15	0.39	0.24	0.10	0.05	33%	0.20	0.20	50%	0.15	0.10	0.29	75%	0.13	0.24	0.42	0.37
Leesburg[(d)]	3.40	6.90	3.50	2.90	0.50	15%	3.45	3.45	50%	2.95	1.73	5.18	75%	1.71	4.68	6.88	6.38
Minneola[(e)]	N/A	0.60	0.60	N/A	0.30	N/A	0.30	0.30	50%	0.00	0.15	0.45	75%	0.15	0.45	0.60	0.60
Mount Dora[(f)]	1.19	3.10	1.91	0.44	0.75	63%	1.55	1.55	50%	0.80	0.78	2.33	75%	0.77	1.58	3.09	2.34
Mascotte[(g)]	N/A	0.70	0.70	0.10	0.10	50%	0.35	0.35	50%	0.25	0.18	0.53	75%	0.17	0.43	0.70	0.60
Montverde[(h)]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tavares[(i)]	1.39	2.31	0.92	0.70	0.70	50%	1.15	1.15	50%	0.46	0.58	1.73	75%	0.57	1.04	2.30	1.61
Umatilla[(j)]	0.20	0.40	0.20	0.20	0.00	0%	0.20	0.20	50%	0.20	0.10	0.30	75%	0.10	0.30	0.40	0.40
Fruitland Park[(k)]	N/A	0.10	0.10	N/A	N/A	N/A	0.05	0.05	50%	0.05	0.03	0.08	75%	0.02	0.08	0.10	0.10
Lady Lake[(l)]	N/A	0.45	0.45	N/A	0.15	N/A	0.23	0.23	50%	0.08	0.11	0.34	75%	0.11	0.19	0.45	0.30
Howey-in-the-Hills[(m)]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	**9.58**	**21.23**	**11.65**	**6.13**	**4.11**	**40%**	**10.61**	**10.61**	**50%**	**6.51**	**5.31**	**15.92**	**75%**	**5.29**	**11.81**	**21.21**	**17.40**

(1) Beneficial reuse water is defined as water that offsets potable water demands. Example of beneficial reuse include golf course and public access area irrigation. Sprayfields and RIBs are considered non-beneficial reuse.
(2) Includes reuse waters currently planned for capture and/or treatment to public access reuse standards, and beneficial distribution of these waters to existing demands.
(3) Surface water is not considered a feasible reuse supplementation source for individual Alliance members, due to the cost of treatment required and potential resource availability constraints.
(4) From FDEP's 2005 Reuse Inventory.

(a) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 40% increase in served population.
(b) Wastewater flow projection linear to 2030 from 2025 by WRA based on SJRWMD's 9% increase in served population. Flow projection to 2025 based on City of Eustis response to SJRWMD CUP RAI#2 Application #2634, (2006).
(c) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 260% increase in served population. Surfacewater augmentation of reclaimed system currently planned.
(d) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 105% increase in served population.
(e) Wastewater flow projection at 2030 by WRA based on residential flow of 50 gpcd (AWWA, 1998) and SJRWMD's 9,168 person increase in served population from 2005 to 2030.
(f) Wastewater flow projection linear to 2030 from 2025 by WRA based on SJRWMD's 12% increase in served population. Flow projection to 2025 based on City of Mount Dora Water Supply Facilities Work Plan (2006).
(g) Wastewater flow projection at 2030 by WRA based on residential flow of 50 gpcd (AWWA, 1998) and SJRWMD's 14,800 person increase in served population from 2010 to 2030.
(h) Email correspondence, Arthur Nix.
(i) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 66% increase in served population.
(j) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 100% increase in served population.
(k) No available reuse data per FDEP's 2005 Reuse Inventory. No correspondence received.
(l) Wastewater flow projection linear to 2030 from 2025 by WRA based on SJRWMD's 1% increase in served population. Flow projection to 2025 based on Town of Lady Lake CUP application (2004), using a 2025 served population of 26,352 and a residential flow of 50 gpcd (AWWA, 1998).
(m) No available reuse data per FDEP's 2005 Reuse Inventory. No correspondence received.

Table 3-2. Private Utility Current and Projected Reuse and Non-Potable Flows

	Current and Projected Wastewater Flow			Current Reuse Flow and Distribution[1]			Projected Reuse Flow and Distribution			
	2005	2030	2005 to 2030	2005	2005	2005	2030	2030	2030	2030
Municipality / Utility	Estimated Wastewater Flow (mgd)	Projected Wastewater Flow (mgd)	Increase in Wastewater Flow (mgd)	Estimated Non-Beneficial Reuse Flow (mgd)	Estimated Beneficial Reuse Flow[2] (mgd)	Reuse Beneficial Utilization (%)	Projected Non-Beneficial Reuse Flow (mgd)	Projected Beneficial Reuse Flow (mgd)	Reuse Beneficial Utilization (%)	Available Increase in Beneficial Reuse Flow (mgd)
Lake Correctional Institute[a]	0.13	0.26	0.13	0.13	0.00	0%	0.26	0.00	0%	0.00
Lake Groves Utilities STP[b]	0.31	0.49	0.18	0.31	0.00	0%	0.49	0.00	0%	0.00
Mid-Florida Lakes[c]	0.16	0.17	0.01	0.16	0.00	0%	0.17	0.00	0%	0.00
Pennbrooke WWTF[d]	0.09	0.10	0.01	0.00	0.09	100%	0.00	0.10	100%	0.01
Plantation @ Leesburg[e]	0.20	0.23	0.03	0.04	0.16	80%	0.05	0.19	80%	0.03
Quail Valley[f]	0.03	0.06	0.03	0.03	0.00	0%	0.06	0.00	0%	0.00
Southlake Community[g]	0.56	1.83	1.27	0.56	0.00	0%	0.91	0.91	50%	0.91
St. Johns - Astor Park[h]	0.11	0.17	0.06	0.11	0.00	0%	0.17	0.00	0%	0.00
Sunshine Parkway[i]	0.08	0.16	0.08	0.08	0.00	0%	0.16	0.00	0%	0.00
Thousand Trails[j]	0.02	0.04	0.02	0.02	0.00	0%	0.04	0.00	0%	0.00
Villages[k]	1.48	1.69	0.21	0.70	0.78	53%	0.84	0.84	50%	0.06
Water Oak Estates[l]	0.06	0.07	0.01	0.06	0.00	0%	0.07	0.00	0%	0.00
Clerbrook RV Resorts[m]	0.05	0.05	0.00	0.05	0.00	0%	0.05	0.00	0%	0.00
Oak Spring MHP[n]	0.04	0.05	0.01	0.04	0.00	0%	0.05	0.00	0%	0.00
TOTAL	**3.21**	**5.20**	**1.98**	**2.18**	**1.03**	**32%**	**3.16**	**2.04**	**39%**	**1.01**

(1) Beneficial reuse water is defined as water that offsets potable water demands. Example of beneficial reuse include golf course and public access area irrigation. Sprayfields and RIBs are considered non-beneficial reuse.
(2) From FDEP's 2005 Reuse Inventory.

(a) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 103% increase in County-wide population.
(b) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 58% increase in served population for Lake Groves / Lusi South.
(c) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 9% increase in served population.
(d) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 6% increase in served population.
(e) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 17% increase in served population.
(f) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 103% increase in County-wide population.
(g) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 326% increase in served population.
(h) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 56% increase in served population.
(i) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 103% increase in County-wide population.
(j) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 103% increase in County-wide population.
(k) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 14% increase in served population.
(l) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 14% increase in served population.
(m) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 0% increase in served population.
(n) Wastewater flow projection linear to 2030 from 2005 by WRA based on SJRWMD's 28% increase in served population.

4.0 Potential Reuse and Alternative Water Supplies Development

Since beneficial reuse replaces or offsets potable water use, it can serve future water demands. Over a given planning horizon, an increase in the availability of beneficial reuse can decrease the traditional groundwater supply requirement, or decrease the (potable) alternative water supply requirement. Since irrigation demands decrease significantly during the wet season and reuse supplies generally remain steady, the use of storage, supplemental sources, and interconnects between reuse systems can increase the quantity of reuse or non-potable water available for beneficial use.

- Storage - Storage of wet season reuse flows and distribution to beneficial applications can increase the availability of beneficial reuse. However, the development of significant wet season storage capacity (reservoir, mine pit, etc) requires major capital outlays and is generally not a feasible option for smaller, individual utilities.

- Supplemental Sources - By matching peak irrigation demands, augmenting reuse supplies with supplemental non-potable sources can also increase the amount of potable water that is replaced or offset by non-potable supplies. Supplemental sources such as surfacewater or stormwater are subject to the permitting and withdrawal constraints established by the SJRWMD. The development of these supplemental sources – which must be treated to public access standards when blended with treated wastewater – requires significant capital outlay, and is generally not a feasible option for smaller reuse systems.

- Interconnects - Interconnects between adjacent reuse systems can also increase beneficial reuse availability by helping to manage daily fluctuations in irrigation demand and reuse supply. However, the effectiveness of interconnects is limited by the overall supply and storage capabilities of the connected systems. Interconnect opportunities may also be limited by pipeline distances between adjacent systems, or hydraulic considerations that would require capital improvements to the recipient system, thereby increasing the cost of interconnection.

Cooperation between smaller utilities can lower costs by providing economies of scale to capital-intense reuse projects such as reservoirs, supplemental sources, and interconnects. Where feasible, these projects can substantially increase beneficial reuse availability and reduce or offset the associated potable water demands. Since the beneficial reuse quantities potentially developed during a cooperative effort would not be otherwise feasible, this type of non-potable supply project is considered an alternative water supply (AWS) by the WMDs.

This Chapter develops non-potable AWS projections relative to potential cooperative efforts among Members. Three sub-regional areas within Lake County are identified as potential project areas for the Members located in each area. The existing reuse estimates from Chapter 3 are compared with the projections to approximate the maximum non-potable supply that potentially could be available.

The potential non-potable AWS projections are based on sources only, and do not consider detailed feasibility considerations such as identification of demands, infrastructure upgrades, siting, or environmental permitting. The projections therefore do not assume that the three project areas or specific flows will be feasible. A more detailed feasibility assessment and evaluation of the three projects will be completed in Task 7 – Evaluation of Existing Facilities and Alternative Water Supply Projects.

4.1 Sub-Regional Cooperative Project Areas

Figure 4-1 shows the potential cooperative project areas. As shown, three potential project areas are identified in the northeast, northwest, and southern areas of Lake County. The project areas were developed on the basis of Member proximity to one another, and to the large surfacewater lakes in the County that may be viable supplemental sources. Stormwater can also serve as a supplemental source, particularly for project areas where lake withdrawals are not viable. The Members located within each project area are listed below in Table 4-1 below:

Table 4-1 Members Located in Cooperative Project Areas

Northeast:	Northwest:	Southern:
Eustis	Leesburg	Mascotte
Mount Dora	Fruitland Park	Minneola
Umatilla	Lady Lake	Clermont
Tavares		Groveland

Note: Howey-in-the-Hills and Montverde do not have a central wastewater treatment facility and are not included in the cooperative project areas.

Figure 4-2 shows an example project design for the northwest project area. As shown, surfacewater would be withdrawn from Lake Eustis and/or Lake Dora, treated, and stored in a central facility. Wet season reuse flows would also be stored in the central facility. The central facility would function as a distribution hub and send treated water to the Eustis, Umatilla, Mount Dora, and Tavares reuse systems for beneficial use. Each of the reuse systems would be interconnected to provide flexibility to the system.

Conceptual project designs for each of the project areas will be developed for the detailed feasibility assessment and evaluation in Task 7. These designs will include a unit cost estimate for each project.

4.2 Surfacewater Withdrawals in Lake County

Since MFLs have not been developed for the Upper Ocklawaha River, most of the current estimates of potential surfacewater yield from within Lake County are planning-level. The most recent, County-level analysis indicated that the Palatlakaha River/Haines Creek System (the approximate Upper Ocklawaha River Basin) has a cumulative total of about 31.9 mgd potentially available (CH2M Hill, 1996). This analysis was based on hydrologic data and did not consider the biological relationships to basin hydrology. MFLs to be based on biological relationships have not yet been developed for the Upper Ocklawaha River.[12]

Of the 31.9 mgd potentially available in Lake County, the SJRWMD has indicated that about 14 mgd remains available for withdrawal, due to existing permitted withdrawals within the basin. These existing permitted withdrawals were not verified, due to the difficulty in determining whether a given withdrawal is within the basin system or is isolated. The 14 mgd estimate is

[12] Preliminary biological work relative to MFLs has been conducted for the Ocklawaha River (Rogers and Allen, 2004).

considered to be best available information for this report. However, considerable uncertainty is present within the 31.9 mgd planning estimate that was used to generate the 14 mgd estimate. Adopted MFLs for either the Upper Ocklawaha River or within its basin system will likely determine the actual yield available for withdrawal.

The spatial distribution of the potentially available surfacewater will also affect its ability to support withdrawals, because some locations that have demand may not have available surfacewater in their vicinity (and vice versa). The major lakes and their potential ability to support withdrawals are discussed below:

> Clermont Chain of Lakes: MFLs have been adopted for the Clermont Chain of Lakes – Lakes Louisa, Minnehaha, Minneola, and Cherry Lake. Current permitted withdrawals from the Chain include the Cherry Lake Tree Farm (1.3 mgd), the City of Groveland (0.1 mgd), and the Palisades Golf Course (0.8 mgd). Beyond the currently permitted withdrawals, the current SJRWMD estimate is that about 0.5 mgd remains available from the Clermont Chain (J. Hollingshead, email correspondence).
>
> Lake Apopka: MFLs have been proposed for Lake Apopka. The SJRWMD yield estimate for Lake Apopka is about 5.0 mgd, but a recently authorized withdrawal was petitioned by the Lake County Water Authority (LCWA). As a result, there is no current SJRWMD yield estimate for Lake Apopka (J. Hollingshead, pers. comm.).
>
> Lakes Harris, Griffin, Dora, and Eustis: These large lakes are not currently scheduled for MFL development. Using the 14 mgd total yield estimate for the Upper Ocklawaha River, and subtracting 5.0 mgd for Lake Apopka and 2.7 mgd for the Clermont Chain of Lakes, leaves an estimate of 6.3 mgd available from these lakes. The SJRWMD has also indicated that water is available in these lakes (B. Vergara, pers. comm.)

Structural alterations to surfacewater bodies can also affect their ability to support withdrawals. Historic channelization and dredging of Upper Ocklawaha River Basin lakes has resulted in a net reduction in streamflow, as lake stages have been artificially maintained to support navigation, recreational, and aesthetic functions (Tibbals et. al., 2004). Since current yield estimates and MFLs incorporate these historic alterations, the replacement of historic flood storage in Lake County could increase the available yield. As an example, the Lake Apopka yield estimate does not include restoration of its north shore.

For the AWS evaluation to be conducted as part of Task 7, it is assumed that the Clermont Chain will support an additional 0.5 mgd withdrawal, and that the Lake Harris, Lake Griffin, Lake Dora, and Lake Eustis system will support a withdrawal of 6.3 mgd.

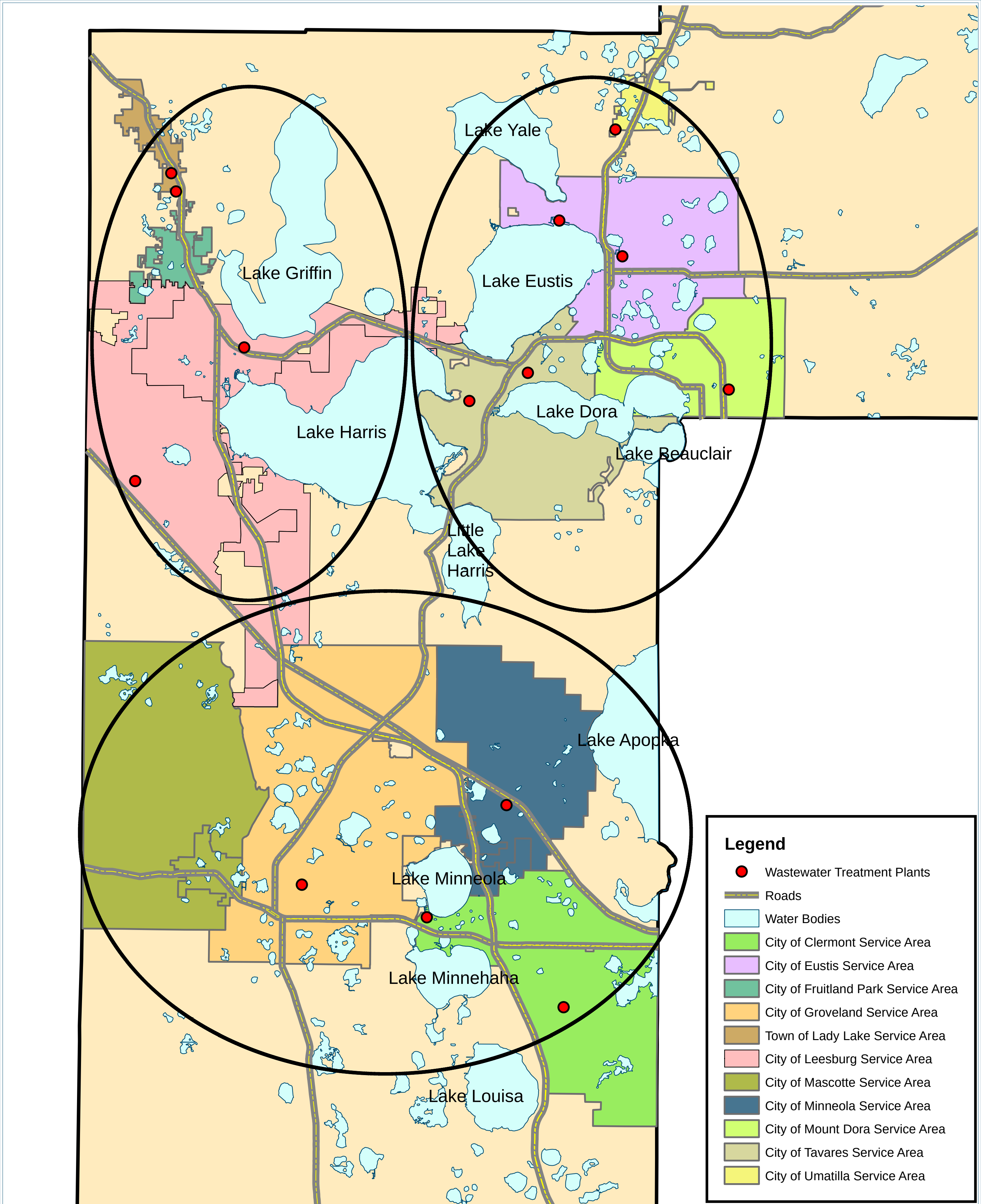

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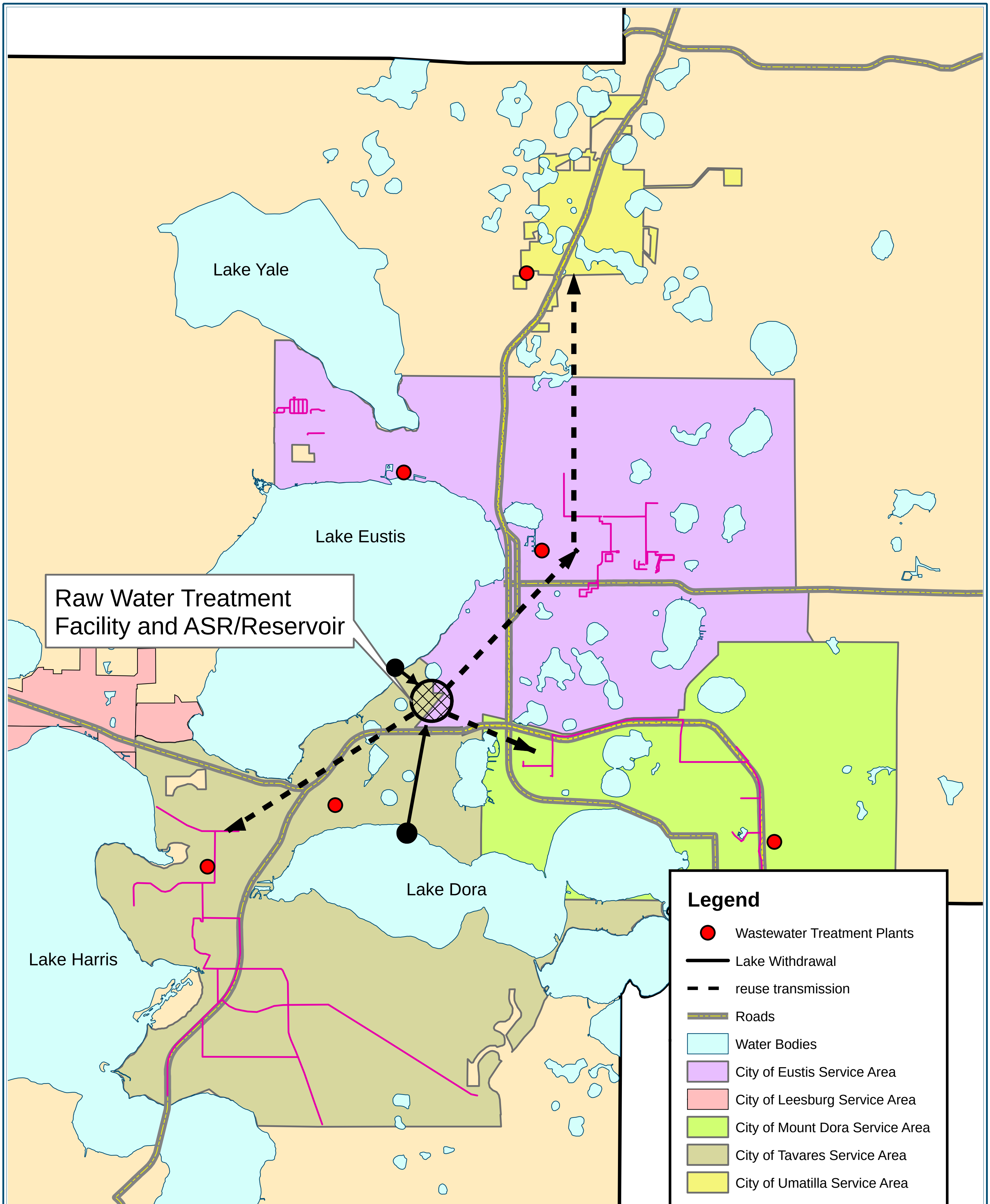
Figure 4-1
Cooperative Reuse
Project Areas

ORIGINAL DATE: 05-30-07
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: 0407_Regions...mxd
GIS OPERATOR: DR



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PROJECT: 0407- Lake County Water Supply Plan Authority

Figure 4-2
Conceptual Augmentation
System For Reuse

ORIGINAL DATE: 05-30-07
REVISION DATE: 07-26-07
JOB NUMBER: 0407
FILE NAME:0407_Conceptual...mxd
GIS OPERATOR: JAC

5.0 Aquifer Storage and Recovery Alternative

The sub-regional reuse/lake augmentation alternative water supply option to meet future non-potable demands of the Alliance requires seasonal storage capacity. This storage capacity is typically created by construction of surfacewater reservoirs, but in some cases may also be created by aquifer storage and recovery (ASR) wells.

The use of ASR for the Alliance would involve deep well injection of non-potable reuse/lake augmentation water captured during periods of wet weather, and then pumping the stored water out for distribution when needed during the dry weather months. Typically, an ASR deep well is screened such that the injected water is below a defined confining unit and in higher density water, such that a water bubble is created. This water bubble contains the higher quality injected water for storage and later recovery. The advantage of ASR, if the hydrology is favorable, is the need for less land area at typically lower costs than a surfacewater reservoir.

A successful ASR system must meet several requirements, including the following.

- The injection zone should be sufficiently permeable to accept the design volumes of water to be pumped into the aquifer.
- The aquifer should be confined above and below the injection zone so that the injected water (injectate) does not migrate away from the injection zone. This is especially critical if there is a significant density difference between the native groundwater and the injectate.
- The groundwater flow system within the injection zone should not cause the injectate to drift away from the ASR injection well in order to minimize losses from storage.
- The injection zone should not include significant fractures or other physical features that allow the injectate to migrate away from the injection zone.
- Water quality of the injectate must meet state and federal standards and be chemically compatible with the host water so that scale and other deleterious chemical reactions can be minimized.
- The salinity of the host aquifer water can vary from fresh to saline as long as the mixing between the injectate and native groundwater does not cause the water quality of the injectate to deteriorate to the extent that it becomes unusable.

In the state of Florida, ASR wells have been operational since 1983, with approximately 65 ASR wells currently operating at 13 permitted sites. As shown in 5-1, the ASR sites are located south of Tampa and Cocoa Beach, Florida and generally near the coastline. The viability of using ASR for non-potable water storage is uncertain in Lake County, due to the differences in hydrogeology between Lake County and other locations in Florida where non-potable ASR is in use. since the County relies on both the Upper Florida and, to a lesser degree, the Lower Floridan aquifer as its primary potable water source.

A preliminary review of available data to evaluate the potential for ASR as a viable storage option was conducted as part of this study. The USGS, in cooperation with the Lake County Water Authority, SJRWMD, and SWFWMD, prepared a report titled “Hydrogeology and Simulated Effects of Ground-Water Withdrawals from the Floridan Aquifer System in Lake County and in the Ocala National Forest and Vicinity, North-Central Florida” in 2002 (USGS 2002). While this report focused on groundwater withdrawals in Lake County, it does provide a good geological assessment of the Floridan aquifer and confining units present. The SJRWMD also authorized R. David Pyne, ASR Systems LLC, to prepare a report titled “Aquifer Storage and Recovery Issues and Concepts” in 2005 (ASR Systems 2005) which summarizes the scientific information available to support decisions made regarding ASR viability.

In addition, the SJRWMD has provided data from four deep aquifer system monitoring wells in the vicinity of Lake County. Three wells are located within Lake County: one well at the Lake Louisa State Park, about 10 miles south of Clermont; one well in the Seminole State Forest Brantley Branch Road site in northeast Lake County; and one well is at the Carrot Barn site just east of Lake Griffin. One additional deep monitoring well is located outside Lake County at the Plymouth Fire Tower site east of Lake Apopka in Orange County. The four monitor wells reviewed were drilled to depths ranging from 1,620 feet to 2,400 feet below land surface (bls). Figure 5-2 shows the general location of these four deep wells

The available information was reviewed to determine the viability of ASR in Lake County. In summary, the geologic profile for each of the wells illustrates a surficial aquifer consisting of sand, clay, and dolostone that extends to depths of 120 to 250 feet bls. This data is consistent with Figure 5-3 (USGS 2002 report) which identifies the surficial aquifer approximately 200 feet think.

Below the surficial aquifer, a continuous carbonate formation containing predominantly limestone and dolostone is shown in the four boring logs to the remaining bore hole depth. The groundwater levels and conductivity values appear to be generally stable throughout the bore hole depth, suggesting a aquifer connectivity with depth. This data indicates a defined confining unit or semi-confining unit is not present at the monitor well locations and water quality does not change significantly to depths of 2,400 feet.

This interpretation from the monitoring well data is consistent with the USGS 2002 report. While Figure 5-2 indicates an Upper Floridan and Lower Floridan unit separated by a semi-confining layer is typically present, the report further indicates the semi-confining unit has a relative high leakance value throughout much of the County, suggesting the semi-confining unit may not serve to isolate the injection zone from the “underground source of drinking water”. As illustrated in Figure 5-4 (USGS 2002), only the southwestern portion of Lake County appears to have a middle confining unit that may provide a reasonable separation of the Floridan aquifer.

Based on the primary use of the Upper Floridan aquifer for water supply, the apparent absence of an effective confining layer between the Upper and Lower Floridan aquifer throughout much of Lake County, and the relatively stable water quality with depth indicted in the four deep monitoring wells, the viability of using ASR appears to be limited. While there may be some potential for using ASR in the southwestern portion of the County, this area is a considerable distance from the projected population increase and demands for 2025. There may also be the potential for going below the Lower Floridan aquifer where better confinement may be present, but there is currently insufficient data to access this option. Consequently, at this phase of the planning study, it does not appear to warrant a significant effort and cost to further investigate ASR in Lake County until an in-County water supply alternative requiring water storage is further evaluated.

Figure 5-1. ASR Wells in Florida (ASR Systems 2005)

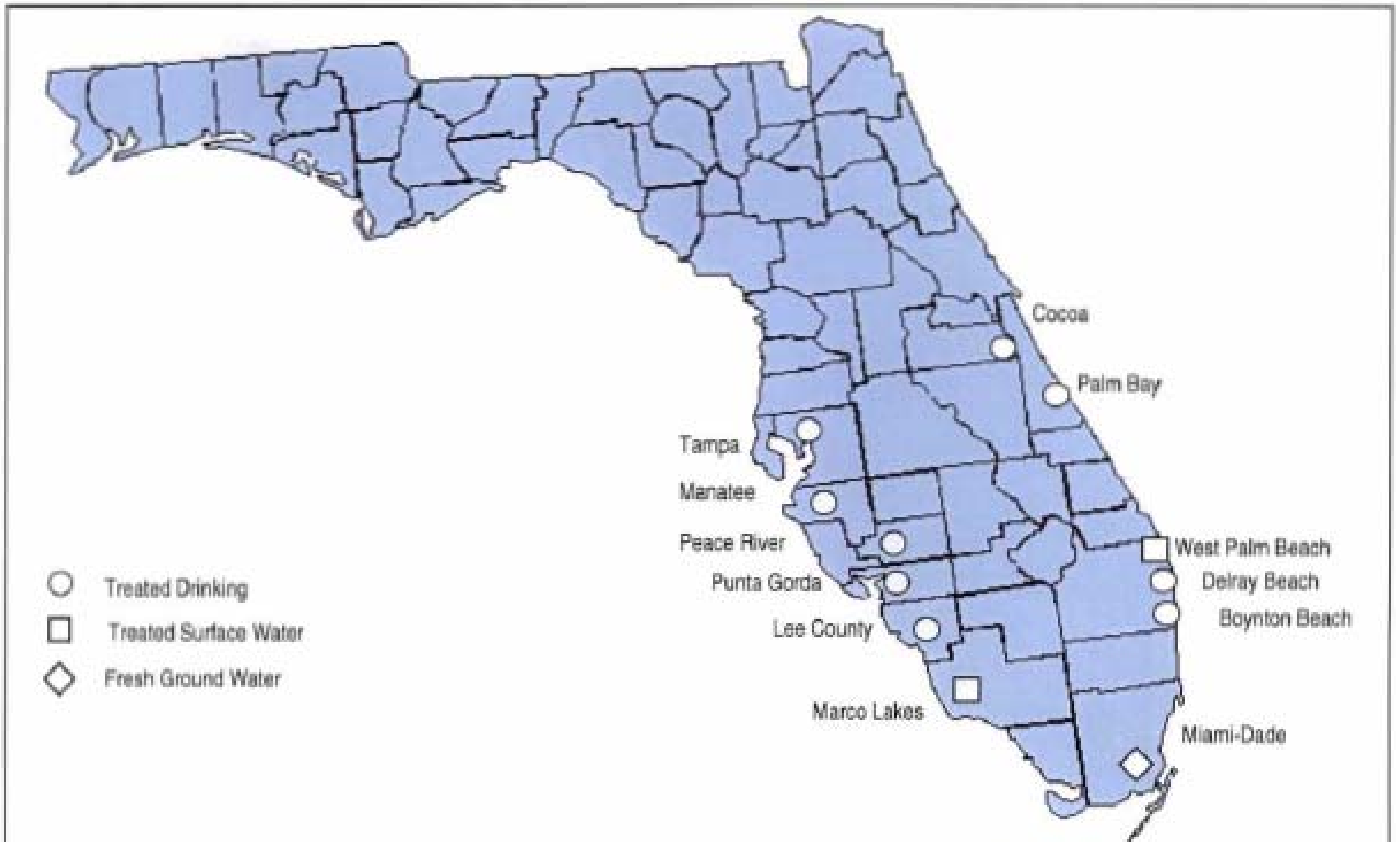
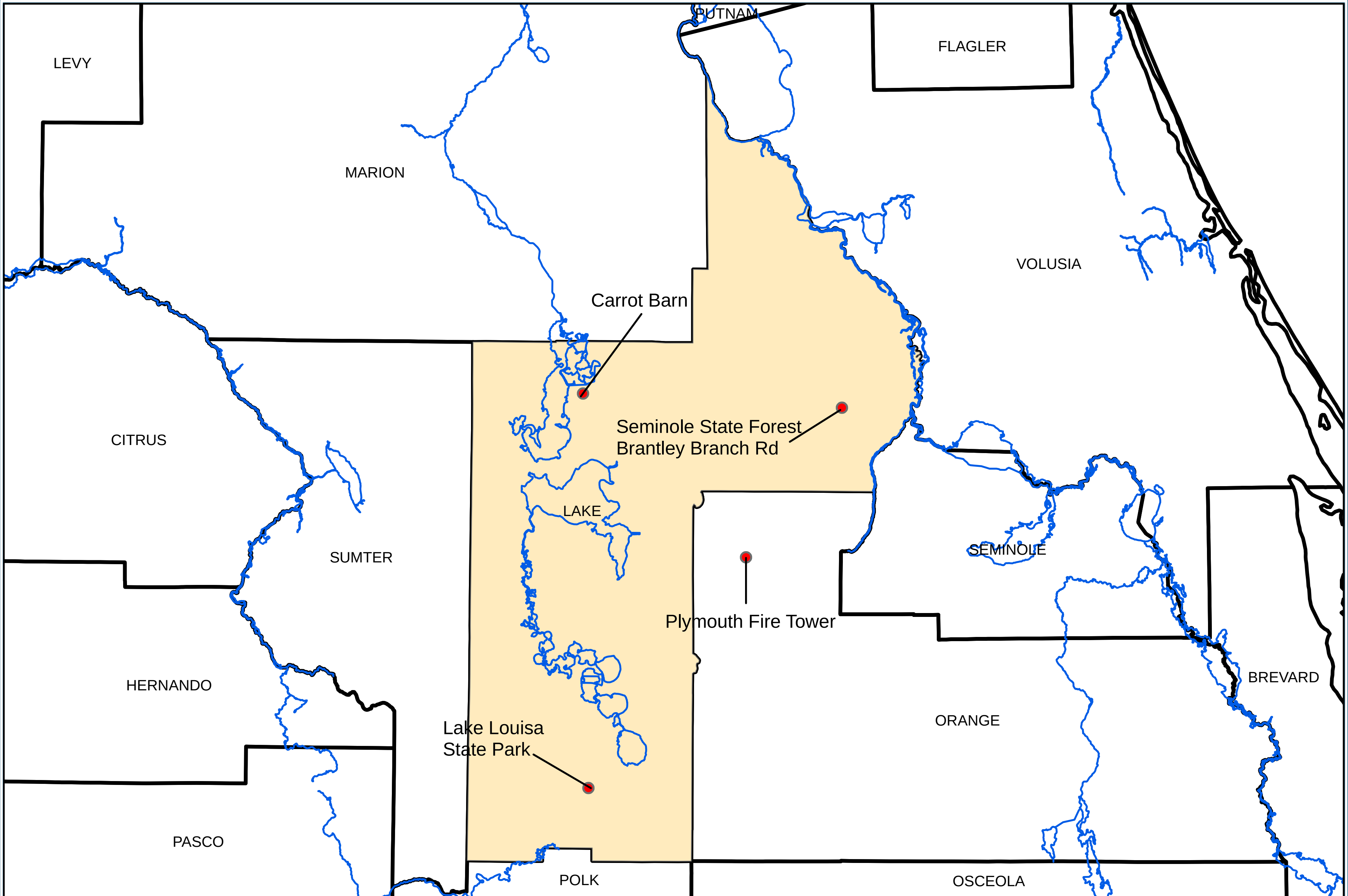


Figure 1. ASR Wells in Florida (operational, fully permitted)



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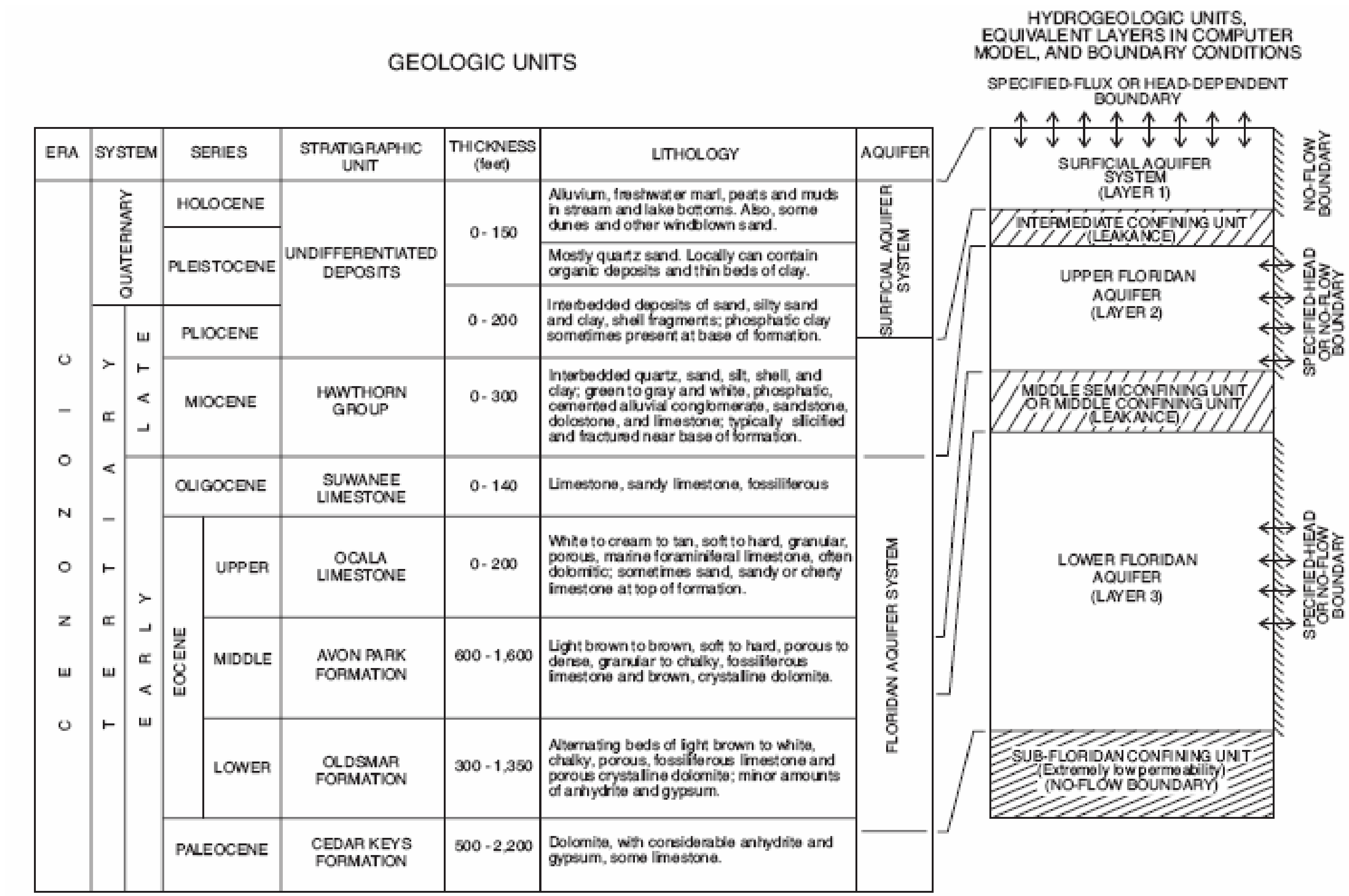
PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 5-2
Deep Aquifer Monitoring Well Locations

ORIGINAL DATE: 06-27-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: 0407_Deep Wells.mxd
GIS OPERATOR: DR

N S W E
1 Inch = 11 Miles

Figure 5-3. Geologic units, hydrogeologic units, and equivalent layers



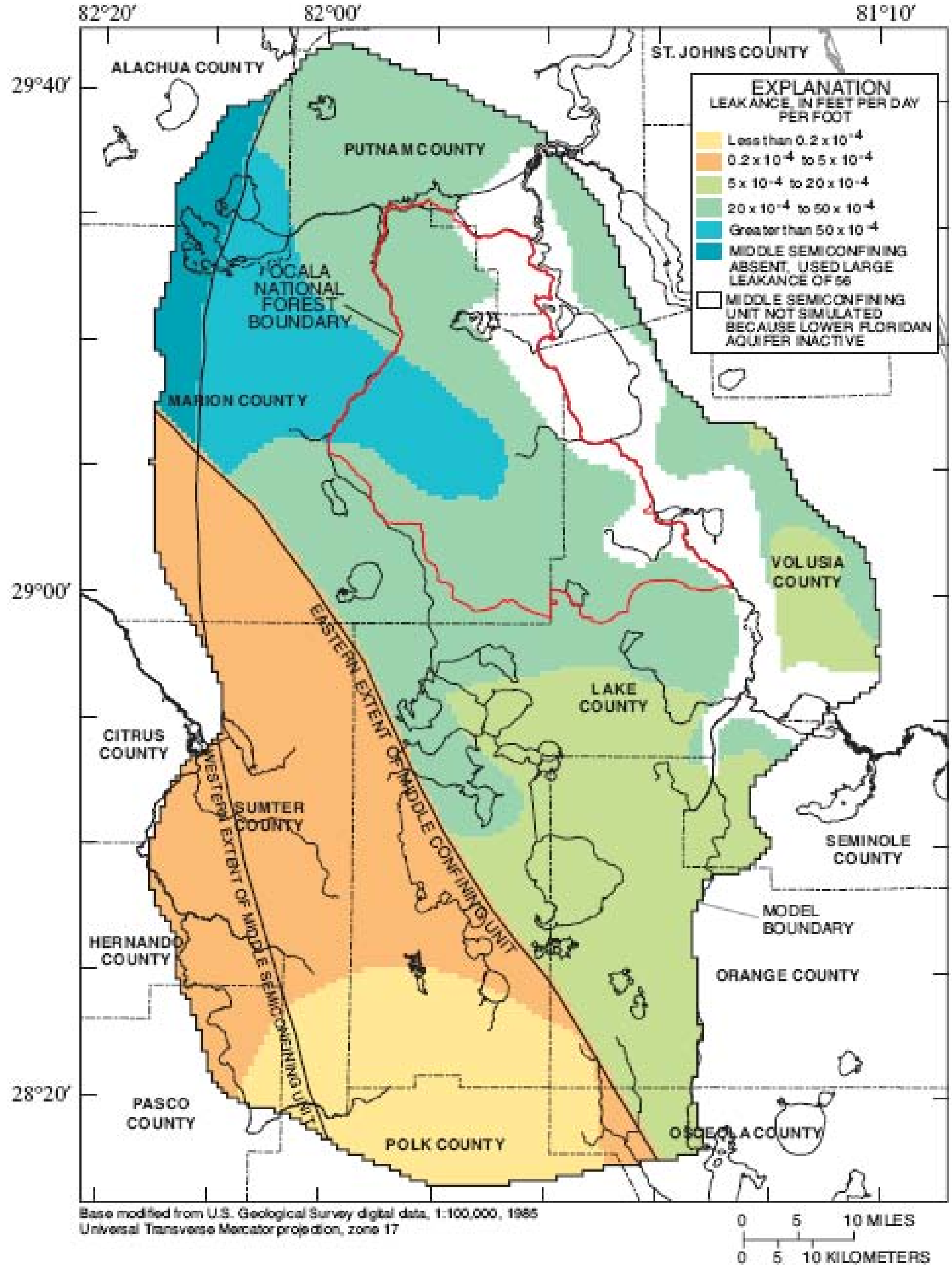


Figure 5-4. Leakance of the middle semiconfining and middle confining units based on confining thickness and vertical hydraulic conductivity (USGS 2002)

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APPENDIX A

LAKE COUNTY CONSERVATION MEASURE INVENTORY

Table 2-1 summarizes the existing or anticipated conservation programs for the Alliance Members. This section provides more detail on some of these programs[1] and was generated from information provided by Alliance Member and the SJRWMD Technical Staff Reports for Consumptive use Permits.

CLERMONT

Dedicated Conservation Staff

The City currently employs as full-time conservation coordinator. A second employee will be hired in the near future.

Landscaping

The City, in cooperation with Florida Yards and Neighborhoods, offers seminars on low maintenance and water efficient landscaping. The conservation coordinator also gives these seminars to Home Owner Associations.

Rain Sensor Ordinance

The building code requires that a rain sensor be installed on irrigation systems installed or modified after 1991. Under the City of Clermont Code of Ordinances all automatic systems must be equipped with a working rain sensor set to shut off at no more than 1/2" of rainfall. This Ordinance requires the retrofitting of those systems installed prior to 1991, if used in the automatic mode. Rain sensors are required on all irrigation systems within the City of Clermont Utility District. Homes constructed prior to May 1991 were not required to have a rain sensor, but under the current City Ordinance and the most recent order from SJRWMD, all automatic irrigation systems must be equipped with a rain sensor. Residents residing within the City Utility District that do not have a rain sensor on their irrigation system may fill out a request to receive a free rain sensor. Assistance is provided to customers for programming irrigation controllers/timers. This service is free to all City of Clermont water customers.

Watering Restriction Enforcement

Watering restrictions are enforced in the City of Clermont. Irrigation enforcement, with the following fees charged per household for each consecutive violation: warning, $50, $250, and $500. If violations continue, the water is cut off if the household is on city water, or the household must install a separate irrigation meter if not on city water. All homes built after April 2004 must have irrigation meter installed. A record of homes with repeated violations is maintained. Commercial users may not use city water for irrigation.

Water Audits

The conservation coordinator tracks outdoor irrigation and how much should be used. The City is in the process of replacing utility water budget software to track the water budget on a house-by-house calculation basis (currently this is done manually right now).

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[1] The categories listed under each Alliance Member may not all be covered by the summary table (Table 2.1), or may be categorized differently than in Table 2-1. Alliance Members may have additional BMPs than detailed in this section.

The conservation coordinator also audits irrigation system to check for leaks and missing heads.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	1,000 - 10,000	$1.10
2	10,001 - 20,000	$1.43
3	20,001 - 30,000	$2.20
4	30,001 - plus	$3.00

EUSTIS

Watering Restriction Enforcement

The City's Water Conservation Ordinance was approved on May 19, 2005, which provides for codification requirements and enforcement and penalty mechanisms available to the City to enforce compliance with SJRMWD watering restrictions and water shortage emergency rules. The City-declared water shortage emergency may be more restrictive than the SJRWMD's to support resource protection objectives and the City CUP compliance. The ordinance applies to all users of city potable water; city reclaimed water, private wells, lake pumps, as well as other suppliers of water. The water conservation ordinance includes a penalty matrix for violation of any provision of the City's water conservation code. Fines imposed are added to a user's water bill.

Landscaping

The Water Conservation Xeriscape Landscape Ordinance establishes minimum standards for the development, installation, and maintenance of landscaped areas on a site with efficiency as a goal without inhibiting the use of creative landscape design. The intent of these codes is to recognize the need for and the protection of groundwater as a natural resource through the application of enhanced landscape practices. Water-efficient landscaping maximizes water conservation by using site adapted plants and efficient watering methods that will generally result in a reduction of irrigation requirements, costs, energy, and maintenance. Seven basic principles of water-efficient landscaping are incorporated into the ordinance and apply to construction or development activity requiring a planting within buffers or other associated landscaping. A list of recommended plants is also included.

Dual line ordinance All new homes must be served reuse when available. Properties with existing irrigation systems must connect to the city reuse water service when available.

Water Audits

The City of Eustis performs a water audit of all its facilities every two years. Audits are performed on the entire water system, including treatment facilities and water distribution system. It is the City's policy to review the findings of water audit, perform annual leak detection activities to further define the causes of water losses, and make repairs to the system to address water losses. Repairs to the system are prioritized in accordance to the magnitude of water loss. The city also proactively schedules the replacement of older unreliable sections of the water distribution system in its 5-year capital improvement plan, and updates and completes these projects on an annual basis.

Unmetered Water Usage

Unmetered water usage (such as fire fighting, water hydrant/main flushing and construction, utility plant operation and maintenance use and line leaks and breaks) is tracked monthly by the City, and a monthly report is generated to monitor this water usage.

Metering Requirements

A separate water meter for irrigation is required for all new developments. The use of master meters for multi-family or multi-unit structures are prohibited (except for hospitals and hotels). The installation of individual meters for all service connections, including schools, municipal buildings and irrigation systems is required.

Mechanical and Technical Improvements

The City has implemented programs to improve the physical condition of the system and has implemented internal policies to improve the accountability of the system. The efforts include: Leak detection, testing of supply well and WTP water meters, testing of master meters and water meter change-out, fire hydrant maintenance, water saving devices and fixtures.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	0 - 8,000	$1.53
2	8,001 - 20,000	$1.91
3	20,001 - 50,000	$2.68
4	50,001 - plus	$3.04

FRUITLAND PARK

The City has proposed a water conservation program that will promote efficient and economical use of water within the service area. A water audit of the City's utility system found that unaccounted for water and water utility losses are less than 4% (combined) of total water use

Water Audits

The water conservation program incorporates water audits provided to residential and commercial customers.

Education

The City has an education program that includes water conservation information provided with customer invoices.

Ordinances

The City has proposed a landscape ordinance with significant water conservation features. And City building code contains a plumbing code that requires low volume fixtures in new construction, water conservation, and water conserving landscaping requirements for new construction.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	0 - 3,000	$0.00
2	3,001 - 5,000	$0.77
3	5,001 - 9,000	$1.10
4	9,001 - 14,000	$1.47
5	14,001 - 18,000	$2.00
6	18,001 - plus	$2.47

GROVELAND

Education

The City has proposed a customer and employee water conservation education program that meets District criteria. The City has committed to participating in the District's Water Conservation Partnership Campaign and to constructing a water efficient demonstration project by March 30, 2008.

Ordinances

The City has adopted a landscape irrigation ordinance that limits irrigation to two days per week and excludes irrigation between 10:00 am and 4:00 pm daily.

Rate Structure

Tier	RANGE (GALLONS)	COST INSERVICE AREA(COST/1000 GALLONS)
1	FLAT RATE	$2.75

These rates will apply to both potable water and non-potable water, including reclaimed water. Furthermore, the City has committed to reviewing the rates on a continuing basis and providing annual reports regarding the effectiveness of the water conservation rate structure

HOWEY IN THE HILLS

Education

The Town has a water conservation education program in place pursuant to section 12.2.5.1(e). Water conservation information is distributed to the community in the water bills.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	5,001 - 9,000	$1.77
2	9,001 - 14000	$1.95
3	14,001 - 20,000	$2.11
4	20,001 - 30,000	$2.50
5	30,001 - 60,000	$2.89
6	60,001 - plus	$3.60

LADY LAKE

Landscaping

The Town amended the “Landscaping and Tree Protection” chapter of its Land Development Code to incorporate water conserving landscape standards. The water conserving landscape standards limit high water use plants to a maximum of 40% of the landscaped area of each lot and incorporate standards for efficient watering design and practices.

Watering Restriction Enforcement

The Town also enforces watering restrictions. A warning is first issued. Following the first warning, \$50, \$125, \$475 fees are issued and added to the utility water bill. After 3rd and 4th offenses, water is shut off with a \$25 reconnect fee.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)	COST OUTSIDE SERVICE AREA (COST/1000 GALLONS)
1	0	\$1.95	\$2.44
2	0 - 3,000	\$1.95	\$2.44
3	3,001 - 7,000	\$2.40	\$3.00
4	7,001 - plus	\$2.85	\$3.56

Where potable water is used for irrigation, it is charged at the highest block rate for all levels of use.

LEESBURG

The City has a detailed conservation plan in place. Some elements of this plan are as follows:

General water use accounting

To assure water use accountability and efficient use of water throughout the distribution system the water utility department maintains records on:

Water pumped from supply wells each month and water entering the distribution system each day.

Number of connections served and number of meters installed and replaced. And daily records of water used by the fire department and utility maintenance.

Education

The City participates with the University of Florida/IFAS Florida Yards and Neighborhoods program.

The City provides water conservation information in billing inserts, school programs and presentations to civic organizations and home owners associations and community functions.

The City provides indoor and outdoor water audit information for customers to evaluate their water efficiency.

The City identifies high water use customers and offers assistance to determine reason.

Building and Planning and Zoning Departments

Water conservation elements are required by state and local ordinances include:

- Automatic irrigation system require working rain sensor shut-offs.
- New developments are required to install dual line systems to utilize reclaimed water.
- Requires the landscape and irrigation designs meet the requirements of the water management district and promote the use of Xeriscaping.
- Requires the installation of water-saving plumbing fixtures and fittings in all new buildings and remodelings.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	0	$0.89
2	0 - 8,976	$0.89
3	8,977 - 15,708	$1.21
4	15,709 - 33,660	$1.59
5	33,661 plus	$2.20

MONTVERDE

Landscaping

The City passed a new landscape code in 2005 that is modeled on strong conservation ordinances adopted by other towns in Lake County. The City has adopted a Florida Friendly Landscaping ordinance. Under the ordinance, the irrigated portion of any residential lot shall not exceed 40% of the lot are excluding the home, driveway and sidewalk. St. Augustine grass is not allowed in any portion of a residential or commercial lawn. High water use plants are limited to a maximum of 40% of the landscaped area of each lot.

Education

The City has proposed a customer and employee water conservation education program that meets District criteria.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	3,000-8,999	$3.50
2	9,000-19,999	$4.25
3	20,000 - Plus	$5.00

MINNEOLA

The City of Minneola has proposed to implement all available water conservation measures that are economically, environmentally or technologically feasible during the time frame of the requested permit. All residential and commercial water use connections are metered and billed. The City has an inclining block rate structure to encourage water conservation.

Landscaping

The City has adopted a landscape ordinance that District staff have concluded is one of the best such ordinances in the District. The ordinance incorporates an Extensive ‘Approved Plant List’ that will serve as a guide and precedent for site adaptable and site-appropriate species. High water use plants are limited to a maximum of 40 percent of the landscape area. St. Augustine grass is allowed on residential sites, but limited by the 40 percent maximum or otherwise used in low-lying areas that retain moisture naturally.

Water Conservation Handbook

The City has produced a water conservation handbook designed to be a reference for water conservation initiatives.

Education

The City participates in programs to promote, water conservation education to the public through public service announcements, bill stuffers, school education programs and civic organization meetings.

The City promotes the use of water efficient landscape and rain sensor shutoffs and the University of Florida/IFAS Florida Yards & Neighborhoods programs

Water Restriction enforcement

The City enforces watering restrictions by issuing citations.

Water Audits

The City will provide outdoor and indoor water audits upon customer request.

Dual Distribution Systems

The City requires that new developments install dual distribution systems and that individual service connections be metered. The water conservation ordinance requires that reclaimed or non-potable water shall be used for irrigation if a source is available.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	2,000 - 4,999	$1.85
2	5,000 - 11,999	$2.00
3	12,000 - 19,999	$2.50
4	20,000 - 29,999	$3.00
5	30,000 - plus	$3.50

MOUNT DORA

Education

The City has several customer and employee education on programs including conservation materials distributed in customer bill, schools and information booths. Specific water conservation literature is targeted to different user categories.

Water Audit

The City has conducted a water audit of the amount of water used in the production and treatment facilities, transmission lines, and distribution system. This audit indicated a combined unaccounted for water loss and water utility use of 5.82%. This was less than the 10% threshold set by the district for the requirement of additional water conservation measures.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	0 - 10,472	$0.86
2	10,473 - 12,716	$1.32
3	12,717 - 15,708	$1.67
4	15,709 - 18,700	$1.99
5	18,7001 - 21,692	$2.33
6	21,693 - 24,684	$2.66
7	24,685 - plus	$2.99

TAVARES

Watering Restrictions

City Land Development Regulations details a 5 level plan for water conservation during water shortages. These restrictions are scaled in restrictions from Condition 1 which initiates voluntary water use cutbacks to Condition 5 which is mandatory reduction in water use to only vital needs. Watering restrictions are not however enforced at this time.

Meter Replacement

The City has and ongoing meter replacement program and regularly tests meters for accuracy.

Water Conservation Handbook

The City has produced a water conservation handbook designed to be a reference for water conservation initiatives. Contents include: Participation in education programs provided by the SJRWMD, Lake County Water Authority and University of Florida/IFAS Florida Yards & Neighborhoods programs, water conservation education to the public through public service announcements, bill stuffers, school education programs and civic organization meetings, promotion of water efficient landscape and rain sensor shutoffs and the updating of ordinances to require the installation on water saving plumbing fixtures, and more.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)	COST OUTSIDE SERVICE AREA (COST/1000 GALLONS)
1	0	$0.93	$1.16
2	0 - 3,000	$0.93	$1.16
3	3,001 - 7,000	$1.35	$1.68
4	7,001 - 14,000	$2.20	$2.75
5	14,000 - plus	$2.95	$3.68

UMATILLA

Education

The City has an ongoing water conservation plan that involves educating the public through bimonthly conservation statements on billing notices. Additionally, the City provides educational information on water conservation to employees and local residents via newsletters.

Landscaping

The City has incorporated xeriscape principles of landscape design into the City Land Development Regulations. The City has begun ordinance development to address water efficient landscaping for new developments. The applicant has identified a site to implement a xeriscape demonstration project and is coordinating with District staff for funding and technical advice on landscape design.

Water Audits

The City documents for all unmetered water use such as fire fighting, sewer cleaning, main flushing, street cleaning and construction use.

Rain Sensors

The City has begun ordinance development to require final site inspection checklists to have a line item for rain sensor placement on automatic sprinkler systems.

Rate Structure

Tier	RANGE (GALLONS)	COST IN SERVICE AREA (COST/1000 GALLONS)
1	1,000 - 4,000	$1.60
2	4,001 - 9,000	$1.95
3	9,001 - 14,000	$2.30
4	14,001 - 19,000	$2.65
5	19,001 - plus	$3.00

APPENDIX B

Summary of Florida Rule Chapter 62-610 Reuse of Reclaimed water and land application.

Type of Reuse System	Reuse Activities	Rule Part	Treatment & Disinfection Requirements	TSS	Nitrate
Agricultural Irrigation	Irrigation of feed, fodder & pasture crops	II	Secondary treatment and basic disinfection	10 mg/l	
	Irrigation of edible crops	III	Secondary treatment, filtration & high-level disinfection	5 mg/l	
Urban Irrigation and Other Public Access Uses	Irrigation of: Residential properties Golf courses Parks, athletic fields, schools Other landscaped areas Toilet flushing Fire protection Vehicle washing Decorative water features Construction dust control Commercial laundries Flushing of sewers Cleaning roads and sidewalks Making ice for ice rinks Other urban uses	III	Secondary treatment, filtration & high-level disinfection	5 mg/l	
Industrial Applications	Cooling water	VII	Secondary treatment and basic disinfection. Shall meet rule part III if open tower system. If filtration and high-level disinfection are provided setback distances are not required.	5 mg/l	
	Process water	VII	Secondary treatment and basic disinfection (additional treatment may be needed to meet the needs of a particular industrial application)		
	Wash water	VII	Secondary treatment and basic disinfection		
	Use at wastewater plant	VII	Secondary treatment and basic disinfection		

APPENDIX B

Wetlands	Use of reclaimed water to create, restore, or enhance wetlands	--	Secondary treatment with nitrification and basic disinfection (some types of wetland systems require higher levels of treatment or disinfection)		
Ground Water Recharge	Rapid infiltration basin (RIBs)	IV	Secondary treatment and basic disinfection	10 mg/L	Nitrate <12 mg/L
	Rapid infiltration basins in unfavorable conditions (including areas in SE Florida overlying the Biscayne Aquifer).	IV	Secondary treatment, filtration & high-level disinfection. Meet drinking water standards	10 mg/L	TN < 10 mg/L
	Create barriers to control saltwater intrusion	V	Secondary treatment, filtration and full treatment disinfection. Multiple barriers for control of pathogens & organics. TOC (<3.0 mg/L) & TOX (<0.2 mg/L) limits. Meet drinking water standards. (reduced levels of treatment allowed for injection to high TDS ground water)	5 mg/L	TN < 10 mg/L
	Use of wetlands that percolate to ground water	---	Secondary treatment & basic disinfection. Meet ground water standards. (additional treatment and/or disinfection may be needed)		
Indirect Potable Reuse	Augmentation of Class I surface waters	V	Secondary treatment, filtration & full treatment disinfection. TOC (<3.0 mg/L) limit. Meet WQBELs	5 mg/L	TN < 10mg/L

Lake County Water Supply Plan

Technical Memorandum #4

September 2007

FINAL

Chapter 1 – Groundwater Availability

Chapter 2 – Alternative Water Supply Evaluation

Prepared by

Water Resource Associates

I. Introduction

The ongoing Lake County Water Alliance – Water Supply Plan (Plan) has identified existing and draft projected demand, conservation projections, and beneficial reuse projections within Lake County. These tasks have been completed through a series of draft Technical Memorandums and workshops to the Alliance Management/Technical Committee. The amount of traditional groundwater available to meet these estimated future demands over the planning horizon (2005 – 2030) is the topic of Chapter 1.

Chapter 2 addresses the preliminary screening and evaluation of readily available alternative water supply (AWS) development projects. The results of this AWS evaluation may provide input to the St. Johns Water Management District's (SJRWMD's) joint preliminary design report (PDR) for regional AWS projects, or may be used to support other AWS investigations. Accordingly, a number of Alliance Members have submitted statement of interests regarding a PDR to the SJRWMD. Since groundwater is a significantly less costly source than AWS sources, a detailed and accurate estimate of available groundwater is critical to developing an effective water supply plan. The estimate of available groundwater does affect the Plan's evaluation of AWS and the selection process of the most beneficial water sources to meet future demands.

1.0 Groundwater Availability

Determination of available groundwater quantities to meet estimated future water demands primarily revolves around two main concepts:

> (1) The interplay of regulatory and planning perspectives and approaches on existing CUP allocations of varying duration, relative to imposed planning limitations on when groundwater is assumed to no longer be an option. This planning and regulatory dynamic can dictate the interpretation of how much groundwater is essentially available for future use.
>
> (2) The amount of groundwater potentially made available through conversion of existing agricultural CUPs to serve public supply users, and the role of planning and regulatory policies in determining the groundwater quantities that may be shifted to other water use categories.

As shown in Table 1-1, the current regulatory duration of groundwater availability – as determined by a review of CUP data – varies significantly among Alliance Members. However, significant planning efforts are underway at the SJRWMD to encourage all Members to participate in Alternative Water Supply (AWS) planning, based on an approximate 2013 timeframe. Additionally, special regulatory requirements and groundwater restrictions are already in place for utilities located within the Central Florida Coordination Area (CFCA).

Table 1-1 Alliance Regulatory Groundwater Durations

Alliance Member Status	Number	Longest Duration CUP	Shortest Duration CUP
Groundwater Allocated to Serve Projected 2013 Demands	6	2026	2010
Groundwater Not Allocated to Serve Projected 2013 Demands	7	2014	Monthly Temporary Allocations

As shown in Table 1-2, the current regulatory duration of groundwater availability – as determined by a review of CUP data – also varies significantly among private utilities. Private utilities also tend to use more water, on a per capita basis, than do Alliance municipalities. The median gross per capita for private utilities in Lake County is 249 gallons per capita per day (gpcd), and the median gross per capita for Alliance Members is 178 gpcd. Since groundwater durations, groundwater availability, and regulatory requirements vary both within the Alliance and among private utilities, the specific circumstances of each utility will affect their AWS participation. This Chapter discusses the planning, regulatory, and geographic factors that will affect future groundwater availability to Alliance Members.

Table 1-2 Private Utility Regulatory Groundwater Durations

Private Utility Status	Number	Longest Duration CUP	Shortest Duration CUP
Groundwater Allocated to Serve Projected 2013 Demands	6	2026	2009
Groundwater Not Allocated to Serve Projected 2013 Demands	10	2026	2007

1.1 Public Supply and Domestic Self-Supply Groundwater Availability Analysis

The SJRWMD has identified 2013 as a date when groundwater sources will be regionally restricted in the Central Florida Coordination Area (CFCA). The CFCA is a region established by the water management districts to assure a coordinated and consistent approach for the areas with shared water management district boundaries. These include Polk, Orange, Osceola and Seminole counties, southern Lake County, and the City of Cocoa's public supply service area in Brevard County.

From a regulatory perspective within Lake County, the year 2013 applies to groundwater supply restrictions of Alliance Members within the CFCA (Clermont, Groveland, Mascotte and Minneola). Groundwater restrictions for Alliance Members outside the CFCA (northern Alliance Members) are not directly controlled by this date. However, 2013 impact assessments using the SJRWMD's East-Central Florida (ECF) modeling results may be applied on a case-by-case basis as a supplement in assessing the potential for harm from proposed groundwater withdrawals in addition to other factors set forth in the 40C-2 rule.

The SJRWMD's ECF groundwater model was used to establish 2013 as the date of regional groundwater restriction for the CFCA. Regional groundwater modeling will continue to play an important role in determining the groundwater availability in Lake County. As shown in Figure 1-1, the SJRWMD's ECF model encompasses most of Lake County, but a regional limitation for Alliance Members outside of the CFCA has not yet been determined. Additionally, in addition to the ECF model, the SJRWMD's North Central Florida (NCF) model encompasses much of Northern Lake County. NCF model results were recently used by the SJRWMD in issuing a 20–year groundwater permit to a utility located in Marion County. It is possible that the NCF model results may vary from the ECF model results for the portion of Lake County where the model areas overlap.

An additional modeling concern is the location of the ECF model boundary along the western perimeter of Lake County. Model artifacts generally increase with proximity to model boundaries, so the ECF model may not provide the most accurate representation of groundwater availability along the western perimeter of the Lake County. In comparison, the boundaries of the Southwest Florida Water Management District's Northern District (ND) model extend well beyond the western perimeter of Lake County. The ND model was calibrated to 1995 conditions with transient analyses to 2002, and released for use by the SWFWMD in 2007. The potential for conflicting model results will complicate future efforts to assess groundwater availability in northern Lake County, and will require coordination both within the SJRWMD and between the SJRWMD and the SWFWMD.

It is appropriate to present data pertinent to the 2013 target date, in the absence of a defined regional groundwater limitation for northern Alliance Members (Eustis, Fruitland Park, Howey in the Hills, Lady Lake, Leesburg, Montverde, Mount Dora, Tavares, Umatilla), a planning estimate of groundwater availability applicable to the Alliance must be developed.

Within the planning framework of the Lake County WSP, it is also appropriate to recognize the regulatory data for each Alliance Member as applied by the SJRWMD regulatory staff, as this data used within the context of CUP processing will affect how much water individual Alliance Members will seek for alternative water supply development.

The groundwater estimates calculated in this Technical Memorandum include analyses stemming from both the regulatory and planning positions. This Technical Memorandum points to the distinctions between the two frameworks within the SJRWMD which may lead to a range of estimated future groundwater availability, and attempts to interpret this range as it applies to AWS development. A summary of these two approaches are summarized as follows:

> <u>Planning:</u> For planning purposes, AWS projects must be identified to meet the projected demands beyond 2013. In the absence of a defined regional limitation for northern Alliance Members, 2013 is used in this technical memorandum as a basis of comparison. For purposes of water supply planning, the SJRWMD has determined 2013 to be the date after which no additional groundwater will be available in the CFCA, due to adverse impacts such withdrawals may cause.
>
> <u>Regulatory:</u> The Cities of Clermont, Groveland, Mascotte, and Minneola are subject to the 2013 groundwater availability constraint, as they are situated in the CFCA. The SJRWMD determined the CFCA to have regionally unacceptable groundwater impacts after 2013. Individual CUPs for the northern Alliance Members located outside of the CFCA will be reviewed on a case-by-case basis, relative to potential adverse environmental impacts. Consequently, from a regulatory perspective, the current CUP allocations become an additional basis of comparison.

This Technical Memorandum includes tabulation and analysis of data presented in previous technical memoranda relative to groundwater availability, and discusses incorporating an estimate of groundwater availability to the Plan.

Existing data for Lake County utilities have been identified and tabulated under Task 3 of the Plan's scope of work. Utility demands, their withdrawal allocations and pumpage have now been reviewed and generally verified by SJRWMD regulatory staff.[1] In order to ensure that groundwater is the primary emphasis of this analysis, reclaimed and surfacewater allocations are not included here. Since the Alliance is the focus of the Plan, the data presented is generally organized as Alliance members and non-members.

Data is presented for non-Alliance or private water suppliers, because some of these suppliers are potential AWS partners to Alliance members and the Plan's groundwater estimate may be affected by these entities. Data for domestic self-supply is also presented, because projections of this use can influence estimates of resource availability to the public suppliers.

1.1.1 Lake County Groundwater Deficit Evaluation

Due to uncertainties and variation between planning, regulatory, and geographic perspectives on groundwater availability, groundwater deficits are calculated for each Alliance Member and private utility to reflect a range of potential values. The total deficit will ultimately depend on which basis is used and cannot be determined with reasonable certainty at this time.

Demand deficits were calculated on a demand basis (planning perspective) and from a CUP allocation basis (regulatory perspective). For each supplier group, demand deficits (from 2013 to 2030) were calculated based on a number of factors. The deficit by demand assumes that the projected 2013 demand is subtracted from 2030 demand, without consideration of existing CUP allocations. Deficits by current CUP allocation assumes that the existing allocation as a baseline to subtract from 2030.

Given the dualistic approach to viewing groundwater availability, two additional scenarios were developed, which are a mix of allocations and demand projections. Where allocations were incorporated, the current allocation is used as best available information, even though these allocations may change over time. The low aggregate deficit value was determined by assuming, for each supplier, the higher of the permitted allocation or 2013 demand allocation of groundwater is available and this value was subtracted from the 2030 demand. This assumes that CUP allocations exceeding the 2013 demand are not rescinded by the SJRWMD. Alternately, the high aggregate deficit value was determined by assuming, for each supplier, the lower of the permitted allocation or 2013 demand allocation of groundwater is available and this value was subtracted from the 2030 demands. The high aggregate deficit scenario assumes SJRWMD will rescind groundwater allocations currently exceeding 2013 demand. Table 1-2 summarizes the range of demand deficits. It should be noted that these projections are unadjusted, and therefore do not reflect potential groundwater demand reductions from conservation / reuse as discussed in Technical Memorandum #3. Tables A-1 and A-2 (Appendix A) present the details for each supplier summarized in Table 1-2.

In additional to Alliance and private utility demand deficits, projections of domestic self-supply demand can influence resource availability to public suppliers, since this demand is typically

[1] See the finalized Tech Memo 2 for complete data.

taken into account in modeling the environmental effects of groundwater withdrawals. Unless a local government establishes effective conservation practices applicable to domestic self-supply (e.g., watering restriction enforcement), this use can function as an uncontrolled groundwater supply. These projected deficits are included in Table 1-2.

Table 1-2 Range of Projected 2030 Demand Deficits**

Supplier Group	Deficit by 2013 Demand Estimate (mgd)	Deficit by Current Allocation (mgd)	Low Aggregate Deficit (mgd)	High Aggregate Deficit (mgd)
Alliance Members	16.6	19.7	13.99	22.31
Private Suppliers (>0.1 mgd)	8.55	14.16	8.44	14.27
Total Public Supply	23.43	33.86	22.43	36.58
Domestic Self-Supply*	19.71	19.71	19.71	19.71
County-wide Deficit	43.14	53.57	42.14	56.29

*Domestic self-supply water use is not permitted, so the projected 2013 – 2030 deficit by demand is listed for each scenario.

**Does not include potential reductions in groundwater demand from conservation/reuse as discussed in Technical Memorandum # 3

As shown, if the aggregate of demand and allocation quantities are considered, the selection of a low aggregate demand deficit based on the most beneficial allocation will result in a lower public supply need for AWS. The selection of a high aggregate demand deficit based on the least beneficial allocation would result in a higher public supply need for AWS.

1.1.2 Conclusions

This Technical Memorandum includes tabulation and analysis of data presented in previous technical memoranda relative to groundwater availability, and discusses incorporating an estimate of groundwater availability to the Plan based on the following conclusions:

- The potential differences between the regulatory, planning, and geographic perspectives on groundwater availability imparts considerable uncertainty to the Plan. Groundwater availability for public supply in Lake County can only be estimated, at this time, in terms of the range of groundwater that may be available.

- For utilities within the CFCA that show a demand deficit to 2013, the SJRWMD has not indicated that current allocations will be increased to serve projected 2013 demand. These utilities have experienced recent difficulty increasing their groundwater allocations, even though they are not allocated to serve projected 2013 demand.

- For utilities within the CFCA that show an allocation surplus beyond 2013, the SJRWMD has indicated that if demand is not present to justify a given allocation, the allocation may be recalled. However, this will not be an issue for the public supply utilities in Lake

County, as they have demands that increase beyond the current allocation from 2013 to 2030.

- Both private and public utilities in Lake County show significant demand deficits on the basis of their current CUP data. As a result, private utilities could be viable AWS partners to Alliance Members. Private utilities are also competing users for remaining groundwater supplies, and tend to use more water on a gross per capita basis than do Alliance Members.

- As a conceptual AWS design input for each individual utility, the selection of either the 2013 projected geographic demand or the current permitted allocation could be a nexus from which to define a demand deficit for AWS projects. These nexus reflect the planning and regulatory perspectives, of the Plan, respectively. However, any selection would affect different utilities differently. Those utilities that do not have a current permitted groundwater allocation to serve their projected 2013 demand would benefit from a 2013 selection. Those utilities that have a current permitted groundwater allocation that serves beyond their projected 2013 demand would be restricted by a 2013 selection.

1.2 Agricultural Water Use

With total population growth increasing in Lake County by approximately 150% over the planning horizon, a portion of the existing agricultural land will be converted to residential or commercial/industrial land. A shift from agricultural water uses to public supply or domestic self-supply will necessarily occur to help support this growth, with the procedural aspects of this shift to vary depending on the specific regulatory circumstances of the water users. In general, this demand shift will affect future groundwater availability and could affect the water demand to be met by AWS. Locations of agricultural CUPs are shown in Appendix B.

In order to determine the amount of water that may be potentially available for use in other water use sectors, projections were necessary in order to approximate the quantity of water used in the agricultural sector that may be available due to the shift from agricultural use to public supply and/or domestic self-supply use. This analysis involved an assessment of existing land within agricultural consumptive use permits (CUPs) and associated agricultural water use and allocations.

1.2.1 Agricultural Land Conversion Methodology

Population vs. Countywide Agricultural Land

A spatial depiction of population growth and its intersection with existing (2005) agricultural land was analyzed to predict the total number of acres that may convert from agricultural land use to residential or commercial/industrial land use over the planning horizon. The draft SJRWMD agricultural land use layer and population growth layers were used in this analysis.

Existing Countywide Agricultural Land vs. Agricultural CUP Land

For this groundwater availability analysis, it was pertinent to look spatially at the intersection of population growth with existing CUP boundaries rather than a countywide land use map or other source, as it is the area tied to agricultural consumptive water use that is of interest. However, only the intersection of population growth with the 2005 countywide agricultural land use layer (discussed above) was available. Thus, it was necessary to establish the relationship between agricultural land that may convert on this countywide scale and land within agricultural CUP boundaries that may convert.

In comparing existing countywide agricultural land use coverage with agricultural CUP boundaries, discrepancies between the two datasets were apparent. When the CUP layer was superposed on the existing agricultural land layer, the majority of the area was <u>not</u> designated agricultural (Figure 1-2). It is possible that this discrepancy is a result of refinements still underway for the agricultural land use layer as part of the quality assurance phase, or by mapping issues in the CUP data. The process employed by the SJRWMD in establishing the county-wide agricultural layer is very intensive, and includes a compilation of aerial photography coupled with field verification, and data gleaned from land use cover and future land use maps, the Florida Agricultural Statistics Service (FASS), and information from local growers.[2] The CUP process is more straightforward. CUP applicants submit drawings depicting the boundaries of the area to be covered by the CUP, and these drawings are ultimately transferred to GIS by the SJRWMD after individual project review and approval of boundaries.

The differences in datasets outlined above limited the scope of agricultural conversion analysis, and precluded a closer examination of individual CUPs. Considering the discrepancies in datasets, a broad approach was taken to correlate population growth with agricultural CUP land.

<u>Conversion Factor</u>

The quantitative relationship between population growth and each agricultural land dataset (countywide and CUP agricultural land) was ascertained in order to cross check the overall relationship between the two spatial depictions of agricultural land, and in turn, calculate an approximate value for agricultural CUP land conversion. This analysis generated a conversion factor that was used to project determined the total percentage of agricultural CUP land that may convert to residential or commercial/industrial land use by 2030 within Lake County. The conversion factor calculations were based on the intersection of parcels exhibiting 2005 to 2030 population growth with the countywide agricultural land dataset. The following calculations were made:

- The ratio of agricultural land exhibiting population growth to total existing countywide agricultural land (approximately 39%)

- The ratio of existing agricultural CUPs containing agricultural land (from the countywide layer) exhibiting population growth to the total number of existing agricultural CUPs (approximately 54%)

These values were similar enough such that 39% was taken to be a sound approximation for a land use conversion factor. This value was selected over the 54%, as it is a more conservative estimate.

[2] The layer used in this analysis is outdated by 2-3 months, but within that time frame approximately 4,000 acres of citrus was not captured, as citrus is easily confused with timer and other agricultural operations without field verification.

1.2.2 Existing Agricultural Consumptive Use Permits – Allocations and Actual Use

A baseline of existing agricultural CUP data was determined and analyzed in order to establish the amount of water that is currently allocated and the quantity actually used. This data, with the conversion factor applied, ultimately yields an approximation of groundwater currently allocated for agricultural use that may supply future residential and/or commercial/industrial water needs.

Data associated with existing agricultural CUPs was extracted from the 100,000 gpd and 4-inch well tabulation in Technical Memorandum 2 of the Lake County Water Supply Plan. The total existing allocated agricultural CUP quantity for Lake County is 34.6 mgd[3]. The total groundwater and surfacewater allocations are approximately 31.1 mgd (96% of the total allocation) and 2.3 mgd (6% of the total allocation), respectively. The remaining 1.4 mgd (4% of the total allocation) is allocated to reuse water. Groundwater is the major agricultural water use allocation and is also the focus of this analysis.

It is important to estimate the actual water use, or pumpage, of agricultural water allocations on a countywide basis, as actual use may affect the amount of water that the SJRWMD reallocates to other water use sectors. For the purpose of this analysis, individual CUPs were assigned one of the following three (3) categories according to historical pumpage:[4]

- Inactive: No pumpage over the 2000-2005 timeframe. Eight (8) permits having no pumpage reported from 2000 to 2005, with a total inactive allocated quantity of approximately 2.22 mgd (6.4% of all agricultural permit allocations).

- Underutilized: <25% of the total existing allocated quantities were utilized over the 2000-2005 period. A total of thirty-five (35) permits fell under this category, for a total of 8.16 mgd underutilized (23.5% of the total agricultural permit allocations).

- Active: ≥25% of total existing allocated quantities were utilized over the 2000-2005 period. Sixty-eight (68) total permits fell under this category, with a total allocation (the total average pumped quantity) of 6.14 mgd not utilized.

In summary, approximately 10.4 mgd of existing allocated agricultural quantities are unused in permits that are inactive or underutilized. These permits are located throughout the County and could potentially support future public supply or domestic self-supply demands. The quantity of existing agricultural water use that may be shifted to other water uses was then determined on a broad, countywide scale. The total projected estimated acreage of agricultural CUP land that may be converted over the planning horizon from 2005 to 2030 was then translated to a water quantity to help serve the demand shift.

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[3] Many agricultural CUPs have been allowed to expire due to the decline in agricultural operations throughout Lake County, so this number may appear lower than expected.
[4] These categories are not reflective of those the SJRWMD assigns to indicate the status of CUPs. Scenarios 2 and 3 utilize the average of 2000-2005 agricultural CUP pumpage.

1.2.3 Conclusions

Three agricultural water quantity baselines were established to compute a range of potentially available groundwater from the water use shift. The actual amount of water that will be available is dependent on how the SJRWMD will view unused allocations, and will also vary spatially within the County on an (Alliance) Member by Member basis. Scenario (1) assumes that the baseline quantity is the total existing water allocated to agricultural permits. Scenario (2) is based on the allocations of existing agricultural users using > 25% of their existing allocations. Scenario (3) is based on the pumped quantities only.[5] To obtain the potential groundwater quantities for each scenario, the 39% agricultural conversion factor was applied, and the current proportion of groundwater (89.9%) in existing allocations was assumed to remain constant. Using this methodology, 12.09 mgd annual average is available in scenario 1, 8.47 mgd annual average in scenario 2, and 7.61 mgd annual average in scenario 3. These results are presented in Table 1-3. In contrast to conservation and reuse which are generally under the control of a single permit holder, public supply access to agricultural demand shift will require coordination between multiple permit holders under the umbrella of the SJRWMD's permitting program.

Table 1-3 Agricultural Demand Shift Scenario Comparison

Agricultural Quantity Category Scenarios and Associated Potential Groundwater Shift			
	(1) Total Existing Agricultural Allocations (mgd)	**(2) "Active" Agricultural Allocations (mgd)**	**(3) Pumped Share of Total Agricultural Allocations (mgd)**
Baseline Quantity	34.65	24.28	21.81
Quantity with 39% Conversion Factor	13.52	9.47	8.50
Total Groundwater Potentially Available to Shift	**12.09**	**8.47**	**7.61**

(1) This scenario uses the total existing (2007) allocated quantities as a baseline and uses the conversion factor to arrive at the total amount of water potentially shifted to public supply or domestic self-supply use. The existing percent of groundwater allocation (89.9%) is then kept constant to calculate the total amount of groundwater potentially available to shift.
(2) This scenario uses the total "active" allocated quantities as a baseline and uses the conversion factor to arrive at the total amount of water potentially shifted to public supply or domestic self-supply use. Active is defined as the portion of water actually pumped by users that pumped an average of >25% of their existing allocations from 2000-2005. The existing percent of groundwater allocation (89.9%) is then kept constant to calculate the total amount of groundwater potentially available to shift.
(3) This scenario uses only the total averaged 2000-2005 pumped quantities as a baseline and then uses the 39% conversion factor to calculate the total water quantity potentially that will potentially shift to public supply or domestic self-supply use. The existing percent of groundwater allocation (89.9%) is then kept constant to calculate the total amount of groundwater potentially available to

[5] 2000-2005 average pumpage.

shift. The drought 2000 and 2001 drought year conditions may cause pumpage calculations to appear high.

2.0 Alternative Water Supply

This Chapter evaluates potential regional alternative water supply (AWS) development projects that have passed a preliminary screening in Technical Memorandum No. 2. Specifically, this Chapter addresses the Scope of Work - Task 7 – Evaluation of Existing Facilities and Alternative Water Supply Development Projects. As stated in the scope, this technical memorandum includes:

- Review and evaluation of AWS projects; and
- Identification of the preferred development projects for Lake County.

The results of the preliminary screening process described in Technical Memorandum 2 identified six AWS projects for more detailed evaluation as viable potable water sources of alternate surfacewater for the County. The six project locations are shown on Figure 2-1 and include:

- St. Johns River Yankee Lake Project
- Lower Ocklawaha River (LOR) – (below confluence with Silver River)
- St. Johns River Near DeLand
- Lake Panasoffkee
- Withlacoochee River at Holder
- Withlacoochee River at Lake Rousseau

2.1 Development of AWS Demands

A water balance approach to evaluate the AWS project demands was developed based on the Alliance Member's 2030 demands and the potential resources to meet the demand deficit. The actual AWS demand deficit will ultimately be based on the management and implementation of four key elements:

- Conservation (discussed in TM # 3);
- Wastewater Reuse (discussed in TM # 3);
- Agricultural Land Conversion (discussed in Chapter 1);
- Groundwater Availability (discussed in Chapter 1)

Each of these elements will vary by utility, and management and implementation of each element will interface in different ways with the planning and regulatory functions of the SJRWMD. As a result, the ultimate need for individual AWS participation is a judgment which each individual Alliance member will ultimately have to make.

Furthermore, the six AWS projects that passed the TM #2 screening step are included in the SJRWMD and/or Withlacoochee Regional Water Supply Authority water supply planning processes, suggesting that the Alliance (and individual members) only represent a portion of the total potential regional participants. The uncertainty regarding potential partners for each project was illustrated at the recent meeting sponsored by the SJRWMD, held in Orlando on July 18, 2007, which addressed Alternative Water Supply Project Planning Meeting for Local Governments and Utilities. The partnerships that eventually form will drive the selection of the AWS projects and the cost of implementing the AWS alternative. The possibility of more than one AWS regional project moving forward may also create a situation where the Alliance Members are better served by splitting their support for select AWS projects.

The multiple variables that currently exist in the regional water supply planning process make it impossible to conduct a specific, detailed AWS evaluation that results in a recommendation of a single AWS project for the Alliance. Consequently, the intent is to develop an evaluation/decision matrix that will incorporate the many variables and uncertainties into a logical decision matrix that the Alliance Members can use to evaluate their individual water demands and determine which, if any, AWS projects are appropriate to a given member.

As presented in Section 1 of this memorandum, as well as previous Technical Memorandum and workshops, there are a variety of methods to reduce the 2030 projected demand deficit in conjunction with future AWS projects. A summary of elements that can impact the demand deficit is provided as a guide. The AWS alternatives review follows.

Alliance 2005-2030 Total Unadjusted Water Demand Increase ----- 26.5 mgd

The Alliance Members total unadjusted water demand increase over the planning horizon (through 2030) is approximately 26.5 mgd. Unadjusted demand is defined as the total water demand increase based on projected population increases and per capita usage rates discussed in TM #3 without any reductions in demand. However, when considering high cost AWS, a longer planning horizon (through 2055) and associated higher demand may be more appropriate because of the high investment cost and time frame for execution of any AWS program.

Potential Alternative Methods to Meet Demand Increase

a. Current Groundwater (Allocated) .... 7.3 mgd
b. Additional Groundwater (2013 Planning Number) .... 2.6 mgd
c. Conservation Demand Reduction .... 6.2 mgd
d. Projected Beneficial Reuse Supply .... 6.5 mgd
e. Agricultural to Residential Shift .... 4.6 mgd
Total Potential Deficit Reduction without AWS................................27.2 mgd

a. Current Groundwater – The baseline assumption is that only currently allocated groundwater supply is available to meet the added Alliance demand, or 7.3 mgd. The SJRWMD has indicated that additional groundwater supply may be available and allocated as permits are renewed on a case-by-case basis for utilities that are not located in the CFCA. The four Alliance Members in the CFCA (Cities of Clermont, Groveland, Mascotte, and Minneola) are apparently restricted to 2013 demand numbers.

b. Additional Groundwater – A more aggressive interpretation of groundwater supply is based on the SJRWMD 2013 planning numbers which suggest that an additional 2.6 mgd may be available.

c. Conservation Demand Reduction – Conservation is a viable means to reduce the future dependency on AWS. As presented in TM #3, the potential reduction of 6.2 mgd could be realized by the Alliance based on aggressive conservation programs by members.

d. Beneficial Reuse – Beneficial reuse of wastewater as the population grows can off-set some potable water demands through the planning horizon. As presented in TM #3, a planning target of 50% of the average annual daily wastewater flow for beneficial reuse is reasonable for the entire Alliance, resulting in a potential demand reduction of 6.5 mgd for the Alliance Members (assuming beneficial reuse is used as efficiently as potable water).

e. Agriculture to Residential Demand Shift – Agricultural to Residential demand shift presented in Chapter 1 of this memorandum incorporates two components; groundwater available from unused agricultural allocation and allocated groundwater shifting to residential public supply. A countywide range of demand shift was determined from an aggressive 12.1 mgd to a more moderate 7.6 mgd estimate. For AWS review purposes, it is assumed that the Alliance Members account for approximately 60% of the total county water demand, so the 60% of the lower estimate of 7.6 mgd or 4.6 mgd is assumed to become available for the Alliance members over the planning horizon.

2.2 Demand Projections for AWS Comparison

Recognizing the substantial variability related to the Alliance future water supply demands, each AWS is being evaluated based on two levels of need:

- Demand Scenario 1 – assumes a moderate demand deficit projection of about 10 to 15 mgd. This range was selected based on assuming groundwater availability to Alliance members will be between the regulated and planning numbers discussed above, but no additional groundwater from agricultural to residential demand shift will be provided, and limited reduction from conservation and reuse will be realized.

- Demand Scenario 2 – assumes a high demand deficit projection of greater than 20 to 25 mgd. This range is based on groundwater availability to Alliance members based on current allocations (SJRWMD regulatory water use permit values) and no additional groundwater from agricultural to residential demand shift, conservation or reuse.

On an Alliance-wide basis, it should be noted that it is possible that through aggressive conservation, the projected contribution from reuse, and additional future groundwater allocations that no AWS demand will be present to 2030. However, eventually, AWS will be required to meet the growing water demands of the County.

2.3 AWS Project Evaluation Criteria

The AWS project evaluation is not only complicated by the range of potential demand deficits for the Alliance members, but also by the potential for a broad and diverse group of partners that may be interested in sharing the cost of AWS development and operation.

In general, it is understood that the overall unit cost (cost per 1,000 gallons) for water supply will be reduced as more partners are aligned to develop a particular AWS project. However, as these partnerships are now just beginning to be developed for the larger AWS projects, it is not possible to predict the many partnership combinations that may occur.

The uncertainties related to groundwater availability, Alliance member methods to reduce demands, and the consolidation of partnerships for specific AWS projects clearly impacts the level of detail that can be incorporated into the AWS evaluation. Therefore, this evaluation is based on some simplifying assumptions, with discussion directed at the more significant “what if” scenarios that may develop.

- The AWS options are evaluated based on Alliance Member projected demands without regional partnerships, such as Orange County or the WRWSA, to create an equivalent comparison of AWS options to the Alliance. Discussion is added to summarize the anticipated benefits assuming multiple partners are found.

- For comparison of cost data, Demand Scenario 1 is used for Alliance Members, recognizing the cost comparison is only performed for evaluating differences between alternatives and does not reflect actual costs that may ultimately be realized. The estimate also assumes a similar in-county primary pipe network to provide a backbone for distribution to the Alliance Members is the same for each alternative.

- The Lake County settlement agreement approved in 2004 gives Lake County the option to use up to 5 mgd alternative water supply developed by OUC for the municipalities in Lake County. The companion four-party settlement agreement calls for a commitment from OUC and Orange County to develop at least 15 million gallons per day of alternative water supplies for use in their service areas by the year 2013. While the value the Alliance members will receive from this agreement is not clear, the 5 mgd supply is considered in the AWS evaluation description.

The Evaluation Criteria developed for this more detailed AWS review includes seven (7) categories, which are described in Table 2-1. These categories include:

- Resource Availability, Reliability, and Longevity;
- Raw Water Quality;
- Permittability;
- Environmental Compatibility;
- Cost;
- Jurisdictional Complexity; and
- Location.

A brief discussion of each AWS project is included, along with a discussion focused on the evaluation criteria and grading for each element.

2.4 St. Johns River Yankee Lake Project

2.4.1 Project Description

The SJR Yankee Lake Project is being developed in two phases. Phase I includes construction of a river intake, raw water pump station, and a pipeline to convey the raw water from the St. Johns River to a new treatment facility which will supply about 10 mgd of water to augment Seminole County's reuse program. The program also includes the potential development of a 25 mgd potable water treatment capacity. The development program includes the potential to expand the treatment facility for a future capacity of 75 mgd to meet the regions potable needs. It is assumed that it would take 8 to 10 years for the Alliance Members to begin receiving water supply from this AWS

As Phase I of this project has already been initiated, this would be a shared facility with Seminole County (as a minimum).

Figure 2-2 illustrates the general location of the Yankee Lake intake facility as well as a potential transmission line route from the facility to Alliance Members. A northern pipeline of about 20 miles is assumed to convey water to the Mt. Dora area and a second north-south pipeline of about 34 miles is assumed to convey water to the Clermont area. Primary in-county piping is assumed to be the same for all regional AWS projects.

2.4.2 Resource Availability, Reliability, and Longevity:

The SJR Yankee Lake Project located on the St Johns River which has an estimated total yield of 116 mgd per the SJRWMD, independent of brine disposal needs and less water that may be allocated to the City of Melbourne and Cocoa Beach. This availability far exceeds the range of Alliance Member demands being considered. Resource reliability and longevity are both present, as MFLs for the St John's River have been established and it is assumed the estimated yield considers these values. Regulatory constraints on water supply development should maintain significant yield.

Grade: A

2.4.3 Raw Water Quality

The St John's River water quality is a mix of fresh water during high-flow conditions, and slightly–to–moderately brackish water during low flow periods. Consequently, surfacewater treatment methods will be more elaborate than fresh water supply (i.e. membrane technology and concentrate management) to produce a potable water supply. Discharge of the waste high-concentrate brine will be a critical component of the project viability. Currently, brine or concentrate discharge is proposed to be sent back to the river.

Grade: C

2.4.4 Permittability

The source is expected to be permittable for potable water supply. There is adequate water supply and interest by the SJRWMD and other state agencies, such that it is assumed any project development issues can be resolved. The management and disposal of concentrate from the brackish water treatment process will result in more complicated permitting issues from the FDEP to protect downstream resources.

Grade: B

2.4.5 Environmental Compatibility

The disposal of brine concentrate, generated from the water treatment process, is the most significant environmental factor associated with this project. A detailed evaluation of the brine dilution capacity of the St. Johns River at this location is currently being conducted; alternative brine disposal methods are not currently being evaluated. That portion of the St. Johns River located downstream of the mouth of the Wekiva River and upstream of S.R. 44 is designated as an Outstanding Florida Water (OFW). Included within or adjacent to it are additional state-owned lands, including portions of the Lower Wekiva River Preserve State Park, Blue Spring State Park, and Hontoon Island State Park. Most of these lands and more are designated as the

Wekiva River Aquatic Preserve. The Florida Department of Environmental Protection (FDEP) will not allow the discharge of brine into an OFW.

This project receives an Environmental Compatibility Score of B, meaning the likelihood of significant adverse environmental impacts is low, with the following assumptions: 1) The disposal of brine, whether it be into the St. Johns River, underground, or off site, will not adversely affect the St. Johns River ecosystem or downstream aquatic resources. 2) The pipeline will not be constructed through Wekiva River State Park or Lower Wekiva River Preserve State Park.

Grade: B

2.4.6 Cost

Development of the source would require conventional surfacewater treatment plus membrane treatment (enhanced coagulation, filtration, reverse osmosis, and disinfection). Some ground storage for equalization would be needed, but a large reservoir to manage seasonal variations would not be required.

For planning purposes, transmission lines would run from the potable water treatment location in Seminole County west to a point east of Mt Dora, where the main line would split, with the western line supplying central Lake County Alliance Members and the southern line feeding southern Lake County Alliance Members. As this AWS will be a shared project with Seminole County (as a minimum), the cost reflects a portion of the transmission line to Mt Dora (11 miles) as well as a portion of the southern pipeline cost is shared with non-Lake County utilities that are along the assumed pipe route. The in-county primary pipe network to provide a backbone for distribution to the Alliance Members is similar in all AWS scenarios.

Additionally, the large number of interested partners with associated demands from communities in Lake, Marion, Orange, Seminole, and Volusia Counties may translate into a more cost effective AWS until the projected capacity of 45 mgd is reached.

Based on Demand Scenario 1 (design capacity of about 15 mgd) for cost comparison, the preliminary estimate prepared by SJRWMD, unit production cost (October 2006) for Lake County Alliance, are as follows:

o Treatment Cost	$3.24 per 1000 gals.
o Transmission Cost	$2.17 per 1000 gals.
Projected Total Unit Production Cost	$5.41 per 1000 gals.

As this unit cost is above $5 per 1000 gallons, and reflects significantly higher treatment cost, it receives a relative ranking of D.

Grade: D

2.4.7 Jurisdictional Complexity

The Yankee Lake project and Alliance are within the SJRWMD area, so no interaction with other WMD's is necessary. However, this project is identified as an AWS with significant interest from communities in Lake, Marion, Orange, Seminole, and Volusia Counties. As such, developing final partnership agreements between interested parties will be complex.

Grade: B

2.4.8 Location

The location is east of Lake County and is similar in most respects to the SJR DeLand project; including distance from the Alliance in-county pipe network. The transmission distance is greater than the Lake Panasoffkee AWS, but less than the remaining AWS projects.

Grade: B

2.4.9 Overall Grade

The Yankee Lake project gets high marks (B or higher) for 5 of the 7 evaluation criteria. Raw water quality and cost, however, are significant factors which lower the overall ranking. Therefore the overall project score is C.

Grade: C

2.5 St. Johns River, near DeLand

2.5.1 Project Description

The SJR DeLand alternative has been characterized as an alternate water source for Seminole, Volusia and Lake Counties. This alternative would include construction of a river intake, raw water pump station, and a pipeline to convey the raw water from the St. Johns River to a new treatment facility, which would supply the County with potable water needs. It is assumed that it would take 10 to 12 years for the Alliance Members to begin receiving water supply from this AWS.

Figure 2-3 illustrates the general location of the SJR DeLand intake facility as well as a potential transmission line route from the facility to Alliance Members. A pipeline of about 23 miles is assumed to convey water to the Mt. Dora area. Primary in-county piping is assumed to be the same for all regional AWS projects.

2.5.2 Resource Availability, Reliability, and Longevity:

The SJR DeLand project has an estimated total yield of 94 to 127 mgd, independent of brine disposal needs and less water that may be allocated to the City of Melbourne and Cocoa Beach. This availability far exceeds the range of Alliance Member demands being considered. Although the MFLs for the St John's River have been established and it is assumed the estimated yield is available, concerns regarding brine discharge are greater at this location. The presence of Outstanding Florida Waters both upstream and downstream of the preliminary facility location at SR-44 reduce the reach of river available for mixing of the brine and may significantly complicate the discharge of concentrate to the river and ultimately reduce the source reliability and longevity.

Grade: B

2.5.3 Raw Water Quality

The St John's River water quality is a mix of fresh water during high-flow conditions, and slightly–to–moderately brackish water during low flow periods. Consequently, surfacewater treatment methods will be more elaborate than fresh water supply (i.e. membrane technology and concentrate management) to produce a potable water supply. Discharge of the waste high-concentrate brine will be a critical component of the project viability. Currently, brine or concentrate discharge is proposed to be discharged back to the river.

Grade: C

2.5.4 Permittability

This AWS location is less likely to be permitted than the Yankee Lake AWS because of the brine concentrate disposal mixing zone appears to be smaller because of the OFWs immediately upstream and downstream of the facility. There is adequate water supply and interest by the SJRWMD such that the project development issues might be resolved. However, the FDEP and anticipated restriction in the management and disposal of concentrate from the brackish water treatment process may complicate or significantly reduce the usability of this AWS.

Grade: C

2.5.5 Environmental Compatibility

The disposal of the brine concentrate, which is a product of the desalination process, is the most significant environmental factor associated with this project. A detailed evaluation of the brine dilution capacity of the St. Johns River at this location is currently being conducted; alternative brine disposal methods are not currently being evaluated. Lake Woodruff National Wildlife Refuge is located immediately downstream of this project, and the Wekiva River Aquatic Preserve is located upstream; both systems are classified OFWs by the FDEP. The discharge of brine into an OFW will not be permitted by the FDEP.

The likelihood of significant adverse environmental impacts resulting from this project is higher than the Yankee Lake project as the OFWs are immediately adjacent to the brine discharge location. Therefore, this project receives an Environmental Compatibility Score of C with the following assumptions: 1) The disposal of brine concentrate, whether it be into the St. Johns River, underground, or off site, will not adversely affect the St. Johns River ecosystem or downstream aquatic resources. 2) The pipeline will be constructed in existing road right-of-ways and will not adversely affect the aquatic and wetland systems adjacent to SR 44.

Grade: C

2.5.6 Cost

Development of the source would require conventional surfacewater treatment plus membrane treatment (enhanced coagulation, filtration, reverse osmosis, and disinfection). Some ground storage for equalization would be needed, but a large reservoir to manage seasonal variations would not be required.

For planning purposes, transmission lines would run from the potable water treatment location on the Lake County/Seminole County border to a point east of Mt Dora (about 23 miles), where the main line would connect to the in-county pipe network. The in-county primary pipe network to provide a backbone for distribution to the Alliance Members is similar in all AWS scenarios.

The smaller number of interested partners in Seminole, Lake and Volusia Counties and associated demands, may translate into only marginally lower costs as compared to the Yankee Lake project.

Based on Demand Scenario 1 (design capacity of about 15 mgd) for cost comparison, the preliminary estimate prepared by SJRWMD, unit production cost (October 2006) for Lake County Alliance are as follows:

o Treatment Cost	$3.47 per 1000 gals.
o Transmission Cost	$2.03 per 1000 gals.
Projected Total Unit Production Cost	$5.50 per 1000 gals.

As this unit cost is above $5 per 1000 gallons, and reflects significantly higher treatment cost, it receives a relative ranking of D.

Grade: D

2.5.7 Jurisdictional Complexity

The SJR DeLand project and Alliance are within the SJRWMD area, so no interaction with other WMD's is necessary. This project is identified as an AWS with interest from primarily communities in Seminole, Lake and Volusia Counties. The smaller interest group, when compared to the Yankee Lake project, should allow development of final partnership agreements between interested parties to be less complex.

Grade: B

2.5.8 Location

The location is northeast of Lake County and is similar in most respects to the Yankee Lake project; including distance from the Alliance in-county pipe network. The transmission distance is greater than the Lake Panasoffkee AWS, but less than the remaining AWS projects.

Grade: B

2.5.9 Overall Grade

The DeLand AWS project gets high marks (B or higher) for 3 of the 7 evaluation criteria. The project was rated as C for the other categories, except for cost which it received a lower D score. Therefore, the overall project score is C-.

Grade: C-

2.6 Lower Ocklawaha River

2.6.1 Project Description

The Lower Ocklawaha River (LOR) alternative assumes a raw water intake structure and treatment system would be located downstream of the confluence with the Silver River in Marion County. This alternative would include construction of a river intake, raw water pump station and treatment facility, and a pipeline to convey the treated water from the LOR to Lake County. It is assumed that it would take 10 to 12 years for the Alliance Members to begin receiving water supply from this AWS.

Figure 2-4 illustrates the general location of the LOR intake facility as well as a potential transmission line route from the facility to the Alliance Members. A pipeline of about 28 miles is assumed to convey water to the northern end of the County. Primary in-county piping is assumed to be the same for all regional AWS projects.

2.6.2 Resource Availability, Reliability, and Longevity:

The SJRWMD and Marion County WRAMS studies, as previously discussed in Technical Memo #2, identified a potential high-water supply yield from this source. The SJRWMD suggested a yield of 100 to 107 mgd estimated for the Lower Ocklawaha River Basin (DWSP 2005). The WRAMS indicated a range of 70 to 100 mgd. Both the SJRWMD and the WRAMS indicated the high potential for an alternate surfacewater supply below the confluence with Silver River. Although MFLs are not yet established and the yield may be further restricted, it is assumed the established yield will be adequate to meet the long-term range of Alliance Member demands being considered.

Grade: A

2.6.3 Raw Water Quality

The LOR water quality is very good, due in large part to the substantial fresh groundwater contribution of Silver Springs. The water is always fresh and would require only conventional surfacewater treatment prior to transport and distribution.

Grade: B

2.6.4 Permittability

The LOR source is expected to be permittable for potable water supply. There is adequate water supply and interest by the SJRWMD and other state agencies, such that it is assumed any project development issues can be resolved. The need for transmission through the Ocala National Forest and the historic structural alterations to the river flow could complicate permitting.

Grade: B

2.6.5 Environmental Compatibility

Both the Silver and Ocklawaha Rivers are designated OFWs, and the proposed withdrawal is located within the sovereign submerged lands of the Ocklawaha River Aquatic Preserve and near Silver River State Park. Since MFLs have not been set for the Ocklawaha River, the available yield is uncertain, and the Ocklawaha River's confluence with the Silver River is complex. MFLs for the Ocklawaha River are currently being developed by the SJRWMD and will be set concurrently with the Silver Springs MFL in 2009 (Rainbow and Silver Springs MFLs will be set jointly by the SWFWMD and SJRWMD).

The transmission line to convey water from this location would have to be constructed through Ocala National Forest which may complicate the transmission line construction. Because the transmission line would be located on federal lands, a formal Environmental Impact Statement (EIS) may also be needed.

The Ocklawaha River has also been significantly affected by structural alterations in the past, and further alterations to the river's flow regime would receive significant opposition by environmental groups.

In addition, the SJRWMD recently permitted the withdrawal of water from Lake Apopka, the headwaters of the Ocklawaha River, which included modifications to Lake Apopka's flow control structures, decreasing the amount of water discharged to the Ocklawaha River. If this permitting approach is followed for other large lakes in the Upper Ocklawaha River Basin in the future (e.g., Lakes Griffin, Harris, and Dora), the amount of water discharged to the Ocklawaha River from the large lakes in the upper basin will continue to decrease which may adversely impact the lower basin.

This project receives an Environmental Compatibility Score of C, meaning that the likelihood of adverse environmental impacts is significant.

Grade: C

2.6.6 Cost

Development of the source would require conventional surfacewater treatment (enhanced coagulation, filtration, and disinfection). Some ground storage for equalization would be needed, but a large reservoir to manage seasonal variations in river flow would not be required.

For planning purposes, a transmission line would run from the potable water treatment location in Marion County to the northern Lake County area and interconnect with the in-county pipe network. The in-county primary pipe network to provide a backbone for distribution to the Alliance Members is similar in all AWS scenarios.

Additionally, the large number of interested partners with associated demands may translate into a more cost effective AWS as partnerships are realized.

Based on Demand Scenario 1 (design capacity of about 15 mgd) for cost comparison, the SJRWMD unit production cost (October 2006) for the Lake County Alliance are as follows:

o Treatment Cost	\$2.01 per 1000 gals.
o Transmission Cost	\$2.56 per 1000 gals.
Projected Total Unit Production Cost	\$4.57 per 1000 gals.

As this projected unit cost is less than \$5 per 1000 gallons, it receives a relative ranking of B when compared to the other AWS projects.

Grade: B

2.6.7 Jurisdictional Complexity

The LOR project and Alliance are within the SJRWMD area, so no interaction with other WMD's is necessary. However, this project is identified as an AWS with significant interest from communities in Lake, Marion, Orange, and Volusia Counties. As such, developing final partnership agreements between interested parties will be complex. However, as the number of communities increases with associated demands, this project becomes more cost effective.

Grade: B

2.6.8 Location

The LOR location in Marion County is north of Lake County and slightly further away from the in-county pipe network than the St John's River AWS options.

Grade: B

2.6.9 Overall Grade

The LOR AWS project gets high marks (B or higher) for 6 of the 7 evaluation criteria. Environmental compatibility received the rating of C based on no MFLs currently established and a historical track record which is not favorable. Therefore, the overall project score is B.

Grade: B

2.7 Lake Panasoffkee

2.7.1 Project Description

Lake Panasoffkee on the Withlacoochee River in Sumter County represents the AWS surfacewater location closest to the demand area in Lake County. This alternative would include construction of a lake intake, raw water pump station and treatment facility on the eastern side of the lake, and a pipeline to convey the treated water from Lake Panasoffkee to Lake County. It is assumed that it would take 10 to 12 years for the Alliance Members to begin receiving water supply from this AWS.

Figure 2-5 illustrates the general location of the Lake Panasoffkee intake facility as well as a potential transmission line route from the facility to Alliance Members. A pipeline of about 15 miles is assumed to convey water to the Leesburg area. Primary in-county piping is assumed to be the same for all regional AWS projects.

2.7.2 Resource Availability, Reliability, and Longevity:

Lake Panasoffkee has an estimated annual available yield of 9 to 19 mgd. Future withdrawals may be dependent on a withdrawal schedule connected to Lake Panasoffkee's adopted MFLs. The schedule will need to consider the hydraulic relationship between Lake Panasoffkee, the Wysong-Coogler Conservation Structure, and Tsala Apopka Chain of Lakes. Both resource availability and reliability are questionable subject to more detailed analysis of the historic record and hydraulic relationships relative to MFLs. A reduction in the lake's groundwater inputs could occur with increased groundwater withdrawals in Sumter County.

The range of potable water demands for the Alliance impacts the longevity of this water source to meet the Alliance future needs. Lake Panasoffkee appears to have sufficient water to meet Demand Scenario 1, but would be deficient in meeting Demand Scenario 2. Withdrawals from Sumter County users could further reduce available supply to the Alliance.

Because Lake Panasoffkee yield will be limited, compared to the river options, a dual grade is provided for the demand scenarios.

Grade: B (Demand Scenario 1)
D (Demand Scenario 2)

2.7.3 Raw Water Quality

Lake Panasoffkee has good water quality and receives substantial groundwater inputs, accounting for over 40% of the lake's inflow. Lake Panasoffkee's water quality has been considered good since 1989, when the first Lake Panasoffkee Surfacewater Improvement and Management Program (SWIM) Plan was drafted. However, sediment accumulation and encroachment of emergent vegetation are significant issues affecting the lake (SWFWMD, 2004). The Lake Panasoffkee Restoration Council has an on-going dredging program of sediments to rehabilitate navigation and fish spawning areas with the intention of returning the lake to hard bottom conditions.

Grade: B

2.7.4 Permittability

Lake Panasoffkee is a ranked water-body on the SWFWMD SWIM Priority List, an Outstanding Florida Water (OFW), and a popular sport fishery. Lake Panasoffkee flows to the Withlacoochee River via the Outlet River, which flows over a two-mile watercourse from the western shore of the lake and serves as the sole discharge from the lake. These issues create uncertainty with respect to obtaining necessary permits to utilize this source.

Grade: C

2.7.5 Environmental Compatibility

Lake Panasoffkee is a popular sport fishery, a ranked water body on the SWFWMD Surfacewater Improvement and Management Program (SWIM) Priority List, and an OFW. Lake Panasoffkee flows to the Withlacoochee River via the two-mile Outlet River, which serves as the sole discharge from the lake. Stage-based MFLs have been adopted by the SWFWMD for Lake Panasoffkee, which receives 40% of its water from groundwater via springs located within the lake. MFLs are currently under development for the Withlacoochee River by the SWFWMD; preliminary or proxy MFLs, developed for water supply planning purposes, will be available by the end of August 2007.

The ecological and hydrological relationships between the Withlacoochee River, the Tsala Apopka Chain of Lakes (which has an adopted stage-based MFL), and Lake Panasoffkee are extremely complex. Since Lake Panasoffkee is located in the Upper Withlacoochee River Basin, the available yield of surfacewater would be highly variable. When the SWFWMD develops MFLs for a particular water body, it evaluates historical flows and levels in the absence of any withdrawals, and the ground and surfacewater withdrawals in the Withlacoochee River Basin have not been accessed. Since MFLs have not been developed for the Withlacoochee River, the available yield is uncertain, and the Outlet River contributes a significant amount of water to the Withlacoochee River.

A project to withdraw surfacewater from Lake Panasoffkee, an OFW, has a reasonable likelihood of significant adverse environmental impacts.

Grade: C

2.7.6 Cost

Development of the source would require conventional surfacewater treatment (coagulation, filtration, and disinfection). Some ground storage for equalization would be needed, but a large reservoir to manage seasonal variations is not included in the cost projection. However, the cost would escalate considerably if storage is required due to a restricted withdrawal schedule

For planning purposes, the transmission line would run from the eastern side of Lake Panasoffkee to the Leesburg area and interconnect with the in-county pipe network. The transmission main would be approximately 15 miles long. The in-county primary pipe network to provide a backbone for distribution to the Alliance Members is similar in all AWS scenarios.

The smaller number of interested partners in northeastern Sumter and Lake Counties and associated demands, may translate into only marginally lower costs as compared to other AWS projects.

Based on Demand Scenario 1 (design capacity of about 15 mgd) for cost comparison, unit production costs for the Lake County Alliance are projected as follows:

o Treatment Cost	$1.96 per 1000 gals.
o Transmission Cost	$1.84 per 1000 gals.
Projected Total Unit Production Cost	$3.81 per 1000 gals.

As this unit cost is less than $4 per 1000 gallons and represents the least projected cost when compared to the other AWS options, it receives a relative ranking of A, assuming no reservoir is needed.

Grade: A (no reservoir required)

2.7.7 Jurisdictional Complexity

The Lake Panasoffkee project is located within the SWFWMD. Consequently, communication and cooperation between the SJRWMD and SWFWMD is critical and will complicate the project approval process.

With respect to partnerships, this project is considered a small regional AWS, so only communities in northeastern Sumter and Lake Counties are likely partners. As such, developing final partnership agreements between interested parties should be less complex then the larger AWS projects.

Grade: C

2.7.8 Location

The Lake Panasoffkee project west of Lake County is the closest AWS project to Lake County.

Grade: A

2.7.9 Overall Grade

The Lake Panasoffkee AWS project gets high marks (B or higher) for 4 of the 7 evaluation criteria when considering a lower demand projection (Demand Scenario 1). However, the high marks are reduced to 2 when considering Demand Scenario 2. In addition, permittability, environmental compatibility, and jurisdictional complexity are rated very low because of the characteristics of the lake. Therefore, the overall project score is C for Demand Scenario 1 and D for Demand Scenario 2.

Grade: C+ (Demand Scenario 1)
D (Demand Scenario 2)

2.8 Withlacoochee River at Holder

2.8.1 Project Description

The Withlacoochee River is a potentially viable AWS source on the portion of the river that forms the boundary between Citrus and Marion Counties. The Withlacoochee River at Holder represents the river (i.e., USGS hydrologic gage) location assumed for this AWS evaluation. This alternative is being considered by the WRWSA for surfacewater supply.

This AWS assumes a raw water intake structure and treatment system would be located on the Withlacoochee River in the vicinity of the Holder. This alternative would include construction of a river intake, raw water pump station and treatment facility, and a pipeline to convey the treated water to Lake County. It is assumed that it would take 10 to 12 years for the Alliance Members to begin receiving water supply from this AWS.

Based on preliminary MFLs analysis being conducted as part of the WRWSA planning study, it appears that during low flow conditions water will not be able to be harvested for water supply needs. Consequently, a reservoir is likely needed to capture water during high flow conditions to provide adequate year round water supply.

Figure 2-6 illustrates the general location of the Withlacoochee River at Holder intake facility as well as a potential transmission line route from the facility to Alliance Members. A pipeline of about 36 miles is assumed to convey water to the northern end of the County, similar to the LOR AWS. Primary in-county piping is assumed to be the same for all regional AWS projects

2.8.2 Resource Availability, Reliability, and Longevity:

The Withlacoochee River at Holder has an estimated annual available yield of about 50 mgd. This availability far exceeds the range of Alliance Member demands being considered. An MFL scheduled for 2009 for the Middle Withlacoochee could result in the river not being available for water supply during low-flow periods, but it is assumed that reliability and longevity are present, as the assumed average yields are far in excess the Alliance Members demands. Withdrawals from other users could further reduce available supply to the Alliance.

Grade: B

2.8.3 Raw Water Quality

The Withlacoochee at Holder maintains the organic and color rich character of the upper river, and also receives fair to good quality discharges from Tsala Apopka's Hernando Pool and Lake Panasoffkee. Some buffering of water quality due to the higher quality inputs is anticipated, but conventional treatment is expected to be required for potable use.

Grade: B

2.8.4 Permittability

The source is expected to be permittable. Some downstream competition for water may occur due to resource management issues with low levels in Lake Rousseau. A withdrawal schedule based on a "percent flow reduction" would be developed to protect downstream resources. It is anticipated this withdrawal schedule will result in the river not being available for water supply during low-flow periods.

Grade: B

2.8.5 Environmental Compatibility

MFLs are currently under development by the SWFWMD for the Withlacoochee River, an OFW. Preliminary or proxy MFLs will be available by the end of August 2007; these proxy MFLs were developed for water supply planning purposes. Historical flows and levels in the absence of any withdrawals are evaluated by the SWFWMD when developing MFLs, and the ground and surfacewater withdrawals in the Withlacoochee River Basin have not been accessed. Since MFLs have not been developed for the Withlacoochee River, the available yield is uncertain

This project receives an Environmental Compatibility Score of B since the likelihood of significant adverse environmental impacts is low. Transfer of water across basin boundaries would reduce recharge to the basin. This score also assumes that approximately 36 miles of transmission main needed to connect to a countywide distribution system will be constructed in existing right-of-ways and will not affect ecological resources.

Grade: B

2.8.6 Cost

Development of the source would require conventional surfacewater treatment (coagulation, filtration, and disinfection). In addition, a large reservoir to manage seasonal variations in flow is anticipated and included in the cost projection.

For planning purposes, the transmission line would run from the treatment facility to the northern area of Lake County and interconnect with the in-county pipe network. The transmission main would be approximately 36 miles long. The in-county primary pipe network to provide a backbone for distribution to the Alliance Members is similar in all AWS scenarios.

Additionally, the large number of interested partners with associated demands may translate into a more cost effective AWS as partnerships are realized.

Based on Demand Scenario 1 (design capacity of about 15 mgd) for cost comparison, unit production costs for the Lake County Alliance are projected as follows:

o Treatment Cost	$1.96 per 1000 gals.
o Reservoir Cost	$2.30 per 1000 gals.
o Transmission Cost	$2.63 per 1000 gals.
Projected Total Unit Production Cost	$6.89 per 1000 gals.

As this unit cost is above $6 per 1000 gallons because of the likely need for a reservoir, it receives a relative ranking of D.

Grade: D

2.8.7 Jurisdictional Complexity

The Withlacoochee at Holder project is located within the SWFWMD. Consequently, communication and cooperation between the SJRWMD and SWFWMD is critical and will complicate the project approval process.

With respect to partnerships, this project is considered an AWS with significant interest from communities in Lake, Marion, Sumter, and the WRWSA members. As such, developing final partnership agreements between interested parties will be complex.

Grade: C

2.8.8 Location

The Withlacoochee at Holder project west of Lake County is slightly further away than the LOR AWS project.

Grade: B

2.8.9 Overall Grade

The Withlacoochee at Holder AWS project gets high marks (B or higher) for 5 of the 7 evaluation criteria. However, cost and jurisdictional complexity are rated very low because of the need for a reservoir and crossing District boundaries. Therefore, the overall project score is C.

Grade: C

2.9 Lake Rousseau

2.9.1 Project Description

Lake Rousseau is a man-made lake formed upstream of the Inglis Dam on the Withlacoochee River. Surfacewater resource availability is not an issue as Lake Rousseau represents the Withlacoochee Basin (i.e., USGS hydrologic gage) location with the highest available yield. This alternative is being considered by the WRWSA for surfacewater supply and is a viable option for consideration by the Lake County Alliance.

This AWS assumes a raw water intake structure and treatment system would be located below the confluence of the Rainbow River and Withlacoochee River near or within the boundaries of Lake Rousseau. This alternative would include construction of a river intake, raw water pump station and treatment facility, and a pipeline to convey the treated water to Lake County. It is assumed that it would take 10 to 12 years for the Alliance Members to begin receiving water supply from this AWS.

Figure 2-7 illustrates the general location of the Lake Rousseau intake facility as well as a potential transmission line route from the facility to Alliance Members. A pipeline of about 50 miles is assumed to convey water to the northern end of the County, similar to the Holder AWS. Primary in-county piping is assumed to be the same for all regional AWS projects

2.9.2 Resource Availability, Reliability, and Longevity:

Lake Rousseau has an estimated annual available yield ranging from 87 to 98 mgd. This availability far exceeds the range of Alliance Member demands being considered. A reduction in yield could occur with environmental studies to return freshwater to the Lower Withlacoochee. However, resource availability, reliability, and longevity are present.

Grade: A

2.9.3 Raw Water Quality

Lake Rousseau blends middle Withlacoochee River and Rainbow River characteristics with water quality impacts from adjacent land uses. Some buffering of water quality due to the higher quality inputs is anticipated, but conventional treatment is expected to be required for potable use.

Grade: B

2.9.4 Permittability

The U.S. Army Corps of Engineers regulates the discharge schedule from Lake Rousseau. Consequently, for this source to be utilized, the intake would be located upstream of the lake, but is still believed to have difficulty in receiving approval from both the Corps and the SWFWMD. Additionally, some competition for water may occur due to resource management issues with low levels and muck accumulation in Lake Rousseau, and saltwater intrusion patterns in the Lower Withlacoochee. A withdrawal schedule based on a "percent flow reduction" would be developed to protect downstream resources.

Grade: B

2.9.5 Environmental Compatibility

MFLs are currently under development for the Withlacoochee River by the SWFWMD. Preliminary or proxy MFLs will be available by the end of August 2007 for water supply planning purposes. The SWFWMD evaluates historical flows and levels in the absence of any withdrawals when developing MFLs, and the ground and surfacewater withdrawals in the Withlacoochee River Basin have not been accessed. Since MFLs have not been developed for the Withlacoochee River, the available yield for Lake Rousseau is uncertain and could be affected by the need to return freshwater to the Lower Withlacoochee River for ecological restoration reasons.

Since the likelihood of significant adverse environmental impacts is low, this project receives an Environmental Compatibility Score of B. This score assumes that the approximately 50 miles of transmission main needed to connect to a countywide distribution system will be constructed in existing right-of-ways and will not affect ecological resources.

Grade: B

2.9.6 Cost

Development of the source would require conventional surfacewater treatment (enhanced coagulation, filtration, and disinfection). Some ground storage for equalization would be needed, but a large reservoir to manage seasonal variations is not included in the cost projection.

For planning purposes, the transmission line would run from treatment facility to the northern area of Lake County and interconnect with the in-county pipe network. The transmission main would be approximately 50 miles long. The in-county primary pipe network to provide a backbone for distribution to the Alliance Members is similar in all AWS scenarios.

Additionally, the large number of interested partners with associated demands may translate into a more cost effective AWS as partnerships are realized.

Based on Demand Scenario 1 (design capacity of about 15 mgd) for cost comparison, unit production costs for the Lake County Alliance are projected as follows:

o Treatment Cost	$1.96 per 1000 gals.
o Transmission Cost	$3.00 per 1000 gals.
Projected Total Unit Production Cost	$4.96 per 1000 gals.

As this projected unit cost is projected at about $5 per 1000 gallons, it receives a relative ranking of C when compared to the other AWS projects.

Grade: C

2.9.7 Jurisdictional Complexity

The Lake Rousseau project is located within the SWFWMD. Consequently, communication and cooperation between the SJRWMD and SWFWMD is critical and will complicate the project approval process. Additionally, the Corps of Engineers will have significant input as this withdrawal may impact the discharges from Lake Rousseau at Inglis Dam.

With respect to partnerships, this project is considered an AWS with significant interest from communities in Lake, Marion, Sumter, and the WRWSA members. As such, developing final partnership agreements between interested parties will be complicated.

Grade: C

2.9.8 Location

The Lake Rousseau project west of Lake County is similar to the Holder AWS project but further away from the Alliance Members.

Grade: C

2.9.9 Overall Grade

The Lake Rousseau AWS project gets high marks (B or higher) for 3 of the 7 evaluation criteria. However, cost, permittability, location, and jurisdictional complexity are rated very low. Therefore, the overall project score is similar to the project at Holder.

Grade: C

2.10 Alternative Water Supply Comparison

Each AWS project has been graded based on each of the seven comparison criteria. The feasibility for AWS development, using the qualitative evaluation matrix is summarized in Table 2-2.

2.11 Other Alternative Water Supply Development Considerations

2.11.1 Regional Water Supply Development Strategies

Planning and development for water use must consider its mobility. Water crosses jurisdictional boundaries, and withdrawals in one jurisdiction may affect future withdrawals in another. Water resource availability varies with location, so that one jurisdiction may be water-rich, while another may be water-poor. Finally, "water banking," or the capture of water supplies well before the time of use, is prevented by the Districts.

The mobility of water, its supply variability, and the inability to bank water mean that water supply development cannot be effectively conducted in a vacuum. The regional water supply context must be understood in order to adequately direct its development. Present water management strategies cannot be solely relied upon to meet the long-term water demand in Lake County. Involvement and development of water management strategies both locally and regionally will be required to satisfy water resource management needs in Lake County. This includes coordinating development of the remaining groundwater and surfacewater supplies within Lake County, and closely monitoring the regional water supply situation as it changes over time.

Orange, Seminole, Volusia, Flagler, and Brevard Counties are currently engaged in intensive searches for new sources of water to meet future demand. A recent permit application for 60 million gallons per day (mgd) of groundwater withdrawals was approved by the SJRWMD and received several legal objections, due to its potential to affect existing legal users. Another recent permit application for 5 mgd of surfacewater withdrawals was approved by the SJRWMD and also received a legal objection.

The legal wrangling in central Florida likely foreshadows increasing future water supply conflicts in its vicinity. As one jurisdiction may be water-rich, while another may be water-poor, the transfer of water across jurisdictional boundaries can help to manage water supply conflict. This need has been foreseen by the state legislature and inter-jurisdiction transfer of water is provided for under Florida law.

2.11.2 Transfer of Water – Florida Water Law

Florida water law provides that the ground and surfacewater sources in the State are the property of the citizens of Florida and that no jurisdictional water rights exist in Florida. Current Florida law does not allow local governments or the WMDs to keep water supply sources that are located within their jurisdictional boundaries to be utilized only to the benefit of users within their jurisdictional boundaries.

However, under the provision of Florida law known as "local sources first" (Ch. 373.223, F.S.), the permitting WMD must evaluate additional conditions for application that propose to transport water from one jurisdiction to another. The additional conditions require feasibility analyses of local sources before transport of water is approved, as described in 373.223 F.S.:

> *…..when evaluating whether a potential transport and use of ground or surfacewater across county boundaries is consistent with the public interest…the governing board or department shall consider:*
>
> *(a) The proximity of the proposed water source to the area of use or application.*

(b) All impoundments, streams, groundwater sources, or watercourses that are geographically closer to the area of use or application than the proposed source and that are technically and economically feasible for the proposed transport and use.

(c) All economically and technically feasible alternatives to the proposed source, including, but not limited to, desalination, conservation, reuse of nonpotable reclaimed water and stormwater, and aquifer storage and recovery.

(d) The potential environmental impacts that may result from the transport and use of water from the proposed source, and the potential environmental impacts that may result from use of the other water sources identified in paragraphs (b) and (c).

(e) Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for existing legal uses and reasonably anticipated future needs of the water supply planning region in which the proposed water source is located.

(f) Consultations with local governments affected by the proposed transport and use.

(g) The value of the existing capital investment in water-related infrastructure made by the applicant.

Since inter-jurisdictional transfer of water is provided for under Florida under certain circumstances, the transfer of water can be an important tool in managing water supply conflict. However, inter-jurisdictional transfers of water must be carefully contemplated and evaluated relative to the availability of other local sources and demand reduction opportunities.

2.12 Alternative Water Supply Project Discussion

The considerable uncertainties involved in establishing an AWS demand, and the sheer number of possible partnership opportunities for a given AWS project, make selection of a specific AWS project difficult. A discussion of possible AWS alternatives is provided below.

Lower Ocklawaha River - The LOR AWS project appears to provide the most effective balance of evaluation criteria including resource availability, raw water quality, cost, jurisdictional complexity and location. This AWS project also is projected to be the least costly outside-County AWS project that will meet the high end of the demand range that the Alliance may experience over the planning horizon. This project also has the yield to serve long-term water needs in Lake County beyond the planning horizon. The primary weakness of the LOR project is its environmental compatibility, primarily based on the historic alterations to the river hydrology and the need to access the Ocala National Forest for transmission.

Upper Ocklawaha River Basin - In addition to the LOR AWS project, individual Alliance Members have access to several in-county lakes within the Upper Ocklawaha River Basin (UORB) which could serve as a local source of water supply. These lakes were identified in Technical Memorandum 2 as a potential AWS alternative. However, the in-county lakes were not further reviewed due to a lack of verifiable data regarding their yield.

The lakes could supply anywhere from upwards of 20 mgd to as low as 6 mgd. Actual yield determination would require hydro-biologic analyses and review of additional water use data. Clearly, the lakes could provide reuse augmentation and potentially could serve as a potable water supply. There are two significant concerns with development of the in-County lakes:

- Any yield from the lakes could be substantially reduced as upstream and downstream withdrawals are proposed and permitted. Water use in Florida is essentially “first come, first serve” as long as the use is reasonable and beneficial, does not interfere with existing legal users, and is consistent with the public interest. These three tests are unlikely to prevent upstream and downstream withdrawals from affecting available yield in the in-County lakes.

- The Lake County Water Authority (LCWA) has a relatively unique statutory authority over the in-County lakes. It includes “controlling and conserving the freshwater resources” of Lake County and improving the “streams, lakes and canals”. However, the role and legal authority of the LCWA relative to water supply is unclear.

OUC Settlement Agreement - The Lake County settlement agreement approved in 2004 provides Lake County with the option to use up to 5 mgd of alternative water supply developed by OUC for the municipalities in Lake County. Since Lake County does not have a water utility, this agreement suggests that 5 mgd may become available to offset Alliance AWS demands. However, it is unclear if the Alliance has any formal standing relative to the agreement.

Villages Settlement Agreement - The Villages settlement agreement approved in 2007 provides Lake County with a $250,000 cost-share contribution towards joint water supply planning efforts. It is unclear if the Alliance has any formal standing relative to the agreement. Additionally, the Villages has a large AWS requirement within the SWFWMD and WRWSA jurisdiction. This will complicate any joint planning efforts that are to be simultaneously funded by the SJRWMD.

Lake Panasoffkee - The Lake Panasoffkee AWS project scores well for three significant evaluation criteria: raw water quality, location and cost. This AWS project is projected to be the least costly outside-County AWS project that will meet the low end of the demand range that the Alliance may experience over the planning horizon. The primary weaknesses of this project to the Alliance are its resource availability and its location within the SWFWMD and WRWSA. This project does not have the yield to serve long-term water needs in Lake County beyond the planning horizon, and its yield could also be reduced by competing users within the WRWSA.

A graphical illustration of the viable water supply alternatives for the Alliance is shown as Figure 2-8. This illustration includes the AWS project options as well as two additional water supply options for the Alliance Members: the use of in-county lakes and the potential supply from the OUC/Lake County AWS agreement.

Table 2-1

Lake County Surface Water Supply Evaluation Criteria

Evaluation Information	
Criteria Categories	**Grading Explanation**
1. Resource Availability, Reliability, and Longevity - This criterion relates to the quantity of water available for treatment, relative to projected demands. It includes the probability of long term availability without resulting in system or withdrawal termination. It considers the characteristics of the hydrogeology and/or surface water resources.	D - Supply source not adequate to meet high demand deficit (Demand Scenario 2) C - Significant negative water quantity or supply variability issues B - Few negative water quantity or supply variability issues A - No negative water quantity, variability, or resource issues
2. Raw Water Quality- This criterion is based on assessment of the raw water quality and the level of treatment expected for the intended water use. It also considers the compatibility for treatment for use in a blended system, and the potential for long-term degradation of source water quality.	C - Enhanced conventional-type treatment likely (e.g. high rate clarification, brackish reverse osmosis), or a reasonable possibility of future source degradation B - Conventional-type treatment likely (e.g. complete filtration, membrane softening) A - Limited treatment likely (e.g. lime softening)
3. Permittability - This criterion assesses the probability of complying with current rules and regulations of the applicable agencies, including permits for water use and environmental resources. It also includes the probability of being compatible with other existing legal users of water, and compatibility with minimum flows and levels.	C - Difficult to permit due to various regulatory reasons or local government opinion B - Permitting will follow normal permitting course with few issues A - Permitting will follow normal permitting course and likely will be supported by local governments and the WMDs
4. Environmental Compatibility - This criterion considers the potential environmental impacts or benefits of developing the supply at the given location, including disposal of wastes generated in the treatment process. It includes the impacts to the environment, groundwater, surface water flows, and downstream resources. Minimum flows and levels and stressed lakes will be considered. This criterion does not include environmental impacts from a specific construction footprint.	C - Reasonable likelihood of significant adverse environmental impacts B - Low likelihood of significant adverse environmental impacts A - No likelihood of significant adverse environmental impacts
5. Cost - This criterion includes evaluation of the facility's anticipated design, treatment, and storage requirements. It also includes construction time, need for transmission lines and interconnections, waste disposal needs, and facility operations and maintenance. It is relative to other new supply alternatives under consideration.	D - Very high anticipated costs from alternative treatment technologies (e.g., brackish water), reservoir and transmission needs C - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and transmission needs B - Moderate anticipated costs resulting from conventional treatment or transmission needs A - Low anticipated costs due to good source quality and limited transmission needs

Table 2-1

Lake County Surface Water Supply Evaluation Criteria

Evaluation Information	
Criteria Categories	**Grading Explanation**
6. Jurisdictional Complexity - This criterion evaluates the project relative to the jurisdictional issues associated with its development.	C - Project area is beyond both the SJRWMD and Lake County borders B - Project area is beyond Lake County borders; but is within SJRWMD A - Project area is within Lake County.
7. Location - This criterion assesses the proximity of the anticipated project area to water demand area(s).	C - Project area is significantly distant from Lake County demand areas (greater than 40 miles) B - Project area is reasonably proximate to demand areas, but not ideally located (between 15 and 40 miles) A - Project area is in close proximity to demand areas (less than 15 miles)
OVERALL GRADE:	D - Project is not recommended for further consideration C - Project is not recommended for further consideration without significant modifications B - Project is recommended for further consideration with qualifications A - Project is recommended for further consideration

Table 2-2

Lake County AWS Comparison

General Characteristics	St John's River		Ocklawaha River	Withlacoochee River		
	Yankee Lake	Near Deland	Lower Reach - Silver Springs	Lake Panasoffkee	Near Holder	Lake Rousseau
Potential Surface Water Yield (MGD) [1]	116	94 - 127	100 - 107	9 - 19	52	87 - 98
Water Quality	Brackish	Brackish	Fresh	Fresh	Fresh	Fresh
Criteria Categories						
1. Resource Availability, Reliability, and Longevity	A	B	A	B/D [2]	B	A
2. Raw Water Quality	C	C	B	B	B	B
3. Permittability	B	C	B	C	B	B
4. Environmental Compatibility	B	C	C	C	B	B
5. Cost	D	D	B	A/D [2]	D	C
6. Jurisdictional Complexity	B	B	B	C	D	C
7. Location	B	B	B	A	B	C
OVERALL GRADE:	**C**	**C-**	**B**	**C+/D**	**C**	**C**

Notes:
1 Potential surface water yield may be reduced by future MFLs, environmental considerations, and detailed safe yield analyses.
2 Dual ranking is provided with with first ranking for Demand Scenario 1 and second ranking for Demand Scenario 2

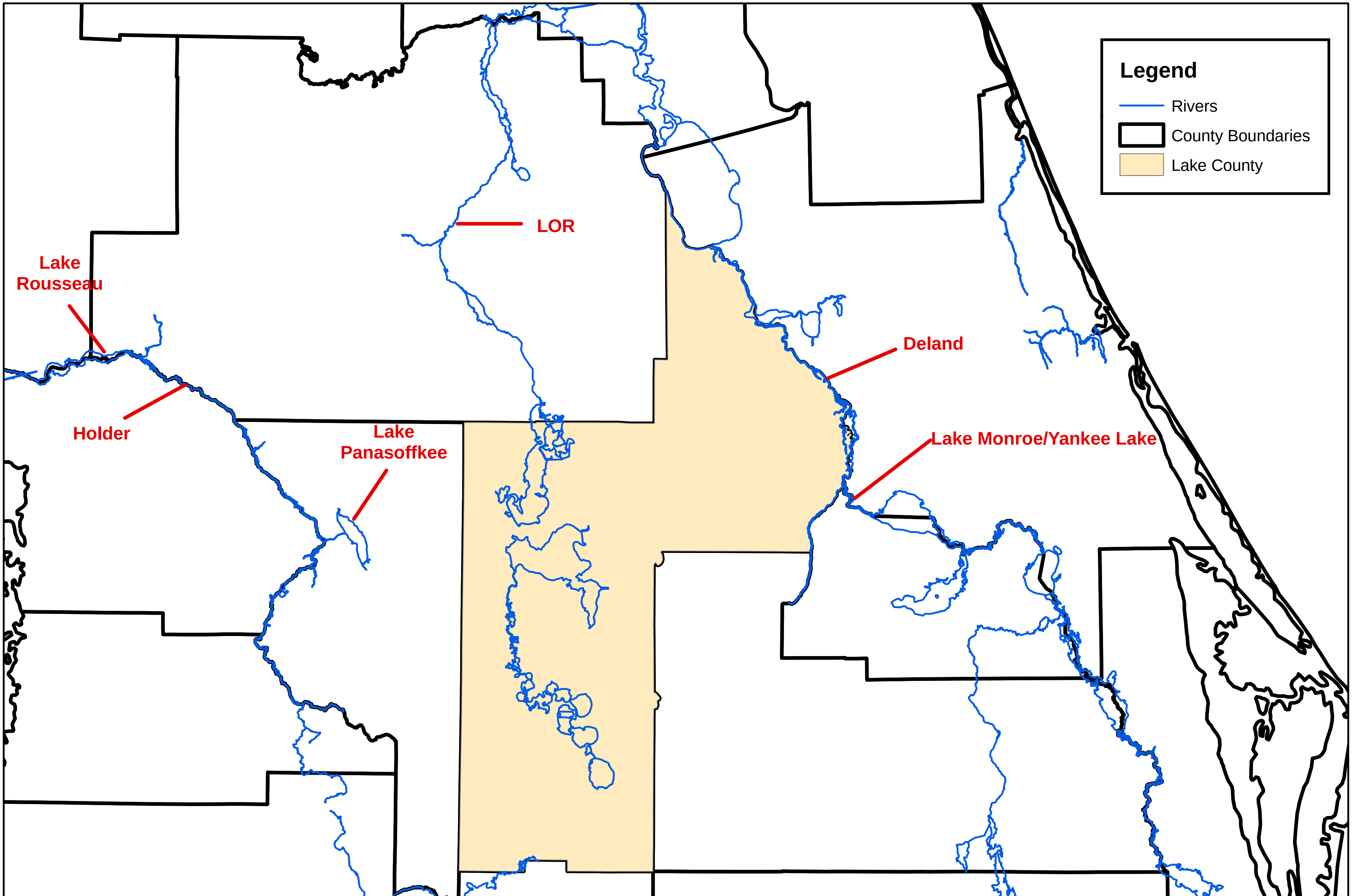

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Figure 2-1
Alternative Water Supply Projects

ORIGINAL DATE: 04-24-07
REVISION DATE: N/A
JOB NUMBER: 0306
FILE NAME:Recwaterprojects.mxd
GIS OPERATOR: DR

N
W E
S

1 Inch = 65,000 Feet

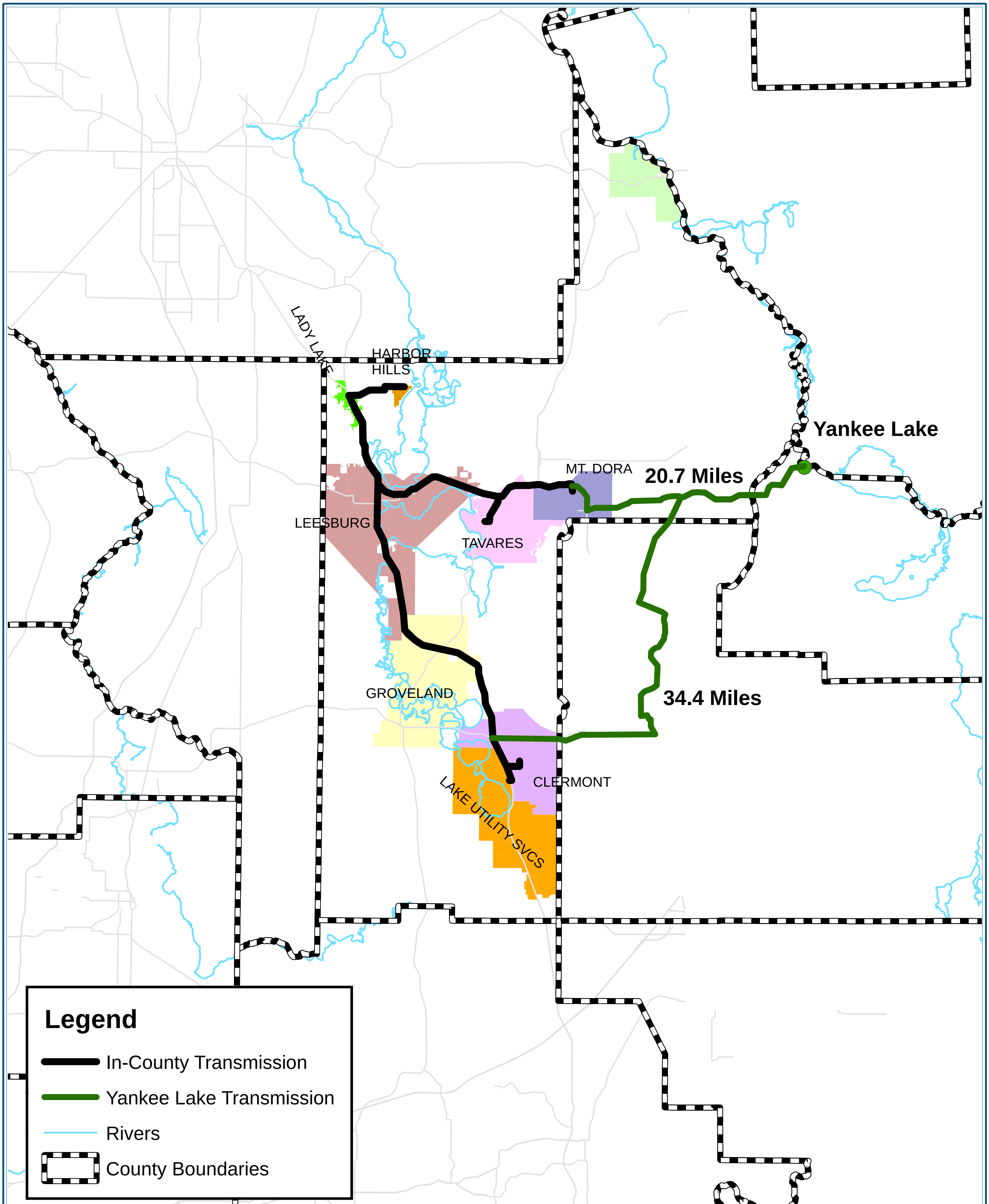

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Figure 2-2
AWS-Yankee Lake Option

ORIGINAL DATE: 12-09-03
REVISION DATE: 08-06-07
JOB NUMBER: 0407
FILE NAME: Alternative Water...mxd
GIS OPERATOR: DR

1 Inch = 50,000 Feet

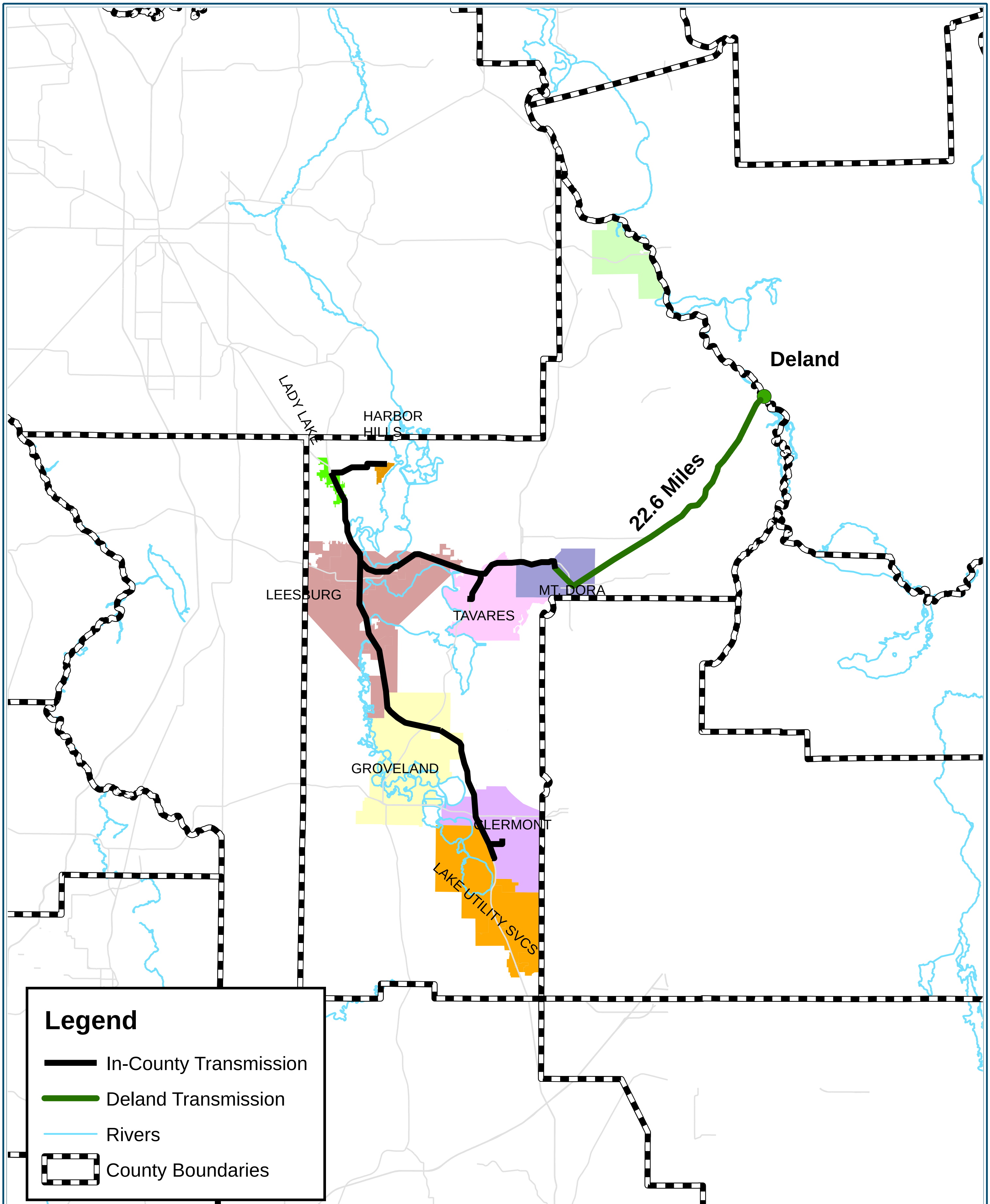

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Figure 2-3
AWS-Deland Option

ORIGINAL DATE: 12-09-03
REVISION DATE: 08-06-07
JOB NUMBER: 0407
FILE NAME: Alternative Water...mxd
GIS OPERATOR: DR

N W E S

1 Inch = 50,000 Feet

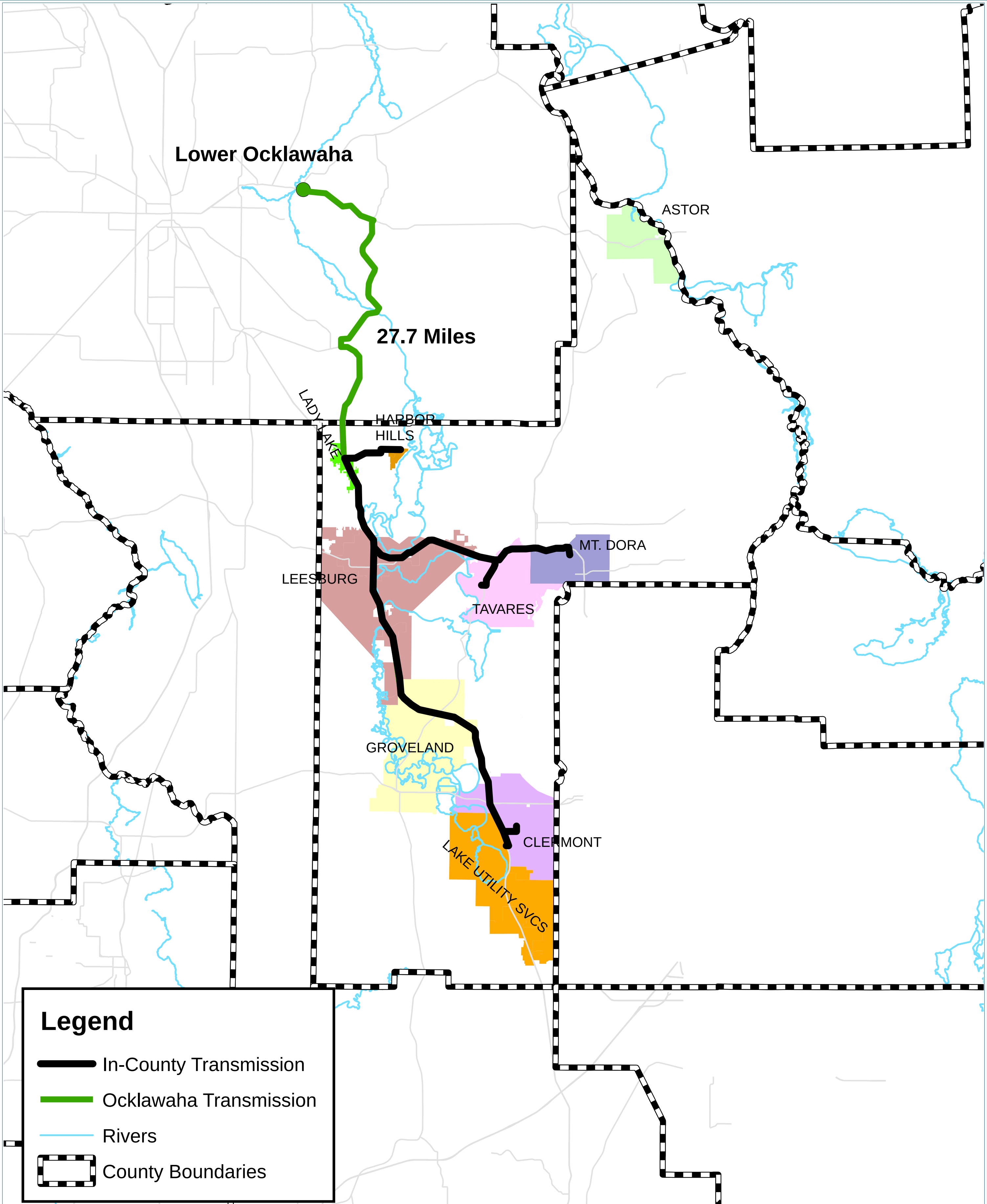

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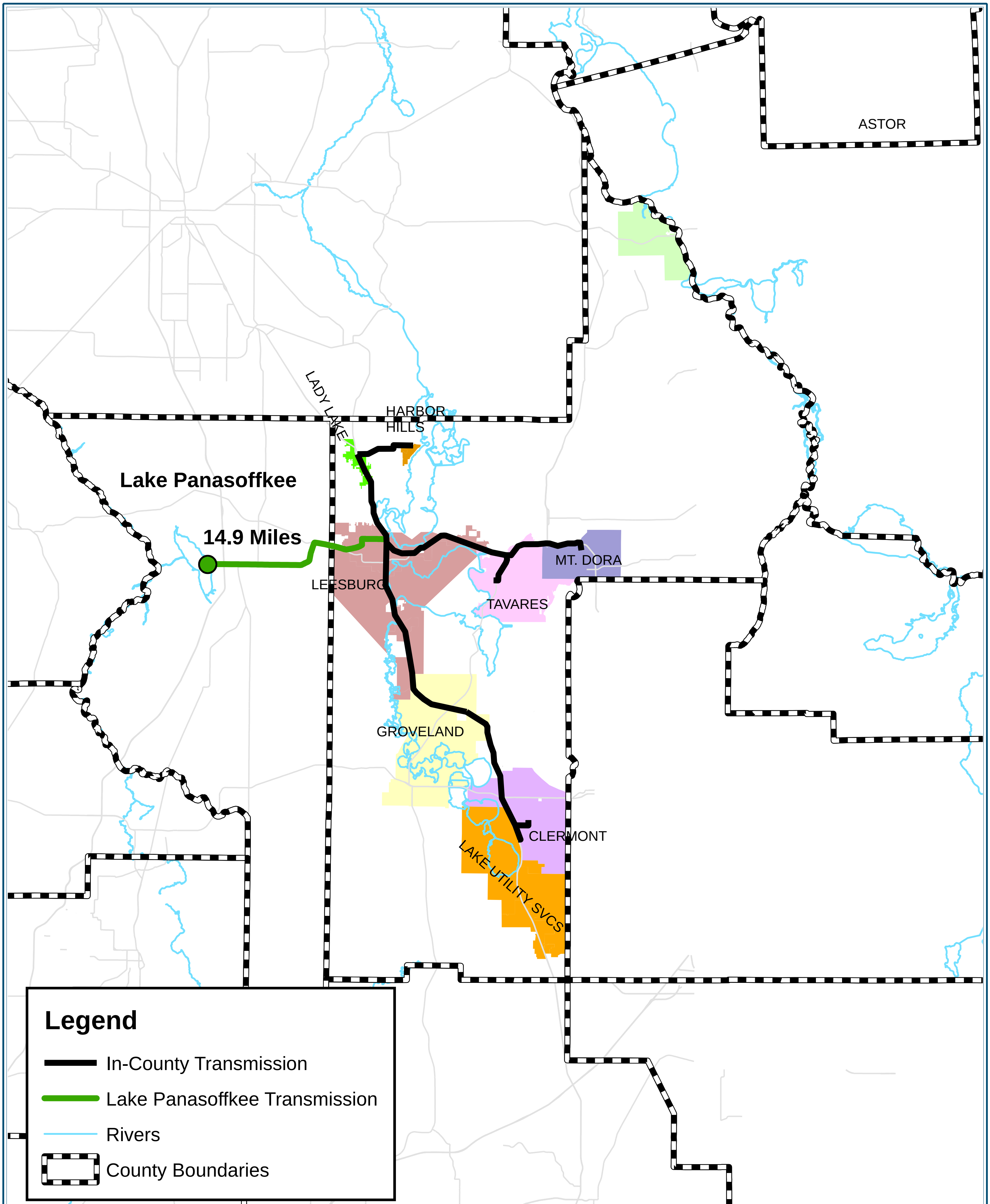
Figure 2-4
AWS-Lower Ocklawaha River Option

ORIGINAL DATE: 12-09-03
REVISION DATE: 08-06-07
JOB NUMBER: 0407
FILE NAME: Alternative Water...mxd
GIS OPERATOR: DR

N W E S

1 Inch = 50,000 Feet



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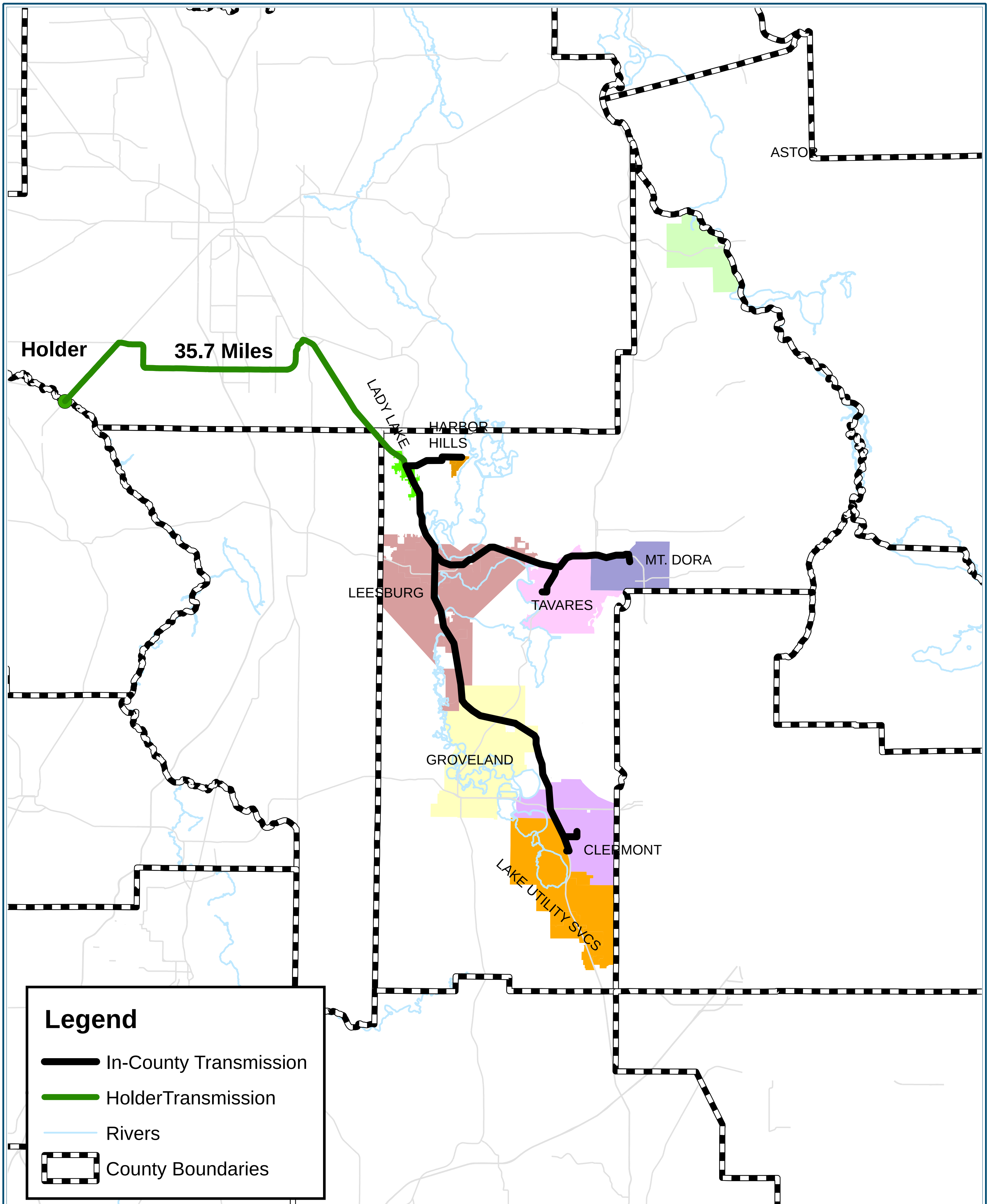
PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 2-5
AWS-Lake Panasoffkee Option

ORIGINAL DATE: 12-09-03
REVISION DATE: 08-06-07
JOB NUMBER: 0407
FILE NAME: Alternative Water...mxd
GIS OPERATOR: DR

N W E S

1 Inch = 50,000 Feet



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PROJECT: 0407 - Lake County Water Supply Plan Development

Figure 2-6
AWS-Holder Option

ORIGINAL DATE: 12-09-03
REVISION DATE: 08-06-07
JOB NUMBER: 0407
FILE NAME: Alternative Water...mxd
GIS OPERATOR: DR

N W E S
1 Inch = 50,000 Feet

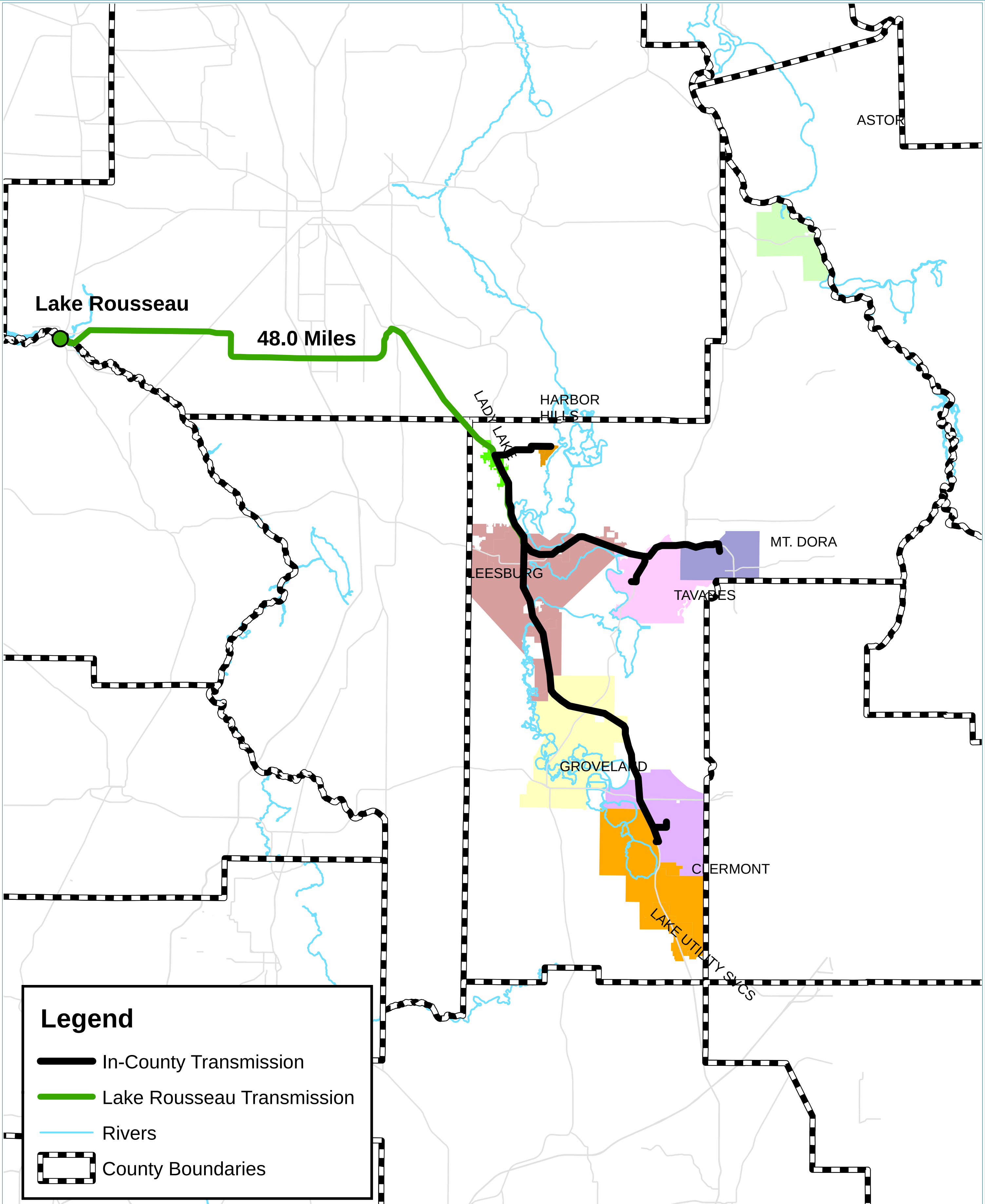

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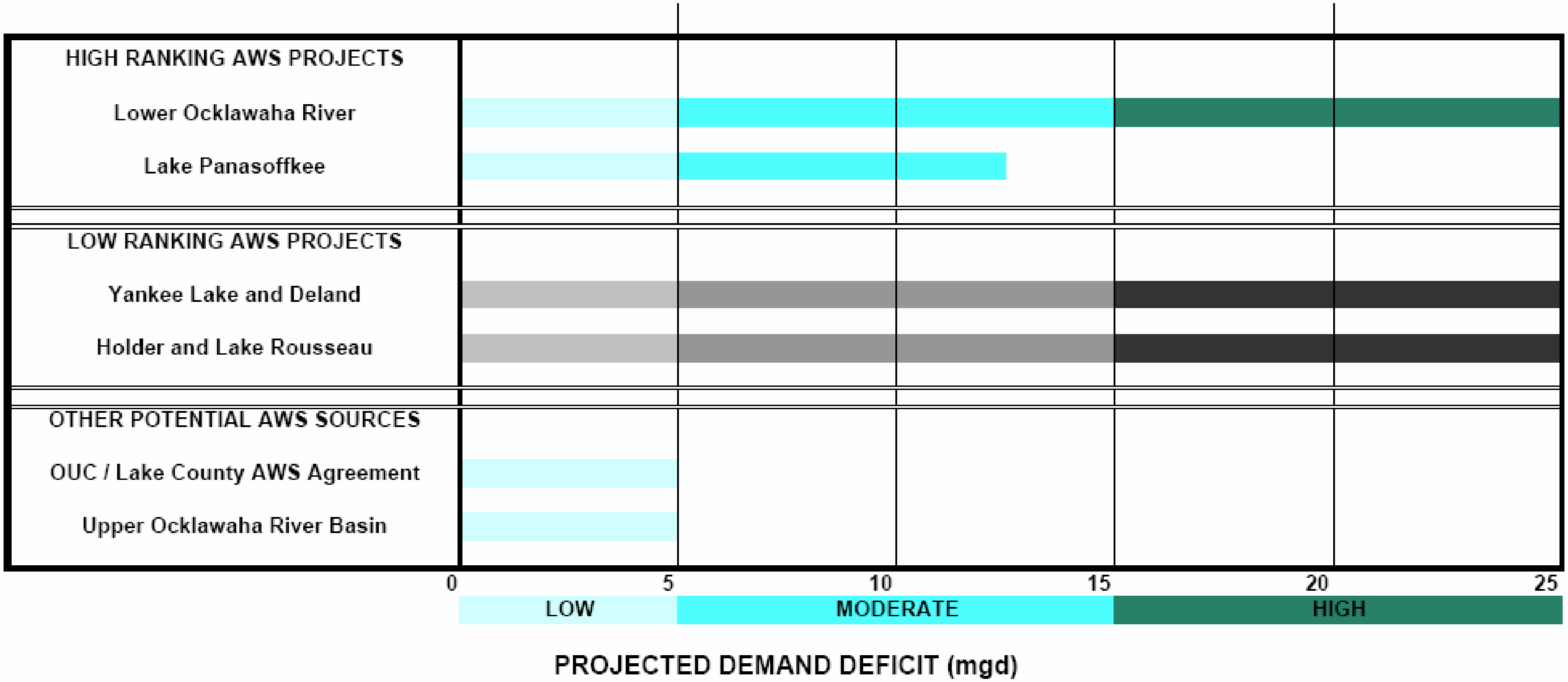
Figure 2-7
AWS-Lake Rousseau Option

ORIGINAL DATE: 12-09-03
REVISION DATE: 08-06-07
JOB NUMBER: 0407
FILE NAME: Alternative Water...mxd
GIS OPERATOR: DR

N W E S
1 Inch = 50,000 Feet



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PROJECT: 0407 - Lake County Water Supply Plan Development

Figure **2-8**
Comparison of Demands and Water Supply Alternatives

ORIGINAL DATE: 08-31-07
REVISION DATE: none
JOB NUMBER: 0407
FILE NAME: N/A
GIS OPERATOR: DR

APPENDIX A

Summary of Table A-1

Table A-1 shows a tabulation of Plan data by Alliance member.[1] Key points from the table are listed below:

- As shown, CUP expiration dates vary from 2026 to present (e.g., monthly temporary CUPs).
- The total estimated demand in 2005 is 26.06 mgd. The total projected demand in 2013 is 35.98 mgd, a difference of 9.92 mgd.
- The total permitted allocation of 33.34 mgd is 2.64 mgd less than the total projected demand in 2013.
- The total permitted allocation is 21.25 mgd less than the total projected demand of 52.58 mgd in 2030. The total projected 2013 demand is 16.60 mgd less than the total projected demand in 2030.

[1] No County utility is currently using surfacewater for potable supply.

Table A-1. Lake County Water Alliance Groundwater Supply Data

CUP #	CUP Name	Issue Date	Expiration Date	Avg. Actual Pumpage (mgd) (2000-2005)	2005 Estimated Demand (mgd)	2013 Projected Demand[1] (mgd)	2030 Projected Demand (mgd)	Total Permitted Groundwater Allocation[2] (mgd)	2013 Projected Demand Allocated (Y/N)	2013 Projected Demand Deficit (mgd)	Potential 2013-2030 Demand Served by Current Allocation (mgd)	1995 - 2005 Gross Per Capita (gpcd)	Primary GW Basin	AWS Participation Required in CUP (Y/N)	2030 Projected Demand Deficit[3]	2030 Potential Demand Deficit Low Range[4]	2030 Potential Demand Deficit High Range[5]
2478	Clermont[6]	9/11/2002	9/11/2022	3.47	5.21	8.58	9.86	3.78	N	4.80	0.00	216	3	Y	6.08	1.28	6.08
2634	City of Eustis[7]	3/13/2007	3/13/2012	2.80	3.08	3.61	5.09	3.80	Y	0.00	0.19	124	3	Y	1.29	1.29	1.48
2482	City of Fruitland Park	4/28/2006	6/13/2008	0.49	0.73	0.87	1.10	0.80	N	0.07	0.00	200	1	Y	0.30	0.23	0.30
2913/2796	Groveland[8]	3/13/2007	12/7/2014		1.22	2.06	4.40	1.97	N	0.09	0.00	112	3	Y	2.43	2.34	2.43
2596	Howey in the Hills	8/27/2003	8/27/2008		0.28	0.38	0.52	0.27	N	0.11	0.00	229	3	N	0.25	0.14	0.25
50049	Town of Lady Lake	6/26/2006	7/11/2026	0.46	0.55	0.66	0.73	1.19	Y	0.00	0.07	117	1	Y	0.00	0.00	0.07
94	Leesburg[9]	Pending		5.75	5.69	8.19	12.48	9.13	Y	0.00	0.94	221	1	N	3.35	3.35	4.29
2453	City of Mascotte[10]	Pending		0.34	0.41	0.61	1.49	0.37	N	0.24	0.00	69	1	N	1.12	0.88	1.12
2886	City of Minneola	09/22/05	02/09/10	1.07	1.49	2.16	3.96	2.51	Y	0.00	0.35	211	3	Y	1.45	1.45	1.80
2671	Town of Montverde	2/5/2007	2/5/2009	0.34	0.36	0.57	0.81	0.38	N	0.19	0.00	152	3	Y	0.43	0.24	0.43
50147	City of Mount Dora	11/8/2005	11/8/2025	2.60	3.74	4.30	6.47	5.05	Y	0.00	0.75	194	3	Y	1.42	1.42	2.17
2765	City of Tavares	12/14/2004	12/14/2011	1.76	2.73	3.26	4.53	3.57	Y	0.00	0.31	178	3	Y	0.96	0.96	1.27
2646	Umatilla	9/12/2001	2/13/2006		0.57	0.73	1.14	0.53	N	0.20	0.00	155	3	N	0.61	0.41	0.61
SUM				19.09	26.06	35.98	52.58	33.34	6	5.71	2.61			9	19.70	13.99	22.31

(1) Straight line interpolation between draft SJRWMD projected 2010 and 2015 demands.
(2) Groundwater allocations are shown. Reclaimed and surfacewater allocations are not included.
(3) Projected 2030 demand minus permitted allocation. Assumes that current groundwater allocations that exceed projected 2013 demands will not be withdrawn.
Does not include conservation and reuse options discussed in Tech Memo 2.
(4) Projected 2030 demand minus the greater of permitted allocation or projected 2013 demand. Assumes that current groundwater allocations that exceed projected 2013 demands will not be withdrawn.
Assumes that groundwater will be allocated to serve projected 2013 demands. Does not include conservation and reuse options discussed in Tech Memo 2.
(5) Projected 2030 demand minus the lesser of permitted allocation or projected 2013 demand. Assumes that current groundwater allocations that exceed projected 2013 demands will be withdrawn.
Does not assumes that groundwater will be allocated to serve projected 2013 demands. Does not include conservation and reuse options discussed in Tech Memo 2.
(6) 2013 to 2022 allocation is shown. 2002 to 2012 allocation is 7.38 mgd.
(7) Required to investigate feasibility of withdrawing 2 mgd of surfacewater from Lake Eustis or Lake Yale.
(8) Does not include a 0.13 mgd surfacewater allocation for reuse supplementation.
(9) Application pending since 2004.
(10) Monthly temporary CUPs.

Summary of Table A-2

Table A-2 shows a tabulation of data by Non-Alliance or private utility.[2] Only utilities greater than 0.1 mgd were included in the tabulation. Key points from the table are listed below:

- CUP expiration dates vary from 2026 to present (e.g., 2 year renewals).
- The total estimated demand in 2005 is 11.88 mgd. The total projected demand in 2013 is 16.24 mgd, a difference of 4.36 mgd.
- The total permitted allocation of 11.60 mgd is 4.64 mgd less than the total projected demand in 2013.
- The total permitted allocation is 13.19 mgd less than the total projected demand of 24.79 mgd in 2030. The total projected 2013 demand is 8.55 mgd less than the total projected demand in 2030.

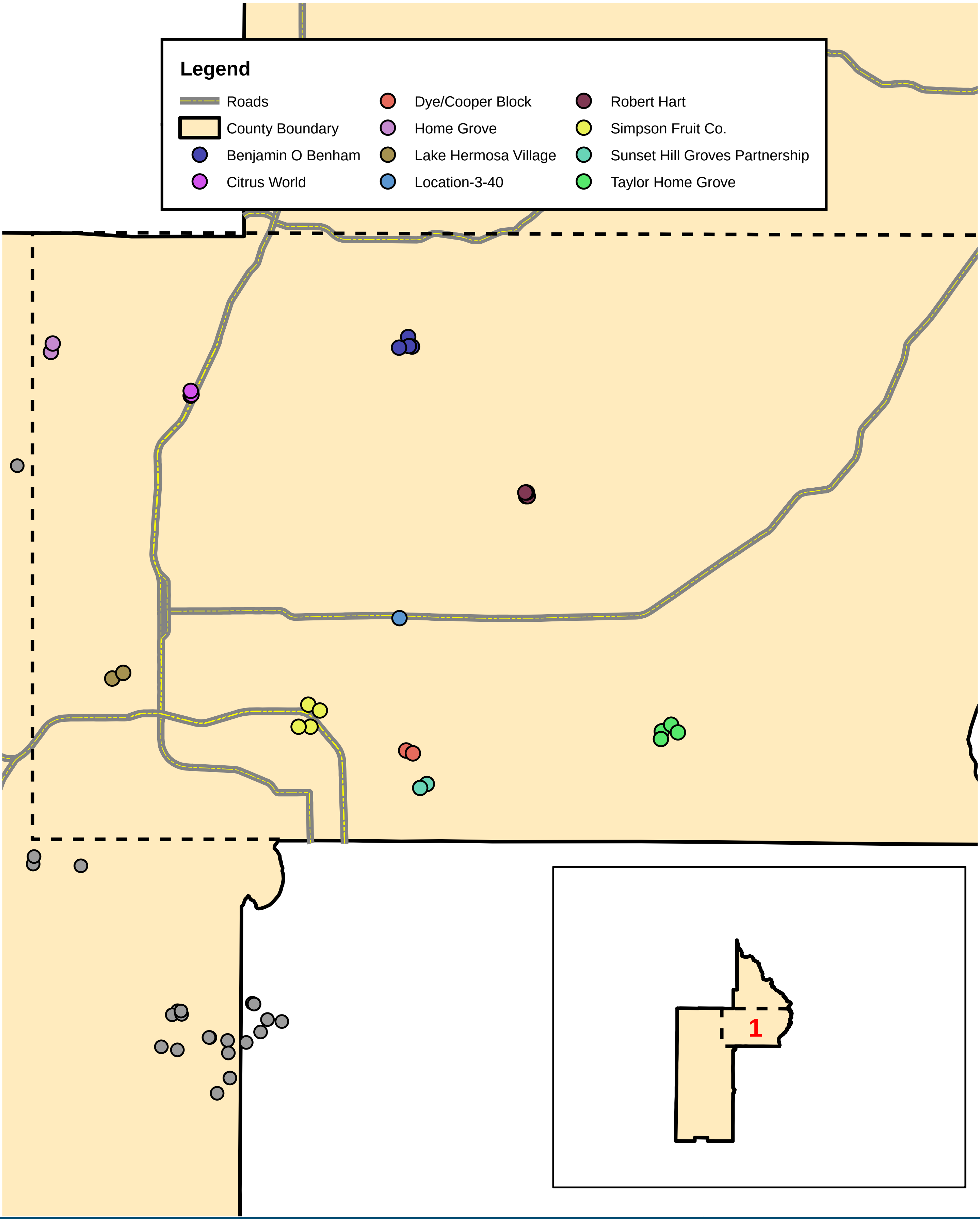
[2] No utility in Lake County is currently using surfacewater for potable supply.

Table A-2. Non-Alliance Groundwater Supply Data

CUP #	CUP Name[6]	Issue Date	Expiration Date	Avg. Actual Pumpage (mgd) (2000-2005)	2005 Estimated Demand (mgd)	2013 Projected Demand[1] (mgd)	2030 Projected Demand (mgd)	Total Permitted Allocation[2] (mgd)	2013 Projected Demand Allocated (Y/N)	2013 Projected Demand Deficit (mgd)	Potential 2013-2030 Demand Served by Current Allocation (mgd)	1995 - 2005 Gross Per Capita (gpcd)	Primary GW Basin	AWS Participation Required in CUP (Y/N)	2030 Projected Demand Deficit[3]	2030 Potential Demand Deficit Low Range[4]	2030 Potential Demand Deficit High Range[5]
20-069-2701-3	Aqua Source Inc. -Kings Cove Subdivision	4/21/2006	4/21/2026	0.08	0.12	0.12	0.13	0.14	Y	0.00	0.01	185	1	N	0.00	0.00	0.01
20-069-50178-	Astor Park Water Assoc	5/7/1998	5/7/2013	0.30	0.31	0.39	0.48	0.44	Y	0.00	0.05	128	1	Unkn[8]	0.04	0.04	0.09
20-069-2810-3	Lake Griffin Isles	4/11/2003	4/15/2008	0.10	0.12	0.12	0.12	0.13	Y	0.00	0.00	691	1	N	0.00	0.00	0.00
2-069-2718	Plantation at Leesburg[7]	3/5/2007	8/13/2022	0.20	0.16	0.18	0.19	0.98	Y	0.00	0.01	47	1	N	0.00	0.00	0.01
2-069-2392	Southlake Utilities	6/7/2006	1/1/2009	1.03	1.53	2.82	6.53	2.85	Y	0.00	0.03	258	3	Y	3.68	3.68	3.71
20-069-2717-5	Utilities inc. of Pennbrooke	08/20/06	08/20/26	0.28	0.27	0.28	0.29	0.45	Y	0.00	0.01	101	3	N	0.00	0.00	0.01
20-069-2632-5	Lake Utiities/Valencia Terrace	7/2/2004	8/11/2020	0.08	0.76	1.23	1.37	0.12	N	1.12	0.00	132	1	N	1.25	0.14	1.25
20-069-6398-6	Clerbrook Golf & RV Resort	3/10/2002	3/10/2007	0.11	0.20	0.20	0.20	0.15	N	0.06	0.00	107	3	N	0.05	0.00	0.05
2-069-279-6	Harbor Hills Utilities	4/11/2005	4/12/2007	0.98	0.81	0.89	1.26	0.50	N	0.40	0.00	857	1	N	0.76	0.37	0.76
2-069-2860-4	Hawthorne at Leesburg	7/25/1997	7/25/2007	1.29	0.48	0.48	0.50	0.46	N	0.02	0.00	260	1	N	0.04	0.02	0.04
2-069-2700-26	Lake Utility Services, Inc.	4/12/2006	4/12/2011	1.66	5.39	7.77	11.87	3.89	N	3.88	0.00	248	3	Unkn[8]	7.98	4.10	7.98
20-069-2888-3	Mid Florida Lakes	9/2/2003	9/2/2008	0.19	0.42	0.44	0.46	0.43	N	0.00	0.00	250	3	N	0.03	0.02	0.03
20-069-2565-4	Orange Lake MHP	5/18/2005	5/25/2015		0.12	0.12	0.12	0.09	N	0.03	0.00	558	3	N	0.03	0.00	0.03
20-069-2454-4	Sunlake Estates	9/12/2006	8/30/2026	0.27	0.52	0.52	0.52	0.35	N	0.17	0.00	668	3	N	0.17	0.00	0.17
20-069-282-5	Water Oaks Estates	9/27/2002	9/27/2007	0.22	0.46	0.46	0.53	0.45	N	0.02	0.00	357	3	Y	0.08	0.07	0.08
20-069-50152-	Wedgewood Homeowner's Assoc Inc.	6/19/2003	6/19/2023	0.15	0.20	0.21	0.22	0.18	N	0.03	0.00	227	3	N	0.04	0.01	0.04
SUM				6.93	11.88	16.24	24.79	11.60	6	5.72	0.04			3	14.16	8.44	14.27

(1) Straight line interpolation between draft SJRWMD projected 2010 and 2015 demands.
(2) Groundwater allocations are shown. Reclaimed and surfacewater allocations are not included.
(3) Projected 2030 demand minus total permitted allocation. Assumes that current groundwater allocations that exceed projected 2013 demands will not be withdrawn.
(4) Projected 2030 demand minus the greater of permitted allocation or projected 2013 demand. Assumes that current groundwater allocations that exceed projected 2013 demands will not be withdrawn.
Assumes that groundwater will be allocated to serve projected 2013 demands. Does not include conservation and reuse options discussed in Tech Memo 2.
(5) Projected 2030 demand minus the lesser of permitted allocation or projected 2013 demand. Assumes that current groundwater allocations that exceed projected 2013 demands will be withdrawn.
Does not assumes that groundwater will be allocated to serve projected 2013 demands. Does not include conservation and reuse options discussed in Tech Memo 2.
(6) CUP 2-069-50280, Villages of Lake Sumter, is not shown. It is primarily an irrigation allocation.
(7) Portion of CUP will be transferred to City of Leesburg after 2012. Allocation is 1.5 mgd from 2007 to 2012. Allocation is 0.98 mgd from 2013 through 2022, however, the allocation transferred to Leesburg will continue to serve Plantation at Leesburg.
(8) No Staff Report Available

APPENDIX B



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PROJECT: 0407 - Lake County Water Supply Development

Agricultural CUPs In Section 1 of Lake County

ORIGINAL DATE: 06-15-07
REVISION DATE: NA
JOB NUMBER: 0407
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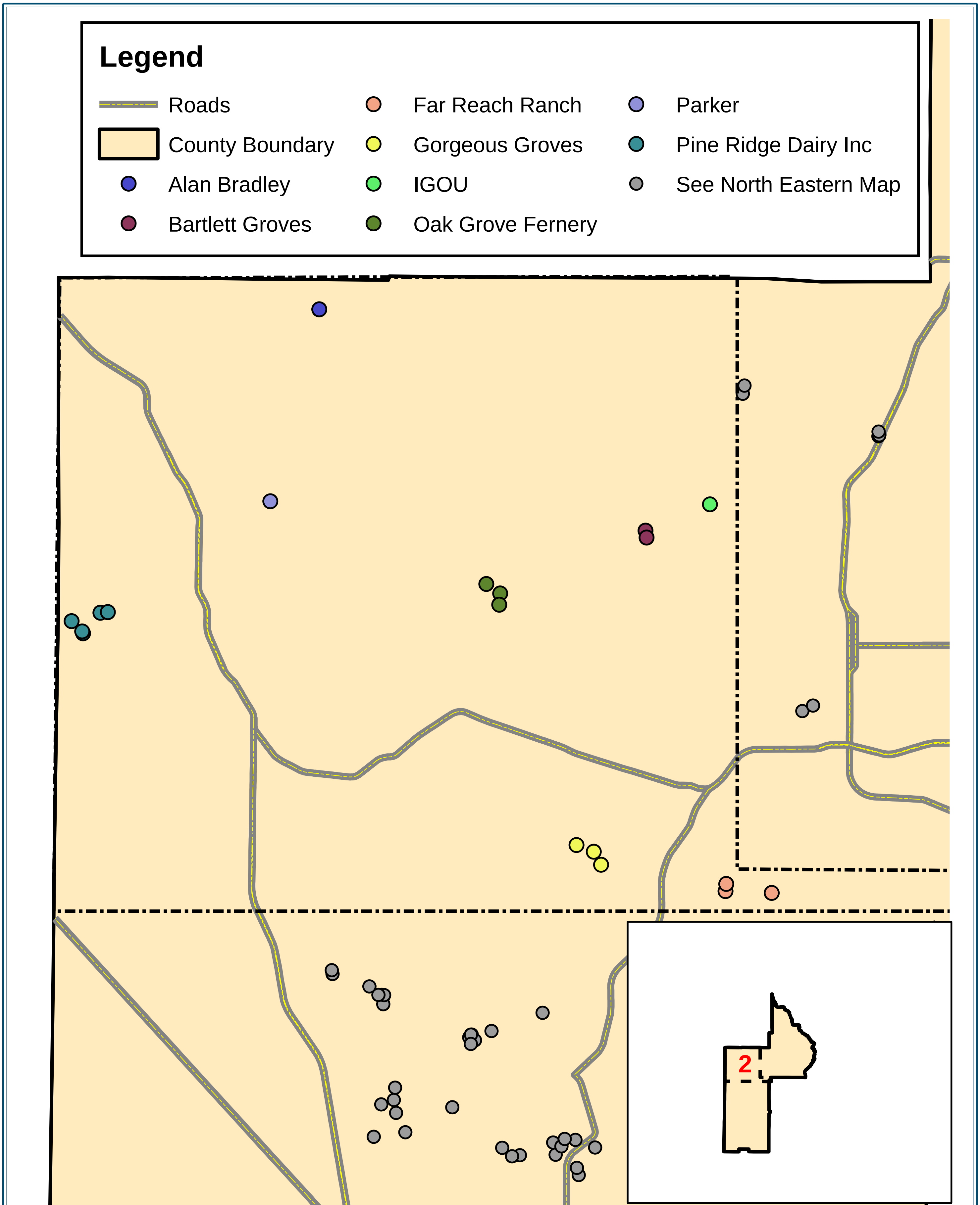
N W E S
1 Inch = 7 Miles



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Agricultural CUPs
In Section 2 of
Lake County

ORIGINAL DATE: 06-15-07
REVISION DATE: NA
JOB NUMBER: 0407
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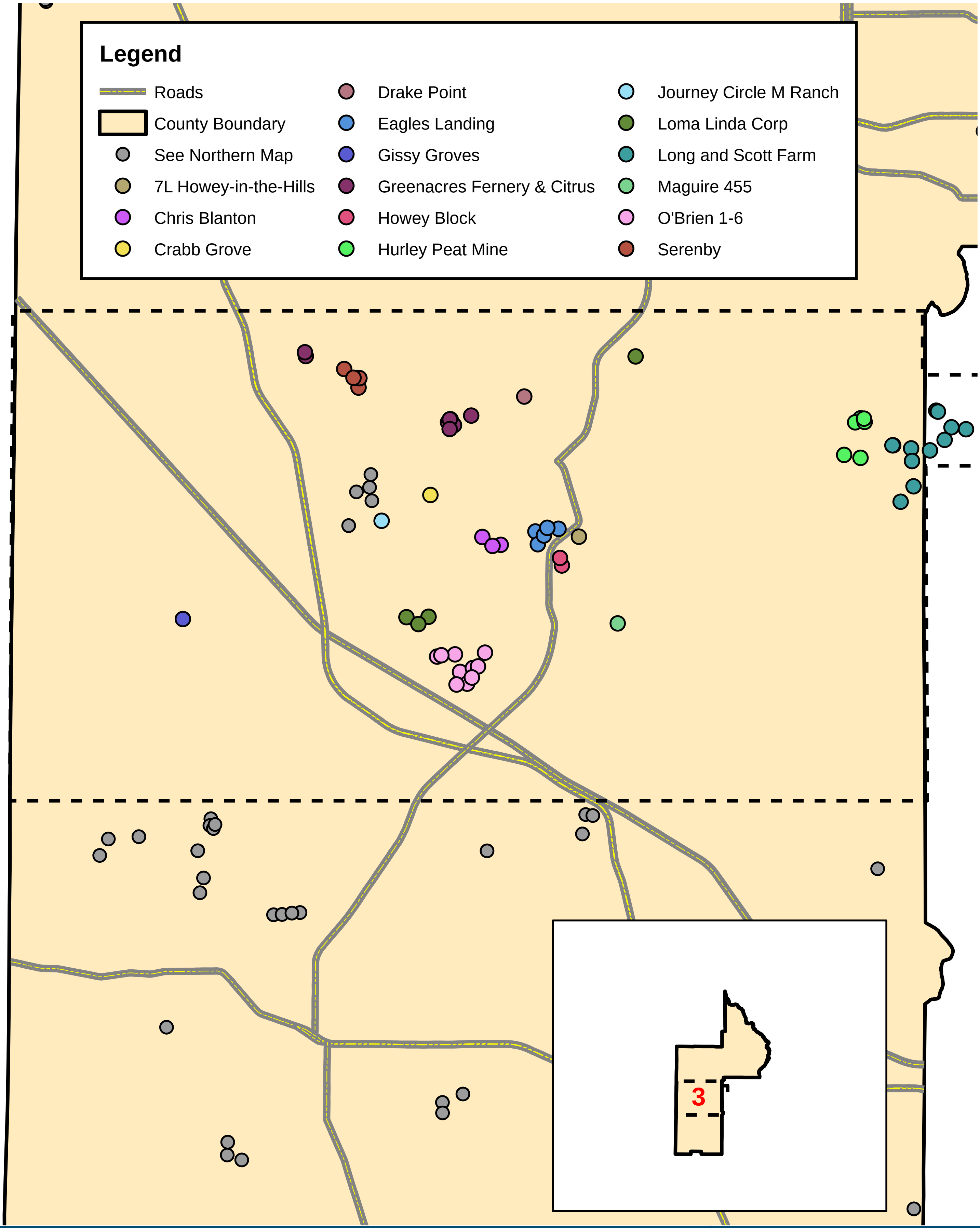

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PROJECT: 0407 - Lake County Water Supply Development

Agricultural CUPs
In Section 3 of
Lake County

ORIGINAL DATE: 06-15-07
REVISION DATE: NA
JOB NUMBER: 0407
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W E
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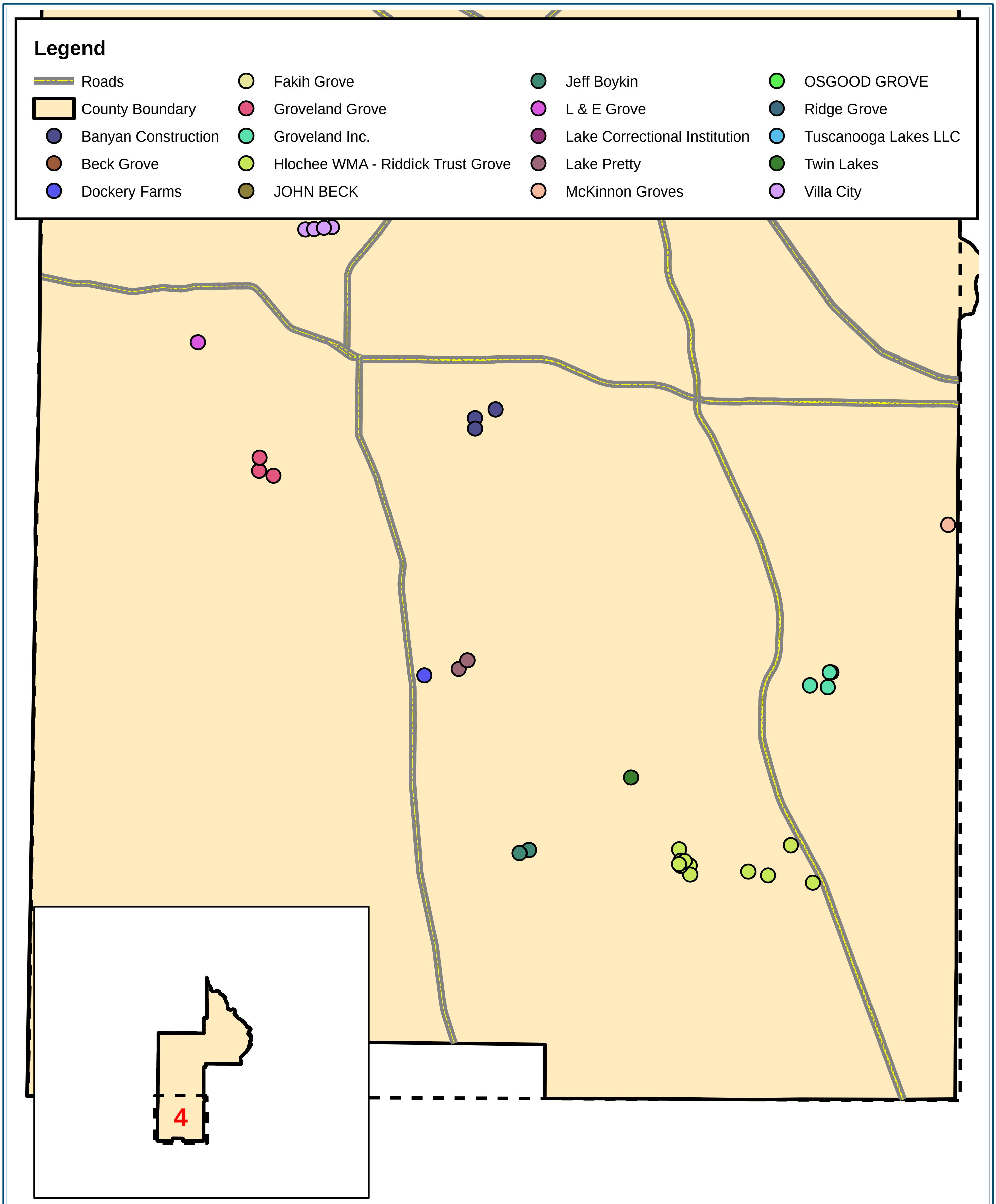
1 Inch = 7 Miles



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PROJECT: 0407 - Lake County Water Supply Development

Agricultural CUPs In Section 4 of Lake County

ORIGINAL DATE: 06-15-07
REVISION DATE: NA
JOB NUMBER: 0407
FILE NAME: 0407_Agricultural...mxd
GIS OPERATOR: DR

N W E S

1 Inch = 7 Miles

Lake County Water Supply Plan

Technical Memorandum #5

September 2007

FINAL

Regional Monitoring Plan

Prepared by

Water Resource
ASSOCIATES

Lake County Water Supply Plan

Regional Monitoring Plan

1.0 Introduction

Water Resource Associates (WRA) was selected by the Lake County Water Alliance (Alliance) to develop the "Lake County Water Supply Plan (Plan)" for its member governments. The Alliance is constituted of the following jurisdictions: the Cities of Clermont, Eustis, Fruitland Park, Groveland, Howey-In-The-Hills, Lady Lake, Leesburg, Mascotte, Minneola, Montverde, Mount Dora, Tavares and Umatilla. Originally, Lake County and Astatula were members of the Alliance but withdrew during the Plan process. The City of Leesburg, acting as an administrative arm of the Alliance, contracted with WRA in May of 2006 to complete the Plan. The St. Johns River Water Management District (SJRWMD) provided funding to the Alliance for the study and has been an active participant in providing data to the study and review of work-product.

Resource monitoring is a vital component for the protection of water resources. Monitoring involves the collection of both water quality, water level and water flow data, where appropriate, at strategically placed groundwater and surfacewater sites. These data are evaluated and reported upon by the monitoring agency to assess the health and quality of the resource and to identify areas where environmental degradation or impacts are occurring. These impacts could be related to Minimum Flows and Levels (MFLs) compliance, drawdown effects on wetlands and surfacewater bodies, and changes in groundwater quality.

The Scope of Work for the Plan included the development of a regional monitoring plan (RMP) that would assess the accuracy of the groundwater modeling conducted for the Plan. The factors to be addressed in the RMP included:

1. Identification of the presence, location, and quality of existing surfacewater and wetlands stage data;
2. Locations of features with existing and proposed Minimum Flows and Levels;
3. Estimate of the number of new sites needed, appropriate spatial density, and appropriate monitoring frequency;
4. Types of monitoring locations (e.g., lakes, wetlands, etc);
5. Appropriate monitoring methods (e.g. staff gauge, wells, etc); and
6. Statistical methods and modeling to be used for assessing the data collected.

The RMP that WRA accomplished for the Plan identifies existing surfacewater, wetlands, and groundwater stage data. It includes locations of features with existing and proposed MFLs. However, the groundwater modeling that was originally considered for the Plan was ultimately cut from the scope based on consensus of the Alliance, SJRMWD and WRA. Therefore, estimates of the number, type, and method for new groundwater monitoring sites are not applicable to this RMP.

It should also be noted that none of the proposed Alternative Water Supply (AWS) projects are located within Lake County and those that have been identified are conceptual in detail. It is not known how many of these projects will be implemented, or what their withdrawals will be. Due to these factors, designing a monitoring program to assess surfacewater impacts is difficult. Based on these groundwater and surfacewater uncertainties, a more general approach to the RMP was taken.

This RMP gives a brief overview of the types of monitoring currently underway by several agencies, including the United States Geological Survey (USGS), the Florida Department of Environmental Protection (FDEP), the St. Johns River Water Management District (SJRWMD), and the Southwest Florida Water Management District (SWFWMD). Data collected by the Lake County Water Authority (LCWA) was also considered. Other than compliance monitoring at permitted locations,[1] there is no systematic water-resource monitoring underway by local governments in Lake County. In anticipation of groundwater and AWS monitoring requirements in the future, the RMP discusses regional monitoring program development for groundwater and surfacewater sources.

2.0 Data Sources

Much of the information contained within this document has been obtained and modified from Internet resources. Each of the agencies listed above has an Internet website that can be queried for various environmental data. The SJRWMD website (www.sjrwmd.com/programs/data.html) provides access to environmental and regulatory data; however, some data must be requested directly from SJRWMD staff. The SWFWMD website (www.swfwmd.state.fl.us/data) allows access to a host of environmental and regulatory data, including Geographic Information Systems (GIS) coverages that allow the rapid mapping of environmental data. USGS and FDEP data can be accessed via their respective webistes (www.usgs.gov; www.dep.state.fl.us). In addition, the Lake County Water Atlas (www.lake.wateratlas.usf.edu/) provides a general overview of data collected by various agencies and can be used to identify data that may be available. The specific sources used here are listed in as references at the end of the document.

Monitoring of temperature, evapotranspiration and other meteorological phenomena can be important for modeling purposes, but were not reviewed for this investigation. These data are available from the SJRWMD and the SWFWMD, and in some cases, from the National Oceanic and Atmospheric Administration (NOAA) website (www.noaa.gov). Additionally, compendiums of data from a variety of sources are available from the United States Environmental Protection Agency (USEPA)'s storage and retrieval website STORET (www.epa.gov/storet).

3.0 Water Resource Monitoring

Water-resource monitoring in Lake County can be separated by water source: surfacewater (including lakes, streams, and wetlands) and groundwater (including the surficial, Upper and Lower Floridan aquifers). Effective monitoring of these sources will require characterization of physical and chemical parameters such as rainfall, water level, flow and water quality. Minimum Flows and Levels (MFLs) will dictate the viability of water supply from surface water bodies and groundwater by imposing limits to withdrawals, and monitoring of MFL water bodies will be important to understanding the ability of these water bodies to allow nearby withdrawals.

Figures 3-1 through 3-8 show the location of active water quantity, quality and rainfall monitoring sites in Lake County. Active sites are locations where data collection at a specific time-interval or frequency is ongoing. The major river systems currently under consideration for Alternative Water Supply (AWS) development are also shown. These include the Ocklawaha River, the St. Johns River, and the Withlacoochee River. Appendices A through E, respectively, list the groundwater and surfacewater data collected at these sites.

[1] The SJRWMD regulates water use under Chapter 373, Florida Statutes (F.S).

It should be noted that inactive surfacewater and groundwater monitoring sites, where regularly scheduled monitoring is not ongoing but was conducted in the past, have also been developed on a project-specific basis by monitoring agencies. Updated lists of these sites are not generally maintained, but their data may be available upon request and may be relevant to specific water resource investigations. Since these sites are inactive, the physical site may have been abandoned or lost depending on its specific circumstances.

FDEP collects a variety of surfacewater quality data through its Integrated Water Resource Monitoring Program (IWRM), including the baseline data required for Total Maximum Daily Load (TMDL) development and the data tied to regulatory permits. Most of this data is collected on a temporary basis and was not reviewed for this RMP, but is available through STORET. FDEP also collected groundwater quality data from 1985 to 1995 as part of its Background Monitoring Network.

Water resource monitoring for groundwater and surfacewater, and associated MFLs, is discussed below.

3.1 Groundwater

Groundwater, a traditional water source, is currently the main potable water supply source in Lake County, with fresh water from the Upper Floridan aquifer being the main source for public supply. The surficial aquifer, which overlies the Floridan in parts of the County, is rarely used as a potable water supply and is mainly tapped for small-scale irrigation and rural farm use. Refer to Technical Memorandum #2 for additional information on groundwater as a water supply source.

Monitoring of the Floridan aquifer has been extensive since the late 1960s with the establishment of the Water Management Districts (WMDs). This monitoring has involved the collection of groundwater levels from monitoring wells, springflow discharges, and the collection of water quality samples. Water level and flow data are relevant to water resource availability and can indicate the extent of aquifer drawdown or reductions in springflow due to groundwater withdrawals.

Water quality parameters vary with the purpose of the monitoring. In most cases, monitoring has focused on major ions (calcium, magnesium, chloride, sulfate, etc) and field analytes (pH and conductivity). These parameters are relevant to potable water quality and treatment, since the Lower Floridan and surficial aquifers can contain lower quality or brackish water, which does not meet potable standards due to its higher mineral content.[2] Water quality can deteriorate with increased groundwater withdrawals as areas of lower quality groundwater are accessed. Trace chemicals and contaminants such as nitrate may also be included in special monitoring projects.

3.2 Surface Water

Surfacewaters, including lakes, wetlands, and streams, are not currently utilized for potable water supply in Lake County. Relative to groundwater supplies, surfacewater requires more sophisticated treatment to remove organic and chemical constituents for potable use. Due to variations in rainfall and a shorter residence time in comparison to groundwater, surfacewater

[2]Chloride and sulfate concentrations greater than or equal to 250 milligrams per liter (mg/L), or total dissolved solids (TDS) greater than or equal to 500 mg/L.

also requires management of flow and level variations for use as a potable source. Refer to Technical Memorandum #2 for additional information on surfacewater as a water supply source. The monitoring of surfacewater in and around Lake County includes water level, flow, and water quality data.

Water level and flow data can indicate the extent of hydrologic impact to lakes, wetlands, and rivers from either groundwater or surfacewater withdrawals. They can also indicate the hydrologic relationship between connected ground- or surfacewaters. Due to the biological activity in surfacewater, a water withdrawal can also affect more than just the hydrology of the water body. Low water levels can facilitate consumption of dissolved oxygen in the water column, causing stress to fish and aquatic invertebrates. Freshwater withdrawals can cause downstream migration of the salinity interface, affecting the distribution of aquatic habitat.

Water quality data can describe an array of biological and chemical conditions, including alkalinity, salinity and trophic (or nutrient level) state. In many cases, water quality analytes are focused on the aesthetic and ecological characteristics of the water body with emphasis on parameters such as clarity, nutrients, dissolved oxygen, and pH. Some water quality parameters are relevant to potable water quality and treatment, as undesirable chemicals such as high levels of carbonate or sulfate must be adjusted or removed during treatment. The relationship between water quality, biology and a given surfacewater withdrawal must be developed on a case-by-case basis.

3.3 Minimum Flows and Levels

MFLs are established by the WMDs as required under Florida Statute 373.042, and will dictate the viability of water supply from surface water bodies and groundwater by imposing limits to withdrawals. Monitoring of MFL locations is important to understanding the ability of these water bodies to allow nearby withdrawals. The MFLs of interest to Alliance Members are for surface water bodies and springs, although MFLs can be set for groundwater levels under some circumstances.

Existing or anticipated MFL locations are present within Lake County and along the Ocklawaha River, St. Johns River, and the Withlacoochee River systems. These major river systems are reviewed in the Plan as major potential alternative water supply sources. As such, MFLs will constrain water supply development both from traditional groundwater within Lake County and from alternative water supplies that may be imported from outside the County. Refer to Technical Memorandum #2 for more information on MFLs. Figure 3-9 shows the location of MFL priority water bodies within Lake County and along the major river systems. Monitoring locations associated with the water bodies are provided in Appendix F.

4.0 Regional Groundwater Monitoring

As previously discussed, the RMP was originally designated to assess the accuracy of the groundwater modeling conducted for the Plan. However, the groundwater modeling that was originally considered for the Plan was subsequently cut from the scope. Since Alliance Members may be affected by the accuracy of regional groundwater modeling in the SJRWMD and SWFWMD water supply planning efforts, a general approach to regional groundwater monitoring is discussed in this section. Groundwater monitoring efforts already underway for Member CUPs and the effects of additional conservation, reuse, and AWS on groundwater modeling predictions are also discussed in this section.

Regional groundwater models are intended for planning purposes and thus have relatively coarse resolution in comparison to regulatory or withdrawal-specific models. For example, the cell length in the model grid for these types of models can be on the order of a ½ mile, so hydrogeologic features of smaller size end up incorporated to a larger, cell average. Although the models make efforts to include all applicable geologic data in their calibration, the accuracy of the representation in a given cell will be limited by the geologic data that is available for that cell. In addition, groundwater models are sensitive to their input data with respect to recharge and estimates/projections of water use. Generally, unadjusted water demands are input to these models and do not reflect additional water supplies achieved through conservation, reuse, or AWS. As these uncertainties can compound over time and space in the model results, groundwater level monitoring and comparison of model predictions to the monitoring results is essential to establishing the accuracy of the modeling. In confined settings, paired wells (one in the Upper Floridan and one in the surficial) are extremely valuable to these efforts.

When groundwater modeling results are developed, they are evaluated with respect to environmental impacts to lakes, wetlands, and springs within the model domain. This is to assess the potential for adverse impacts or harm (drawdown, reduction in springflow, etc) to these features due to the projected groundwater withdrawals. The harm analysis involves a general comparison of both the type of system and the soil and hydrogeologic setting in its vicinity. As shown in Table 4-1 below, SJRWMD drawdown constraints vary by wetland type, depending on the vegetative characteristics of the wetland system. The soil and hydrogeologic setting will affect the translation of drawdown effects to the wetland above.

Table 4-1. Wetland Drawdown Constraints[3]

Wetland Type	Feet of Drawdown
Bay Swamp	0.35
River / Lake Swamp	0.35
Cypress Swamp	0.55
Mixed Forest	0.35
Freshwater Marsh	0.55
Wet Prairie	0.35
Emergent Aquatic Vegetation	0.85
Submergent Aquatic Vegetation	1.20
Mixed Scrub-Shrub	0.75
Non-Vegetated Wetland	1.20

A wetland located in highly permeable soils will be more susceptible to drawdown effects than a comparable wetland located in soils that are less permeable. A wetland located in an unconfined setting will be more susceptible than a comparable wetland located in a confined setting, since the confinement provides some protection from the Upper Floridan aquifer drawdown. Based on a harm assessment that considers these factors, determinations of the need for restrictions in groundwater use will be made.

[3] Adapted from CH2M Hill (1998).

As with groundwater levels, monitoring and comparison of predictions of harm to field results is essential to establishing the accuracy of the assessment. This is particularly important for environmental impacts, which will be more variable than hydrologic data due to the complexity of the ecological systems under evaluation. Therefore, effective monitoring of environmental impacts will require many more locations in the area of interest than will direct monitoring of groundwater model output. Both the SJRWMD and the SWFWMD monitor selected wetland sites in certain areas in order to assess impacts due to groundwater withdrawals.

Historically, groundwater CUPs included monitoring requirements with respect to water quality, to ensure that withdrawals did not entrain lower quality groundwater from the surficial and Lower Floridan aquifers. As groundwater supplies become increasingly limited, nearly all groundwater CUPs now include environmental monitoring requirements also. These may include monitoring of nearby lakes, wetlands, or other features. Water quality, water level and environmental monitoring will continue to become increasingly important as groundwater supplies dwindle. The monitoring already in place for Member CUPs could be valuable when utilized on a regional basis.

5.0 Regional Surfacewater Supply Monitoring

As previously discussed, it is possible that Alliance Members will participate in one or more large surfacewater withdrawals that have been contemplated from the major river systems in the region. Due to the biological activity and resource value of surfacewater systems, large withdrawals typically require development of a comprehensive environmental monitoring program as a condition of CUP approval. Since Alliance Members may participate in the development of such a program, a general approach to regional monitoring program development for surfacewater withdrawals is discussed in this section.

Since large river or lake systems must support recreational, navigation, environmental, and water supply functions, many stakeholders will be interested in the development of the monitoring program. A consensus-based approach including continuous review and oversight of program development by interested parties is important to achieving consensus approval of the monitoring program.

The SJRWMD's consumptive use permitting program requires that water withdrawals "will not cause adverse environmental impacts to wetlands, lakes, streams, estuaries, fish and wildlife, or other natural resources."[4] The general goal of the monitoring program is to ensure consistency with the CUP criteria. Specific performance standards include, at a minimum, that flows in the affected water body should not deviate from the normal rate and range of fluctuation to the extent that:

- Water quality, vegetation, and animal populations are adversely impacted in streams and estuaries;
- Salinity distributions in tidal streams and estuaries are significantly altered as a result of withdrawals;
- Recreational use or aesthetic qualities of the resource are adversely impacted

[4] 40C-2.301(c), Florida Administrative Code (F.A.C).

Therefore, the environmental monitoring program must be of sufficient breadth and depth to ensure that these criteria are met throughout the implementation period of the project. General programmatic areas of interest include hydrology and water quality, biota and fauna, and habitat and vegetation. For each of these areas, key parameters can be identified and assessed for their applicability to the monitoring program. Data for the applicable parameters may be available through monitoring efforts underway elsewhere, or may need to be acquired specifically by the monitoring program. A list of key parameters is provided in Table 1-1 below.

Table 5-1. Key Environmental Monitoring Parameters[5]

Program Area of Interest		
Hydrology and Water Quality	**Biota and Fauna**	**Habitat and Vegetation**
• Flow • Water level • Salinity and conductivity • Dissolved oxygen • Temperature • Secchi depth • Light transmission / photosynthetically active radiation • Chlorophyll-a • Color • Total and dissolved organic carbon • Total suspended solids	• Benthic macroinvertebrates • Aquatic invertebrates • Zooplankton / Ichthyoplankton (fish larvae) • Phytoplankton • Fish • Water-dependent birds	• Emergent aquatic vegetation • Submersed aquatic vegetation • Sediment grain size • Sediment organic content

In addition to the consensus-based approach previously described, the diverse interests of multiple stakeholders essentially require that the monitoring program be scientifically rigorous and defensible. The monitoring plan should generate clear, scientifically-based conclusions that leave little uncertainty as to the actual effect of the withdrawal. The following elements should be present in the monitoring program:[6]

- Meaningful monitoring goals and objectives should be developed and clearly articulated;
- Baseline conditions and the area of interest should be identified;
- Sampling design should be technically sound and statistically valid, as applicable;
- Supporting research should be conducted where applicable to the goals and objectives of the program;
- Procedures for quality assurance should be identified and followed, included scientific peer review;

[5] Adapted from PBS&J (2000).
[6] Modified from National Research Council (1990)

- Adequate resources should be assigned to the program, including analysis, evaluation and reporting of data.

6.0 Conclusions

The conclusions of the RMP are provided below.

- Many agencies including the SJRWMD, SWFWMD, and USGS conduct water resource monitoring in Lake County. Data gathered by these agencies includes ground- and/or surfacewater levels, flow, and quality.

- Water level, water quality, and environmental monitoring requirements in Member CUPs are a valuable source of data and could be utilized on a regional basis.

- Regional groundwater models are used for planning purposes to estimate groundwater availability. They require ongoing monitoring to assess the accuracy of their predictions over time.

- The projections of water use included in regional models do not generally include additional water supplies achieved through conservation, reuse, or AWS.

- Large surfacewater withdrawals will require development of a comprehensive environmental monitoring program as a condition of CUP approval. A consensus-based approach is important to achieving consensus approval of the monitoring program.

7.0 Recommendations

Active monitoring by the SJRWMD, SWFWMD, USGS, and others is based on their goals and monitoring needs. While some of the existing monitoring will have clear applicability to water supply in Lake County, the need for monitoring for Alliance Members will depend on the specific goals and objectives of the Members. In addition, as traditional groundwater supplies become increasingly limited and AWS are developed, effective monitoring will be critical to accurately establishing the sustainable limits of both groundwater and surfacewater. With this in mind, the following recommendations are provided to both the Alliance and its Members.

- Develop data-sharing agreements, such as Memoranda of Understanding (MOUs), both internally among Members and externally with agencies such as the SJRWMD, SWFWMD, Lake County Water Authority (LCWA) and USGS, to share water resource data on a timely basis.
- Develop economies of scale within the Alliance for both monitoring and analysis of data. Utilize monitoring already underway for CUPs to help assess water resources on a Lake County-wide basis.
- Review and analyze water resource data within Lake County on a regular basis, at least annually.

- Identify environmentally sensitive areas and areas of need – such as assessing accuracy of groundwater modeling or the groundwater resource benefit provided by conservation, reuse, and AWS -- not covered by the regional monitoring networks of the SJRWMD and USGS. Seek funding sources to implement monitoring of specific areas of concern and/or encourage agencies to implement adequate monitoring, as applicable.
- Coordinate monitoring efforts and review of water resource data with the LCWA.

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List of Appendices

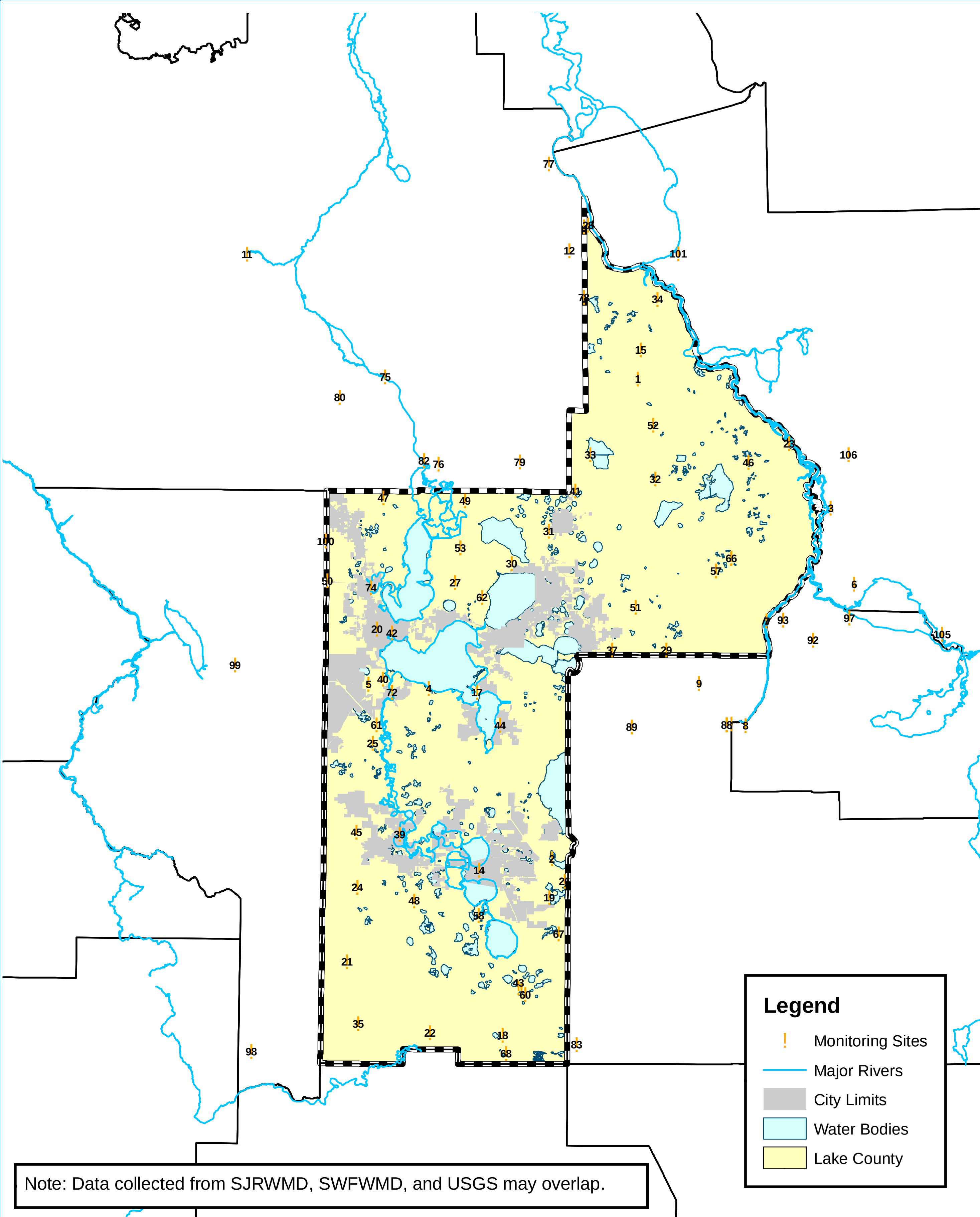

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Figure 3-1
SJRWMD Groundwater
Hydrologic Monitoring Locations

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REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: MonitoringSites.mxd
GIS OPERATOR: DR

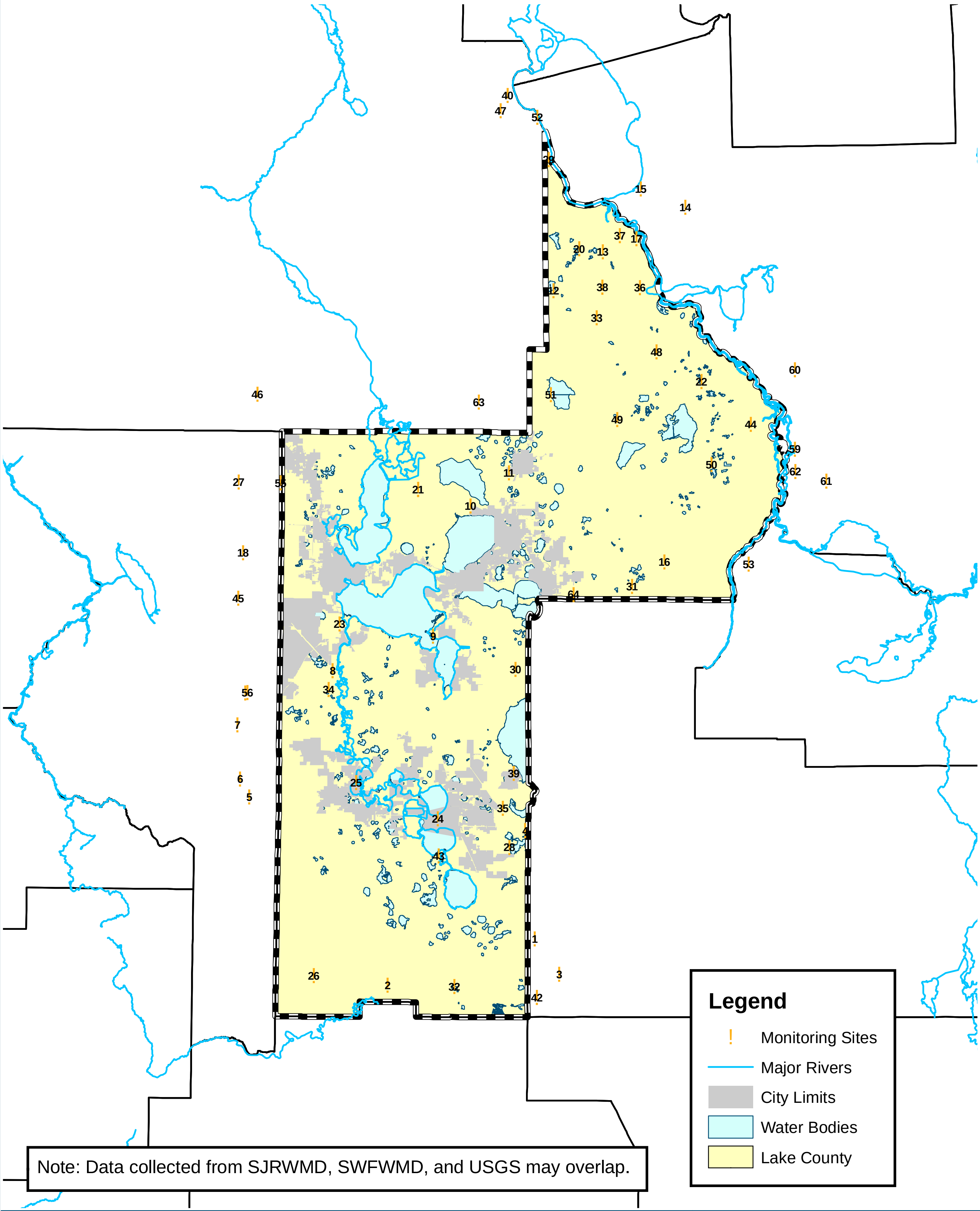

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Figure 3-2
USGS Groundwater
Hydrologic Monitoring Locations

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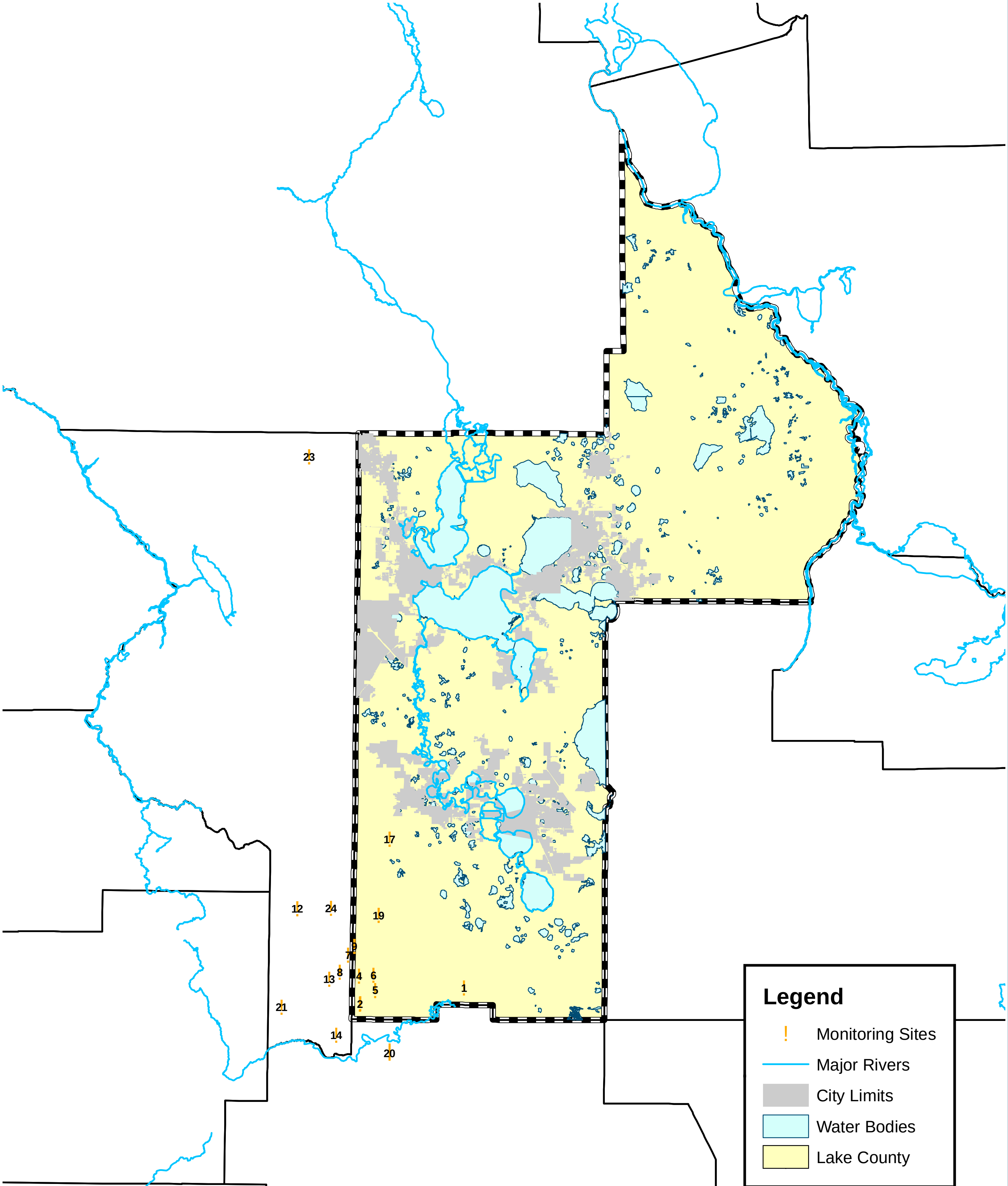
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: MonitoringSites.mxd
GIS OPERATOR: DR

1 inch equals 9 miles



Note: Data collected from SJRWMD, SWFWMD, and USGS may overlap.

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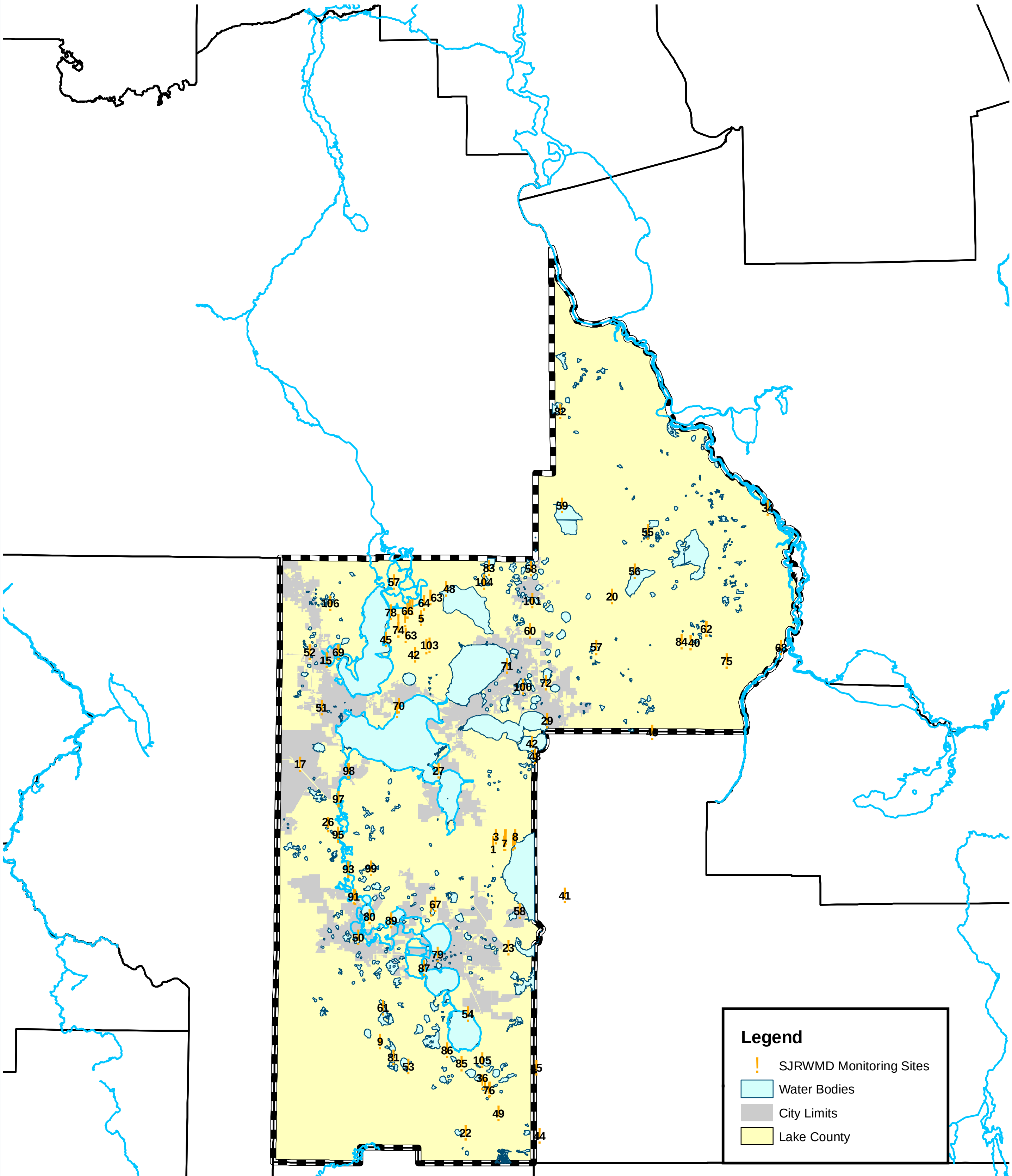
Figure 3-3
SWFWMD Groundwater Hydrologic Monitoring Locations

ORIGINAL DATE: 08-31-07
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: MonitoringSites.mxd
GIS OPERATOR: DR

1 inch equals 9 miles



Note: Data collected from SJRWMD, SWFWMD, and USGS may overlap.

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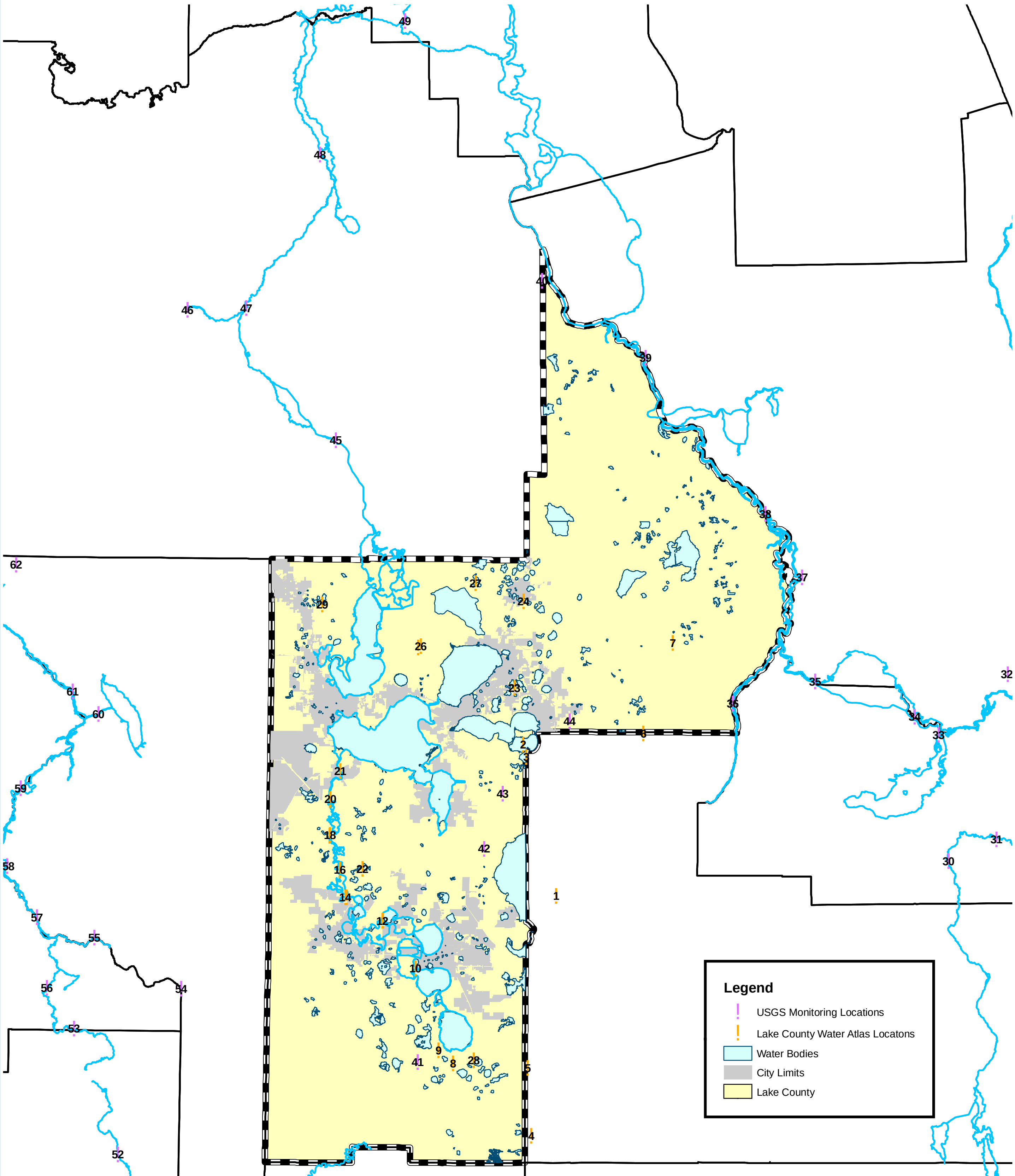
Figure 3-4
SJRWMD Surface Water
Hydrologic Monitoring Locations

ORIGINAL DATE: 08-31-07
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: sw hydrologic...mxd
GIS OPERATOR: LEF

1 inch equals 9 miles



Note: Data collected from SJRWMD, SWFWMD, Lake County Water Atlas and USGS may overlap.

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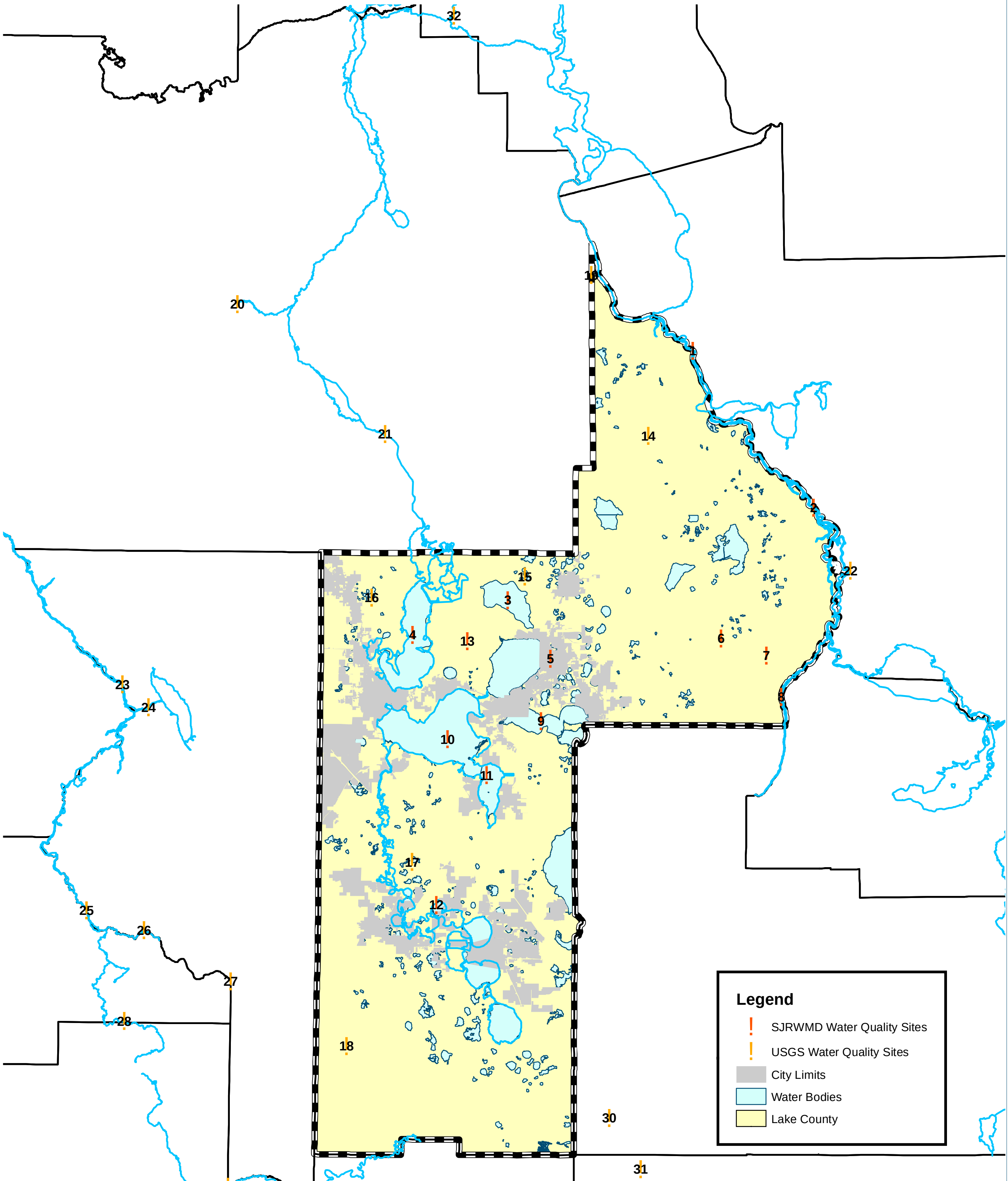
Figure 3-5 Water Atlas and USGS Surface Water Hydrologic Monitoring Locations

ORIGINAL DATE: 08-31-07	
REVISION DATE: NA	
JOB NUMBER: 0216	
FILE NAME: sw hydrologic...mxd	
GIS OPERATOR: LEF	

1 inch equals 10 miles



Note: Data collected from SJRWMD, SWFWMD, and USGS may overlap.

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Figure 3-6
Surface Water Quality
Monitoring Locations

ORIGINAL DATE: 08-31-07
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: Water Quality...mxd
GIS OPERATOR: LEF

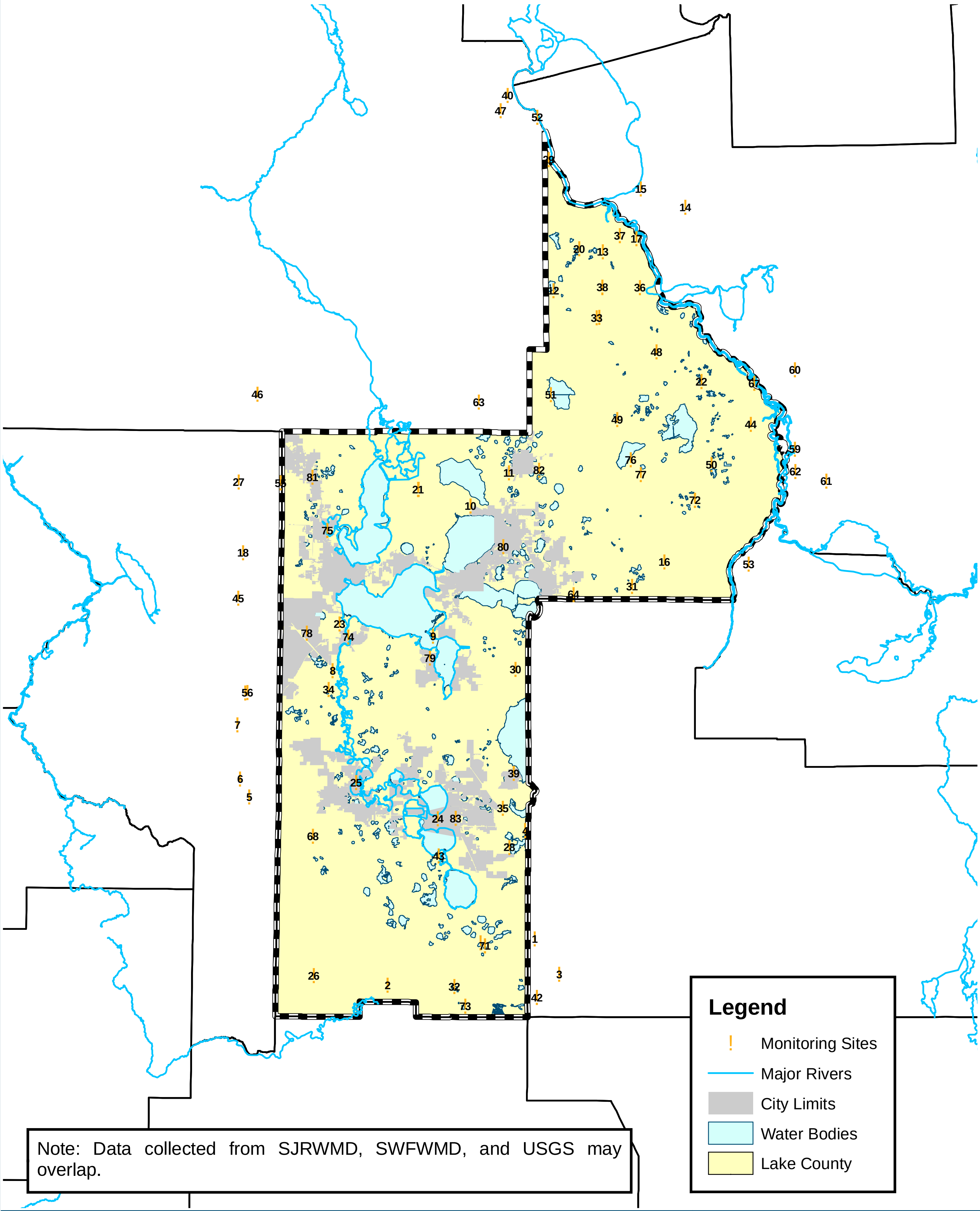

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Figure 3-7
SJRWMD & USGS
Groundwater Quality Locations

ORIGINAL DATE: 08-31-07
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: MonitoringSites.mxd
GIS OPERATOR: DR

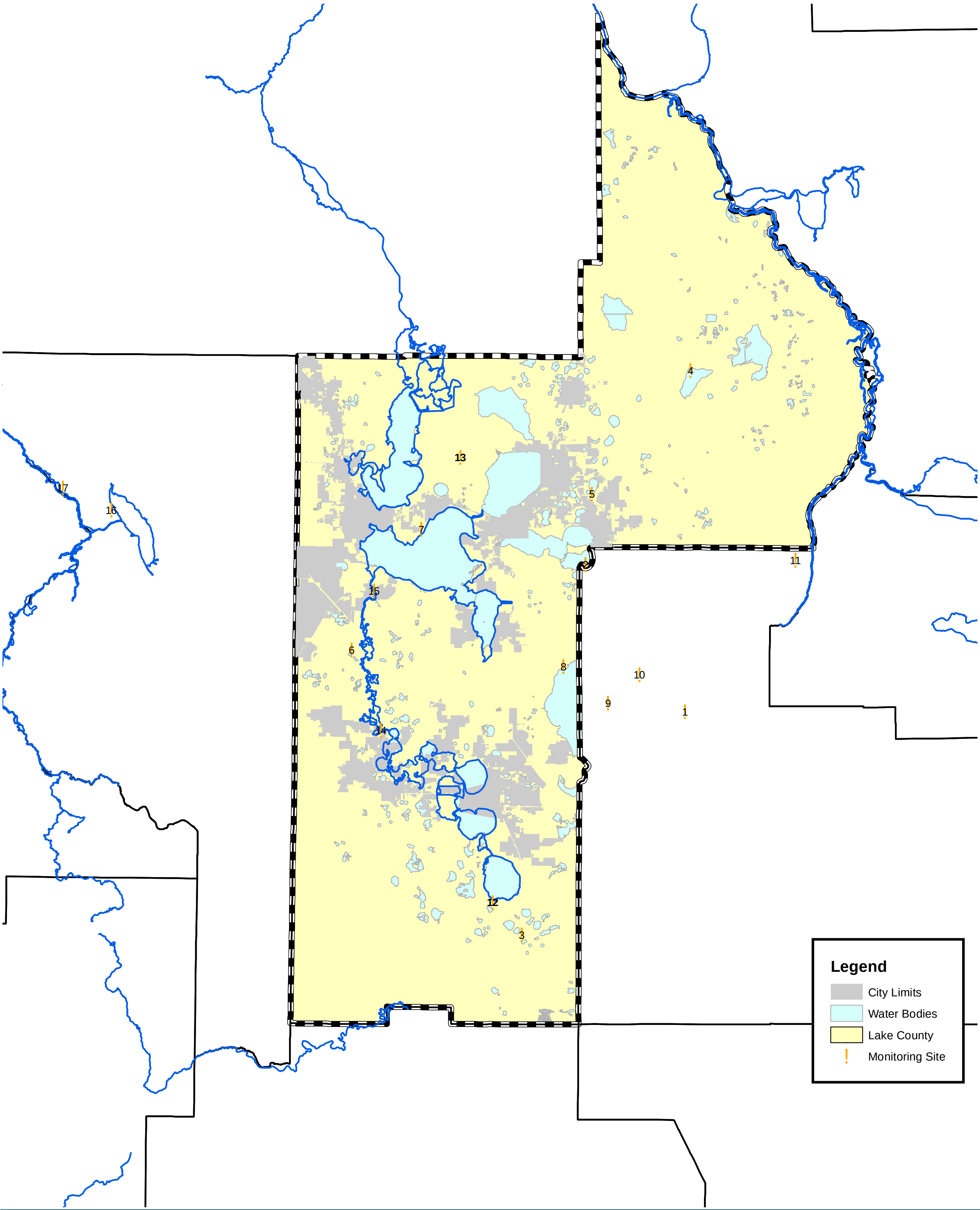

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Figure 3-8
Precipitation
Monitoring Locations

ORIGINAL DATE: 08-31-07
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: MonitoringSites.mxd
GIS OPERATOR: DR

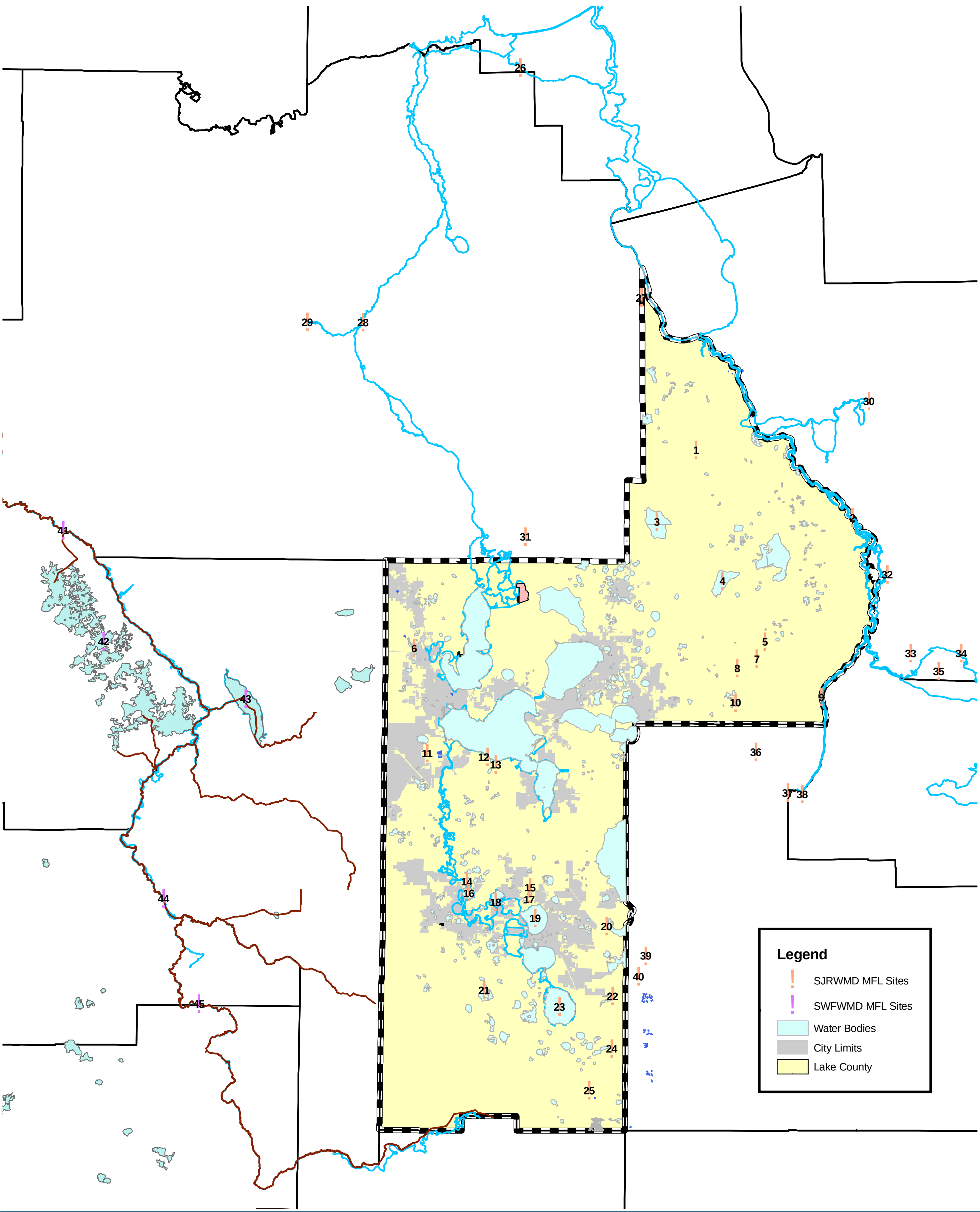

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Figure 3-9
Minimum Flows and Levels (MFL) Locations

ORIGINAL DATE: 08-31-07
REVISION DATE: NA
JOB NUMBER: 0216
FILE NAME: MonitoringSites.mxd
GIS OPERATOR: DR

APPENDIX A

Active Groundwater Hydrologic Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER		DATA SOURCE	PERIOD OF RECORD			LOCATION		AQUIFER BEING MONITORED	APPROXIMATE FREQUENCY	
		USGS SITE #	WMD SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE
Collected from SJRWMD												
1	Alexander Springs	N/A	91335	SJRWMD	NO DATA	NO DATA	NO DATA	29.08	-81.58	FLORIDAN	4 TIMES PER YEAR	SEMI - ANNUAL
2	Apopka Spring	N/A	91336	SJRWMD	NO DATA	NO DATA	NO DATA	28.57	-81.68	FLORIDAN	SEMI - ANNUAL	NO DATA
3	Blue Spring - Volusia	N/A	91337	SJRWMD	NO DATA	NO DATA	NO DATA	28.94	-81.34	FLORIDAN	DAILY	DAILY
4	Blue Spring Yal Run	N/A	91338	SJRWMD	NO DATA	NO DATA	NO DATA	28.75	-81.83	FLORIDAN	4 TIMES PER YEAR	NO DATA
5	Bugg Spring Run	N/A	91339	SJRWMD	NO DATA	NO DATA	NO DATA	28.75	-81.90	FLORIDAN	MONTHLY	NO DATA
6	Gemini Springs	N/A	91342	SJRWMD	NO DATA	NO DATA	NO DATA	28.86	-81.31	FLORIDAN	SEMI - ANNUAL	NO DATA
7	Island Spring	N/A	91345	SJRWMD	NO DATA	NO DATA	NO DATA	28.82	-81.42	FLORIDAN	SEMI - ANNUAL	NO DATA
8	Miami Springs	N/A	91348	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.44	FLORIDAN	4 TIMES PER YEAR	SEMI - ANNUAL
9	Rock Springs	N/A	91352	SJRWMD	NO DATA	NO DATA	NO DATA	28.76	-81.50	FLORIDAN	DAILY	DAILY
10	Silver Glen Springs	N/A	91355	SJRWMD	NO DATA	NO DATA	NO DATA	29.24	-81.64	FLORIDAN	MONTHLY	SEMI - ANNUAL
11	Silver Springs	N/A	91356	SJRWMD	NO DATA	NO DATA	NO DATA	29.21	-82.05	FLORIDAN	DAILY	DAILY
12	Sweetwater Springs	N/A	91358	SJRWMD	NO DATA	NO DATA	NO DATA	29.22	-81.66	FLORIDAN	MONTHLY	SEMI - ANNUAL
13	Wekiwa Springs	N/A	91360	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.46	FLORIDAN	DAILY	DAILY
14	L-0001	N/A	91679	SJRWMD	NO DATA	NO DATA	NO DATA	28.55	-81.77	FLORIDAN	NO DATA	DAILY
15	L-0040	N/A	91683	SJRWMD	NO DATA	NO DATA	NO DATA	29.11	-81.57	FLORIDAN	NO DATA	MONTHLY
16	L-0041	N/A	91684	SJRWMD	NO DATA	NO DATA	NO DATA	28.54	-81.91	SURFICIAL	NO DATA	DAILY
17	L-0043	N/A	91685	SJRWMD	NO DATA	NO DATA	NO DATA	28.74	-81.77	FLORIDAN	NO DATA	MONTHLY
18	L-0050	N/A	91686	SJRWMD	NO DATA	NO DATA	NO DATA	28.38	-81.74	SURFICIAL	NO DATA	MONTHLY
19	L-0052	N/A	91688	SJRWMD	NO DATA	NO DATA	NO DATA	28.53	-81.68	FLORIDAN	NO DATA	MONTHLY
20	L-0054	N/A	91690	SJRWMD	NO DATA	NO DATA	NO DATA	28.81	-81.89	FLORIDAN	NO DATA	DAILY
21	L-0056	N/A	91691	SJRWMD	NO DATA	NO DATA	NO DATA	28.46	-81.93	FLORIDAN	NO DATA	MONTHLY
22	L-0057	N/A	91692	SJRWMD	NO DATA	NO DATA	NO DATA	28.38	-81.82	FLORIDAN	NO DATA	MONTHLY
23	L-0059	N/A	91693	SJRWMD	NO DATA	NO DATA	NO DATA	29.01	-81.39	FLORIDAN	NO DATA	MONTHLY
24	L-0062	N/A	91694	SJRWMD	NO DATA	NO DATA	NO DATA	28.54	-81.91	FLORIDAN	NO DATA	DAILY
25	L-0096	N/A	91697	SJRWMD	NO DATA	NO DATA	NO DATA	28.69	-81.90	SURFICIAL	NO DATA	DAILY
26	L-0146	N/A	91698	SJRWMD	NO DATA	NO DATA	NO DATA	28.54	-81.66	FLORIDAN	NO DATA	SEMI - ANNUAL
27	L-0289	N/A	91700	SJRWMD	NO DATA	NO DATA	NO DATA	28.86	-81.80	SURFICIAL	NO DATA	DAILY
28	L-0322	N/A	91702	SJRWMD	NO DATA	NO DATA	NO DATA	29.25	-81.64	FLORIDAN	NO DATA	SEMI - ANNUAL
29	L-0339	N/A	91703	SJRWMD	NO DATA	NO DATA	NO DATA	28.79	-81.54	FLORIDAN	NO DATA	SEMI - ANNUAL
30	L-0373	N/A	91704	SJRWMD	NO DATA	NO DATA	NO DATA	28.88	-81.73	FLORIDAN	NO DATA	SEMI - ANNUAL
31	L-0380	N/A	91705	SJRWMD	NO DATA	NO DATA	NO DATA	28.92	-81.68	FLORIDAN	NO DATA	SEMI - ANNUAL
32	L-0390	N/A	91706	SJRWMD	NO DATA	NO DATA	NO DATA	28.97	-81.55	FLORIDAN	NO DATA	SEMI - ANNUAL
33	L-0394	N/A	91707	SJRWMD	NO DATA	NO DATA	NO DATA	29.00	-81.63	FLORIDAN	NO DATA	SEMI - ANNUAL
34	L-0460	N/A	91711	SJRWMD	NO DATA	NO DATA	NO DATA	29.17	-81.55	SURFICIAL	NO DATA	MONTHLY
35	L-0555	N/A	91712	SJRWMD	NO DATA	NO DATA	NO DATA	28.39	-81.91	FLORIDAN	NO DATA	SEMI - ANNUAL
36	L-0599	N/A	91719	SJRWMD	NO DATA	NO DATA	NO DATA	28.90	-81.79	LOWER FLORIDAN	NO DATA	DAILY
37	L-0600	N/A	91720	SJRWMD	NO DATA	NO DATA	NO DATA	28.79	-81.61	FLORIDAN	NO DATA	SEMI - ANNUAL
38	L-0620	N/A	91721	SJRWMD	NO DATA	NO DATA	NO DATA	28.90	-81.79	FLORIDAN	NO DATA	DAILY
39	L-0656	N/A	91722	SJRWMD	NO DATA	NO DATA	NO DATA	28.59	-81.86	FLORIDAN	NO DATA	SEMI - ANNUAL
40	L-0657	N/A	91723	SJRWMD	NO DATA	NO DATA	NO DATA	28.76	-81.88	FLORIDAN	NO DATA	SEMI - ANNUAL
41	L-0663	N/A	91725	SJRWMD	NO DATA	NO DATA	NO DATA	28.96	-81.65	SURFICIAL	NO DATA	DAILY
42	L-0664	N/A	91726	SJRWMD	NO DATA	NO DATA	NO DATA	28.81	-81.87	SURFICIAL	NO DATA	DAILY
43	L-0677	N/A	91727	SJRWMD	NO DATA	NO DATA	NO DATA	28.43	-81.72	FLORIDAN	NO DATA	DAILY
44	L-0680	N/A	91728	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.74	FLORIDAN	NO DATA	SEMI - ANNUAL
45	L-0693	N/A	91729	SJRWMD	NO DATA	NO DATA	NO DATA	28.59	-81.91	SURFICIAL	NO DATA	DAILY
46	L-0695	N/A	91730	SJRWMD	NO DATA	NO DATA	NO DATA	28.99	-81.44	SURFICIAL	NO DATA	DAILY
47	L-0696	N/A	91731	SJRWMD	NO DATA	NO DATA	NO DATA	28.95	-81.89	SURFICIAL	NO DATA	DAILY
48	L-0697	N/A	91732	SJRWMD	NO DATA	NO DATA	NO DATA	28.52	-81.84	SURFICIAL	NO DATA	DAILY
49	L-0699	N/A	91733	SJRWMD	NO DATA	NO DATA	NO DATA	28.95	-81.79	SURFICIAL	NO DATA	DAILY
50	L-0700	N/A	91734	SJRWMD	NO DATA	NO DATA	NO DATA	28.86	-81.95	SURFICIAL	NO DATA	DAILY
51	L-0701	N/A	91735	SJRWMD	NO DATA	NO DATA	NO DATA	28.84	-81.58	SURFICIAL	NO DATA	DAILY
52	L-0702	N/A	91736	SJRWMD	NO DATA	NO DATA	NO DATA	29.03	-81.56	SURFICIAL	NO DATA	DAILY
53	L-0703	N/A	91737	SJRWMD	NO DATA	NO DATA	NO DATA	28.90	-81.79	SURFICIAL	NO DATA	DAILY
54	L-0709	N/A	91738	SJRWMD	NO DATA	NO DATA	NO DATA	28.42	-81.71	FLORIDAN	NO DATA	DAILY
55	L-0710	N/A	91739	SJRWMD	NO DATA	NO DATA	NO DATA	28.42	-81.71	SURFICIAL	NO DATA	DAILY
56	L-0715	N/A	91740	SJRWMD	NO DATA	NO DATA	NO DATA	28.88	-81.48	SURFICIAL	NO DATA	MONTHLY
57	L-0716	N/A	91741	SJRWMD	NO DATA	NO DATA	NO DATA	28.88	-81.48	SURFICIAL	NO DATA	MONTHLY
58	L-0719	N/A	91742	SJRWMD	NO DATA	NO DATA	NO DATA	28.51	-81.77	FLORIDAN	NO DATA	SEMI - ANNUAL
59	L-0729	N/A	91743	SJRWMD	NO DATA	NO DATA	NO DATA	28.42	-81.71	LOWER FLORIDAN	NO DATA	DAILY
60	L-0730	N/A	91744	SJRWMD	NO DATA	NO DATA	NO DATA	28.42	-81.71	FLORIDAN	NO DATA	DAILY

Active Groundwater Hydrologic Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER		DATA SOURCE	PERIOD OF RECORD			LOCATION		AQUIFER BEING MONITORED	APPROXIMATE FREQUENCY	
		USGS SITE #	WMD SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE
61	L-0741	N/A	91745	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.89	FLORIDAN	NO DATA	SEMI - ANNUAL
62	L-0799	N/A	91746	SJRWMD	NO DATA	NO DATA	NO DATA	28.85	-81.76	SURFICIAL	NO DATA	DAILY
63	L-0814	N/A	91747	SJRWMD	NO DATA	NO DATA	NO DATA	28.89	-81.46	SURFICIAL	NO DATA	DAILY
64	L-0815	N/A	91748	SJRWMD	NO DATA	NO DATA	NO DATA	28.89	-81.46	INTERMEDIATE	NO DATA	DAILY
65	L-0816	N/A	91749	SJRWMD	NO DATA	NO DATA	NO DATA	28.89	-81.46	FLORIDAN	NO DATA	DAILY
66	L-0817	N/A	91750	SJRWMD	NO DATA	NO DATA	NO DATA	28.89	-81.46	LOWER FLORIDAN	NO DATA	DAILY
67	L-0872	N/A	91751	SJRWMD	NO DATA	NO DATA	NO DATA	28.49	-81.67	SURFICIAL	NO DATA	MONTHLY
68	L-0877	N/A	91752	SJRWMD	NO DATA	NO DATA	NO DATA	28.36	-81.73	FLORIDAN	NO DATA	DAILY
69	L-0883	N/A	91753	SJRWMD	NO DATA	NO DATA	NO DATA	28.74	-81.87	SURFICIAL	NO DATA	MONTHLY
70	L-0884	N/A	91754	SJRWMD	NO DATA	NO DATA	NO DATA	28.74	-81.87	INTERMEDIATE	NO DATA	MONTHLY
71	L-0902	N/A	91755	SJRWMD	NO DATA	NO DATA	NO DATA	28.74	-81.87	FLORIDAN	NO DATA	MONTHLY
72	L-0904	N/A	91756	SJRWMD	NO DATA	NO DATA	NO DATA	28.74	-81.87	INTERMEDIATE	NO DATA	DAILY
73	L-0926	N/A	91757	SJRWMD	NO DATA	NO DATA	NO DATA	28.86	-81.90	SURFICIAL	NO DATA	MONTHLY
74	L-0927	N/A	91758	SJRWMD	NO DATA	NO DATA	NO DATA	28.86	-81.90	FLORIDAN	NO DATA	MONTHLY
75	M-0013	N/A	91761	SJRWMD	NO DATA	NO DATA	NO DATA	29.08	-81.88	FLORIDAN	NO DATA	MONTHLY
76	M-0020	N/A	91762	SJRWMD	NO DATA	NO DATA	NO DATA	28.99	-81.82	FLORIDAN	NO DATA	6 TIMES PER YEAR
77	M-0021	N/A	91763	SJRWMD	NO DATA	NO DATA	NO DATA	29.31	-81.69	FLORIDAN	NO DATA	MONTHLY
78	M-0049	N/A	91777	SJRWMD	NO DATA	NO DATA	NO DATA	29.17	-81.64	FLORIDAN	NO DATA	MONTHLY
79	M-0062	N/A	91781	SJRWMD	NO DATA	NO DATA	NO DATA	28.99	-81.72	FLORIDAN	NO DATA	SEMI - ANNUAL
80	M-0445	N/A	91803	SJRWMD	NO DATA	NO DATA	NO DATA	29.06	-81.94	FLORIDAN	NO DATA	DAILY
81	M-0481	N/A	91808	SJRWMD	NO DATA	NO DATA	NO DATA	28.99	-81.84	SURFICIAL	NO DATA	DAILY
82	M-0483	N/A	91809	SJRWMD	NO DATA	NO DATA	NO DATA	28.99	-81.84	FLORIDAN	NO DATA	DAILY
83	OR0064	N/A	91850	SJRWMD	NO DATA	NO DATA	NO DATA	28.37	-81.65	FLORIDAN	NO DATA	MONTHLY
84	OR0106	N/A	91853	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.58	FLORIDAN	NO DATA	MONTHLY
85	OR0107	N/A	91854	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.58	SURFICIAL	NO DATA	MONTHLY
86	OR0546	N/A	91862	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.47	INTERMEDIATE	NO DATA	DAILY
87	OR0547	N/A	91863	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.47	FLORIDAN	NO DATA	DAILY
88	OR0548	N/A	91864	SJRWMD	NO DATA	NO DATA	NO DATA	28.71	-81.47	FLORIDAN	NO DATA	DAILY
89	S-0097	N/A	91977	SJRWMD	NO DATA	NO DATA	NO DATA	28.83	-81.41	FLORIDAN	NO DATA	NO DATA
90	S-1225	N/A	91998	SJRWMD	NO DATA	NO DATA	NO DATA	28.82	-81.40	LOWER FLORIDAN	NO DATA	DAILY
91	S-1230	N/A	91999	SJRWMD	NO DATA	NO DATA	NO DATA	28.82	-81.40	FLORIDAN	NO DATA	DAILY
92	S-1284	N/A	92011	SJRWMD	NO DATA	NO DATA	NO DATA	28.80	-81.36	SURFICIAL	NO DATA	DAILY
93	S-1310	N/A	92022	SJRWMD	NO DATA	NO DATA	NO DATA	28.82	-81.40	SURFICIAL	NO DATA	DAILY
94	S-1385	N/A	92027	SJRWMD	NO DATA	NO DATA	NO DATA	28.83	-81.32	INTERMEDIATE	NO DATA	DAILY
95	S-1386	N/A	92028	SJRWMD	NO DATA	NO DATA	NO DATA	28.83	-81.32	SURFICIAL	NO DATA	DAILY
96	S-1397	N/A	92029	SJRWMD	NO DATA	NO DATA	NO DATA	28.83	-81.32	FLORIDAN	NO DATA	DAILY
97	S-1398	N/A	92030	SJRWMD	NO DATA	NO DATA	NO DATA	28.83	-81.32	FLORIDAN	NO DATA	6 TIMES PER YEAR
98	SU0002	N/A	92080	SJRWMD	NO DATA	NO DATA	NO DATA	28.36	-82.04	FLORIDAN	NO DATA	SEMI - ANNUAL
99	SU0003	N/A	92081	SJRWMD	NO DATA	NO DATA	NO DATA	28.77	-82.06	FLORIDAN	NO DATA	SEMI - ANNUAL
100	SU0006	N/A	92083	SJRWMD	NO DATA	NO DATA	NO DATA	28.91	-81.96	FLORIDAN	NO DATA	SEMI - ANNUAL
101	V-0142	N/A	92112	SJRWMD	NO DATA	NO DATA	NO DATA	29.22	-81.53	SURFICIAL	NO DATA	6 TIMES PER YEAR
102	V-0801	N/A	92174	SJRWMD	NO DATA	NO DATA	NO DATA	28.81	-81.20	FLORIDAN	NO DATA	MONTHLY
103	V-0818	N/A	92181	SJRWMD	NO DATA	NO DATA	NO DATA	28.81	-81.20	FLORIDAN	NO DATA	MONTHLY
104	V-0821	N/A	92183	SJRWMD	NO DATA	NO DATA	NO DATA	28.81	-81.20	SURFICIAL	NO DATA	MONTHLY
105	V-0822	N/A	92184	SJRWMD	NO DATA	NO DATA	NO DATA	28.81	-81.20	INTERMEDIATE	NO DATA	MONTHLY
106	V-0867	N/A	92190	SJRWMD	NO DATA	NO DATA	NO DATA	29.00	-81.32	FLORIDAN	NO DATA	DAILY

Active Groundwater Hydrologic Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER		DATA SOURCE	PERIOD OF RECORD			LOCATION		AQUIFER BEING MONITORED	APPROXIMATE FREQUENCY	
		USGS SITE #	WMD SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE (1)
COLLECTED FROM USGS												
1	82513801	282543081385801	NO DATA	USGS	5/4/1977	5/22/2007	59	28.25	-81.38	NO DATA	NO DATA	SEMI - ANNUAL
2	822149213A USGS OBSER W EVA SHALLOW AT EVA, FL.	282245081492602	NO DATA	USGS	1/11/1963	5/21/2007	282	28.22	-81.49	NO DATA	NO DATA	6 TIMES PER YEAR
3	82313702 27416 E USGS W HARTZOG LK Buena Vista, FL	282331081370801	NO DATA	USGS	2/22/1979	9/20/2006	66	28.23	-81.37	NO DATA	NO DATA	SEMI - ANNUAL
4	83213902 EDGEWATER BEACH DEEP	283232081394101	NO DATA	USGS	5/23/1968	5/16/2006	67	28.32	-81.39	NO DATA	NO DATA	20 MONTHS
5	83415901 22S23E15 JC 51 HUGH ILEY	283432081592401	NO DATA	USGS	11/3/1959	5/21/2007	85	28.34	-81.59	NO DATA	NO DATA	20 MONTHS
6	83520001 25S23E10 JC 67 FLA ROCK IND NO 2	283539082000301	NO DATA	USGS	5/1/1978	5/21/2007	59	28.35	-82.00	NO DATA	NO DATA	SEMI - ANNUAL
7	83920001 21S23E22 JC 65 U S GEOL SURVEY	283904082001601	NO DATA	USGS	2/9/1977	5/22/2007	65	28.39	-82.00	NO DATA	NO DATA	6 TIMES PER YEAR
8	842153142 20S24E34	284232081533001	NO DATA	USGS	5/23/1963	9/20/2006	106	28.42	-81.53	NO DATA	NO DATA	SEMI - ANNUAL
9	844146244 LAKE YALE GROVES WELL NR TAVARES, FL.	284445081462101	NO DATA	USGS	5/22/1963	5/23/2007	399	28.44	-81.46	NO DATA	NO DATA	9 TIMES PER YEAR
10	852143121 18S26E32 J EICHEL BERGER	285257081434201	NO DATA	USGS	5/21/1963	5/22/2007	67	28.52	-81.43	NO DATA	NO DATA	18 MONTHS
11	855140-- 18S26E14 AUSTIN GROVES	285504081405901	NO DATA	USGS	12/29/1967	5/22/2007	76	28.55	-81.40	NO DATA	NO DATA	SEMI - ANNUAL
12	90613701 16S27E18 CAMP OCALA	290633081375201	NO DATA	USGS	5/11/1978	5/22/2007	62	29.06	-81.37	NO DATA	NO DATA	SEMI - ANNUAL
13	909134 15S27E-- ASTOR PARK	290900081342002	NO DATA	USGS	5/1/1970	5/22/2007	58	29.09	-81.34	NO DATA	NO DATA	18 MONTHS
14	91112806 15S28E14 HARPERS WELL E OF MURPHY RD	291150081282501	NO DATA	USGS	11/27/1978	5/21/2007	69	29.11	-81.28	NO DATA	NO DATA	SEMI - ANNUAL
15	91213103 4" SUPPLY WELL,SE L.GEORGE,NR EMPORIA	291258081313701	NO DATA	USGS	1/18/1978	5/21/2007	80	29.00	-81.31	NO DATA	NO DATA	SEMI - ANNUAL
16	ABANDONED FREEFLOW SR46A NR SORRENTO	284929081294901	NO DATA	USGS	5/2/1977	5/24/2007	51	28.49	-81.29	NO DATA	NO DATA	18 MONTHS
17	Astor Park Well at Astor Park, FL	290950081315501	NO DATA	USGS	1/2/1936	9/5/2007	631	29.09	-81.31	NO DATA	NO DATA	9 TIMES PER YEAR
18	BYRD TRAILER WELL NR ORANGE HOME,FL	284955081595801	NO DATA	USGS	9/4/1984	5/23/2007	34	28.49	-81.59	NO DATA	NO DATA	18 MONTHS
19	CABBAGE HAMMOCK SHALLOW L-0703 NR EMERALDA ISLAND	285359081472702	NO DATA	USGS	9/12/1997	11/16/2006	19	28.53	-81.47	NO DATA	NO DATA	SEMI - ANNUAL
20	CAMP MCQUARRIE ABANDONED DP AT CROOKED LAKE	290910081360001	NO DATA	USGS	5/3/1977	5/22/2007	66	29.09	-81.36	NO DATA	NO DATA	SEMI - ANNUAL
21	CARROT BARN FULLY SAS PROD(L-0885)AT LISBON, FL	285359081472703	NO DATA	USGS	8/4/2005	11/16/2006	27	28.53	-81.47	SAS/INT/LSAS/USAS	NO DATA	BI-WEEKLY
22	CENTRAL BAPTIST YOUTH CAMP	290052081271201	NO DATA	USGS	6/2/1994	5/24/2007	23	29.00	-81.27	NO DATA	NO DATA	18 MONTHS
23	CHURCH OF GOD OF PROPHECY	284528081530201	NO DATA	USGS	12/12/1996	5/23/2007	28	28.45	-81.53	NO DATA	NO DATA	SEMI - ANNUAL
24	CITY WELL REPLACEMENT AT CLERMONT, FL	283314081455501	NO DATA	USGS	5/17/1982	6/14/2007	187	28.33	-81.45	NO DATA	NO DATA	7 TIMES PER YEAR
25	DR PHILLIPS & SONS DP	283530081514501	NO DATA	USGS	11/21/1961	9/22/2006	70	28.35	-81.51	NO DATA	NO DATA	20 MONTHS
26	GREEN SWAMP AQUIFER TEST LK751W	282318081544003	NO DATA	USGS	5/1/1975	5/23/2007	36	28.23	-81.54	NO DATA	NO DATA	YEARLY
27	HATCHER WELL AT LAKE MIONA NR OXFORD,FL	285422082001901	NO DATA	USGS	5/24/1982	5/23/2007	51	28.54	-82.00	NO DATA	NO DATA	SEMI - ANNUAL
28	JOHNS LAKE WELL NR CLERMONT (SJ L-0052)	283128081404701	NO DATA	USGS	9/10/1985	5/21/2007	44	28.31	-81.40	NO DATA	NO DATA	SEMI - ANNUAL
29	JUNIPER HUNT CLUB SUPPLY	291448081381601	NO DATA	USGS	5/20/1997	5/22/2007	27	29.14	-81.38	NO DATA	NO DATA	SEMI - ANNUAL
30	KEEN RANCH NR LAKE JEM	284241081402601	NO DATA	USGS	1/31/1975	5/21/2007	59	28.42	-81.40	NO DATA	NO DATA	SEMI - ANNUAL
31	L KNOWLES DEEP	284757081320701	NO DATA	USGS	5/14/1996	7/18/2007	30	28.47	-81.32	NO DATA	NO DATA	SEMI - ANNUAL
32	L-0051 SAND MINE RD DP WELL NR CLERMONT	282241081443901	NO DATA	USGS	11/3/1983	5/21/2007	24	28.22	-81.44	FLORIDAN	NO DATA	YEARLY
33	L-0066 OBS WELL ALEXANDER SP NR ASTOR	290451081344401	NO DATA	USGS	5/21/1997	5/22/2007	21	29.04	-81.34	FLORIDAN	NO DATA	SEMI - ANNUAL
34	L-0095 GROVELAND TOWER DEEP	284122081534401	NO DATA	USGS	9/20/1995	5/23/2007	26	28.41	-81.53	FLORIDAN	NO DATA	SEMI - ANNUAL
35	L-0199 TURNPIKE	283355081411701	NO DATA	USGS	9/14/1995	5/21/2007	26	28.33	-81.41	FLORIDAN	NO DATA	SEMI - ANNUAL
36	L-0441 USFS WELL NR ASTOR,FL	290646081314001	NO DATA	USGS	5/15/2000	5/22/2007	15	29.06	-81.31	FLORIDAN	NO DATA	SEMI - ANNUAL
37	L-0455 ASTOR 150 CF	291002081330601	NO DATA	USGS	5/23/1996	5/22/2007	24	29.10	-81.33	FLORIDAN	NO DATA	SEMI - ANNUAL
38	L-0456 ALEXANDER SPS SH	290647081342102	NO DATA	USGS	10/23/1991	5/22/2007	10	29.06	-81.34	SURFICIAL	NO DATA	BIANNUAL
39	L-0658 CITY OF MONTVERDE	283608081403001	NO DATA	USGS	5/23/1997	5/21/2007	34	28.36	-81.40	FLORIDAN	NO DATA	3 TIMES A YEAR
40	Lake George Well near Salt Springs, FL	291849081411401	NO DATA	USGS	9/14/1982	5/24/2007	285	29.18	-81.41	NO DATA	NO DATA	MONTHLY
41	LAKE OLIVER DEEP WELL NEAR VINELAND, FL	282202081384601	NO DATA	USGS	2/9/1962	8/28/2007	384	28.22	-81.38	NO DATA	NO DATA	6 TIMES PER YEAR
42	LAKE OLIVER SHALLOW WELL NEAR VINELAND, FL	282202081384602	NO DATA	USGS	2/10/1959	8/28/2007	344	28.22	-81.38	NO DATA	NO DATA	6 TIMES PER YEAR
43	LCFD DIST.9 STATION 1	283019081455701	NO DATA	USGS	5/19/1995	5/21/2007	33	28.30	-81.45	NO DATA	NO DATA	SEMI - ANNUAL
44	LOWER WEKIVA R 4"FREEFLO	285810081234101	NO DATA	USGS	1/28/1998	5/24/2007	24	28.58	-81.23	NO DATA	NO DATA	SEMI - ANNUAL
45	LOWES BURNED HOUSE WELL NR ADAMSVILLE, FL	284703082001701	NO DATA	USGS	12/17/1981	9/20/2006	46	28.47	-82.00	NO DATA	NO DATA	20 MONTHS
46	M-0467 LAKE WEIR MIDDLE SCHOOL NR LADY LAKE,FL	285953081590101	NO DATA	USGS	9/24/2001	5/22/2007	12	28.59	-81.59	NO DATA	NO DATA	SEMI - ANNUAL
47	OCALA NF 4IN SHALLOW WELL(M-0413)	291751081414301	NO DATA	USGS	5/14/1997	5/24/2007	25	29.17	-81.41	NO DATA	NO DATA	SEMI - ANNUAL
48	OCALA NF4" NR ALEX.SPGS.CR BOAT LANDING	290244081302601	NO DATA	USGS	8/23/1968	5/22/2007	75	29.02	-81.30	NO DATA	NO DATA	SEMI - ANNUAL
49	PAUL SHOKLEY AT PAISLEY	285827081331401	NO DATA	USGS	9/21/1967	5/22/2007	77	28.58	-81.33	NO DATA	NO DATA	SEMI - ANNUAL
50	PINE LAKES WELL ON SR 44	285539081262901	NO DATA	USGS	9/22/1981	5/24/2007	67	28.55	-81.26	NO DATA	NO DATA	SEMI - ANNUAL
51	PITTMAN WORK CENTER ABANDONED NR ALTOONA,FL	290000081380001	NO DATA	USGS	3/28/1961	5/22/2007	118	29.00	-81.38	NO DATA	NO DATA	SEMI - ANNUAL
52	PONDEROSA CLUB FREEFLOW	291728081390501	NO DATA	USGS	4/26/1979	5/24/2007	60	29.17	-81.39	NO DATA	NO DATA	SEMI - ANNUAL
53	S-1230 YANKEE LAKE	284923081234802	NO DATA	USGS	1996-05-00	5/24/2007	42	28.49	-81.23	NO DATA	NO DATA	QUARTERLY
54	SJR DEEP NR CABBAGE HAMMOCK L-0620	285357081472801	NO DATA	USGS	9/12/1997	5/22/2007	57	28.53	-81.47	NO DATA	NO DATA	6 TIMES PER YEAR
55	SMITH WELL NO.2 NR CHERRY LAKE,FL	285420081571901	NO DATA	USGS	5/17/1984	5/23/2007	47	28.54	-81.57	NO DATA	NO DATA	SEMI - ANNUAL
56	STUART RANCH 6IN AG WELL	284106081594001	NO DATA	USGS	9/16/1998	5/22/2007	14	28.41	-81.59	NO DATA	NO DATA	15 MONTHS
57	STUART RANCH REPLACEMENT NR CENTER HILL	284105081594301	NO DATA	USGS	9/16/1998	9/19/2006	13	28.41	-81.59	NO DATA	NO DATA	15 MONTHS
58	USGS WELL,2MI N ALEX SPGS,ALTOONA	290647081342101	NO DATA	USGS	5/18/1982	9/19/2006	115	29.06	-81.34	NO DATA	NO DATA	6 TIMES PER YEAR
59	V-0083 BLUE SPGS WELL SOUTH, ORANGE CITY, FL	285638081203101	NO DATA	USGS	9/4/1981	5/21/2007	21	28.56	-81.20	FLORIDAN	NO DATA	20 MONTHS

Active Groundwater Hydrologic Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER		DATA SOURCE	PERIOD OF RECORD			LOCATION		AQUIFER BEING MONITORED	APPROXIMATE FREQUENCY	
		USGS SITE #	WMD SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE (1)
60	V-0115 USGS J-24 TEST WELL,W.OF DELAND	290138081203202	NO DATA	USGS	1/3/1967	5/21/2007	96	29.01	-81.20	FLORIDAN	NO DATA	SEMI - ANNUAL
61	V-0196 ORANGE CITY TWR DEEP	285442081181401	NO DATA	USGS	5/19/1997	5/21/2007	21	28.54	-81.18	NO DATA	NO DATA	SEMI - ANNUAL
62	V-1091 WELL SO OF BLUE SPRINGS NR DEBARY,FL	285513081202801	NO DATA	USGS	9/12/2000	5/21/2007	20	28.55	-81.20	FLORIDAN	NO DATA	QUARTERLY
63	WELL SR42 WEST OF ALTOONA, FL	285930081430901	NO DATA	USGS	5/17/1985	5/22/2007	48	28.59	-81.43	NO DATA	NO DATA	SEMI - ANNUAL
64	WOLF SINK OBSERVATION WELL NR SORRENTO	284725081361901	NO DATA	USGS	10/16/1992	5/24/2007	41	28.47	-81.36	NO DATA	NO DATA	SEMI - ANNUAL

(1) Frequency assumed based on period of record and number of records.

Active Groundwater Hydrologic Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER		DATA SOURCE	PERIOD OF RECORD			LOCATION		AQUIFER BEING MONITORED	APPROXIMATE FREQUENCY	
		USGS SITE #	WMD SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE (1)
COLLECTED FROM SWFWMD												
1	EVA WELL DEEP	282245081492601	436	USGS	1/30/1959	8/27/2007	1704	28.22	-81.49	FLORIDAN	NO DATA	MONTHLY
2	GREEN SWAMP 1 UPL SURF	NO DATA	17398	SWFWMD	7/30/1999	8/29/2007	91	28.21	-81.56	SURFICIAL	NO DATA	MONTHLY
3	GREEN SWAMP 1 WTL SURF	NO DATA	1987	SWFWMD	11/15/2001	8/29/2007	1513	28.21	-81.56	SURFICIAL	NO DATA	DAILY
4	GREEN SWAMP 2 UPL SURF	NO DATA	17399	SWFWMD	7/30/1999	8/29/2007	87	28.22	-81.56	SURFICIAL	NO DATA	MONTHLY
5	GREEN SWAMP 3 UPL SURF	NO DATA	17400	SWFWMD	7/30/1999	8/29/2007	90	28.22	-81.55	SURFICIAL	NO DATA	MONTHLY
6	GREEN SWAMP 4 UPL SURF	NO DATA	17401	SWFWMD	7/30/1999	8/29/2007	89	28.23	-81.55	SURFICIAL	NO DATA	MONTHLY
7	GREEN SWAMP 5 UPL SURF	NO DATA	17402	SWFWMD	7/30/1999	8/29/2007	91	28.24	-81.57	SURFICIAL	NO DATA	MONTHLY
8	GREEN SWAMP 6 UPL SURF	NO DATA	17403	SWFWMD	7/30/1999	8/29/2007	91	28.23	-81.58	SURFICIAL	NO DATA	MONTHLY
9	GREEN SWAMP BAY UPL SURF	NO DATA	1851	SWFWMD	8/25/2000	8/29/2007	80	28.25	-81.57	SURFICIAL	NO DATA	MONTHLY
10	GREEN SWAMP BAY WTL SURF	NO DATA	1995	SWFWMD	5/16/2001	8/29/2007	1361	28.25	-81.57	SURFICIAL	NO DATA	DAILY
11	GREEN SWAMP L12B DEEP	282740082012101	686	USGS	9/6/1973	8/27/2007	694	28.74	-82.01	FLORIDAN	NO DATA	MONTHLY
12	GREEN SWAMP L12B SHALLOW	282740082012102	687	USGS	9/6/1973	8/27/2007	727	28.27	-82.01	SURFICIAL	NO DATA	MONTHLY
13	GREEN SWAMP RIV UPL SURF	NO DATA	1784	SWFWMD	8/25/2000	8/29/2007	80	28.23	-81.59	SURFICIAL	NO DATA	MONTHLY
14	GREEN SWAMP WET PRA UPL S	NO DATA	1783	SWFWMD	8/25/2000	8/29/2007	80	28.19	-81.58	SURFICIAL	NO DATA	MONTHLY
15	GREEN SWP DOME 7 WTL SURF	NO DATA	1993	SWFWMD	7/3/2002	8/29/2007	67	28.19	-81.54	SURFICIAL	NO DATA	MONTHLY
16	MASCOTTE DEEP	283204081544901	173	USGS	1/27/1959	8/27/2007	16097	28.32	-81.54	FLORIDAN	NO DATA	NO DATA
17	MASCOTTE SHALLOW	283204081544902	1337	USGS	1/28/1959	1/19/2005	15299	28.32	-81.54	SURFICIAL	NO DATA	NO DATA
18	ROMP 101 6-IN SURF	NO DATA	917	SWFWMD	5/29/2004	8/13/2007	344	28.27	-81.55	SURFICIAL	NO DATA	DAILY
19	ROMP 101 AVPK	282717081553101	651	USGS	7/7/1977	8/13/2007	10590	28.27	-81.55	FLORIDAN	NO DATA	DAILY
20	ROMP 88 AVPK	281837081544101	10754	USGS	6/5/1990	8/29/2007	5961	28.18	-81.54	FLORIDAN	NO DATA	DAILY
21	ROMP 89 OCAL	282127082022501	424	USGS	3/27/1959	8/27/2007	20319	28.21	-82.02	FLORIDAN	NO DATA	DAILY
22	THE VILLAGES PERM SURF	NO DATA	2383	SWFWMD	3/25/2004	8/14/2007	42	28.56	-82.00	SURFICIAL	NO DATA	MONTHLY
23	THE VILLAGES PERM UFA FLDN	NO DATA	2384	SWFWMD	3/25/2004	8/14/2007	42	28.56	-82.00	FLORIDAN	NO DATA	MONTHLY
24	WSF GREEN SWAMP FLDN	282741081585701	542	USGS	7/21/1959	9/19/2005	328	28.27	-81.58	FLORIDAN	NO DATA	NO DATA

(1) Frequency assumed based on period of record and number of records.

APPENDIX B

Active SJRWMD Surface Water Hydrologic Monitoring Sites

MAP ID	STATION NAME	SJRWMD SITE NUMBER (1)	DATA SOURCE	DISCHARGE DATA			STAGE DATA			LOCATION		PARAMETER	FREQUENCY	
				DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE(1)
COLLECTED FROM SJRWMD (2)														
1	Lake Apopka MFW B1 In at Astatula (WL)	18473764	SJRWMD	NO DATA	NO DATA	NO DATA	8/5/2003	9/24/2007	1514	28.67	-81.71	STAGE	NO DATA	HOURLY
2	Lake Apopka MFW B2 In at Astatula (WL)	18483766	SJRWMD	2/15/2005	9/25/2007	NO DATA	8/7/2003	9/24/2007	512	28.67	-81.69	STAGE	NO DATA	HOURLY
3	Lake Apopka MFW C1 In at Astatula (WL)	18493768	SJRWMD	NO DATA	NO DATA	NO DATA	8/5/2003	9/24/2007	NO DATA	28.68	-81.70	STAGE	NO DATA	NO DATA
4	Lake Apopka MFW C2 In at Astatula (WL)	18503770	SJRWMD	2/16/2005	9/25/2007	NO DATA	8/8/2003	9/24/2007	1511	28.68	-81.69	STAGE	NO DATA	HOURLY
5	L-0599 Carrot Barn at Griffin Flow-way (WL) LFA	03264226	SJRWMD	NO DATA	NO DATA	NO DATA	6/30/2004	9/24/2007	NO DATA	28.90	-81.79	STAGE	NO DATA	NO DATA
6	Lake Apopka MFW C1 TW Out at Astatula (WL)	15184291	SJRWMD	NO DATA	NO DATA	NO DATA	2/9/2005	9/24/2007	960	28.68	-81.69	STAGE	NO DATA	HOURLY
7	Lake Apopka MFW B1 TW Out at Astatula (WL)	15154293	SJRWMD	NO DATA	NO DATA	NO DATA	2/9/2005	9/24/2007	960	28.67	-81.69	STAGE	NO DATA	HOURLY
8	Lake Apopka MFW C2 TW Out at Astatula (WL)	15194292	SJRWMD	NO DATA	NO DATA	NO DATA	2/9/2005	9/24/2007	960	28.68	-81.68	STAGE	NO DATA	HOURLY
9	L-0872 Eva Tower at Groveland (WL) SF	19534471	SJRWMD	NO DATA	NO DATA	NO DATA	2/14/2006	9/24/2007	514	28.47	-81.83	STAGE	NO DATA	HOURLY
10	L-0883 Palatlakaha Dam M1 at Hawthorne CDP (WL) SF	19784572	SJRWMD	NO DATA	NO DATA	NO DATA	12/13/2005	9/24/2007	650	28.74	-81.87	STAGE	NO DATA	HOURLY
11	L-0884 Palatlakaha Dam M1 at Hawthorne CDP (WL) IM	19784573	SJRWMD	NO DATA	NO DATA	NO DATA	12/13/2005	9/24/2007	650	28.74	-81.87	STAGE	NO DATA	HOURLY
12	L-0902 Palatlakaha Dam M1 at Hawthorne CDP (WL) FA	19784574	SJRWMD	NO DATA	NO DATA	NO DATA	12/13/2005	9/24/2007	650	28.74	-81.87	STAGE	NO DATA	HOURLY
13	L-0904 Palatlakaha Dam M1 at Hawthorne CDP (WL) IM	19784575	SJRWMD	NO DATA	NO DATA	NO DATA	12/13/2005	9/24/2007	650	28.74	-81.87	STAGE	NO DATA	HOURLY
14	L-0926 Lake Griffin State Park at Leesburg (WL) SF	27354791	SJRWMD	NO DATA	NO DATA	NO DATA	4/20/2007	9/24/2007	159	28.86	-81.90	STAGE	NO DATA	HOURLY
15	L-0927 Lake Griffin State Park at Leesburg (WL) SF	27354792	SJRWMD	NO DATA	NO DATA	NO DATA	4/20/2007	9/24/2007	159	28.86	-81.90	STAGE	NO DATA	HOURLY
16	L-0924 Leesburg WWTF at Leesburg (WL) FA	27364793	SJRWMD	NO DATA	NO DATA	NO DATA	1/23/2007	9/24/2007	NO DATA	28.75	-81.93	STAGE	NO DATA	NO DATA
17	L-0874 Leesburg WWTF at Leesburg (WL) SF	27364896	SJRWMD	NO DATA	NO DATA	NO DATA	4/2/2007	9/24/2007	39	28.75	-81.93	STAGE	NO DATA	HOURLY
18	L-0929 Lake Norris Wells at Paisley (WL) SF	19414939	SJRWMD	NO DATA	NO DATA	NO DATA	NO DATA	9/24/2007	NO DATA	28.92	-81.57	STAGE	NO DATA	NO DATA
19	L-0930 Lake Norris Wells at Paisley (WL) IM	19414940	SJRWMD	NO DATA	NO DATA	NO DATA	NO DATA	9/24/2007	NO DATA	28.92	-81.57	STAGE	NO DATA	NO DATA
20	L-0935 Lake Norris Wells at Paisley (WL) UFA	19414941	SJRWMD	NO DATA	NO DATA	NO DATA	NO DATA	9/24/2007	NO DATA	28.92	-81.57	STAGE	NO DATA	NO DATA
21	L-0051 Horsehead Pond (WL) FA	05170969	SJRWMD	NO DATA	NO DATA	NO DATA	11/10/2005	9/24/2007	686	28.38	-81.74	STAGE	NO DATA	HOURLY
22	L-0050 Horsehead Pond (WL) SF	05170970	SJRWMD	NO DATA	NO DATA	NO DATA	11/10/2005	9/24/2007	686	28.38	-81.74	STAGE	NO DATA	HOURLY
23	L-0199 Turnpike (WL) FA	38003797	SJRWMD	NO DATA	NO DATA	NO DATA	1/1/1990	9/24/2007	6477	28.57	-81.69	STAGE	NO DATA	HOURLY
24	Griffin Flow-way Site Q West (WL)	60326049	SJRWMD	NO DATA	NO DATA	NO DATA	6/14/1996	9/24/2007	4121	28.91	-81.83	STAGE	NO DATA	HOURLY
25	L-0095 Groveland Fire Tower at Groveland (WL) FA	70271001	SJRWMD	NO DATA	NO DATA	NO DATA	6/14/1996	9/24/2007	NO DATA	28.69	-81.90	STAGE	NO DATA	NO DATA
26	L-0096 Groveland Fire Tower at Groveland Deep (WL)	70271002	SJRWMD	NO DATA	NO DATA	NO DATA	8/22/1989	9/24/2007	6610	28.69	-81.90	STAGE	NO DATA	HOURLY
27	L-0043 Lake Yale Groves (WL) FA	05401025	SJRWMD	NO DATA	NO DATA	NO DATA	12/9/2005	9/24/2007	654	28.74	-81.77	STAGE	NO DATA	HOURLY
28	Griffin Flow-way Cell T at T-J Levee (WL)	30113070	SJRWMD	NO DATA	NO DATA	NO DATA	3/25/1994	9/24/2007	4934	28.90	-81.82	STAGE	NO DATA	HOURLY
29	Lake Dora at Mount Dora (WL)	30013010	SJRWMD	NO DATA	NO DATA	NO DATA	2/10/1994	9/24/2007	4977	28.80	-81.64	STAGE	NO DATA	HOURLY
30	Lake Eustis at Eustis (WL)	30083018	SJRWMD	NO DATA	NO DATA	NO DATA	11/15/1993	9/24/2007	5064	28.85	-81.69	STAGE	NO DATA	HOURLY
31	Black Water Creek at DeBary (WL)	30143084	SJRWMD	8/15/1991	9/25/2007	2250	10/4/1990	9/24/2007	2250	28.86	-81.44	DISCHARGE/STAGE	2 TIMES PER WEEK	HOURLY
32	Lake Griffin at Leesburg (WL)	30023014	SJRWMD	NO DATA	NO DATA	NO DATA	2/21/1994	9/24/2007	NO DATA	28.86	-81.89	STAGE	NO DATA	HOURLY
33	L-0620 Carrot Barn at Griffin Flow-way (WL) FA	03260331	SJRWMD	NO DATA	NO DATA	NO DATA	3/23/1999	9/24/2007	3110	28.90	-81.79	STAGE	NO DATA	HOURLY
34	L-0059 Crows Bluff NFS (WL) FA	05791087	SJRWMD	NO DATA	NO DATA	NO DATA	4/29/2005	9/24/2007	NO DATA	29.01	-81.39	STAGE	NO DATA	NO DATA
35	Lake Harris at Leesburg (WL)	30053040	SJRWMD	NO DATA	NO DATA	NO DATA	7/16/1995	9/24/2007	5186	28.81	-81.82	STAGE	NO DATA	HOURLY
36	L-0677 Lake Louisa State Park at Clermont (WL) FA	00660060	SJRWMD	NO DATA	NO DATA	NO DATA	1/3/2008	9/24/2007	246	28.43	-81.72	STAGE	NO DATA	HOURLY
37	L-0709 Smokehouse Lake at Clermont (WL) FA	01840090	SJRWMD	NO DATA	NO DATA	NO DATA	6/11/1998	9/24/2007	3392	28.42	-81.71	STAGE	NO DATA	HOURLY
38	L-0710 Smokehouse Lake at Clermont (WL) SF	01840092	SJRWMD	NO DATA	NO DATA	NO DATA	6/11/1998	9/24/2007	3392	28.42	-81.71	STAGE	NO DATA	HOURLY
39	L-0715 Seminole State Forest at Cassia (WL) IM	11512184	SJRWMD	NO DATA	NO DATA	NO DATA	8/10/2004	9/24/2007	1143	28.88	-81.48	STAGE	NO DATA	HOURLY
40	L-0716 Seminole State Forest at Cassia (WL) SF	11512185	SJRWMD	NO DATA	NO DATA	NO DATA	8/10/2004	9/24/2007	1143	28.88	-81.48	STAGE	NO DATA	HOURLY
41	L-0289 Leesburg Fire Tower at Burle L/D (WL) SF	03190341	SJRWMD	NO DATA	NO DATA	NO DATA	2/24/1999	9/24/2007	3137	28.86	-81.80	STAGE	NO DATA	HOURLY
42	L-0290 Leesburg Fire Tower at Burle L/D (WL) FA	03190329	SJRWMD	NO DATA	NO DATA	NO DATA	2/24/1999	9/24/2007	3137	28.86	-81.80	STAGE	NO DATA	HOURLY
43	L-0703 Carrot Barn at Griffin Flow-way (WL) SF	03260330	SJRWMD	NO DATA	NO DATA	NO DATA	4/27/1999	9/24/2007	3075	28.90	-81.79	STAGE	NO DATA	HOURLY
44	Griffin Flow-way Site Q East (WL)	60326050	SJRWMD	NO DATA	NO DATA	NO DATA	6/14/1996	9/24/2007	4122	28.91	-81.83	STAGE	NO DATA	HOURLY
45	Lowrie Brown Staff at Pump House (WL)	14482662	SJRWMD	NO DATA	NO DATA	NO DATA	NO DATA	9/24/2007	NO DATA	28.88	-81.83	STAGE	NO DATA	NO DATA
46	Eustis Muck Farm Area 7 at EMCA (WL)	14522667	SJRWMD	NO DATA	NO DATA	NO DATA	4/12/2001	9/24/2007	2358	28.92	-81.78	STAGE	NO DATA	HOURLY
47	Long Farm Area 5 at EMCA (WL)	14532668	SJRWMD	NO DATA	NO DATA	NO DATA	4/10/2001	9/24/2007	2360	28.92	-81.79	STAGE	NO DATA	HOURLY
48	L-0729 Keene Lake Wells at Clermont (WL) LFA	03242753	SJRWMD	NO DATA	NO DATA	NO DATA	9/28/2000	9/24/2007	2552	28.42	-81.71	STAGE	NO DATA	HOURLY
49	L-0730 Keene Lake Wells at Clermont (WL) FA	03242755	SJRWMD	NO DATA	NO DATA	NO DATA	9/28/2000	9/24/2007	2552	28.42	-81.71	STAGE	NO DATA	HOURLY
50	Griffin Flow-way Cell Z at T-J Levee (WL)	30110356	SJRWMD	NO DATA	NO DATA	NO DATA	2/14/2000	9/24/2007	2477	28.90	-81.82	STAGE	NO DATA	HOURLY
51	Griffin Flow-way Site K at North South Levee (WL)	14923004	SJRWMD	NO DATA	NO DATA	NO DATA	1/24/2001	9/24/2007	2463	28.90	-81.81	STAGE	NO DATA	HOURLY
52	Lake Apopka MFW B1 Out at Astatula (WL)	15153063	SJRWMD	NO DATA	NO DATA	NO DATA	7/1/2003	9/24/2007	1548	28.67	-81.69	STAGE	NO DATA	HOURLY
53	Lake Apopka MFW B2 Out at Astatula (WL)	15173144	SJRWMD	NO DATA	NO DATA	NO DATA	7/1/2003	9/24/2007	1548	28.67	-81.68	STAGE	NO DATA	HOURLY
54	Lake Apopka MFW C1 Out at Astatula (WL)	15183152	SJRWMD	5/15/2005	9/25/2007	NO DATA	7/1/2003	9/24/2007	1548	28.68	-81.69	STAGE	NO DATA	HOURLY
55	Lake Apopka MFW C2 Out at Astatula (WL)	15193158	SJRWMD	2/16/2005	9/25/2007	NO DATA	7/1/2003	9/24/2007	1548	28.68	-81.68	STAGE	NO DATA	HOURLY
56	Griffin Flow-way Area 3 Site P at EMCA (WL)	15143120	SJRWMD	2/15/2005	9/25/2007	NO DATA	4/26/2001	9/24/2007	2345	28.91	-81.81	STAGE	NO DATA	HOURLY
57	Ashley Farm Area 1 at EMCA (WL)	15483126	SJRWMD	NO DATA	NO DATA	NO DATA	5/8/2003	9/24/2007	1603	28.94	-81.82	STAGE	NO DATA	HOURLY
58	L-0658 Montverde (WL) FA	08163016	SJRWMD	NO DATA	NO DATA	NO DATA	4/25/2007	9/24/2007	NO DATA	28.60	-81.67	STAGE	NO DATA	NO DATA
59	L-0815 Seminole New at Cassia (WL) IM	17043378	SJRWMD	NO DATA	NO DATA	NO DATA	11/21/2002	9/24/2007	1769	28.89	-81.46	STAGE	NO DATA	HOURLY
60	L-0814 Seminole New at Cassia (WL) SF	17043379	SJRWMD	NO DATA	NO DATA	NO DATA	11/21/2002	9/24/2007	1769	28.89	-81.46	STAGE	NO DATA	HOURLY
61	L-0816 Seminole New at Cassia (WL) FA	17043609	SJRWMD	NO DATA	NO DATA	NO DATA	11/21/2002	9/24/2007	1769	28.89	-81.46	STAGE	NO DATA	HOURLY
62	L-0817 Seminole New at Cassia (WL) LFA	17043610	SJRWMD	NO DATA	NO DATA	NO DATA	11/21/2002	9/24/2007	1769	28.89	-81.46	STAGE	NO DATA	HOURLY
63	Griffin Flow-way U (WL)	17923640	SJRWMD	NO DATA	NO DATA	NO DATA	12/4/2002	9/24/2007	1758	28.88	-81.81	STAGE	NO DATA	HOURLY
64	Cabbage Hammock West Area 5 at EMCA (WL)	18383737	SJRWMD	NO DATA	NO DATA	NO DATA	3/6/2003	9/24/2007	1666	28.91	-81.80	STAGE	NO DATA	HOURLY
65	Lake Apopka MFW Pump 1 at Astatula (WL)	18413756	SJRWMD	NO DATA	NO DATA	NO DATA	8/10/2003	9/24/2007	1508	28.67	-81.68	STAGE	NO DATA	HOURLY

(1) Hourly data is collected in real time. Long term records are stored daily.
(2) Paired surface water and groundwater monitoring locations are included.

Active USGS and Lake County Water Atlas Surface Water Hydrologic Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER	DATA SOURCE	DISCHARGE DATA			STAGE DATA			LOCATION		PARAMETER	FREQUENCY[1]	
				DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE
COLLECTED FROM LAKE COUNTY WATER ATLAS														
1	Apopka	NO DATA	ORANGE CO	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	14.09	-81.40	NO DATA	NO DATA	NO DATA
2	Beauclair	NO DATA	ORANGE CO	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	14.60	-81.52	NO DATA	NO DATA	NO DATA
3	Carlton	NO DATA	ORANGE CO	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	14.56	-81.51	NO DATA	NO DATA	NO DATA
4	Mac	NO DATA	ORANGE CO	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	13.29	-81.49	NO DATA	NO DATA	NO DATA
5	Needham	NO DATA	ORANGE CO	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	13.52	-81.50	NO DATA	NO DATA	NO DATA
6	Neighborhood	NO DATA	ORANGE CO	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	14.64	-81.11	NO DATA	NO DATA	NO DATA
7	BLACKWATER CREEK NEAR CASSIA, FL	02235200	USGS	9/23/1962	9/26/2007	9773	9/23/1962	9/26/2007	9412	14.94	-81.00	DISCHARGE/STAGE	4 TIMES PER WEEK	DAILY
8	BIG CREEK NR CLERMONT, FLA.	02236500	USGS	8/1/1958	9/26/2007	17228	8/1/1958	9/26/2007	17954	13.53	-81.76	DISCHARGE/STAGE	DAILY	DAILY
9	LITTLE CREEK NR CLERMONT, FLA.	02236700	USGS	1/7/1979	9/26/2007	9363	1/7/1979	9/26/2007	9363	13.58	-81.81	DISCHARGE/STAGE	DAILY	DAILY
10	LAKE MINNEHAHA AT CLERMONT, FLA.	02236840	USGS	1/10/1946	9/26/2007	20599	1/10/1946	9/26/2007	20887	14.93	-81.87	DISCHARGE/STAGE	DAILY	DAILY
11	PALATLAKAHA R AT CHERRY LK OUT NR GROVELAND, FLA	02236900	USGS	1/3/1957	9/26/2007	17544	1/3/1957	9/26/2007	17873	13.85	-81.89	DISCHARGE/STAGE	DAILY	DAILY
12	PALATLAKAHA R BL SPWY AT CH LK OUT NR GRV., FLA.	02236901	USGS	1/8/1957	9/26/2007	17120	1/8/1957	9/26/2007	17454	14.01	-82.00	DISCHARGE/STAGE	DAILY	DAILY
13	PALATLAKAHA RIVER NR MASCOTTE, FLA.	02237000	USGS	5/30/1945	9/26/2007	17122	5/31/1945	9/26/2007	17473	15.14	-81.68	DISCHARGE/STAGE	5 TIMES PER WEEK	DAILY
14	PALATLAKAHA RIVER BELOW SPWY, NR MASCOTTE, FLA.	02237001	USGS	1/4/1964	9/26/2007	12964	1/4/1964	9/26/2007	13269	13.54	-81.69	DISCHARGE/STAGE	DAILY	DAILY
15	PALATLAKAHA R AT M-6 NR MASCOTTE, FL.	02237010	USGS	5/29/1981	9/26/2007	8058	5/29/1981	9/26/2007	8399	14.01	-82.00	DISCHARGE/STAGE	DAILY	DAILY
16	PALATLAKAHA R. BELOW M-6 NR.MASCOTTE, FL.	02237011	USGS	5/29/1981	9/26/2007	8408	5/29/1981	9/26/2007	8763	14.09	-82.12	DISCHARGE/STAGE	DAILY	DAILY
17	PALATLAKAHA R. AT M-5 NR.OKAHUMPKA, FL.	02237050	USGS	5/31/1981	9/26/2007	8647	5/31/1981	9/26/2007	8991	14.09	-82.13	DISCHARGE/STAGE	DAILY	DAILY
18	PALATLAKAHA R. BELOW M-5 NR.OKAHUMPKA, FL.	02237051	USGS	5/28/1981	9/26/2007	8917	5/28/1981	9/26/2007	9261	15.07	-82.21	DISCHARGE/STAGE	DAILY	DAILY
19	PALATLAKAHA R.AT M-4 NR OKAHUMPKA, FL	02237206	USGS	6/19/1981	9/26/2007	9105	6/19/1981	9/26/2007	9426	14.18	-82.15	DISCHARGE/STAGE	DAILY	DAILY
20	PALATLAKAHA R. BELOW M-4 NR.OKAHUMPKA, FL.	02237207	USGS	5/28/1981	9/26/2007	8967	5/28/1981	9/26/2007	9317	14.18	-82.15	DISCHARGE/STAGE	DAILY	DAILY
21	PALATLAKAHA R AT STRUCT M-1, NR OKAHUMPKA, FLA.	02237293	USGS	1/1/1970	9/26/2007	13017	1/1/1970	9/26/2007	13214	14.29	-82.18	DISCHARGE/STAGE	DAILY	DAILY
22	CHURCH LAKE NR GROVELAND, FLA.	02237370	USGS	NO DATA	9/26/2007	NO DATA	3/13/1970	9/26/2007	1840	14.30	-82.18	DISCHARGE/STAGE	NO DATA	DAILY
23	WEST CROOKED LAKE NR EUSTIS, FLA.	02237753	USGS	NO DATA	9/26/2007	NO DATA	2/19/1970	9/26/2007	1911	14.41	-82.18	DISCHARGE/STAGE	NO DATA	DAILY
24	LAKE UMATILLA AT UMATILLA, FLA.	02237865	USGS	NO DATA	9/26/2007	NO DATA	3/6/1970	9/26/2007	2110	14.41	-82.18	DISCHARGE/STAGE	NO DATA	DAILY
25	HAINES CREEK AT LISBON, FLA.	02238000	USGS	7/1/1942	9/26/2007	23050	7/1/1942	9/26/2007	23411	14.51	-82.15	DISCHARGE/STAGE	DAILY	DAILY
26	HAINES CREEK BELOW BURRELL DAM AT LISBON, FLA.	02238001	USGS	3/6/1957	9/26/2007	17296	3/6/1957	9/26/2007	17655	14.18	-82.07	DISCHARGE/STAGE	DAILY	DAILY
27	HOLLY LAKE NEAR UMATILLA, FLA.	02238180	USGS	NO DATA	9/26/2007	NO DATA	10/12/1967	6/30/2007	1583	14.79	-81.55	DISCHARGE/STAGE	NO DATA	DAILY
28	TROUT LAKE NR CLERMONT, FLA.	02266239	USGS	NO DATA	9/26/2007	NO DATA	3/16/1970	8/28/2007	2026	15.08	-81.52	DISCHARGE/STAGE	NO DATA	DAILY
29	LADY LAKE NR LADY LAKE, FLA.	02312694	USGS	NO DATA	9/26/2007	NO DATA	8/4/1968	2/14/2007	247	14.92	-81.88	DISCHARGE/STAGE	NO DATA	DAILY
COLLECTED FROM USGS														
30	ECONLOCKHATCHEE RIVER NEAR OVIEDO, FL	2233484	USGS	12/4/2001	8/30/2007	2096	9/5/2002	10/26/2005	5	28.66	-81.17	DISCHARGE/STAGE	DAILY	YEARLY
31	ECONLOCKHATCHEE RIVER NEAR CHULUOTA, FL	2233500	USGS	10/1/1935	8/30/2007	26174	3/13/1936	10/26/2005	63	28.68	-81.11	DISCHARGE/STAGE	DAILY	YEARLY
32	ST. JOHNS RIVER AT OSCEOLA, FL	2234010	USGS	2/17/2005	9/30/2006	591	11/4/2005	11/4/2005	1	28.79	-81.06	DISCHARGE/STAGE	DAILY	YEARLY
33	LAKE JESUP OUTLET NEAR SANFORD, FL	2234435	USGS	1/16/1993	8/29/2007	4815	3/20/1998	6/13/2006	9	28.78	-81.18	DISCHARGE/STAGE	DAILY	YEARLY
34	ST. JOHNS RIVER AT STATE HWY 415 NEAR SANFORD, FL	2234440	USGS	1/18/2005	9/30/2006	621	11/4/2005	11/4/2005	1	28.80	-81.21	DISCHARGE/STAGE	DAILY	YEARLY
35	ST. JOHNS RIVER NEAR SANFORD, FL	2234500	USGS	5/1/1987	8/30/2007	5447	12/7/1987	11/8/2005	12	28.84	-81.32	DISCHARGE/STAGE	5 TIMES PER WEEK	YEARLY
36	WEKIVA RIVER NEAR SANFORD, FL	2235000	USGS	10/1/1935	8/30/2007	26267	6/5/1936	10/26/2005	71	28.82	-81.42	DISCHARGE/STAGE	DAILY	YEARLY
37	BLUE SPRINGS NEAR ORANGE CITY, FL	2235500	USGS	12/8/2001	8/30/2007	1865	11/28/1998	12/1/2005	6	28.94	-81.34	DISCHARGE/STAGE	DAILY	YEARLY
38	ST. JOHNS RIVER NEAR DELAND, FL	2236000	USGS	10/1/1933	8/30/2007	26996	7/5/1934	11/8/2005	73	29.01	-81.38	DISCHARGE/STAGE	DAILY	YEARLY
39	ST. JOHNS RIVER AT ASTOR, FL	2236125	USGS	2/10/1994	8/30/2007	4772	11/23/1994	11/24/2005	12	29.17	-81.52	DISCHARGE/STAGE	DAILY	YEARLY
40	SILVER GLEN SPRINGS NEAR ASTOR, FL	2236160	USGS	11/1/2002	8/30/2007	1673	12/1/2002	6/19/2006	3	29.24	-81.64	DISCHARGE/STAGE	DAILY	YEARLY
41	LITTLE CREEK AT GREEN SWAMP ROAD NEAR CLERMONT, FL	2236605	USGS	6/11/2005	8/30/2007	769	10/25/2005	10/25/2005	1	28.45	-81.78	DISCHARGE/STAGE	DAILY	YEARLY
42	APOPKA FLOW-WAY FEEDER CANAL NEAR ASTATULA, FL	2237698	USGS	4/18/2003	8/30/2007	1570	2/3/2004	3/9/2006	3	28.67	-81.71	DISCHARGE/STAGE	DAILY	YEARLY
43	APOPKA-BEAUCLAIR CANAL NEAR ASTATULA, FL	2237700	USGS	7/1/1958	8/31/2007	17857	4/22/1959	10/25/2005	48	28.72	-81.68	DISCHARGE/STAGE	DAILY	YEARLY
44	WOLF BRANCH AT FCRR NEAR MOUNT DORA, FL	2237734	USGS	1/10/1992	8/30/2007	5656	9/8/1993	10/25/2005	14	28.80	-81.61	DISCHARGE/STAGE	DAILY	YEARLY
45	OCKLAWAHA RIVER AT MOSS BLUFF, FL	2238500	USGS	10/1/1943	8/31/2007	18993	7/4/1944	2/6/2006	52	29.08	-81.88	DISCHARGE/STAGE	6 TIMES PER WEEK	YEARLY
46	SILVER SPRINGS NEAR OCALA, FL	2239500	USGS	10/1/1932	8/30/2007	27362	9/22/1948	10/13/2004	57	29.21	-82.05	DISCHARGE/STAGE	DAILY	YEARLY
47	OCKLAWAHA RIVER NEAR CONNER, FL	2240000	USGS	2/13/1930	8/30/2007	17000	4/6/1931	2/8/2006	59	29.21	-81.99	DISCHARGE/STAGE	4 TIMES PER WEEK	YEARLY
48	OCKLAWAHA RIVER AT EUREKA, FL	2240500	USGS	3/1/1930	8/30/2007	14753	4/7/1931	2/10/2006	37	29.37	-81.90	DISCHARGE/STAGE	4 TIMES PER WEEK	YEARLY
49	OCKLAWAHA R AT RODMAN DAM NEAR ORANGE SPRINGS, FL	2243960	USGS	10/1/1968	8/31/2007	14214	10/23/1968	2/13/2006	38	29.51	-81.80	DISCHARGE/STAGE	DAILY	YEARLY
50	WITHLACOOCHEE RIVER NEAR CUMPRESSCO, FL	2310947	USGS	1/1/1967	8/30/2007	14852	7/18/1968	10/28/2005	39	28.31	-82.06	DISCHARGE/STAGE	DAILY	YEARLY
51	WITHLACOOCHEE-HILLSBOROUGH OVFLO NEAR RICHLAND, FL	2311000	USGS	3/1/1930	8/30/2007	17494	3/19/1960	10/29/2005	47	28.27	-82.10	DISCHARGE/STAGE	4 TIMES PER WEEK	YEARLY
52	WITHLACOOCHEE RIVER NEAR DADE CITY, FL	2311500	USGS	3/1/1930	8/30/2007	9861	8/14/1984	10/31/2005	23	28.35	-82.13	DISCHARGE/STAGE	3 TIMES PER WEEK	YEARLY
53	WITHLACOOCHEE RIVER AT TRILBY, FL	2312000	USGS	9/1/1928	8/30/2007	28439	4/19/1931	11/5/2005	76	28.48	-82.18	DISCHARGE/STAGE	DAILY	YEARLY
54	LITTLE WITHLACOOCHEE RIVER NEAR TARRYTOWN, FL	2312180	USGS	10/1/1966	8/30/2007	14944	9/4/1967	10/29/2005	40	28.52	-82.05	DISCHARGE/STAGE	DAILY	YEARLY
55	LITTLE WITHLACOOCHEE RIVER AT RERDELL, FL	2312200	USGS	8/1/1958	8/30/2007	17927	3/22/1959	11/2/2005	48	28.57	-82.16	DISCHARGE/STAGE	DAILY	YEARLY
56	WITHLACOOCHEE RIVER AT RITAL FL	2312300	USGS	3/1/2004	8/30/2007	1278	11/7/2005	11/7/2005	1	28.52	-82.21	DISCHARGE/STAGE	DAILY	YEARLY
57	WITHLACOOCHEE RIVER AT NOBLETON FL	2312558	USGS	3/1/2004	8/30/2007	1258	11/7/2005	11/7/2005	1	28.64	-82.26	DISCHARGE/STAGE	DAILY	YEARLY
58	WITHLACOOCHEE RIVER NR PINEOLA, FL	2312598	USGS	10/27/2005	8/30/2007	673	11/9/2005	11/9/2005	1	28.72	-82.24	DISCHARGE/STAGE	DAILY	YEARLY
59	CHITTY CHATTY CREEK NR WILDWOOD, FLA.	2312690	USGS	10/1/1963	9/30/1992	6054	9/13/1964	9/14/1992	16	28.81	-81.98	DISCHARGE/STAGE	4 TIMES PER WEEK	YEARLY
60	OUTLET RIVER AT PANACOOCHEE RETREATS, FL	2312700	USGS	10/1/1962	8/30/2007	16341	4/13/1963	2/5/2006	44	28.80	-82.15	DISCHARGE/STAGE	DAILY	YEARLY
61	WITHLACOOCHEE RIVER AT WYSONG DAM, AT CARLSON, FL	2312720	USGS	8/10/1965	8/30/2007	14993	3/16/1966	11/11/2005	40	28.82	-82.18	DISCHARGE/STAGE	DAILY	YEARLY
62	GUM SPRINGS NEAR HOLDER, FL	2312764	USGS	10/1/2003	8/30/2007	1415	9/27/2004	10/7/2005	3	28.95	-82.25	DISCHARGE/STAGE	DAILY	YEARLY

1) Frequency assumed based on period of records and number of records

APPENDIX C

Active USGS and SJRWMD Surface Water Quality Monitioring Sites

MAP ID	STATION NAME	SITE NUMBER	DATA SOURCE	PERIOD OF RECORD			LOCATION		APPROXIMATE FREQUENCY
		USGS SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE	
COLLECTED FROM SJRWMD									
1	St. Johns River State Road 40 near A	20010002	SJRWMD[1]	5/8/1995	11/30/2005	3984	28.35	-81.48	EVERY OTHER MONTH
2	St. Johns River near DeLand	2236000	SJRWMD[1]	6/28/1995	12/6/2005	5471	28.52	-81.47	MONTHLY
3	LYC (Lake Yale)	N/A	SJRWMD[1]	2/8/1990	28-Dec	13023	28.4	-81.25	EVERY OTHER MONTH
4	Lake Griffin	20020381	SJRWMD[1]	7/5/1995	12/28/2005	11816	28.52	-81.29	EVERY OTHER MONTH
5	Lake Eustis	20020368	SJRWMD[1]	5/30/1995	12/27/2005	8191	28.51	-81.5	EVERY OTHER MONTH
6	BWC44 (Blackwater Creek)	N/A	SJRWMD[1]	3/19/1991	11/3/2005	3983	28.51	-81.26	EVERY OTHER MONTH
7	BWCCPB (Blackwater Creek)	N/A	SJRWMD[1]	5/22/1991	11/3/2005	4166	28.47	-81.41	EVERY OTHER MONTH
8	Wekiva River	2235000	SJRWMD[1]	5/24/1995	12/6/2005	2973	29	-81.22	EVERY OTHER MONTH
9	DOR (Lake Dora)	N/A	SJRWMD[1]	6/5/1990	12/27/2005	9430	28.46	-81.48	EVERY OTHER MONTH
10	HAR (Lake Harris)	N/A	SJRWMD[1]	6/5/1990	12/27/2005	12397	28.44	-81.45	EVERY OTHER MONTH
11	LLHARRIS (Little Lake Harris)	N/A	SJRWMD[1]	11/18/1990	12/27/2005	5885	28.54	-81.44	EVERY OTHER MONTH
12	Cherry Lake	20020321	SJRWMD[1]	11/1/1990	1/1/2006	4187	28.5	-81.45	EVERY OTHER MONTH
13	Haynes Creek	2238000	SJRWMD[1]	7/5/1995	12/14/2005	3315	29.09	-81.31	MONTHLY
COLLECTED FROM USGS									
14	ALEXANDER SPRINGS NEAR ASTOR, FLA.	2236095	USGS	2/12/1931	5/10/2007	95	29.08	-81.34	YEARLY
15	HOLLY LAKE NEAR UMATILLA, FL	2238180	USGS	5/9/1968	4/13/2007	11	28.94	-81.43	4 YEARS
16	LADY LAKE NEAR LADY LAKE, FL	2312694	USGS	8/4/1968	2/14/2007	247	28.91	-81.53	BI-MONTHLY
17	CHURCH LAKE NEAR GROVELAND, FL	2237370	USGS	8/6/1968	4/18/2007	103	28.64	-81.50	SEMI-ANNUAL
18	BAYROOT SLOUGH HEADWATERS NEAR BAYLAKE, FL	2312140	USGS	2/26/1959	4/3/2007	346	28.46	-81.55	BI-MONTHLY
19	SILVER GLEN SPRINGS NEAR ASTOR, FL	2236160	USGS	3/17/1931	5/10/2007	105	29.24	-81.38	YEARLY
20	SILVER SPRINGS NEAR OCALA, FL	2239500	USGS	5/26/1906	6/26/2007	303	29.21	-82.03	THREE TIMES A YEAR
21	OCKLAWAHA RIVER AT MOSS BLUFF, FL	2238500	USGS	5/1/1936	11/6/2006	288	29.08	-81.53	THREE TIMES A YEAR
22	BLUE SPRINGS NEAR ORANGE CITY, FL	2235500	USGS	3/7/1932	6/4/2007	578	28.94	-81.20	BI-MONTHLY
23	WITHLACOOCHEE RIVER AT WYSONG DAM, AT CARLSON, FL	2312720	USGS	6/1/1966	5/16/2007	205	28.82	-82.11	BI-MONTHLY
24	OUTLET RIVER AT PANACOOCHEE RETREATS, FL	2312700	USGS	8/20/1908	7/9/2007	262	28.80	-82.09	THREE TIMES A YEAR
25	WITHLACOOCHEE RIVER AT CROOM, FL	2312500	USGS	5/2/1956	3/14/2007	272	28.61	-82.13	BI-MONTHLY
26	LITTLE WITHLACOOCHEE RIVER AT RERDELL, FL	2312200	USGS	8/18/1958	9/5/2006	247	28.34	-82.09	BI-MONTHLY
27	LITTLE WITHLACOOCHEE RIVER NEAR TARRYTOWN, FL	2312180	USGS	10/5/1967	2/28/2006	202	28.52	-82.03	BI-MONTHLY
28	WITHLACOOCHEE RIVER AT TRILBY, FL	2312000	USGS	5/1/1956	3/21/2007	232	28.48	-82.10	QUARTERLY
29	WITHLACOOCHEE RIVER NEAR CUMPRESSCO, FL	2310947	USGS	5/24/1961	2/26/2007	371	28.21	-82.03	BI-MONTHLY
30	WHITTENHORSE CREEK NEAR VINELAND, FL	2266200	USGS	5/1/1968	7/18/2006	133	28.39	-81.37	SEMI-ANNUAL
31	REEDY CREEK NEAR VINELAND, FL	2266300	USGS	5/23/1961	7/18/2006	277	28.35	-81.34	BI-MONTHLY
32	OCKLAWAHA R AT RODMAN DAM NEAR ORANGE SPRINGS, FL	2243960	USGS	5/7/1970	12/1/2006	87	29.50	-81.48	30 MONTHS

1) Part of SJRWMD Arc hydro program

APPENDIX D

Active Groundwater Water Quality Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER		DATA SOURCE	PERIOD OF RECORD			LOCATION		AQUIFER BEING MONITORED	APPROXIMATE FREQUENCY	
		USGS SITE #	WMD SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE (1)
COLLECTED FROM USGS												
1	82513801	282543081385801	NO DATA	USGS	5/4/1977	5/22/2007	59	28.25	-81.38	NO DATA	NO DATA	SEMI - ANNUAL
2	822149213A USGS OBSER W EVA SHALLOW AT EVA, FL.	282245081492602	NO DATA	USGS	1/11/1963	5/21/2007	282	28.22	-81.49	NO DATA	NO DATA	6 TIMES PER YEAR
3	82313702 27416 E USGS W HARTZOG LK Buena Vista, FL	282331081370801	NO DATA	USGS	2/22/1979	9/20/2006	66	28.23	-81.37	NO DATA	NO DATA	SEMI - ANNUAL
4	83213902 EDGEWATER BEACH DEEP	283232081394101	NO DATA	USGS	5/23/1968	5/16/2006	67	28.32	-81.39	NO DATA	NO DATA	20 MONTHS
5	83415901 22S23E15 JC 51 HUGH ILEY	283432081592401	NO DATA	USGS	11/3/1959	5/21/2007	85	28.34	-81.59	NO DATA	NO DATA	20 MONTHS
6	83520001 25S23E10 JC 67 FLA ROCK IND NO 2	283539082000301	NO DATA	USGS	5/1/1978	5/21/2007	59	28.35	-82.00	NO DATA	NO DATA	SEMI - ANNUAL
7	83920001 21S23E22 JC 65 U S GEOL SURVEY	283904082001601	NO DATA	USGS	2/9/1977	5/22/2007	65	28.39	-82.00	NO DATA	NO DATA	6 TIMES PER YEAR
8	842153142 20S24E34	284232081533001	NO DATA	USGS	5/23/1963	9/20/2006	106	28.42	-81.53	NO DATA	NO DATA	SEMI - ANNUAL
9	844146244 LAKE YALE GROVES WELL NR TAVARES, FL.	284445081462101	NO DATA	USGS	5/22/1963	5/23/2007	399	28.44	-81.46	NO DATA	NO DATA	9 TIMES PER YEAR
10	852143121 18S26E32 J EICHEL BERGER	285257081434201	NO DATA	USGS	5/21/1963	5/22/2007	67	28.52	-81.43	NO DATA	NO DATA	18 MONTHS
11	855140-- 18S26E14 AUSTIN GROVES	285504081405901	NO DATA	USGS	12/29/1967	5/22/2007	76	28.55	-81.40	NO DATA	NO DATA	SEMI - ANNUAL
12	90613701 16S27E18 CAMP OCALA	290633081375201	NO DATA	USGS	5/11/1978	5/22/2007	62	29.06	-81.37	NO DATA	NO DATA	SEMI - ANNUAL
13	909134 15S27E-- ASTOR PARK	290900081342002	NO DATA	USGS	5/1/1970	5/22/2007	58	29.09	-81.34	NO DATA	NO DATA	18 MONTHS
14	91112806 15S28E14 HARPERS WELL E OF MURPHY RD	291150081282501	NO DATA	USGS	11/27/1978	5/21/2007	69	29.11	-81.28	NO DATA	NO DATA	SEMI - ANNUAL
15	91213103 4" SUPPLY WELL,SE L.GEORGE,NR EMPORIA	291258081313701	NO DATA	USGS	1/18/1978	5/21/2007	80	29.00	-81.31	NO DATA	NO DATA	SEMI - ANNUAL
16	ABANDONED FREEFLOW SR46A NR SORRENTO	284929081294901	NO DATA	USGS	5/2/1977	5/24/2007	51	28.49	-81.29	NO DATA	NO DATA	18 MONTHS
17	Astor Park Well at Astor Park, FL	290950081315501	NO DATA	USGS	1/2/1936	9/5/2007	631	29.09	-81.31	NO DATA	NO DATA	9 TIMES PER YEAR
18	BYRD TRAILER WELL NR ORANGE HOME,FL	284955081595801	NO DATA	USGS	9/4/1984	5/23/2007	34	28.49	-81.59	NO DATA	NO DATA	18 MONTHS
19	CABBAGE HAMMOCK SHALLOW L-0703 NR EMERALDA ISLAND	285359081472702	NO DATA	USGS	9/12/1997	11/16/2006	19	28.53	-81.47	NO DATA	NO DATA	SEMI - ANNUAL
20	CAMP MCQUARRIE ABANDONED DP AT CROOKED LAKE	290910081360001	NO DATA	USGS	5/3/1977	5/22/2007	66	29.09	-81.36	NO DATA	NO DATA	SEMI - ANNUAL
21	CARROT BARN FULLY SAS PROD(L-0885)AT LISBON, FL	285359081472703	NO DATA	USGS	8/4/2005	11/16/2006	27	28.53	-81.47	SAS/INT/LSAS/USAS	NO DATA	BI-WEEKLY
22	CENTRAL BAPTIST YOUTH CAMP	290052081271201	NO DATA	USGS	6/2/1994	5/24/2007	23	29.00	-81.27	NO DATA	NO DATA	18 MONTHS
23	CHURCH OF GOD OF PROPHECY	284528081530201	NO DATA	USGS	12/12/1996	5/23/2007	28	28.45	-81.53	NO DATA	NO DATA	SEMI - ANNUAL
24	CITY WELL REPLACEMENT AT CLERMONT, FL	283314081455501	NO DATA	USGS	5/17/1982	6/14/2007	187	28.33	-81.45	NO DATA	NO DATA	7 TIMES PER YEAR
25	DR PHILLIPS & SONS DP	283530081514501	NO DATA	USGS	11/21/1961	9/22/2006	70	28.35	-81.51	NO DATA	NO DATA	20 MONTHS
26	GREEN SWAMP AQUIFER TEST LK751W	282318081544003	NO DATA	USGS	5/1/1975	5/23/2007	36	28.23	-81.54	NO DATA	NO DATA	YEARLY
27	HATCHER WELL AT LAKE MIONA NR OXFORD,FL	285422082001901	NO DATA	USGS	5/24/1982	5/23/2007	51	28.54	-82.00	NO DATA	NO DATA	SEMI - ANNUAL
28	JOHNS LAKE WELL NR CLERMONT (SJ L-0052)	283128081404701	NO DATA	USGS	9/10/1985	5/21/2007	44	28.31	-81.40	NO DATA	NO DATA	SEMI - ANNUAL
29	JUNIPER HUNT CLUB SUPPLY	291448081381601	NO DATA	USGS	5/20/1997	5/22/2007	27	29.14	-81.38	NO DATA	NO DATA	SEMI - ANNUAL
30	KEEN RANCH NR LAKE JEM	284241081402601	NO DATA	USGS	1/31/1975	5/21/2007	59	28.42	-81.40	NO DATA	NO DATA	SEMI - ANNUAL
31	L KNOWLES DEEP	284757081320701	NO DATA	USGS	5/14/1996	7/18/2007	30	28.47	-81.32	NO DATA	NO DATA	SEMI - ANNUAL
32	L-0051 SAND MINE RD DP WELL NR CLERMONT	282241081443901	NO DATA	USGS	11/3/1983	5/21/2007	24	28.22	-81.44	FLORIDAN	NO DATA	YEARLY
33	L-0066 OBS WELL ALEXANDER SP NR ASTOR	290451081344401	NO DATA	USGS	5/21/1997	5/22/2007	21	29.04	-81.34	FLORIDAN	NO DATA	SEMI - ANNUAL
34	L-0095 GROVELAND TOWER DEEP	284122081534401	NO DATA	USGS	9/20/1995	5/23/2007	26	28.41	-81.53	FLORIDAN	NO DATA	SEMI - ANNUAL
35	L-0199 TURNPIKE	283355081411701	NO DATA	USGS	9/14/1995	5/21/2007	26	28.33	-81.41	FLORIDAN	NO DATA	SEMI - ANNUAL
36	L-0441 USFS WELL NR ASTOR,FL	290646081314001	NO DATA	USGS	5/15/2000	5/22/2007	15	29.06	-81.31	FLORIDAN	NO DATA	SEMI - ANNUAL
37	L-0455 ASTOR 150 CF	291002081330601	NO DATA	USGS	5/23/1996	5/22/2007	24	29.10	-81.33	FLORIDAN	NO DATA	SEMI - ANNUAL
38	L-0456 ALEXANDER SPS SH	290647081342102	NO DATA	USGS	10/23/1991	5/22/2007	10	29.06	-81.34	SURFICIAL	NO DATA	BIANNUAL
39	L-0658 CITY OF MONTVERDE	283608081403001	NO DATA	USGS	5/23/1997	5/21/2007	34	28.36	-81.40	FLORIDAN	NO DATA	3 TIMES A YEAR
40	Lake George Well near Salt Springs, FL	291849081411401	NO DATA	USGS	9/14/1982	5/24/2007	285	29.18	-81.41	NO DATA	NO DATA	MONTHLY
41	LAKE OLIVER DEEP WELL NEAR VINELAND, FL	282202081384601	NO DATA	USGS	2/9/1962	8/28/2007	384	28.22	-81.38	NO DATA	NO DATA	6 TIMES PER YEAR
42	LAKE OLIVER SHALLOW WELL NEAR VINELAND, FL	282202081384602	NO DATA	USGS	2/10/1959	8/28/2007	344	28.22	-81.38	NO DATA	NO DATA	6 TIMES PER YEAR
43	LCFD DIST.9 STATION 1	283019081455701	NO DATA	USGS	5/19/1995	5/21/2007	33	28.30	-81.45	NO DATA	NO DATA	SEMI - ANNUAL
44	LOWER WEKIVA R 4"FREEFLO	285810081234101	NO DATA	USGS	1/28/1998	5/24/2007	24	28.58	-81.23	NO DATA	NO DATA	SEMI - ANNUAL
45	LOWES BURNED HOUSE WELL NR ADAMSVILLE, FL	284703082001701	NO DATA	USGS	12/17/1981	9/20/2006	46	28.47	-82.00	NO DATA	NO DATA	20 MONTHS
46	M-0467 LAKE WEIR MIDDLE SCHOOL NR LADY LAKE,FL	285953081590101	NO DATA	USGS	9/24/2001	5/22/2007	12	28.59	-81.59	NO DATA	NO DATA	SEMI - ANNUAL
47	OCALA NF 4IN SHALLOW WELL(M-0413)	291751081414301	NO DATA	USGS	5/14/1997	5/24/2007	25	29.17	-81.41	NO DATA	NO DATA	SEMI - ANNUAL
48	OCALA NF4" NR ALEX.SPGS.CR BOAT LANDING	290244081302601	NO DATA	USGS	8/23/1968	5/22/2007	75	29.02	-81.30	NO DATA	NO DATA	SEMI - ANNUAL
49	PAUL SHOKLEY AT PAISLEY	285827081331401	NO DATA	USGS	9/21/1967	5/22/2007	77	28.58	-81.33	NO DATA	NO DATA	SEMI - ANNUAL
50	PINE LAKES WELL ON SR 44	285539081262901	NO DATA	USGS	9/22/1981	5/24/2007	67	28.55	-81.26	NO DATA	NO DATA	SEMI - ANNUAL
51	PITTMAN WORK CENTER ABANDONED NR ALTOONA,FL	290000081380001	NO DATA	USGS	3/28/1961	5/22/2007	118	29.00	-81.38	NO DATA	NO DATA	SEMI - ANNUAL
52	PONDEROSA CLUB FREEFLOW	291728081390501	NO DATA	USGS	4/26/1979	5/24/2007	60	29.17	-81.39	NO DATA	NO DATA	SEMI - ANNUAL
53	S-1230 YANKEE LAKE	284923081234802	NO DATA	USGS	1996-05-00	5/24/2007	42	28.49	-81.23	NO DATA	NO DATA	QUARTERLY
54	SJR DEEP NR CABBAGE HAMMOCK L-0620	285357081472801	NO DATA	USGS	9/12/1997	5/22/2007	57	28.53	-81.47	NO DATA	NO DATA	6 TIMES PER YEAR
55	SMITH WELL NO.2 NR CHERRY LAKE,FL	285420081571901	NO DATA	USGS	5/17/1984	5/23/2007	47	28.54	-81.57	NO DATA	NO DATA	SEMI - ANNUAL
56	STUART RANCH 6IN AG WELL	284106081594001	NO DATA	USGS	9/16/1998	5/22/2007	14	28.41	-81.59	NO DATA	NO DATA	15 MONTHS
57	STUART RANCH REPLACEMENT NR CENTER HILL	284105081594301	NO DATA	USGS	9/16/1998	9/19/2006	13	28.41	-81.59	NO DATA	NO DATA	15 MONTHS
58	USGS WELL,2MI N ALEX SPGS,ALTOONA	290647081342101	NO DATA	USGS	5/18/1982	9/19/2006	115	29.06	-81.34	NO DATA	NO DATA	6 TIMES PER YEAR
59	V-0083 BLUE SPGS WELL SOUTH, ORANGE CITY, FL	285638081203101	NO DATA	USGS	9/4/1981	5/21/2007	21	28.56	-81.20	FLORIDAN	NO DATA	20 MONTHS
60	V-0115 USGS J-24 TEST WELL,W.OF DELAND	290138081203202	NO DATA	USGS	1/3/1967	5/21/2007	96	29.01	-81.20	FLORIDAN	NO DATA	SEMI - ANNUAL
61	V-0196 ORANGE CITY TWR DEEP	285442081181401	NO DATA	USGS	5/19/1997	5/21/2007	21	28.54	-81.18	NO DATA	NO DATA	SEMI - ANNUAL
62	V-1091 WELL SO OF BLUE SPRINGS NR DEBARY,FL	285513081202801	NO DATA	USGS	9/12/2000	5/21/2007	20	28.55	-81.20	FLORIDAN	NO DATA	QUARTERLY
63	WELL SR42 WEST OF ALTOONA, FL	285930081430901	NO DATA	USGS	5/17/1985	5/22/2007	48	28.59	-81.43	NO DATA	NO DATA	SEMI - ANNUAL
64	WOLF SINK OBSERVATION WELL NR SORRENTO	284725081361901	NO DATA	USGS	10/16/1992	5/24/2007	41	28.47	-81.36	NO DATA	NO DATA	SEMI - ANNUAL
COLLECTED FROM SJRWMD												
65	Alexander Springs	L-0066	91335	SJRWMD	1989	2007	N/A	29.04	-81.34	UFA	NO DATA	ANNUAL
66	Near Alexander Springs	L-0040	91683	SJRWMD	1991	2007		29.06	-81.34	UFA	NO DATA	ANNUAL
67	Crows Bluff	L-0059	N/A	SJRWMD	1989	2007	N/A	29.00	-81.23	UFA	NO DATA	SEMI-ANNUAL
68	Mascotte	L-0062	N/A	SJRWMD	1985	2007	N/A	28.32	-81.54	UFA	NO DATA	ANNUAL

Active Groundwater Water Quality Monitoring Sites

MAP ID	STATION NAME	SITE NUMBER		DATA SOURCE	PERIOD OF RECORD			LOCATION		AQUIFER BEING MONITORED	APPROXIMATE FREQUENCY	
		USGS SITE #	WMD SITE #		DATE COLLECTION BEGAN	LAST COLLECTION DATE	NUMBER OF RECORDS	LATITUDE	LONGITUDE		DISCHARGE	STAGE (1)
69	Carrot Barn near Griffin Flowway	L-0599	91719	SJRWMD	1993	2007	N/A	28.53	-81.47	LFA	NO DATA	ANNUAL
69	Carrot Barn near Griffin Flowway	L-0620	91720	SJRWMD	2003	2007	N/A	28.53	-81.47	UFA	NO DATA	ANNUAL
70	Smokehouse Lake near Clermont	L-0709	91738	SJRWMD	1998	2007	N/A	28.25	-81.42	UFA	NO DATA	ANNUAL
71	Keene Lake	L-0729	91743	SJRWMD	1998	2007	N/A	28.25	-81.42	LFA	NO DATA	ANNUAL
71	Keene Lake	L-0730	91744	SJRWMD	1998	2007	N/A	28.25	-81.42	UFA	NO DATA	ANNUAL
72	Seminole State Forest	L-0816	91749	SJRWMD	2000	2007	N/A	28.53	-81.27	UFA	NO DATA	ANNUAL
72	Seminole State Forest	L-0817	91750	SJRWMD	2002	2007	N/A	28.53	-81.27	LFA	NO DATA	ANNUAL
73	Hilochee WMA	L-0877	91752	SJRWMD	2002	2007	N/A	28.21	-81.43	FLORIDAN	NO DATA	QUARTERLY
73	Hilochee WMA	L-0897	N/A	SJRWMD	2005	2007	N/A	28.21	-81.43	LFA	NO DATA	QUARTERLY
73	Hilochee WMA	L-0906	N/A	SJRWMD	2005	2007	N/A	28.21	-81.43	UFA	NO DATA	QUARTERLY
73	Hilochee WMA	L-0907	N/A	SJRWMD	2005	2007	N/A	28.21	-81.43	SA	NO DATA	QUARTERLY
73	Hilochee WMA	L-0908	N/A	SJRWMD	2005	2007	N/A	28.21	-81.43	SA	NO DATA	QUARTERLY
74	Palatlakaha Dam	L-0883	91753	SJRWMD	2005	2007	N/A	28.44	-81.52	SA	NO DATA	QUARTERLY
74	Palatlakaha Dam	L-0884	91754	SJRWMD	2005	2007	N/A	28.44	-81.52	INTERMEDIATE	NO DATA	QUARTERLY
74	Palatlakaha Dam	L-0902	N/A	SJRWMD	2005	2007	N/A	28.44	-81.52	UFA	NO DATA	QUARTERLY
75	Lake Griffin State Park	L-0926	91757	SJRWMD	2007	2007	N/A	28.51	-81.53	SA	NO DATA	QUARTERLY
75	Lake Griffin State Park	L-0927	91758	SJRWMD	2007	2007	N/A	28.51	-81.53	UFA	NO DATA	QUARTERLY
77	Black Water Creek, West Side	L-0032	91680	SJRWMD	N/A	N/A	N/A	28.85	-81.41	FLORIDAN	NO DATA	SEMI-ANNUAL
77	Black Water Creek, Carter east	L-0037	91681	SJRWMD	N/A	N/A	N/A	28.84	-81.43	FLORIDAN	NO DATA	SEMI-ANNUAL
77	Black Water Creek, Carter west	L-0038	91682	SJRWMD	N/A	N/A	N/A	28.83	-81.43	FLORIDAN	NO DATA	SEMI-ANNUAL
34	Groveland Tower	L-0095	N/A	SJRWMD	1987	2007	N/A	28.41	-81.53	UFA	NO DATA	ANNUAL
35	Turnpike near Apopka Spring	L-0199	N/A	SJRWMD	1991	2007	N/A	28.33	-81.41	UFA	NO DATA	SEMI-ANNUAL
78	Leesburg Tower	L-0290	N/A	SJRWMD	1991	2007	N/A	28.51	-81.47	UFA	NO DATA	ANNUAL
37	Astor	L-0455	N/A	SJRWMD	1997	2007	N/A	29.10	-81.33	SA	NO DATA	SEMI-ANNUAL
79	Howey In The Hills PS #3	L-0591	91713	SJRWMD	1992	2007	N/A	28.73	-81.78	FLORIDAN	NO DATA	ANNUAL
78	Leesburg PS #6, Canal Street	L-0592	91714	SJRWMD	1992	2007	N/A	28.81	-81.87	FLORIDAN	NO DATA	ANNUAL
80	Eustis PS, Easterly WTP	L-0593	91715	SJRWMD	1993	2007	N/A	28.86	-81.65	FLORIDAN	NO DATA	ANNUAL
81	Lady Lake PS	L-0594	91716	SJRWMD	1993	2007	N/A	28.91	-81.92	FLORIDAN	NO DATA	ANNUAL
82	Umatilla PS, Blanding well 2	L-0595	91717	SJRWMD	1992	2007	N/A	28.94	-81.67	FLORIDAN	NO DATA	ANNUAL
83	Clermont PS Grand Highway	L-0596	91718	SJRWMD	1993	2007	N/A	28.56	-81.75	FLORIDAN	NO DATA	ANNUAL
39	Monteverde	L-0658	N/A	SJRWMD	2002	2007	N/A	28.36	-81.40	UFA	NO DATA	ANNUAL
78	Leesburg WWTP	L-0874	N/A	SJRWMD	2003	2007	N/A	28.45	-81.55	SA	NO DATA	QUARTERLY
78	Leesburg WWTP	L-0924	N/A	SJRWMD	2007	2007	N/A	28.45	-81.55	UFA	NO DATA	QUARTERLY
76	Lake Norris	L-0929	N/A	SJRWMD	2007	2007	N/A	25.55	-81.34	SA	NO DATA	QUARTERLY
76	Lake Norris	L-0930	N/A	SJRWMD	2007	2007	N/A	25.55	-81.34	INTERMEDIATE	NO DATA	QUARTERLY
76	Lake Norris	L-0935	N/A	SJRWMD	2007	2007	N/A	25.55	-81.34	UFA	NO DATA	QUARTERLY

APPENDIX E

Active Precipitation Monitoring Sites

Map ID	Station ID	Source Agency	Station Name	Location		PERIOD OF RECORD DATA	
				Latitude	Longitude	DATE COLLECTION BEGAN	FREQUENCY
Orange County							
1	Lake Apopka	Orange County	Lake Apopka	14.15	-81.18	NO DATA	NO DATA
2	Lake Beauclair	Orange County	Beauclair	14.59	-81.49	NO DATA	NO DATA
COLLECTED FROM SJRWMD							
3	00660059	SJRWMD	L-0677 @ Lake Louisa State Park near Clermont Rain	13.47	-81.69	3/23/1998	CONTINUOUS
4	04170737	SJRWMD	Norris Lake near Paisley Rain	15.18	-81.17	1/13/1992	CONTINUOUS
5	30093061	SJRWMD	Joanna Lake - LJD Rain	14.80	-81.47	5/31/1989	CONTINUOUS
6	70271003	SJRWMD	Groveland Firetower Rain	14.33	-82.22	8/22/1989	CONTINUOUS
7	30053150	SJRWMD	Lake Harris At Leesburg	14.60	-80.84	3/5/1996	CONTINUOUS
8	60406091	SJRWMD	Lake Apopka Dedication Tower	14.28	-81.56	1/29/1997	CONTINUOUS
9	50004997	SJRWMD	Lake Apopka Center	14.17	-81.42	1/1/1990	CONTINUOUS
10	60346062	SJRWMD	IFAS Gage at Winter Gardens	14.70	-82.00	6/22/1996	CONTINUOUS
11	11303088	SJRWMD	Rock Springs Well	14.26	-81.32	11/1/1994	CONTINUOUS
COLLECTED FROM SWFWMD							
12	RNF-83	SWFWMD	Clermont	28.27	-81.44	12/1/1958	DAILY
13	RNF-88	SWFWMD	Burrell Lock	28.50	-81.47	1/1/1901	DAILY
COLLECTED FROM USGS							
14	2237000	USGS	Palatlakaha river nr Mascotte, Fla	14.08	-82.12	4/17/1987	DAILY
15	02237293	USGS	Palatlakaha at struct m-1, nr Okahumpka	14.5	-82.14	4/15/1987	DAILY
16	2312700	USGS	Outlet River at Panacoochee Retreats, Fl	28.49	-82.08	NO DATA	CONTINUOUS
17	2312720	USGS	Withlacoochee River at Wysong Dam, at Carlson, Fl	28.49	.82.11	NO DATA	CONTINUOUS

APPENDIX F

MFL Priority Waterbody Locations

MAP ID	STATION NAME	SJRWMD WATER BODY UNIQUE NUMBER[1]	DATA SOURCE	MFL PRIORITY	ADOPTED	WATER BODY TYPE	WATER BODY LOCATIONS	
							LATITUDE	LONGITUDE
SJRWMD - LAKE COUNTY								
1	ALEXANDER SPRINGS	1441	SJRWMD	2010	N	STREAM	29.04	-81.26
3	DORR	338	SJRWMD	1996	Y	LAKE	29.00	-81.40
4	NORRIS	877	SJRWMD	1996	Y	LAKE	28.56	-81.16
5	BLACKWATER CREEK @ SR 44	1437	SJRWMD	1992	Y	RIVER	28.52	-81.00
6	SUNSET	1417	SJRWMD	1998	Y	LAKE	28.51	-82.28
7	MESSANT SPRING	1435	SJRWMD	1992	Y	STREAM	28.51	-81.03
8	SEMINOLE SPRINGS	1434	SJRWMD	1992	Y	STREAM	28.50	-81.10
8	BLUE CYPRESS WMA	1438	SJRWMD	1995	Y	WETLAND	27.41	-78.42
9	WEKIVA RIVER @ SR 46	1436	SJRWMD	1992	Y	RIVER	28.48	-80.80
10	MOUNT PLYMOUTH	845	SJRWMD	2008	N	LAKE	28.48	-81.11
11	BUGG SPRING	1443	SJRWMD	2009	N	STREAM	28.45	-82.23
12	BLUE SPRINGS	1448	SJRWMD	N/A	N	STREAM	28.44	-82.01
13	HOLIDAY SPRINGS	1449	SJRWMD	N/A	N	STREAM	28.44	-81.98
14	EMMA	388	SJRWMD	2003	Y	LAKE	28.36	-82.09
15	APSHAWA NORTH	35	SJRWMD	2002	Y	LAKE	28.36	-81.86
16	LUCY	757	SJRWMD	2003	Y	LAKE	28.36	-82.08
17	APSHAWA SOUTH	5035	SJRWMD	2002	Y	LAKE	28.36	-81.86
18	CHERRY	205	SJRWMD	2002	Y	LAKE	28.35	-81.98
19	MINNEOLA	825	SJRWMD	2002	Y	LAKE	28.34	-81.84
20	APOPKA SPRING	1442	SJRWMD	2009	N	STREAM	28.34	-81.58
21	PINE ISLAND	951	SJRWMD	2001	Y	LAKE	28.29	-82.02
22	FLAT	419	SJRWMD	2007	N	LAKE	28.29	-81.56
23	LOUISA	740	SJRWMD	2000	Y	LAKE	28.28	-81.75
24	SAWGRASS	1032	SJRWMD	2007	N	LAKE	28.26	-81.56
25	BOGGY MARSH	132	SJRWMD	2001	Y	WETLAND	28.23	-81.64
SJRWMD - OCKLAWAHA RIVER SYSTEM								
26	OCKLAWAHA RIVER @ RIVERSIDE LANDING	60002	SJRWMD	N/A	N	RIVER	29.29	-81.90
28	OCKLAWAHA RIVER @ SR 40	60001	SJRWMD	2008	N	RIVER	29.12	-82.48
29	SILVER SPRINGS	1445	SJRWMD	2008	N	STREAM	29.12	-82.68
SJRWMD - ST JOHNS RIVER SYSTEM								
2	SJR @ SR 44	1427	SJRWMD	2003	Y	RIVER	29.00	-80.68
27	SILVER GLEN SPRINGS	1444	SJRWMD	2010	N	STREAM	29.14	-81.46
30	DeLEON SPRINGS	1424	SJRWMD	2007	N	STREAM	29.08	-80.62
32	BLUE SPRING	1423	SJRWMD	2006	N	STREAM	28.56	-80.56
33	GEMINI SPRINGS	1425	SJRWMD	2007	N	STREAM	28.51	-80.47
34	GREEN SPRINGS	1426	SJRWMD	2007	N	STREAM	28.51	-80.29
35	MONROE	838	SJRWMD	2006	N	LAKE	28.50	-80.37
36	ROCK SPRINGS	1433	SJRWMD	1992 / 2007	Y	STREAM	28.45	-81.04
SJRWMD - OTHER SITES IN PROXIMITY TO LAKE COUNTY								
31	BIG BASS	95	SJRWMD	2008	N	LAKE	28.59	-81.88

MFL Priority Waterbody Locations

MAP ID	STATION NAME	SJRWMD WATER BODY UNIQUE NUMBER[1]	DATA SOURCE	MFL PRIORITY	ADOPTED	WATER BODY TYPE	WATER BODY LOCATIONS	
							LATITUDE	LONGITUDE
37	WEKIWA SPRINGS	1428	SJRWMD	1992 / 2007	Y	STREAM	28.42	-80.92
38	MIAMI SPRINGS	1432	SJRWMD	1992	Y	STREAM	28.42	-80.87
39	JOHNS	635	SJRWMD	2007	N	LAKE	28.32	-81.44
40	AVALON	44	SJRWMD	2007	N	LAKE	28.30	-81.46
SWFWMD - WITHLACOOCHEE RIVER SYSTEM								
41	LAKE PANASOFFKEE	N/A	SWFWMD	2006	Y	LAKE	28.80	-82.17
42	TSALA APOPKA LAKE	02312975[2]	SWFWMD	2006	Y	LAKE	28.96	-82.34
43	WITHLACOOCHEE RIVER NEAR HOLDER	02313000[2]	SWFWMD	2009	N	RIVER	28.99	-82.35
44	WITHLACHOOCHEE RIVER AT CROOM	N/A	SWFWMD	2009	N	RIVER	28.35	-82.13
45	WITHLACHOOCHEE RIVER AT TRILBY	02312000[2]	SWFWMD	2009	N	RIVER	28.48	-82.18

1) Water body locations were not uniquely identified within the SJRWMD data collected. As a result the same site may be labeled differently depending on source that the data was collected from within the SJRWMD.
2) USGS Gage locations