NOTICE AND AGENDA

CEDAR KEY WATER & SEWER DISTRICT
510 3RD STREET, CEDAR KEY, FL32625

SPECIAL MEETING
August 23, 2022
5:00 P.M.

1. Call to order
2. Pledge and Prayer
3. Public Input
4. Adoption of Agenda
5. Waccasassa Regional Water System Task Reports 1-4
6. Commissioner Comments
7. Public Input
8. Adjourn

All persons are advised that if they decide to appeal any decision made at the above-referenced public hearing, they will need a record of the proceedings, and that, for such purpose, they may need to insure that a verbatim record of the proceedings is made, which record includes the testimony and evidence upon which the appeal will be based.

Phase 1: Regional AWS Feasibility – Cedar Key, Bronson, Otter Creek, and Unincorporated Areas in Levy County

Task 1 – Evaluation of Current & Future Water Supply Challenges, Needs, and Limitations (Draft)

Prepared for

Suwannee River Water Management District

TWA: 19/20-064.006

April 11, 2022

Prepared by

Wetland Solutions Inc

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Section 1 Water Supply

1.1 Introduction

The Suwannee River Water Management District (SRWMD) is one of five water management districts tasked with four core mission areas: water supply, water quality, flood control/floodplain management, and natural systems. The SRWMD comprises all or portions of 15 counties and encompasses approximately 7,640 square miles. The SRWMD is responsible for managing the needs of both natural systems and water users. To accomplish this, the SRWMD issues water supply permits for water users and develops minimum flows and minimum levels (MFLs) for natural systems within the SRWMD. These efforts are carried out in conjunction with water supply planning to determine where additional water is needed, identify alternative water supplies (AWSs), and implement cost-effective projects to address identified water challenges or shortages.

Within the Waccasassa Basin the City of Cedar Key, unincorporated Levy County, and the Towns of Otter Creek and Bronson have a variety of water and wastewater challenges that they are attempting to address with assistance from the SRWMD. For both Cedar Key and Otter Creek, these include water quality concerns related to their supply wells and treatment requirements. Additionally, Cedar Key is faced with challenging wastewater treatment issues and loss of treated water to a marine ecosystem where it cannot be beneficially recharged or reused. Bronson and Levy County are concerned with water supply and managing increasing demand in a responsible manner. These disparate challenges present potential opportunities for these entities to collaborate to develop regional projects that can help address these concerns, while also providing a reliable and resilient water supply and employing wastewater treatment and reuse strategies that can benefit the region.

The SRWMD is working with the Florida Department of Environmental Protection (FDEP) and the communities to evaluate this study area and the identified water and wastewater challenges by developing an alternatives analysis for these specific challenges and needs faced by each community. This effort is evaluating not only current needs, but also anticipated growth in the region and potential medium to long-term water supply challenges. The tasks to complete this project include:

- Task 1: Evaluation of current and future water supply challenges, needs, and limitations for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 2: Alternatives development to address current and future water supply needs.
- Task 3: Evaluation of current and projected wastewater treatment and disposal needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 4: Alternatives development for wastewater reuse and recharge.
- Task 5: Cost estimation and cost-effectiveness calculation for the identified alternatives.

This report is focused on Task 1 of the project including identification and evaluation of current and projected water supply needs and challenges.

1.1.1 Study Area

The study area for this project is the portion of the SRWMD that lies within the Waccasassa River Basin and Levy County. The primary focus of this project is the area between the Town of Bronson and the City of Cedar Key along and within the vicinity of State Road 24 (SR24). This includes the Town of Otter Creek and portions of Unincorporated Levy County along and near SR24 including the unincorporated communities of Rosewood and Sumner. The relevant boundaries and study area are shown in Figure 1.

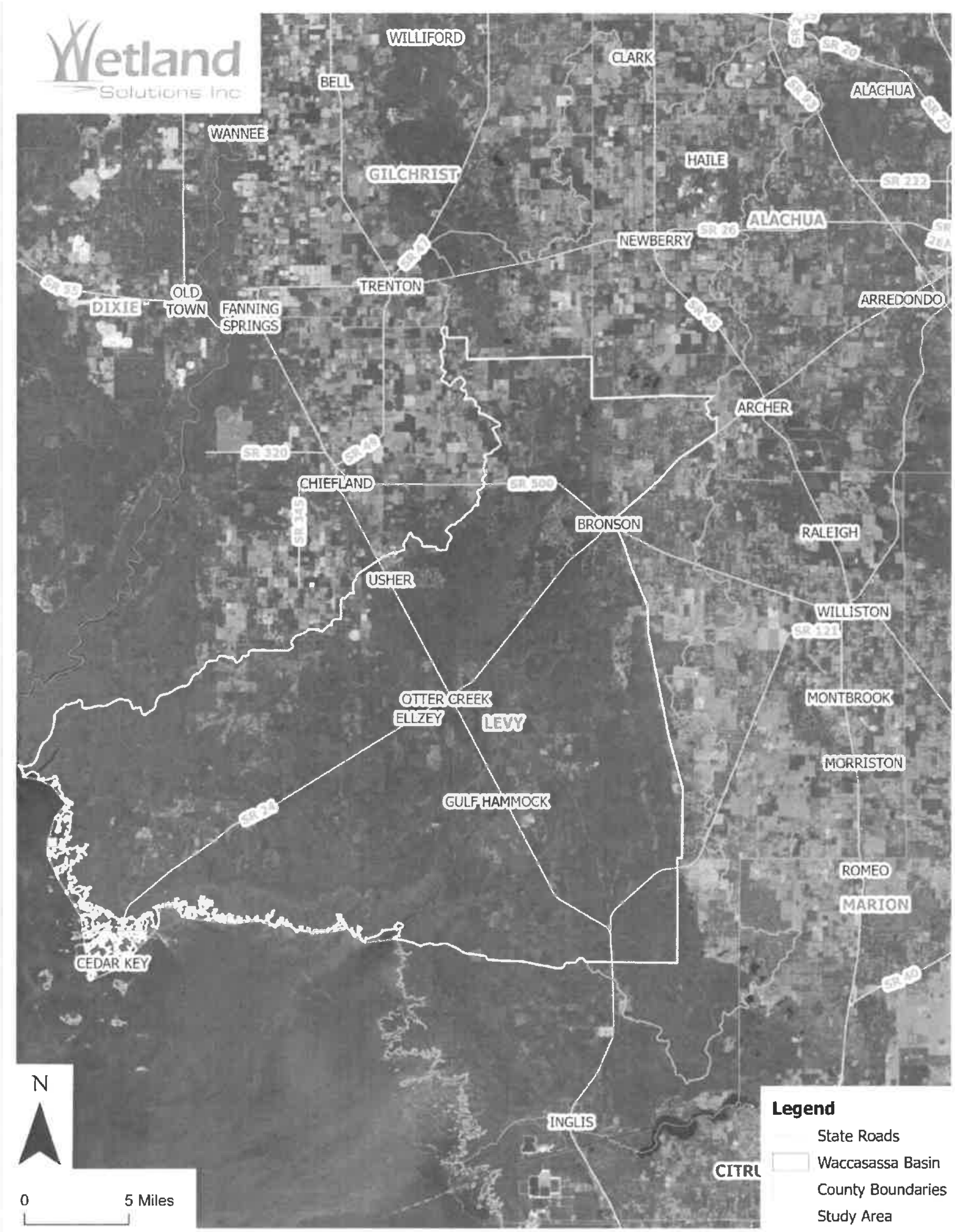

Figure 1. Regional Alternative Water Supply Feasibility Study Area Extents

Section 2 Data and Methods

This section describes the data that were collected as part of this project. Primary data types included geographic data, water treatment plant data, and population data. The following sections discuss each of these sources and the data evaluated as a part of this study.

2.1 *Geographic Data*

Geographic data were collected to evaluate the spatial attributes of features of interest. These data were generally in geographic information system (GIS) formats.

2.1.1 Data Sources

Data were collected from a variety of sources including the SRWMD, FDEP, Florida Department of Transportation (FDOT), United States Geological Survey (USGS), and the Florida Geographic Data Library (FGDL). Table 1 shows the data collected, source, and year.

Table 1. Data, Source, and Year

Data	Source	Year
Waccasassa River Basin (HUC8)	USGS	2016
Parcels	FGDL	2019
County Boundaries (Detailed Shoreline)	FGDL	2015
State Roads	FDOT	2022
Water Use Permit Wells	SRWMD	2022
Water Well Construction	SRWMD	2022
SRWMD Boundary	SRWMD	2022
Public Service Area Boundaries	SRWMD	2021
Statewide Land Use Land Cover	FDEP	2022

2.2 *Water Facility Data*

Water facilities as described in this section are facilities for which the FDEP has issued construction or operational permits for raw potable water treatment and distribution systems following the regulations in Chapter 62-550, Florida Administrative Code (F.A.C.). The following definitions have been excerpted from Chapter 62-550 and characterize public water systems based on the number of service connections and frequency with which finished water is delivered to the end users:

- *"Public Water System" or "PWS" means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes: any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system; and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Such term does not include any "special irrigation district." A public water system is either a "community water system" or a "non-community water system." See the Code of Federal Regulations (C.F.R.), title 40, part 141, section 2.*

- *"Community Water System" (CWS) means a public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.*
- *"Non-Community Water System" means a public water system that is not a community water system. A non-community water system is either a "transient non-community water system" (TWS) or a "non-transient non-community water system" (NTNCWS). See the Code of Federal Regulations (C.F.R.), title 40, part 141, section 2. Other public water systems are addressed in Chapter 64E-8, F.A.C.*
- *"Transient Non-Community Water System" or "TWS" means a non-community water system that does not regularly serve at least 25 of the same persons over six months per year. See the Code of Federal Regulations (C.F.R.), title 40, part 141, section 2.*
- *"Non-Transient Non-Community Water System" means a public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.*

Public water systems do not include individual wells used by homeowners and small businesses to meet their potable water supply needs. These are described and inventoried in Section 2.2.2.

2.2.1 Inventory of Existing Public Water System Facilities

Table 2 summarizes the Public Water Systems located within the study area. Of these 19 systems, 4 are community systems and 15 are non-community systems. The "community" water systems are owned by the larger entities such as the City of Cedar Key, the Towns of Bronson and Otter Creek, and Levy County's University Oaks facility. The "non-community" systems include commercial establishments, recreational vehicle campgrounds, and some schools and religious facilities. The combined capacity of the community systems is about 0.75 million gallons per day (MGD).

Table 2. Permitted Potable Water Supply Facilities

PERMIT ID	SRMWD CUP	NAME	CITY	CAPACITY (MGD)	FACILITY TYPE
2381178	216830	BRONSON WTP	BRONSON	0.235	COMMUNITY
2381208	220497	UNIVERSITY OAKS MHP	BRONSON	<0.1	COMMUNITY
2381414	220940	LEVY FORESTRY WORK CAMP	BRONSON	<0.1	NONCOMMUNITY
2381416	N/A	BRONSON SPEEDWAY	BRONSON	<0.1	NONCOMMUNITY
2381421	N/A	IMAGINATION STATION I	BRONSON	<0.1	NONTRANSIENT NONCOMMUNITY
2381440	N/A	IMAGINATION STATION CENTER II	BRONSON	<0.1	NONCOMMUNITY
2381451	N/A	FLAMINGO PRODUCE & SEAFOOD	BRONSON	<0.1	NONCOMMUNITY
2381464	N/A	BRONSON RD BAPTIST CHURCH & SCHOOL	BRONSON	<0.1	NONCOMMUNITY
2381472	N/A	TEMPLO DE LA ALABANZA	BRONSON	<0.1	NONCOMMUNITY
2381477	215897	BLACK PRONG EQUESTRIAN VILLAGE WTP	BRONSON	0.0097	NONCOMMUNITY
2380178	216821	CEDAR KEY WTP	CEDAR KEY	0.3026	COMMUNITY
2381415	216321	RAINBOW COUNTRY RV CAMPGROUND	CEDAR KEY	<0.1	NONCOMMUNITY
2381419	217095	CEDAR KEY RV AND STORE	CEDAR KEY	<0.1	NONCOMMUNITY

PERMIT ID	SRMWD CUP	NAME	CITY	CAPACITY (MGD)	FACILITY TYPE
2381426	N/A	THE OTHER PLACE, TOO	CEDAR KEY	<0.1	NONCOMMUNITY
2381457	N/A	ROBINSON'S SEAFOOD & RESTAURANT	CEDAR KEY	<0.1	NONCOMMUNITY
2381468	N/A	SHELLMOUND RV PARK	CEDAR KEY	<0.1	NONCOMMUNITY
2380854	216656	OTTER CREEK	OTTER CREEK	0.108	COMMUNITY
2381379	N/A	ODYSSEY CAMPGROUND	ROSEWOOD	<0.1	NONCOMMUNITY
2381442	N/A	CLAM SHACK, THE	ROSEWOOD	<0.1	NONCOMMUNITY

2.2.2 Inventory of Existing Domestic Self-Supply Facilities

In addition to the public supply systems and associated wells there are many domestic self-supply wells located in the study area. Most of these wells are located outside of the PSAs although some number of wells are shown within the identified PSAs. Well data were provided by the SRWMD and included both water use permit (WUP) wells and water well construction (WWC). Figure 2 shows the known domestic self-supply wells located within the study area. There are 1,467 private wells within the project area and 379 wells associated with water use permits. Most of these wells are in the northeastern portion of the study area between Newberry and Bronson. Within Levy County and the Waccasassa Basin there are 616 private wells and 96 wells associated with WUPs. Within the PSAs there were 19 private wells in Bronson, 3 private wells in Otter Creek, and 20 private wells in Cedar Key.

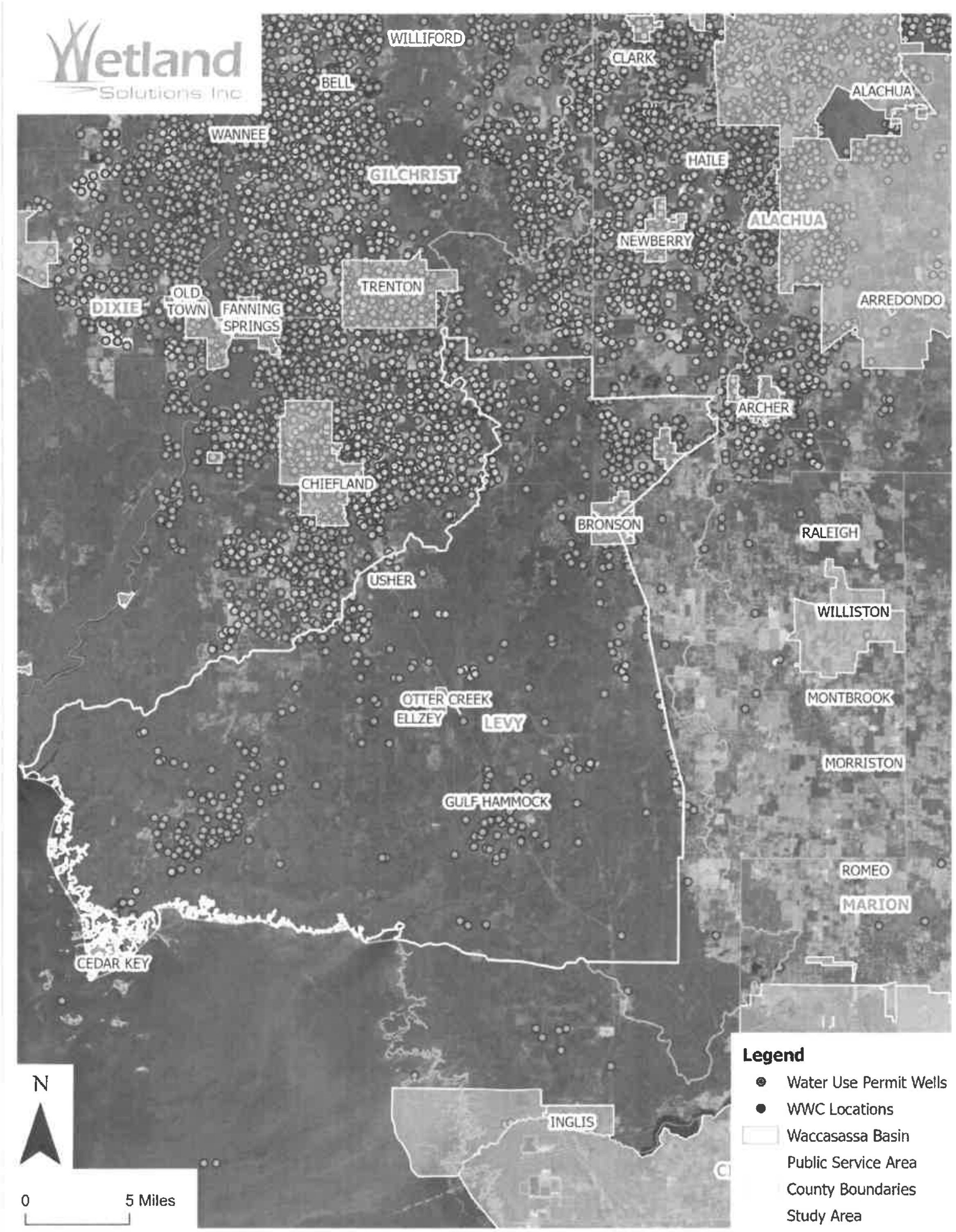

Figure 2. Domestic Self-Supply and Public Supply Wells in the Waccasassa Feasibility Study Area

2.3 Population Growth Projections

This study also considered expected population growth through 2045. The primary sources used for population growth estimates were the Bureau of Economic Research (BEBR) at the University of Florida (Rayer and Wang 2021) and population projections developed for the SRWMD for regional water demand projections (Suwannee River Water Management District 2021). BEBR population estimates include a low, medium, and high estimate. Population projections were compared between BEBR and SRWMD. The SRWMD estimates provide information for evaluating water use for a single water-using entity, while the BEBR estimates present county totals. Population projections for each of the entities in this study are discussed in later sections. Population projections for each utility varied between the number reported on the monthly operations report (MOR), number discussed in conversations with the municipalities, and numbers estimated in the SRWMD's water use projections. In all cases, except Cedar Key, the numbers were similar, but not identical. The deviation in Cedar Key's values are believed to be the difference based on permanent versus weekend tourists.

Section 3 Water Supply Considerations

This project is evaluating water supply considerations for Bronson, Cedar Key, Otter Creek, and Unincorporated Levy County. These entities have a variety of concerns that include water quality, water availability, accommodating growth, operational costs, and future water supplies. WSI met with representatives of the local governments and/or utilities to better understand existing challenges, needs, and limitations for each of the entities. The findings of these meetings and information gathered from existing permits and related documentation are discussed for each of the entities in the following sections.

3.1 Town of Bronson

The Town of Bronson is in the southeast portion of the SRWMD, with a part of the Town's limits lying within the Southwest Florida Water Management District (SWFWMD). As part of the permit renewal for the Town's consumptive use permit (CUP), the SWFWMD legal counsel reviewed the permit and found that an interagency agreement was unnecessary because all supply wells were located within the SRWMD. Bronson's existing CUP is for an average daily rate of 0.235 MGD and was issued January 13, 2013, with an expiration of January 13, 2033. The Town of Bronson, supply wells, and the Public Service Area (PSA) is shown in Figure 3.

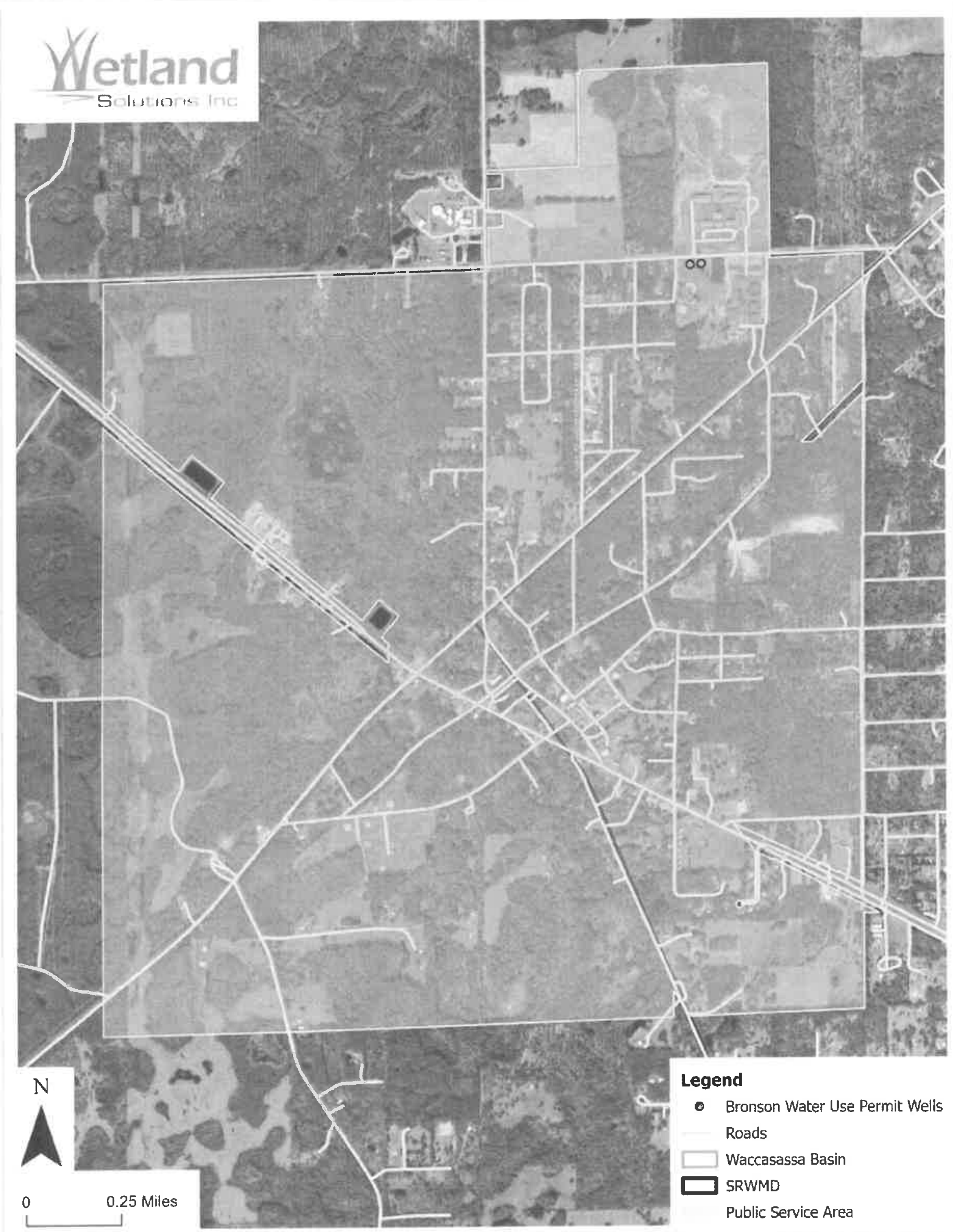

Figure 3. Town of Bronson Public Supply Wells and Public Service Area

3.1.1 Water Infrastructure and Treatment

The Town of Bronson operates PWS 2381178, a community water system with a maximum day capacity of 0.864 MGD. The PWS includes two production wells (Wells 2 and 3) and treatment consisting of chlorination before distribution. Well 2 is an 8" well that was installed in 1987 with a capacity of 320 gpm. Well 3 is a 12" well installed in 1993 with a capacity of 500 gpm. An existing project is rehabilitating the wells to increase the capacity of Well 2 from 320 gpm to 500 gpm.

The distribution system was upgraded in 1994 with many lines converted to 4-6" PVC although portions of the system remain on 2" lines. There are also some remaining asbestos pipes in the system that are replaced as they are identified. Water plant operation is contracted to Water Pro, Inc.

3.1.2 Existing Water Use

Based on data from the January 2022 monthly operation report (MOR), a total of 1,125 people were served through 600 service connections. Average water use during the month was 0.165 MGD. This equates to approximately 147 gallons per person per day.

In the meeting with the Town of Bronson, it was explained that there are 661 accounts with 55 government accounts, 17 church accounts, 66 commercial accounts, and 523 residential accounts. The population is approximately 1,081 people although this number is increasing with current development. The MOR value and Town estimate vary slightly due to minor variations in populations and accounts served. It is expected that the number of accounts is more accurate from the Town than from the MOR since they do the water billing.

The Town has increased rates by 11.5% each of the last two years to increase revenue to offset the Town's costs. Current water rates are structured as an inclining block rate and include a base rate of $14.19 that includes the first 2,000 gallons per month. Water use beyond the first 2,000 gallons costs $3.00/1,000 gallons for 2,000-4,000 gallons, $3.36/1,000 gallons for 4,000-6,000 gallons, $3.75/1,000 gallons for 6,000-8,000 gallons, $4.18/1,000 gallons for 8,000-10,000 gallons, and $4.64/1,000 gallons for use beyond 10,000 gallons.

3.1.3 Water Supply Challenges and Limitations

Bronson water quality tends to be very good requiring minimal treatment with no reported issues. The Bronson WTP has had no reported water quality violations.

Water system challenges primarily relate to providing adequate flow rates for fire flows and concerns with meeting future demands. Currently the system is incapable of maintaining pressure while also delivering fire flows. This results in inadequate pressure for meeting fire flow demands and substantial pressure drops in the system that cause a loss of pressure at residences. Additionally, the Town's new fire station cannot receive adequate flow to meet fire suppression system needs within the building. To address issues at the fire station, Bronson is constructing a $260,000, 12" well to provide supplemental water and pressure to meet fire flow needs. This new well will be dedicated to the fire station and will not be tied in with the Town's water supply system. During the meeting with the Town, staff indicated that there is variable groundwater quality depending on geography. Groundwater quality on the high and dry east side of town is superior to that in the lower-lying flatwoods areas in the western portion.

The other primary water-related issue facing Bronson is growth related demands. In the past year, Bronson has seen the addition of 20 homes. There are also plans for the addition of 50 more homes over the next several years. These homes will result in additional residents that could increase population by more than 10%. In discussions with the Town, there were concerns that the population could grow by 20% over the next five years. Further complicating population projections are potential toll roads that may be constructed in the area. These roads could drastically increase traffic and the need for businesses to meet traveler's needs. It is also expected that this kind of infrastructure could result in a large increase in housing demand. The potential effects of this these projects are currently unknown.

3.1.3.1 Water Quality

The Town of Bronson's water supply wells produce excellent quality water with no parameters above maximum contaminant levels (MCLs). Concentrations of nitrate, which is highly mobile in groundwater, indicate a water that is influenced by some source of enrichment (i.e., fertilizer or wastewater).

Table 3. Town of Bronson Finished Water Quality

Parameter*	Result	MCL	Units	Qualifier
Nitrate+Nitrite (as N)	2.46		mg/L	
Nitrate (as N)	2.46	10	mg/L	
Nitrite (as N)	0.2	1	mg/L	U
Arsenic	0.001	0.01	mg/L	U
Barium	0.002	2	mg/L	U
Cadmium	0.001	0.005	mg/L	U
Chromium	0.0017	0.1	mg/L	I
Cyanide	0.005	0.2	mg/L	U
Fluoride	0.2	4.0	mg/L	U
Lead	0.001	0.015	mg/L	U
Mercury	0.0001	0.002	mg/L	U
Nickel	0.001	N/A	mg/L	U
Selenium	0.002	0.05	mg/L	U
Sodium	3.77	N/A	mg/L	
Antimony	0.001	0.006	mg/L	U
Beryllium	0.0005	0.004	mg/L	U
Thallium	0.001	0.002	mg/L	U
Aluminum	0.01	0.05-0.2	mg/L	U
Chloride	6.43	250	mg/L	J
Copper	0.0012	1.0	mg/L	I
Fluoride	0.2	2.0	mg/L	U
Iron	0.01	0.3	mg/L	U
Manganese	0.01	0.05	mg/L	U
Silver	0.0005	0.1	mg/L	U
Sulfate	2.12	250	mg/L	
Zinc	0.0051	5	mg/L	
Color	5	15	CU	U
Odor	1	3	TON	U, Q
pH	8.13	6.5-8.5	SU	Q
Total Dissolved Solids	136	500	mg/L	

Parameter*	Result	MCL	Units	Qualifier
Foaming Agents	0.2	0.5	mg/L	U
Xylenes	0.00251	10	mg/L	
Total Haloacetic Acids (HAA5)	0.00889	0.06	mg/L	
Total Trihalomethanes (TTHM)	0.00573	0.08	mg/L	

All VOCs and Synthetic Organics except Xylenes were BDL
***All parameters sampled 10/27/2021, except HHA5 and TTHM sampled 8/24/2021**

3.1.4 Projected Water Use

The population of Bronson was estimated by the SRWMD, as part of their water use projections, to be 1,133 in 2020 with no change projected in 2045. Water use projections for the town were 0.15 MGD of groundwater use in 2020 with the same projected use of 0.15 MGD in 2045. These estimates were based on available information at the time of water use projections. In the absence of specific information (e.g., development plans), the SRWMD considered the BEBR medium estimate as the most aggressive estimate of future population. In the case of Bronson, no additional population growth was anticipated.

Based on conversations with the Town of Bronson, it appears current SRWMD estimates may underestimate population growth through 2045. BEBR estimates for Levy County include slightly negative population growth in the low estimate (-5% through 2045) while the medium estimate includes approximately 16% growth between 2021 and 2045 (Rayer and Wang 2021). Town staff estimate that they will see at least 20% growth over the next 5 years based on the addition of 20 homes in the past year, a new planned development of 50 homes, and additional interest from developers. The intent of these developments and Town staff would be to connect the homes to both water and sewer.

To consider potential higher growth scenarios, the estimated population of Bronson was calculated based on a base population of 1,133 from the SRWMD and the BEBR medium and high population Levy County estimates. The medium estimate was 1,310 and the high estimate was 1,539 through 2045.

Bronson had a water audit completed by the Florida Rural Water Association (FRWA) in 2012 (Florida Rural Water Association 2012b). This analysis found that corrected annual pumping was 57.58 million gallons, with 49.98 million gallons of water sold. After accounting for authorized unmetered use, 6.04 million gallons was assigned to potential system leakage (10.5%). Based on discussions with the Town, a more recent audit found that unaccounted for water loss has decreased.

3.2 *City of Cedar Key*

The City of Cedar Key is in the southwestern tip of Levy County on an island in the Gulf of Mexico. The City has a long history and was first developed in the late 1860s. Of historical significance, the City includes one of Florida's two state museums and the smallest school in Florida. The City is also one of the only coastal areas in Florida that derives a majority of its income from industry (primarily aquaculture) rather than tourism. Figure 4 shows the City of Cedar Key, supply wells, and PSA boundary.

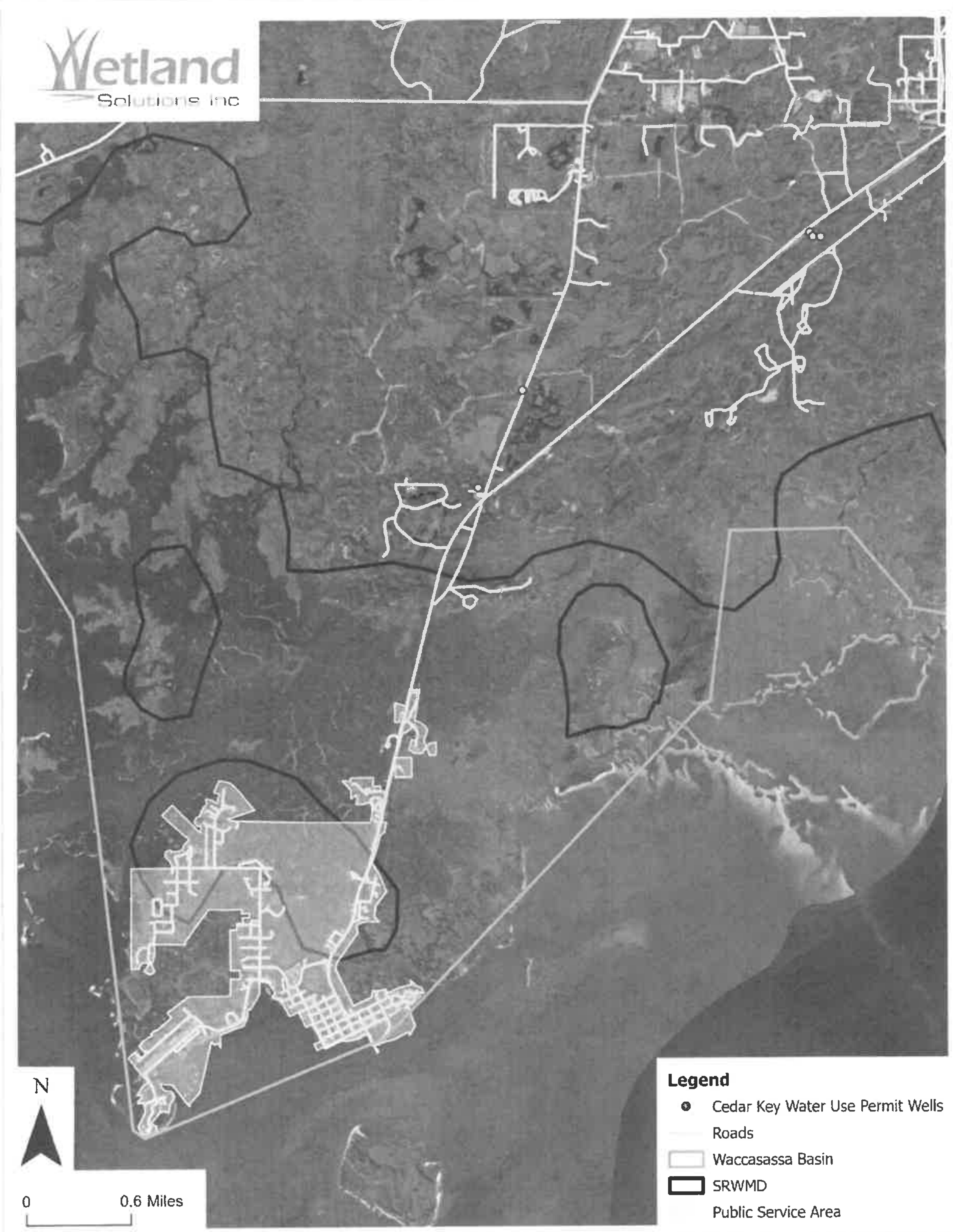

Figure 4. City of Cedar Key Public Supply Wells and Public Service Area

3.2.1 Water Infrastructure and Treatment

The Cedar Key Water and Sewer District (CKWSD, a Special District) operates PWS 2380178, a community water system with a maximum day capacity of 0.360 MGD. A map of the CKWSD's Service Area (Cedar Key Water & Sewer District n.d.) is shown in Figure 5.

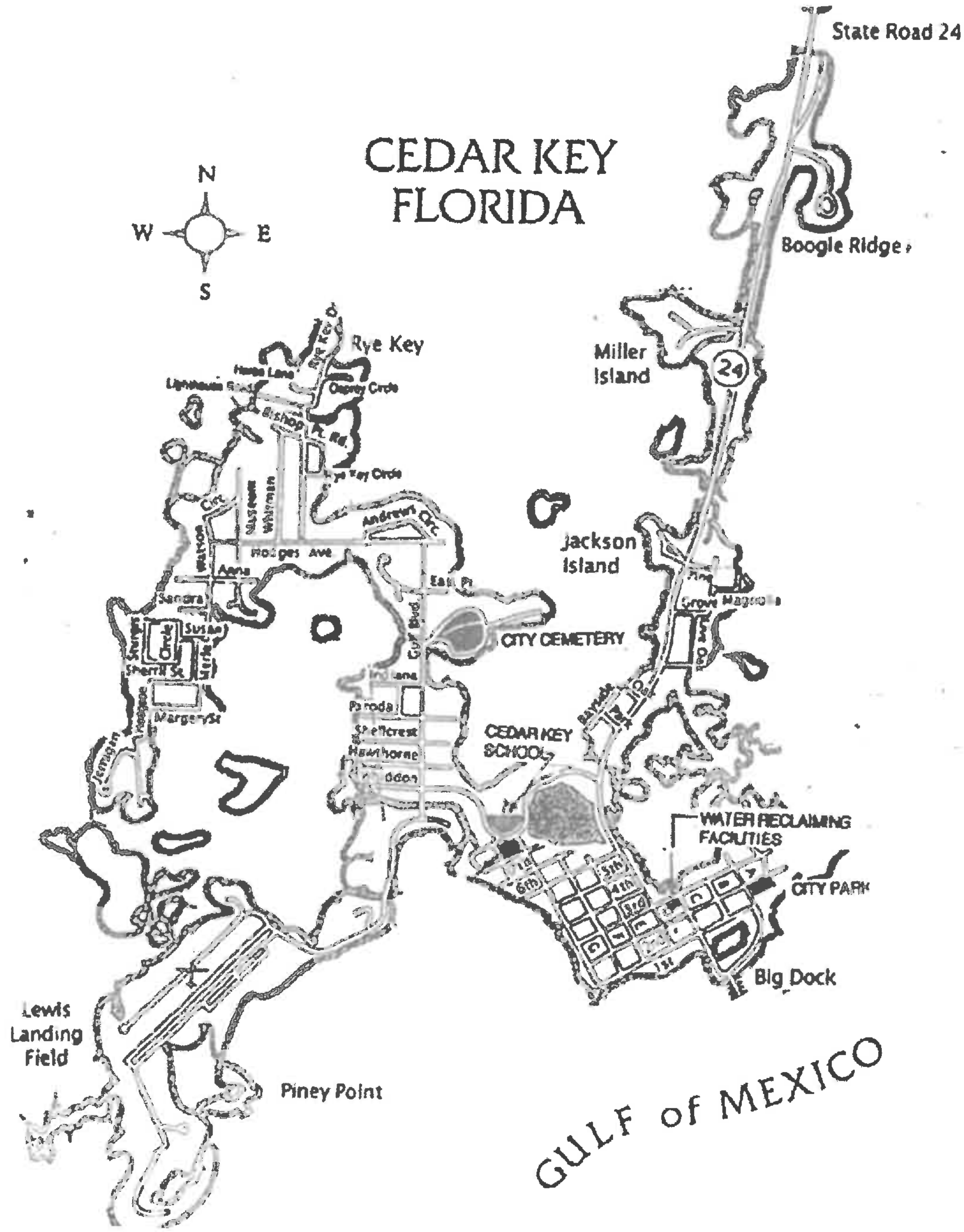

Figure 5. Cedar Key Water & Sewer District Service Area

The CKWSD has faced water supply challenges for years. These problems are primarily related to poor source water quality from the CKWSD's water supply wells. The CKWSD has a total of five wells numbered 1-5, although Wells 1-3 are inactive and no longer used for providing drinking water. Wells 4 and 5 provide water with pumping alternated between the wells. Well 4 is constructed to 145 feet and Well 5 is constructed to 186 feet deep.

Following withdrawal, the CKWSD uses a multi-step treatment process to manage high levels of total organic carbon (TOC) and hardness in the source water. This process is briefly outlined below.

- Initial treatment with sodium permanganate,
- Ion exchange,
- Initial chlorination,
- Lime softening,
- Sand filters with aeration,
- Hydrogen peroxide for de-chlorination,
- Carbon filters, and
- Final chlorination (with re-chlorination if the residual is not met).

The CKWSD's current water treatment plant was constructed in 1962 and has been upgraded to continue to provide good quality water, but the plant is reaching the end of its useful lifespan and will need substantial retrofit or replacement to continue to meet the community's needs. The cost for replacement of the water treatment plant was estimated to be between $13 and $15 million based on meetings with the CKWSD and the City of Cedar Key. The CKWSD has also completed a study of potential new well construction. Based on exploratory wells drilled and evaluated along SR24, there was no indication of higher quality water until close to Bronson.

3.2.2 Existing Water Use

Based on data from the January 2022 MOR, an estimated 734 people were served through 908 service connections. Average water use during the month was 0.144 MGD. This equates to 196 gallons per person per day, although this average flow is highly impacted by tourism related use on the weekends and likely overestimates use by residents.

The CKWSD has approximately 1,008 water accounts, although this number can vary. The served population is highly variable based on part-time owners and weekend tourism. Current flows are approximately 90,000-100,000 gallons per day Monday through Thursday with flows approximately doubling to tripling on weekends. During the meeting with CKWSD, it was noted that flows may increase to 250,000-280,000 gallons per day on festival weekends.

The CKWSD's water rates have an increasing block rate structure with a $27/month account charge. Water usage is charged at a rate of $2.71/1,000 gallons for 0-3,000, $5.08/1,000 gallons for 3,000-6,000, $7.17/1,000 gallons for 6,000-9,000 gallons, and $9.27/1,000 gallons for usage over 9,000 gallons per month. The current water rates in combination, with a portion of ad valorem taxes, allow for the system to generate approximately the amount of revenue that is spent to run the system.

3.2.3 Water Supply Challenges and Limitations

The City of Cedar Key/CKWSD have a variety of water system challenges. These include poor water quality from the supply wells, a treatment plant that is near its end of life, an aquaculture industry that is reliant on extremely high-quality water, increasing treatment costs, and highly variable demands. Resolving all of these problems completely would require either an expensive new water plant with continuing expensive treatment or an alternative water supply with higher source water quality and presumably lower treatment costs. Specific water quality related issues are discussed below.

3.2.3.1 Water Quality

The CKWSD relies on Wells 4 and 5 to provide water supply to the water treatment plant. During water quality testing as part of well completion for Well 5 (Mittauer & Associates, Inc. 2016) results indicated elevated levels of both iron (2.1 milligrams per liter [mg/L] vs. MCL of 0.3 mg/L) and color (60 Platinum-Cobalt Units [PCU] vs MCL of 15 PCU) in the source water.

Water quality following treatment is shown in Table 4. Sampling for disinfection byproducts is completed at two locations within the CKWSD system: Hodgson and Jernigan, and Gulf and Hodges. The most recent sampling in November 2021 for disinfection byproducts found total haloacetic acids (HAA5) with concentrations of 17.61 micrograms per liter (ug/L) and 0.98 ug/L compared to the MCL of 60 ug/L and total trihalomethanes (TTHM) with concentrations of 45.88 ug/L and 2.18 ug/L compared to the MCL of 80 ug/L at Hodgson and Jernigan, and Gulf and Hodges, respectively.

Table 4. City of Cedar Key Finished Water Quality

Parameter*	Result	MCL	Units	Qualifier
Nitrate (as N)	0.5	10	mg/L	U
Nitrite (as N)	0.1	1	mg/L	U
Arsenic	0.00052	0.01	mg/L	I
Barium	0.021	2	mg/L	
Cadmium	0.00025	0.005	mg/L	U
Chromium	0.005	0.1	mg/L	U
Cyanide	0.004	0.2	mg/L	U
Fluoride	0.25	4.0	mg/L	U
Lead	0.003	0.015	mg/L	U
Mercury	0.000071	0.002	mg/L	I
Nickel	0.0012	N/A	mg/L	U
Selenium	0.0012	0.05	mg/L	U
Sodium	15	N/A	mg/L	
Antimony	0.001	0.006	mg/L	U
Beryllium	0.002	0.004	mg/L	U
Thallium	0.00025	0.002	mg/L	U
Aluminum	0.15	0.05-0.2	mg/L	
Chloride	33	250	mg/L	
Copper	0.001	1.0	mg/L	U
Fluoride	0.25	2.0	mg/L	U
Iron	0.0067	0.3	mg/L	U
Manganese	0.001	0.05	mg/L	U

Parameter*	Result	MCL	Units	Qualifier
Silver	0.0005	0.1	mg/L	U
Sulfate	23	250	mg/L	
Zinc	0.05	5	mg/L	U
Color	1	15	CU	U
Odor	1	3	TON	U
pH	7.9	6.5-8.5	SU	
Total Dissolved Solids	240	500	mg/L	
Foaming Agents	0.04	0.5	mg/L	U

All VOCs were BDL

***All parameters sampled 5/18/2021, except HHA5 and TTHM sampled 11/3/2021**

3.2.4 Projected Water Use

Population estimates for Cedar Key from the SRWMD provide an estimated population of 2,304 people in 2020 with an unchanged projected population in 2045. These population estimates appear to represent the average population, considering the influence of seasonal residents and tourists. Cedar Key is nearly completely developed, and any additional people could only be accommodated by temporary residents becoming permanent residents or re-development within the City. The SRWMD water projections for Cedar Key estimated 0.13 MGD of groundwater use in 2020 and 0.13 MGD of groundwater use in 2045. The City did not indicate that they anticipate significant growth in population.

Cedar Key had a water audit completed by the Florida Rural Water Association (FRWA) in 2012 (Florida Rural Water Association 2012a). This analysis found that corrected annual pumping was 47.61 million gallons, with 39.16 million gallons of water sold with unaccounted water of 8.46 million gallons (18%). Of this, after accounting for authorized unmetered use, 6.03 million gallons was assigned to potential system leakage (12.7%). Based on meeting with the City and identified system improvements, this previous audit may overestimate system losses.

3.3 *Town of Otter Creek*

The Town of Otter Creek is located along SR24 between Bronson and Cedar Key just west of the intersection with US19 (Figure 6). Otter Creek's existing CUP is for 0.108 MGD of water. Otter Creek's current CUP was issued March 12, 2007 and expires March 12, 2027.

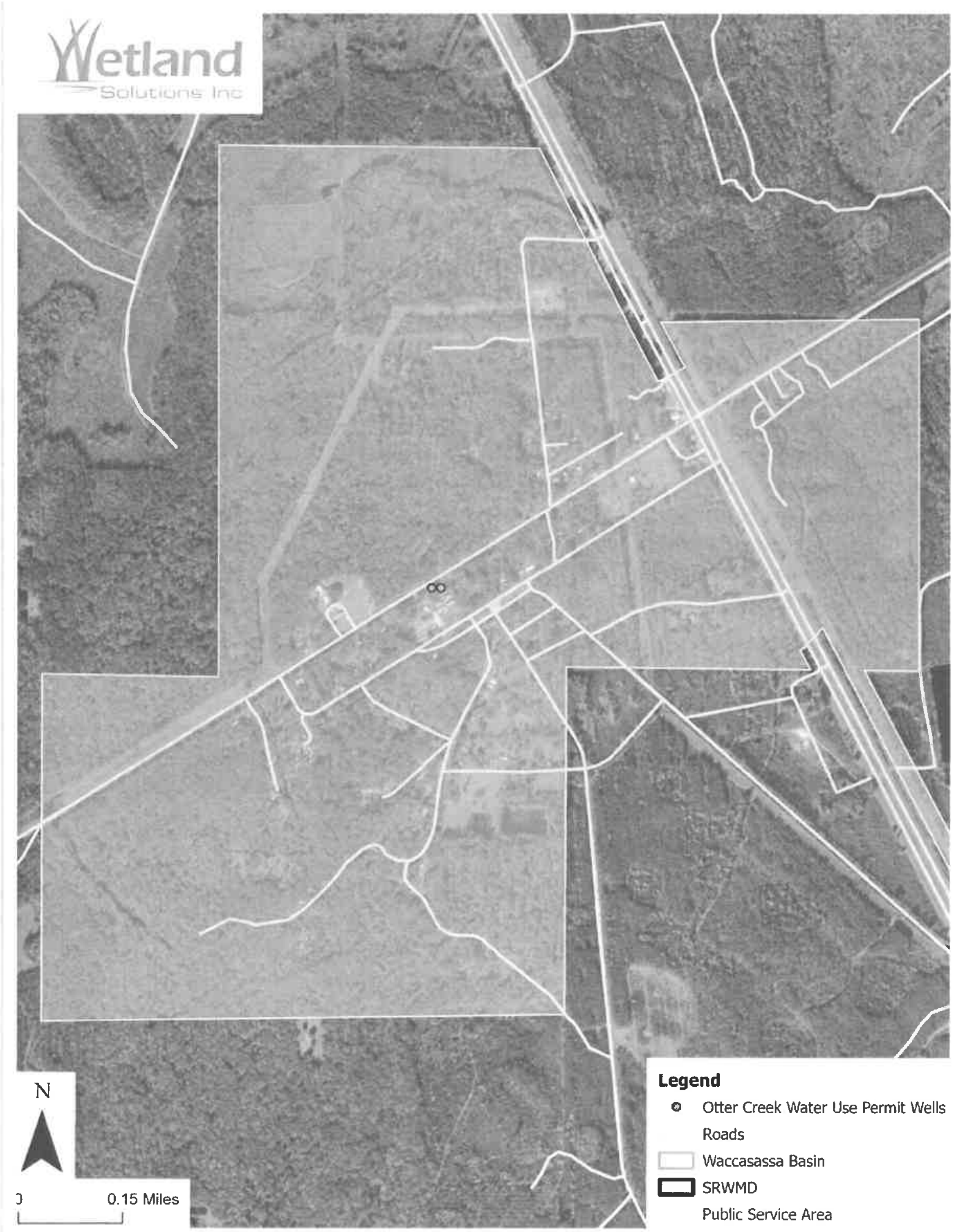

Figure 6. Town of Otter Creek Public Supply Wells and Public Service Area

3.3.1 Water Infrastructure and Treatment

The Town of Otter Creek operates PWS 2380854, a community water system with a maximum day capacity of 0.108 MGD. The Town currently supplies water to approximately 118 people through 75 service connections. Water is supplied by two wells, although only one is currently being used because of better water quality. Well 1 has a depth of approximately 102 feet and Well 2 has a depth of 65 feet ("Otter Creek Construction Permit" 1981). Following withdrawal, water is treated using permanganate and ammonium hydroxide to reduce hardness and improve water quality prior to disinfection with chlorine. The system also includes a storage tank and a pneumatic pressure tank. The distribution system is approximately 20 years old and is primarily 6" PVC pipe. The current system also supplies a network of fire hydrants. The Town is currently having a filtration system installed by a vendor to improve water quality. After one year of use the filters will become the property of the Town.

3.3.2 Existing Water Use

Based on data from the January 2022 monthly operation report (MOR), a total of 120 people were served through 88 service connections. Average water use during the month was 0.0093 MGD. This use equates to 78 gallons per person per day. The water system is currently operated by Water Pro, Inc.

The Town's water rates are structured as an increasing block rate structure. Current water rates are $24/month for the first 2,000 gallons of water with the following blocks beyond this first block; 2,000-5,000 gallons are $6.00/1,000 gallons, 5,000-8,000 gallons are $6.50/1,000 gallons, and use over 8,000 gallons is charged at $7.00/1,000 gallons. Meters are read monthly. Rates were previously $22.50/month for 4,000 gallons of water, but the Town was losing money on operation of the water system. With these rate adjustments it is still expected to take 5 years to have the state required set aside of $10,000 to cover maintenance.

3.3.3 Water Supply Challenges and Limitations

After treatment the water retains some taste and odor and most residents do not drink the water, but rather use bottled water for consumption. The treatment system is old, and many components are in major need of repair including the storage tank, pneumatic tank, and other components. Several grants have been applied for and received to improve the current water system. The distribution system was upgraded approximately 20 years ago to PVC and is in good repair. Similarly, meters at the service connections are in good repair and have been replaced as needed. The current distribution system includes fire hydrants although the ability of the storage tank (32,000 gallons) to meet prolonged fire demands is limited.

3.3.3.1 Water Quality

Based on sampling data for Well 1 source water from 1966, iron was 2.7 mg/L (MCL of 0.3 mg/L) and color was 50 PCU (MCL of 15 PCU) ("Otter Creek Construction Permit" 1981). Raw water samples in June 1993 reported an iron concentration of 5.5 mg/L for iron, a sample from August 1993 had iron at 6.7 mg/L for Well 1 and at 5.8 mg/L for Well 2, and a third sample from August 1993 had an iron of 7.08 mg/L with a color of 333 PCU ("Otter Creek Pump Documents" 1995). These parameters continue to cause issues with treatment and finished water quality. Disinfection byproducts data from September 2021 indicated concentrations below the relevant MCLs.

Table 5. Town of Otter Creek Finished Water Quality

Parameter	Result	MCL	Units	Qualifier
Nitrate+Nitrite (as N)	0.318		mg/L	I
Nitrate (as N)	0.318	10	mg/L	I
Nitrite (as N)	0.2	1	mg/L	U
Arsenic	0.001	0.01	mg/L	U
Barium	2	2	mg/L	
Cadmium	0.005	0.005	mg/L	U
Chromium	0.1	0.1	mg/L	
Cyanide	0.2	0.2	mg/L	U
Fluoride	4	4.0	mg/L	U
Lead	0.015	0.015	mg/L	U
Mercury	0.002	0.002	mg/L	U
Nickel	0.1	N/A	mg/L	U
Selenium	0.05	0.05	mg/L	U
Sodium	160	N/A	mg/L	
Antimony	0.006	0.006	mg/L	U
Beryllium	0.004	0.004	mg/L	UJ
Thallium	0.002	0.002	mg/L	U
Aluminum	0.01	0.05-0.2	mg/L	
Chloride	51.1	250	mg/L	
Copper	0.001	1.0	mg/L	U
Fluoride	0.2	2.0	mg/L	U
Iron	0.01	0.3	mg/L	U
Manganese	0.01	0.05	mg/L	U
Silver	0.0005	0.1	mg/L	U
Sulfate	2.17	250	mg/L	
Zinc	0.002	5	mg/L	U
Color	5	15	CU	U
Odor	1	3	TON	U
pH	8.04	6.5-8.5	SU	
Total Dissolved Solids	394	500	mg/L	
Foaming Agents	0.2	0.5	mg/L	U
Total Haloacetic Acids (HAA5)	0.0317	0.06	mg/L	
Total Trihalomethanes (TTHM)	0.0111	0.08	mg/L	

All VOCs and Synthetic Organics were BDL
***All parameters sampled 9/29/2021, except HHA5 and TTHM sampled 9/7/2021**

3.3.4 Projected Water Use

Currently population in Otter Creek is not expected to change. Estimates from the SRWMD were 173 people in 2020 with no projected change in population in 2045. There are several significant unknowns that could have large impacts on population. These include two major toll highways that are expected to divert traffic through the area along US19. It is not currently known what the impacts of these roads might be, but there could be a need for local businesses to support travelers. In conflict with this potential for growth, development opportunities within the vicinity of the town are limited by low-lying areas prone to flooding and within the 100-year floodplain. The SRWMD groundwater projections for Otter Creek are estimated as 0.01 MGD in 2020 and 0.01 MGD in 2045.

3.4 *Unincorporated Levy County*

Unincorporated Levy County includes the areas outside of the towns and cities. This includes all of the areas between Bronson and Otter Creek and between Otter Creek and Cedar Key including the community of Rosewood.

3.4.1 Water Infrastructure and Treatment

The County currently operates two water treatment facilities associated with small developments. In both cases the facilities were taken over after the operating entities became insolvent. The County does not serve water to residents outside of these two areas but does have an interest in helping ensure that their residents have a safe and reliable water supply.

3.4.2 Existing Water Use

One of the County's water plants is located at University Oaks (PWS 2381208) in Bronson, while the second system is located at Springside Park Adult Community near Chiefland. The Town of Bronson has considered annexing University Oaks and including it within their water service area. Springside Park is not located within the area of interest for this project.

Based on the January MOR, University Oaks served a population of 369 people through 123 connections. The average daily water use was 49,500 gallons for a per capita water use of 134 gallons per person per day.

3.4.3 Water Supply Challenges and Limitations

Levy County's primary concerns are not with their existing water systems, although these systems have not been profitable for the County. The primary concern for the County is related to users, particularly between Otter Creek and Cedar Key, that are on relatively shallow wells with poor and potentially unsafe water quality. These users either have to tolerate the poor quality or spend money on treatment systems to improve the water quality. There are also significant concerns given the area's flooding, that when there is standing water, bacteria or other pathogens may leach from the adjacent septic systems, mix with the standing water, and contaminate the drinking water wells. The County would like to see these residents transition to a safer and more reliable drinking water supply.

3.4.4 Projected Water Use

Unlike the PSAs, it is challenging to assign a population or population growth to the unincorporated area of Levy County. Within the primary area of interest, there appear to be 574 private wells, although it is unlikely that all of these accounts could be served cost-effectively given their spatial distribution. Growth in these areas is likely to be dependent on the availability of water and the same factors that may influence growth in Otter Creek (i.e., availability of developable land and toll roads).

Section 4 References

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Phase 1: Regional AWS Feasibility – Cedar Key, Bronson, Otter Creek, and Unincorporated Areas in Levy County

Task 2 – Alternatives Development to Address Current and Future Water Supply Needs (Draft)

Prepared for
Suwannee River Water Management District

TWA: 19/20-064.006

May 16, 2022

Prepared by

Wetland Solutions Inc

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Section 1 Water Supply

1.1 Introduction

The Suwannee River Water Management District (SRWMD) is one of five water management districts tasked with four core mission areas: water supply, water quality, flood control/floodplain management, and natural systems. The SRWMD comprises all or portions of 15 counties and encompasses approximately 7,640 square miles. The SRWMD is responsible for managing the needs of both natural systems and water users. To accomplish this, the SRWMD issues water supply permits for water users and develops minimum flows and minimum levels (MFLs) for natural systems within the SRWMD. These efforts are carried out in conjunction with water supply planning to determine where additional water is needed, identify alternative water supplies (AWSs), and implement cost-effective projects to address identified water challenges or shortages.

Within the Waccasassa Basin, the City of Cedar Key, unincorporated Levy County, and the Towns of Otter Creek and Bronson have a variety of water and wastewater challenges that they are attempting to address with assistance from the SRWMD. For both Cedar Key and Otter Creek, these include water quality concerns related to their supply wells and treatment requirements. Additionally, Cedar Key is faced with challenging wastewater treatment issues and loss of treated water to a marine ecosystem where it cannot be beneficially recharged or reused. Bronson and Levy County are concerned with water supply and managing increasing demand in a responsible manner. These disparate challenges present potential opportunities for these entities to collaborate to develop regional projects that can help address these concerns, while also providing a reliable and resilient water supply and employing wastewater treatment and reuse strategies that can benefit the region.

The SRWMD is working with the Florida Department of Environmental Protection (FDEP) and the communities to evaluate this study area and the identified water and wastewater challenges by developing an alternatives analysis for these specific challenges and needs faced by each community. This effort is evaluating not only current needs, but also anticipated growth in the region and potential medium to long-term water supply challenges. The tasks to complete this project include:

- Task 1: Evaluation of current and future water supply challenges, needs, and limitations for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 2: Alternatives development to address current and future water supply needs.
- Task 3: Evaluation of current and projected wastewater treatment and disposal needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 4: Alternatives development for wastewater reuse and recharge.
- Task 5: Cost estimation and cost-effectiveness calculation for the identified alternatives.

This report is focused on Task 2 of the project and describes the development of alternatives to address current and future water supply needs.

The study area for this project is the portion of the SRWMD that lies within the Waccasassa River Basin and Levy County. The primary focus of this project is the area between the Town of Bronson and the City of Cedar Key along and within the vicinity of State Road 24 (SR24). This includes the Town of Otter Creek and portions of Unincorporated Levy County along and near SR24 including the unincorporated communities of Rosewood and Sumner. The relevant boundaries and study area are shown in Figure 1.

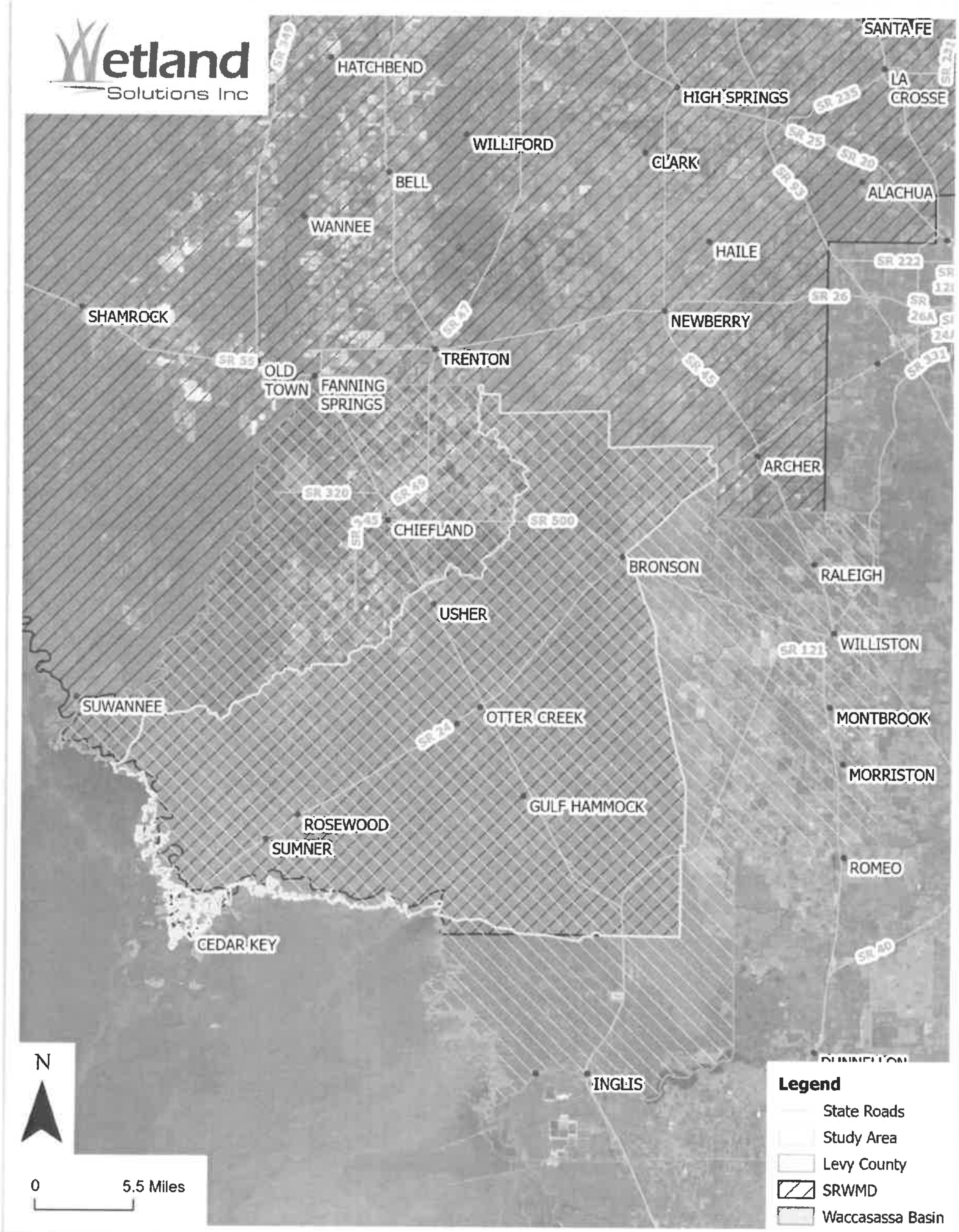

Figure 1. Regional Alternative Water Supply Feasibility Study Area Extents

Section 2 Source Water Alternatives

This study considered potential water sources that might be used to supply the communities of interest. Potential sources include surface water and groundwater. Each of these options was evaluated for feasibility. Given Bronson's current high-quality water supply it is not expected that Bronson would transition off their current groundwater source. For this reason, only Otter Creek and Cedar Key were considered as transitioning to an alternative water source.

2.1 *Surface Water*

There are two primary potential surface water sources within the vicinity of the study area. These are the Suwannee and Waccasassa Rivers as shown in Figure 2. Both of these rivers have adopted MFLs.

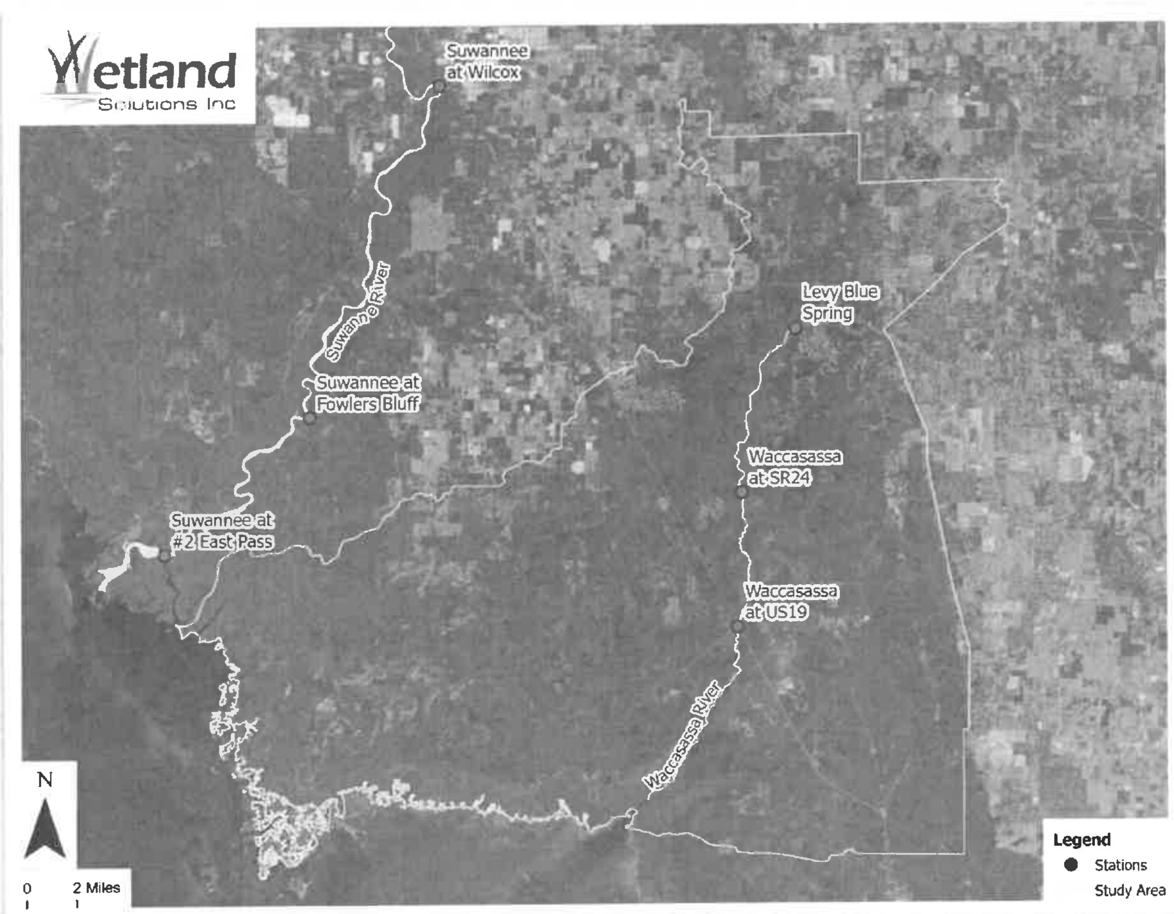

Figure 2. Suwannee and Waccasassa Rivers and Surface Water Stations

2.1.1 Waccasassa River

The Waccasassa River originates at Levy Blue Spring and flows south-southwest before crossing under SR24, approximately 3 miles northeast of Otter Creek. The river then flows south and then southwest to reach the Gulf of Mexico after receiving flows from other tributaries including Otter Creek, Magee Branch, and the Wekiva River.

2.1.1.1 Flows

The Waccasassa River is a spring-fed river with flows dominated by spring flow during dry periods and by runoff during wet periods. Flows at Levy Blue Springs have averaged 10.3 cfs since 2016 with a maximum flow of 18.2 cfs and a minimum flow of 1.38 cfs. Flows were historically collected at the Waccasassa River crossing at SR24 from 1944 to 1953. The minimum flow at this location was 6.7 cfs, with a maximum flow of 1,170 cfs, and a median flow of 50 cfs. Three more recent manual flow measurements from 1995-96 at this location reported an average of 20.5 cfs.

2.1.1.2 Water Quality

The Waccasassa River at SR24 is fed by the combination of spring and wetland flows and is generally a dark-water system due to the influence of the floodplain wetlands present throughout the Devils Hammock Wildlife Management Area and downstream areas. Limited water quality data were available for the Waccasassa River at SR24. However, the SRWMD has a monitoring station on the Waccasassa River at US19 that has been monitored approximately quarterly to monthly since 2006. At this location, data for iron, color (filtered), and total organic carbon (TOC) have been reported consistently since 2014. During this time iron averaged 0.70 mg/L, color averaged 202 PCU, and TOC averaged 21.4 mg/L.

2.1.1.3 Treatment Requirements

The Waccasassa River is generally a tannic river except in the upstream reaches during low-flow periods when Levy Blue Springs flow dominates. These conditions are demonstrated by the color measurements with high values greater than 500 PCU and low values of less than 30 PCU. The water quality of the river is similar in many regards to the current water supplies of Otter Creek and Cedar Key. This finding is consistent with the depth of these communities' groundwater wells and the overlying surface waters that likely infiltrate and feed these wells. Removal of natural color is difficult and requires a multi-step process such as the process currently used by Cedar Key. The cost and challenges associated with treatment are expected to be similar to the communities' current water systems.

2.1.1.4 Regulatory Constraints

The Waccasassa River and Levy Blue Springs had an MFL developed in 2006 and adopted in 2007 (40B-8.051). The adopted MFL for Levy Blue Spring was the surface water flow that would maintain 90% of the historic flow regime. The median flow reported in the MFL study was 6.87 cfs with an MFL median flow of 6.18 cfs. The adopted MFL for the Waccasassa River was the surface water flow that would maintain 87.5% of the historic flow regime. The assessment point for the Waccasassa River was located at the Gulf Hammock Gage downstream of the confluence with US19. The median flow for the Waccasassa River was 157 cfs with an MFL median flow of 137 cfs. The range of flows (5th-95th percentile) was -6 to 875 cfs at this gauge.

The optimum location for a surface water withdrawal to serve Otter Creek and Cedar Key on the Waccasassa River would be in the vicinity of the river crossing at SR24 given the proximity of the river to the locations of interest. Median flows at this location were, based on limited historical data, about 50 cfs. The expected withdrawal need at this location, if taken as the combination of Cedar Key's and Otter Creek's CUPs is 0.468 MGD, or 0.724 cfs. This flow would cause exceedances of the Levy Blue Springs MFL during some low-flow periods although the withdrawal location would be downstream where median flows are higher. It is possible a surface water use permit may be allowed for this location with demonstration of no adverse impacts to the waterbody and MFL.

2.1.1.5 Discussion

Using the Waccasassa River as a water supply is expected to involve a variety of challenges. These include the adopted MFL for the system, variability in flows, and water quality. Based on the flow record at SR24 it appears that there would be times when permitted withdrawals could exceed 10% of the flow at this location. This would likely necessitate a significant volume of storage to accommodate these potential low-flow periods with withdrawals preferentially taken during higher flow periods. The primary concern relative to using this water source for supply is the water quality of the Waccasassa River, which frequently includes high color and TOC concentrations. Both of these parameters are likely to cause treatment challenges and are similar to the current issues that these utilities face with their groundwater supplies. Furthermore, the flashy nature of river flows based on rainfall and runoff are likely to cause significant variability in water quality which could further challenge water treatment. Finally, using this water source would require a pipe between the river and Otter Creek and Cedar Key. This is a long distance without any significant gain in water quality or availability.

2.1.2 Lower Suwannee River

The Lower Suwannee River is located approximately 10-20 miles north of the SR24 corridor near Otter Creek and Cedar Key. The river flows approximately south-southeast before discharging to the Gulf of Mexico at the Town of Suwannee.

2.1.2.1 Flows

The Suwannee River is a substantial river with a watershed starting in southern Georgia and extending to the Gulf of Mexico. The river is fed by stormwater runoff from numerous wetlands as well a substantial baseflow contribution from springs along the river. In the lower reaches the river is tidally-influenced. Suwannee River flows are measured at several locations along the river. In the lower river reaches the gage at Wilcox provides a long-term flow record. At this location flows have averaged 7,730 cfs since 2000, with a range from less than 2,000 cfs to 39,500 cfs.

2.1.2.2 Water Quality

The Lower Suwannee River has had water quality data collected at a wide variety of locations over varying periods of record. For the purposes of this study water quality was considered at

Fowlers Bluff and at the #2 East Pass. The lower river is tidally-influenced and experiences incursions of brackish to salty water during storms or major tidal events. These events are apparent in specific conductance measurements which had a maximum value of 38,500 µS/cm at #2 East Pass and a maximum value of 445 µS/cm at Fowlers Bluff.

Data were also evaluated for color, TOC, and iron since 2014 based on approximately quarterly data. Color averaged 149 PCU at Fowlers Bluff with a range from 11 to 420 PCU. Color at the #2 East Pass station averaged 142 PCU with a range from 13 to 415 PCU. TOC averaged 15.5 mg/L with a range from 2.4 to 34 mg/L at Fowlers Bluff; and averaged 14.4 mg/L at the #2 East Pass station with a range from 2.8 to 34 mg/L. Iron averaged 0.43 mg/L at Fowlers Bluff with a range from 0.07 to 1.0 mg/L; and averaged 0.38 mg/L at #2 East Pass with a range from 0.07 to 1.1 mg/L.

2.1.2.3 Treatment Requirements

The Lower Suwannee River is a tannic river during normal or high flows. This tannin-stained water is demonstrated by the relatively high color values observed in water samples. Additionally, the river generally has high TOC which is also indicative of the wetland contribution to the river system under normal or high-flow conditions. During lower flows the river has a higher percentage of spring flows and TOC and color tend to be lower (Figure 3). As with water in the Waccasassa River these constituents are expected to pose treatment challenges in much same way as the cities' current groundwater supplies.

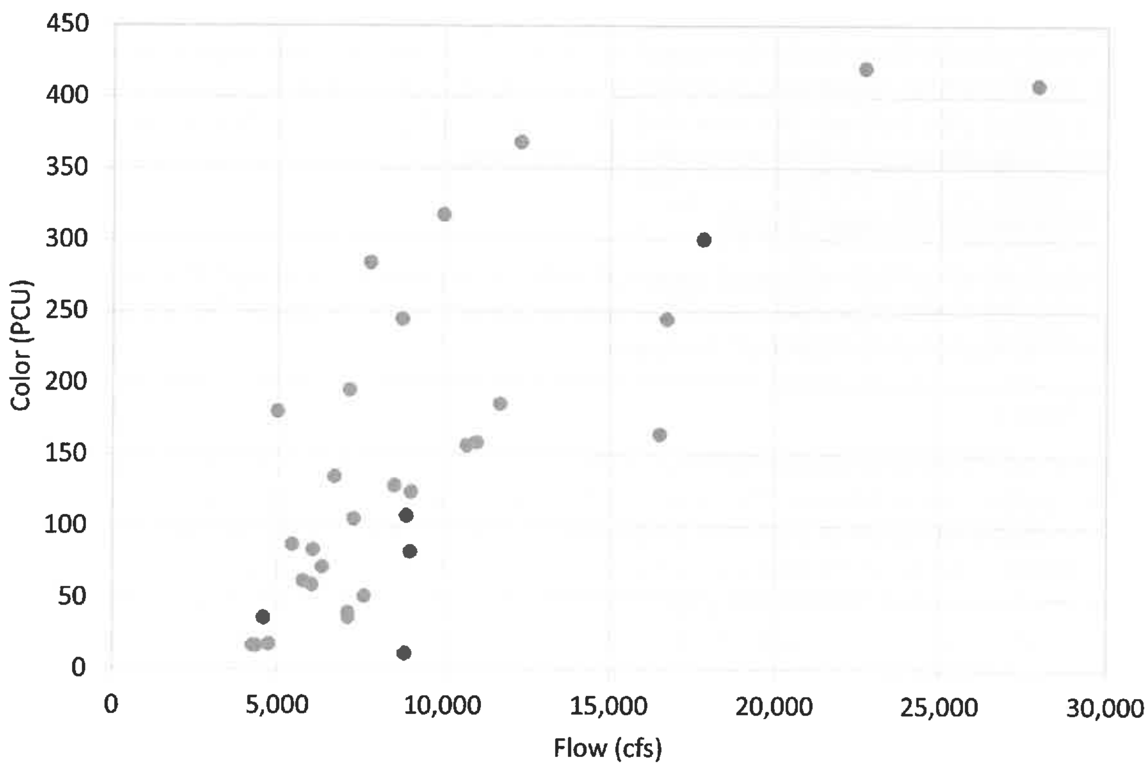

Figure 3. Flow (Suwannee River Near Wilcox; 02323500) Versus Color (Suwannee River at Fowlers Bluff; 02323590)

2.1.2.4 Regulatory Constraints

The Lower Suwannee River, Little Fanning Springs, Fanning Springs, and Manatee Springs had MFLs developed in 2005, with adoption in 2006. The adopted MFLs for the Lower Suwannee River are a median flow of 7,600 cfs between November 1 and April 30 and a median flow of 6,600 cfs between May 1 and October 31 at the Wilcox Gage. In addition, a recommendation was made that the 40B-2 water use permitting Basis of Review be modified to require additional information to ensure withdrawals are not impacting medium or higher flows. Given the flows in the Lower Suwannee River, the 0.724 cfs of withdrawals that would allow complete replacement of the CUPs for both Cedar Key and Otter Creek are a fraction of a percent. However, the median flows in the Lower Suwannee River are highly variable and the median flows have not exceeded the winter and summer targets in numerous years over the past several decades Figure 4.

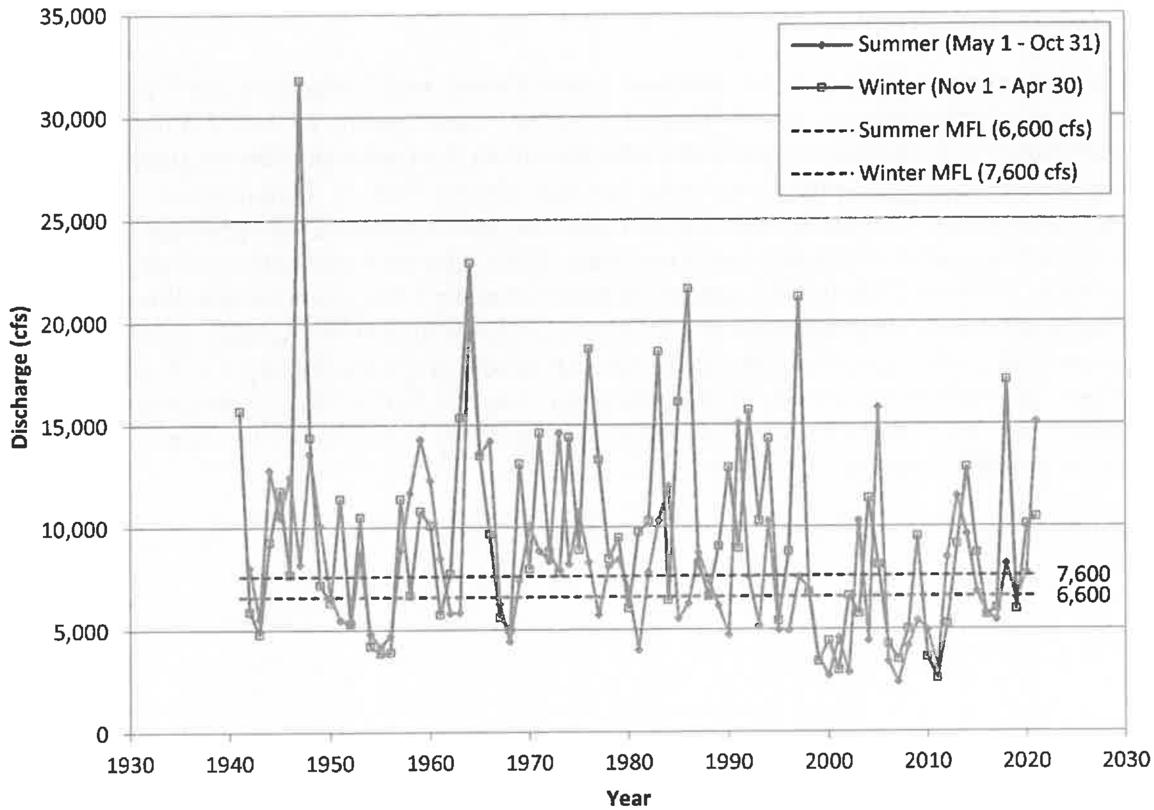

Figure 4. Lower Suwannee River Median Flows and Adopted MFL

2.1.2.5 Discussion

The Lower Suwannee River is expected to be a challenging water source for three key reasons: distance from project area, flows, and water quality. At a distance of about 20 miles to the Suwannee River from Otter Creek the cost to move this water to the project area is expected to be significant and prohibitive. A second challenge to securing a surface water source from the Suwannee River is the interpretation of the current MFL and the availability of water. Finally, the

Suwannee River has significant color and TOC during some periods that is expected to pose many of the same treatment challenges as with the current water sources.

2.1.3 Gulf of Mexico

A final surface water option would be to take brackish or saltwater from the Gulf of Mexico or a tributary to the Gulf. This option is expected to result in substantial costs associated with treatment that are beyond the current level of treatment required from groundwater sources. This option also requires design and construction of a surface water intake structure, conveyance to the treatment facility, and construction of either a surface water discharge pipeline and diffuser or deep injection well for brine concentrate disposal. For these reasons, this alternative did not receive additional consideration.

2.2 *Groundwater*

The current water supply used by Bronson, Otter Creek, and Cedar Key are Upper Floridan Aquifer wells. In the location where Bronson is located water quality in the UFA is excellent, but wells operated by both Otter Creek and Cedar Key have the issues previously presented. There are two primary aquifers in the project area that may be available as drinking water sources: the UFA and the Lower Floridan Aquifer (LFA). Figure 5 shows a general hydrogeologic cross section of the Floridan aquifer (Williams and Kuniansky 2015). The area of interest for this project lies between FL_DIX4 and P66 at the southern end of the transect. The cross section shows that there is inconsistent confinement between the UFA and LFA and that water quality rapidly degrades with proximity to the coast as evidenced by the shallowing of the 10,000 mg/L TDS concentration threshold. The 10,000 mg/L TDS "line" is referred to as the limit of the Underground Source of Drinking Water (USDW) and represents the poorest quality water that can be used as a raw water source for potable supplies.

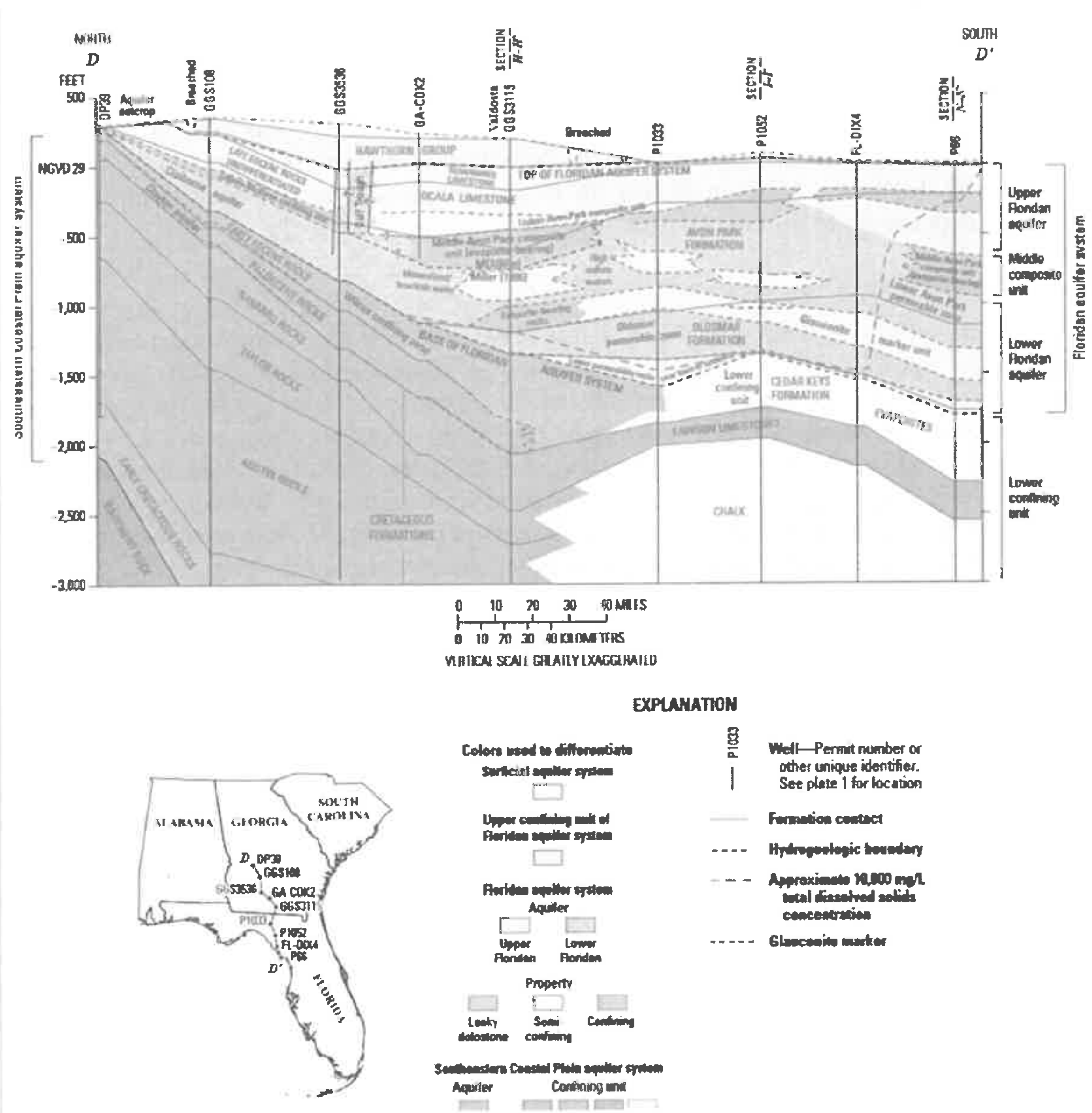

Figure 5. Generalized Hydrogeologic Cross-Section D-D′ from Macon County, GA, to Levy County, FL (Williams and Kuniansky 2015)

2.2.1 Upper Floridan Aquifer

The Upper Floridan Aquifer in the vicinity of the study area provides water of varying quality but is the primary water source for both utilities and domestic self-supply users.

2.2.1.1 Availability

The Floridan Aquifer underlies all of Florida at varying depths, thicknesses, and with varying confinement. The UFA in the vicinity of the project area is unconfined with a depth of approximately 500 feet to the Middle Confining Unit (Miller 1986). The UFA is composed of limestone in the area with generally high transmissivity and easy access for water supply. Typical domestic well depths are between 30 and 100 feet below ground surface in the study area with generally deeper wells to the east toward Bronson.

2.2.1.2 Water Quality and Spatial Variability

Water quality within the UFA is highly variable between Cedar Key and Bronson as previously illustrated by existing water supplies and challenges. Generally, water quality along SR24 is relatively consistent from west to east until reaching Bronson. Water quality in wells west of Bronson is generally marked by higher levels of TOC, color, and iron. These conditions can result in taste, odor, staining, and tooth discoloration. Additionally, given the relatively shallow well depths there is a higher potential for contamination from pathogens. Upon reaching Bronson water quality improves markedly with no parameters of concern except in areas where land use specific activities may cause localized water quality concerns (e.g., nutrients).

Water quality near the coast can also be impacted by saltwater intrusion from the adjacent Gulf of Mexico. This intrusion has been observed directly in Cedar Key's Wells 1, 2, and 3 which were abandoned incrementally due to elevated chloride concentrations and saltwater intrusion. The current supply, Wells 4 and 5 are located east of Wells 1 and 2 and deeper than Well 3.

Water quality data were evaluated for UFA wells monitored by the SRWMD, USGS, and FDEP. Specific parameters of interest included: chloride, color, iron, specific conductance, TDS, and TOC. Average chloride (Figure 6) ranged from 2.31 mg/L to 755 mg/L, with the highest concentration at a well in Rosewood (21FLGW_WQX-50813/21FLSUW_WQX-128724/S141429001) that is reported to have a total depth of 442 feet. This well was the only well in the database exceeding the secondary drinking water standard (DWS) of 250 mg/L for chloride. Color data were sparser than chloride data with values ranging from 0.325 PCU to 243 PCU (Figure 7). Again, the highest value was measured at the same Rosewood station. Generally, color appeared to increase in UFA water samples from east to west as sandy ridges give way to the lower elevation wet flatwoods. Iron concentrations (Figure 8) ranged from 3 to 14,000 micrograms per liter (µg/L) with a moderate number exceeding the secondary DWS of 300 µg/L. Specific conductance (Figure 9) ranged from 30.2 to 5,748 micromhos per centimeter (µmhos/cm). TDS concentrations (Figure 10) ranged from 15 to 10,200 mg/L, with some sites exceeding the secondary DWS value of 500 mg/L, and the highest value reported near Chiefland. TOC concentrations (Figure 11) ranged from 0.2 to 68 mg/L. With the exception of color, there were no clearly apparent spatial trends in concentration, but analysis of the data was hampered by a lack of reported depth data for the wells.

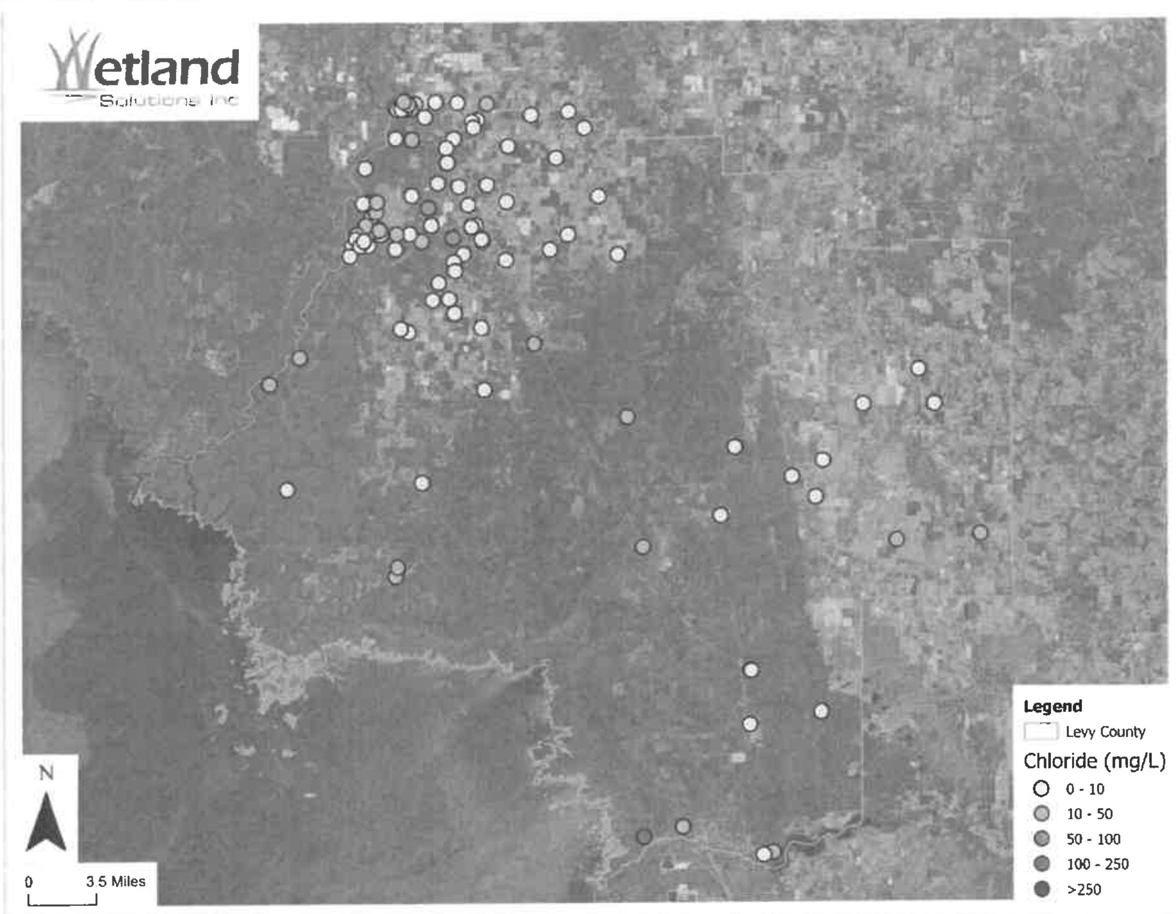

Figure 6. Chloride Concentrations in Levy County UFA Wells

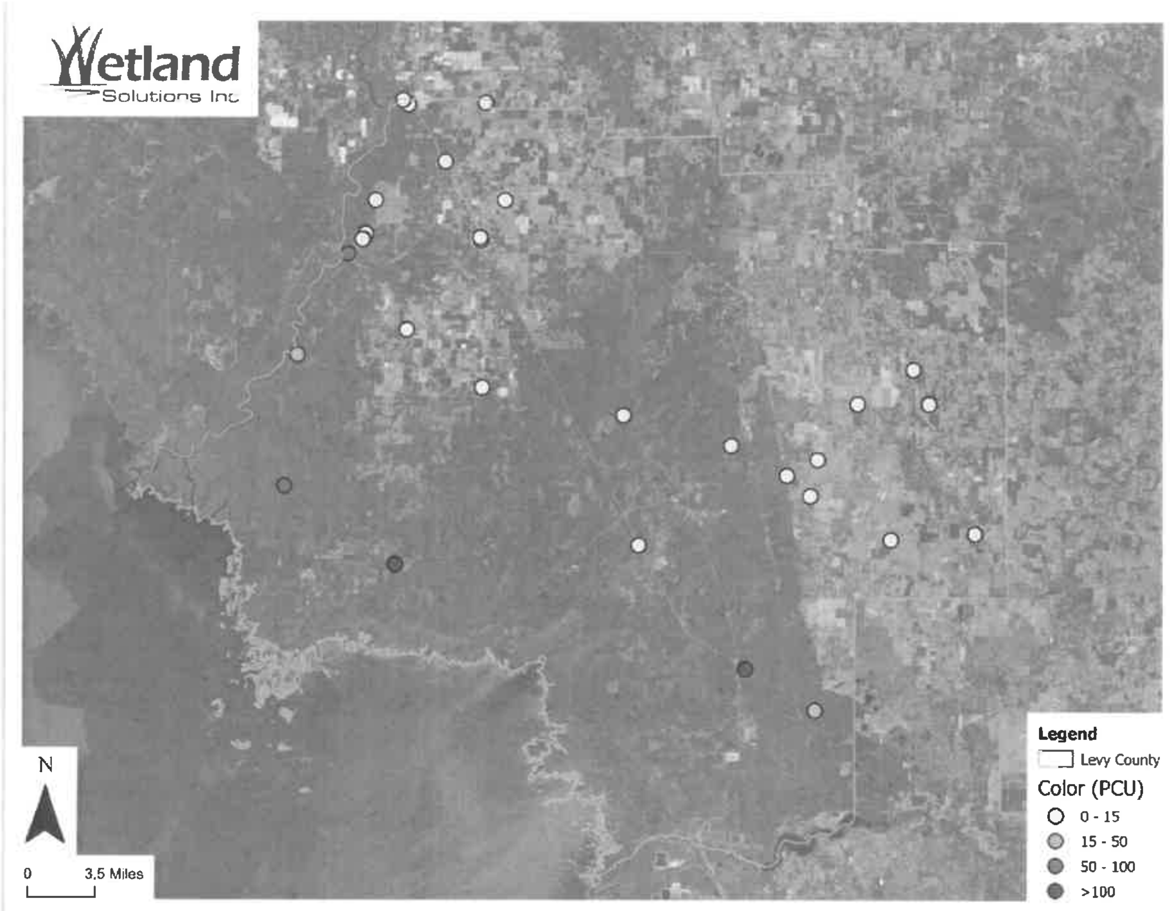

Figure 7. Color Concentrations in Levy County UFA Wells

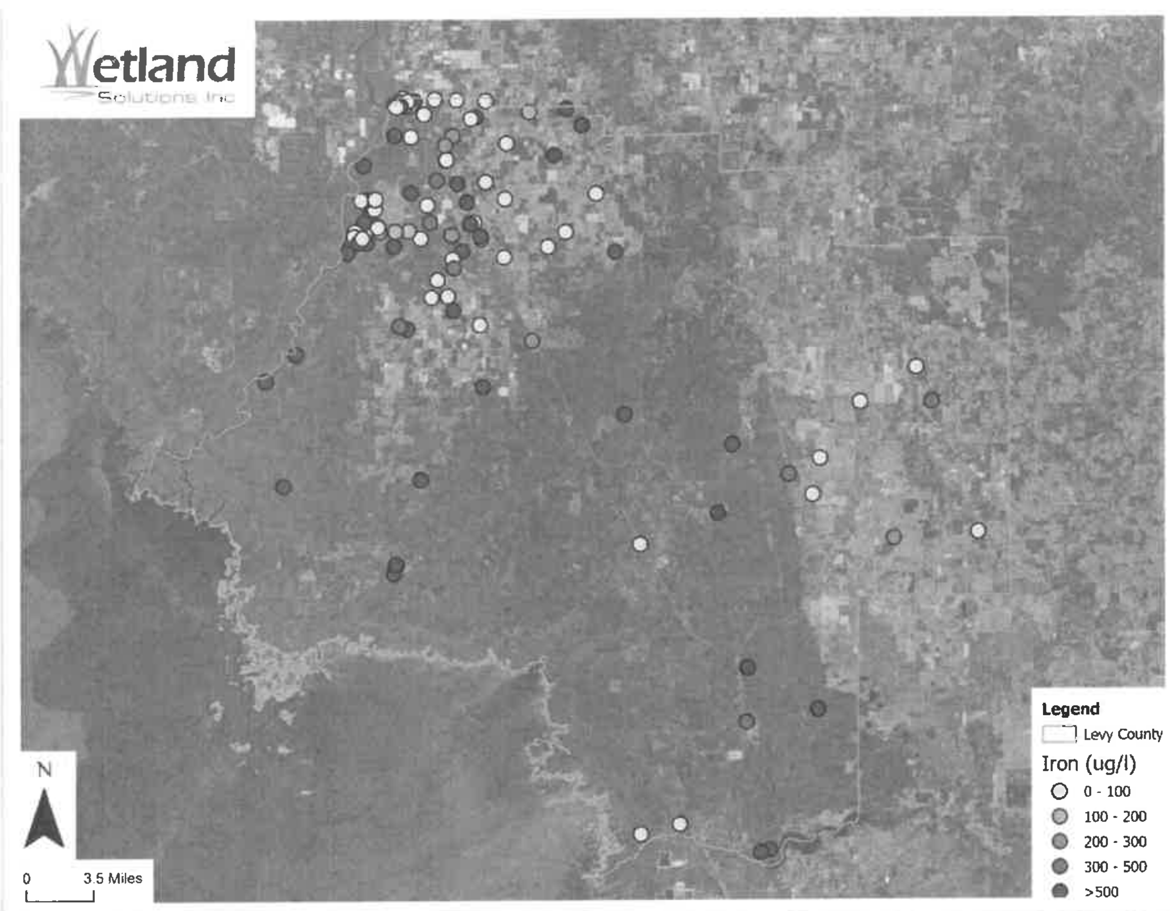

Figure 8. Iron Concentrations in Levy County UFA Wells

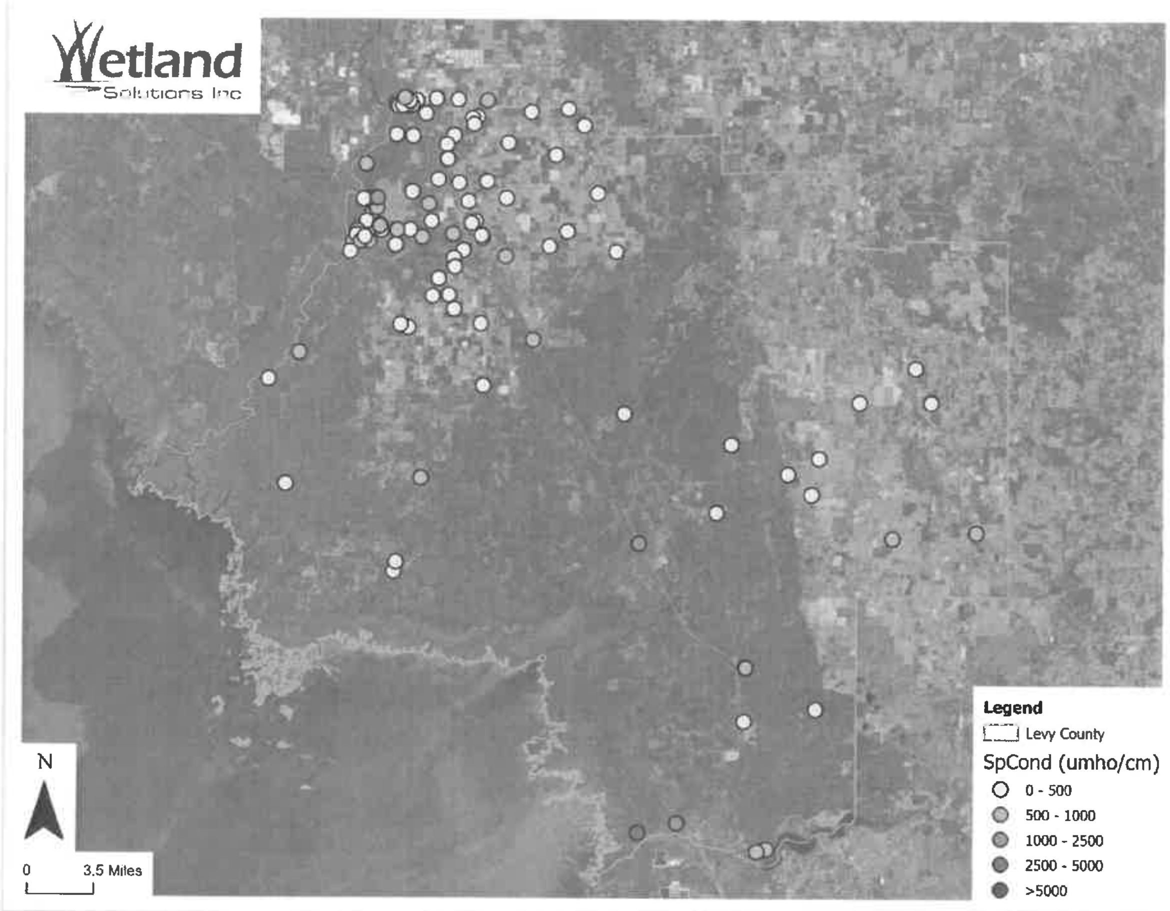

Figure 9. Specific Conductance in Levy County UFA Wells

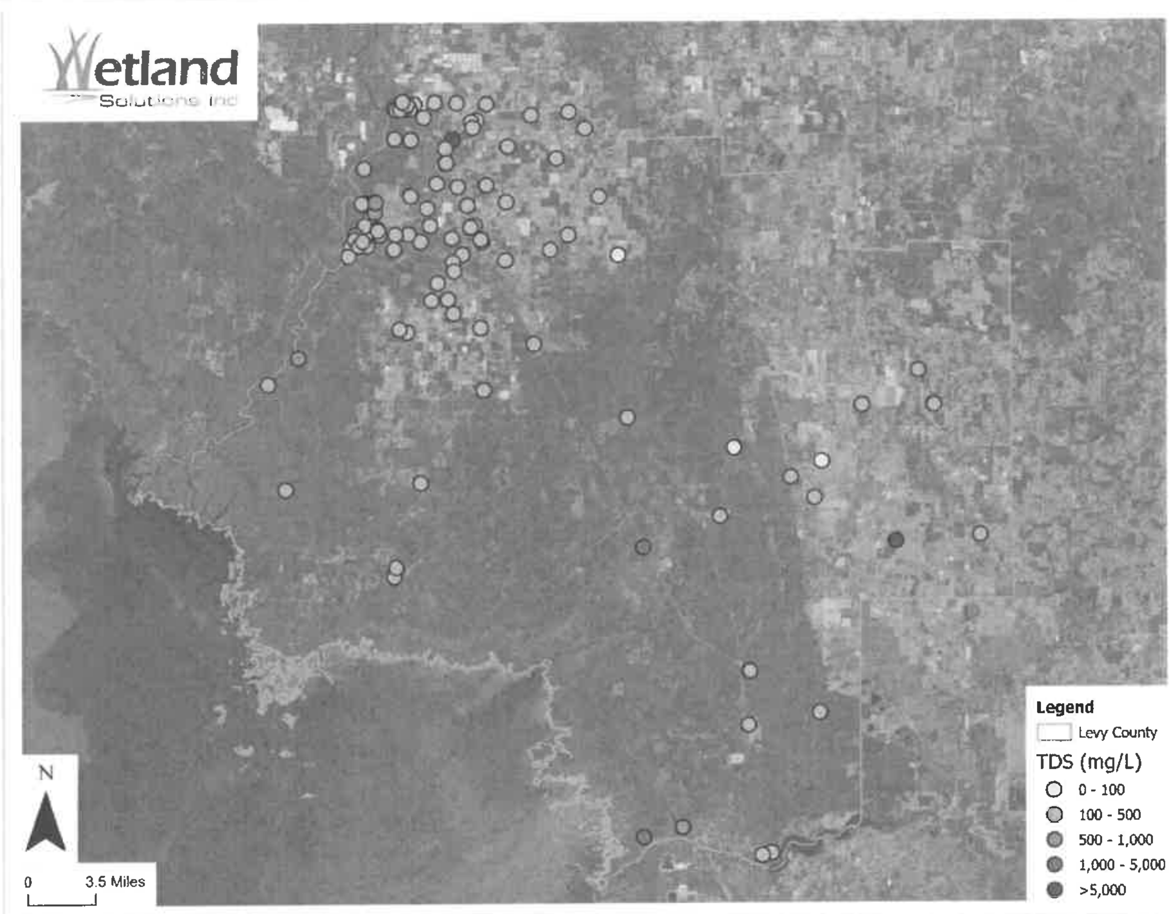

Figure 10. Total Dissolved Solids Concentrations in Levy County UFA Wells

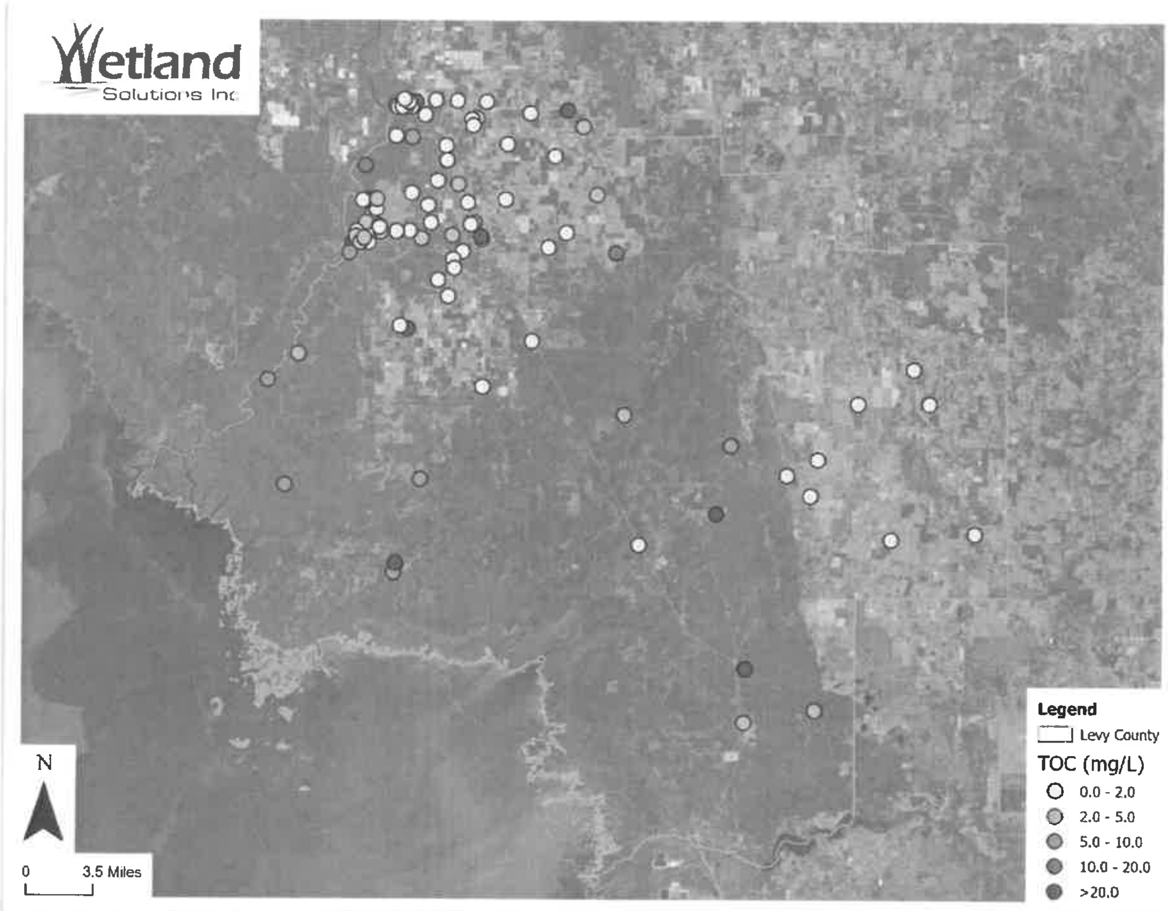

Figure 11. Total Organic Carbon Concentrations in Levy County UFA Wells

2.2.1.3 Treatment Requirements

Treatment requirements vary substantially for water from the UFA within the study area. In Bronson, public supply is accomplished through withdrawal, chlorination, and distribution. Upon moving west, water treatment becomes more challenging as the unconfined UFA is overlain by extensive natural wetlands that contribute tannic water through infiltration. This results in water quality changes with increases in color, TOC, and iron. Treatment of this water for domestic self-supply can require small reverse osmosis (RO) systems or membrane filtration. Similar technologies can be used for larger public systems, although there are typically additional chemical treatment steps. Cedar Key's water treatment process is an example of a conventional treatment train approach that can be used to produce water to potable standards from the water source between west of Bronson and the coast. It includes:

- Initial treatment with sodium permanganate,
    - Permanganate reduces taste and odor issues, iron, and disinfection byproduct (DBP) precursors
- Magnetic Ion exchange (MIEX) to reduce TOC,

- Initial chlorination,
- Lime softening to reduce hardness associated with calcium and magnesium,
- Sand filters with aeration,
- Hydrogen peroxide to reduce trihalomethane (THM) precursors,
- Carbon filters to remove DBPs, and
- Final chlorination (with re-chlorination if the residual is not met).

2.2.2 Lower Floridan Aquifer

The Lower Floridan Aquifer (LFA) lies beneath the Middle Confining Unit and ranges from about 600 to 1,200 feet below land surface between Bronson and Cedar Key (Miller 1986). The LFA is composed of dolomite and limestone. It should be noted that because the LFA is brackish (Section 2.2.2.2) and membrane treatment is required (Section 2.2.2.3), there is about a 20% loss of withdrawn water associated with the membrane concentrate that requires disposal.

2.2.2.1 Availability

With adequate water supply in the UFA near Bronson, it is unlikely that the LFA would be considered as a source until future demand projections and drawdown modeling exercises indicate that there would be undesirable impacts associated with increased withdrawals. The shallowest zone with adequate transmissivity for water supply is the Lower Avon Park permeable zone which occurs at depths between about 800 and 900 feet near Otter Creek and Cedar Key (Williams and Kuniansky, 2015). Presently, there are no known production wells in the LFA in Levy County. While the LFA could be a future source of water for these communities, it is more likely that the UFA would continue to be used and treatment would be improved to enhance finished water quality.

2.2.2.2 Water Quality and Spatial Variability

As noted above, USGS studies (Williams and Kuniansky, 2015) show that the depth to the 10,000 mg/L TDS concentration "line" decreases rapidly between inland areas and Cedar Key. There were 3 LFA wells found in SRWMD, FDOH, and STORET databases in Levy County with recent water quality data records. Historical data were also located for an oil and gas exploration well (Well P-13) drilled in 1946 about 9.8 miles south of Otter Creek and 3 miles east of US-19. Table 1 shows the available data from these wells. In general, with the TDS and specific conductance data following the expected increase in salinity with increasing depth.

Table 1. Water Quality in Levy County Lower Floridan Wells

Well ID	Depth (ft)	Chloride (mg/L)	Color (PCU)	Iron (ug/L)	Specific Conductance (umhos/cm)	TDS (mg/L)	TOC (mg/L)
P-13	1,089	39.0	--	180	111	807	--
P-13	2,650	248	--	--	263	2,210	--
ROMP 131.5 L Fldn Aq (Below MCU I)	650	10.1	0.77	8.50	293	250	0.77
ROMP 131.5 L Fldn Aq (Below MCU II-A)	1,121	14.0	--	35.9	588	373	--
ROMP 131.5 L Fldn Aq (Below MCU II-B)	1,338	14.0	--	252	615	46,500	--

2.2.2.3 Treatment Requirements

LFA source water requires membrane-based treatment processes such as RO to provide suitable finished water quality. Typically, various pre-treatment steps such as sand filtration and cartridge filtration are also required to remove solids that would blind the RO membranes. The process train may also require pH adjustment and the addition of anti-scaling chemicals to further maximize membrane cycle time and lifespan and the RO step will be followed by disinfection prior to distribution. Membrane treatment facility costs for LFA source waters are 3-5 times more expensive than costs for facilities treating high quality UFA source waters. As noted above, membrane treatment produces a concentrated waste stream that requires disposal, typically in a deep injection well that is completed below the confining unit beneath the USDW. In the study area, this depth starts at about 1,500 feet below land surface. The concentrate stream also constitutes about 20% of the raw water volume, meaning that 1.25 gallons of raw water need to be withdrawn and treated to produce 1.0 gallons of finished water.

2.3 *Water Source Discussion*

The surface water and groundwater sources discussed have a wide variety of qualities and potential challenges for treatment across the study area. The highest quality water source is the UFA in the eastern and northern portions of the study area which is of exceptional quality and requires minimal treatment. Water quality within the UFA degrades from the higher sandy ridge areas near Bronson and Chiefland as topography drops onto the coastal plain in the Waccasassa River and Gulf Hammock area. This change in water quality is characterized by higher color, TOC, and iron. In these areas water quality treatment is also complicated because of the potential for disinfection creating DBPs without adequate pre-treatment. Surface water sources including fresh, brackish, or saltwater have equivalent or more significant treatment related challenges with the level of treatment and cost increasing as the water source becomes more saline. Similarly, treatment of LFA water will be more complex and more costly than treating either the higher or lower water qualities within the UFA. From the quantity standpoint, UFA water near Bronson is currently considered to be available to meet the future demand in the study area. Similarly, LFA water and brackish to saline surface waters are sufficiently available. Fresh surface water sources located closer to Otter Creek and Cedar Key (e.g., the Waccasassa River) are not expected to be consistently available at the flows needed without potentially causing adverse environmental impacts.

Given the water qualities and availability of the various sources it appears that the best locally available source of water for each utility is currently being used. While water quality in the Cedar Key and Otter Creek areas is of lower quality than water in the Bronson area, this water is more treatable than alternative water sources in the vicinities of these utilities. However, given regional water qualities, the UFA near Bronson or north towards Chiefland appears to offer the optimal water source in the area.

Section 3 Independent Water Supplies

While the previous section noted that the inland UFA is the preferred source of future water supply, it is technically feasible for Cedar Key and Otter Creek to continue to use their existing wells with either current or enhanced treatment processes. With current treatment processes, Cedar Key produces a water of good quality that meets applicable standards. Otter Creek's current process does not offer a water of high quality and is not used by most residents for consumption, but current projects and pilot studies are underway to improve quality. Technically viable future water supply alternatives are summarized below for each of the municipalities.

3.1 Cedar Key

The Cedar Key Water and Sewer District (CKWSD) currently provides a water of good quality to its customers via a complex, expensive, multi-step treatment process. During the past several decades, CKWSD's existing wells and well fields have migrated inland as more coastal wells have been impacted by saltwater intrusion. Given loss of use at Wells 1, 2, and 3 it appears possible that this migration will likely continue with wells moved further east in the event of impaired water quality.

While the CKWSD can provide a water of suitable quality to their customers, the water treatment plant was originally constructed in 1962 with various upgrades and process enhancements since that time. Given the age of the water treatment plant it is expected that a new facility will be required to continue to provide good quality water. An estimate for a new water treatment facility was developed for the CKWSD in January of 2022 by Mittauer and Associates, Inc. with an estimated cost of $12.6 million for a facility located near the current well field. The anticipated treatment at this facility is expected to involve many of the same processes currently employed in the CKWSD's treatment system to provide a water of similar or better quality.

3.2 Otter Creek

The Town of Otter Creek currently produces an effluent that is not used for drinking by most of the Town's residents due to color, hardness, and iron. In attempt to mitigate these challenges, the Town has completed pilot projects for filters with a vendor demonstrating technology for a year before turning the system over to the Town. It is not known whether the Town will be able to afford the O&M costs for the filter system.

Otter Creek also has challenges associated with aging infrastructure and has several projects currently underway, seeking funding to replace their pneumatic tank and add additional storage. This is in addition to several recently completed water projects to add high-service pumps and to improve treatment for iron and to reduce DBPs. With these modifications and continued investment in the water system, it is expected that the Town can continue to provide water with similar or improved water quality.

3.3 Bronson

The Town of Bronson currently produces water at a low cost from UFA wells with excellent quality. Current challenges are generally associated with problems in the distribution system versus the water production facilities. A current project is underway to increase the capacity of the existing wells to improve system pressures in the town. The Town of Bronson is expected to be able to continue to provide high quality water to their residents.

3.4 Unincorporated Levy County

Residents in unincorporated areas of Levy County rely on domestic self-supply for their water. Within the project area and along SR24, there are the unincorporated communities of Sumner and Rosewood. Based on conversations that were a part of this study, the residents of these areas have significant water quality challenges including hardness, iron, and color. To address these issues, many residents have either individual water treatment systems or purchase their water from retail establishments for consumption. Costs associated with water purchase or treatment can be significant for these residents. These residents would be expected to continue their current water supply strategies, whether through purchase or individual treatment systems.

Section 4 Cooperative Water Supplies

In contrast to independent water supplies, this project is considering cooperative water supplies to address the challenges associated with existing water quality for the communities. With consideration of the various challenges experienced by the communities, this study considered a range of alternatives to develop cooperative water supplies. Each of these options is discussed in additional detail in the following sections.

4.1 Regional 1: Cedar Key + County

The CKWSD has developed a water system that allows for compliance with applicable water quality standards despite challenging water quality conditions in their supply wells. The CKWSD's treated water therefore offers a better product than can be achieved by many residents within the unincorporated communities of Sumner and Rosewood. Given the previous discussion of the CKWSD, potentially constructing a new water treatment plant in the vicinity of their current well field there is an opportunity for CKWSD to provide high-quality water to residents and businesses in Sumner and Rosewood. This could be accomplished by the CKWSD expanding their service area to include these communities which would allow for provision of water and billing of these customers. The approximate distance from the existing Cedar Key well field to Sumner is 1.6 miles with an additional 2.3 miles to Rosewood as shown in Figure 12. This alternative would have the benefit of increasing revenue to help fund the new Cedar Key water plant and operations while improving water quality for customers in Sumner and Rosewood. For residents and businesses that currently rely on individual treatment systems or purchase water for consumption, there is the potential that this water supply could result in cost savings associated with provision of safe drinking water. The total approximate pipeline length is 3.9 miles.

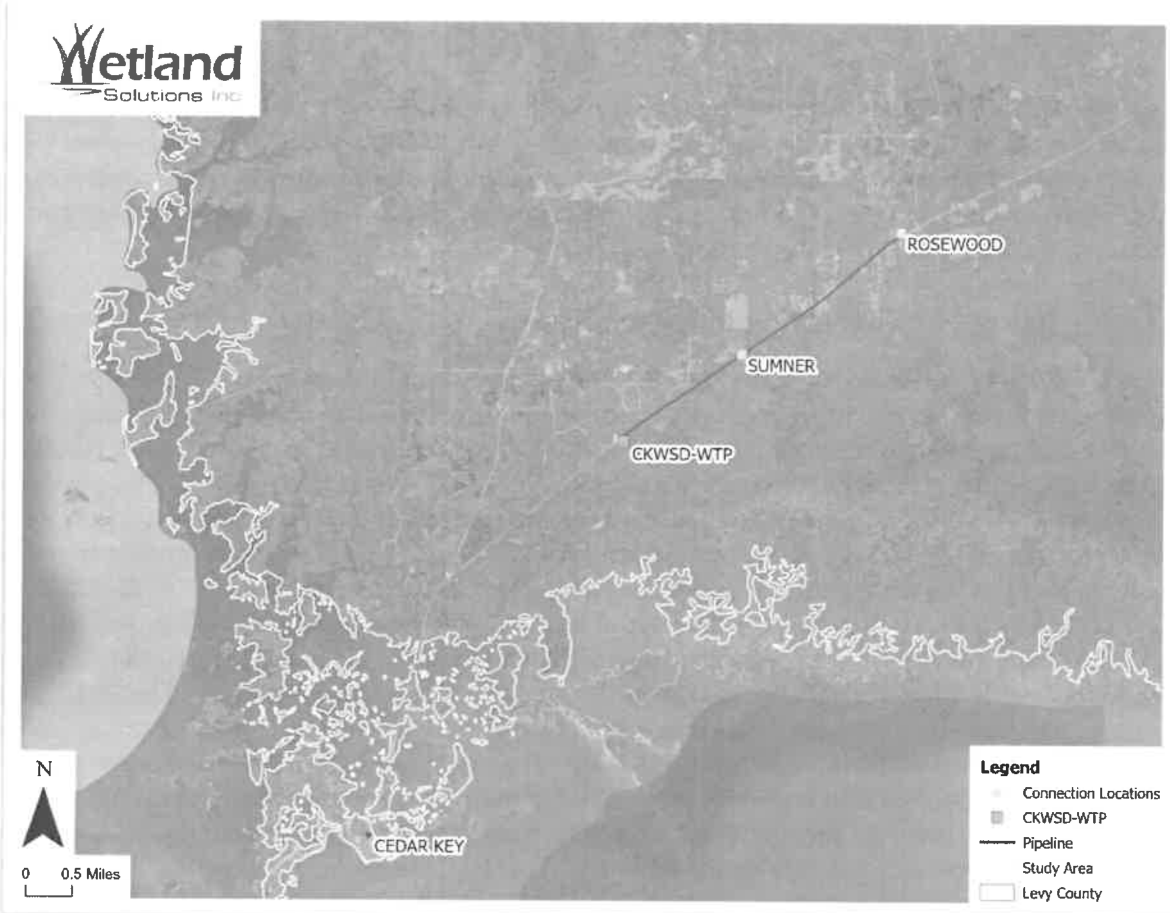

Figure 12. Cedar Key Pipeline to Sumner and Rosewood

4.2 *Cedar Key + County + Otter Creek*

When considering projects that may involve more partners there is increased potential for making modifications to the system to improve water quality, operation, and cost. These opportunities are discussed for Cedar Key, unincorporated Levy County, and Otter Creek in the following sections.

4.2.1 Regional 2: Cedar Key Wells

Expanding on the concept of the CKWSD providing water to Rosewood and Sumner, there may be the potential for CKWSD to extend water service to Otter Creek. This is an additional 11.7 miles of pipe from Rosewood and would allow Otter Creek to discontinue use of their existing water system. However, this project would require grant funding, as neither utility would be able to afford or feasibly pay for this pipeline while maintaining affordable rates. The inclusion of Otter Creek would help CKWSD cover the costs of construction of the new water plant, excluding the pipeline, while reducing redundant facilities, operation, and water testing between the facilities. Relative to treatment it is likely that either: CKWSD would need to provide re-chlorination and pumping prior to water entering Otter Creek's system, or that Otter Creek would need to provide the same after accepting the water. This project would most likely involve CKWSD expanding their PSA to include Sumner and Rosewood and developing an interlocal agreement with Otter Creek for provision of water. The anticipated pipeline alignment is shown in Figure 13 with an approximate total length of 15.7 miles.

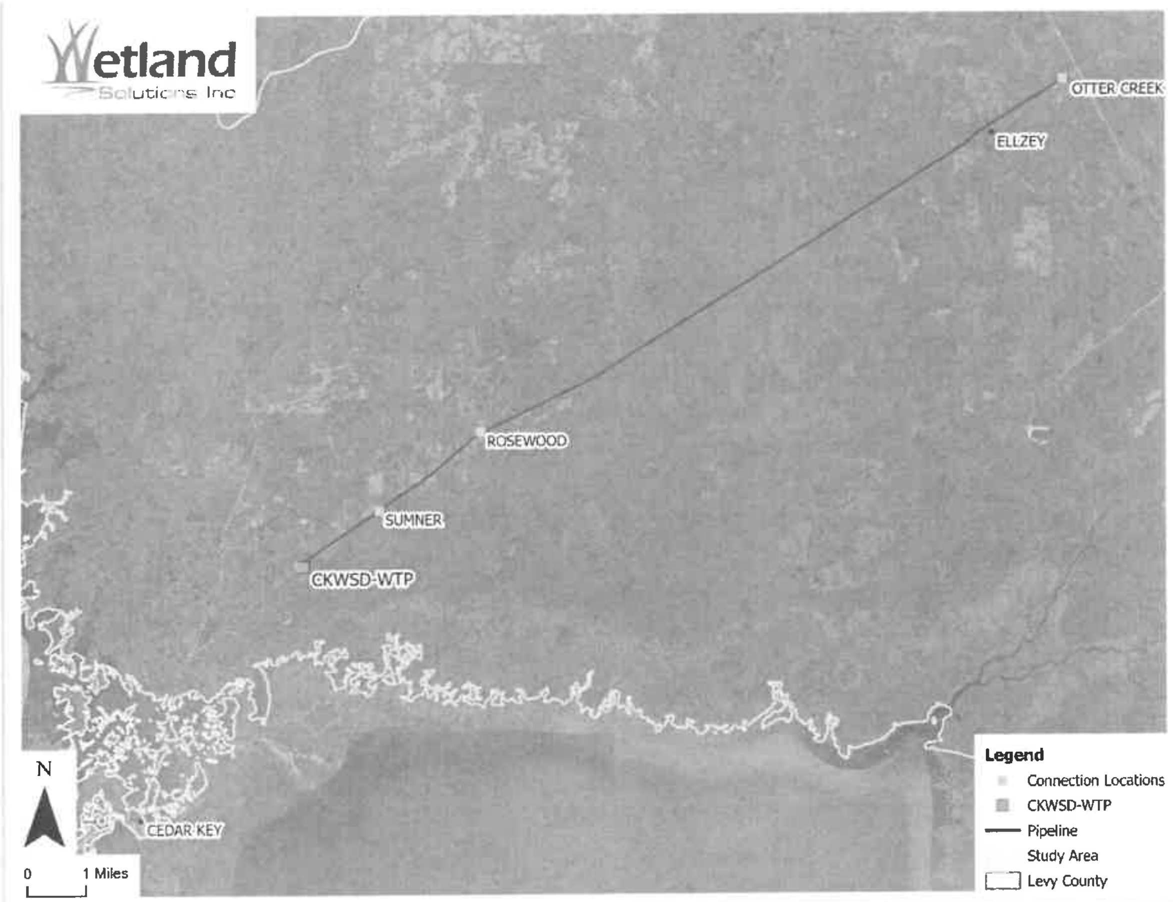

Figure 13. Cedar Key Pipeline to Sumner and Rosewood and Otter Creek

4.2.2 Regional 3: Regional Water Authority

A second considered alternative was CKWSD and Otter Creek developing a Regional Water Authority (RWA) to pursue a joint project from a new, higher-quality water source. The concept for this project would be to develop new wells and a treatment facility northwest of Otter Creek and south of Chiefland's PSA with water piped to the SR24 corridor with a tap/master meter to Otter Creek and a tap/master meter to CKWSD. In this scenario, CKWSD would expand their PSA to serve Rosewood and Sumner and receive water from the newly-formed RWA just east of Rosewood. The potential location for a well field and co-located new water treatment facility and the expected pipeline alignment are shown in Figure 14 with a pipeline length of 20.9 miles. This scenario offers the benefit of serving the areas that currently have poor source water quality while minimizing pipeline distance and providing water from a higher-quality water source that is expected to have fewer treatment requirements and reduced operational costs.

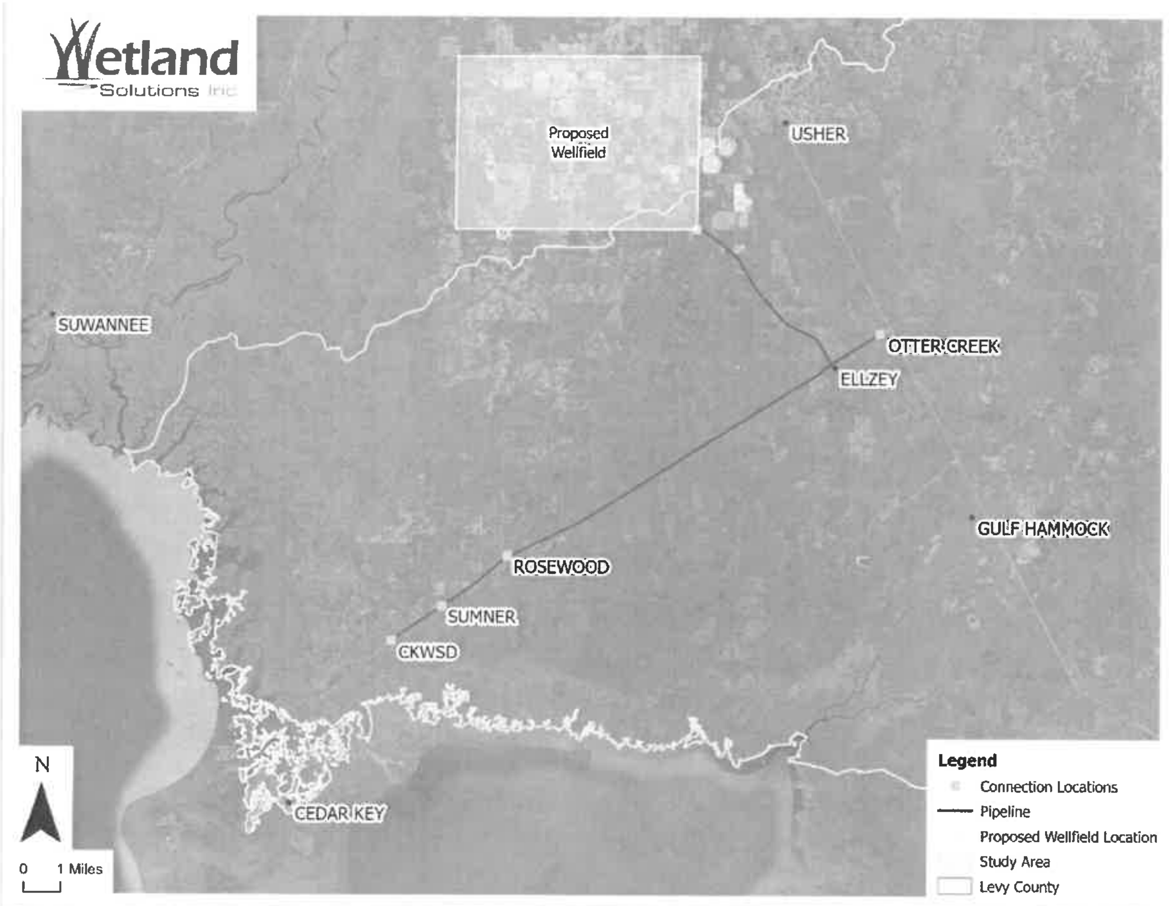

Figure 14. Cedar Key Pipeline to Sumner and Rosewood and Otter Creek

4.3 *Regional 4: Cedar Key + County + Otter Creek + Bronson*

The final cooperative scenario considered was development of a RWA that would serve water to Bronson, Otter Creek, Cedar Key, and areas of unincorporated Levy County along SR24. It is expected that the well field and treatment facility for this WRA would be near Bronson with a tap/master meter to the Town of Bronson, a tap/master meter to Otter Creek, and a tap/master meter to the CKWSD. To serve the communities of Rosewood and Sumner, the CKWSD could potentially expand their service area and receive water through a connection east of Rosewood, or Levy County could develop a public water supply entity to provide water in these areas. In this scenario, it is expected that the RWA would provide water to each of the involved entities with billing of customers completed by the municipality. This project has the benefit of pumping water from the UFA in an area with excellent water quality and expected low treatment requirements. Use of a RWA provides several benefits that are discussed in additional detail in later sections. The approximate pipe alignment is shown in Figure 15 with a total length of approximately 28.9 miles. This scenario has the benefit of reducing redundant operational and monitoring costs between the utilities and significantly reducing treatment costs for both Otter Creek and the CKWSD which will help offset the cost of pumping water to the project partners.

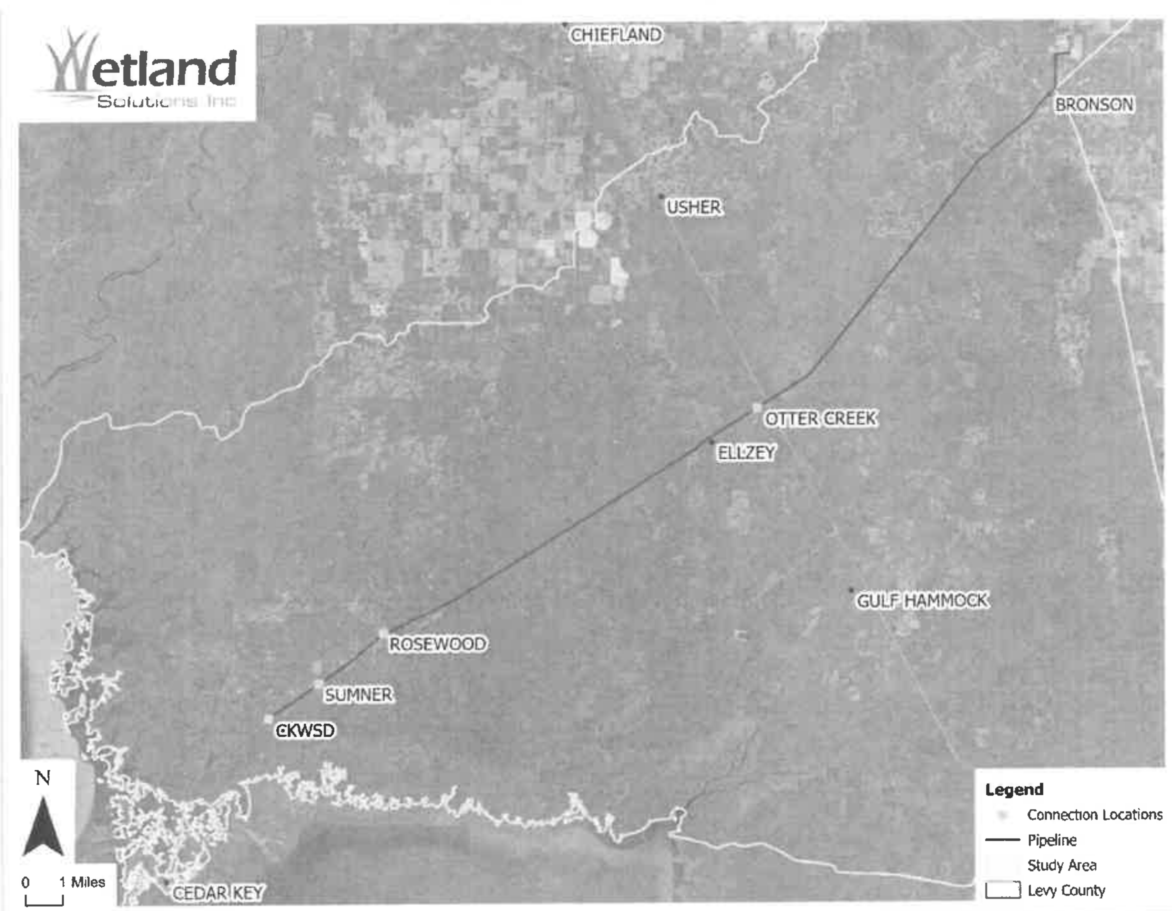

Figure 15. Regional Water Authority Pipeline to Bronson, Otter Creek, Rosewood and Sumner, and Cedar Key

4.4 Alternatives Evaluation

After consideration of the individual and cooperative paths forward, a qualitative alternatives evaluation was developed (Table 2). This initial alternatives evaluation will be refined with incorporation of wastewater and cost considerations developed as part of future tasks. Based on this qualitative analysis it is observed that Sumner and Rosewood are expected to remain unserved unless there is a regional solution. Bronson is observed to have similar outcomes regardless of an independent or regional approach. Cedar Key and Otter Creek are expected to continue to have poor source water quality in the absence of either the Regional 3 or 4 projects. Given the cost of treating current water sources and the desire of the impacted communities to incorporate neighbors, an independent approach is not recommended, except possibly for Bronson.

By developing the Regional 1 project, higher quality finished water can be provided to both Sumner and Rosewood, as well as to Otter Creek in the Regional 2 project. Drawbacks of these alternatives include continued high treatment costs because of poor source water quality. The Regional 3 project resolves source water issues by relocating wells to an area with better source water quality. This alternative provides all communities with a better-quality source water but will involve development of a new well field and treatment plant, although treatment requirements and costs are expected to be significantly lower than they are currently. The Regional 4 project offers similar benefits relative to source water quality but includes Bronson and has a significantly longer pipeline length. Both the Regional 3 and 4 projects involve formation of a RWA to own, operate, and deliver water to the partner communities.

Table 2. Water Supply Alternatives Evaluation

Consideration \ Entity	Independent: Cedar Key	Independent: Sumner/Rosewood	Independent: Otter Creek	Independent: Bronson	Regional 1: Cedar Key, County	Regional 2: Cedar Key, County, Otter Creek	Regional 3: Water Authority, Cedar Key, County, Otter Creek	Regional 4: Water Authority, Bronson, Otter Creek, County, Cedar Key
Served[1]	Y	N	Y	Y	Y	Y	Y	Y
Source Water Quality[2]	P	P	P	G	P	P	G	G
Treatment Costs[3]	H	N/A	H	L	H	H	L	L
Treated Water Quality[2]	G	N/A	M	G	G	G	G	G
Pipeline Length (Miles)	N/A	N/A	N/A	N/A	3.9	15.7	20.9	28.9
Regional Project[1]	N	N	N	N	Y	Y	Y	Y
Regional Water Authority[1]	N	N	N	N	N	N	Y	Y
Served Population[5]	M	S	S	M	M	M	M	L
New Wells[1]	N	N/A	N	N	N	N	Y	M

[1]Y – Yes, M – Maybe, N – No
[2]G – Good, M – Moderate, P – Poor
[3]H – High, L – Low
[4]Transmission system only, excludes distribution system pipe lengths.
[5]L – Large, M – Medium, S – Small

Section 5 Framework for Regional Cooperation

Regionalization across entities can create economies of scale to deliver services more cost-effectively for customers. There are a variety of examples of Florida municipalities collaborating to deliver utility services within a specific geographic area. This section provides an overview of the various regional utilities and the methods in which they were formed and operate. Included in the discussion of regional approaches are considerations for local agreements and how governance approach can influence funding opportunities to offset and finance the cost of engineering and construction of the necessary infrastructure for a regional utility authority.

5.1 Regional Water Authority

The drivers to form a regional approach to provide utility solutions vary across the State as do the methods of formation and governance, with interlocal agreements being a common tool towards creating utility partnerships. Interlocal agreements can range from simple to complex individual agreements. The formation of a regional authority is described within the Florida Statutes (F.S), Title XXVIII, Natural Resources; Conservation, Reclamation, and Use, Chapter 373 Water Resources, Part VII, Water Supply Policy, Planning, Production, and Funding and includes the legal authority for regional water supply, under 373.713 F.S.

> *(1) By interlocal agreement between counties, municipalities, or special districts, as applicable, pursuant to the Florida Interlocal Cooperation Act of 1969, s. 163.01, and upon the approval of the Secretary of Environmental Protection to ensure that such agreement will be in the public interest and complies with the intent and purposes of this act, regional water supply authorities may be created for the purpose of developing, recovering, storing, and supplying water for county or municipal purposes in such a manner as will give priority to reducing adverse environmental effects of excessive or improper withdrawals of water from concentrated areas. In approving said agreement the Secretary of Environmental Protection shall consider, but not be limited to, the following:*
>
> > *(a) Whether the geographic territory of the proposed authority is of sufficient size and character to reduce the environmental effects of improper or excessive withdrawals of water from concentrated areas.*
> >
> > *(b) The maximization of economic development of the water resources within the territory of the proposed authority.*
> >
> > *(c) The availability of a dependable and adequate water supply.*
> >
> > *(d) The ability of any proposed authority to design, construct, operate, and maintain water supply facilities in the locations, and at the times necessary, to ensure that an adequate water supply will be available to all citizens within the authority.*
> >
> > *(e) The effect or impact of any proposed authority on any municipality, county, or existing authority or authorities.*
> >
> > *(f) The existing needs of the water users within the area of the authority.*

Under 373. 713 F.S., within Section 2, there are additional powers and duties that include the authority to levy ad valorem taxes, not to exceed 0.5 mill, with an affirmative vote of the electors residing within the County or municipality. Regional authorities can develop, store, and transport water; provide, sell, and deliver water for county or municipal uses and purposes, and provide for services upon terms, conditions, and rates that apportion to parties and nonparties an equitable share of capital cost and operating expenses of the authority's work to the purchaser. Other allowable services include the collection, treatment, and recovery of wastewater.

5.2 *Special Districts*

In addition to the establishment of a regional authority, in adherence to the rules and polices outlined under 373.713, there is another common legal mechanism called the special district. Not all regional authorities are also special districts and are authorized to serve a special purpose, within a defined geographic territory, such as water and wastewater services. Under Title XIII Planning and Development is Chapter 189 F.S., the Uniform Special District Accountability Act. This section of administrative rules contains the requirements and differences between the special districts, such as the distinction that an independent special district has authority to levy ad-valorem taxes and issue bonds. To create a new district, add or change services provided, or dissolve the district requires the approval of the Florida Legislature as well as ratification of a local referendum. There are several advantages to regional authorities also becoming a special district, such as streamlining the governance and delivery of services as a separate standalone entity as well as simplifying complex local agreements. Challenges aside from the legislative and legal process to establish a special district include extensive reporting and auditing, compliance requirements, as well as administrative and board protocols. Table 3 identifies a subset of regional utility authorities that have been established in traditionally rural areas of Florida.

Table 3. Florida Regional Utility Authorities

Name of Authority	Service	Members	Governance	Established & Governance	Service/Size
Peace River Manasota Regional Water Supply Authority	Potable Water	Charlotte, DeSoto, Manatee, and Sarasota Counties	Board of Directors & Executive Director	1991, Independent Special District under Section 373.1962, F.S. and an interlocal agreement executed	26 MGD
Withlacoochee Regional Water Supply Authority	Potable Water	Citrus, Hernando, Marion, and Sumter Counties, and 13 municipal governments	Board of Directors and a municipal representative from each County & Executive Director	1977, Independent Special District under Section 373.1962, F.S. and by Interlocal Agreement and revised in January 2014	4.6 MGD
Tampa Bay Water	Potable Water	Hillsborough, Pasco, and Pinellas Counties. Cities of New Port Richie, St.	Board of Directors, consisting of municipal and County representatives	1998, non-profit special district. Formed through contracts & legislation to change the West Coast	2.5 Million people

Name of Authority	Service	Members	Governance	Established & Governance	Service/Size
		Petersburg, and Tampa	& General Manager	Regional Water Supply Authority.	
Polk Regional Water Cooperative	Alternative Water Supply	Polk County, Cities of Haines City, Auburndale, Lakeland, Bartow, Davenport, Dundee, Eagle Lake, Fort Meade, Frostproof, Lakeland, Lake Hamilton, Lake Wales Mulberry, Polk City, Winter Haven	Board of Directors, consisting of municipal and County representatives & Executive Director	2017, Independent Special District under Section 373.1962, F.S. and by Interlocal Agreement	15 MGD
Clay County Utility Authority	Potable Water, Wastewater Reclaimed Water	Clay County	Board of Directors, appointed by the Clay County Commissioners and one member by the Governor of the State of Florida & Executive Director	1994, Independent Special District under Section 373.1962, F.S.	50,000 rate payers

5.3 *Interlocal Agreement Considerations*

Important considerations related to cooperative interlocal agreements are summarized below.

1) Ambiguities of a Newly Formed Utility
   a) Contracts must be specific and contain precise language for the services and actions that drive an interlocal agreement. However, the planning, design, and construction of new infrastructure for a newly formed utility, regional authority, or even an established utility that is expanding its service area requires flexibility within an interlocal agreement to allow the entity to proceed through to the process to deliver utility services, i.e., easement, facilities and upgrades, permitting, rates, financing, etc.
   b) Agreements will be modified because the process of forming includes new financing and rate structures, such as a credit rating, and will include unforeseen contractual needs within the initial agreement. To begin the process of formation other contractual items such as the business of delivering utility services and how that is accomplished will also evolve as the infrastructure necessary for a regional authority is designed, engineered,

and then operated which includes additional staffing and resource needs that may not be sustainable in the initial formation.

2) Quantity of Water & Allocations
   a) The formation of a regional authority may occur at a time when there is capacity within the existing infrastructure and the agreement to deliver utility services does not include the need to expand capacity in the future. Interlocal agreements should provide projected infrastructure capacity needs and outline the process to meet facility and operational demands as existing infrastructure ages, regulatory requirements change, and/or the need for services expands.
   b) If the formation of a regional authority requires extensive new infrastructure to provide services, the interlocal agreements can be more complex:
      i) Investment, bond, and financing of new infrastructure requires a newly formed entity to commit to a minimum water allocation. This is necessary to offer credit agencies assurance the new regional authority will have customers and revenues to repay loans and sustain and maintain the new infrastructure.
      ii) Also, in the case of some financing providers such as the Water Infrastructure Finance and Innovation Act (WIFIA) a secondary assurance of the ability to repay the loan is needed as the facilities and distribution infrastructure is right sized to the demand for services with customer payments occurring as infrastructure comes on-line.
      iii) For smaller municipal partners, credit ratings can be challenging, which may require the regional authority to have an anchor member that either has a substantive quantity or allocation of water or can absorb the allocation of a smaller member in the case of default. This can require a very complex series of agreements or may be simplified through loan agency guarantee agreements and/or interlocal agreements but should be noted as a time consuming and necessary consideration of forming a regional authority.
3) Service Areas
   a) The new regional authority should have a service area outlined within the interlocal agreements and items to consider include current and future service areas with agreements defining:
      i) The extent of the regional authority service areas,
      ii) An outline describing how new areas are served and who they may include, and
      iii) Procedures to change or expand the service area.
   b) Should there be two or more service providers, other agreement items may include considerations for:
      i) New residential development,
      ii) Industry and manufacturing,
      iii) Government institutions, and
      iv) Commercial customers.

4) Service Interruptions and Supply Shortages
   a) Emergencies and increased peak demands and other infrastructure needs such as maintenance can alter the utility level of service or result in limitations to water supply. Interlocal agreements should address these interruptions and shortages.
   b) Noticing requirements for the seller and provider to report service interruptions to facilitate routine maintenance and ensure timely repairs should be described.
   c) Agreements may detail notification processes, duration, access agreements and easement procedures as well as resolution reporting.
   d) To offer clarity during a crisis or public health threat, agreements should include disaster and emergency protocols and indicate contractual requirements and limitations of services including outlining the authority's ability to act to provide critical infrastructure services during an emergency. It should be noted that language clarifying when and what conditions constitute as an emergency is a desirable item in interlocal agreements and within operating protocol.
5) Water Quality
   a) The quality of water delivered to the distribution system and how that quality is then delivered to the end user can be very straightforward in the case of an existing entity delivering water directly to customers. However, should there be bulk water provided to multiple buyers, the agreements for ensuring water quality may be more complex.
   b) Other procedural items to be considered within agreements include items ranging from odor and taste to public health threats. Interlocal agreements should contain procedures for the communication and resolution of water quality concerns.
   c) In the case of potable water systems, constituents of emerging concern such as Per- and Polyfluoroalkyl Substances (PFAS) and the concentration of DBPs are contractual items interlocal agreements may also consider.
   d) Wastewater services also should address the water quality of the effluent as an essential consideration of local agreements with evolving state regulations for nutrient concentration and the end use(s) of reclaimed water.
6) Wastewater Compliance
   a) Agreements should identify capacity limits and include procedures for regulatory requirements such as engineering analysis and other regulatory expenses/requirements.
   b) Agreements should include pre-treatment programs and other best management practices that may require local partners to adopt individual local ordinances.
   c) Agreements should define methods and responsibilities to ensure compliance with State and local regulations and how the regional authority will resolve compliance violations with explicit specificity.
7) Rates

a) Depending on the formation of a regional utility there may be either retail rates or bulk rates for water delivered to service providers. Interlocal agreements should detail terms and conditions of the rate categories.

b) Determine rate structures and source for water, wastewater, and reclaimed water and indicate if there are connection fees, meter fees, and other ancillary costs.

c) Operation and maintenance costs can be particularly challenging to quantify for a new utility as there is not existing cost or base assumptions.

d) Future infrastructure needs such as capacity increases and treatment technology upgrades to meet regulatory requirements are escalating and should be planned for.

e) Commodity charge considerations include:

   i) Electricity and treatment chemicals, and

   ii) Capital costs.

f) Failure to pay considerations differ based on the governance structure of the regional authority, if there are multiple providers receiving a bulk service, or if it is a more traditional customer to utility organization.

8) Reselling Water or Capacity

   a) Development and future growth in companion with limitations to future water supply should be considered in interlocal agreements and language specifying allocations or limits may be necessary.

   b) Depending on structure of the regional authority, language regarding whether water can be resold, indicating limits, and identifying parameters for any differentiated rates should be outlined within agreements.

Section 6 Project Funding Sources

There are a variety of funding sources available to offset the engineering, permitting, and construction costs for water supply projects. This includes Federal and State dollars in the form of grants and loans. Non-match grant programs include legislative appropriations, an unreliable source of funding because of uncertainties in available budget that can affect both, if an appropriation is received, and the dollar amount of the grant. Often other grant money requires matching funds and the source of those funds may have limitations. An example of a limitation is that no Federal or State monies can be used as match money, with exception of American Rescue Plan Act (ARPA) funds which are an allowable Federal to Federal match. Other considerations for leveraging grants to supplement local dollars include the application cycle and requirements such as permits and design milestones. Grant monies in Florida can also include springs dollars, alternative water supply, and water quality improvement grants. Other funding sources include less traditional sources such as collaboration with non-governmental organizations (NGOs) and Private Public Partnerships (P3s).

6.1 State Revolving Fund

Annually, the State through the FDEP submits a request to the Federal government to receive Drinking Water and Clean Water State Revolving Funds or a United States Environmental Protection Agency (EPA) capacity grant. This process requires an Intended Use Plan (IUP) that provides EPA detailed information about the twenty percent match the State Legislature must appropriate and how any other dollars earned by the program, such as repaid loans and interest, are to be spent. This is a significant source of funding, for example, in fiscal year (FY) 2018 the State received a $43.7 million award from EPA with a state appropriation of $8.7 million with a total available fund of $124.3 million for drinking water projects. The program sets funding priorities through a publicly-noticed meeting process where the priority lists of funded projects are adopted until the funds are exhausted. The funding process and rules are provided in 62-503, F.A.C. for the state revolving funds (SRF).

The Drinking Water State Revolving Fund (DWSRF) provides low-interest loans for planning, designing, and constructing public water facilities. Funds are obligated based on their priority score per chapters 62-552, F.A.C. After the projects are adopted to the list, the project sponsor may submit loan applications to secure the funds. This program provides low interest loans with interest set as a percentage of the weekly average yield (as listed in the Bond Buyer 20-Bond General Obligation [GO] index for the quarter preceding the execution of the loan agreement). The percentage is then calculated from the Median Household Income (MHI), with the project service area as the variable. The standard SRF loan term is limited to a maximum of 20 years, except for financially disadvantaged communities which can receive 30-year loans.

Small, disadvantaged communities can have a portion of their loan principal forgiven, 20-90%. The definition of a small, disadvantaged community is a public water system that serves a population of 10,000 or fewer with a household income below the state average. For disadvantaged communities not meeting the definition of small, 20% loan forgiveness may be available.

The types of projects that can be funded under this loan program include, but are not limited to:

1. Construction or upgrade of treatment facilities,
2. Installation or upgrade of disinfection facilities,
3. Transmission lines and finished water storage,
4. Acquisition of land, if needed, for the purposes of location of eligible project components.

6.2 *Water Infrastructure Finance and Innovation Act*

The Water Infrastructure Finance and Innovation Act (WIFIA) is administered by the Federal Credit Reform Act of 1990 (FCRA) and includes over 100 funding assistance programs across the Federal Government. At present the WIFIA program has closed 82 loans totaling over $14.4 billion in credit assistance to help finance water infrastructure projects (Environmental Protection Agency 2022). Additionally, there are another 72 projects pending with a total value of $12.2 billion. Credit subsidy previously appropriated but unencumbered can roll over to future years. When the credit subsidy is appropriated, WIFIA may release notice of funding availability (NOFA). In addition to a qualifiable project there is a threshold of at least $20 million in loan requirements to be considered as an applicant; except for the credit subsidy set aside of available funds for small, rural communities with populations of less than 25,000 with project costs of $5 million dollars. The maximum loan amount for a WIFIA loan is 49% of project costs.

WIFIA is a federal program to provide long-term, low-cost, supplemental credit assistance under customized terms to creditworthy water and wastewater projects of national and regional significance. The EPA identified four project priorities:

1. Extreme weather change retrofits including water recycling and managed aquifer recovery,
2. Public water systems and conveyance systems,
3. Green infrastructure, and
4. Infrastructure repair, rehabilitation, and replacement.

Examples of WIFIA projects in Florida include:

1. Osceola County Board of County Commissioners: Regional Stormwater Facility
2. Miami-Dade County: Ocean Outfall Compliance Injection Wells (3)
3. Pasco County Board of County Commissioners: Wesley Center Wastewater Treatment Plant
4. Polk Regional Water Cooperative
5. TOHO Regional Water Authority

One of the most beneficial advantages of a WIFIA loan is the ability to secure a substantial amount of long-term funding from a single source, resulting in one, fixed, low-interest rate. Another advantage, loan maturity, is connected to the project(s) substantial completion. The WIFIA program allows for the loan to be secondary to other funding mechanisms. There is a deferral period of up to 5 years where neither interest nor principal payments are due. Another advantage is the loan duration, up to 35 years, with the deferral option considered. Typically, interest rates are competitive at slightly less than 30-year revenue bonds.

The interest rate is no less than the yield on U.S. Treasury securities of a similar maturity to that of the WIFIA loan on the date of execution of the credit agreement. The WIFIA program estimates the yield on comparable Treasury securities by adding one basis point to the State and Local Government Series (SLGS) daily rate with a maturity that is equal to, or greater than, the Weighted Average Life (WAL) of the WIFIA loan. The interest rate will be a single, fixed rate established at closing. It is possible for the prospective borrower to receive multiple disbursements, but the interest rate will be the same for all disbursements. The WIFIA credit instrument shall not be exposed to material amounts of unhedged variable rate debt in the borrower's financing structure. The average interest rate for the 82 closed loans was 5.74% (Environmental Protection Agency 2022).

6.2.1 Amortization

WIFIA loans may capitalize interest, as warranted by the cash flow profile of the project. However, the WIFIA program will not increase its investment in a project by capitalizing interest when other project creditors are withdrawing their investment through principal amortization. The WIFIA program shall seek to amortize the WIFIA credit instrument over the useful life of the project. The loan maturity date must be the earlier of 35 years after the date of substantial completion of the project, or the useful life of the project. Debt service payments must commence no later than 5 years following substantial completion of the project. There is an opportunity to accommodate the projected cash flow from project revenues and other sources and to sculpt debt service payment.

6.2.2 Deferrals

Deferrals may be granted at the sole discretion of the Administrator and can be contemplated in the credit agreement; however, there must be a reasonable assurance of repayment of the WIFIA loan. Final maturity of the WIFIA credit instrument must remain unchanged. The borrower may prepay in whole or part without penalty, but it is important to note that federal funds cannot be used to prepay.

Disbursements of WIFIA loan to fund eligible incurred project costs are solely based on submitted invoices, receipts, and the supporting documentation. Disbursement timing can be structured around the needs of the project financing plan but shall be insulated from risk.

6.2.3 Loan Application Process

The application process begins with a letter of interest (LOI) to provide EPA with the necessary information about the purpose of the project, demonstrate the relationship between the project and the WIFIA selection criteria, as well as provide EPA an LOI point of contact. The WIFIA website includes a LOI form for the applicant. There is no fee to submit an LOI. This form supports the applicant to succinctly provide borrower information and provide the details of the project planning. This first step in the process provides EPA a method to preliminarily assess the credit worthiness of the applicant, evaluate the feasibility of the project and determine the project eligibility for a WIFIA loan. The LOI includes an overview of the project readiness to proceed, organizational structure, and the financial status and experience in executing similar projects.

Examples of specific supporting information includes applicants address, Dun and Bradstreet Data Universal Number System (DUNS) identifier, as well as financial verification through the inclusion of year-end audited financial statements for the previous three years, as available. A financing plan includes the amount of credit the applicant is seeking from the WIFIA program and a detail of the proposed sources and uses of funds for the project. The plan must also include specific financial details such as revenue source, project credit characteristics, how senior obligations of the project provide investment grade rating and the anticipated WIFIA instrument rating. The financial plan should also provide the summary of revenue and expense projections for the duration of the WIFIA debt.

The detailed project section (15 pages) must include the following information:

1. Project Description
2. Location
3. Construction Plans and Specifications
4. Estimated Project Cost
5. Project Schedule
6. Alternatives Analysis
7. System Engineer's Report
8. Environmental Review
9. Other Permits and Approval
10. Project Management and Compliance Monitoring Plan
11. Risks and Mitigation Strategies

To describe the borrower's ability to operate and maintain the project over the life of the WIFIA loan an operation and maintenance plan (8 pages) must be submitted that includes:

1. Operation and Maintenance Plan
2. Management Experience
3. Operational Risks and Mitigation Strategies

The financing plan (15 Pages) provides the WIFIA underwriting team a comprehensive understanding through the inclusion of the following information:

1. Proposed Terms for WIFIA Assistance
2. Preliminary Rating Letter
3. Available Sources of Security
4. Dedicated Sources of Income for Repayment
5. Sources of Funds
6. Cash Flow Pro Forma
7. Financing Restrictions

6.3 United States Department of Agriculture

The United States Department of Agriculture (USDA) administers the Rural Development (RD) loan program to provide funding for drinking water and waste disposal systems. This program prioritizes funding projects to increase the availability of safe drinking water and sanitary waste disposal to improve economic vitality of rural areas. The USDA-RD loans provide funding for construction of water and wastewater facilities in rural communities with populations less than 10,000. Funding through this program is applied for via a web portal, RDApply. This submission system allows for the application and pertinent documents to be uploaded. This online portal requires a Level 2 eAuthentication ID for project submission, which can be applied for online or by visiting a Local Registration Agent (LRA). Grants for as much as 75% of the project costs may be provided for projects which pertain to public health, safety, or environmental improvement depending on the income level and community need.

6.4 Suwannee River Water Management District Cooperative Funding

The SRWMD facilitates and offers funding opportunities through several programs. Each of these programs is discussed further in the following sections.

6.4.1 State Springs Grant Program

The SRWMD is responsible for selecting and passing on projects from within the SRWMD that are designed to improve the quality and quantity of water resources. These grants can be provided with or without local cost-share depending on the purpose, size, and entity seeking funding. Types of projects that can receive funding include: agricultural best management practices, hydrologic restoration, land acquisition, reuse, stormwater, wastewater collection and treatment, water conservation, or other innovative approaches and efficiencies. This program is based around an annual funding cycle with projects submitted to the SRWMD near the end of the calendar year, typically December, for review. Projects are reviewed by the SRWMD and those that are recommended for funding are forwarded to the FDEP in the May timeframe for selection and approval by the beginning of the fiscal year in October. Funding amounts have been highly variable with some projects of more than $5 million recommended for funding.

6.4.2 State Alternative Water Supply Grant Program

In much the same way as for the springs funding program the SRWMD supports application for projects that develop AWS for Florida's growing economy and that support natural systems. This program includes projects such as: reclaimed water, water conservation, stormwater, surface water, brackish groundwater, desalination, other non-traditional source, other water quantity, or feasibility and land acquisition necessary to implement a regional project. Projects are evaluated in the same manner as for springs funding projects with the same timelines for acceptance. Funding amounts and match requirements vary depending on the project type and entity seeking funding.

6.4.3 Regional Initiative Valuing Environmental Resources Cooperative Funding Program

The SRWMD directly provides funds via the Regional Initiative Valuing Environmental Resources (RIVER) Cooperative Funding Program to improve water quality, protect water supplies, restore natural systems, or provide flood protection. Projects that may receive funding include projects that: provide advanced aquifer recharge, conserve water supply, develop alternative water supplies, enhance or restore natural systems, improve water quality, protect springs, or provide improved flood protection. Funding is evaluated annually with applications typically due in April.

6.5 *Local Funding*

Investments in local water, wastewater and reclaimed water infrastructure are driven by the needs of the community, as well as the distribution and collection systems. The source of funds necessary to invest can vary and can include utility service fees, municipal bonds, taxes, and special assessments. This section focuses on private investment and non-ad-valorem, as both are outside the common funding mechanisms.

Revenue bonds are typically used for utility construction because the revenue associated with repayment of the bonds is solely taken from the specific revenue generating purpose of the bonds. Unlike General Obligation bonds, revenue bonds do not require a referendum to issue; however, because the taxing power of government is not behind them, they are typically more costly. To proceed with revenue bonds, a newly formed utility will need to have its bond rating determined and internal rate of return of the assets to be constructed would need to be determined. Before entering into a bond, regional authorities can explore bond anticipation notes, which are valid for five years in Florida and can be used to kick start the project while the issuance of revenue bonds is explored.

In Florida, the law requires that bonds may bear interest at a rate not to exceed an average net interest cost rate, which shall be computed by adding 300 basis points to The Bond Buyer "20 Bond Index" published immediately preceding the first day of the calendar month in which the bonds are sold. Before entering the bond market, an evaluation must be performed to determine if the current financial market is willing to underwrite the project related to the bonds. The actual sale of bonds can be handled by investment bankers and can be sold to large investors or put up for private sale for quantities of $5,000 or more.

Another potential local funding source is a non-ad valorem assessment on units of property. This approach provides a recurring source of revenue, but more importantly, provides a uniform and consistent local investment in necessary infrastructure. Considerations include sunset provisions, fee assessment methodology, estimated revenue, collection and program management responsibilities, and the ordinance that crafts the implementation and management of the funds for utility infrastructure.

Section 7 References

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Phase 1: Regional AWS Feasibility – Cedar Key, Bronson, Otter Creek, and Unincorporated Areas in Levy County

Task 3 – Evaluation of Current and Projected Wastewater Treatment and Disposal Needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County (Draft)

Prepared for
Suwannee River Water Management District

TWA: 19/20-064.006

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Prepared by

Wetland Solutions Inc

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Section 1 Wastewater Infrastructure

1.1 Introduction

The Suwannee River Water Management District (SRWMD) is one of five water management districts tasked with four core mission areas: water supply, water quality, flood control/floodplain management, and natural systems. The SRWMD comprises all or portions of 15 counties and encompasses approximately 7,640 square miles. The SRWMD is responsible for managing the needs of both natural systems and water users. To accomplish this, the SRWMD issues water supply permits for water users and develops minimum flows and minimum levels (MFLs) for natural systems within the SRWMD. These efforts are carried out in conjunction with water supply planning to determine where additional water is needed, identify alternative water supplies (AWSs), and implement cost-effective projects to address identified water challenges or shortages.

Within the Waccasassa Basin the City of Cedar Key, unincorporated Levy County, and the Towns of Otter Creek and Bronson have a variety of water and wastewater challenges that they are attempting to address with assistance from the SRWMD. For both Cedar Key and Otter Creek, these include water quality concerns related to their supply wells and treatment requirements. Additionally, Cedar Key is faced with challenging wastewater treatment issues and loss of treated water to a marine ecosystem where it cannot be beneficially recharged or reused. Bronson and Levy County are concerned with water supply and managing increasing demand in a responsible manner. These disparate challenges present potential opportunities for these entities to collaborate to develop regional projects that can help address these concerns, while also providing a reliable and resilient water supply and employing wastewater treatment and reuse strategies that can benefit the region.

The SRWMD is working with the Florida Department of Environmental Protection (FDEP) and the communities to evaluate this study area and the identified water and wastewater issues by developing an alternatives analysis for the specific challenges and needs faced by each community. This effort is evaluating not only current needs, but also anticipated growth in the region and potential medium to long-term water supply challenges. The tasks to complete this project include:

- Task 1: Evaluation of current and future water supply challenges, needs, and limitations for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 2: Alternatives development to address current and future water supply needs.
- Task 3: Evaluation of current and projected wastewater treatment and disposal needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 4: Alternatives development for wastewater reuse and recharge.
- Task 5: Cost estimation and cost-effectiveness calculation for the identified alternatives.

This report is focused on Task 3 of the project including evaluation of current and projected wastewater treatment and disposal needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.

1.1.1 Study Area

The study area for this project is the portion of the SRWMD that lies within the Waccasassa River Basin and Levy County. The primary focus of this project is the area between the Town of Bronson and the City of Cedar Key along and within the vicinity of State Road 24 (SR24). This includes the Town of Otter Creek and portions of Unincorporated Levy County along and near SR24 including the communities of Rosewood and Sumner. The relevant boundaries and study area are shown in Figure 1.

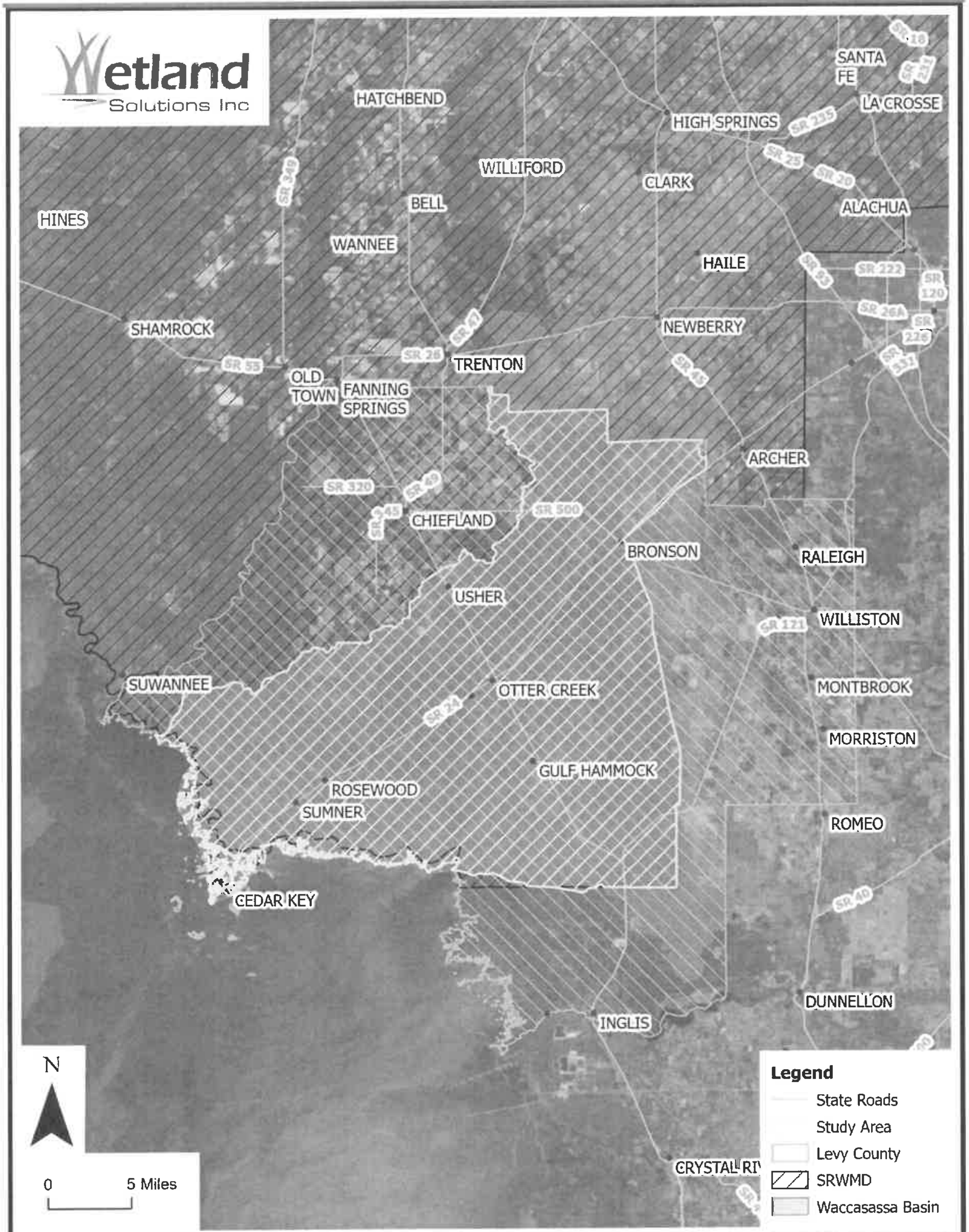

Figure 1. Regional Alternative Water Supply Feasibility Study Area Extents

Section 2 Data and Methods

This section describes the data that were collected as part of this project. Primary data types included geographic data, wastewater facility data, and population data. The following sections discuss each of these sources and the data evaluated as a part of this study.

2.1 Geographic Data

Geographic data were collected to evaluate the spatial attributes of features of interest. These data were generally in geographic information system (GIS) formats.

2.1.1 Data Sources

Data were collected from a variety of sources including the SRWMD, FDEP, Florida Department of Transportation (FDOT), Florida Department of Health (FDOH), United States Geological Survey (USGS), and the Florida Geographic Data Library (FGDL). Table 1 shows the data collected, source, and year.

Table 1. Data, Source, and Year

Data	Source	Year
Waccasassa River Basin (HUC8)	USGS	2016
Parcels	FGDL	2019
County Boundaries (Detailed Shoreline)	FGDL	2015
State Roads	FDOT	2022
Onsite Sewage Treatment & Disposal System	FDOH	2021
Wastewater Facility Regulation (WAFR) - Wastewater Sites	FDEP	2018
SRWMD Boundary	SRWMD	2022
Public Service Area Boundaries	SRWMD	2021
Statewide Land Use Land Cover	FDEP	2022

2.2 Wastewater Data

Wastewater in the study area is either treated centrally at wastewater treatment facilities (WWTFs) or in on-site sewage treatment and disposal systems (OSTDSs). WWTFs within the study area were identified based on FDEP data that are a part of the Wastewater Facility Regulation (WAFR) database. These facilities include all permitted domestic, power plant, or industrial WWTFs, as well as residuals application sites and collection systems. OSTDSs were identified based on FDOH parcel data.

Section 3 Wastewater Considerations

This project is evaluating wastewater considerations for Bronson, Cedar Key, Otter Creek, and Unincorporated Levy County. These entities have various degrees of existing wastewater service and treatment with most homes on septic systems.

3.1 *Inventory of Existing Wastewater Treatment Facilities*

Based on the WAFR database a total of five wastewater facilities are located within the study area as shown in Figure 2. Additionally based on searches of the FDEP Oculus database there were an additional 53 facilities that had permits and had their location marked as either Cedar Key, Bronson, or Unincorporated. A majority of these facilities appear, based on facility name and a spot-check of available permit files, to be aquaculture processing facilities. Upon reviewing a selection of these facilities, the process appears to be a once-through operation model with water pumped from the Gulf through the process and discharged back to the Gulf. Additionally, there are other wastewater permits that appear to be related to small stores or condominiums. These 53 facilities are not of interest to this project because none of these systems are centralized, municipal systems. However, any of these facilities discharging to OSTDSs could be considered for connection to an existing or expanded WWTF.

All the facilities in the WAFR database are domestic facilities with one domestic wastewater residuals application site and four domestic WWTFs, with the characteristics shown in Table 2. Capacities of the wastewater facilities range from 0.024 to 0.18 MGD. Of the four WWTFs, two facilities are associated with municipalities (Bronson and Cedar Key), one with the Levy County Jail, and one with the Levy Forestry Work Camp. The remainder of this study focused specifically on the municipal wastewater facilities located in Bronson and Cedar Key.

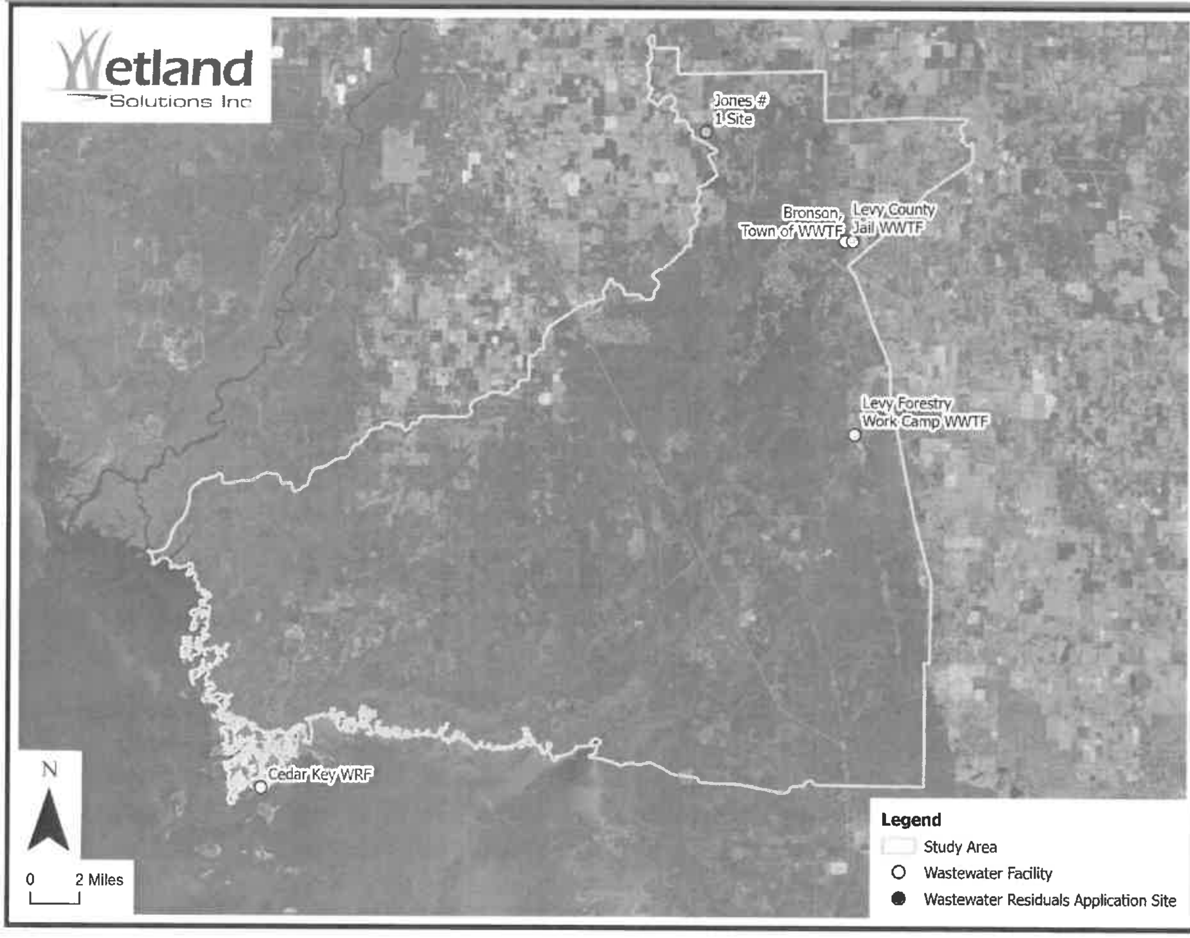

Figure 2. Permitted Wastewater Treatment Facilities in the Waccasassa Feasibility Study Area

Table 2. Permitted Wastewater Treatment Facilities

Facility ID	Name	Capacity (MGD)	Facility Type
FLA956945	Jones #1 Site	--	Domestic WW Residuals Application Site
FLA011656	Levy Forestry Work Camp WWTF	0.035	Domestic WW Facility
FLA011647	Levy County Jail WWTF	0.024	Domestic WW Facility
FLA317659	Bronson, Town of WWTF	0.083	Domestic WW Facility
FL0031216	Cedar Key WRF	0.18	Domestic WW Facility

3.1.1 Current Disposal

Both municipal WWTFs rely on land application for disposal. Cedar Key maintains and operates an absorption field system for disposal, with a surface water discharge to Back Bayou as a backup/emergency disposal system. The absorption field is comprised of 1.148 acres of underground, high-rate drip irrigation system located on the parcel that also houses the City's water tower. The surface water discharge location is to Back Bayou, Class III Marine Waters (WBID# 8037C), which includes approximately 80 feet of pipe, discharging approximately 20 feet from shore at a depth of 3 feet.

The Town of Bronson's WWTF has two sites for disposal that are located on adjoining parcels. The first is slow-rate land application at an 8.2-acre sprayfield and the second is two rapid infiltration basins (RIBs) with a total area of 0.849 acres.

3.1.2 Current Flows

The WWTFs within the study area have permitted capacities ranging from 0.024 to 0.18 MGD (Table 2). Discharge monitoring report (DMR) data were obtained from the FDEP for the Bronson and Cedar Key facilities. Monthly average flows are presented in Figure 3 with average flows at these facilities ranging from 0.048 to 0.097 MGD (Table 3). Another important metric when considering wastewater facilities is the ratio of current flow to permitted capacity. This information is used to determine when a wastewater facility needs to expand capacity to meet population growth. This ratio was calculated for each facility and was 39% for Bronson and 52% for Cedar Key.

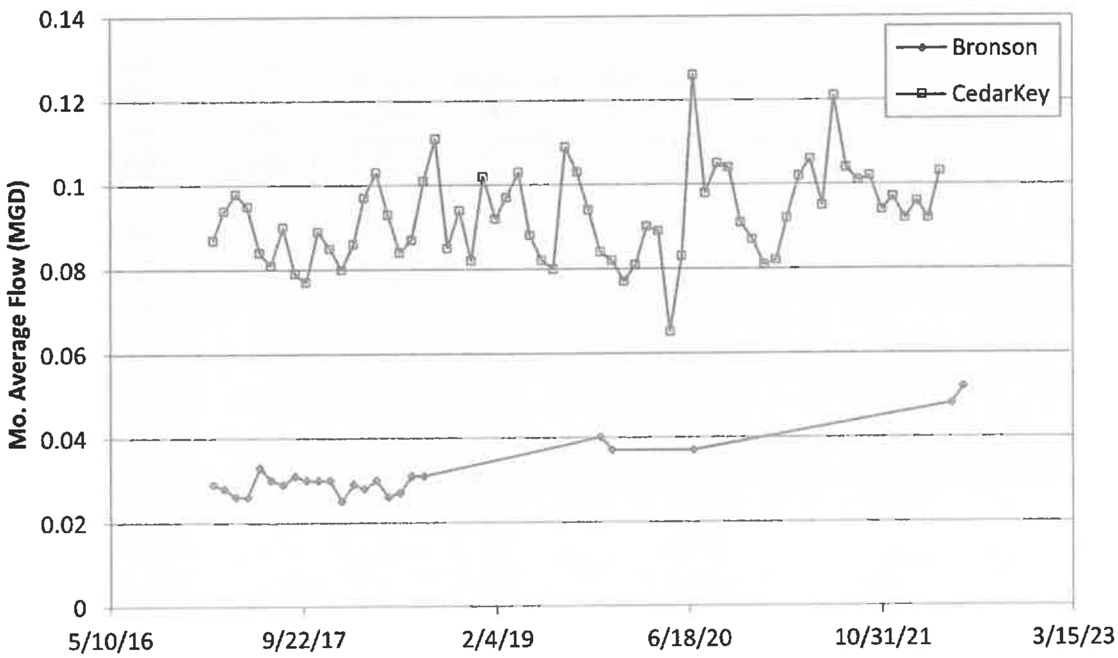

Figure 3. Bronson and Cedar Key Discharge Monitoring Data (2017 – 2022)

Table 3. Permitted Wastewater Treatment Facilities

Facility ID	Name	Capacity (MGD)	Average Flow (MGD)	Flow to Capacity Ratio	Period of Record
FLA317659	Bronson, Town of WWTF	0.083	0.032[1]	39%	Jan 2017 – May 2022
FL0031216	Cedar Key WRF	0.18	0.093	52%	Jan 2017 – Mar 2022

[1] No DMRs available between July 2018 - October 2019 and June 2020 - April 2022

3.1.3 Current Wastewater Quality

Water quality for the WWTFs are reported as part of the monthly DMRs submitted to FDEP. The parameters of primary interest to this study include nutrients and fecal coliform. Fecal coliform concentrations are of particular interest for the Cedar Key facility because of the local aquaculture industry. Regulated parameters in the permits for each WWTF of interest to this study included total Kjeldahl nitrogen (TKN), nitrate+nitrite as nitrogen (NO_X-N), and fecal coliform (FC), with the limits shown in Table 4. Despite being included in the permit for Cedar Key, TKN is not directly sampled at the facility but can be calculated based on the sampled parameters (TN and NO_X-N, as TKN = TN - NO_X-N). Average monthly maximum NO_X-N values shown in Table 4 are concentrations leaving the facility, not at the monitoring wells where concentrations are regulated. Finally, Bronson recently had an operator change for their contracted wastewater operations and had limited DMRs available over the past two years. Time series data for Bronson (NOx-N) and Cedar Key (TN and NO_X-N) are shown in Figure 4 and Figure 5, respectively.

Table 4. Wastewater Facility Water Quality Limits and Average Values

Facility ID	Facility Name	Permitted TKN (mg/L)[1,2]	Permitted NO_X-N (mg/L)[3,4]	Permitted FC (#/ 100mL)[1,4]	Avg. Mo. Max TN (mg/L)[5]	Avg. Mo. Max NO_X-N (mg/L)[1]	Avg. FC (#/ 100 mL)	Period of Record
FLA317659	Bronson, Town of WWTF[6]	--	10.0	200	---	2.83	1,785	Jan 2017 – May 2022
FL0031216	Cedar Key WRF	12.0	10.0	14	9.48	2.32	2.2	Jan 2017 – Mar 2022

[1]Effluent at R-001
[2]Single sample
[3]Groundwater at monitoring wells
[4]Annual average
[5]TN and NO_X-N sampled for rather than TKN
[6]Bronson facility had no DMRs available between July 2018 - October 2019 and June 2020 - April 2022

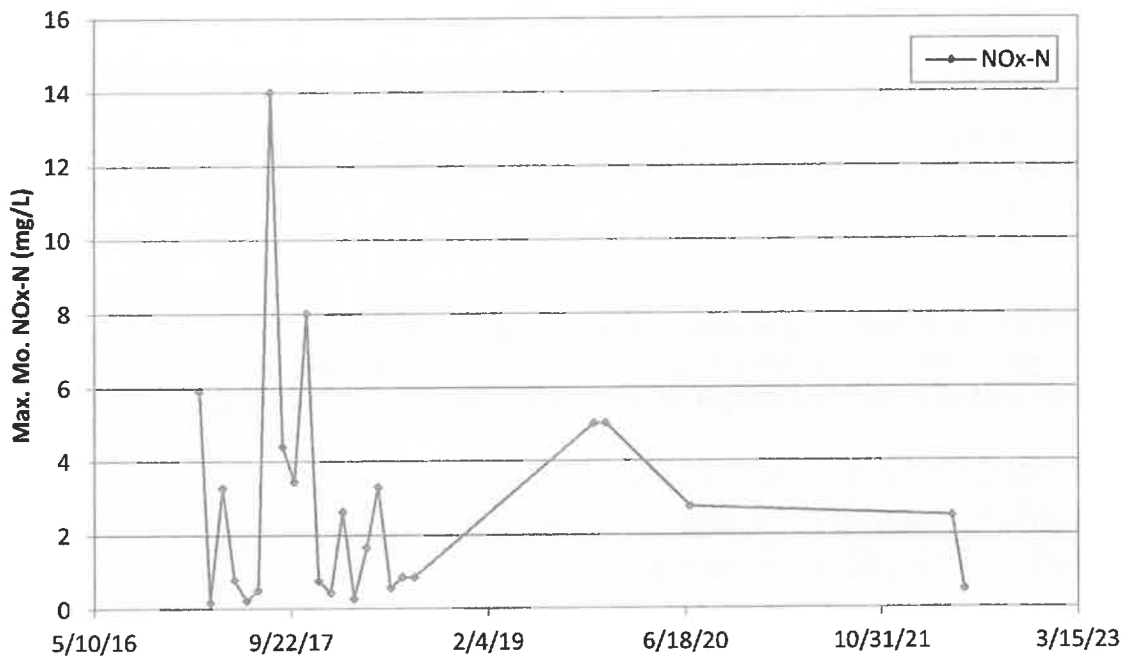

Figure 4. Bronson Discharge Monitoring Report Data (2017 - 2022)

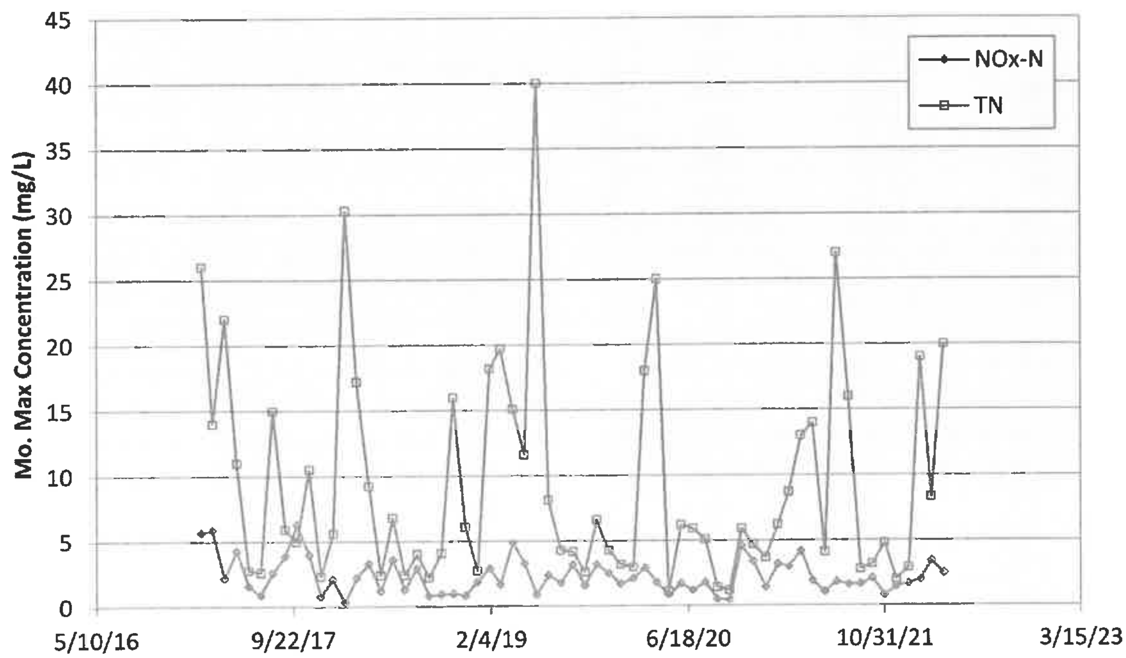

Figure 5. Cedar Key Discharge Monitoring Report Data (2017 - 2022)

3.1.4 Current Wastewater Facility Condition

Wastewater facility condition is evaluated as part of permit renewal. The purpose of this review is to identify current issues with the operation and maintenance of WWTFs and necessary repairs. Both facilities that are a part of this study, Cedar Key and Bronson, had reports prepared and available for their WWTFs from their last permit renewal cycle. These reports are summarized in the following sections.

3.1.4.1 Cedar Key Water Reclamation Facility

The Cedar Key WRF had an Operation and Maintenance Performance Report developed in July 2018 as part of the facility permit renewal. This report described the components of the wastewater system as well as condition of each component. Reported conditions are summarized in Table 5.

Table 5. Cedar Key Water Reclamation Facility Operation and Maintenance Summary

System	Component	Condition	Identified Issues
Influent	Static Screen	Satisfactory	None
Influent	Grit Chamber	Poor	Inoperable, relying on removal in aeration tanks, safety issue with exposed open channels, recommended to monitor sediment accumulation in aeration tanks
Aeration	Tanks	Poor	Walls have cracks that require rehabilitation
Aeration	Blowers	Poor	Leaking oil and require maintenance
Aeration	Diffusers	Good	None
Clarification	Clarifiers	Good	Safety issue with a lack of handrail around edge
RAS	Pumps	Good	None
Filtration	Filters	Good	None, but air scour system is not efficient
Chlorination	Pumps	Good	None
Chlorination	Chamber	Good	None
Dechlorination	Pumps	Good	None
Reclaimed	Pumps	Good	None
Polymer Feed	Pumps	Satisfactory	None
Aerobic Digester	Tank, Blower	Satisfactory	None, but changes could be made to reduce sludge volume
Collection	Collection	--	The system does experience some infiltration and inflow due to materials and condition and is being evaluated in a study

Facility performance was evaluated based on data from January 2016 through June 2017. Performance was well within permit requirements in treated effluent. The groundwater monitoring program indicated permit exceedances for total dissolved solids (TDS), chloride, and sodium, although water quality criteria exemptions have been issued for these parameters.

3.1.4.2 Bronson Wastewater Treatment Facility

The Bronson WWTF had an Operation and Maintenance Performance Report developed in September 2018 as part of the facility permit renewal. This report described the components of the wastewater system as well as condition of each component. Reported conditions and identified issues are summarized in Table 6.

Table 6. Bronson Wastewater Treatment Facility Operation and Maintenance Summary

Component	Condition	Identified Issues
Static Screen	Excellent	None
Surge Tank	Satisfactory	None
Flow Splitter Box	Excellent	Recommended to evaluate sizing to allow simultaneous operations of pumps and to monitor grit levels
Biological Treatment Unit	Satisfactory	Offline blower and clogged line should be repaired
Secondary Clarifiers	Satisfactory	Recommend cleaning to remove scum and algae
Chlorine	Good	None, but cleaning recommended quarterly
Spray fields	Satisfactory	Complete repair of control panel
RIBs	Satisfactory	None, recommend normal maintenance
Aerobic Digester	Satisfactory	None
Collection System	Good	No identified infiltration and inflow issues

Facility performance was evaluated based on data from July 2016 through March 2018. Evaluated constituents were generally within permit limits except during a single event for nitrate (October 2016, 60.09 mg/L) and a single event for fecal coliform (May 2017, 9,000/100 mL). Three-month average daily flows were below 50% for the facility, not requiring a Capacity Analysis Report. Groundwater sampling found pH to be out of compliance, although effluent pH values were within limits and this is believed to be the result of natural soil conditions.

3.2 Inventory of Existing Septic Systems

Data on the location of OSTDSs were collected from the FDOH, which maintains a dataset of parcels and disposal types. These data were combined with parcel data for the state to yield a best estimate of parcels that had both buildings and/or residential units and septic tanks. The OSTDS data are classified based on disposal method with values of: known septic, likely septic, somewhat likely septic, known sewer, likely sewer, somewhat likely sewer, undetermined, unknown, or not applicable. Parcels identified as "unknown" or "undetermined" are due to conflicts between data sources used to derive the OSTDS status. Parcels identified as "NA", are generally for parcels where structures have not yet been constructed (Ursin 2016). For this project, all parcels with one or more buildings and/or residential units and that were identified as known septic, likely septic, or somewhat likely septic were considered as having an OSTDS in use.

This process identified 2,437 parcels as having OSTDSs, with 581 classified as known septic, 1,844 classified as likely septic, and 12 identified as somewhat likely septic. Of the identified parcels that are categorized as having OSTDSs, 638 are located completely or partially within the Public Service Areas (PSAs) of Bronson (n=189), Otter Creek (n=79), Cedar Key (n=2), and the University Oaks Mobile Home Park (n=368). The Town of Otter Creek and University Oaks Mobile Home Park do not provide wastewater service and all homes are on OSTDSs. The City of Cedar Key has virtually all units on centralized wastewater. The Town of Bronson has 220 wastewater accounts that are on centralized wastewater with the remainder apparently served by OSTDSs.

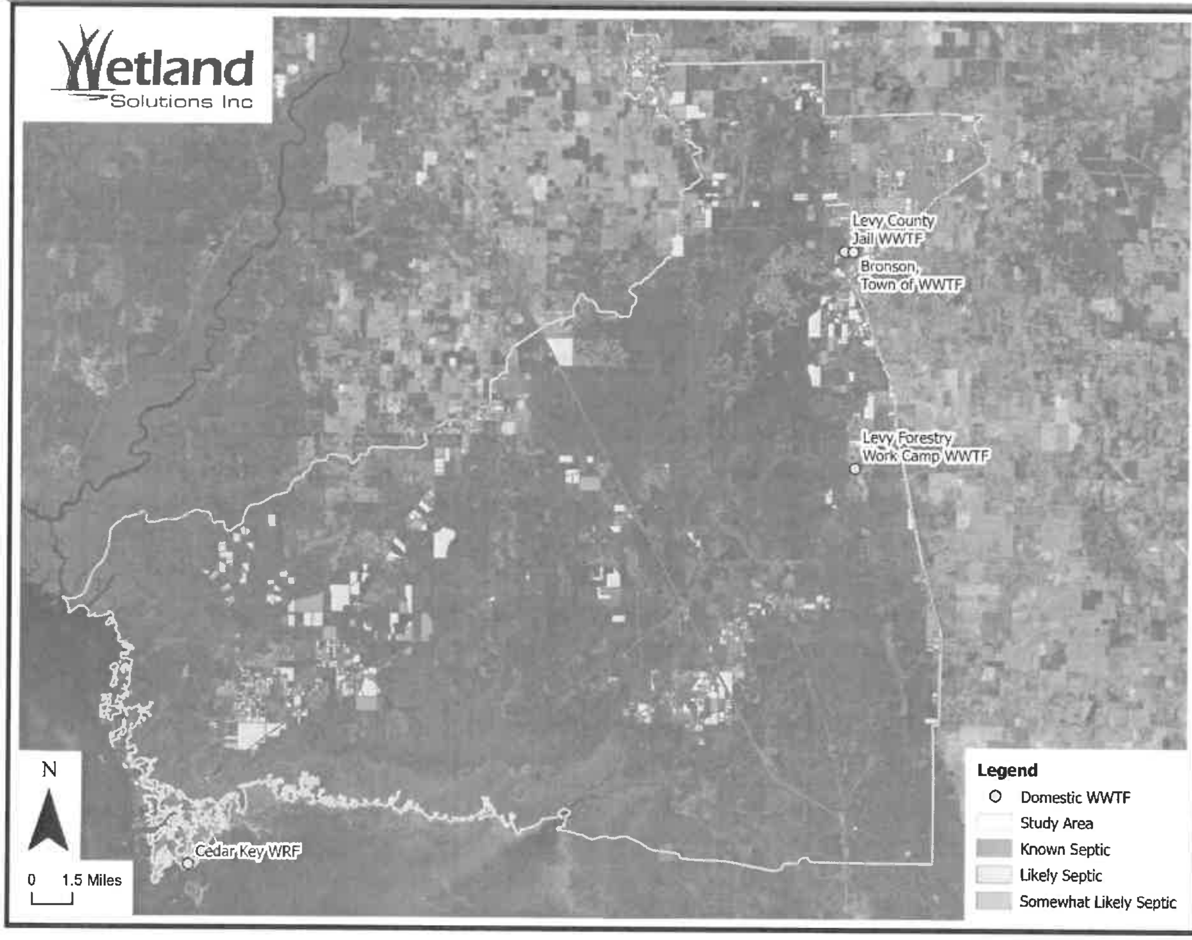

Figure 6. Septic Systems in the Waccasassa Feasibility Study Area

3.3 Population Growth Projections

Population growth projections were presented as part of Task 1. None of the utilities of interest (Cedar Key, Otter Creek, or Bronson) were projected to grow based on estimates from the SRWMD (Suwannee River Water Management District 2021). The current populations as of 2020 were estimated to be 2,304, 173, and 1,133 for Cedar Key, Otter Creek, and Bronson, respectively. Complexities associated with these population estimates are discussed below.

Cedar Key has a substantial transient, tourist population and flows for both the water and wastewater systems increase substantially on weekends, and particularly holiday and festival weekends. This results in wastewater flows doubling to tripling during these periods.

In a meeting with Bronson, the Town discussed current and planned development that could significantly change population during the planning period. To better estimate this potential scenario, the medium and high population growth estimates for Levy County developed by BEBR were used to estimate potential population growth through 2045. This approach resulted in 2045 population estimates of 1,310 and 1,539 for the medium and high growth scenarios, respectively.

3.4 Projected Wastewater Flows

Current combined wastewater flows for both Bronson and Cedar Key average approximately 0.13 MGD. If a centralized wastewater option were available to new and existing parcels for the area, this flow would be expected to increase. This increase would occur due to septic-to-sewer conversion and new development (residential, commercial, institutional, and industrial). These two potential sources of additional flow are discussed in the following sections.

3.4.1 Septic-to-Sewer Conversion

Wastewater flows would be expected to increase if septic-to-sewer conversion occurred for parcels currently served by OSTDSs. These conversions can be split into two primary groups: parcels currently within a PSA and parcels not currently within a PSA. For parcels within a PSA, if septic-to-sewer conversion occurred for the University Oaks Mobile Home Park, Otter Creek, and the remainder of unserved homes in the Town of Bronson, an additional 636 OSTDSs could be sewered. Flow for this number of additional accounts was calculated based on an assumption of 50 gallons per person per day (Tchobanoglous et al. 2003) and an estimate of 2.5 people per OSTDS. This equates to 125 gallons per OSTDS per day. Expected flow increases associated with conversion of the OSTDSs within PSAs would be expected to generate an additional approximately 0.08 MGD of flow.

In addition to existing OSTDSs within the PSAs, there are also parcels currently relying on OSTDSs outside the PSAs. The greatest concentration of these parcels within the study area are in the Rosewood and Sumner areas and north of the Town of Bronson. Along the alignment between Cedar Key and Otter Creek there are approximately 350 additional accounts within one mile of SR24, primarily within the Rosewood and Sumner areas. This number increases to approximately 460 additional accounts within 1.5 miles of the same segment of SR24. This equates to additional wastewater flows of 0.04 to 0.06 MGD. Additionally, north of Bronson there are approximately 350 additional OSTDSs associated with parcels outside of the Bronson PSA. This would equate to additional wastewater flows of approximately 0.04 MGD.

Total wastewater flows, including existing flows and conversion of all the described septic systems to sewer, results in estimated flows of approximately 0.31 MGD.

3.4.2 Wastewater from New Development

A second source of new wastewater flows is new construction of residential, commercial, institutional, or commercial properties. It would be expected that if water and wastewater services were expanded from/to regional or municipal sources, that development would also expand due to avoided complications associated with construction and operation of small water and wastewater systems with challenging hydrologic (shallow water tables) and water quality issues (elevated color, total organic carbon, and iron). Projecting future development based on the availability of water and wastewater services is beyond the scope of this project but should receive consideration during design phases for any potential regional project.

Section 4 References

Suwannee River Water Management District. 2021. "SRWMD Regional Water Supply Projections 2020-2045." https://www.northfloridawater.com/watersupplyplan/documents/Projections-20211029.xlsx.

Tchobanoglous, George, Franklin L. Burton, H. David Stensel, and Metcalf & Eddy, eds. 2003. *Wastewater Engineering: Treatment and Reuse*. 4th ed. McGraw-Hill Series in Civil and Environmental Engineering. Boston: McGraw-Hill.

Ursin, Elke L. 2016. "Florida Onsite Sewage Treatment and Disposal Systems Inventory." Final Project Report. Tallahassee, Florida: Florida Department of Health. http://www.floridahealth.gov/environmental-health/onsite-sewage/research/flwmi/details.html.

DRAFT PENDING COMPILATION OF FINAL REPORT

Phase 1: Regional AWS Feasibility – Cedar Key, Bronson, Otter Creek, and Unincorporated Areas in Levy County

Task 4 – Alternatives Development for Wastewater Reuse and Recharge (Draft)

Prepared for
Suwannee River Water Management District

TWA: 19/20-064.006

July 25, 2022

Prepared by

Wetland Solutions Inc

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Section 1 Wastewater Treatment and Disposal

1.1 Introduction

The Suwannee River Water Management District (SRWMD) is one of five water management districts tasked with four core mission areas: water supply, water quality, flood control/floodplain management, and natural systems. The SRWMD comprises all or portions of 15 counties and encompasses approximately 7,640 square miles. The SRWMD is responsible for managing the needs of both natural systems and water users. To accomplish this, the SRWMD issues water supply permits for water users and develops minimum flows and minimum levels (MFLs) for natural systems within the SRWMD. These efforts are carried out in conjunction with water supply planning to determine where additional water is needed, identify alternative water supplies (AWSs), and implement cost-effective projects to address identified water challenges or shortages.

Within the Waccasassa Basin the City of Cedar Key, unincorporated Levy County, and the Towns of Otter Creek and Bronson have a variety of water and wastewater challenges that they are attempting to address with assistance from the SRWMD. For both Cedar Key and Otter Creek, these include water quality concerns related to their potable water supply wells and treatment requirements. Additionally, Cedar Key is faced with challenging wastewater treatment issues and loss of treated water to a marine ecosystem where it cannot be beneficially recharged or reused. Bronson and Levy County are concerned with water supply and managing increasing demand in a responsible manner. These disparate challenges present potential opportunities for these entities to collaborate to develop regional projects that can help address these concerns, while also providing a reliable and resilient water supply and employing wastewater treatment and reuse strategies that can benefit the region.

The SRWMD is working with the Florida Department of Environmental Protection (FDEP) and the communities to evaluate this study area and the identified water and wastewater issues by developing an alternatives analysis for the specific challenges and needs faced by each community. This effort is evaluating not only current needs, but also anticipated growth in the region and potential medium to long-term water supply challenges. The tasks to complete this project include:

- Task 1: Evaluation of current and future water supply challenges, needs, and limitations for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 2: Alternatives development to address current and future water supply needs.
- Task 3: Evaluation of current and projected wastewater treatment and disposal needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County.
- Task 4: Alternatives development for wastewater reuse and recharge.
- Task 5: Cost estimation and cost-effectiveness calculation for the identified alternatives.

This report is focused on Task 4 and wastewater treatment and disposal alternatives for the study area.

1.1.1 Study Area

The study area for this project is the portion of the SRWMD that lies within the Waccasassa River Basin and Levy County. The primary focus of this project is the area between the Town of Bronson and the City of Cedar Key along and within the vicinity of State Road 24 (SR24). This includes the Town of Otter Creek and portions of Unincorporated Levy County along and near SR24 including the communities of Rosewood and Sumner. The relevant boundaries and study area are shown in Figure 1.

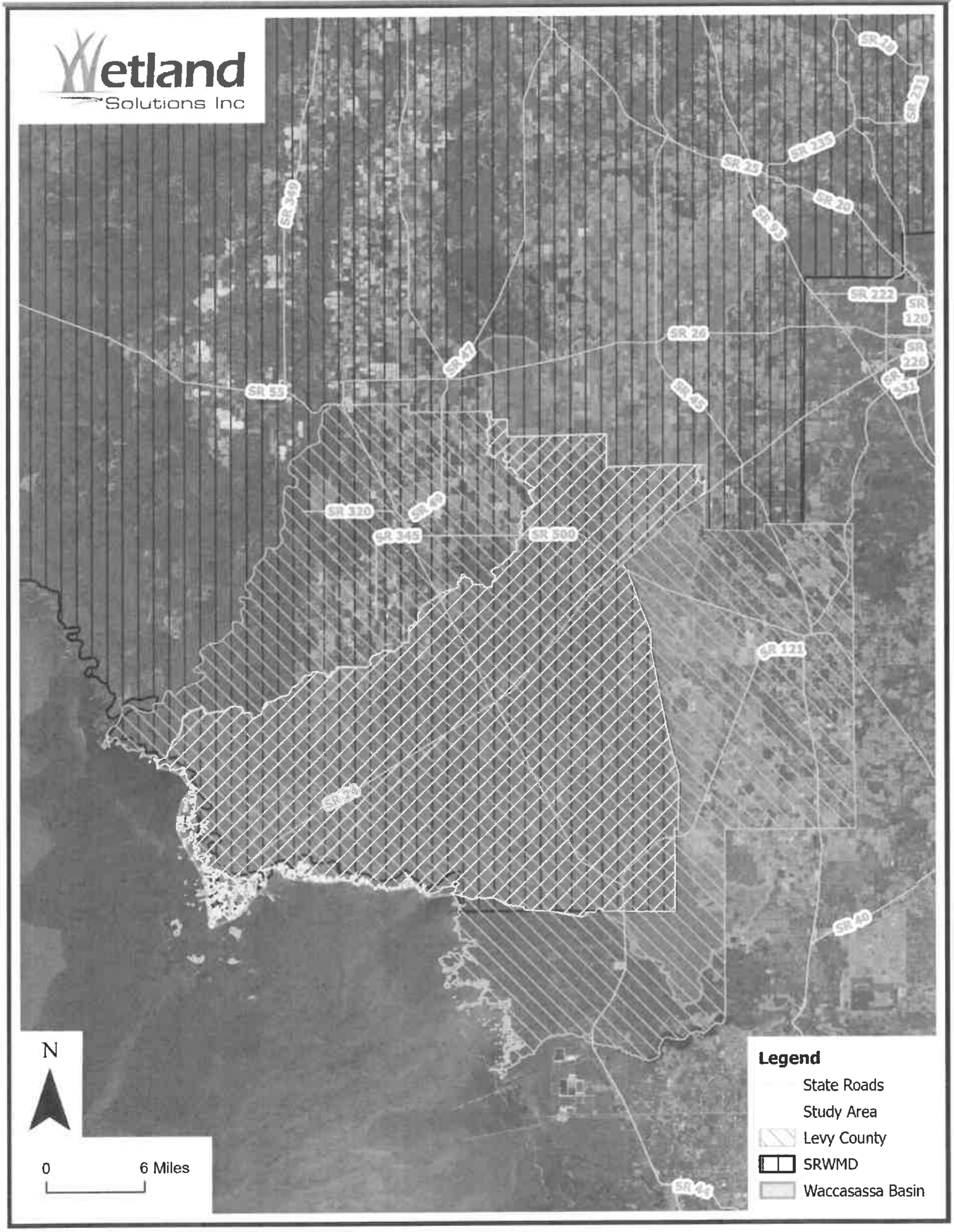

Figure 1. Regional Alternative Water Supply Feasibility Study Area Extents

Section 2 Wastewater Treatment Alternatives

This study is developing alternative wastewater treatment and disposal methods for the communities of interest. Currently, only Bronson and Cedar Key have wastewater facilities to serve their communities. This study is evaluating options for expanding wastewater service to other residents and communities while improving existing wastewater treatment and disposal.

2.1 *Treatment Considerations*

A small portion of the study area lies within the Suwannee River BMAP area (Florida Department of Environmental Protection 2018), with some parcels located in the Fanning and Manatee Springs Priority Focus Area (PFA). Within the BMAP and PFA areas there are requirements that apply to wastewater facilities and to domestic Onsite Sewage Treatment and Disposal Systems (OSTDSs). While not currently mapped it is expected that a portion of the Waccasassa basin lies within the springshed of Levy Blue Springs, as such, there is a chance that some of these same regulations may eventually apply to portions of the study area. These requirements are discussed in additional detail in the following sections along with expected effects on treatment and facility staffing. This section also discusses various treatment considerations for wastewater regionalization.

2.1.1 Wastewater Treatment Requirements

Wastewater facilities developed in the study area will be required to reach variable treatment standards depending on their location. A portion of the study area lies within the Suwannee River BMAP area, Figure 2. Table 1 summarizes total nitrogen (TN) discharge standards for wastewater facilities in the BMAP area based on their capacity and disposal method.

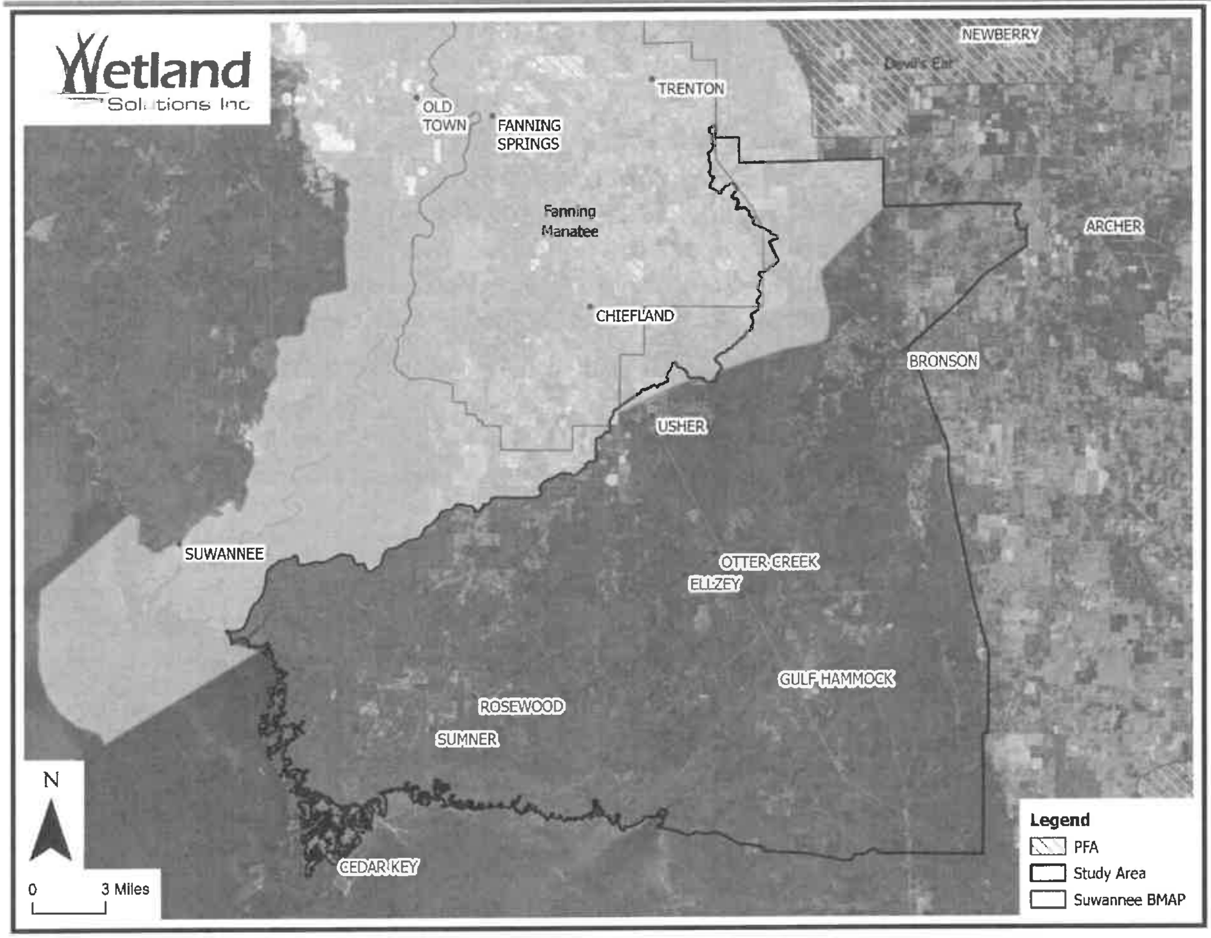

Figure 2. Suwannee River BMAP and PFAs

Table 1. BMAP Land Application Requirements

95% of the Permitted Capacity (gpd)	TN for RIBs and Adsorption Fields (mg/L)	TN for All Other Land Disposal and Reuse (mg/L)
>100,000	3	3
20,000 to 100,000	3	6
<20,000	6	6

2.1.2 Onsite Sewage Treatment and Disposal System Requirements

New, conventional OSTDSs located on parcels less than one acre within the Fanning and Manatee PFAs are prohibited. Any new OSTDS is required to provide additional nitrogen reduction or connect to central sewer. Allowable alternatives to conventional OSTDSs include:

- Nitrogen reducing systems including: in-ground nitrogen-reducing biofilters (INRBs), aerobic treatment units (ATUs), or performance-based treatment systems (PBTSs).
- Connection to sewer (if available).

- Demonstration that sewer will be available within 5 years.

2.1.3 Facility Staffing

Wastewater facility staffing is based on permitted treatment capacity, treatment process configuration, and whether water is supplied for reuse. As plant complexity or treatment capacity increases the level of staffing and required "Class" of operator also increases. It is expected that a facility being constructed to serve a regional area will be larger and potentially require increased staffing compared to the currently smaller facilities. However, this staffing will replace separate staffing at multiple facilities. Staffing is summarized for anticipated configurations in Table 2.

Staffing requirements for systems that provide reuse are generally the same as for other facilities and require staffing by a Class C or higher operator. However, reuse systems require provisions for increased facility reliability and staffing is required whenever flows are sent to the reuse system. Furthermore, only facilities with an average design flow greater than or equal to 0.1 MGD can provide reclaimed water to slow-rate public access areas.

Table 2. Wastewater Facility Staffing Requirements

Category	Class A	Class B	Class C	Class D
I (Nutrient or Membrane)	≥3.0 MGD, 24H/7D, Staff C, Lead A	0.5 - ≤3.0 MGD, 16H/7D, Staff C, Lead B	0.1 - ≤0.5 MGD, 6H/5:1D 0.05 - ≤0.1 MGD, 3H/5:1D ≤0.05 MGD, 1H/5:1D Staff/Lead C	N/A
II (Activated sludge)	≥5.0 MGD, 24H/7D, Staff C, Lead A	1.0 - ≤5.0 MGD, 16H/7D, Staff C, Lead B	0.25 - ≤1.0 MGD, 6H/5:1D 0.1 - ≤0.25 MGD, 3H/5:1D ≤0.1 MGD, 0.5H/5:1D Staff/Lead C	N/A
III (Extended aeration)	≥8.0 MGD, 24H/7D, Staff C, Lead A	2.0 - ≤8.0 MGD, 16H/7D, Staff C, Lead B	0.5 - ≤2.0 MGD, 6H/5:1D 0.25 - ≤0.5 MGD, 3H/5:1D 0.025 - ≤0.25 MGD, 0.5H/5:1D Staff/Lead C	0.01 - ≤0.025 MGD, 1.5H/WK, 3D NC[1] 0.002 - ≤0.01 MGD, 1H/WK, 2D NC, ≤5D BV[2] Staff/Lead D
IV (Trickling Filters, RBC)	≥10.0 MGD, 24H/7D, Staff C, Lead A	3.0 - ≤10.0 MGD, 16H/7D, Staff C, Lead B	2.0 - ≤3.0 MGD, 6H/5:1D 0.75 - ≤2.0 MGD, 3H/5:1D 0.025 - ≤0.75 MGD, 0.5H/5:1D Staff/Lead C	0.002 - ≤0.025 MGD, 1H/WK, 2D NC, ≤5D BV Staff/Lead D

[1]NC – Non-consecutive
[2]BV – Between visits

2.1.4 Wastewater Treatment Considerations

Likely regional alternatives that may be a part of this project are expected to include conveyance of wastewater over long distances to reach treatment facilities. Long sewer residence times can result in undesirable septic conditions that cause a variety of problems in the collection, transmission, and treatment systems. Primary concerns are with anaerobic conditions causing the formation of hydrogen sulfide gas, corrosion of wastewater transmission systems and equipment, and odors. Several alternatives were considered as part of this study. All scenarios for regional treatment are expected to include some degree of collection and centralization. Following centralization, the raw sewage could receive one of four treatments: no treatment, screening and grit removal, partial treatment, or full treatment. Each of these alternatives is expected to have implications for conveyance, costs, and subsequent regional treatment.

2.1.4.1 No Pre-Treatment

The first alternative considered was providing no treatment for wastewater before it is conveyed. In this scenario wastewater would be collected and locally regionalized. Following collection, sewage would be pumped from a master lift station into the pressurized transmission system for conveyance. This alternative has several disadvantages including the potential for water to go septic and cause odor and corrosion issues, accumulation of grit and larger materials in the transmission system, and increased equipment and pumping costs. This alternative would require chemical addition or aeration to reduce septic conditions and is likely to require additional booster pumping because of increased head loss.

2.1.4.2 Screening and Grit Removal

The second alternative considered was screening and grit removal followed by conveyance. This alternative would be functionally the same as the no treatment alternative with the addition of screening and a grit removal system. This alternative has the benefit of removing larger solids and grit from the wastewater before conveyance. The addition of this treatment would remove some biological load as well as mineral solids that will cause premature wear and tear to booster pump stations and increase O&M costs. However, this alternative is expected to involve some level of aeration or chemical addition as part of booster pumping along the transmission line.

2.1.4.3 Partial Treatment

The third alternative is central collection with a higher level of treatment before conveyance. This scenario could include a variety of treatment options that could go only through primary clarification or aerobic digestion and secondary clarification to reduce the biochemical oxygen demand (BOD) of the water and decrease opportunities for the effluent to go septic during transmission. Limitations of this alternative include a lack of infrastructure for completing this treatment in all the areas currently on OSTDSs. This would therefore require construction of package plants or small wastewater facilities to treat water from Rosewood, Sumner, Otter Creek, University Oaks, and other unincorporated areas prior to conveyance. Another downside of this alternative is that it maintains a treatment facility in Cedar Key that is vulnerable to weather and climate driven impacts.

2.1.4.4 Full Treatment

The fourth alternative considered was full treatment prior to transmission. This alternative is an extension of partial treatment and provides the best quality water for transmission. This is expected to reduce the cost of transmission and maintenance. However, only Cedar Key and Bronson currently have wastewater treatment plants. This option would be expected to carry the highest overall capital cost because of the need for treatment plants at all of the locations not currently served by wastewater facilities. Operational costs would not be expected to be much lower because of the need for facility O&M at multiple facilities.

2.1.4.5 Hybrid Options

Finally, there are hybrid options that could be implemented possibly at lower capital and O&M costs. One such option would include Cedar Key maintaining some level of treatment at the existing Cedar Key WRF with treated water being placed in the transmission line. Downstream inputs could then receive just screening and grit removal. This alternative would leverage existing equipment and given Cedar Key's flows would provide substantial dilution to downstream additions of poorer quality water. This alternative would also reduce the need for chemical addition or aeration along the transmission line and would reduce the loading on a new regional wastewater facility. However, this alternative maintains a wastewater facility on Cedar Key which is vulnerable to weather-related impacts.

A second hybrid option would be collection of raw water from Cedar Key, Sumner, and Rosewood with a pre-treatment facility located near Rosewood that would provide some level of treatment before water is conveyed to a regional facility. This alternative has the benefit of removing treatment features (except screening and grit removal) from Cedar Key while reducing the need for aeration and chemical addition. However, this alternative still requires the construction, operation, and maintenance of a supplemental treatment system.

2.2 *Independent Wastewater Treatment Systems*

Within the study area Bronson and Cedar Key provide wastewater treatment to all, or a portion of, the customers within their PSAs. Otter Creek and the remainder of unincorporated Levy County within the study area are served by septic systems. This section discusses options relative to provision of wastewater amongst the communities. Current domestic wastewater facilities and septic systems inventoried by the Florida Department of Health (FDOH) are shown in Figure 3.

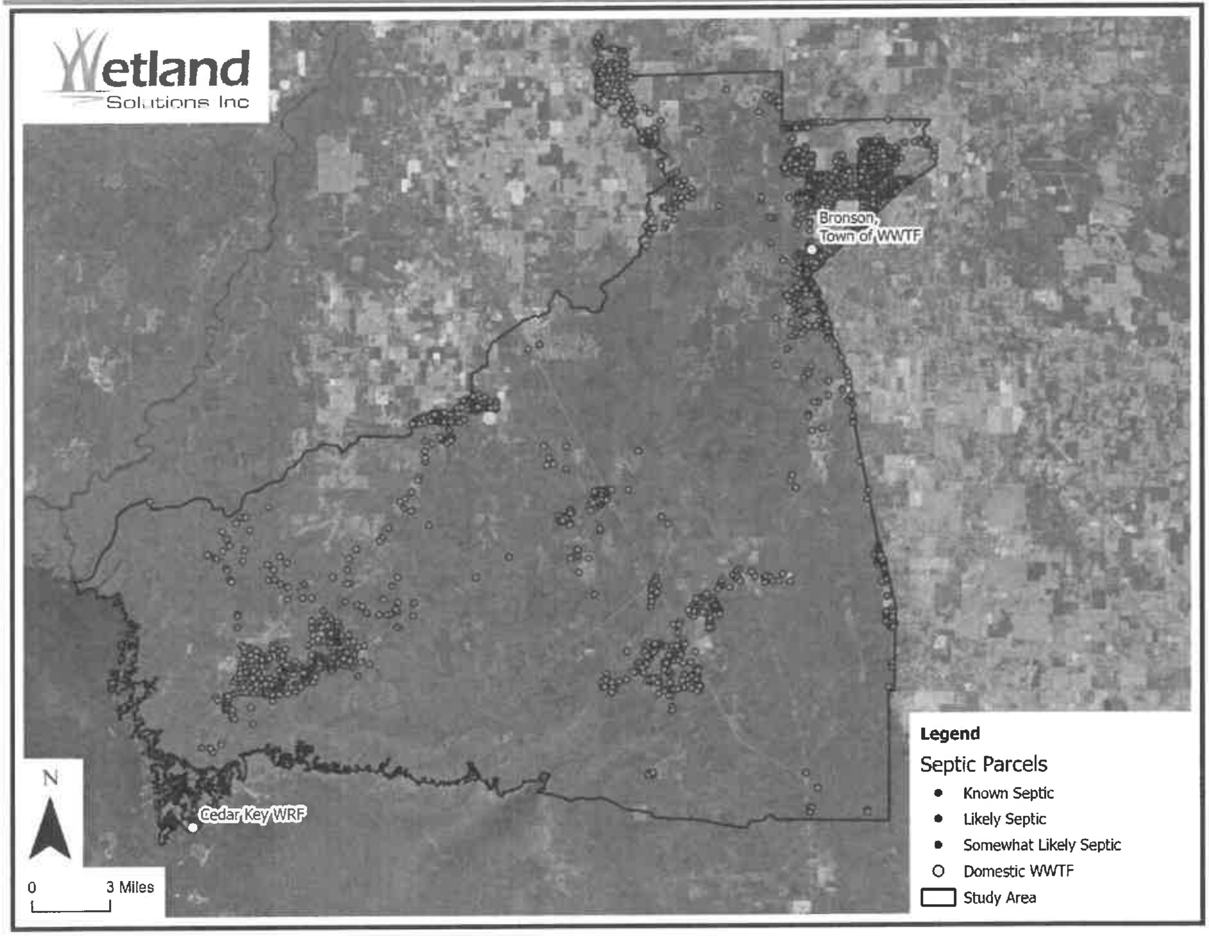

Figure 3. Domestic Wastewater Facilities and Septic Systems

2.2.1 Cedar Key

In the City of Cedar Key virtually all parcels are served by the wastewater treatment facility with only two parcels that have known septic systems listed in the available FDOH data. Cedar Key currently treats and discharges water in substantial compliance with their permit requirements. The existing wastewater facility was constructed in 1993 and is generally in good repair.

The City of Cedar Key could continue to operate their existing wastewater facility which does not have significant issues with compliance. There is also little expectation of population growth meaning that the facility should not need to be expanded to accommodate future customers.

Current challenges facing the continued operation of the wastewater facility are related primarily to storm surge, sea level rise, and occasional inundation of lift stations. There is also a substantial level of risk associated with a potential failure at the facility and a wastewater spill that could impact the City's aquaculture industry. Finally, current disposal practices result in the discharge of fresh, treated water being lost to tide.

2.2.2 Town of Bronson

The Town of Bronson currently provides wastewater service to a portion of the parcels within the PSA. Based on data from the FDOH, 182 parcels within the PSA and the SRWMD remain unserved by the existing wastewater facility. While the Town has had issues with their contracted wastewater operator, a new company has been retained to operate the facility and treatment and reporting are improving. Despite operational challenges the facility is in good repair with limited maintenance needs as of the last Operation and Maintenance Performance Report developed in 2018 for the facility permit renewal.

The Town of Bronson could continue to provide reliable wastewater treatment to the community while expanding their service to parcels within the PSA that are on septic. The existing facility disposes of water in RIBs and on a sprayfield and could be impacted if TMDLs or a BMAP is adopted that requires a reduction in TN concentrations being discharged to the Floridan Aquifer.

2.2.3 Otter Creek and Unincorporated Levy County

Both Otter Creek and other areas of unincorporated Levy County rely on OSTDSs for treatment and disposal of wastewater. These areas currently lie outside of any PSA that has wastewater service. Within the study area there are 1,817 septic systems that lie in unincorporated Levy County outside of any PSA. Additionally, there are 79 septic systems within the Town of Otter Creek and 356 septic systems within the University Oaks PSA.

For these areas there are two options. First, these parcels and new construction could continue to be served by OSTDSs. A second option would be development of centralized wastewater treatment for these areas. This could include separate facilities for Otter Creek, University Oaks, and unincorporated Levy County. Disadvantages of continued treatment and disposal in septic systems includes increased nutrient loading to the Floridan Aquifer; potential contamination of shallow water supply wells in the areas between Otter Creek and Cedar Key; and decreased business opportunities due to lack of water and wastewater services which complicate commercial or industrial development.

2.3 Regional Wastewater Treatment

An alternative wastewater management scenario is regionalization of wastewater treatment. This alternative approach could take a variety of forms including directing wastewater from unserved areas to existing wastewater facilities or construction of new regional facilities. Each of these alternatives is discussed in additional detail.

2.3.1 Regionalization to an Existing Facility

Both Cedar Key and Bronson operate existing wastewater treatment facilities. Currently, both facilities generally meet permit criteria. For either of these facilities to treat additional flows development of an MOU or a modification to their existing PSA would be required. With respect to Cedar Key, receipt and treatment of additional wastewater flows is expected to be undesirable, expensive, and potentially infeasible given existing concerns with risks to the local aquaculture industry, sea level rise, and storm surge. Furthermore, directing additional wastewater to Cedar Key would result in highly treated effluent being disposed of in a coastal area and lost as a source of recharge to support freshwater systems.

Unlike Cedar Key, Bronson does not have existing issues with their wastewater process. There is the potential that additional wastewater customers could be connected to the Bronson WWTF to achieve additional nutrient removal and recharge of treated water to the Floridan Aquifer. For regionalization to the Bronson WWTF, alternatives could include redirecting flows from the existing Cedar Key WRF and conversion of septic-to-sewer for a variable number of customers. These conversions could include parcels within the existing Bronson PSA, parcels within the University Oaks PSA, parcels within the Otter Creek PSA, and those parcels in unincorporated Levy County within a reasonable distance of a potential wastewater collection corridor. Redirecting Cedar Key wastewater flows would allow the existing Cedar Key WRF to be converted to a master lift station that would pump untreated wastewater along SR24 and back to Bronson for treatment. This wastewater line could also collect additional wastewater flows along its length and transmit these flows to Bronson for treatment and disposal. Directing extra flows to the Bronson WWTF could result in the need to expand the facility depending on the added volume.

This study considered several groups of potential septic-to-sewer conversions. These groups were identified based on existing PSAs and distances to existing rights-of-way. This analysis included the following areas relative to septic-to-sewer: Bronson PSA, Otter Creek PSA, University Oaks PSA, parcels within 1-mile of SR24, and parcels within 1.5-miles of SR24. Wastewater flows were estimated based on an assumed 50 gallons per person per day (Tchobanoglous et al. 2003) and an estimate of 2.5 people per OSTDS. This equates to 125 gallons per converted OSTDS per day. The number of potential septic-to-sewer conversions available in each area and estimated flows are provided in Table 3 with locations shown in Figure 4 and Figure 5.

Table 3. Septic Parcels in Identified Area

Potential Septic-to-Sewer Areas	Number	Est. Flow (MGD)
Town of Bronson PSA	182	0.023
University Oaks PSA	356	0.045
Town of Otter Creek PSA	79	0.010
Bronson Area (excl. PSA)	502	0.063
SR24 1-mile Buffer	353	0.044
SR24 1.5-mile Buffer (excl 1-mile)	77	0.010
Total	**1,549**	**0.194**

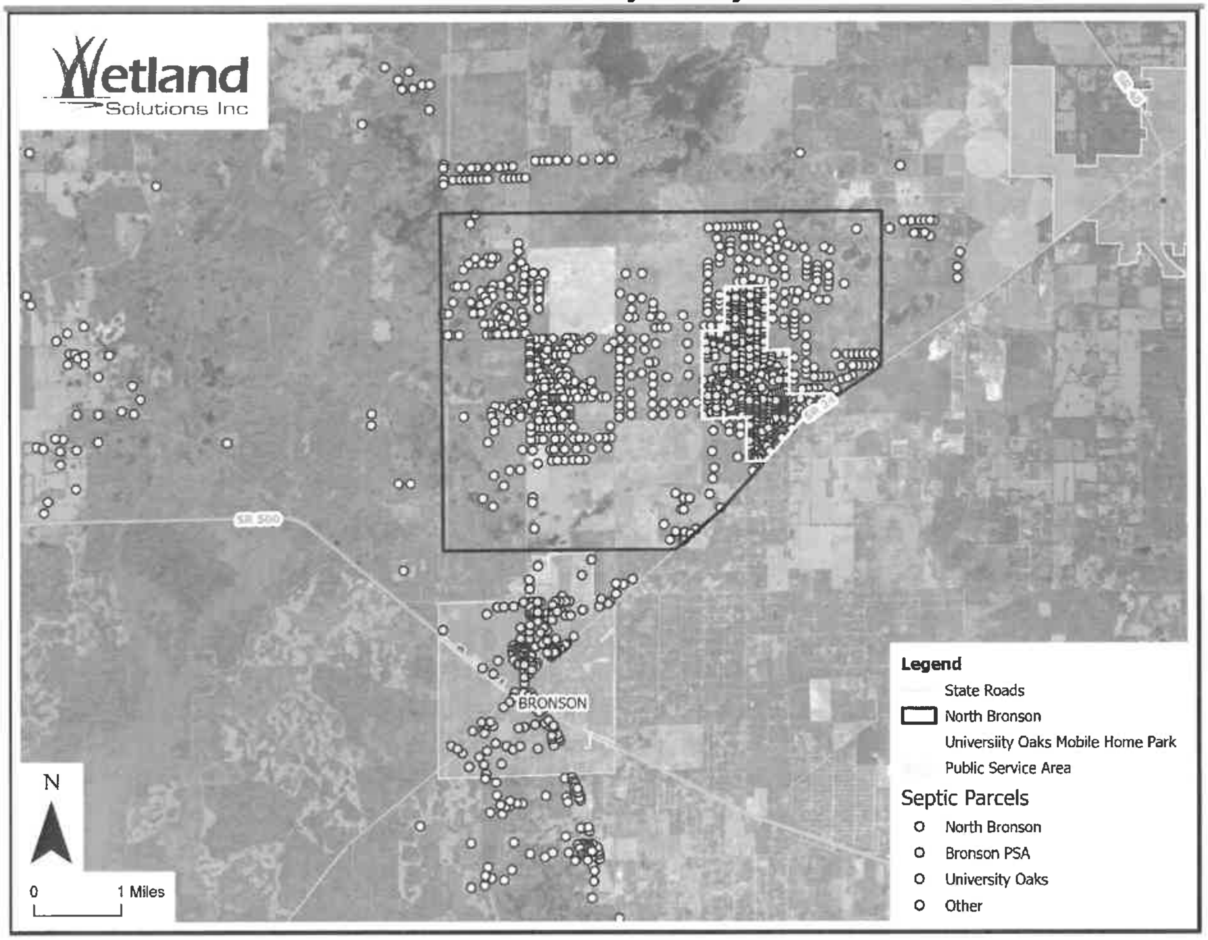

Figure 4. Septic-to-Sewer Parcels Near Bronson

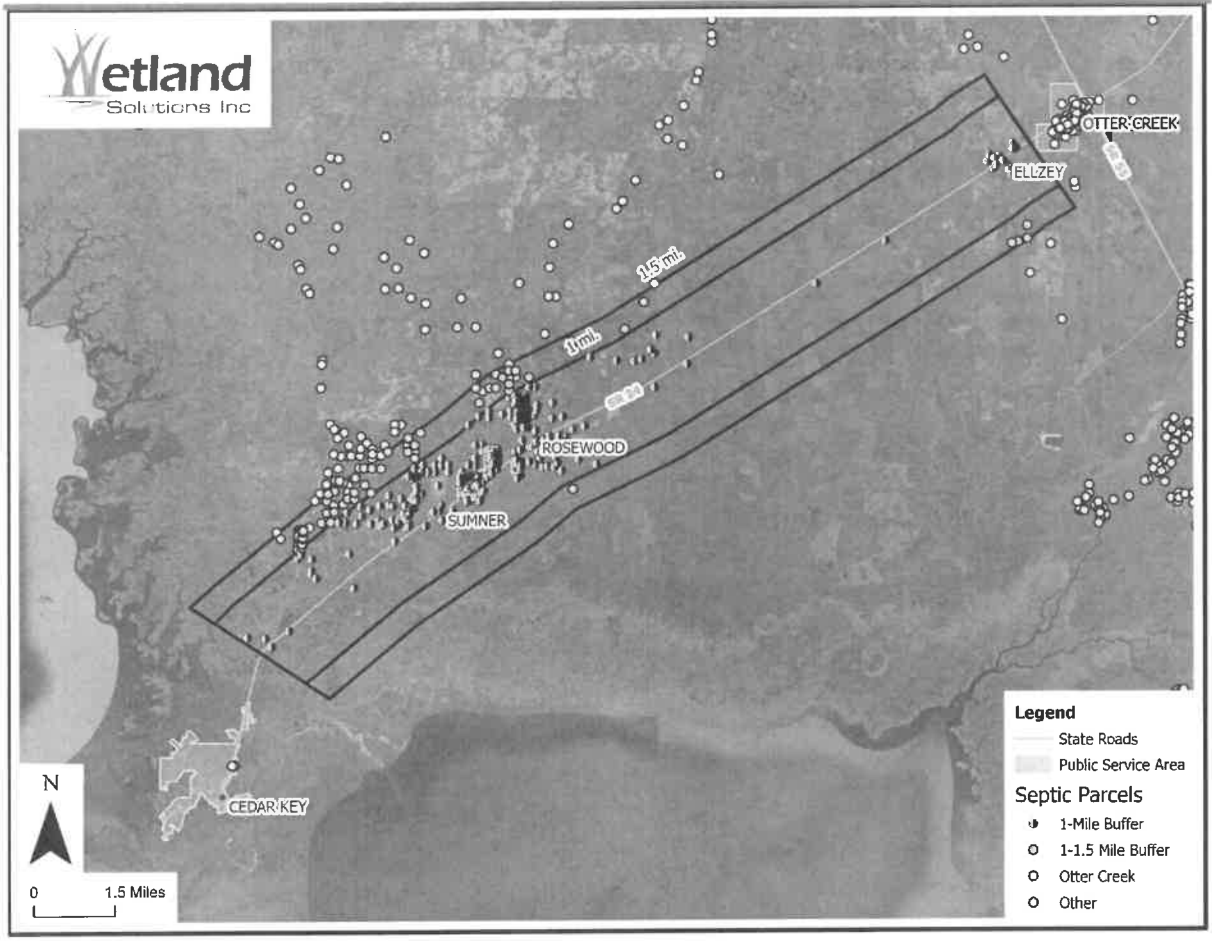

Figure 5. Septic-to-Sewer Parcels Near Otter Creek and Along State Road 24

2.3.2 Regionalization to a New Facility

A second regionalization alternative would have wastewater flows from Cedar Key, Otter Creek, and unincorporated areas of Levy County directed to a new regional wastewater facility. Flows from Bronson could be directed to this same facility, or wastewater from Bronson could continue to be treated in the Town's existing facility. This alternative could include varying degrees of septic-to-sewer conversion. Two alternatives were considered for this scenario: developing two new regional facilities or construction of a single new regional facility to serve all customers.

2.3.2.1 Two Regional Facilities

This scenario considered development of two, new regional facilities. One facility would receive and treat flows from Cedar Key, Otter Creek, and unincorporated areas along SR24 to US19. This facility would be constructed north of SR24 and south of Chiefland, near County Roads 336 and 345, in an area that is expected to have suitable infiltration capacity for disposal. The second regional facility would be either Bronson's existing WWTF or a new facility in this area. If Bronson's existing WWTF was used it would require expansion to receive septic-to-sewer conversion from unserved parcels within the Bronson PSA, the University Oaks PSA, and unserved areas around the Bronson PSA. In this scenario it is expected that the first regional facility would be developed with a capacity of approximately 0.3 MGD to treat and dispose of an estimated 0.157 MGD of flow. Bronson's WWTF or a new facility would be expanded or newly constructed with a capacity of 0.3 MGD to treat an estimated 0.163 MGD of flow. The approximate locations of these facilities and the anticipated pipeline route are shown in Figure 6.

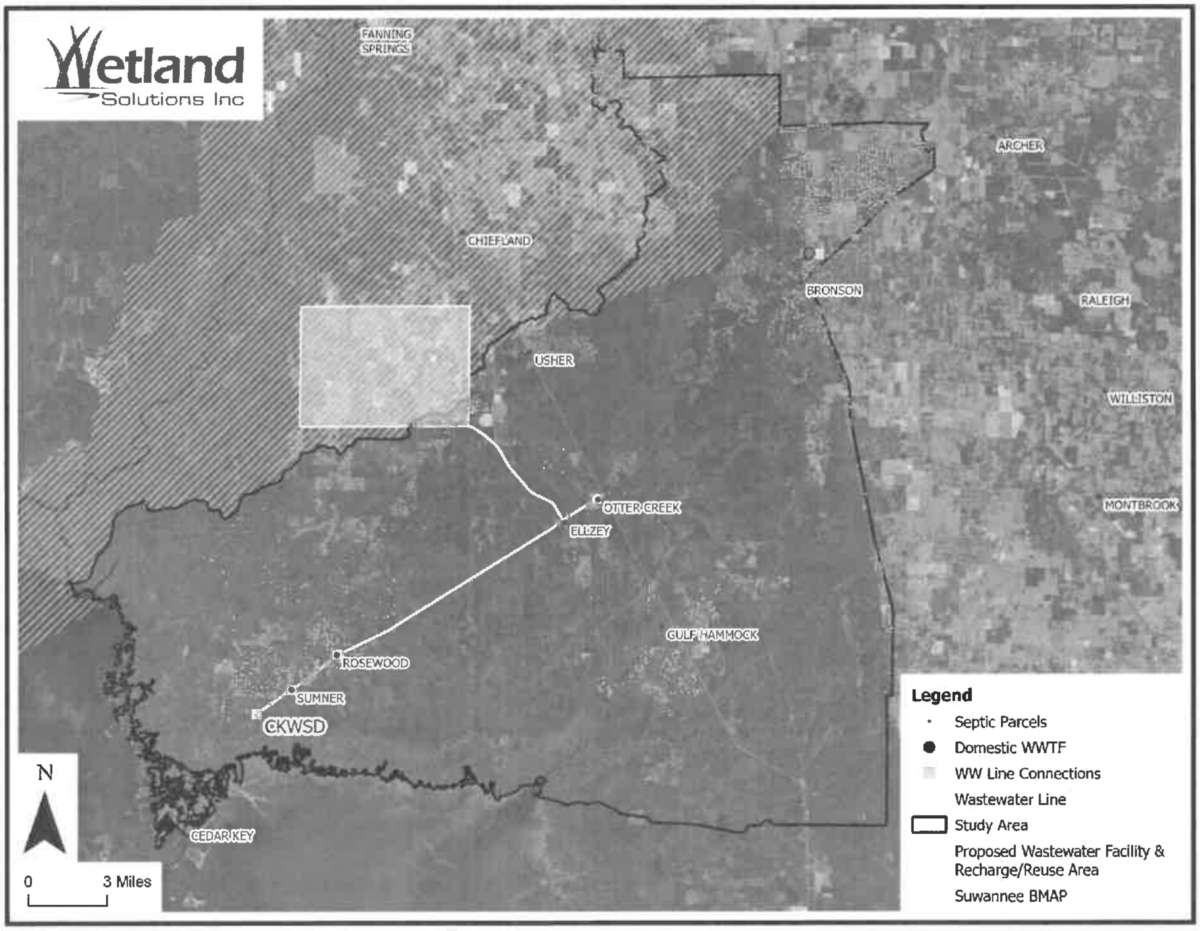

Figure 6. Two Regional Wastewater Facilities and Force Main Routes

2.3.2.2 Single Regional Facility

The second regional alternative considered is routing all wastewater to a single regional wastewater facility. This alternative would include a new wastewater facility in the vicinity of Bronson where wastewater would be treated and either recharged or reused. This alternative would involve construction of an approximately 0.5 MGD facility to treat and dispose of approximately 0.32 MGD of flow, following collection of all of the OSTDSs that were previously discussed. Based on a review of the Town of Bronson's current wastewater facility and property there is the potential this facility could be constructed on the Town's existing property or another property in the area.

Given the location of this facility near Levy Blue Spring and in a high recharge area it is recommended, although requirements are not currently in place, that this facility be designed to comply with AWT for TN with a concentration of 3 mg/L. This will help to protect a sensitive and important recreational resource for the region as well as the water supplies of these communities. Furthermore, funding for an AWT facility is expected to be considered more favorably than a facility producing a secondary effluent. The potential general location of this facility and anticipated pipeline route is shown in Figure 7.

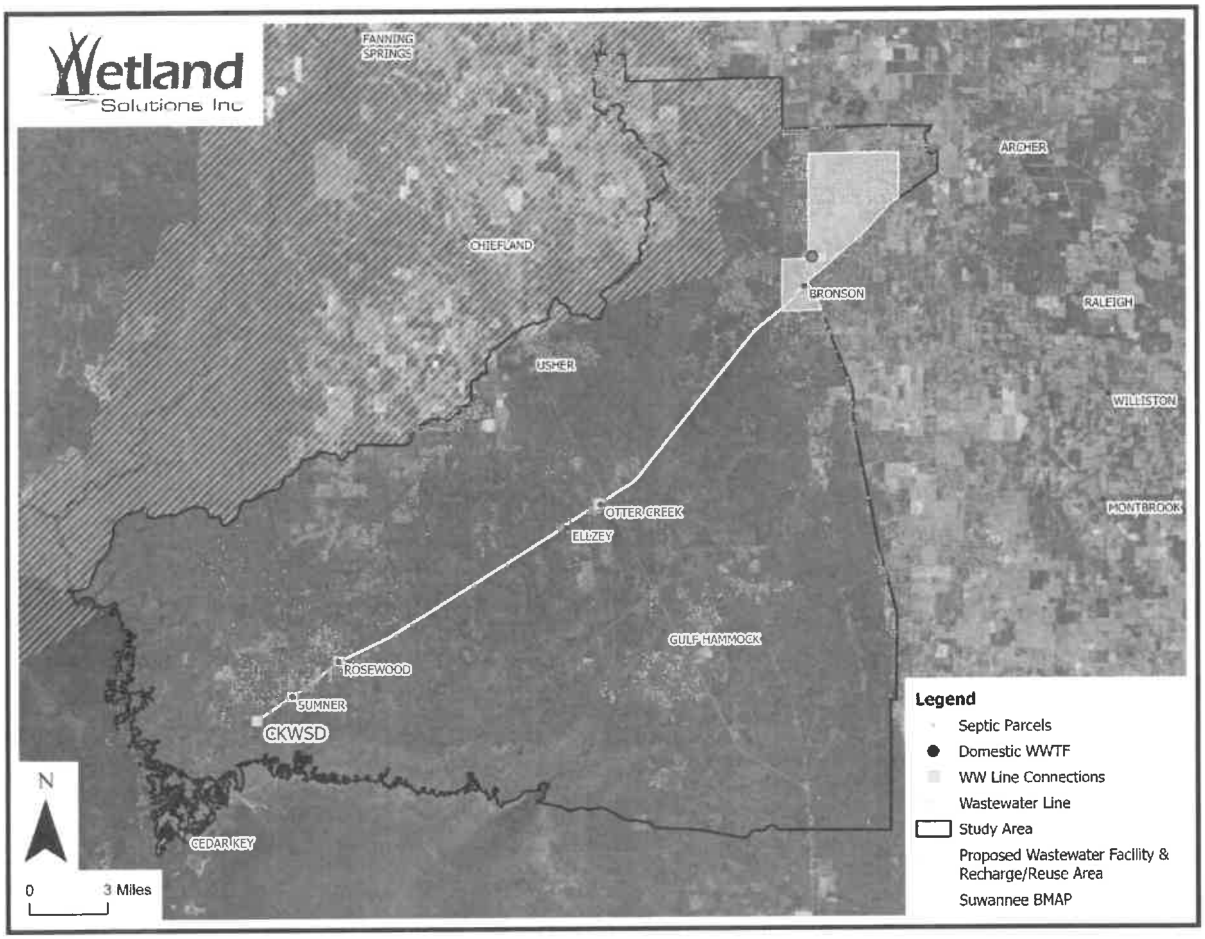

Figure 7. Single Regional Wastewater Facility and Force Main Routes

Section 3 Wastewater Effluent Management Alternatives

Following wastewater treatment, the effluent generated will need to be either reused or recharged. This section discusses effluent management alternatives. These are divided and discussed separately for reuse and recharge alternatives. For both reuse or recharge the goal of this project will be to provide the maximum benefit from the water by reducing waste or loss of the water.

3.1 Wastewater Reuse Alternatives

Reuse of water serves as an offset for current water uses. Typically reuse is provided for irrigation (residential, commercial, recreational, or agricultural) or for industrial uses (frequently as cooling water for power facilities). In general, industrial users are the most reliable customers for reuse as they typically need a fixed amount every day with little variation in demand.

3.1.1 Potential Reuse Locations

To evaluate potential reuse locations, water use permits (WUPs) from the SRWMD were reviewed. The information provided by the SRWMD includes three classifications of wells (active, inactive, and proposed) as shown in Figure 8. A total of 56 active WUPs are located within the study area. These permits are generally for either livestock watering or irrigation.

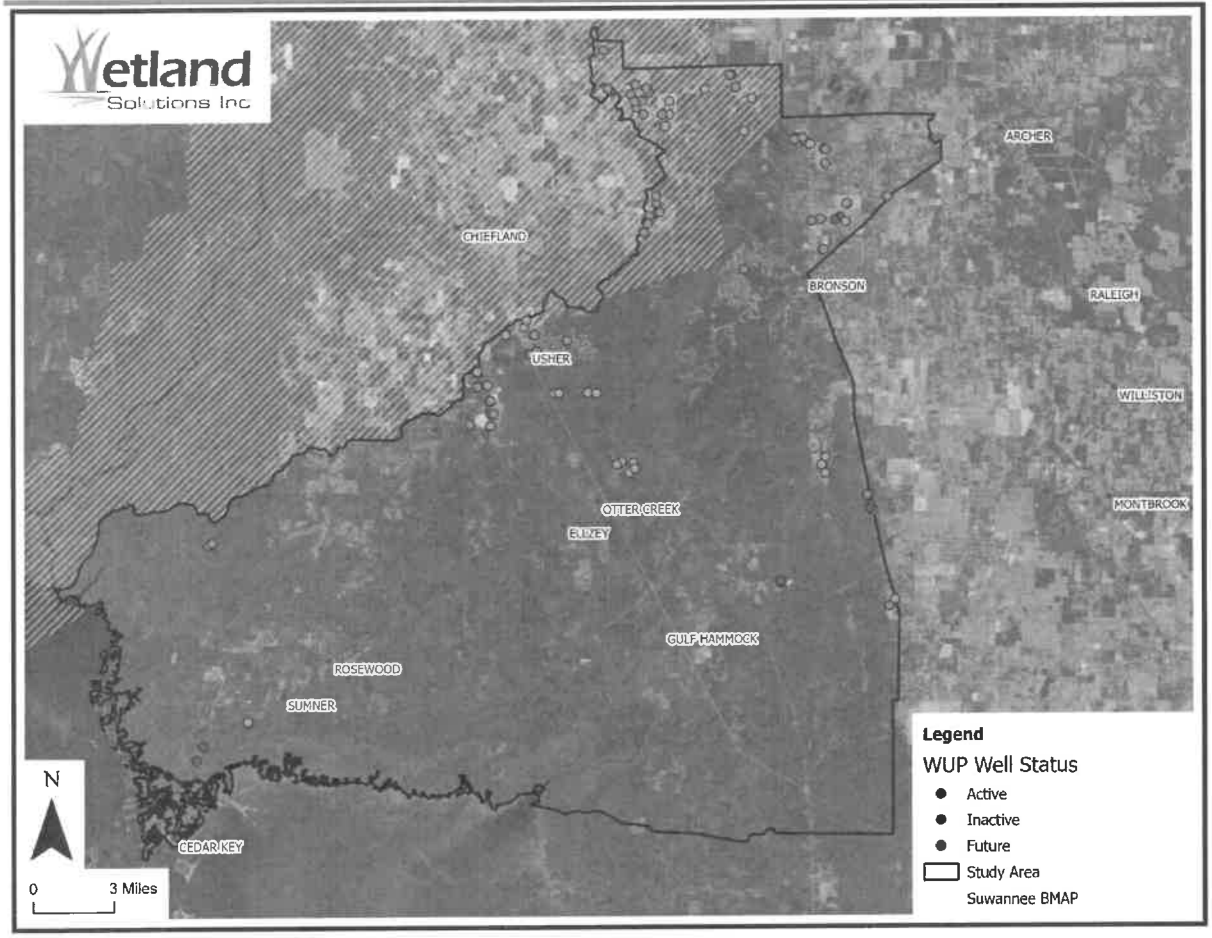

Figure 8. Water Use Permits in the Study Area

Of the wells included in the WUP database, a portion include information on the well pumping capacity. These values are not necessarily representative of the permitted flow but provide an idea of the size and capacity of the well. Active WUPs and available pumping capacity data in the vicinity of a regional facility located north of SR24 between Cedar Key and Otter Creek are shown in Figure 9, with the same information in the vicinity of a regional wastewater facility near Bronson shown in Figure 10.

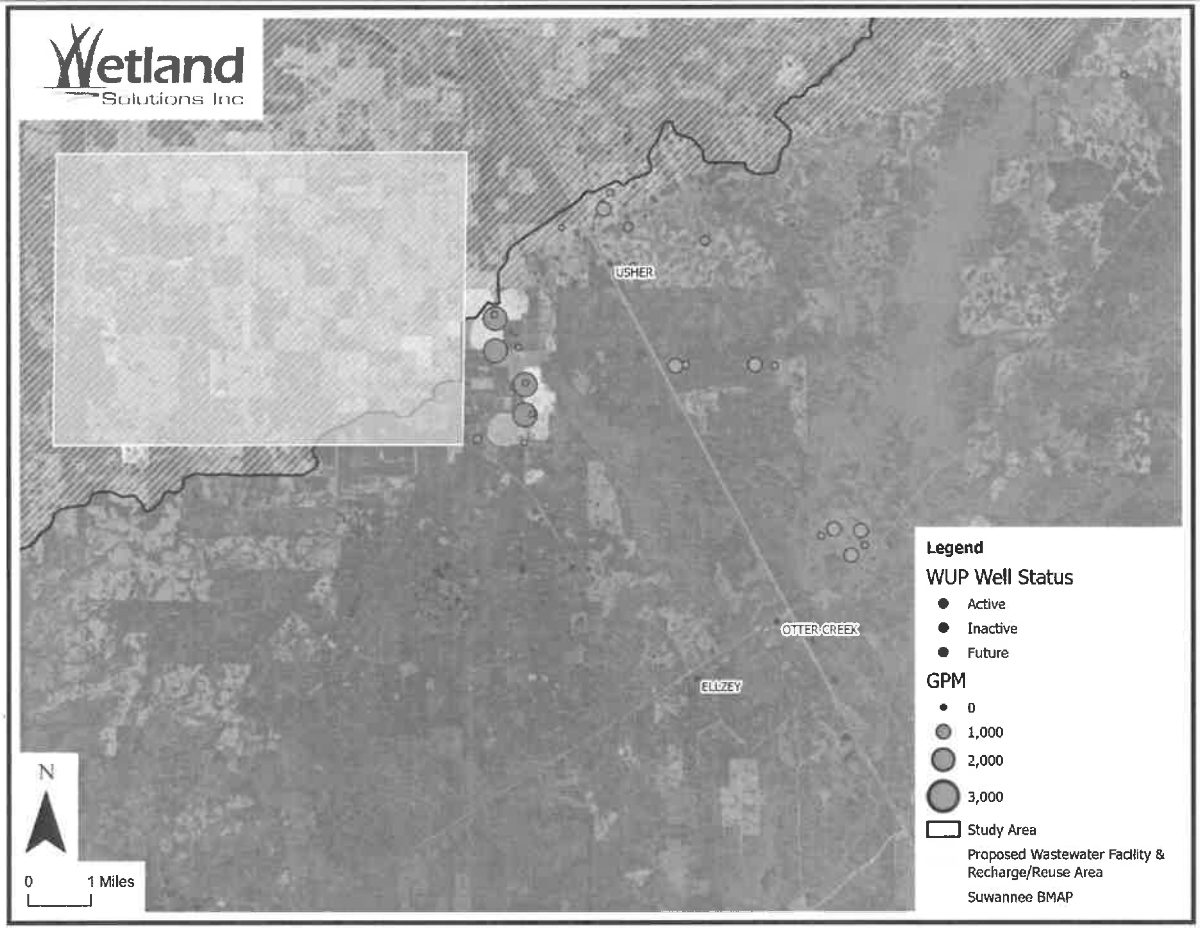

Figure 9. Water Use Permits Near North Regional Wastewater Facility

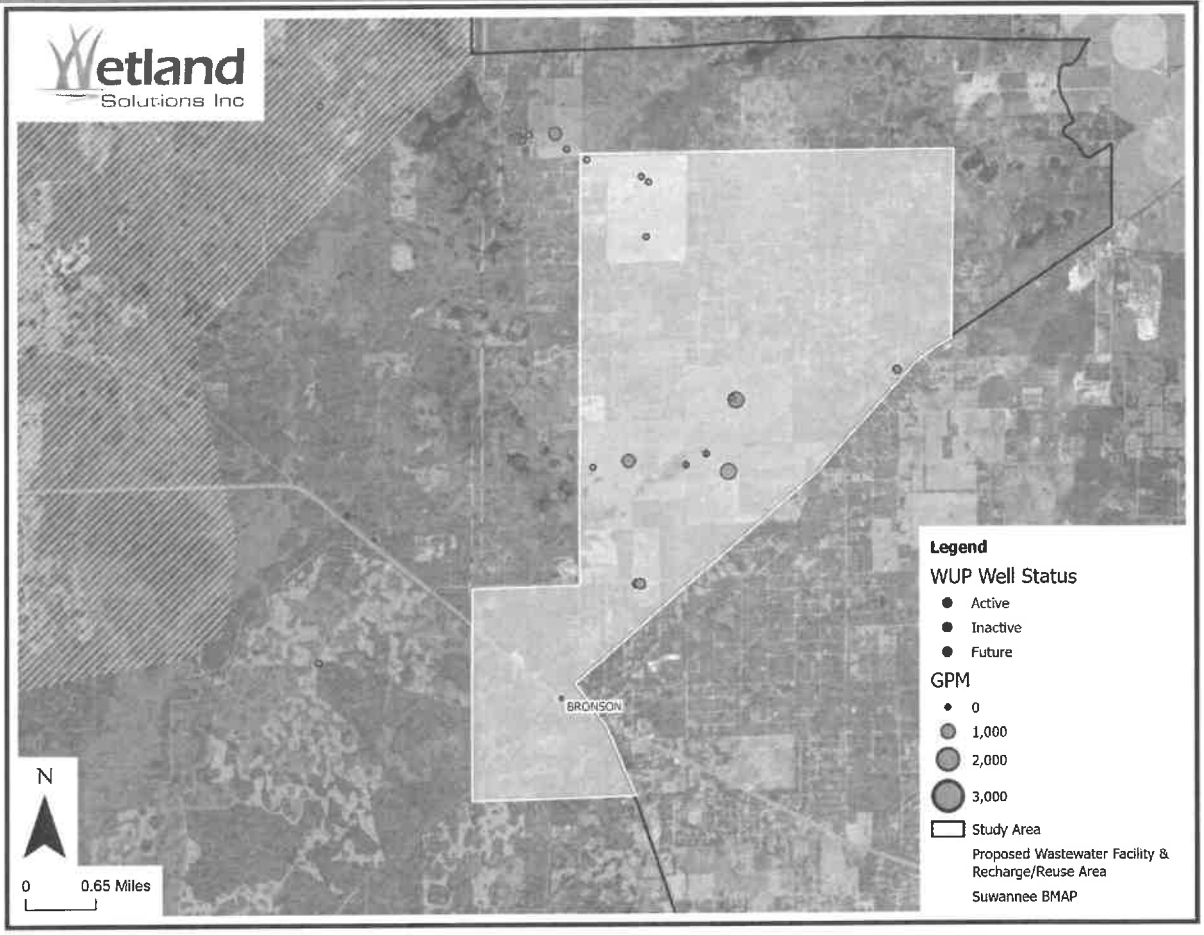

Figure 10. Water Use Permits Near Bronson Regional Wastewater Facility

In both locations there may be potential reclaimed users. Evaluation of potential projects would involve evaluating actual water use for reclaimed users, consideration of distance and cost to convey water, and coordination with a willing landowner. Even with incorporation of reuse it is expected that complete disposal redundancy will be required for treated flows as discussed in the following section. If reuse is to be pursued it is recommended that coordination with potential landowners begin in conjunction with engineering design of the wastewater treatment facility.

3.1.2 Reuse Permitting

Reuse water is required to meet variable treatment standards based on the water user and end use of the effluent. Water provided to customers for irrigation of residential areas or for edible crops are permitted as Part III (Slow-Rate Land Application Systems; Public Access Areas; Residential Irrigation; and Edible Crops) systems in Chapter 62-610.450, Florida Administrative Code (F.A.C.), and require treatment to public access reuse (PAR) standards (filtration and high-level disinfection). Water provided for irrigation of forage for cattle are permitted as Part II (Slow-Rate Land Application Systems; Restricted Public Access) systems in Chapter 62-610.400, F.A.C. These systems are not required to meet PAR, but if cattle are intended for milk production, a 15-day resting period is required between irrigation with the reuse water and rotation of grazing cattle to the application area. Finally, industrial reuse projects are permitted as Part VII (Industrial Use of Reclaimed Water) systems in Chapter 62-610.650, F.A.C. Industrial reuse treatment is dependent on the purposes of the water and the potential for contact. With the exception of open cooling towers, reuse water supplied to industrial users is required to meet secondary treatment and basic disinfection.

To ensure adequate disposal capacity reclaimed systems also have storage requirements. Storage requirements generally include the need for either redundant disposal for all water sent to reuse, or a minimum of 3 days of storage capacity for all water that does not have an alternative disposal location.

3.1.3 Reuse Limitations

There are a variety of challenges associated with supplying reuse for irrigation. Given that irrigation for both agricultural and residential uses are weather dependent, there is often inconsistent demand from customers, with maximum demand during dry periods and minimum or no demand during wet periods. In wastewater systems with infiltration and inflow, this problem is exacerbated since wastewater flows, and hence disposal flows, increase during wet weather conditions. The inconsistent nature of demand typically results in the need for redundant disposal and storage to hold water until times when it is needed and to meet peak reuse demands. Finally, water provided for irrigation of agricultural lands is subject to complete loss of capacity due to changed cropping practices, or land use conversions (e.g., development).

3.2 *Wastewater Recharge Alternatives*

A second alternative for wastewater disposal is recharge to the Floridan Aquifer. This disposal method provides both the natural environment and water users with water supply. Recharge to groundwater can occur as a Part II, Part III, Part IV (Rapid-Rate Land Application Systems), or Part V (Groundwater Recharge and Indirect Potable Reuse) system with permitting criteria described in Chapter 62-610, F.A.C. Generally, slow-rate land application and rapid-rate land application are distinguished depending on the rate at which water is applied with a standard application rate of 2" per week for slow-rate (Part II or Part III) and a standard application rate of 3" per day for rapid-rate (Part IV). Slow-rate land application is further divided by a requirement for water to achieve PAR for permitting as a Part III system for irrigation of public areas. Finally, Part V which allows for recharge wells has a variety of additional requirements because of the perceived lack of an infiltration buffer. These include filtration, high-level disinfection, primary and secondary drinking water standards, and maximum concentrations for total organic carbon (TOC) and total organic halides (TOX).

3.2.1 Land Application

Wastewater disposal methods that rely on land application are used extensively to recharge the Floridan Aquifer. Most frequently in Florida, this disposal relies on the use of either sprayfields or RIBs. The primary difference between these disposal methods is the rate at which water is applied, with sprayfields typically permitted for application of 2" per week, and RIBs typically permitted for application of 3" per day. The application rate is important because of the impacts it has on recharge effectiveness and loss of water to evapotranspiration (ET). Higher application/recharge rates correspond to a greater percentage of water being beneficially recharged, where the hydrogeology is suitable (Wetland Solutions, Inc. 2020). It is expected that for either two regional wastewater facilities or a single regional wastewater facility, land application would be developed at the wastewater facility property to minimize land acquisition and transmission costs.

Another alternative for disposal using land application is groundwater recharge wetlands. Groundwater recharge wetlands have been used for facilities in North Central Florida for wastewater disposal where additional nitrogen removal would be valuable for protecting the Floridan Aquifer and springs. Application rates for groundwater recharge wetlands typically fall between the permitted rates for sprayfields and RIBs with a primary difference being that continuous inundation is maintained to provide additional water quality treatment. As with other forms of land application, development of groundwater recharge wetlands on the wastewater facility property would be desirable to reduce transmission costs to a satellite location. Recharge wetlands also provide ancillary benefits including wildlife habitat and the potential for human use depending on how they are developed. Anticipated areas for land application/recharge are shown in the same locations as the wastewater facilities in Figure 6 and Figure 7.

3.2.2 Recharge Well

A second potential alternative for recharge is a recharge well. While feasible, this alternative involves treatment to much higher standards and the regulatory permitting is more challenging. Given the size of the wastewater facility, availability of land, additional treatment requirements, and permitting challenges this alternative did not receive further consideration.

3.3 Reuse and Recharge Effectiveness

Recharge effectiveness is an important consideration for this project given the value of local water resources (springs) and uses (public supply and agricultural irrigation). For this reason, this study considered the effectiveness of recharge, the portion of treated water that replaces withdrawals or that is returned to the Floridan Aquifer. This concept was considered for each of the evaluated disposal methods.

3.3.1 Reuse

As previously described, reuse is the replacement of a current water withdrawal in part or in whole with treated wastewater. This replacement offers the benefit of reducing or eliminating a withdrawal that would otherwise be occurring. When a customer is available and is taking all of the produced water this results in a one-for-one replacement of withdrawn water and a 100% benefit.

As an example, if a hay farm currently withdraws 0.25 MGD for irrigation and the farm is connected to a wastewater facility that produces 0.25 MGD of treated water then the entire use of the farm could be offset, assuming some storage is available to hold water until it is used. This would equate to a 0.25 MGD reduction in withdrawals and a 100% effectiveness. However, this example also illustrates the challenge of continuously supplying an irrigation customer with reuse. To extend this example, consider that the same farm spends the last two weeks of May harvesting and planting and then that June is particularly rainy. Effectively the irrigation needs and ability to store water during this six-week period may be zero and the wastewater facility has to manage and provide alternate disposal for 10.5 million gallons of water. For this reason, reuse typically requires complete disposal redundancy or significant storage to accommodate periods when the reuse customer may be unwilling or unable to take water.

3.3.2 Groundwater Recharge

Recharge effectiveness for other forms of disposal can be evaluated based on a variety of factors (Wetland Solutions, Inc. 2020). Water lost to ET is not recharged while all water that is not lost to ET, in an area with limited confinement and adequate infiltration rates (e.g., the study area), is recharged to the Floridan Aquifer. The loss of water to ET can be calculated based on the depth of water that is needed by the plant community and held in the soil profile, that is not supplied by rainfall, also termed the net irrigation requirement. This approach allows for calculation of an estimated annual recharge of water that is achieved at varying application rates.

For a sprayfield that is operating at its design capacity and loaded at 2" per week this results in approximately a 19% loss to ET. However, many sprayfields are operated at closer to 50% of their design flow (1" per week) resulting in a 38% loss to ET. Conversely, RIBs operated at 3" per day lose approximately 2% of applied water to ET and operated at 50% of capacity only lose approximately 4% of applied water to ET.

As previously described, groundwater recharge wetlands typically have infiltration rates between those of sprayfields and RIBs. An application rate of 1" per day is a desirable infiltration rate for treatment wetlands. At this application rate the loss of applied water would be approximately 6%. Unlike sprayfields or RIBs, recharge wetlands are continuously loaded and are not rotated or rested. For this reason, even at reduced loading rates recharge wetlands would be expected to have similar losses to ET as a result of reduced wetted footprint.

Section 4 Project Funding Sources

Many of the funding sources available for wastewater projects are similar to those available for potable water projects. The following section discusses the various funding mechanisms available to utilities for wastewater projects. In addition to the listed opportunities various funding mechanisms become available occasionally that can be used to support this project at the state or federal level. Timeframes for submitting projects vary by funding source and year.

4.1 *State Revolving Fund*

The SRF offers a variety of funding mechanisms for both water and wastewater projects. Drinking Water State Revolving Fund (Where) the DWSRF offers funding for water projects the Clean Water State Revolving Fund (CWSRF) offers a similar program for wastewater projects. The CWSRF offers low-interest 20-year loans for the design and construction of wastewater projects including: collection systems, treatment facilities, and reclaimed water lines. As with the DWSRF disadvantaged communities can receive partial loan principal forgiveness.

4.1.1 Small Community Wastewater Construction Grants Program

Also administered under the CWSRF is the Small Community Wastewater Construction Grants Program (SCWCGP). This grant program was developed to assist small communities with planning, design, and construction of wastewater management facilities. To be eligible for the program a community, county, or authority must have a total population of 10,000 or fewer with a per capita income less than the state of Florida average. These grants are applied for in an identical manner to a CWSRF loan. Highest funding priority is given to projects that address a public health risk and/or are listed in a BMAP. Grant percentage is dependent on the entity's affordability index and is 70-90% of the loan amount up to 25% of the funds available during the fiscal year. General information on the SCWCGP is contained in Chapter 62-505, F.A.C.

4.2 *United States Department of Agriculture*

The USDA-RD provides funding for waste disposal systems by the same mechanisms as for drinking water systems. As with the SCWCGP this funding program is only open to entities with a population of 10,000 or fewer. Up to 75% of the loan can be converted to a grant for qualifying projects.

4.3 *Suwannee River Water Management District*

The SRWMD facilitates or directly funds projects through several programs as described below.

4.3.1 State Springs Grant Program

As for drinking water projects the SRWMD facilitates funding of springs grant projects including wastewater projects that can be shown to have a benefit to springs. These projects are submitted to the SRWMD who evaluates the proposals and then forwards a list of recommended projects to the FDEP for funding consideration. Frequently, wastewater facility projects are excellent candidates for these funds because of the concentrated load that can be reduced, resulting in a low dollar per pound cost-effectiveness value.

4.3.2 State Alternative Water Supply Grant Program

This program, previously described in the water supply funding opportunities, is also available to support wastewater projects that provide reclaimed water, implement water conservation, or enhance water quantity.

4.3.3 Regional Initiative Valuing Environmental Resources (RIVER) Cooperative Funding Program

The RIVER Cooperative Funding Program, previously described, can be used to provide funding for projects that improve water quality, enhance aquifer recharge, or develop alternative water supplies. Wastewater projects can be funded and implemented to provide some or all of these benefits.

4.4 *Local Funding*

Projects can also be funded through local channels in the same way as for drinking water systems. These can include revenue bonds or non-ad valorem assessments as previously discussed.

Section 5 References

Florida Department of Environmental Protection. 2018. "Suwannee River Basin Management Action Plan (Lower Suwannee River, Middle Suwannee River, and Withlacoochee River Sub-Basins)." Basin Management Action Plan. Tallahassee, FL.

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Wetland Solutions, Inc. 2020. "Wastewater Effluent Disposal Water Quantity Benefit Calculation." Suwannee River Water Management District.