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 | | | | Status | Reference |
|---|---|---|---|---|---|---|---|---|
| | | | Construction ($M) | Total Capital ($M) | O&M ($M/yr) | Unit Production ($/1000 gallons) | | |
| | | | | | | | | |
| 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* |

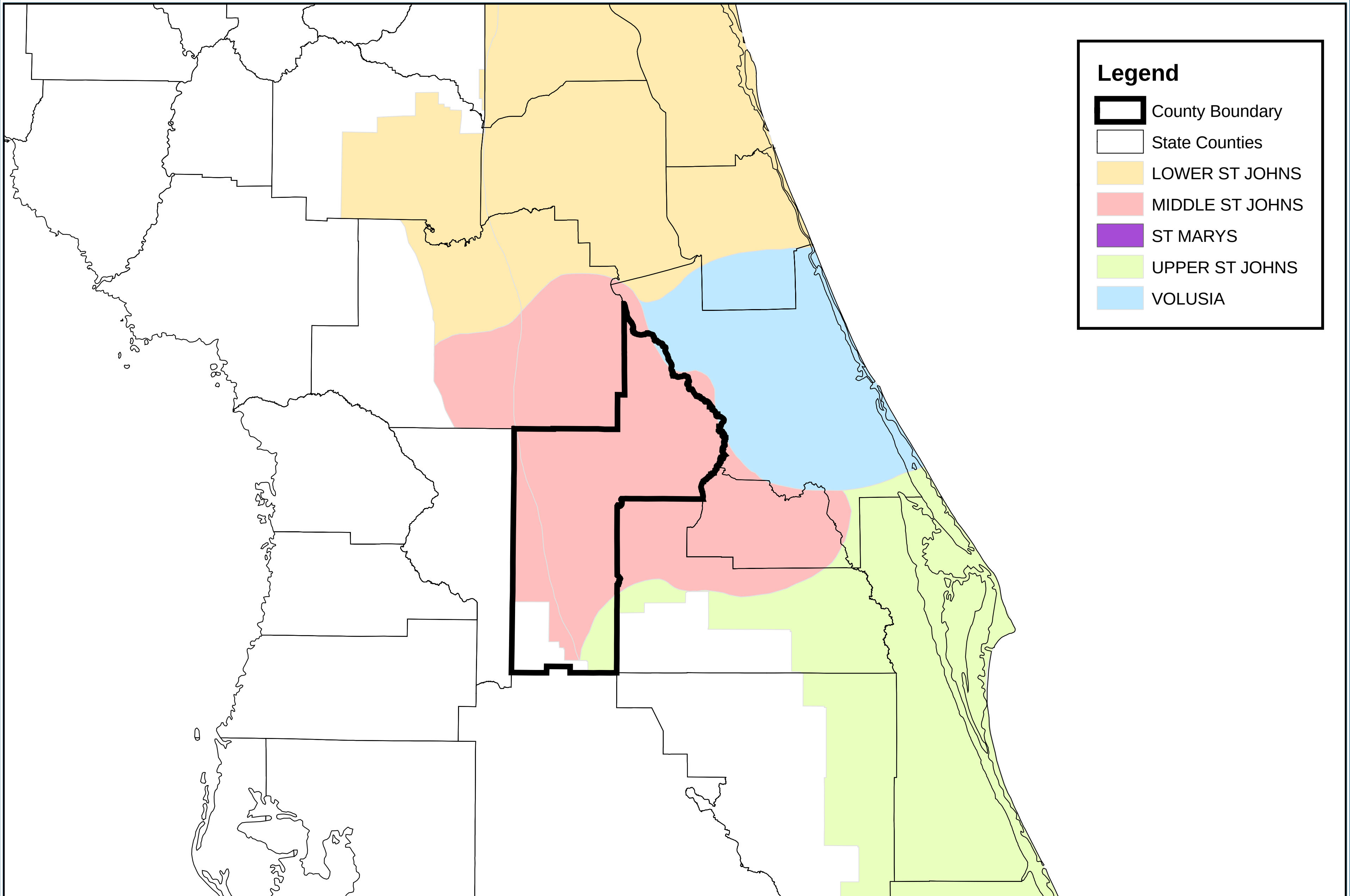
AR - Aquifer Recharge   ASR - Aquifer Storage and Recovery

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





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PROJECT: 0407 - Lake County Water Supply Development

# Figure 2-1
# Groundwater Basins
# In Lake County

ORIGINAL DATE: 05-02-07

REVISION DATE: none

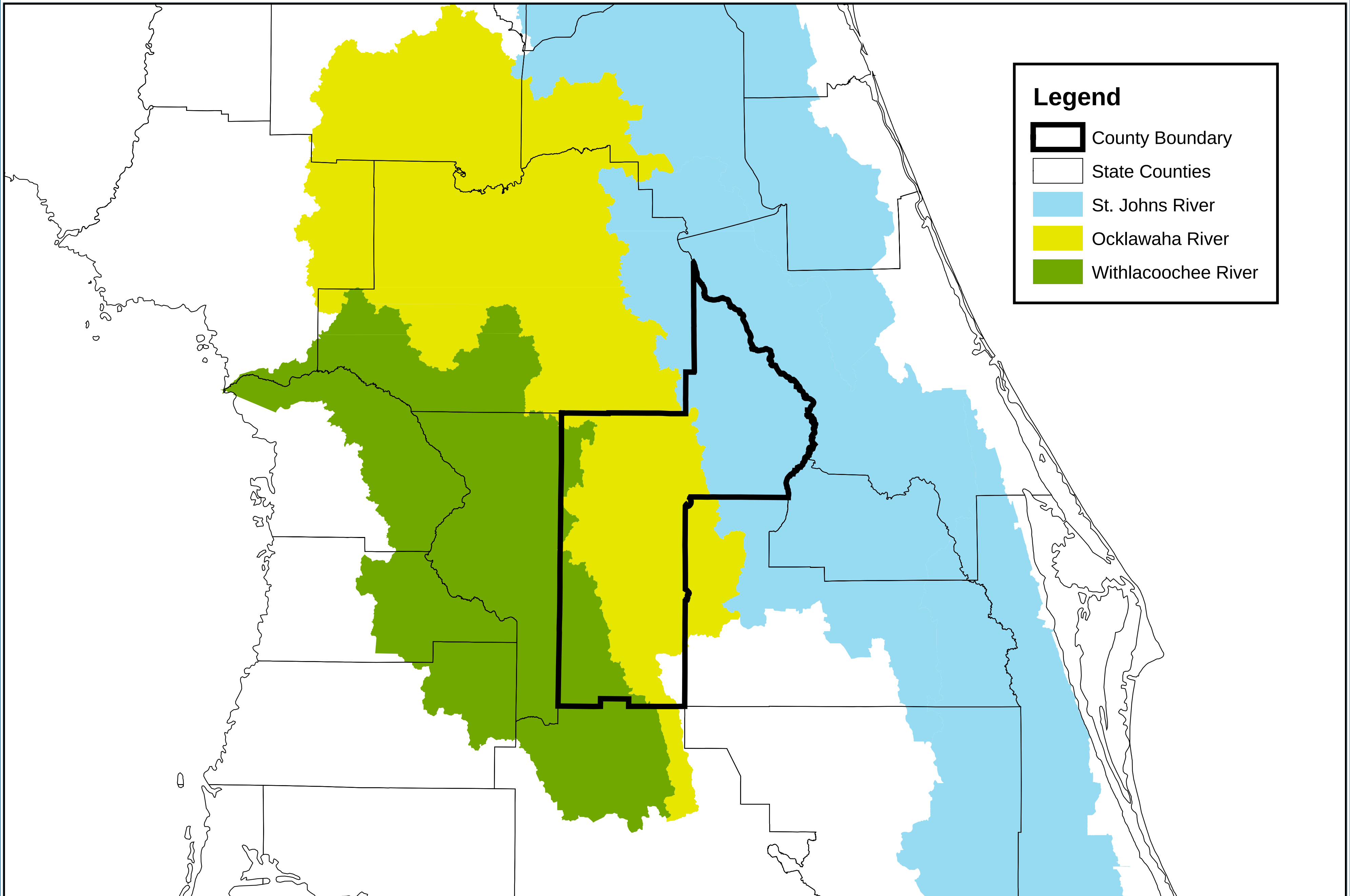
JOB NUMBER: 0407

FILE NAME: 0407_watershed...mxd

GIS OPERATOR: DR

N W E S

1 Inch = 12.0 Miles

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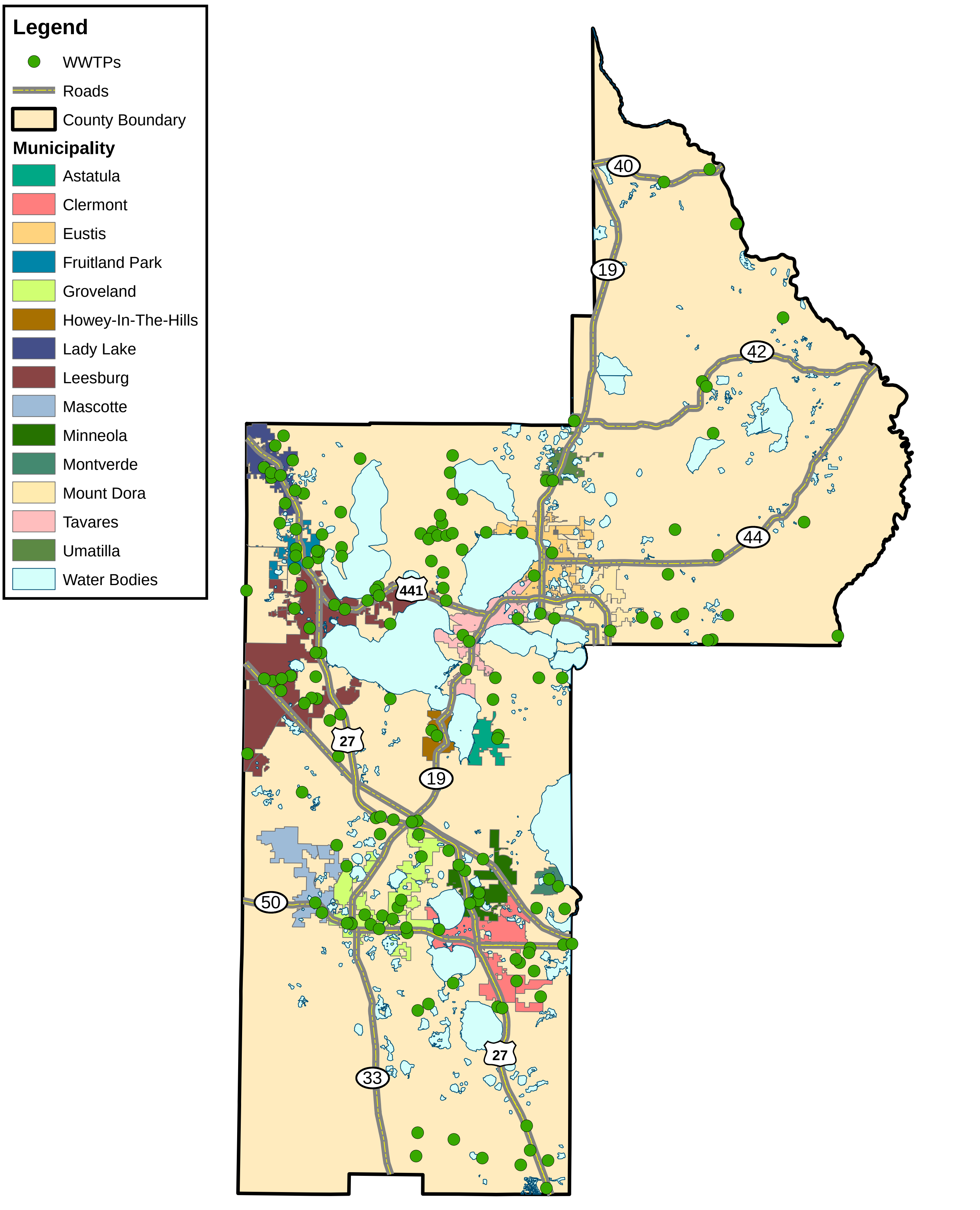
PROJECT: 0407 - Lake County Water Supply Development

# 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

N W E S

1 Inch = 19.5 Miles

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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**

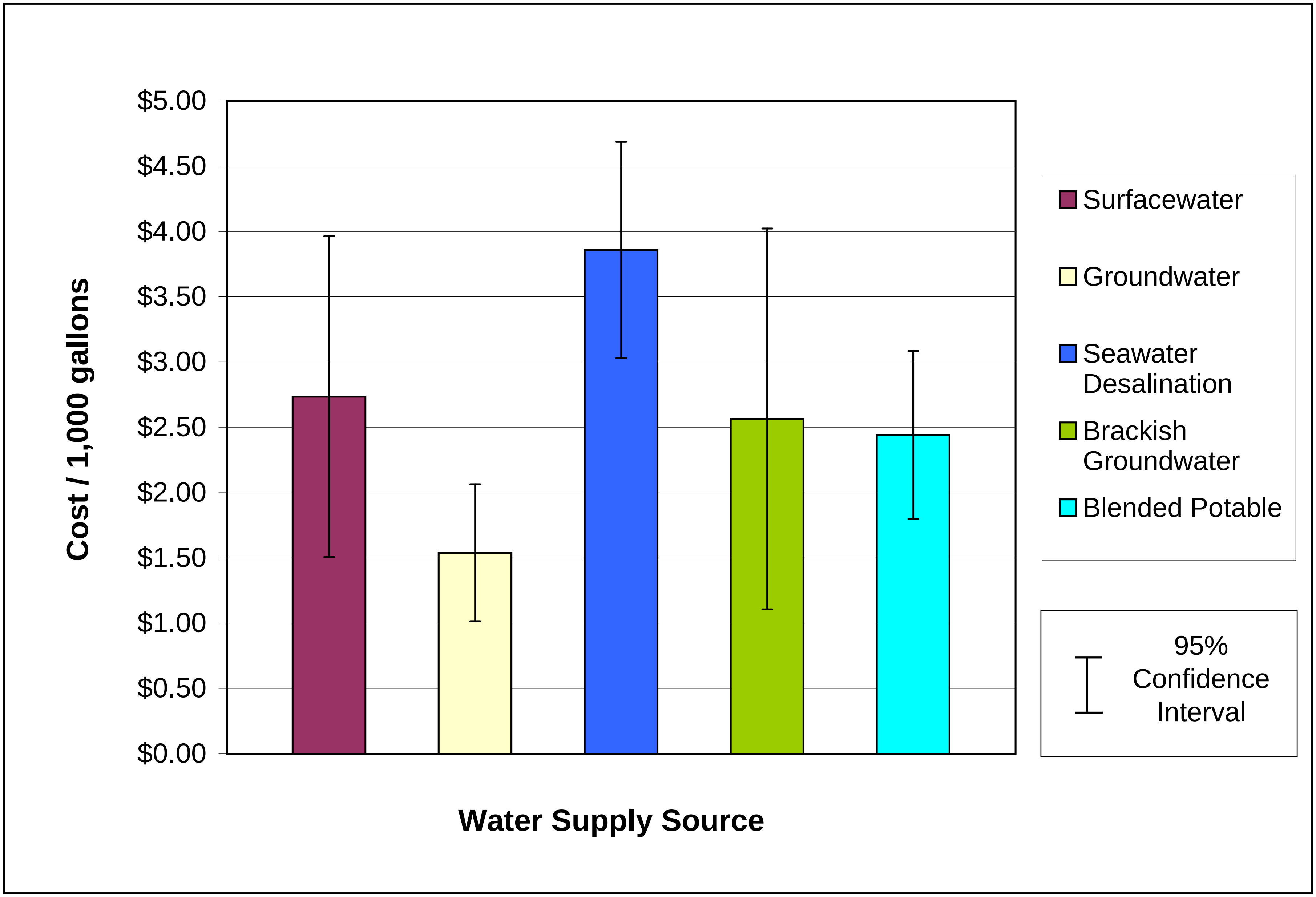
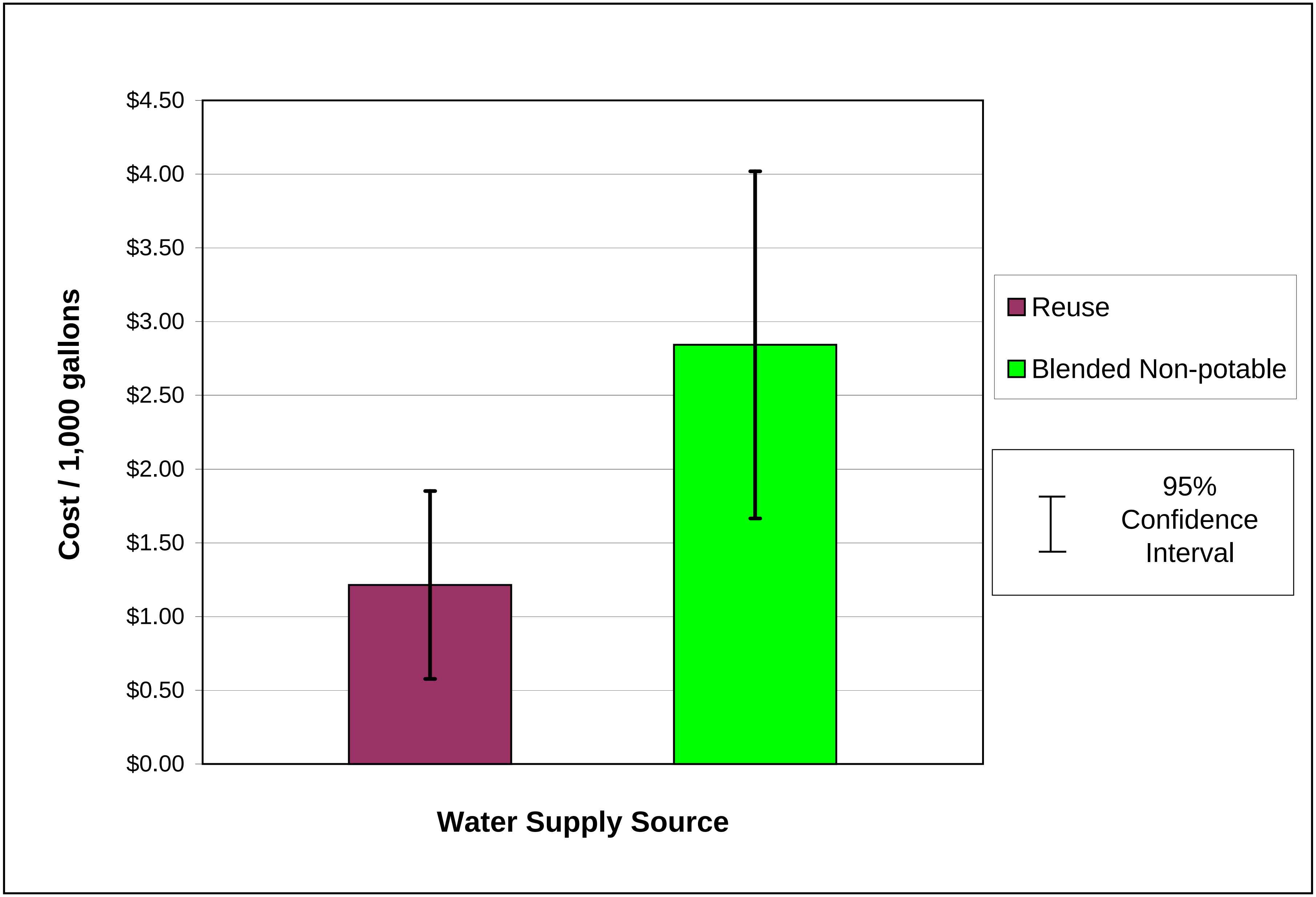


**Figure 2-8 Unit Production Costs for Reuse and Blended Non-potable Projects**



## 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

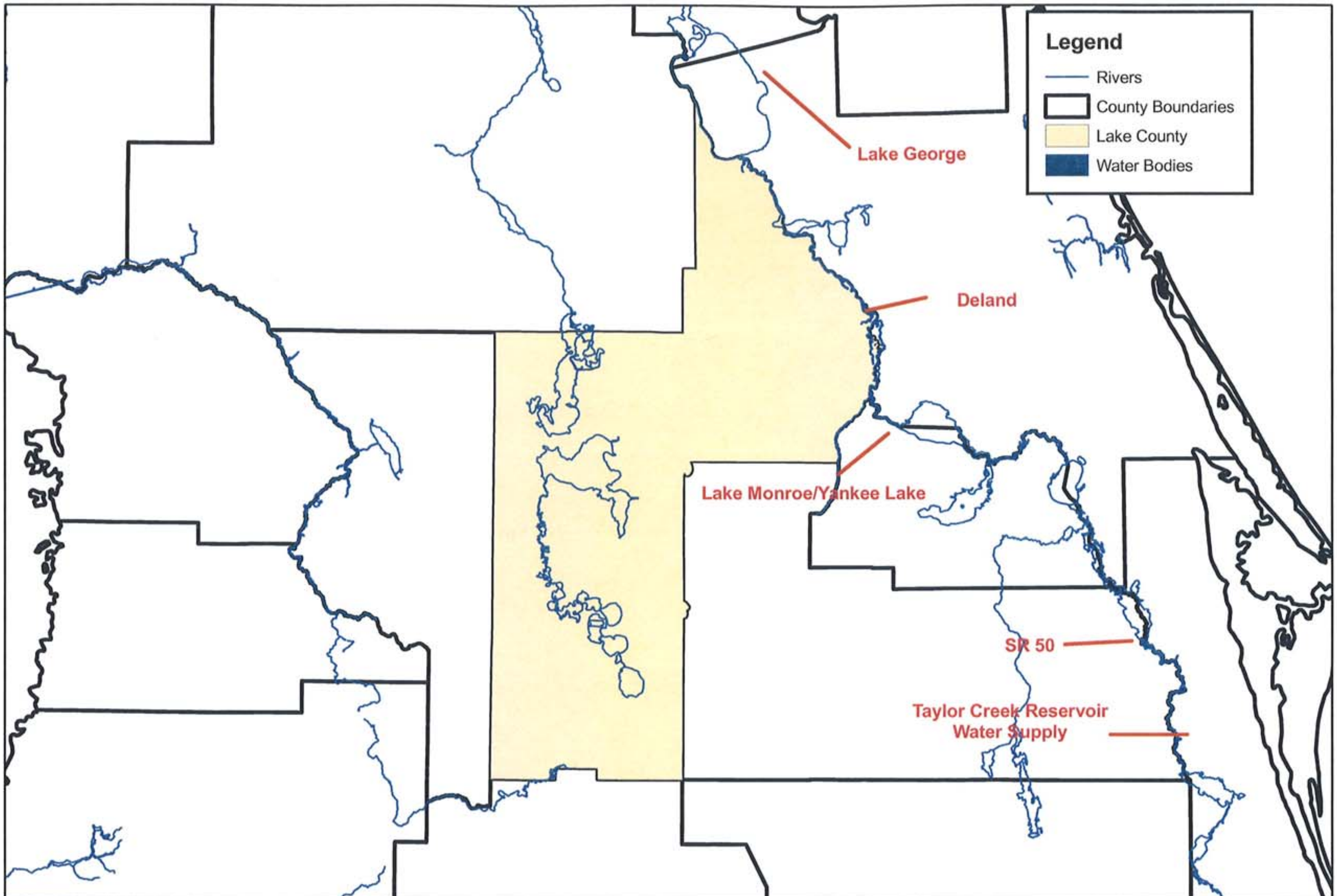



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Figure 3 - 1
St. Johns River Potential Alternative
Water Supply Projects

ORIGINAL DATE: 04-24-07
REVISION DATE: N/A
JOB NUMBER: 0306
FILE NAME: Surfacewater Projects.mxd
GIS OPERATOR: DR

N
W E
S
1 Inch = 65,000 Feet

#### 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.

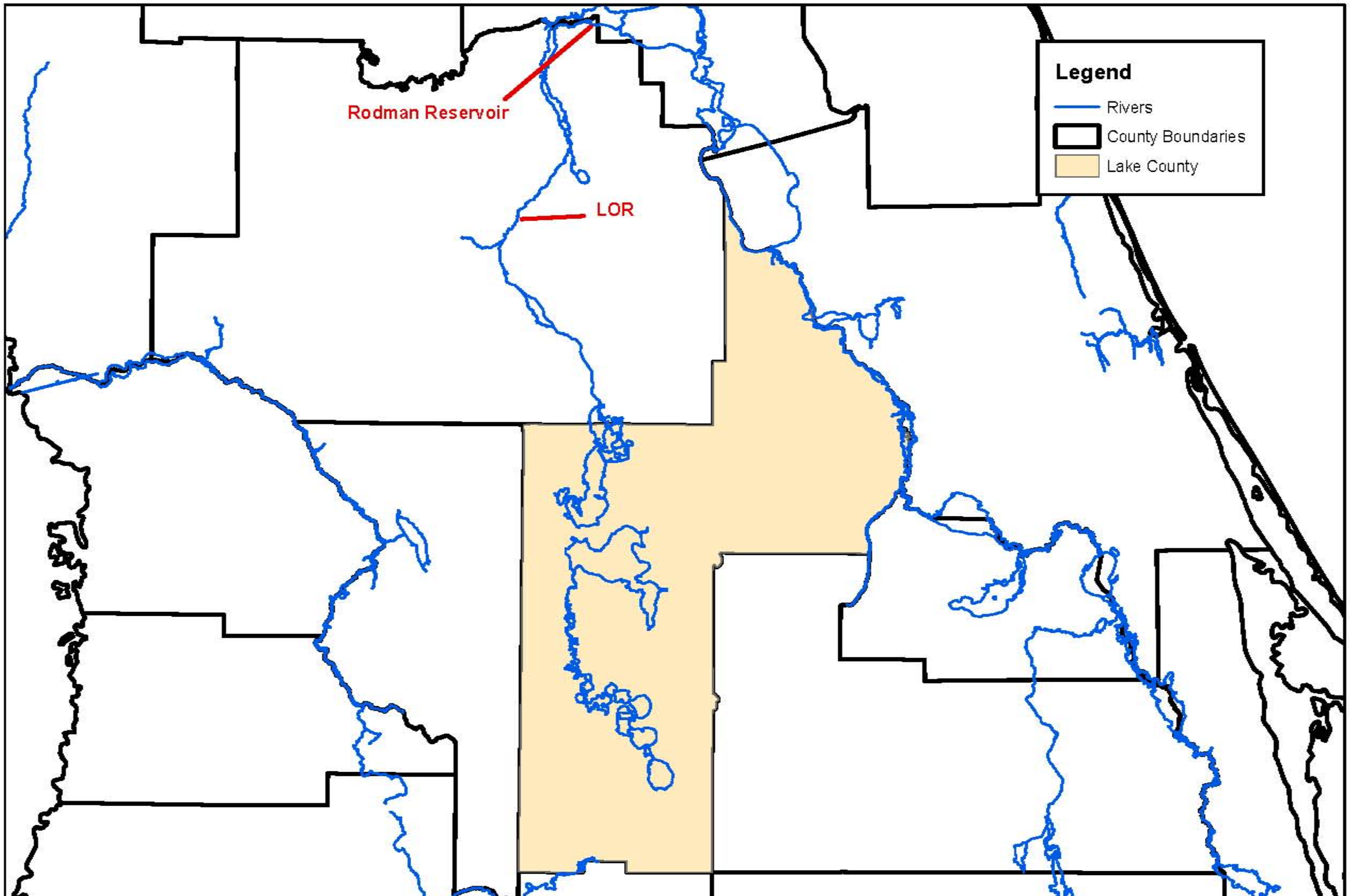


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Figure 3 - 2
Ocklawaha River Potential Alternate Water Supply Projects

ORIGINAL DATE: 04-24-07
REVISION DATE: N/A
JOB NUMBER: 0306
FILE NAME: Surfacewater Ockla.mxd
GIS OPERATOR: DR

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.

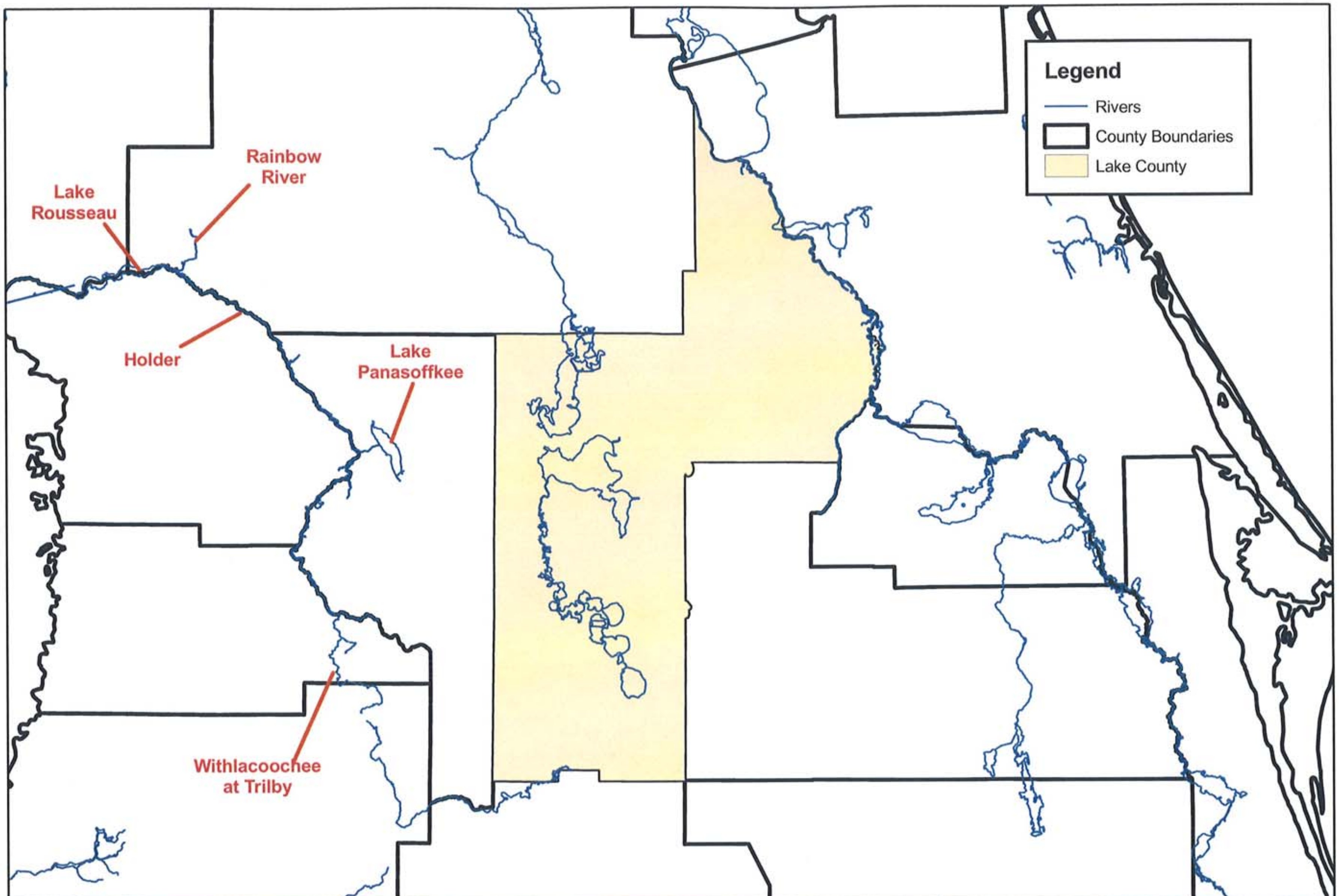


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Figure 3 - 3
Withlacoochee Potential Alternative Water Supply Projects

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:
    - o Treatment Capital and O&M Cost Moderate – Conventional Treatment
    - o 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:
    - o Treatment Capital and O&M Cost Low – Conventional Treatment
    - o 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:

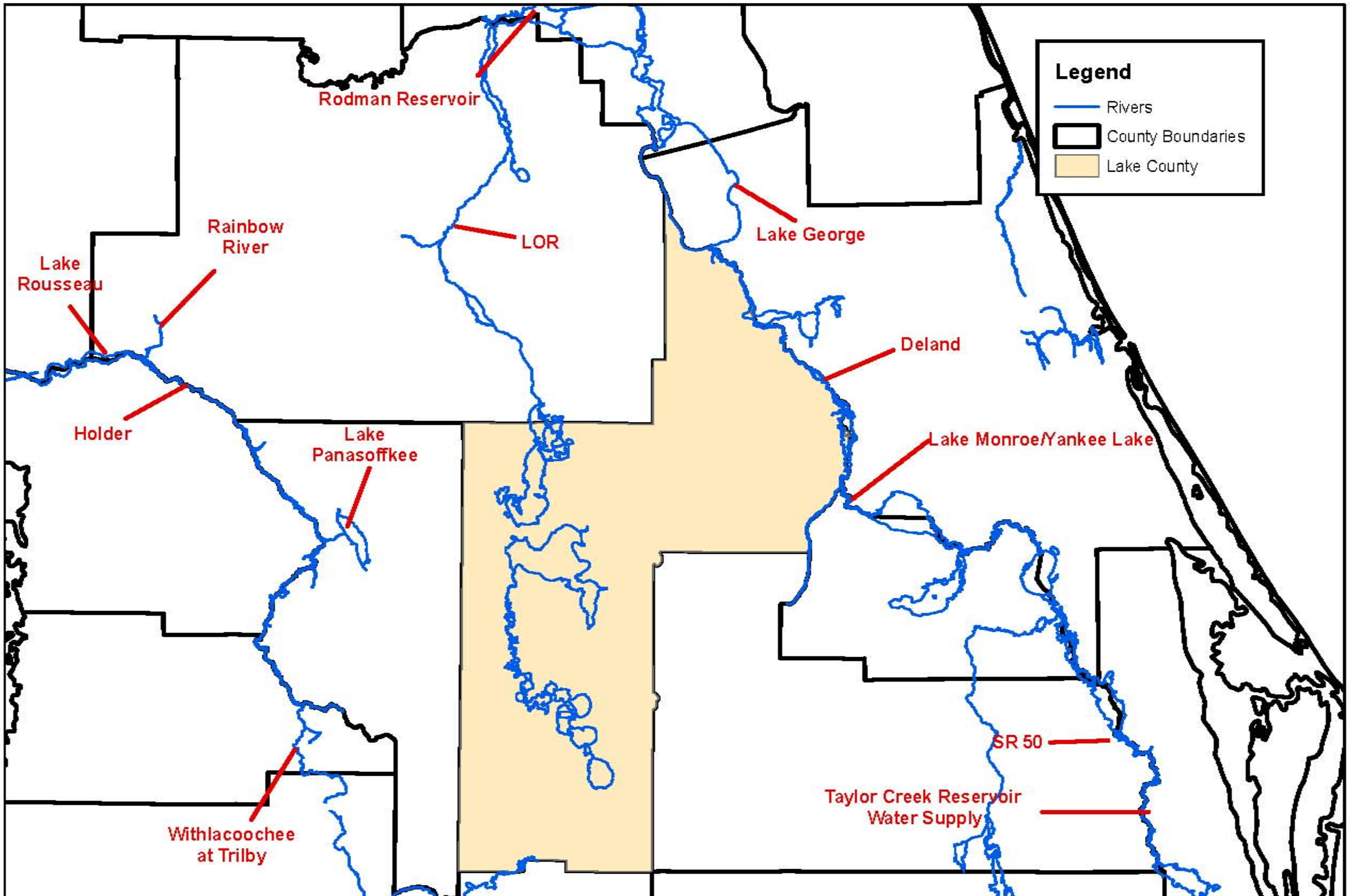


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Figure 3 - 4
Lake County Potential Alternative Water Supply Projects

ORIGINAL DATE: 04-24-07
REVISION DATE: N/A
JOB NUMBER: 0306
FILE NAME: All Surfwater projects.mxd
GIS OPERATOR: DR

N W E S
1 Inch = 65,000 Feet

| Table 3-1<br>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<br>B - Few negative water quantity or supply variability issues<br>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<br>B - Conventional-type treatment likely (e.g. complete filtration, membrane softening)<br>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<br>B - Permitting will follow normal permitting course with few issues<br>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<br>B - Low likelihood of significant adverse environmental impacts<br>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<br>C - High anticipated costs resulting from enhanced treatment, conventional treatment and transmission needs, or storage and transmission needs<br>B - Moderate anticipated costs resulting from conventional treatment or transmission needs<br>A - Low anticipated costs due to good source quality and limited transmission needs |

| Table 3-1<br>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<br>B - Reasonable chance of gaining outside funding<br>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)<br>B - Somewhat compatible with Regional Water Supply Development, Partners outside Lake County not identified<br>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)<br>B - Project area is reasonably proximate to demand areas, but not ideally located (between 10 and 40 miles)<br>A - Project area is in close proximity to demand areas (less than 10 miles) |
| **OVERALL GRADE:** | C - Project is not recommended for further consideration<br>B - Project is recommended for further consideration with qualifications<br>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.

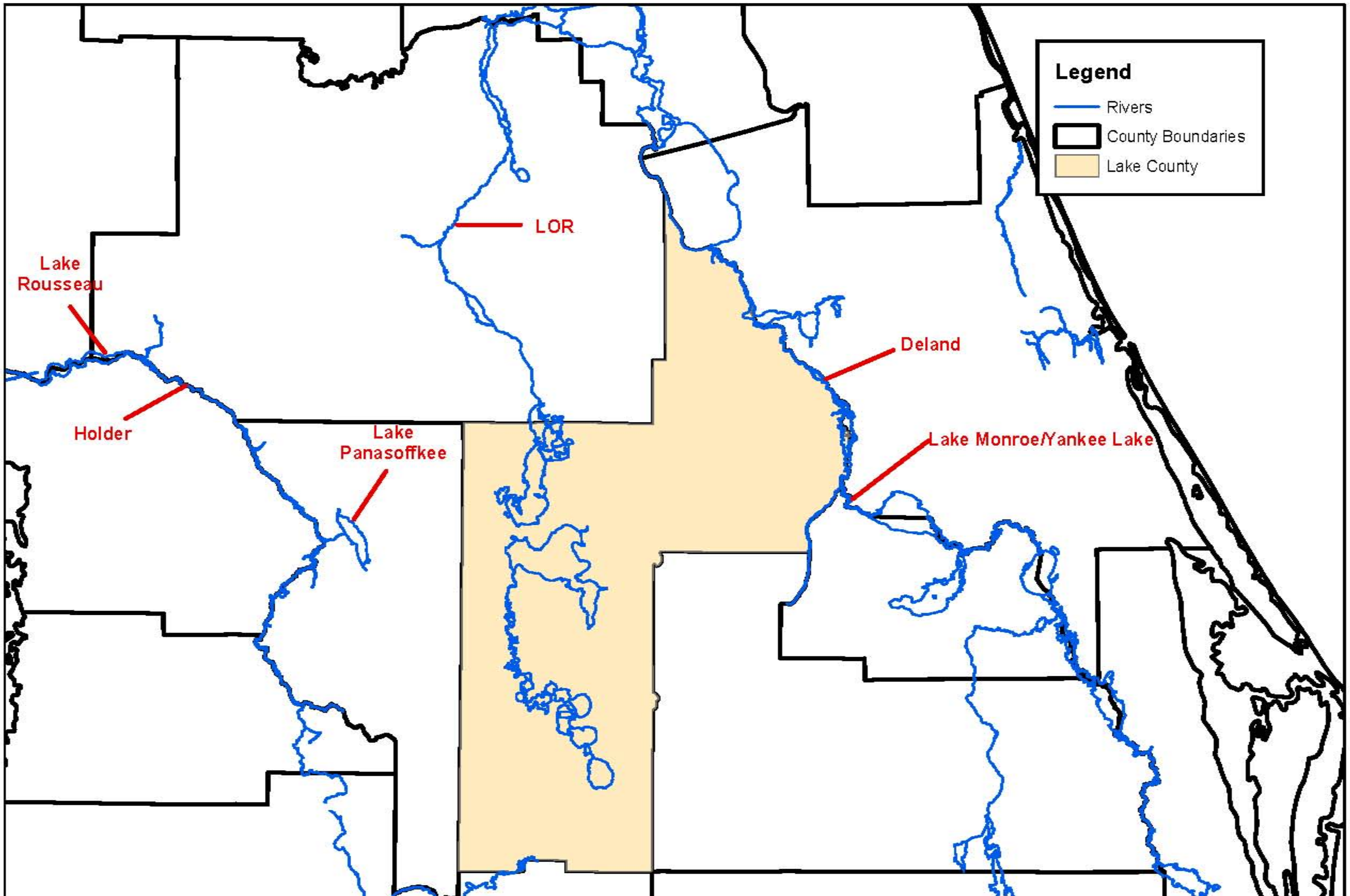
### 3.3 Preliminary Order-of-Magnitude Cost Comparison

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

| General Characteristics | St John's River | | | | | Ocklawaha River | Withlacoochee River | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Near SR 50 | Yankee Lake | Near Deland | Near Lake George | Taylor Creek Reservoir | Lower Reach - Below Conflluence 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** |

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PROJECT: 0407 - Lake County Water Alliance

Figure 3 - 5
Recommended 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

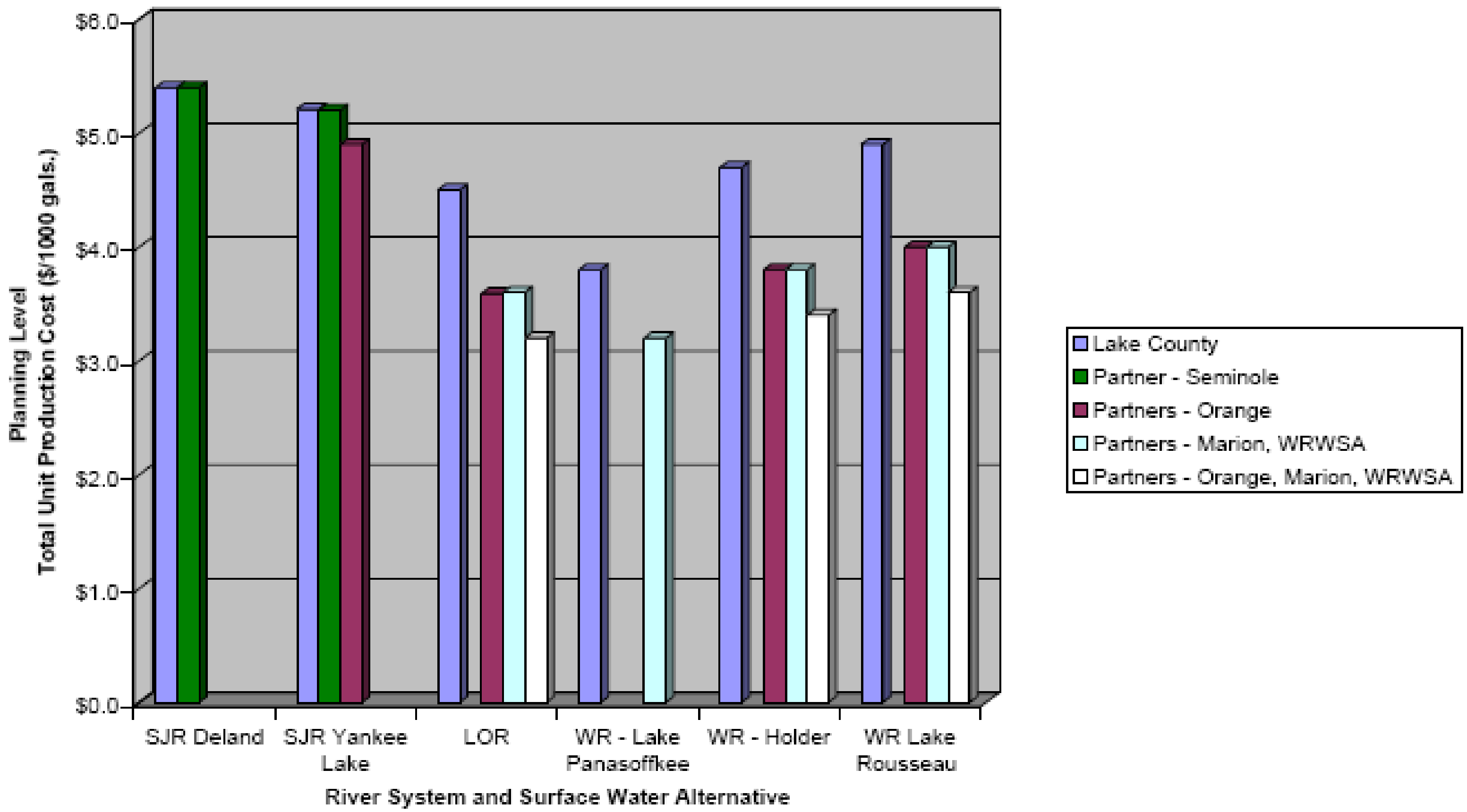
More recently, the SJRWMD has updated the cost factor (using Engineering News Record escalation indices) to provide the alternative source comparison in 2006 dollars. The SJRWMD also expanded the analysis to include partnership options with Lake County and Orange County. Presentations made by the SJRWMD 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.

- Clermont Reclaimed and Stormwater System Expansion Project

  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).

- Clermont Western WWTF – Conversion to Reuse Production

  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).

- Clermont Western WWTF – Flow Diversion to Eastern WWTF

  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).

- Clermont and City of Orlando Partnership

  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