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

Prepared for

Suwannee River Water Management District

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Executive Summary

This regional water supply feasibility study evaluated alternatives to address water supply and wastewater treatment needs for the City of Cedar Key, Town of Otter Creek, Town of Bronson, and unincorporated areas of Levy County including the communities of Rosewood and Sumner. Each of the communities addressed in this study have challenges associated with their water supply, wastewater treatment, or collection and distribution systems. These needs are identified in the study both for the current condition and considering potential population growth. The principal needs identified in this study include:

- Poor source water quality in the eastern two-thirds of the study area (starting just west of Bronson) that impacts Otter Creek, Cedar Key, and unincorporated areas of Levy County,
- Expensive water treatment to address the poor-quality raw water,
- A lack of centralized wastewater collection and treatment outside of Cedar Key and Bronson,
- Potential contamination of private wells during flooding events in unincorporated areas of Levy County,
- Treated wastewater from Cedar Key being infiltrated to the Gulf of Mexico,
- The potential loss of Cedar Key's aquaculture industry due to a wastewater spill,
- Vulnerability of existing water supplies and wastewater treatment in Cedar Key and coastal areas due to saltwater intrusion, storm surge, and sea level rise,
- Large numbers of septic systems within the Town of Bronson and in unincorporated areas of Levy County that have the potential to impact groundwater supplies, springs, and the coastal ecosystem.

Based on identification of the water supply needs this study considered alternative water supplies for the impacted communities. This included consideration of surface water, groundwater, and relocating water supply wells to areas with higher quality groundwater. Based on this evaluation two regional alternatives were proposed. The first regional alternative considered a cooperative that included the City of Cedar Key, Town of Otter Creek, and unincorporated areas of Levy County near State Road 24 including Rosewood and Sumner with a well field developed northwest of Otter Creek. The second regional alternative considered all of the communities relying on a new wellfield developed near the Town of Bronson. Each of these regional alternatives would involve formation of a regional entity to construct, manage, and operate the regional system. The regional system would then supply water to each of the communities for resale to their customers.

Wastewater needs that were identified in the study primarily related to the need to relocate wastewater treatment off the island of Cedar Key because of the vulnerability of the treatment system to natural events and because of the potential impact on the City's aquaculture from a major wastewater spill. Furthermore, the City currently infiltrates treated water on the island where it is lost to the Gulf. Outside of Cedar Key, there is significant reliance on septic systems for wastewater disposal. This effluent management approach has the potential to contaminate shallow drinking water wells, increase nutrients in groundwater, and impact coastal ecosystems. Two regional wastewater treatment alternatives were considered. The first regional alternative would convey wastewater from Cedar Key and the unincorporated communities to a regional wastewater facility located northwest of Otter Creek. The second regional alternative would convey wastewater to a facility in the vicinity of Bronson. In both cases the intent is that wastewater would be returned, treated, and reused or recharged near where raw groundwater was withdrawn for potable supply.

Following development of the proposed regional alternatives (Figure ES-1) the study considered both regionalization development and potential project funding. Both the Nature Coast Regional Water Authority and the Big Bend Water Authority provide examples of regional authorities developed in generally the same geographic area to address water concerns. Project funding opportunities evaluated included: state funding, state loans, state grants, federal loans, federal grants, local revenue, and public private partnerships. The expectation is that multiple funding sources will be required for this project.

Conceptual-level cost estimates were prepared for each of the two regional alternatives. The first regional alternative that would serve Cedar Key, Otter Creek, Sumner, and Rosewood with both water supply from a higher quality source and would provide treatment and disposal of wastewater had an estimated cost that ranged from $67.2 to $69.3 million dependent on the type of wastewater disposal. The second regional alternative that would provide water supply and wastewater treatment to all of the communities had an estimated cost that ranged from $102.2 to $105.5 million dependent on the method of wastewater disposal. Additional identified needs to provide water supply in the Rosewood and Sumner communities and in unserved areas north of Bronson included an estimated $9.4 million of water distribution infrastructure. To provide septic-to-sewer conversion for the 1,549 identified homes on septic systems the estimated cost was $98.3 million, although this cost was highly impacted by the cost of conversion for homes on larger lots. This cost could be refined by eliminating consideration of septic-to-sewer conversion on larger lots.

This study identified two regional alternatives that could meet the needs of some or all of the communities in the study area. Next steps for advancing a selected project include formation of a regional water cooperative and special district that can begin to advocate for and secure funding for the project, development of a preliminary engineering report for the preferred alternative, and preparation of a more detailed cost estimate.

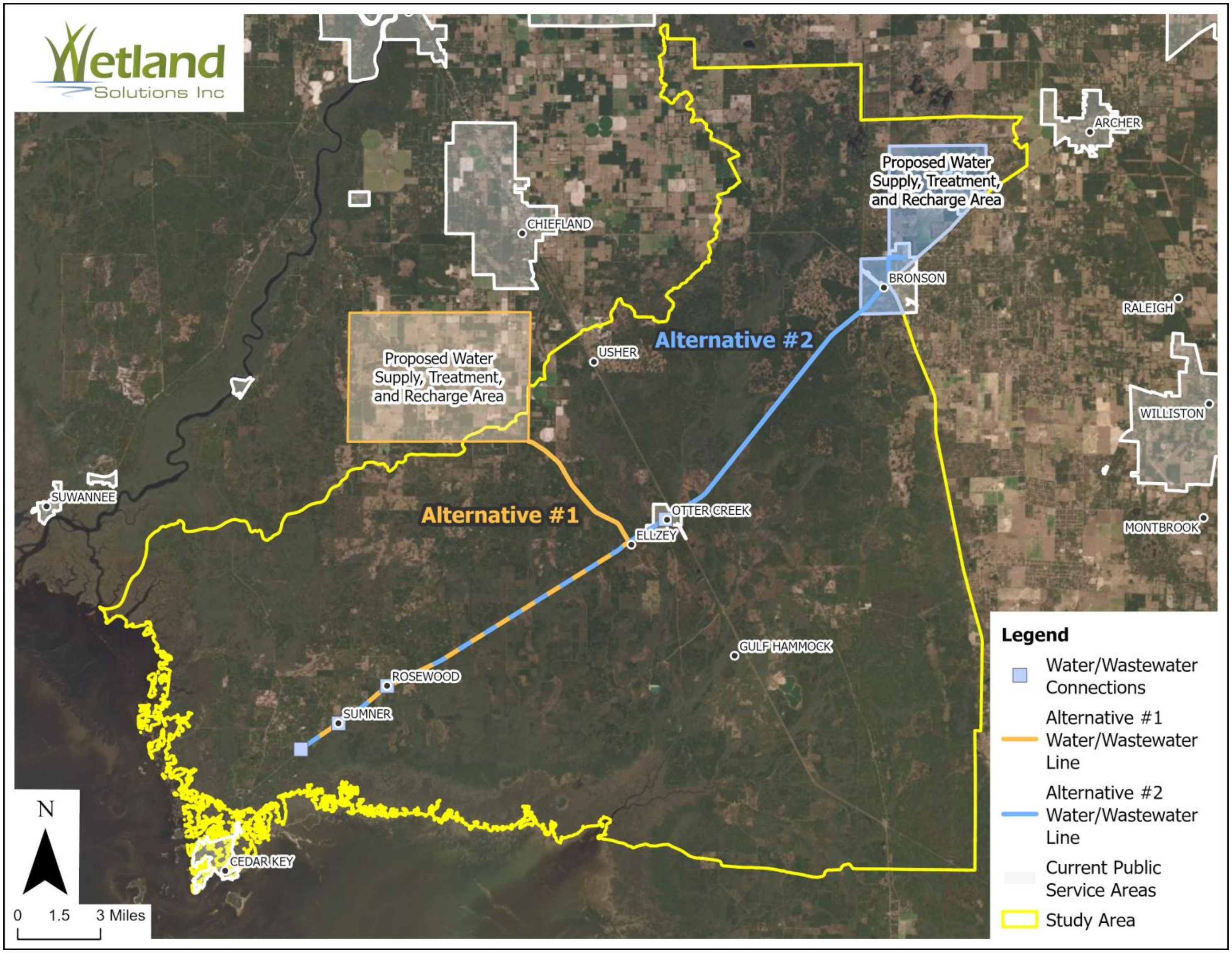

Figure ES-1. Regional Water and Wastewater Alternatives

Section 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 use permits (WUP) for water users, develops minimum flows and minimum levels (MFLs) for natural systems, and prepares a water supply plan. Every five years, the SRWMD updates the water supply plan that identifies where additional water is needed, the alternative water supplies (AWSs) that can be used to meet the identified demand, natural resource concerns, and the projects needed to provide that water to the users and natural systems that depend on it.

Within the Waccasassa Basin, water and wastewater challenges impact unincorporated Levy County, the City of Cedar Key, and the Towns of Otter Creek and Bronson. The SRWMD is collaborating with these communities to address multiple environmental and water supply needs. In Cedar Key and Otter Creek, these needs include potable water quality concerns related to their water supply wells and challenging treatment needs. In Cedar Key, wastewater treatment includes recharge of treated water that is currently lost to a sensitive marine ecosystem. In Bronson and Levy County these needs include increasing demand, aging infrastructure, and variable quality in available water supplies. These disparate challenges present potential opportunities for entities to collaborate and develop regional projects to address these concerns and provide a more reliable and resilient water supply while employing wastewater treatment and reuse strategies that benefit the region.

The SRWMD is working with the Florida Department of Environmental Protection (FDEP) and the communities to evaluate the identified water and wastewater needs and to develop an alternatives analysis to address the needs of each community. This effort is evaluating not only current needs, but also anticipated growth in the region and medium to long-term water supply and wastewater treatment challenges. This project was divided into five tasks that were developed to identify existing and future challenges with water supply and wastewater treatment and regional opportunities to address these challenges.

- 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 presents the findings of these five tasks with the report divided as follows: potable water issues and needs facing the communities, alternatives for addressing the identified potable water needs, wastewater issues and needs facing the communities, alternatives for addressing wastewater needs, frameworks for regional cooperation and project funding, and cost estimates for the identified projects.

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). Within this corridor the project area includes the Town of Otter Creek and portions of Unincorporated Levy County along and near SR24 including the established communities of Rosewood and Sumner. The project area is shown in Figure 1.

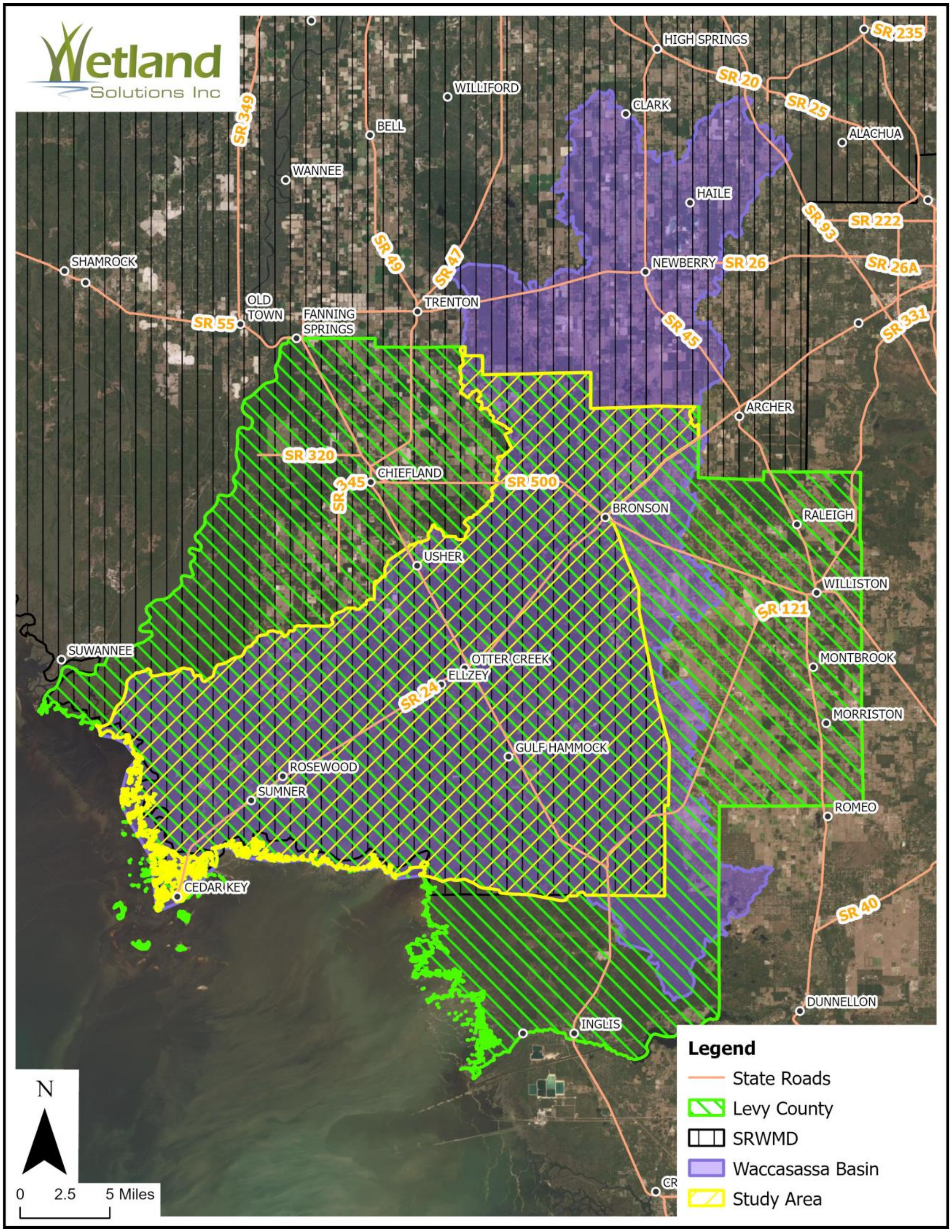

Figure 1. Regional Feasibility Study Area Extents

Section 2 Data and Methods

This section describes the data that were used for this project. Primary data types included geographic data, water treatment plant data, wastewater treatment facility (WWTF) data, and population data. The following sections discuss each of these sources and the data that were evaluated for 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 and 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
Wastewater Facility Regulation (WAFR) - Wastewater Sites	FDEP	2018
Onsite Sewage Treatment & Disposal System	FDOH	2021

2.2 *Water and Wastewater Facility Data*

Water facilities were identified using the FDEP Oculus database. These facilities include larger permitted water systems. Available information included triennial water quality data, operating reports, infrastructure project information, and reports documenting compliance and process performance issues. Water supply well data were provided by the SRWMD and included both WUP wells (wells requiring a water use permit) and water well construction (WWC) wells (generally domestic self-supply wells).

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 wastewater collection systems. Onsite Sewage Treatment and Disposal Systems (OSTDSs) were identified based on FDOH parcel data. Effluent quality data were collected for the permitted WWTFs from the FDEP Oculus Database. Available data included facility permits, discharge monitoring reports (DMRs), and related engineering reports.

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 and Business 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 included a low, medium, and high estimate. Population projections were compared between BEBR and SRWMD. The SRWMD estimates provide information for evaluating water use and populations 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 number estimated in the SRWMD's water use projections. In all cases, except for Cedar Key, the numbers were similar, but not identical. The deviation in Cedar Key's population estimates is believed to be related to the difference between permanent residents and weekend visitors.

Section 3 Evaluation of Current and Future Water Supply Challenges, Needs, and Limitations

This study considered current and future water supplies for the communities of interest. Currently, Bronson, Otter Creek, and Cedar Key provide potable water service to their respective communities. This section discusses current water needs and challenges and presents anticipated future needs.

3.1 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, F.A.C., 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 the individual wells used by homeowners and small businesses to meet their potable water supply needs. These systems are described and inventoried in Section 3.1.2.

3.1.1 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 (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	SRWMD WUP	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
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

3.1.2 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 within the study area. Most of these wells are located outside of the Public Service Areas (PSAs), although some wells are located within the identified PSAs. Figure 2 shows the known domestic self-supply wells. Within the study area there are 597 private wells and 97 wells associated with WUPs. Within the PSAs there were 30 private wells in Bronson, 3 private wells in Otter Creek, and 20 private wells in Cedar Key.

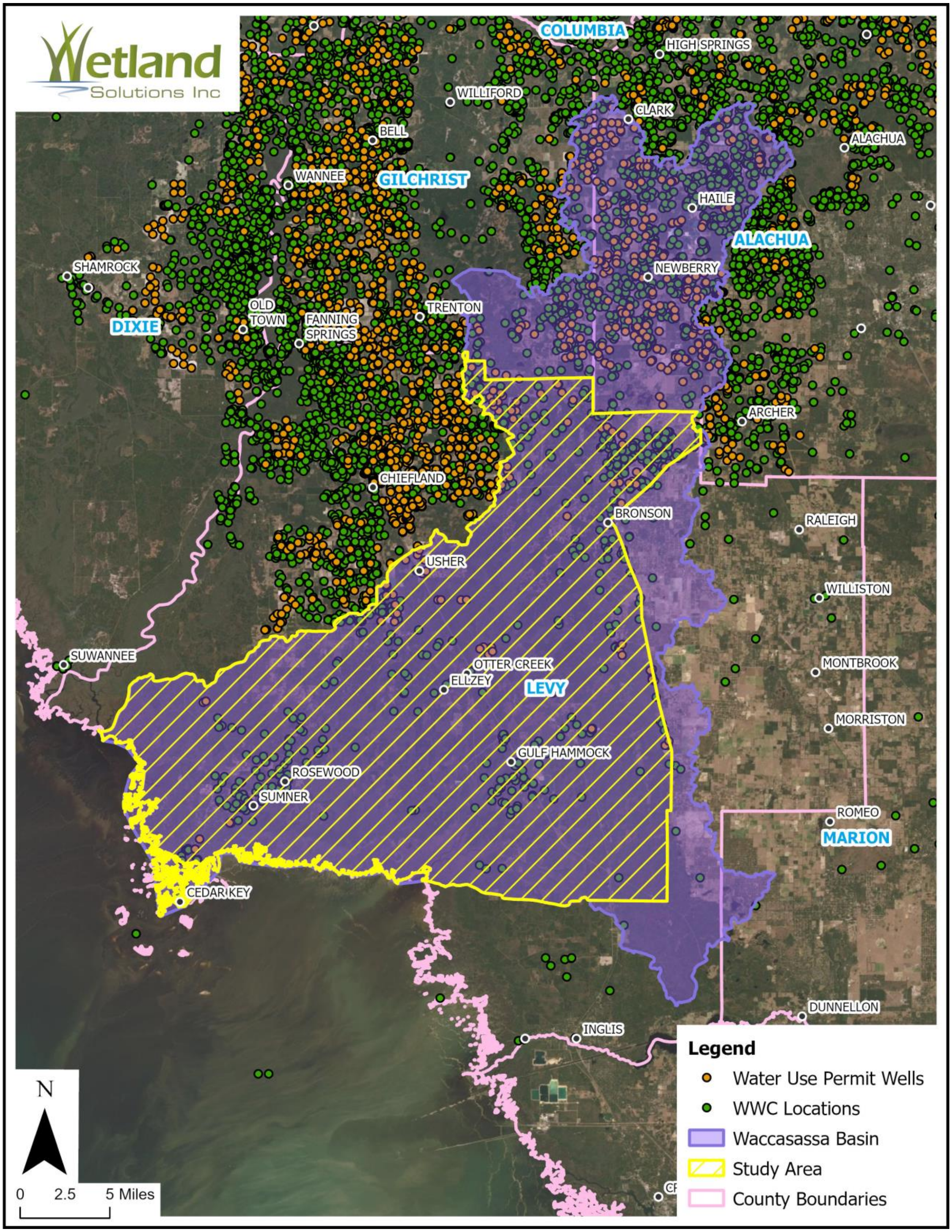

Figure 2. Domestic Self-Supply and Public Supply Wells in the Waccasassa Feasibility Study Area

3.2 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 raw and finished 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.

3.2.1 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 groundwater withdrawal rate of 0.235 MGD and was issued January 13, 2013, with an expiration date of January 13, 2033. The Town of Bronson, supply wells, and the PSA are shown in Figure 3.

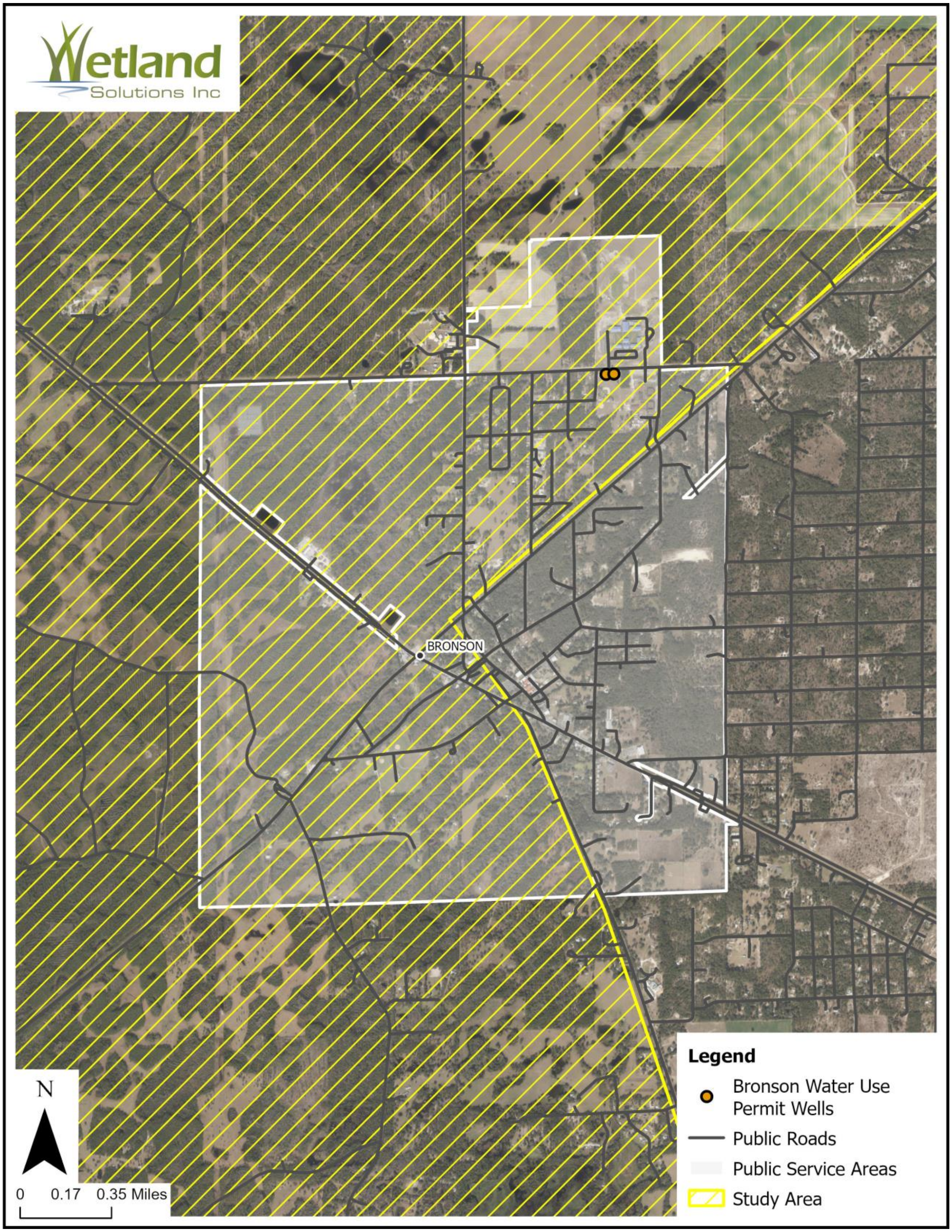

Figure 3. Town of Bronson Public Supply Wells and Public Service Area

3.2.1.1 Water Infrastructure and Treatment Process

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 gallons per minute (gpm). Well 3 is a 12″ well installed in 1993 with a capacity of 500 gpm. The Town has a current project to rehabilitate the wells to increase the capacity of Well 2 from 320 gpm to 500 gpm.

The potable water 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 being replaced as they are identified. Water plant operation is currently contracted to Water Pro, Inc.

3.2.1.2 Existing Water Use

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

During 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 because the Town completes monthly water billing, and MOR populations and number of connections are not typically updated at the same frequency.

The Town has increased water rates by 11.5% each of the last two years to raise revenue to help offset the Town's costs associated with operation of the water system. Current water rates are structured as an inclining block rate with 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 2,001-4,000 gallons, $3.36/1,000 gallons for 4,001-6,000 gallons, $3.75/1,000 gallons for 6,001-8,000 gallons, $4.18/1,000 gallons for 8,001-10,000 gallons, and $4.64/1,000 gallons for use beyond 10,000 gallons as shown in Table 3.

Table 3. Town of Bronson Water Rates

Gallons	Cost per 1,000 Gallons	Flat Rate
Base Rate & ≤2,000	--	$14.19
2,001-4,000	$3.00	--
4,001-6,000	$3.36	--
6,001-8,000	$3.75	--
8,001-10,000	$4.18	--
>10,000	$4.64	--

3.2.1.3 Water Supply Challenges and Limitations

The Town of Bronson's raw water quality tends to be very good requiring minimal treatment with no reported issues. The Bronson Water Treatment Plant (WTP) has had no reported water quality violations.

Water system challenges primarily relate to providing adequate flow rates for fire suppression and concerns with meeting future demands. Currently the system is incapable of maintaining pressure while simultaneously delivering fire flows. 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 serving the fire station and will not be connected to the Town's water supply system.

During the meeting, staff indicated that there is variable groundwater quality within the Town of Bronson depending on geography and topography. 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 of town.

The other water supply issue facing Bronson is related to population growth. In the past year, Bronson has seen the addition of 20 homes. There are also plans for the addition of another 50 homes over the next several years. Construction of 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 substantially increase traffic and the need for businesses to meet traveler's needs. It is also expected that this transportation-related infrastructure could result in increased demand for housing. The effects on population and water demand associated with these potential projects cannot be reliably estimated at the present time.

3.2.1.3.1 Water Quality

The Town of Bronson's water supply wells produce excellent quality water with no regulated parameters above their respective maximum contaminant levels (MCLs, Table 4). Concentrations of nitrate-nitrogen, which is highly mobile in groundwater, indicate a water supply that is influenced by some source of anthropogenic enrichment (*e.g.*, fertilizer or wastewater).

Table 4. Town of Bronson Finished Water Quality

Parameter[1]	Result	MCL	Units	Qualifier[3]
Nitrate+Nitrite (as N)	2.46	N/A[2]	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	
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

[1] All parameters sampled 10/27/2021, except HHA5 and TTHM sampled 8/24/2021

[2] MCLs for nitrate and nitrite independently, but not for combined concentration

[3] Qualifier: I = The value reported is less than the practical quantitation limit and greater than or equal to the method detection limit., J = Estimated; Q = Sample held beyond normal holding time; U = Material was analyzed for, but not detected above the method detection limit

3.2.1.4 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 growth anticipated by 2045. The 2020 water use projection for the Town was 0.15 MGD of groundwater use, with that value remaining unchanged through 2045. These estimates were based on available information at the time of the 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 staff at 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 estimated 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 new 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.

3.2.1.5 System Water Loss

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 water loss had decreased.

3.2.2 City of Cedar Key

The City of Cedar Key is located in the southwestern tip of Levy County on an island in the Gulf of Mexico. The City 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. A 2009 analysis of the economic impact of the clamming industry found that Region 1, which includes Cedar Key hard clams, generated an annual economic impact of $44.9 million and supported 556 jobs (Adams, Hodges, and Stevens 2009). The economic impact of clamming was further described in a 2012 study which found that 75% of clams were sold to areas outside of the region, generating new dollars in the community (Cedar Key Aquaculture Association 2012). This industry is sensitive to water quality conditions, requiring both clean surface water for growing (unimpacted by bacteria) and clean potable water for processing. Water and wastewater service is provided by a Special District, the Cedar Key Water & Sewer District (CKWSD). Figure 4 shows the City of Cedar Key, supply wells, and CKWSD PSA boundary.

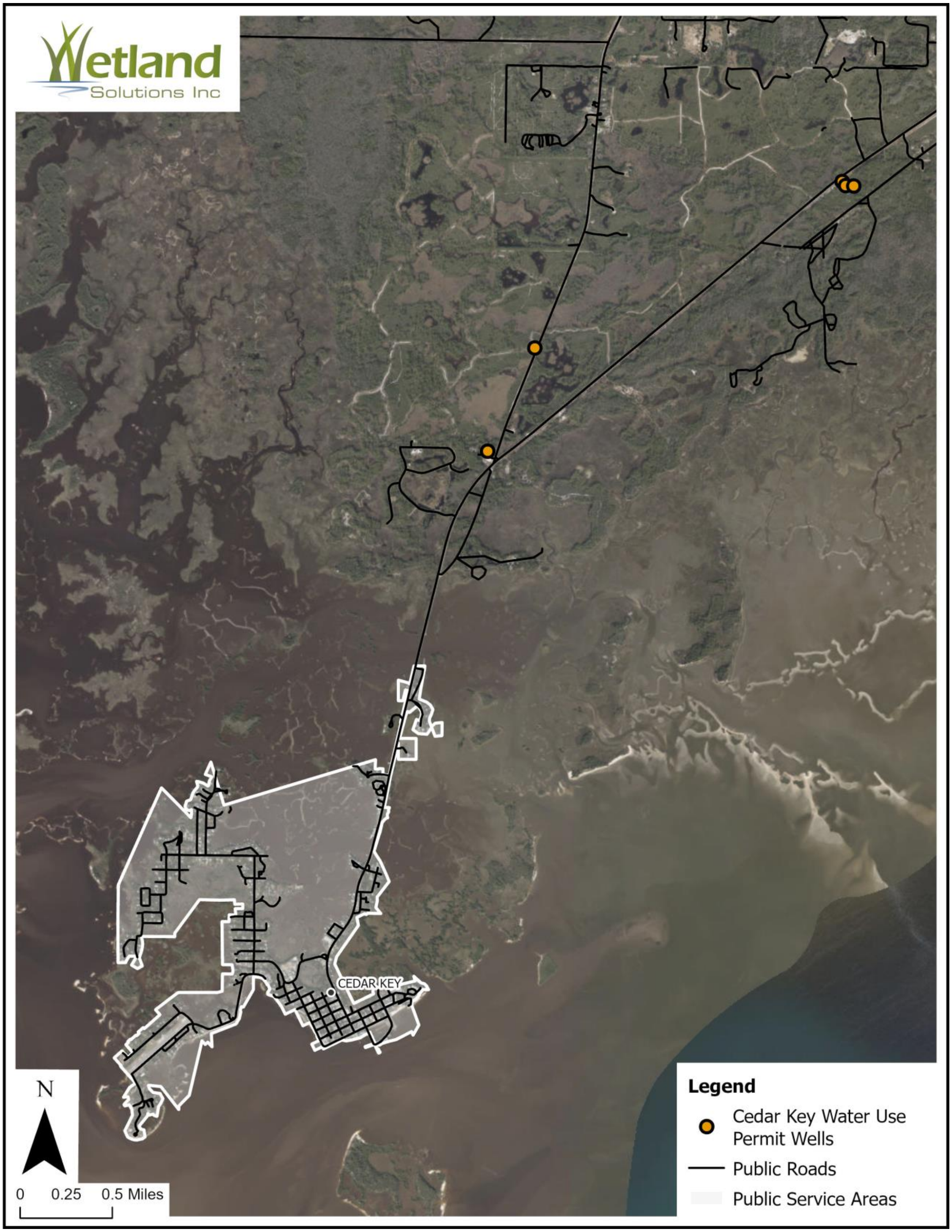

Figure 4. Cedar Key Water & Sewer District Public Supply Wells and Public Service Area

3.2.2.1 Water Infrastructure and Treatment

The CKWSD 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 several years, with issues related to poor source water quality from the CKWSD's wells and saltwater intrusion. The CKWSD has a total of five wells numbered 1-5, although Wells 1-3 are no longer used for providing drinking water due to saltwater intrusion. Wells 4 and 5 currently provide water with pumping alternated between the wells. Wells 4 and 5 are constructed to depths of 145 feet and 186 feet, respectively.

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,
    - Permanganate reduces taste and odor issues, iron, and 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).

The CKWSD's water treatment plant was constructed in 1962 and has been upgraded to continue to provide good quality finished 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. Relative to funding and grant opportunities, the median household income for Cedar Key is above the state average, which limits grant funding to 45% of project cost for United States Department of Agriculture (USDA) grants.

3.2.2.2 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 gpcd, although this average flow is highly impacted by tourism on the weekends and likely overestimates use by residents.

Based on the meeting with the City of Cedar Key and the CKWSD there are approximately 1,008 water accounts, although this number varies. The served population is highly variable based on part-time residents 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 have increased 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 3,001-6,000, $7.17/1,000 gallons for 6,001-9,000 gallons, and $9.27/1,000 gallons for usage over 9,000 gallons per month as shown in Table 5. The current water rates, in combination with a portion of ad valorem taxes, allow for the system to generate approximately the same amount of revenue that is spent to run the system.

Table 5. City of Cedar Key Water Rates

Gallons	Cost per 1,000 Gallons	Flat Rate
Base Rate	--	$27.00
≤3,000	$2.71	--
3,001-6,000	$5.08	--
6,001-9,000	$7.17	--
>9,000	$9.27	--

3.2.2.3 Water Supply Challenges and Limitations

The CKWSD has 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 these problems completely would require either an expensive new water plant with continuing expensive operational costs or an alternative water supply with better source water quality and lower treatment costs. Specific water quality related issues are discussed below.

3.2.2.3.1 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] versus MCL of 0.3 mg/L) and color (60 Platinum-Cobalt Units [PCU] versus MCL of 15 PCU) in the source water. These source water challenges are generally resolved through the relatively complex and costly water treatment system processes that are currently in place.

Water quality following treatment is shown in Table 6. Sampling for disinfection byproducts (DBPs) is completed at two locations within the CKWSD system: Hodgson and Jernigan, and Gulf and Hodges. Sampling in November 2021 for disinfection byproducts found total haloacetic acids (HAA5) with concentrations of 17.6 micrograms per liter (µg/L) and 0.98 µg/L compared to the MCL of 60 µg/L, and total trihalomethanes (TTHM) with concentrations of 45.9 µg/L and 2.18 µg/L compared to the MCL of 80 ug/L at Hodgson and Jernigan, and Gulf and Hodges, respectively.

Table 6. City of Cedar Key Finished Water Quality

Parameter[1]	Result	MCL	Units	Qualifier[2]
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
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

[1] All parameters sampled 5/18/2021, except HHA5 and TTHM sampled 11/3/2021

[2] Qualifier: I = The value reported is less than the practical quantitation limit and greater than or equal to the method detection limit., U = Material was analyzed for, but not detected above the method detection limit

3.2.2.4 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 effective population and include the influence of seasonal residents and tourists. Cedar Key is largely developed, and additional population increases could only be accommodated by temporary residents becoming permanent residents, re-development within the City, or development of the few remaining undeveloped parcels. The SRWMD water use 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.

3.2.2.5 System Water Loss

Cedar Key had a water audit completed by the 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, and 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 current system losses.

3.2.3 Town of Otter Creek

The Town of Otter Creek is located along SR24 between Bronson and Cedar Key just west of the intersection with US Highway 19 (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

3.2.3.1 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 (Well 1 and 2), although only one (Well 1) is currently being used because it has 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.

3.2.3.2 Existing Water Use

Based on data from the January 2022 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 gpcd. The water system is currently operated by Water Pro, Inc.

The Town's water rates follow an increasing block rate structure. Current water rates are $24/month for the first 2,000 gallons of water with the following additional blocks; 2,001-5,000 gallons are $6.00/1,000 gallons, 5,001-8,000 gallons are $6.50/1,000 gallons, and use over 8,000 gallons is charged at $7.00/1,000 gallons as shown in Table 7. 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 the Town still expects it to take five years to have the state required set aside of $10,000 for maintenance expenses.

Table 7. Town of Otter Creek Water Rates

Gallons	Cost per 1,000 Gallons	Flat Rate
Base Rate & ≤2,000	--	$24.00
2,001-5,000	$6.00	--
5,001-8,000	$6.50	--
>8,000	$7.00	--

3.2.3.3 Water Supply Challenges and Limitations

Based on the meeting with the Town, the treated water retains some taste and odor, and most residents choose to use bottled water for consumption. The treatment system is old, and many components are in major need of repair including the storage tank and pneumatic tank. Several grants have been received to improve the current water system. The distribution system was upgraded approximately 20 years ago to PVC and remains 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 storage tank (32,000 gallons) is undersized to meet prolonged fire demands.

3.2.3.3.1 Water Quality

Based on sampling data from 1966, Well 1 source water had an iron concentration of 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, a sample from August 1993 had iron at 6.7 mg/L for Well 1 and 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 applicable MCLs.

Table 8. Town of Otter Creek Finished Water Quality

Parameter[1]	Result	MCL	Units	Qualifier[3]
Nitrate+Nitrite (as N)	0.318	N/A[2]	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

[1] All parameters sampled 9/29/2021, except HHA5 and TTHM sampled 9/7/2021

[2] MCLs for nitrate and nitrite independently, but not for combined concentration

[3] Qualifier: I = The value reported is less than the practical quantitation limit and greater than or equal to the method detection limit., J = Estimated; U = Material was analyzed for, but not detected above the method detection limit

3.2.3.4 Projected Water Use

Currently, the population in Otter Creek is not expected to grow. 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 growth. These include two major toll highways that are anticipated 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 location within the 100-year floodplain. The SRWMD groundwater projections for Otter Creek were estimated as 0.01 MGD in 2020 and 0.01 MGD in 2045.

3.2.3.5 Land Development Regulations

The Town of Otter Creek has adopted Land Development Regulations (LDRs) that are highly protective of natural lands, natural waters, and the floodplain. Compliance with the LDR has been mixed although no large developments have recently been constructed in Otter Creek. These LDRs are expected to impact future development in the Town and limit growth to higher and drier areas. Wastewater provisions are discussed here for expediency although these are not directly relevant to water supply. The primary items of interest in the LDRs relative to development include:

- Maximizing setbacks from natural lands or waters to the extent possible on single-family parcels.
- A setback of 330 feet is required from natural areas as part of a new, planned development.
- Commercial and industrial uses are prohibited on lands contiguous to natural areas, except as part of a planned development.
- Any development contiguous to wetlands, waters of the state, wildlife management areas, or any shoreline requires an environmental impact assessment.
- Trees ≥16" that are removed require replacement with a new tree.
- Development is required to protect against the 100-year flood.
- No encroachments or new construction in the floodway unless certified by a professional engineer that no increase in flood levels will occur.
- Minimum floor elevations in "flood prone areas" are required to be 12" above elevation established on the map.
- New construction or substantial improvement requires the lowest habitable floor be elevated 12" above the 100-year floodplain elevation without the use of fill.
- For all properties within ½-mile of Otter Creek, septic systems are prohibited in the 10-year floodplain. Septic systems are permitted in the 100-year floodplain provided that drainfields be elevated 24" above the seasonal high-water table. All new construction is required to comply and existing homes within this boundary have 60 days from the date of the ordinance to comply.

3.2.4 Unincorporated Levy County

Unincorporated Levy County includes the areas outside of the towns and cities. This includes all the area between Bronson and Otter Creek and between Otter Creek and Cedar Key including the named, but unincorporated communities of Rosewood and Sumner.

3.2.4.1 Water Infrastructure and Treatment

The County currently operates two water treatment facilities, each associated with small developments. In both cases the facilities were taken over after the prior 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 all residents have a safe and reliable water supply.

3.2.4.2 Existing Water Use

One of the County's water plants is located within the study area at University Oaks (PWS 2381208) in Bronson. The Town of Bronson has considered annexing University Oaks and including it within their water service area. Levy County may be amenable to transferring authority for operation of the University Oaks water system to Bronson.

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 gpcd.

3.2.4.3 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 to operate. The primary concern for the County is related to unserved users, particularly between Otter Creek and Cedar Key, who are on relatively shallow wells with poor and potentially unsafe water quality. These users must either tolerate the poor water quality, purchase bottled water to meet their needs, or spend money on expensive individual treatment systems to improve the water quality. There are also significant concerns given the area's frequent flooding, that standing water causes bacteria or other pathogens to leach from septic systems, mix with the standing water, and contaminate the drinking water wells. The County would like to help these residents transition to a safer and more reliable drinking water supply.

3.2.4.4 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 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 Alternatives Development to Address Current and Future Water Supply Needs

4.1 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 high-quality water supply, it is not expected that Bronson would transition from their current groundwater source to an alternative source. For this reason, only Otter Creek, Cedar Key, and unincorporated areas of Levy County with poor water quality were considered as transitioning to an alternative water source.

4.1.1 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 7. Both rivers have adopted MFLs.

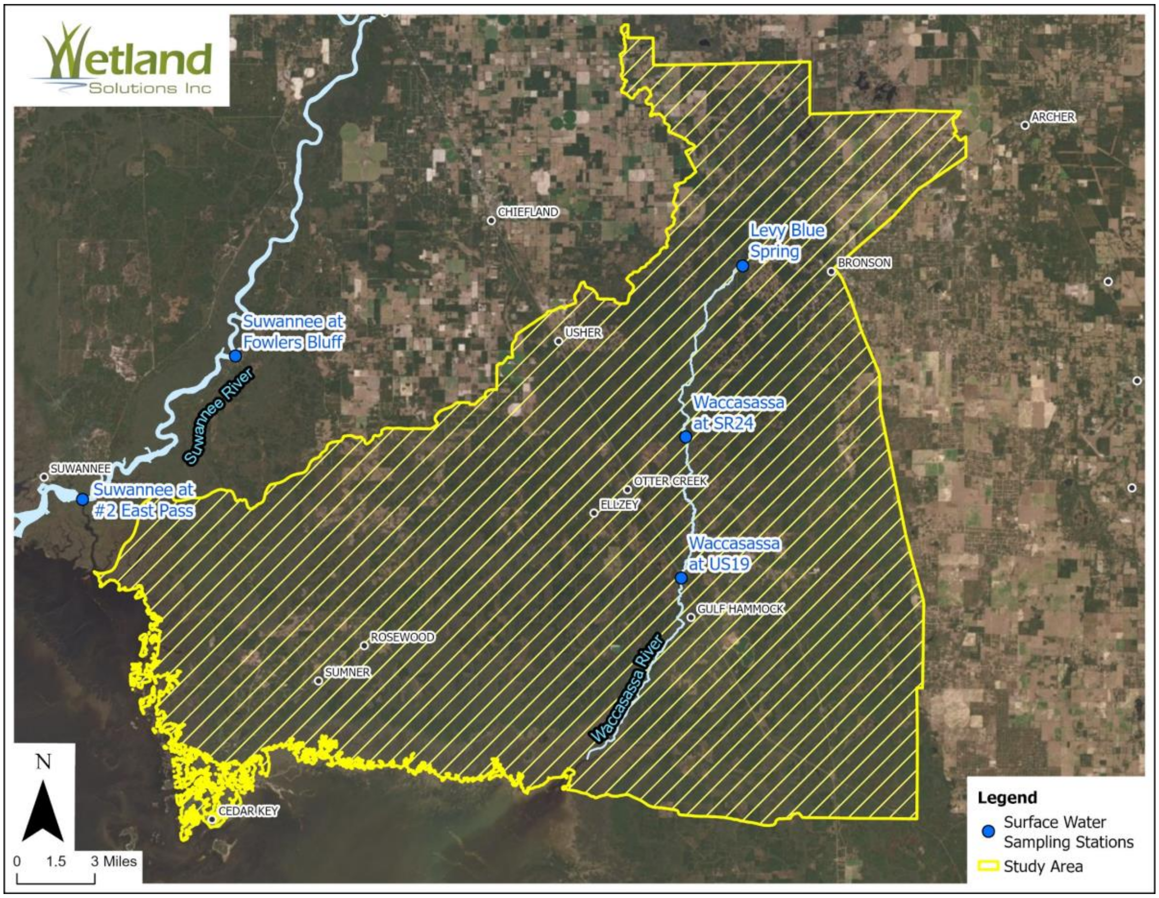

Figure 7. Suwannee and Waccasassa Rivers and Surface Water Stations

4.1.1.1 Waccasassa River

The Waccasassa River originates northeast of Levy Blue Springs with significant contribution from the spring during low-flow periods. The river flows south-southwest before crossing under SR24, approximately 3 miles northeast of Otter Creek. The river then flows south and then southwest to the Gulf of Mexico after receiving flows from tributaries including Otter Creek, Magee Branch, and the Wekiva River.

4.1.1.1.1 Flows

The Waccasassa River has flows dominated by spring discharge during dry periods and by watershed runoff during wet periods. Flows at Levy Blue Springs averaged 10.3 cubic feet per second (cfs) since 2016 with a maximum flow of 18.2 cfs and a minimum flow of 1.38 cfs. Flows were historically measured 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 were collected at this station between 1995 and 1996 and averaged 20.5 cfs.

4.1.1.1.2 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 wetlands. 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 periodically since 2006. Data for iron, color (filtered), and 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.

4.1.1.1.3 Treatment Requirements

The Waccasassa River is generally a tannic river except in the upstream reaches during low-flow periods when Levy Blue Springs flows dominate. 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 to the current water supplies of Otter Creek and Cedar Key with generally high color, iron, and TOC. This finding is consistent with the depth of these communities' groundwater wells and the overlying surface waters that likely infiltrate and recharge these wells. Removal of natural color is difficult and requires a multi-step process such as the process currently employed by Cedar Key. The cost and challenges associated with treatment are expected to be similar to the communities' current water systems.

4.1.1.1.4 Regulatory Constraints

The Waccasassa River and Levy Blue Springs had an MFL developed in 2006 and adopted in 2007 (40B-8.051, F.A.C.). The adopted MFL for Levy Blue Springs 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 cfs (reverse flow) to 875 cfs at this gage.

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. The median flow at this location was, based on limited historical data (July 1, 1944 - October 31, 1953), about 50 cfs. The expected withdrawal 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 withdrawal would cause exceedances of the Levy Blue Springs MFL during low-flow periods when flows are below 7.24 cfs, although the withdrawal location would be downstream where the median flow is higher. It is possible that a surface water use permit could be issued for this location with demonstration of no adverse impacts to the waterbody and MFL.

4.1.1.1.5 Waccasassa River Surface Water Supply 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 daily flows, and raw water quality. Based on the flow record at SR24 it appears that there would be times when permitted withdrawals could exceed 10% of the total 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 flows. 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 parameters are likely to cause treatment challenges that are similar to the current issues that Cedar Key and Otter Creek face with their existing 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 complicate water treatment process design and operation. Finally, using this water source would require construction of a pipeline between the river and Otter Creek and Cedar Key. Constructing the intake and lengthy pipeline would be expensive and would not provide a significant improvement in raw water quality or availability.

4.1.1.2 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.

4.1.1.2.1 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 and its tributaries. In the lower reaches the river is tidally influenced. Suwannee River flows are measured at several locations along the river. The gage at Wilcox provides a long-term flow record for the lower reaches of the river. At this location, flows averaged 7,730 cfs since 2000, with a range from less than 2,000 cfs to 39,500 cfs.

4.1.1.2.2 Water Quality

Lower Suwannee River water quality data have been collected at a large number of locations with 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 and 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.

Approximately quarterly data were also evaluated for color, TOC, and iron since 2014. 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.

4.1.1.2.3 Treatment Requirements

The Lower Suwannee River is a tannic river during normal to high flows. This tannin-stained condition is confirmed by the relatively high color values observed in water samples. Additionally, the river generally has high TOC which is also indicative of the wetland floodplain contributions to the river system under normal to high-flow conditions. During lower flows the river has a higher percentage of springs inputs and TOC and color tend to be reduced (Figure 8). As with water in the Waccasassa River these constituents and the variability in water quality are expected to pose treatment challenges in much the same way as the municipalities' current groundwater supplies.

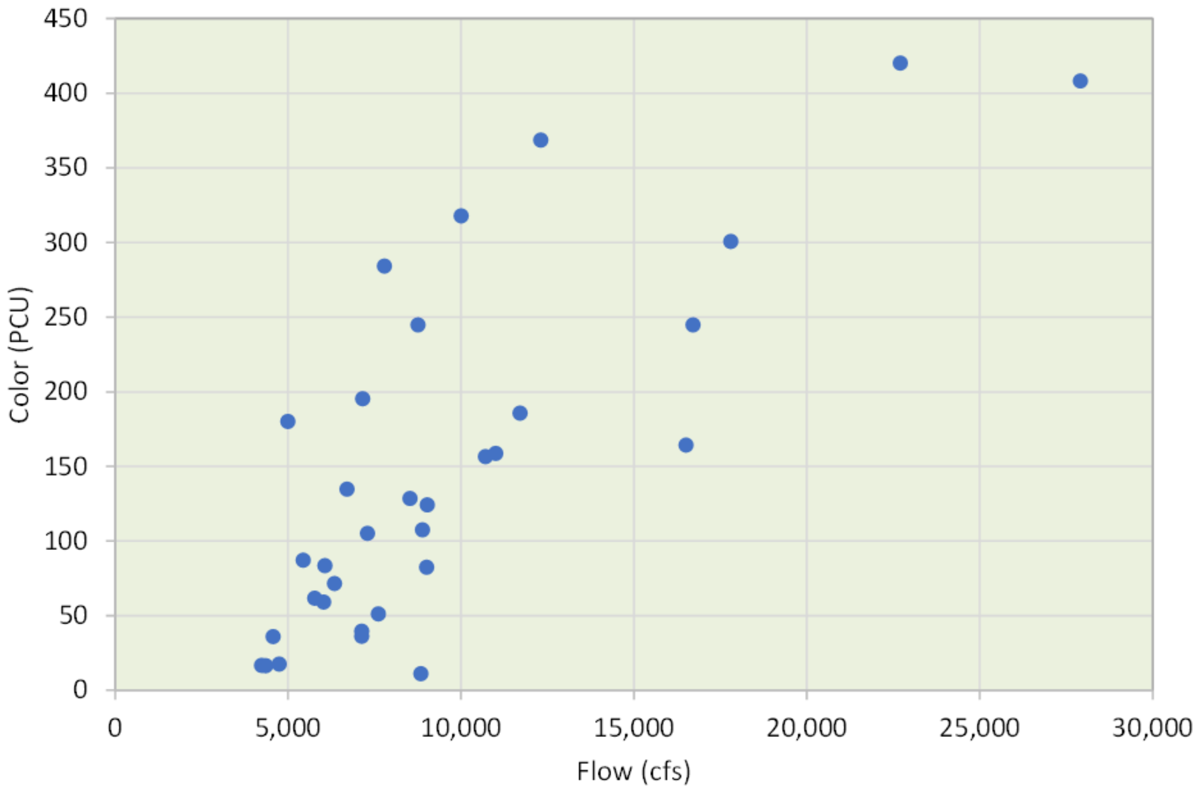

Figure 8. Flow (Suwannee River Near Wilcox; 02323500) Versus Color (Suwannee River at Fowlers Bluff; 02323590)

4.1.1.2.4 Regulatory Constraints

The Lower Suwannee River, Little Fanning Springs, Fanning Springs, and Manatee Springs had MFLs developed in 2005 and adopted 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 Permitting of Water Use – 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 negligible. 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 multiple years over the past several decades Figure 9.

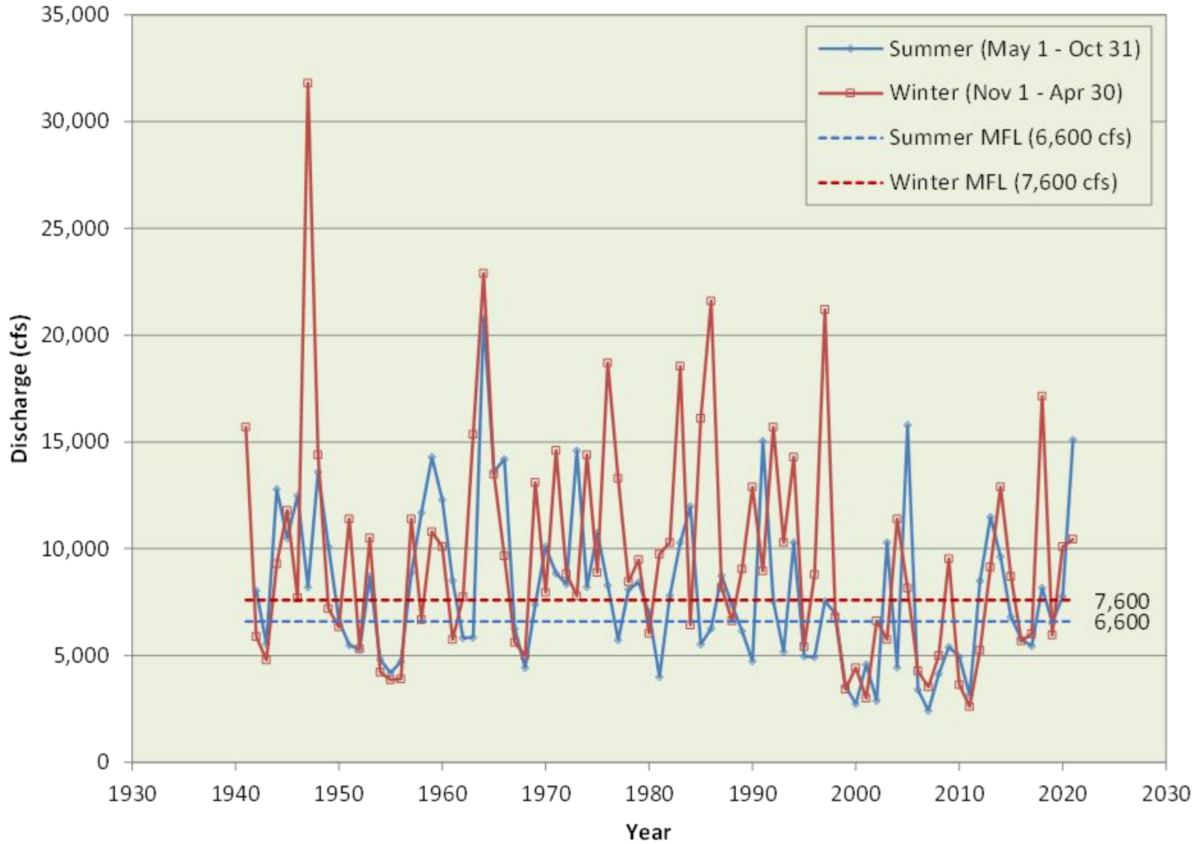

Figure 9. Lower Suwannee River Median Flows and Adopted MFL

4.1.1.2.5 Lower Suwannee River Surface Water Supply Discussion

The Lower Suwannee River is expected to be a challenging water source for three key reasons: distance from project area, flow variability, and raw 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 by comparison to other surface or groundwater sources. A second challenge to securing a surface water use permit 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 Waccasassa River or the existing groundwater sources.

4.1.1.3 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 and conveyance that are beyond the cost and complexity of current treatment required for the municipalities' groundwater sources. This option also requires design and construction of a surface water intake structure, conveyance to a treatment facility located outside of a high-hazard area, and construction of either a surface water discharge pipeline and diffuser or deep injection well for brine concentrate disposal following water treatment. For these reasons, this alternative did not receive additional consideration.

4.1.2 Groundwater

The current water supply source used by Bronson, Otter Creek, and Cedar Key are Upper Floridan Aquifer (UFA) wells. In Bronson, water quality in the UFA is excellent, but wells operated by both Otter Creek and Cedar Key have poor raw water quality, as 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 10 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.

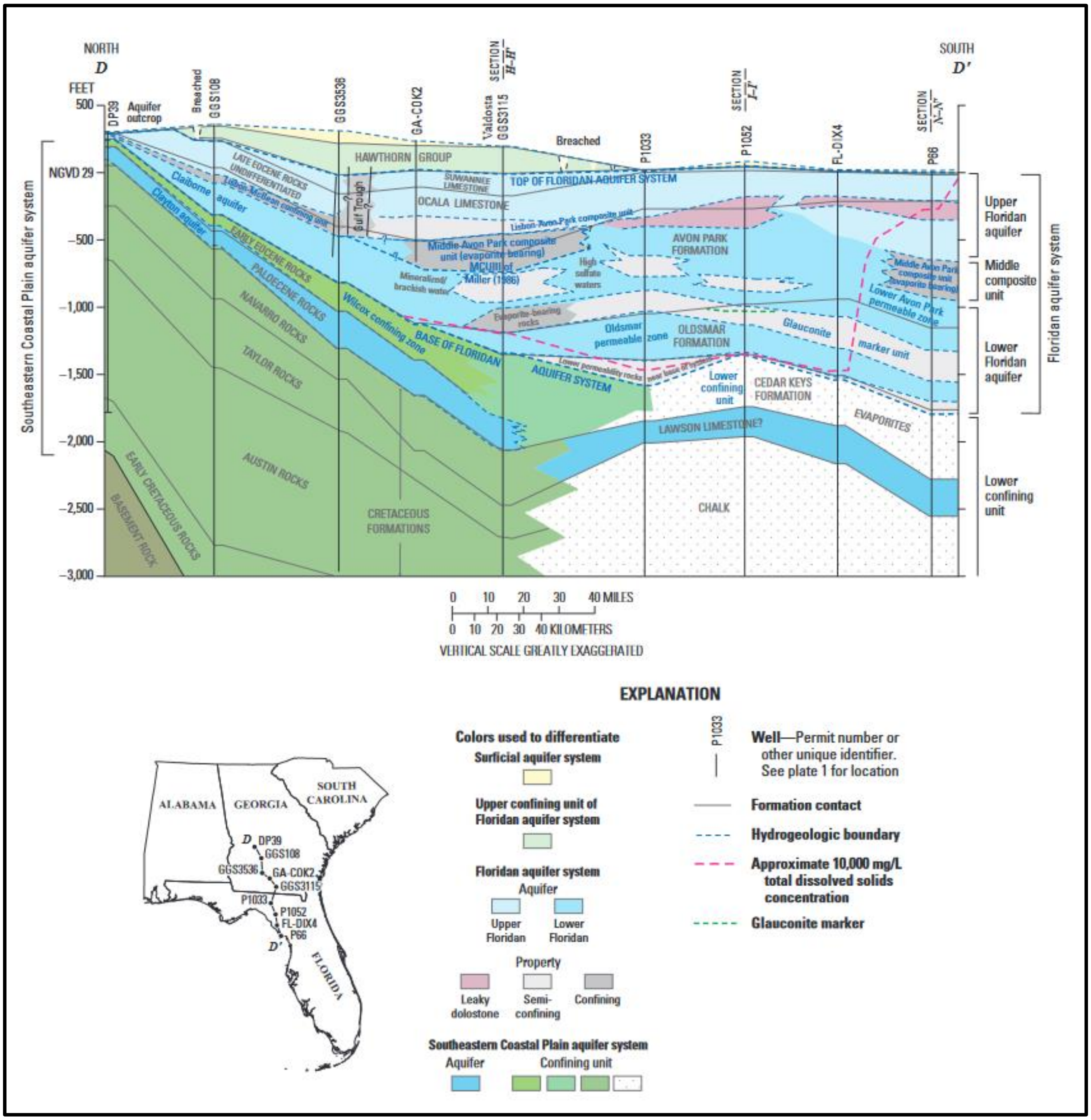

Figure 10. Generalized Hydrogeologic Cross-Section D–D' from Macon County, GA, to Levy County, FL (Williams and Kuniansky 2015)

4.1.2.1 Upper Floridan Aquifer

The UFA 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. Water quality is generally good in the higher topographic areas in the eastern portion of the study area, with poorer water quality in the lower-lying wetland flatwoods located in the western portion of the study area (Figure 11).

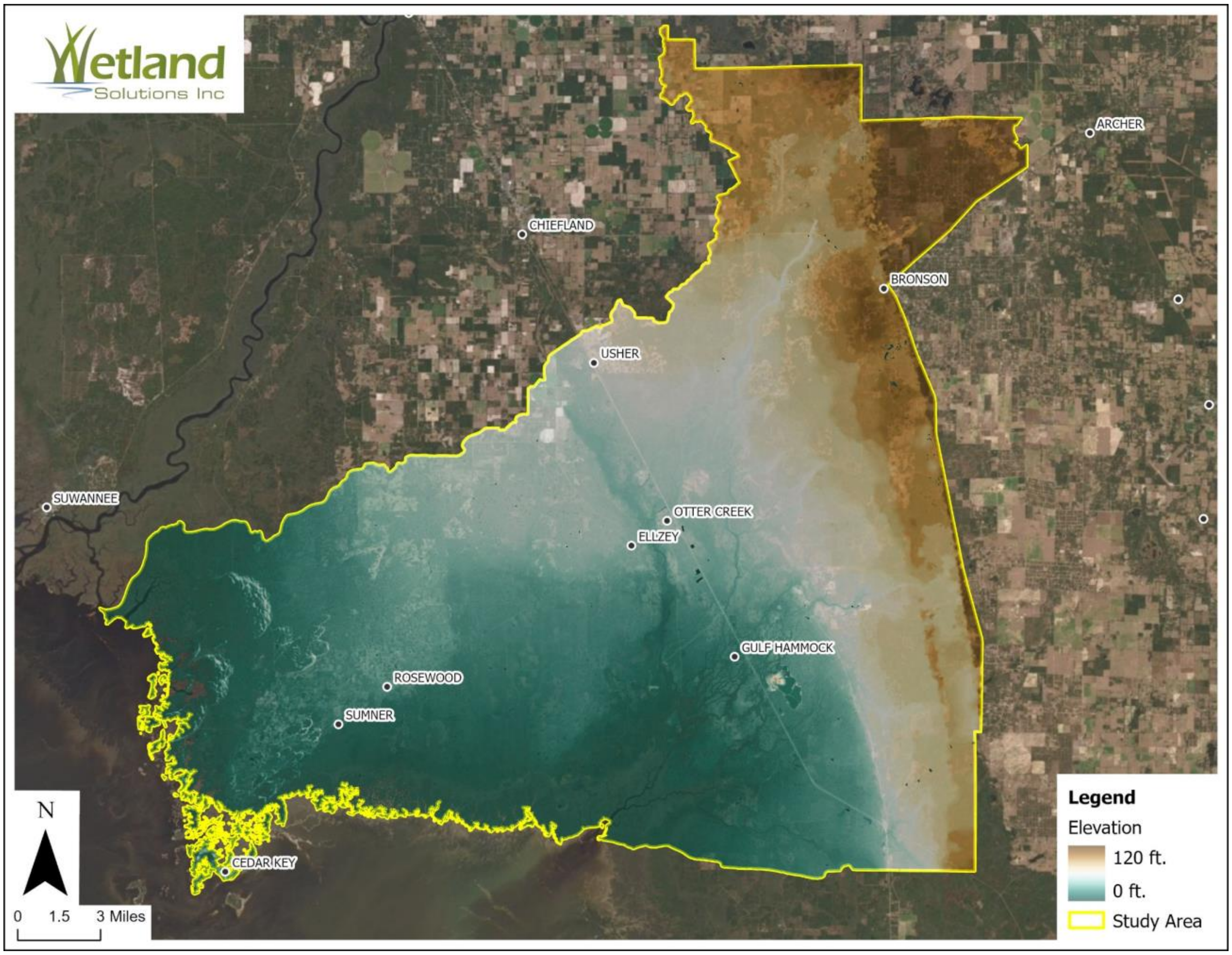

Figure 11. Topography in the Study Area

4.1.2.1.1 Availability

The Floridan Aquifer underlies all of Florida at varying depths, thicknesses, and degrees of 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 regional UFA is composed of limestone with generally high transmissivity and easy access for water supply. Typical domestic well depths are between 30 and 100 feet below the ground surface in the study area with generally deeper wells in the higher elevations in the eastern portion of the study area near Bronson.

4.1.2.1.2 Water Quality and Spatial Variability

Water quality within the UFA is highly variable between Cedar Key and Bronson. Generally, water quality along SR24 is relatively consistent from west to east until reaching Bronson. Water quality in wells west of Bronson are generally characterized 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 at or near the surface migrating into shallow drinking water wells. 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 has been observed in Cedar Key's Wells 1, 2, and 3 which were abandoned incrementally due to elevated chloride concentrations consistent with saltwater intrusion. The City's current supply, Wells 4 and 5, are located east of Wells 1 and 2 and on the same site, but 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. Chloride (Figure 12) 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. Fewer data were available for color than for chloride with values ranging from 0.325 PCU to 243 PCU (Figure 13). 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 wetland flatwoods. Iron concentrations (Figure 14) ranged from 3 to 14,000 µg/L with a moderate number of samples exceeding the secondary DWS of 300 µg/L. Specific conductance (Figure 15) ranged from 30.2 to 5,748 micromhos per centimeter (µmhos/cm). TDS concentrations (Figure 16) 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 17) 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 monitored wells.

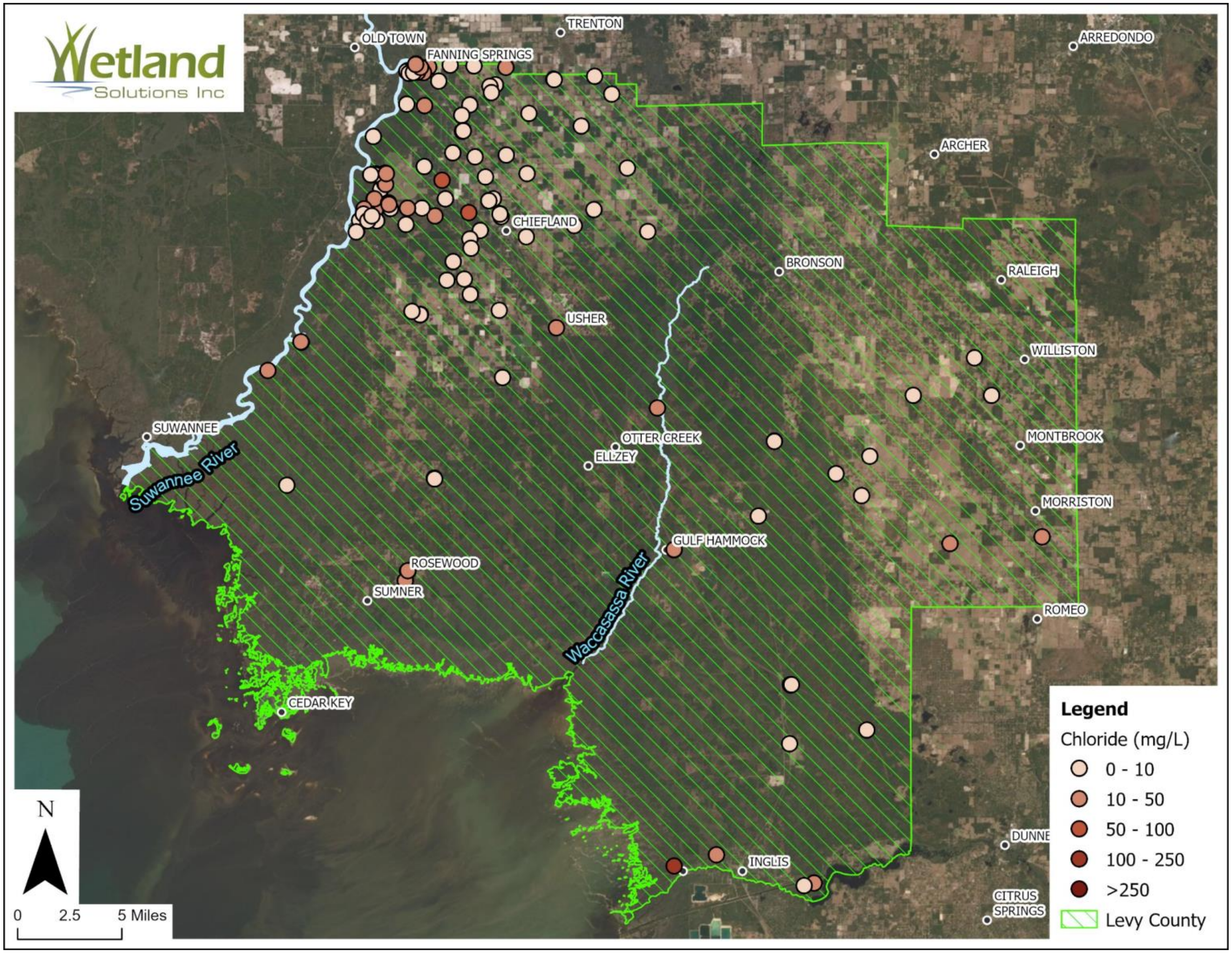

Figure 12. Chloride Concentrations in Levy County UFA Wells

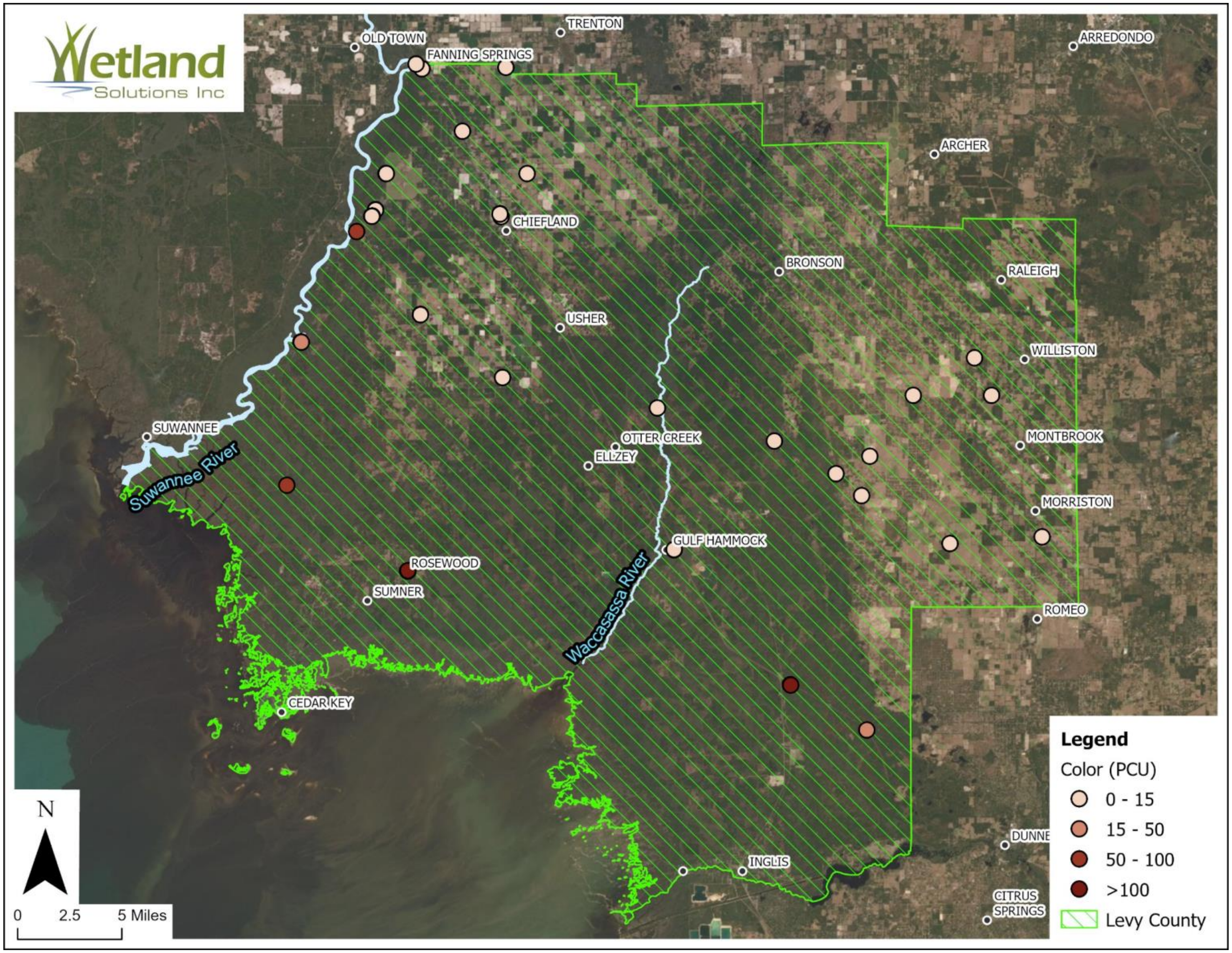

Figure 13. Color Concentrations in Levy County UFA Wells

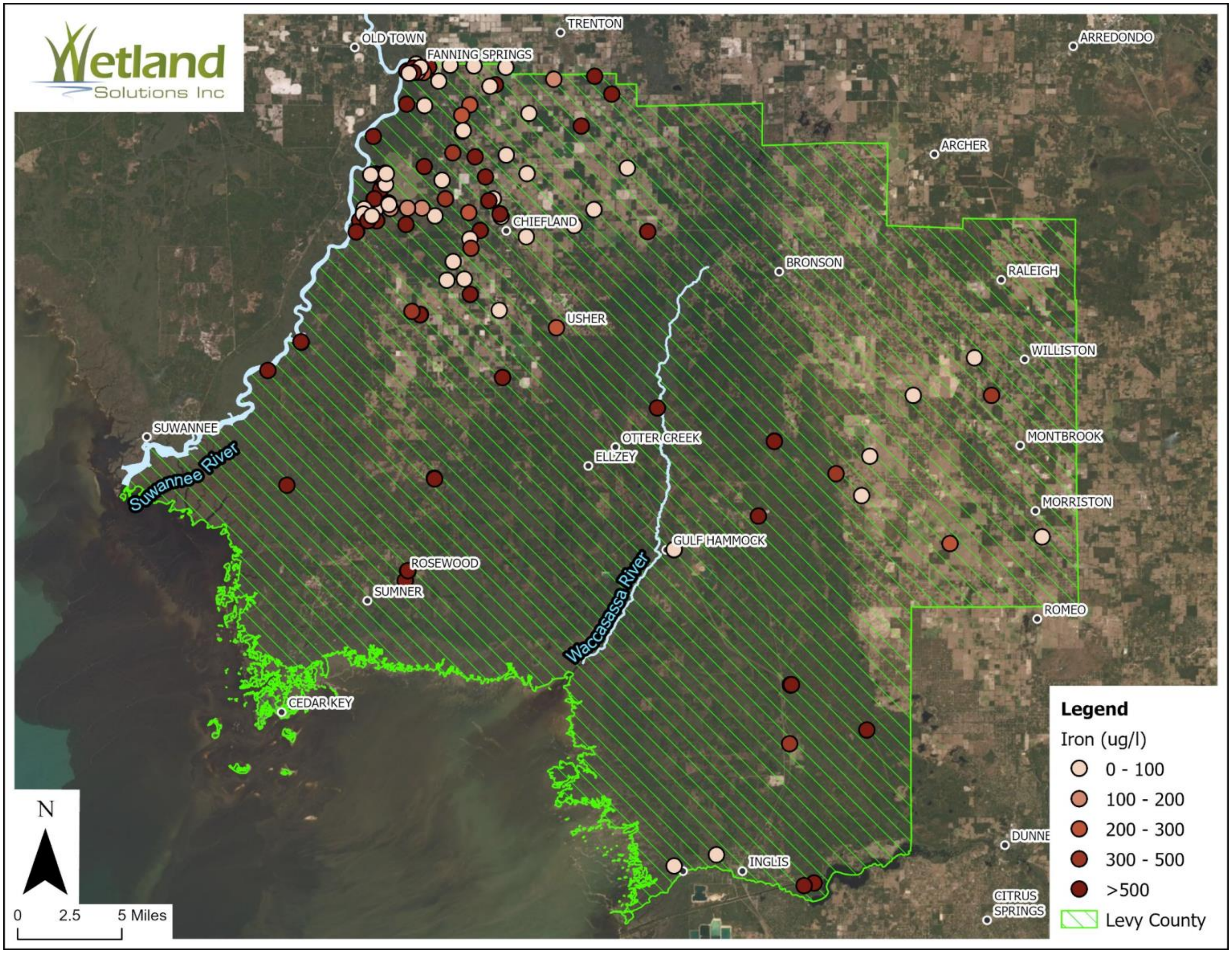

Figure 14. Iron Concentrations in Levy County UFA Wells

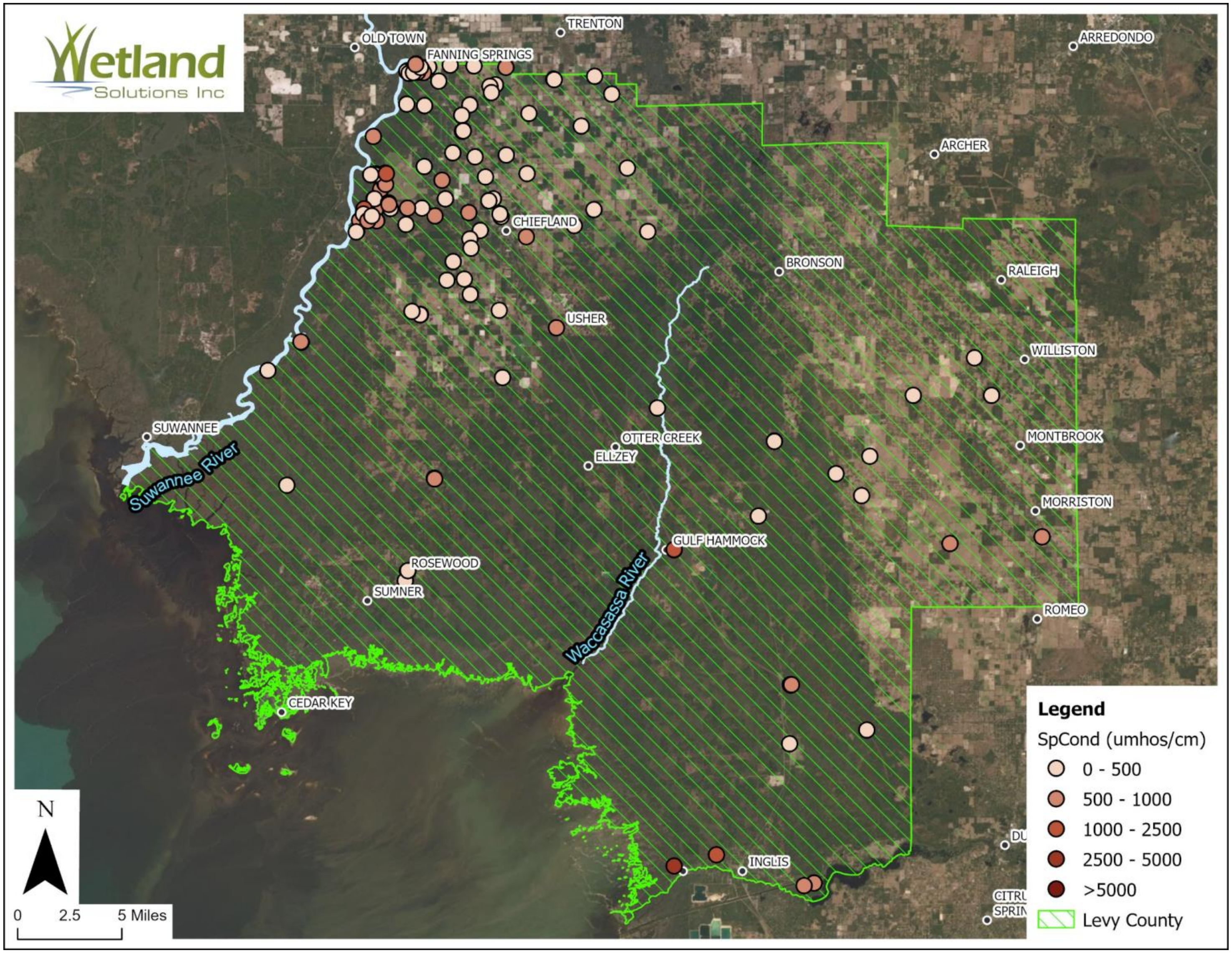

Figure 15. Specific Conductance in Levy County UFA Wells

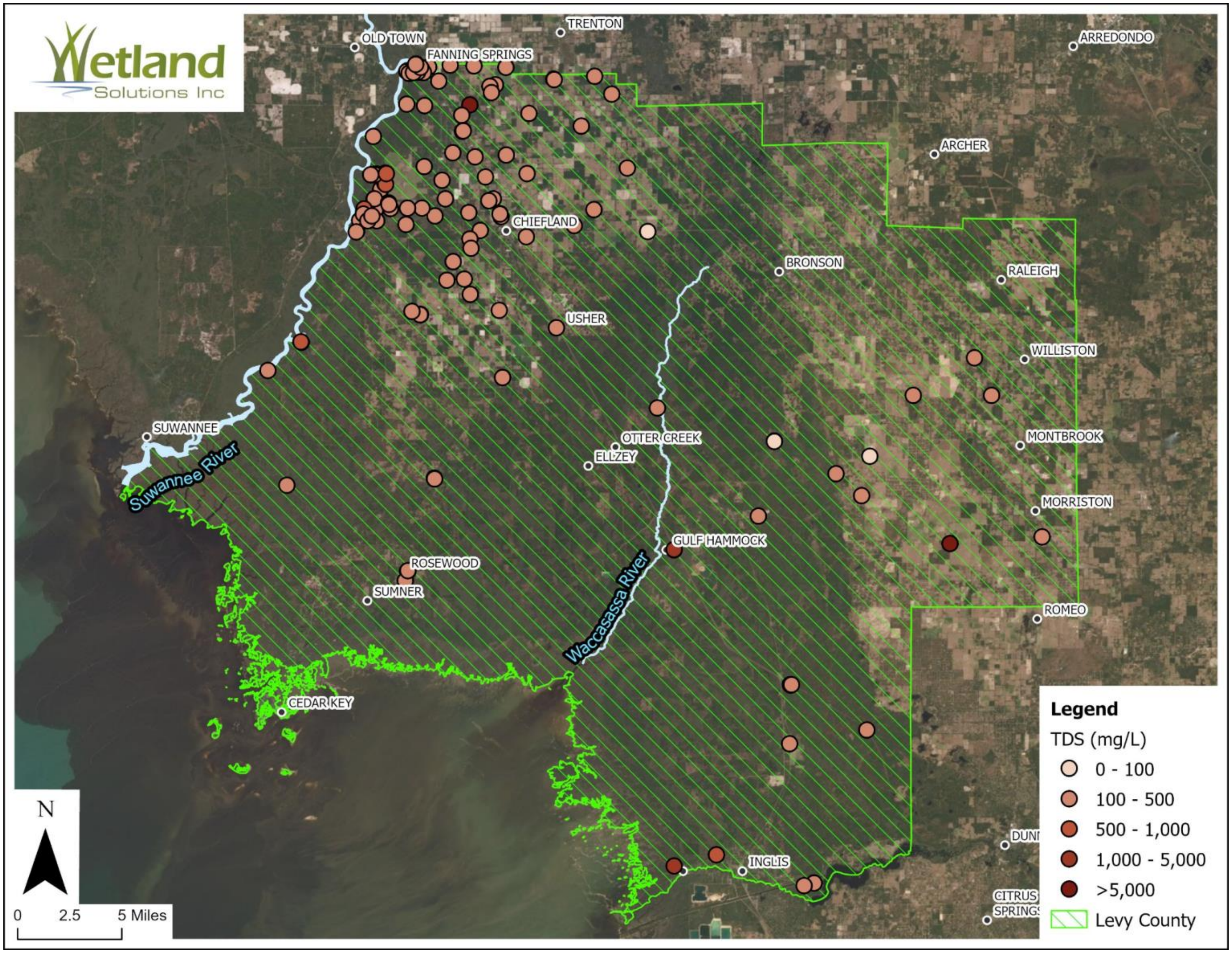

Figure 16. Total Dissolved Solids Concentrations in Levy County UFA Wells

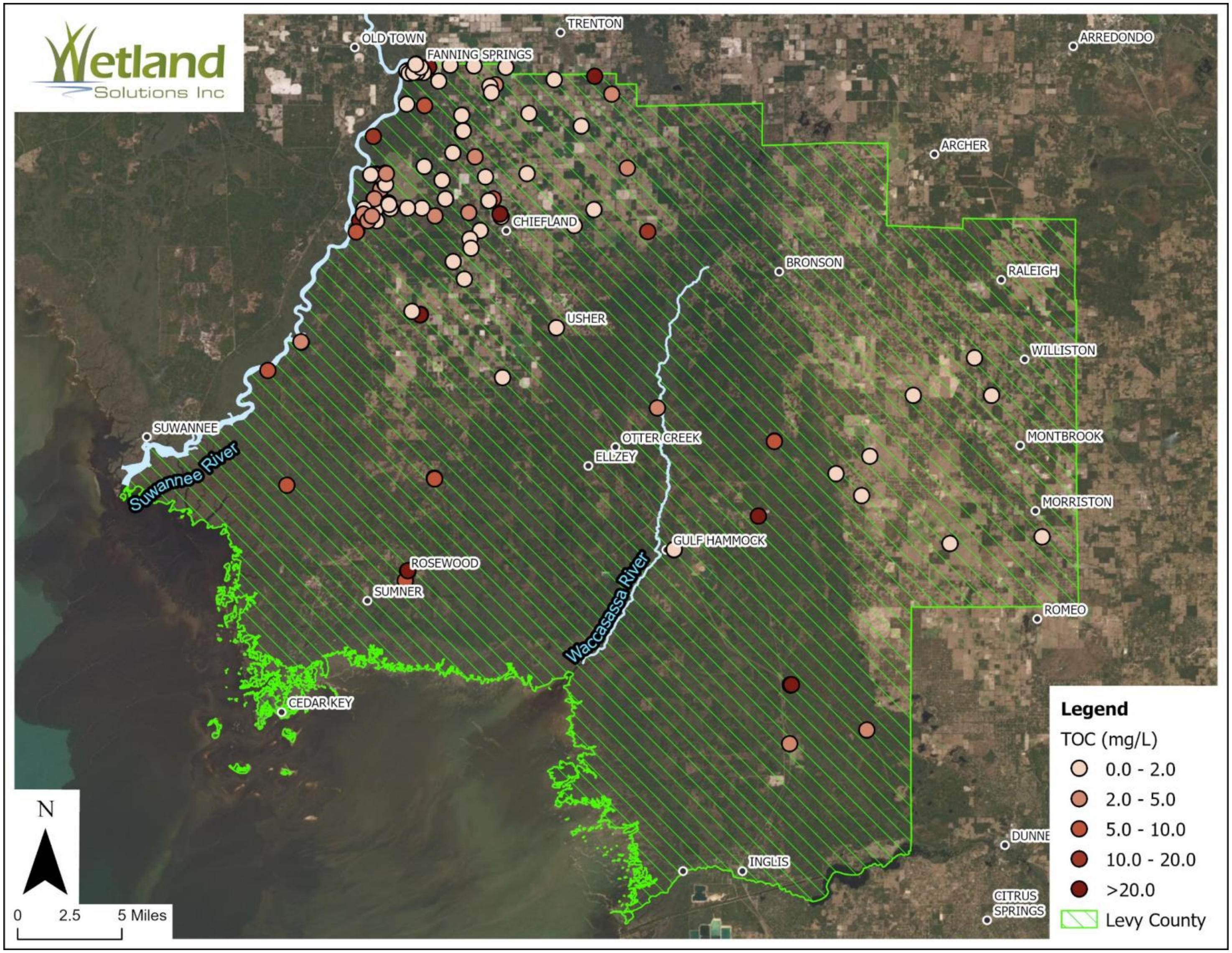

Figure 17. Total Organic Carbon Concentrations in Levy County UFA Wells

4.1.2.1.3 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 degradation 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 required. Cedar Key's water treatment process is an example of a conventional treatment train approach that can be used to produce water that meets potable standards from the water source between west of Bronson and Rosewood.

4.1.2.2 Lower Floridan Aquifer

The 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 4.1.2.2.2) and membrane treatment is required (Section 4.1.2.2.3), there is about a 20% loss of withdrawn water associated with the membrane concentrate that requires disposal.

4.1.2.2.1 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 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.

4.1.2.2.2 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 9 shows the available data from these wells. In general, water quality was poorer than in the UFA, with the TDS and specific conductance data following the expected increase in salinity with increasing depth.

Table 9. Water Quality in Levy County Lower Floridan Aquifer Wells

Well ID	Depth (ft)	Chloride (mg/L)	Color (PCU)	Iron (µg/L)	Specific Conductance (µmhos/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	--

4.1.2.2.3 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. The RO step would 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 a confining unit beneath the USDW. In the study area, this potential disposal zone starts at about 1,500 feet below land surface. The concentrate stream constitutes about 20% of the raw water volume, meaning that 1.25 gallons of raw water need to be withdrawn and treated to produce each gallon of finished water.

4.1.3 Water Source Discussion

The surface water and groundwater sources discussed above have a wide variety of qualities and potential challenges for treatment across the study area. The highest quality raw water source is the UFA in the eastern and northern portions of the study area which is of high quality and requires minimal treatment. Water quality within the UFA degrades from the higher sandy ridge areas near Bronson and Chiefland as topography drops into the wetland flatwoods 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 further 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 immediate 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.

4.2 Independent Water Supplies

While the previous section noted that the inland UFA is the preferred source of future water supply, it is technologically 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.

4.2.1 Cedar Key

The 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 wells closer to the coast have been impacted by saltwater intrusion. Given the loss of use of 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 acceptable quality water. In January 2022, Mittauer and Associates, Inc. estimated that the cost for a new water treatment facility located near the CKWSD's current well field was $12.6 million. The anticipated treatment at this facility is expected to involve many of the same processes currently employed in the CKWSD's existing treatment system to provide a finished water of similar or better quality.

4.2.2 Otter Creek

The Town of Otter Creek currently produces water that is not used for drinking by most of the Town's residents due to color, hardness, and iron. In an attempt to mitigate these challenges, the Town is conducting a filtration pilot project 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 operation and maintenance (O&M) costs for the filter system once the demonstration phase is completed.

Otter Creek also has challenges associated with aging infrastructure and is 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 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.

4.2.3 Bronson

The Town of Bronson currently produces water at a low cost from UFA wells with excellent finished water 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. The Town is expected to be able to continue to provide high quality water to their residents.

4.2.4 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 meetings and conversations that were a part of this study, the residents of these areas have significant water quality challenges including hardness, iron, and color. There is also the risk of contamination of shallow wells due to flooding. To address these issues, many residents have either installed individual water treatment systems or instead purchase their water from retail establishments for consumption. Costs associated with water purchase or treatment can be significant for these residents. In the absence of an alternative these residents would be expected to continue their current water supply strategies, whether through purchase or individual treatment systems.

4.3 *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.

4.3.1 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 creates the 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 and an additional 2.3 miles to Rosewood as shown in Figure 18. 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 water main length is 3.9 miles, excluding distribution.

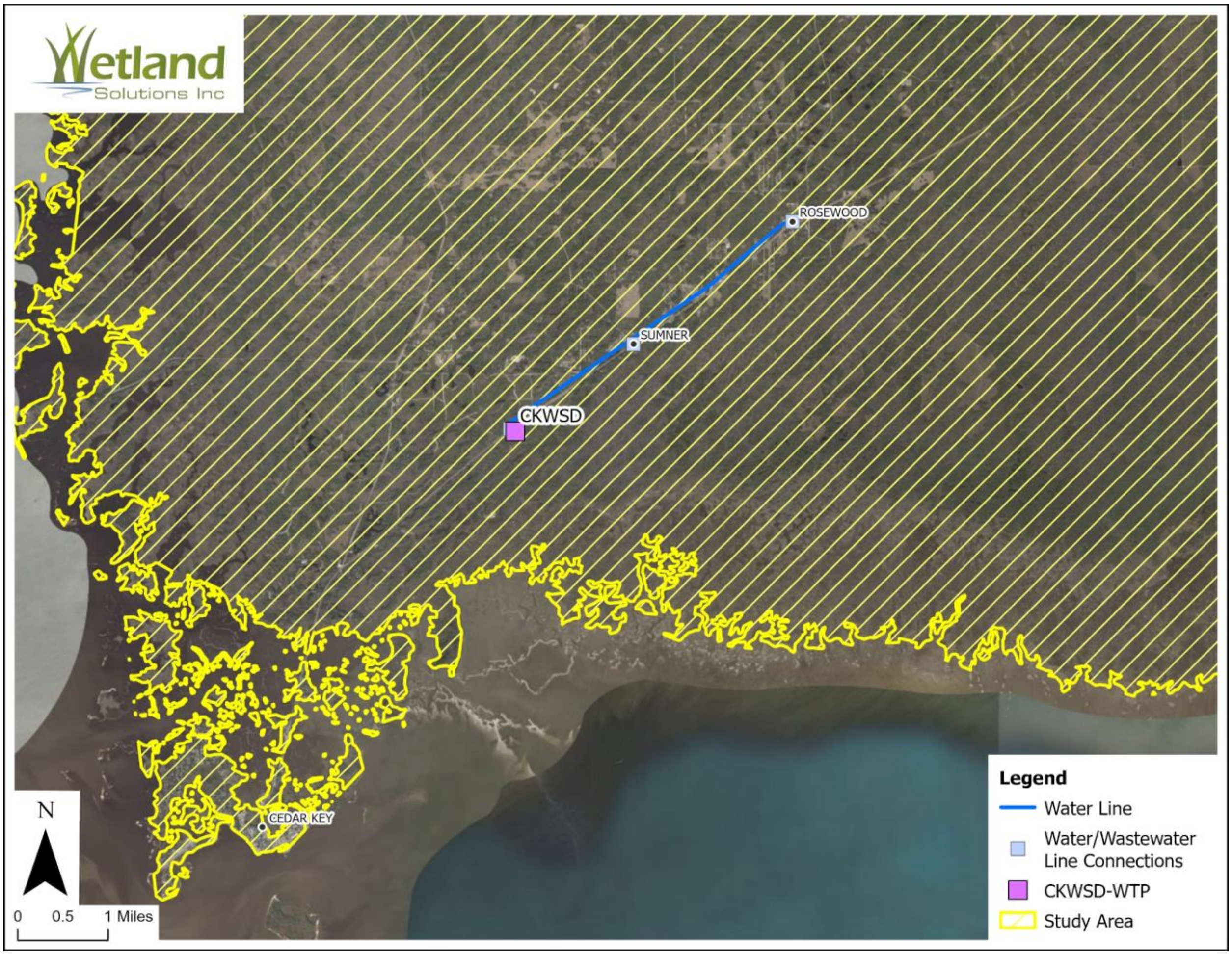

Figure 18. Cedar Key Pipeline to Sumner and Rosewood

4.3.2 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.

4.3.2.1 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 requires 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 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, operations, and water testing between two 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 19 with an approximate total length of 15.7 miles.

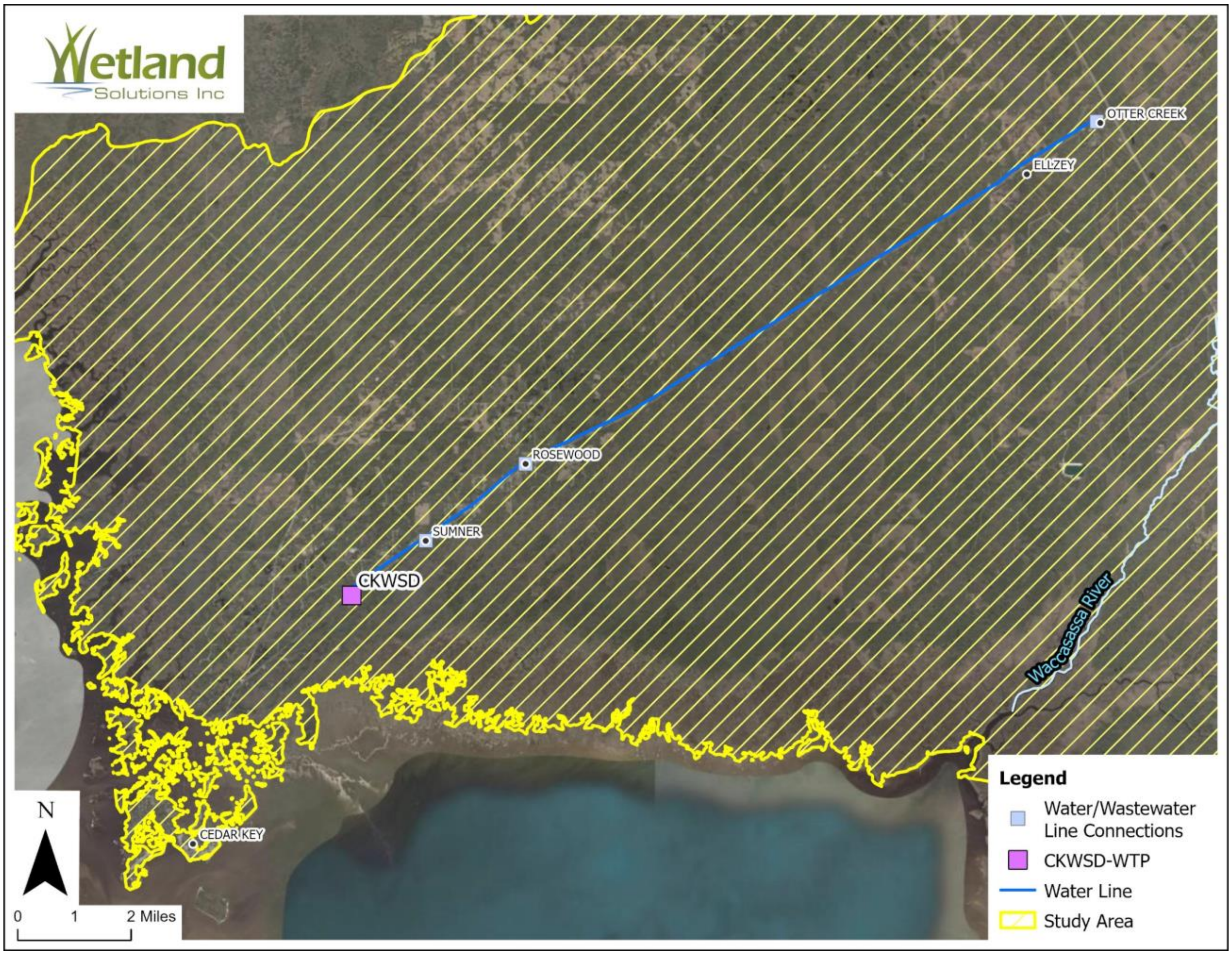

Figure 19. Cedar Key Pipeline to Sumner, Rosewood, and Otter Creek

4.3.2.2 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, Rosewood, Sumner, and Cedar Key. In this scenario, the CKWSD could either expand their PSA to serve Rosewood and Sumner, or Levy County could develop a PSA to serve Rosewood and Sumner. The potential location for a well field and co-located new water treatment facility and the expected pipeline alignment are shown in Figure 20 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.

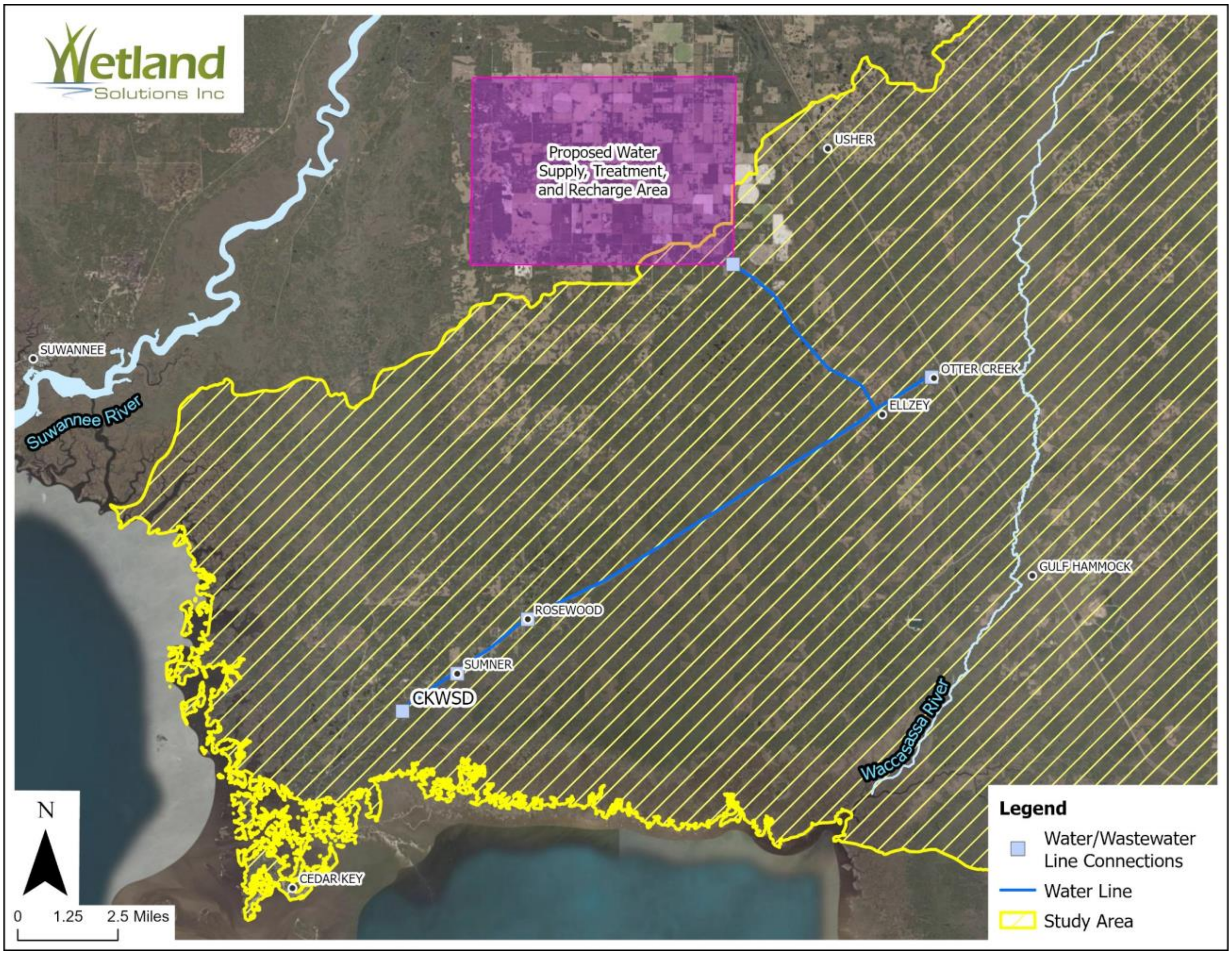

Figure 20. Regional Water Authority Pipeline to Cedar Key, Otter Creek, Sumner, and Rosewood

4.3.3 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 RWA would be near Bronson with a tap/master meter to Bronson, Otter Creek, Rosewood, Sumner, and Cedar Key. As above the communities of Rosewood and Sumner could be served by either an expanded CKWSD or by Levy County through a new PSA. In this scenario, it is expected that the RWA would sell water to each of the municipalities with billing of individual water customers by the municipality. This project has the benefit of pumping water from the UFA in an area with excellent water quality and minimal 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 21 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.

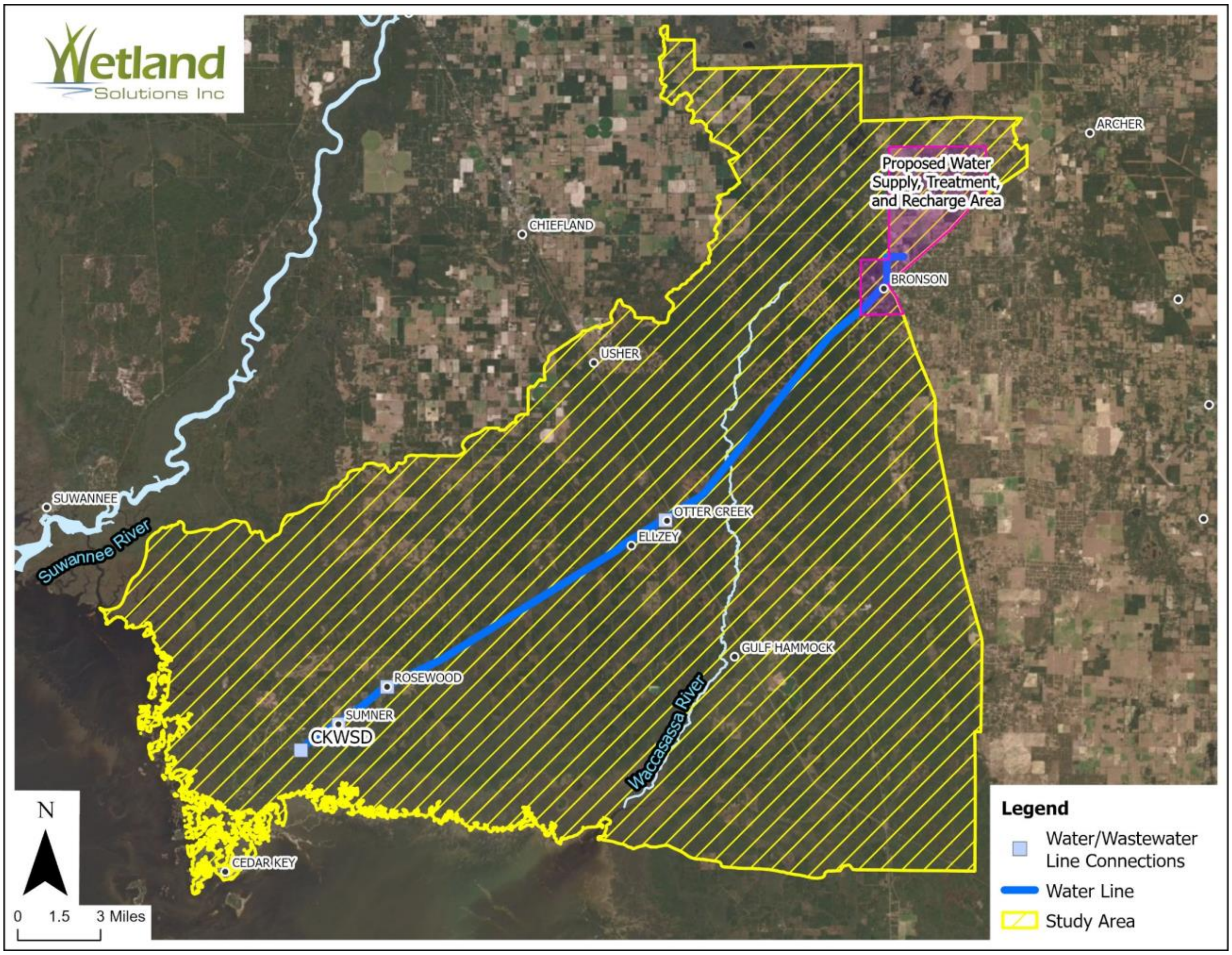

Figure 21. Regional Water Authority Pipeline to Bronson, Otter Creek, Rosewood and Sumner, and Cedar Key

4.3.4 Alternatives Evaluation

After consideration of the individual and cooperative paths forward, a qualitative alternatives evaluation was developed (Table 10). 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 for current facilities. The Regional 4 project offers similar benefits relative to source water quality but includes Bronson and has a significantly longer pipeline length and served population. Both the Regional 3 and 4 projects involve formation of a RWA to own, operate, and deliver water to the partner communities.

Table 10. 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 Evaluation of Current and Projected Wastewater Treatment and Disposal Needs for Cedar Key, Otter Creek, Bronson, and Unincorporated Levy County

In addition to evaluating water sources this study considered current and future wastewater treatment and needs for the communities that were a part of this study. This section presents existing wastewater treatment, disposal practices, and plant performance, as well as an inventory of septic systems for the portions of the study area that are not currently on centralized wastewater treatment.

5.1 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 in the project area served by OSTDSs.

5.1.1 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 22. Based on searches of the FDEP Oculus database for Levy County, there were an additional 53 facilities that had permits and had their location referenced as either Cedar Key, Bronson, or Unincorporated. Most of these facilities appear to be aquaculture processing facilities, based on facility name and a spot-check of available permit files. Upon reviewing a selection of these facilities, the process appears to involve the once-through pumping of water from the Gulf, through the facility, with discharge 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 that discharge to OSTDSs, specifically stores or condominiums, could be considered for connection to an existing or expanded WWTF.

All the facilities in the WAFR database are domestic facilities, this includes one domestic wastewater residuals application site and four domestic WWTFs, with the characteristics shown in Table 11. 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.

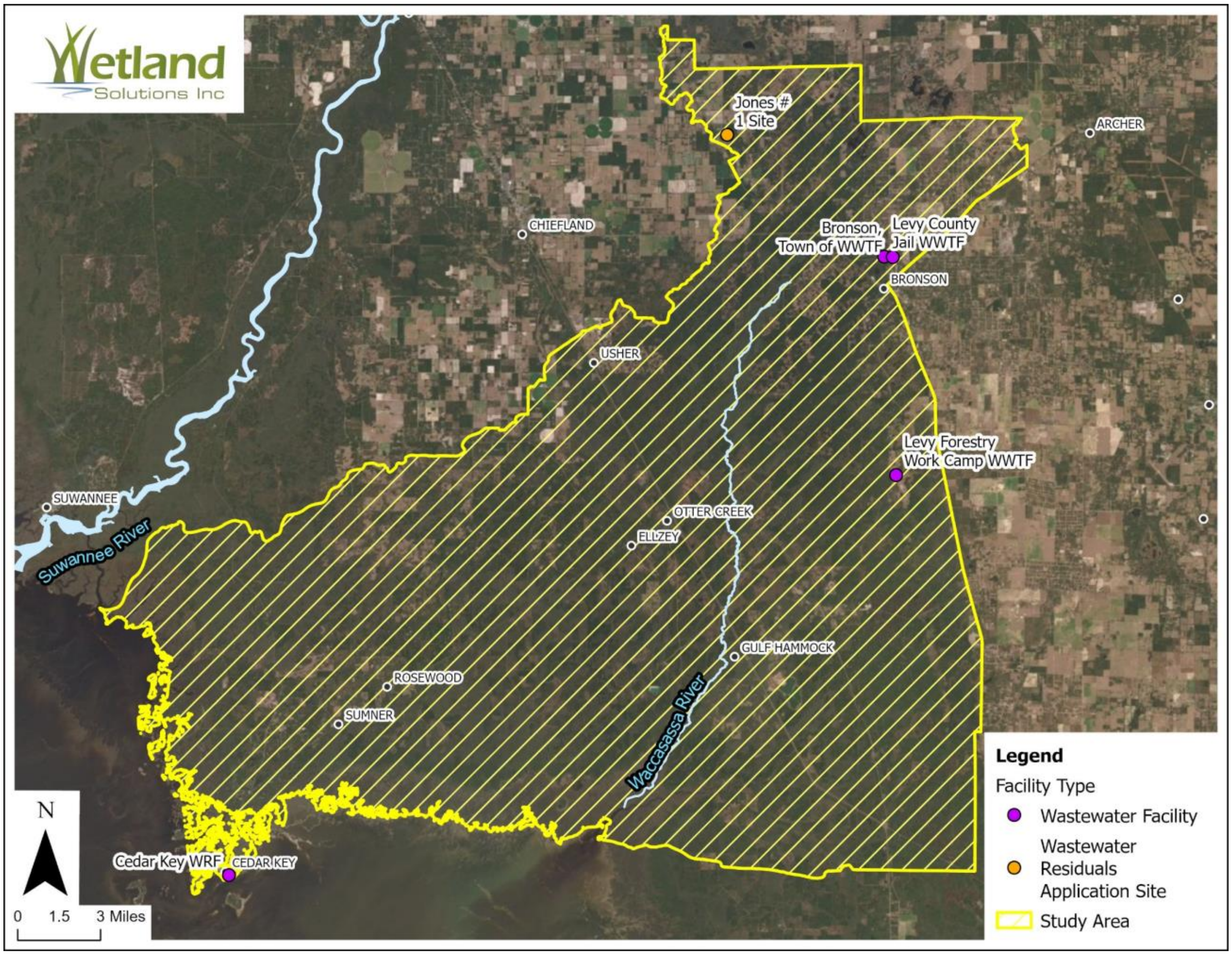

Figure 22. Permitted Wastewater Treatment Facilities in the Waccasassa Feasibility Study Area

Table 11. 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

5.1.1.1 Current Disposal Practices

Both municipal WWTFs rely on land application for disposal. The CKWSD 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 piping 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 disposal sites that are located on adjoining parcels. The first is slow-rate land application at an 8.2-acre sprayfield and the second consists of two rapid infiltration basins (RIBs) with a combined area of 0.849 acres.

5.1.2 Current Flow

The municipal WWTFs within the study area have permitted capacities of 0.083 and 0.18 MGD, for Bronson and Cedar Key, respectively. DMR data were obtained from the FDEP. Monthly average flows are presented in Figure 23 with average flows at these facilities ranging from 0.048 to 0.097 MGD (Table 12). 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.

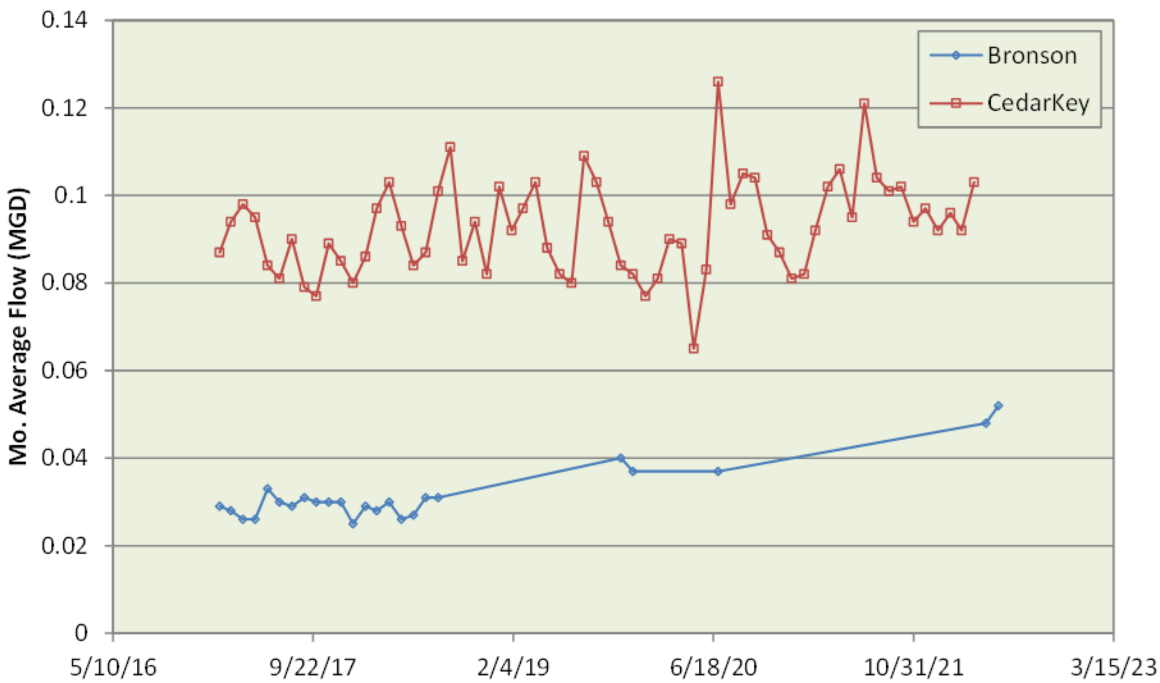

Figure 23. Bronson and Cedar Key Discharge Monitoring Data (2017 – 2022)

Table 12. 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

5.1.2.1 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 13. 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 13 are concentrations leaving the facility, not at the monitoring wells where concentrations are regulated. Finally, Bronson recently had a vendor change for their contracted wastewater operations and had limited DMRs available over the past two years. Time series data for Bronson (NO_X-N) and Cedar Key (TN and NO_X-N) are shown in Figure 24 and Figure 25, respectively.

Table 13. 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

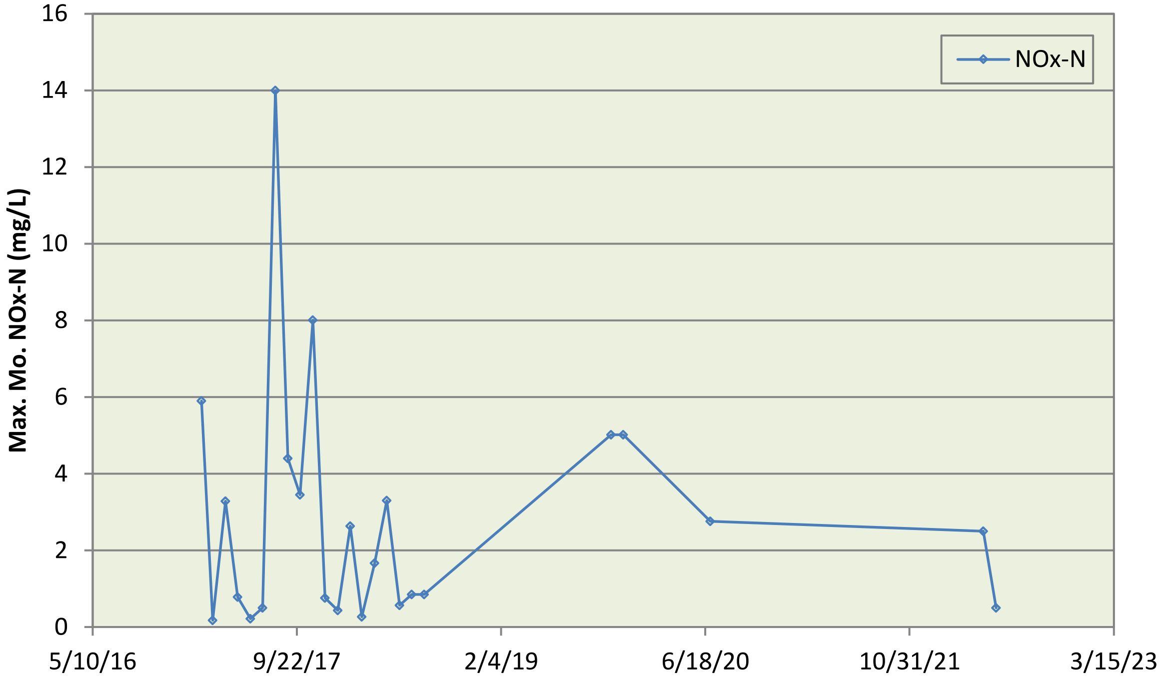

Figure 24. Bronson Discharge Monitoring Report Data (2017 - 2022)

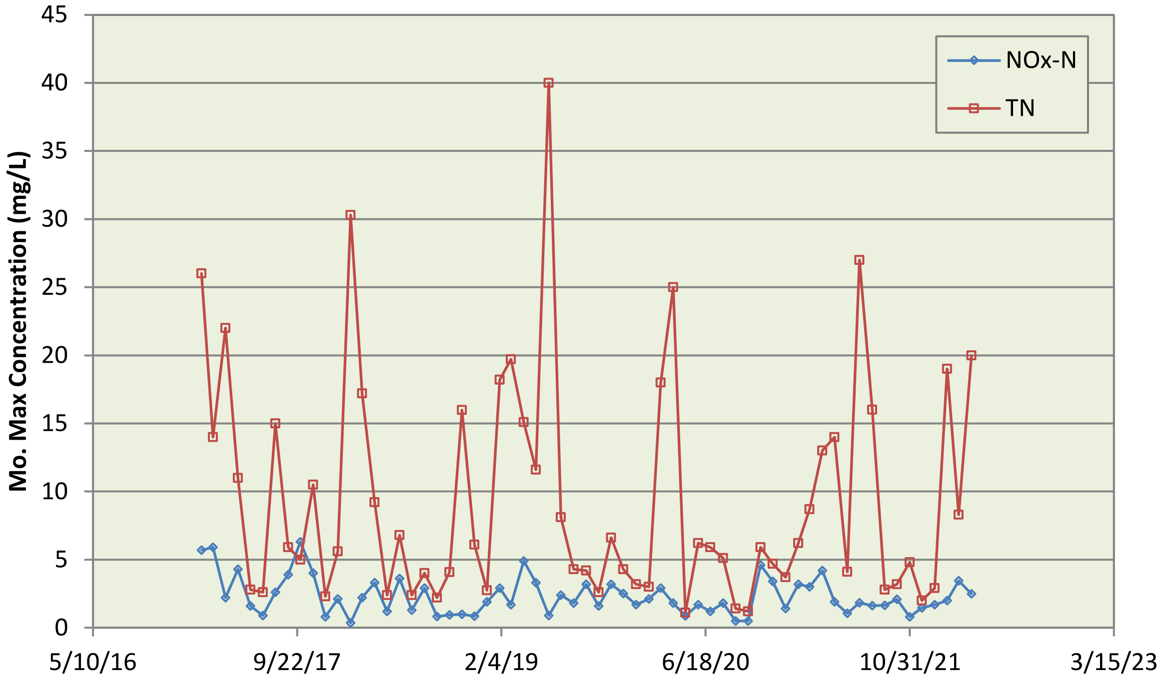

Figure 25. Cedar Key Discharge Monitoring Report Data (2017 - 2022)

5.1.2.2 Current Wastewater Facility Condition

Wastewater facility condition is evaluated as part of the 5-year permit renewal process. The purpose of this review is to identify current issues with the performance, operation, and maintenance of WWTFs and to identify 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.

5.1.2.2.1 Cedar Key Water Reclamation Facility

The Cedar Key WRF had an Operation and Maintenance Performance Report prepared 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 14.

Table 14. 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 for 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.

5.1.2.2.2 Bronson Wastewater Treatment Facility

The Bronson WWTF had an Operation and Maintenance Performance Report prepared 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 15.

Table 15. 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 single events for nitrate (October 2016, 60.09 mg/L) and fecal coliform (May 2017, 9,000/100 mL). Three-month average daily flows were below 50% for the facility, meaning that a Capacity Analysis Report was not required. Groundwater sampling found pH to be out of compliance, although effluent pH values were within limits, this was postulated to be the result of natural soil conditions.

5.1.3 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 map of parcels that were expected to have both buildings and/or residential units and OSTDSs. 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 current use.

This process identified 2,437 parcels within the study area as having OSTDSs, with 581 classified as known septic, 1,844 classified as likely septic, and 12 identified as somewhat likely septic as shown in Figure 26. Of the identified parcels that were 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 converted all units to central sewer and abandoned existing septic systems and the two reported systems are not actually present based on conversations with the City. The Town of Bronson has 220 wastewater accounts that are on central sewer with the remainder served by OSTDSs.

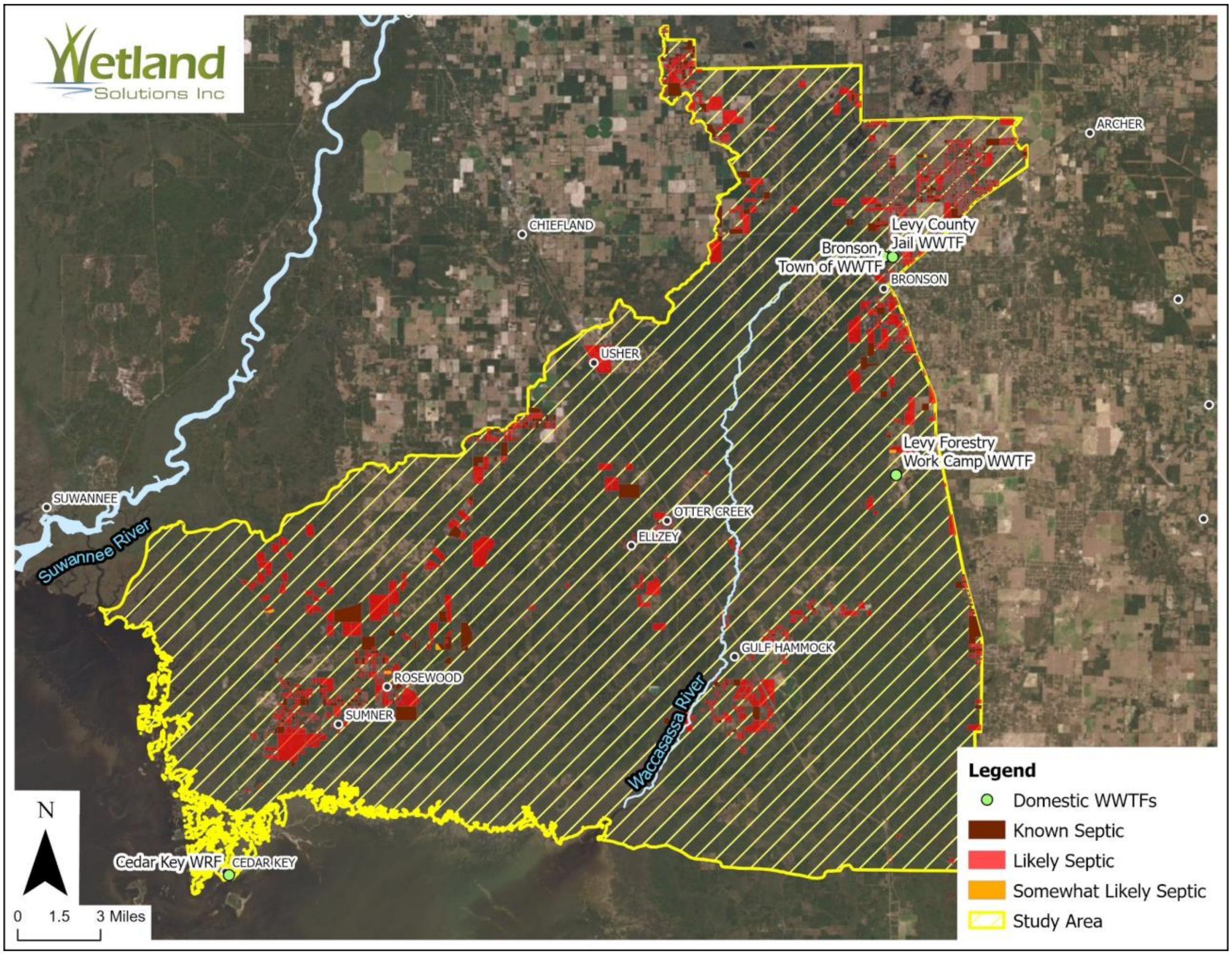

Figure 26. Septic Systems in the Waccasassa Feasibility Study Area

5.1.4 Population Growth Projections

Population growth projections were presented in Section 3. 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. The population reported by the SRWMD is approximately three times the population reported on a recent Cedar Key MOR for their water system, 734 people.

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 for Bronson. This approach resulted in 2045 population estimates of 1,310 and 1,539 for the medium- and high-growth scenarios, respectively.

5.1.5 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 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.

5.1.5.1 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 100 gallons per person per day and an estimate of 2.5 people per OSTDS. This equates to 250 gallons per OSTDS per day. Expected flow increases associated with conversion of the OSTDSs within PSAs would be expected to generate an additional approximately 0.16 MGD of flow.

In addition to existing OSTDSs within the PSAs, there are also parcels currently relying on OSTDSs outside the PSAs. The greatest concentrations of these parcels within the study area are in the Rosewood and Sumner communities 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 0.12 MGD for the OSTDSs within 1.5 miles of SR24. 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 0.09 MGD. A portion of these OSTDSs are on larger lots (>5 acres) and may not be cost-effective to convert to sewer.

Total wastewater flows, including existing flows and conversion of all the described septic systems to sewer, results in estimated flows of approximately 0.5 MGD. This flow estimate does not include the higher wastewater flows that Cedar Key treats on weekends when a large influx of non-residents visit the city.

5.1.5.2 Wastewater from New Development

A second source of new wastewater flows is new construction of residential, 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, TOC, 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 6 Alternatives Development for Wastewater Reuse and Recharge

This study considered 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 section includes a discussion of regulations, pre-treatment, wastewater treatment alternatives, and wastewater disposal alternatives.

6.1 Regulatory 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 specific requirements that apply to wastewater facilities and to domestic 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.

6.1.1 Wastewater Facility Treatment Requirements

Wastewater facilities developed in the study area must meet variable treatment and effluent quality standards depending on their location. A portion of the study area lies within the Suwannee River BMAP area, Figure 27. Table 16 summarizes TN discharge standards for wastewater facilities in the BMAP area based on their capacity and disposal method.

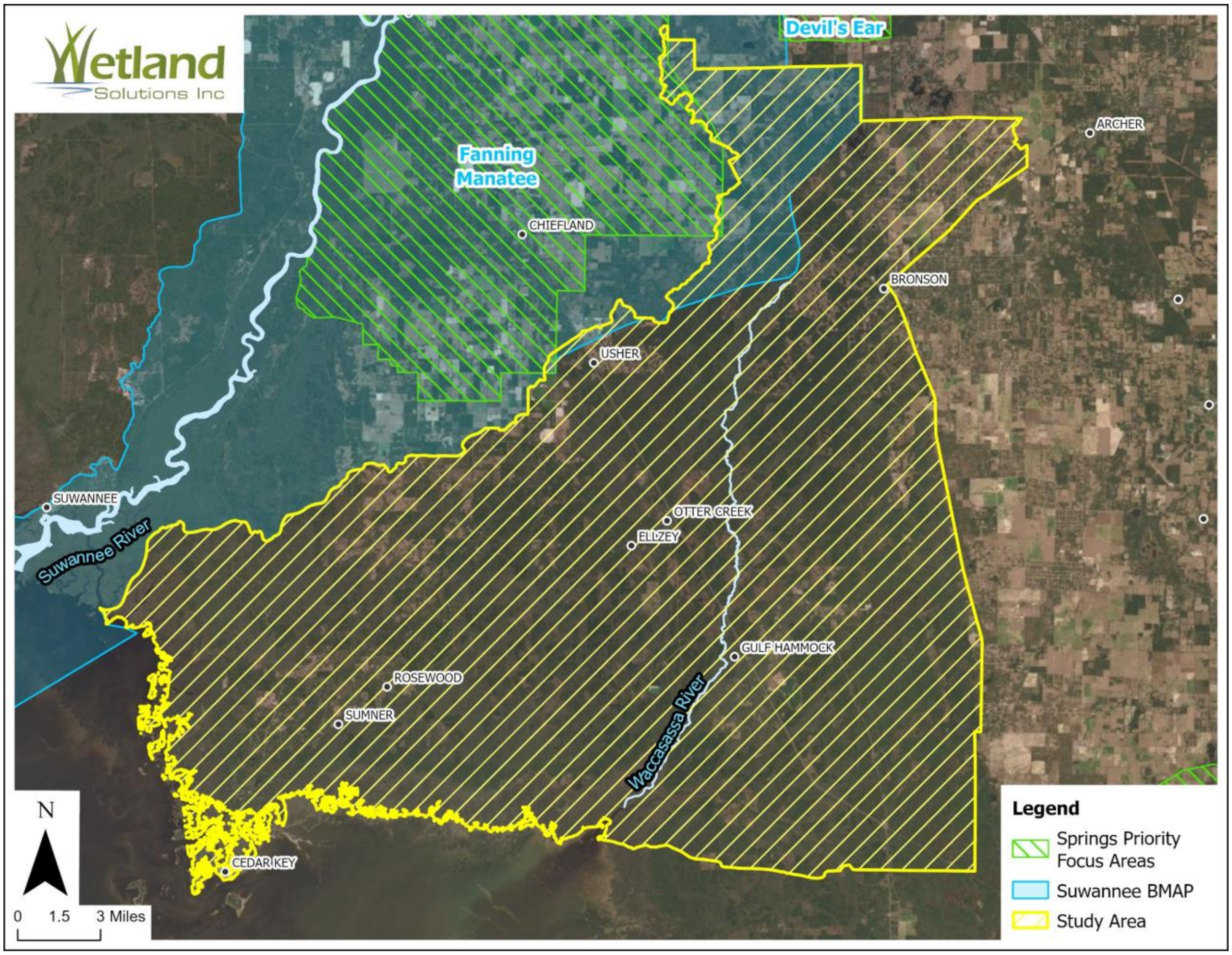

Figure 27. Suwannee River Basin Management Action Plan and Priority Focus Areas

Table 16. Land Application Requirements Within the Basin Management Action Plan Area

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

6.1.2 On-Site 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 to connect to central sewer. Allowable alternatives to conventional OSTDSs are:

- 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).
- Conventional septic with demonstration that sewer will be available within 5 years.

6.2 Treatment Considerations

In addition to regulatory considerations there are treatment related considerations associated with wastewater facility types and capacities and the level of pre-treatment that may be included in a regional project.

6.2.1 Facility Staffing

Wastewater facility staffing is based on permitted treatment capacity, treatment process configuration, and whether water is supplied to reuse customers. As plant complexity or treatment capacity increases, the level of staffing and required licensure or "Class" of operators also increases. Operator classes range from A to D with certifications that reflect on-site hours of experience and training. The Class C operator requires a year of experience and passing the Class C exam, whereas the Class A operator requires 5-years of experience and passing the Class A exam. Florida's operators are accredited through the FDEP wastewater operator licensure program. A facility being constructed to serve a regional area will be larger and require increased staffing compared to the current, smaller facilities. However, in some alternatives staffing is streamlined at one facility by comparison to the operation of multiple facilities. Staffing requirements are summarized for various plant types and flows in Table 17.

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

Table 17. 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

6.2.2 Wastewater Pre-Treatment

Regional alternatives include conveyance of wastewater over long distances to reach wastewater 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 anaerobic conditions causing the formation of hydrogen sulfide gas which corrodes wastewater transmission systems and equipment, increases maintenance costs, and contributes to odors. Several pre-treatment alternatives were considered as part of this study. All scenarios for regional treatment include collection and centralization. Following centralization, the raw sewage could either receive no treatment, screening and grit removal, partial treatment, or full treatment. Each pre-treatment alternative has implications for conveyance, costs, and subsequent regional treatment.

6.2.2.1 No Pre-Treatment

In this scenario, wastewater would be collected and locally regionalized. Following collection, sewage is pumped from a master lift station into the pressurized transmission system for conveyance to a wastewater facility. This alternative has several disadvantages including the potential for water to turn septic and cause odors and corrosion issues, accumulation of grit and larger materials in the transmission system, and increased equipment and pumping costs. This alternative requires chemical addition or aeration to reduce septic conditions and potentially additional booster pumping because of increased head losses. The need for additional pumping and odor control will increase capital and O&M costs.

6.2.2.2 Screening and Grit Removal

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

6.2.2.3 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 go through 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 providing 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 disadvantage of this alternative is that it maintains a treatment facility in Cedar Key that is vulnerable to weather and climate-driven impacts.

6.2.2.4 Full Treatment

The fourth alternative is full treatment prior to transmission. This alternative is an extension of partial treatment and provides the best quality water for transmission. Although expected to reduce the cost of transmission and maintenance, 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 wastewater treatment plants in Sumner/Rosewood and Otter Creek. O&M costs are expected to be higher for this alternative because of multiple facilities.

6.2.2.5 Hybrid Options

Finally, there are hybrid options that could be implemented at potentially lower capital and O&M costs. One such option includes Cedar Key maintaining some level of treatment at the existing Cedar Key WRF with treated water conveyed through the transmission line. Downstream inputs could then receive limited or no treatment. This alternative leverages existing equipment, and given Cedar Key's flows, provides substantial dilution to downstream additions of lower quality water. This alternative reduces the need for chemical addition or aeration along the transmission line and reduces 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 provides treatment before water is conveyed to a regional facility. This alternative has the benefit of removing treatment features from Cedar Key while reducing the need for aeration and chemical addition. However, this alternative still requires the construction and O&M of a new wastewater treatment facility.

6.3 *Wastewater Treatment Alternatives*

This study considered both the status quo (independent wastewater treatment facilities) and variable degrees of regionalization. Some of these alternatives, while technically feasible, are not expected to be regulatorily feasible, cost-effective, or practical. These alternatives are discussed in the following sections.

6.3.1 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 OSTDSs. This section discusses options relative to provision of wastewater amongst the individual communities. Current domestic wastewater facilities and OSTDSs inventoried by the FDOH are shown in Figure 28.

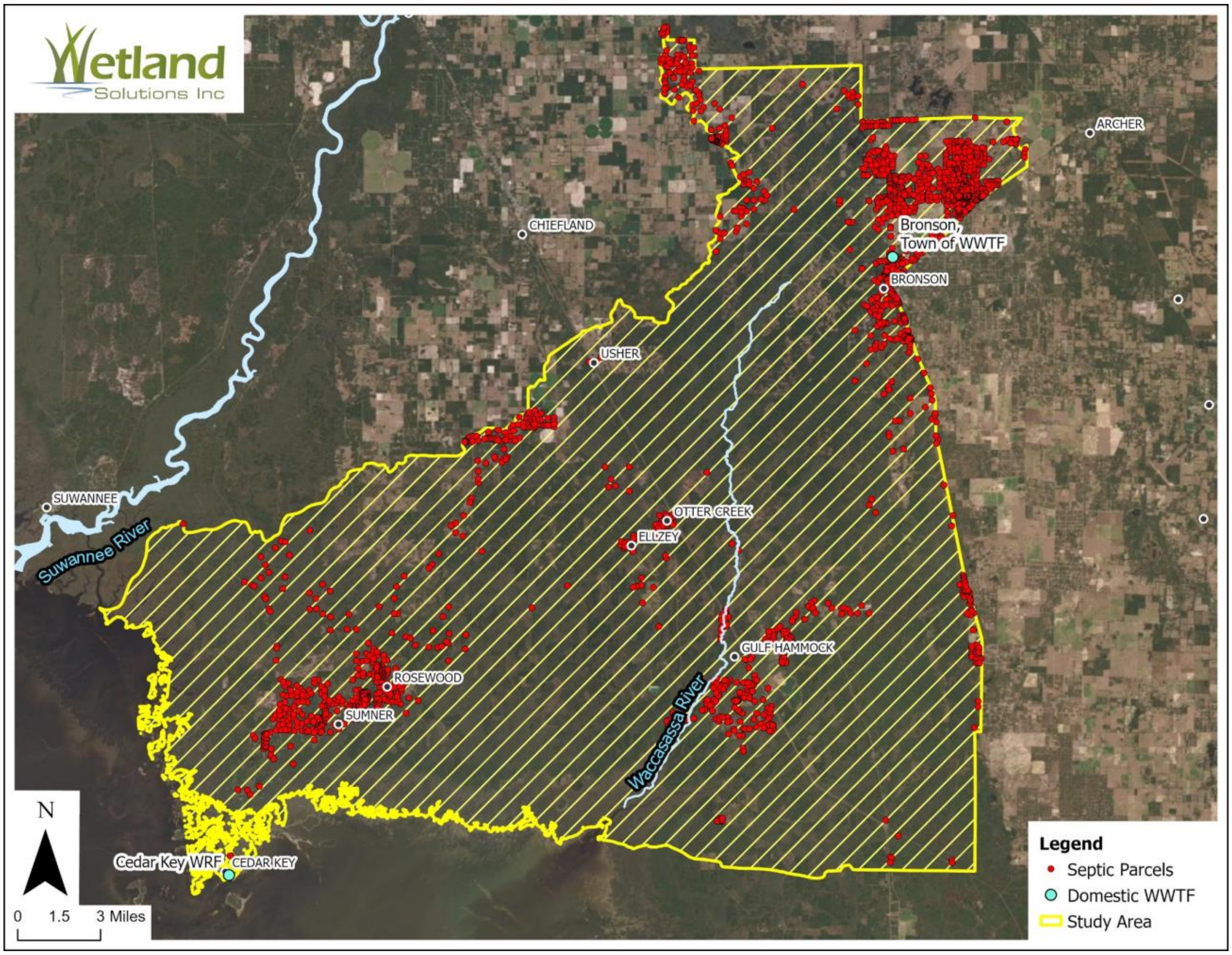

Figure 28. Domestic Wastewater Facilities and Septic Systems

6.3.1.1 Cedar Key

In the City of Cedar Key all parcels are served by the wastewater treatment facility. FDOH data suggests that two parcels have known septic systems, but City staff indicated that these two parcels are served by the WWTF and do not have OSTDSs. Cedar Key treats and discharges water in substantial compliance with their permit requirements. The existing wastewater facility was constructed in 1993 and is 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 significant 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 primarily related 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 that results in a wastewater spill that impacts the City's aquaculture industry. Finally, current disposal practices result in the discharge of treated effluent to tide.

6.3.1.2 Town of Bronson

The Town of Bronson provides wastewater service to a portion of the parcels within the PSA. Based on FDOH data, 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 with wastewater treatment and compliance reporting improving. Despite operational challenges, the facility is in good repair with limited maintenance needs per the last Operation and Maintenance Performance Report prepared in 2018 for the wastewater facility permit renewal.

The Town of Bronson could continue to provide reliable wastewater treatment to the community while expanding service to parcels within the PSA that are on OSTDSs. 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. In this scenario, the plant would be required to improve treatment processes to meet nutrient limits.

6.3.1.3 Otter Creek and Unincorporated Levy County

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

The parcels currently on OSTDSs and new construction could continue to be served by OSTDSs in these areas. A second option is development of centralized wastewater treatment. This could include separate facilities for Otter Creek, University Oaks, and unincorporated Levy County. Disadvantages of continued treatment and disposal in OSTDSs includes increased nutrient loading to the Floridan Aquifer; potential contamination of shallow private 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 hinders commercial and/or industrial development. Benefits of a wastewater treatment facility include improved groundwater quality, increased economic and development opportunities, and the need for licensed operators in the community to staff and maintain the wastewater treatment facility and collection system.

6.3.2 Regional Wastewater Treatment

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

6.3.2.1 Regionalization to an Existing Facility

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

Unlike Cedar Key, Bronson does not have specific issues with expansion of wastewater treatment or disposal. There is the potential that additional wastewater customers could be connected to the Bronson WWTF to achieve nutrient removal and recharge of treated water to the Floridan Aquifer. For regionalization to the Bronson WWTF, alternatives include redirecting flows from the existing Cedar Key WRF and the conversion of septic-to-sewer for parcels on OSTDSs within the existing Bronson PSA, within the University Oaks PSA, within the Otter Creek PSA, and those parcels in unincorporated Levy County within a reasonable distance of a wastewater collection corridor. Redirecting Cedar Key wastewater flows allows the Cedar Key WRF to be converted to a master lift station that would pump untreated wastewater along SR24 to Bronson for treatment. This wastewater transmission line could also collect additional wastewater flows along its length and convey these flows to Bronson for treatment and disposal. Directing flows in excess of 0.04 MGD to the Bronson WWTF would result in the need to expand the facility.

This study considered several clusters of potential septic-to-sewer conversions. These clusters 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, parcels between 1-mile and 1.5-miles of SR24, and parcels north of Bronson. Wastewater flows were estimated based on an assumed 100 gallons per person per day and 2.5 people per OSTDS. This equates to 250 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 18 with locations shown in Figure 29 and Figure 30.

Table 18. Septic Parcels in Identified Area

Potential Septic-to-Sewer Areas	Number	Est. Flow (MGD)
Town of Bronson PSA	182	0.046
University Oaks PSA	356	0.089
Town of Otter Creek PSA	79	0.020
Bronson Area (excl. PSA)	502	0.126
SR24 1-mile Buffer	353	0.088
SR24 1.5-mile Buffer (excl 1-mile)	77	0.019
Total	**1,549**	**0.388**

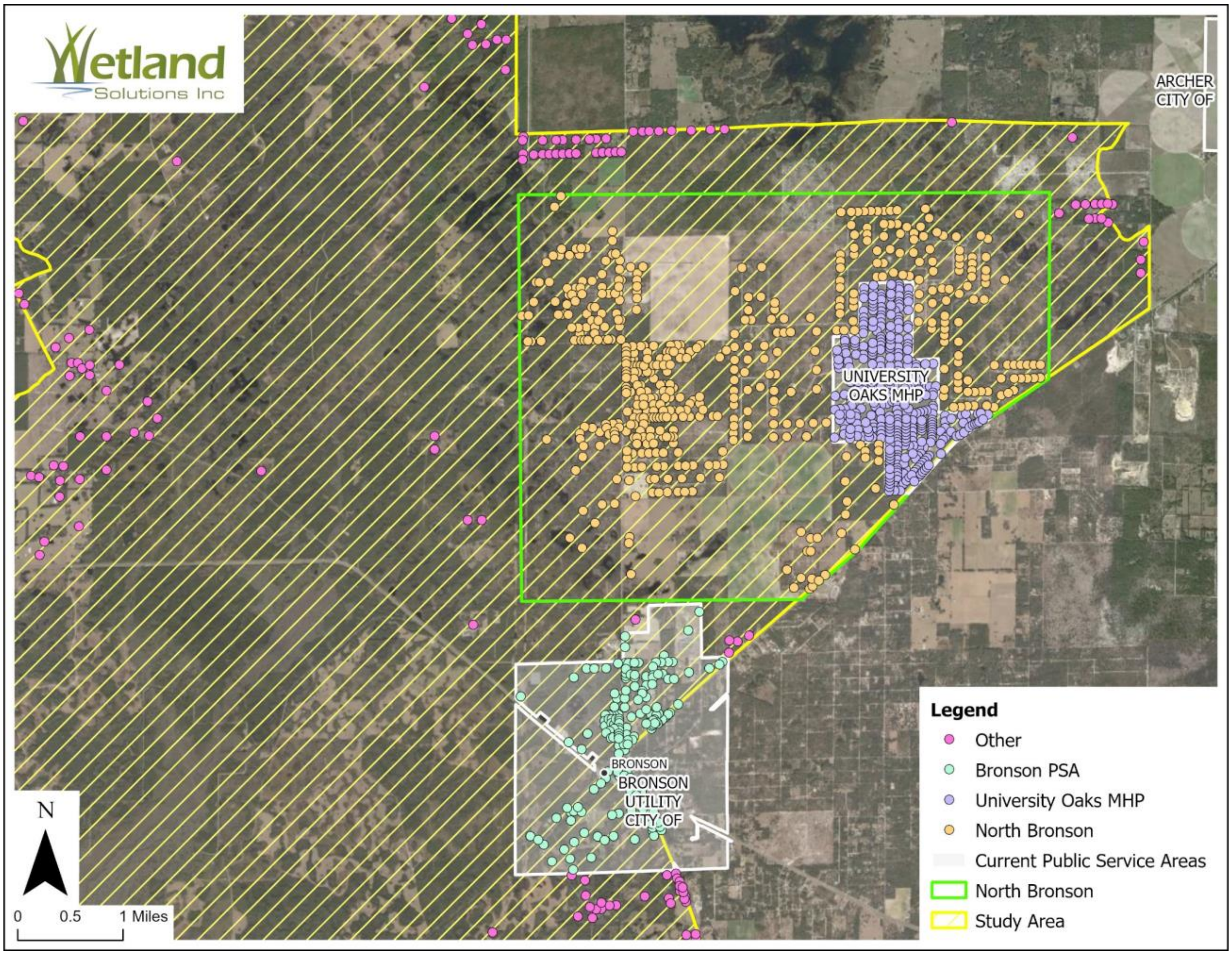

Figure 29. Septic-to-Sewer Parcels Near Bronson

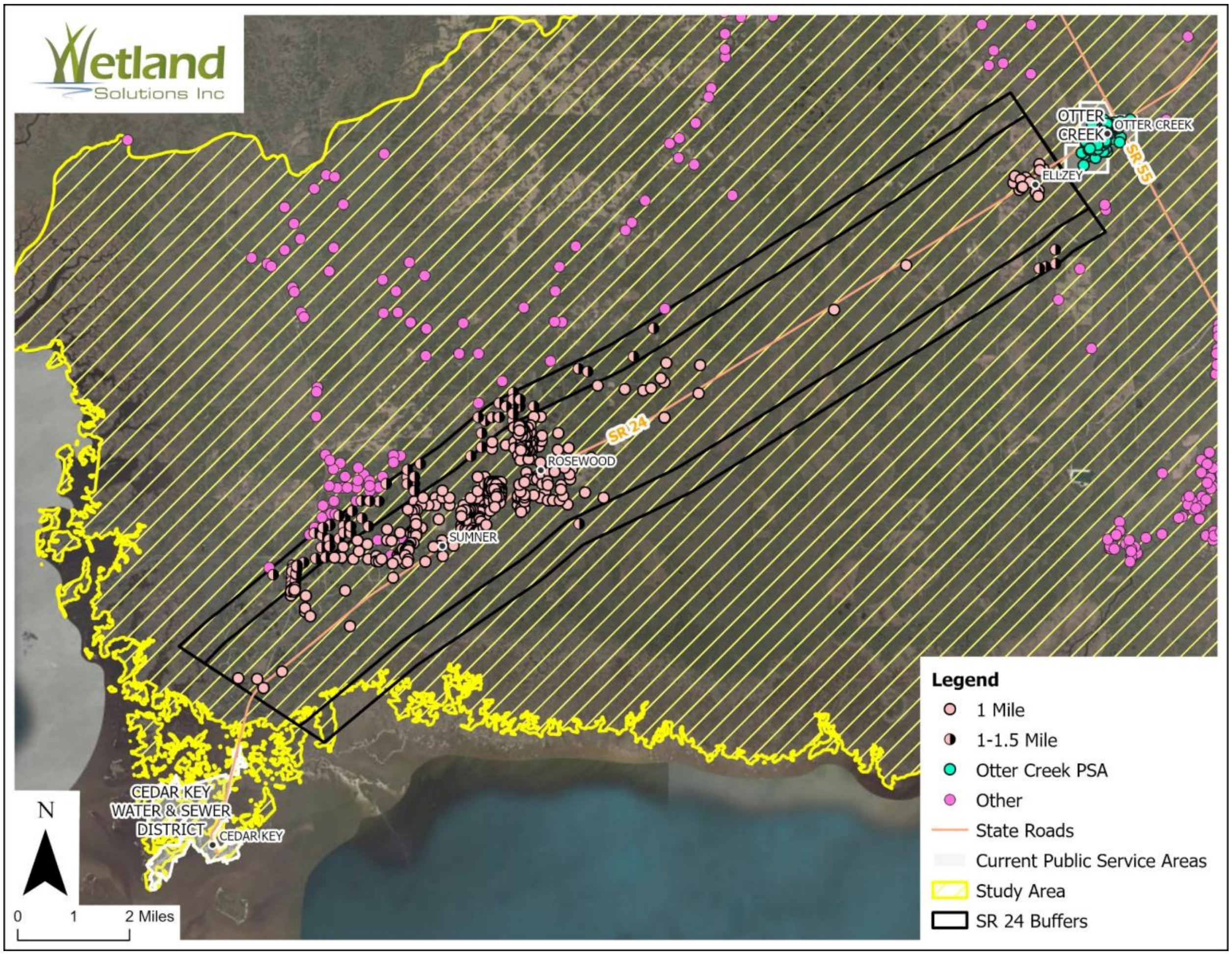

Figure 30. Septic-to-Sewer Parcels Near Otter Creek and Along State Road 24

6.3.2.2 Regionalization to a New Facility

A second alternative would have wastewater flows from Cedar Key, Otter Creek, and unincorporated areas of Levy County along SR24 directed to a new regional wastewater facility. Wastewater flows from Bronson could also 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 regional scenario: developing two new regional facilities or construction of a single, new regional facility to serve all customers.

6.3.2.2.1 Two Regional Facilities

This scenario includes 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 expected to have suitable infiltration capacity for effluent recharge. The second regional facility would be either Bronson's existing WWTF or a new facility in the same area. If Bronson's existing collection system was expanded to receive septic-to-sewer conversion from unserved parcels within the Bronson PSA, the University Oaks PSA, and unserved areas north of the Bronson PSA it would require expansion. In this scenario, it is expected that the first regional facility (Cedar Key, Otter Creek, Rosewood, and Sumner) would be developed with a capacity of approximately 0.45 MGD to treat and dispose of an estimated 0.22 MGD of flow. Bronson's WWTF would be expanded, or a new facility constructed with a capacity of approximately 0.6 MGD to treat an estimated 0.29 MGD of flow. The approximate locations of these facilities and the anticipated pipeline route are shown in Figure 31.

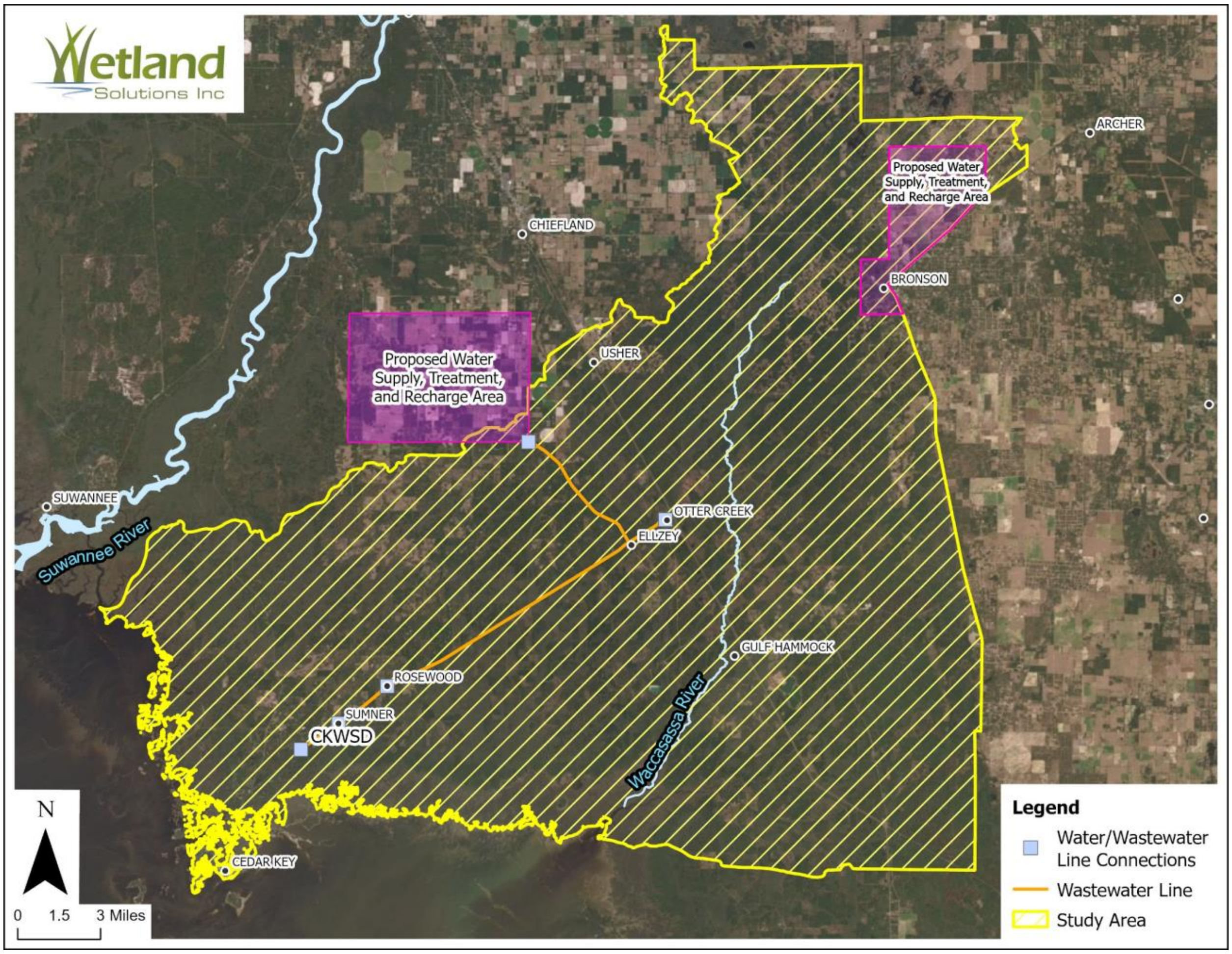

Figure 31. Two Regional Wastewater Facilities and Force Main Routes

6.3.2.2.2 Single Regional Facility

The second regional alternative routes all wastewater to a single regional wastewater facility. This alternative includes a new wastewater facility in the vicinity of Bronson where wastewater would be treated and either recharged or reused. This alternative includes a 1.0 MGD facility to treat and dispose of approximately 0.51 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 Springs and in a high recharge area, this study recommends, although requirements are not currently in place, that this facility be designed to achieve 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, grant funding for an AWT facility is expected to be considered more favorably than a facility producing a secondary effluent, and initial construction to achieve AWT will be more cost-effective than an upgrade in the future. The general location of this facility and anticipated pipeline route is shown in Figure 32.

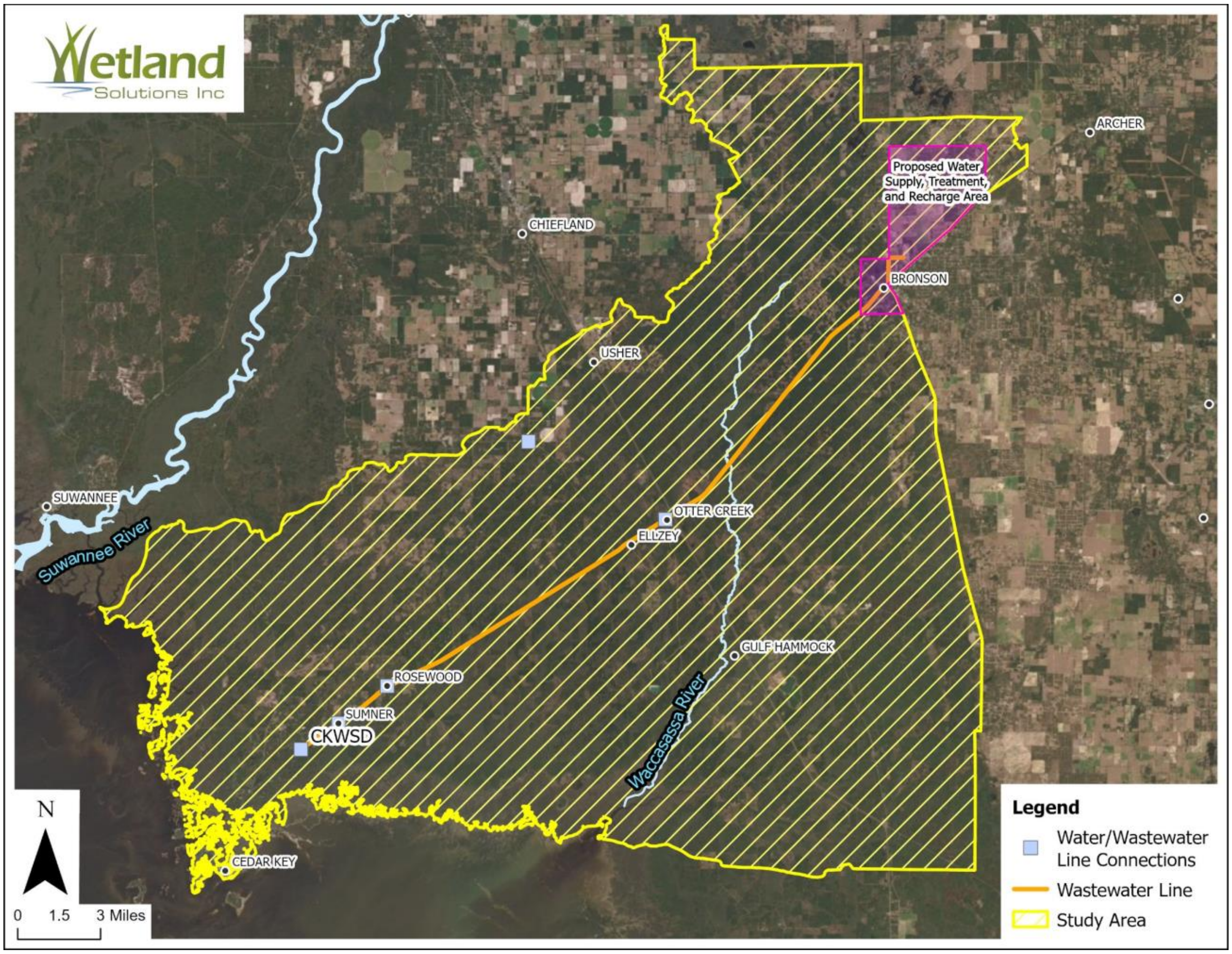

Figure 32. Single Regional Wastewater Facility and Force Main Routes

6.4 Wastewater Effluent Management Alternatives

Following wastewater treatment, the effluent generated will 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 water loss.

6.4.1 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.

6.4.1.1 Potential Reuse Locations

To evaluate potential reuse locations, WUPs from the SRWMD were reviewed. The information provided by the SRWMD includes three classifications of wells (active, inactive, and future) as shown in Figure 33. A total of 56 active WUPs are located within the study area. These permits are generally for either livestock watering or irrigation.

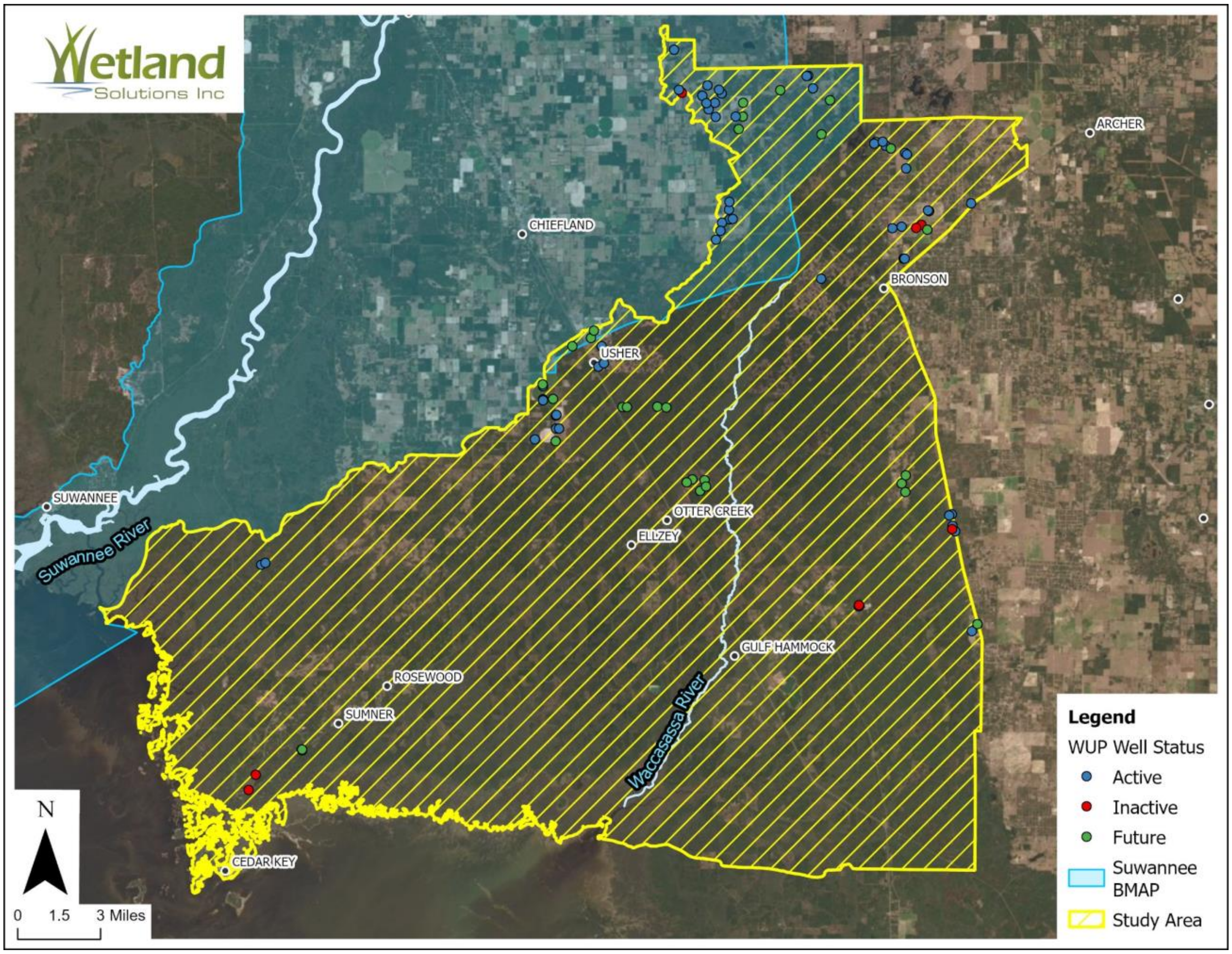

Figure 33. Water Use Permits in the Study Area

Of the wells included in the WUP database, a portion also 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 34, with the same information in the vicinity of a regional wastewater facility near Bronson shown in Figure 35.

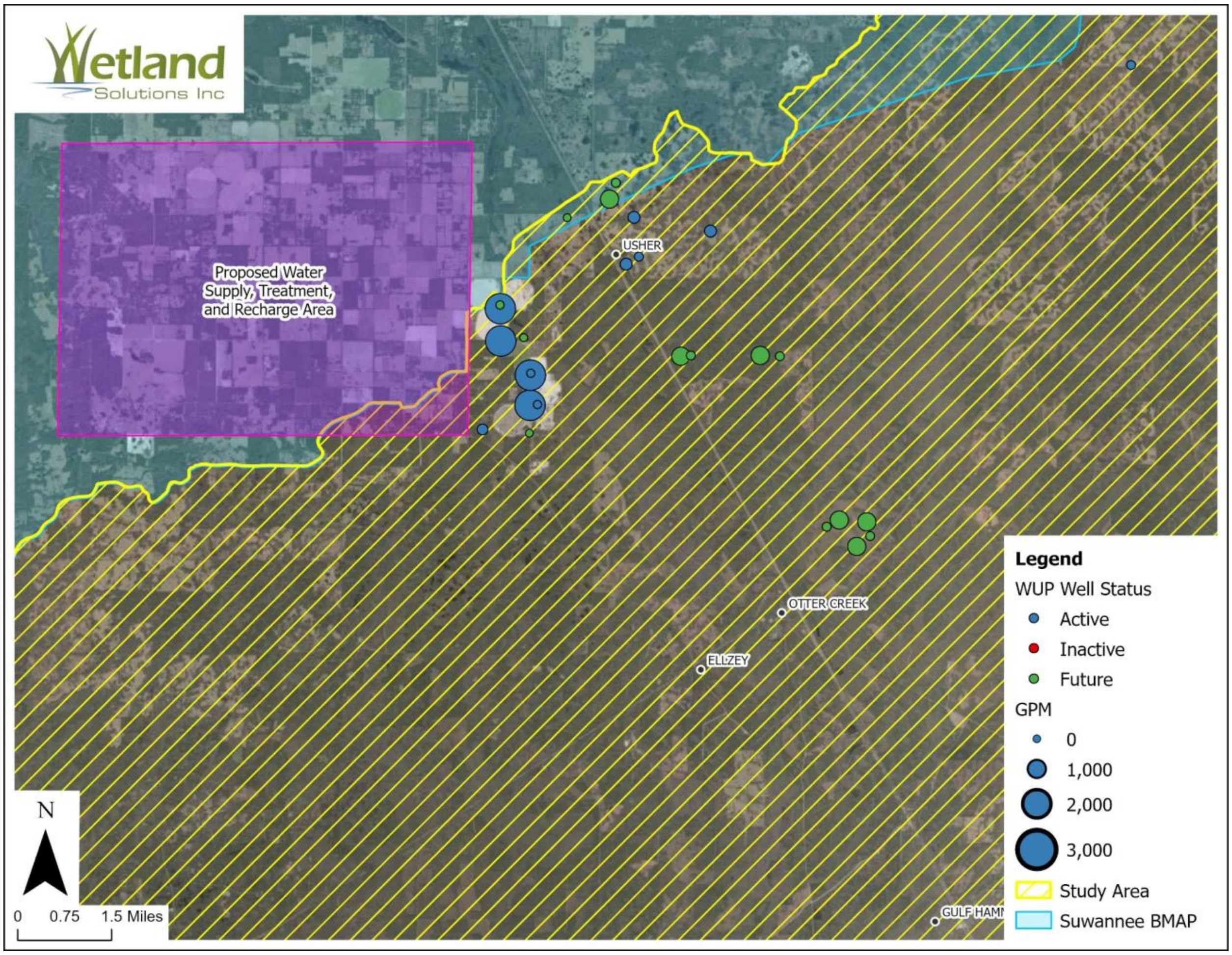

Figure 34. Water Use Permits Near North Regional Wastewater Facility

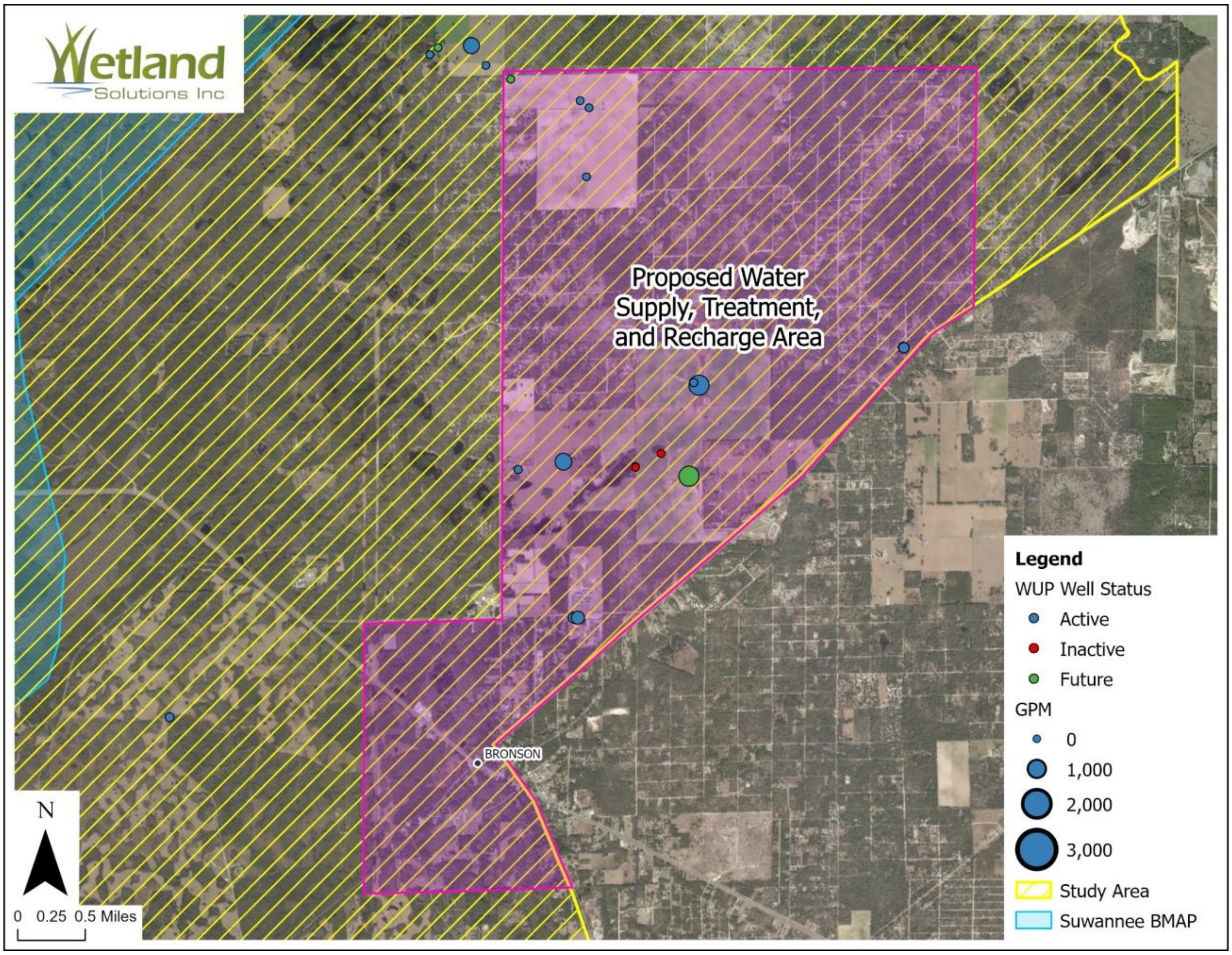

Figure 35. Water Use Permits Near Bronson Regional Wastewater Facility

In both locations, there may be potential reclaimed users. Evaluation of reuse projects would involve estimating actual water use for potential 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.

6.4.1.2 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, 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.

6.4.1.3 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).

6.4.2 Wastewater Recharge Alternatives

A second alternative for wastewater disposal is recharge to the Floridan Aquifer. This disposal method can provide both the natural environment and current/future 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 TOC and total organic halides (TOX).

6.4.2.1 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 on 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 wetland cells are vegetated and maintain continuous inundation 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 31 and Figure 32.

6.4.2.2 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.

6.4.3 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.

6.4.3.1 Reuse Benefits

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 three weeks of May harvesting and planting and then that June is particularly rainy. Effectively the irrigation needs and ability to store water during this seven-week period may be near zero and the wastewater facility has to manage and provide alternate disposal for 12.25 million gallons of water. For this reason, reuse typically requires complete disposal redundancy or 3-days of storage to accommodate periods when the reuse customer may be unwilling or unable to accept water.

6.4.3.2 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 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 7 Framework for Regional Cooperation and Project Funding

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.

7.1.1 Regional Authority

The drivers for forming 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 used to create 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., as excerpted below.

> *(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, of not more than 0.5 mill, with an affirmative vote of the electors residing within the County or municipality. Regional authorities can develop, store, and transport water; and provide, sell, and deliver water for county or municipal uses and purposes. Services are provided upon terms, conditions, and rates that apportion an equitable share of capital costs and operating expenses of the authority's work to the purchaser. Other allowable services include the collection, treatment, and recovery of wastewater.

7.1.2 Special Districts

In addition to the establishment of a regional authority, in adherence to the rules and polices outlined under 373.713, F.S., there is another common legal mechanism called the Special District. Not all regional authorities are also Special Districts. Special Districts are authorized to serve a special purpose, within a defined territory, such as water and wastewater services under Title XIII Planning and Development of 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 a regional authority becoming a Special District, including streamlining governance and delivery of and simplifying complex local agreements. Challenges aside from the legislative and legal process include extensive reporting and auditing, compliance requirements, as well as administrative and board protocols. Table 19 identifies a subset of regional utility authorities that have been established in Florida.

Table 19. Florida Regional Utility Authorities

Name of Authority	Service	Members	Established & Governance
Peace River Manasota Regional Water Supply Authority	Potable Water	Charlotte, DeSoto, Manatee, and Sarasota Counties	1991, Independent Special District under Section 373.1962, F.S. and an interlocal agreement
Big Bend Water Authority	Potable Water, Wastewater, Reclaimed Water	Dixie and Taylor Counties	2007, Independent Special District under Section 373.1962, F.S. and an interlocal agreement
Nature Coast Regional Water Authority	Potable Water, Wastewater, Reclaimed Water	Dixie and Gilchrist Counties, and 3 municipal governments	2009, Independent Special District under Section 373.1962, F.S. and by interlocal agreement, amended in 2012
Withlacoochee Regional Water Supply Authority	Potable Water	Citrus, Hernando, Marion, and Sumter Counties, and 13 municipal governments	1977, Independent Special District under Section 373.1962, F.S. and by interlocal agreement, revised in 2014
Tampa Bay Water	Potable Water	Hillsborough, Pasco, and Pinellas Counties and 3 municipal governments	1998, non-profit Special District. Formed through contracts & legislation to change the West Coast Regional Water Supply Authority.
Polk Regional Water Cooperative	Alternative Water Supply	Polk County and 15 municipal governments	2017, Independent Special District under Section 373.1962, F.S. and an interlocal agreement
Clay County Utility Authority	Potable Water, Wastewater, Reclaimed Water	Clay County	1994, Independent Special District under Section 373.1962, F.S.

7.1.2.1 Local Regional Authorities

Two local regional authorities that are also Special Districts are in operation in the vicinity of the study area; the Nature Coast Regional Water Authority (NCRWA) and the Big Bend Water Authority (BBWA). The NCRWA includes the member governments of Dixie County, Gilchrist County, the Town of Bell, the City of Fanning Springs, and the City of Trenton. The NCRWA was formed partially to allow for provision of water from Fanning Springs to Old Town to address arsenic contamination in Old Town's water supply. The original interlocal agreement forming the NCRWA was adopted in June 2009 and was amended and replaced in 2012. The agreement allows for members to individually own infrastructure while the NCRWA can also own and operate water and wastewater facilities. The NCRWA can provide water and wastewater services in unincorporated areas of Dixie and Gilchrist Counties, as well as in new development areas of Bell, Fanning Springs, and Trenton. The agreement also allows Fanning Springs and Trenton to continue to provide water, wastewater, and reclaimed water services within their respective PSAs. The NCRWA also ensures that the customers of facilities owned by the Authority are provided high-quality, cost-effective service with appropriate future expansion. The NCRWA has the obligation to supply water and wastewater service within their Service Area (Figure 36) if deemed cost feasible. As part of the NCRWA, each member government is encouraged, but not required to contribute $5,000 per year to defray operational expenses associated with the NCRWA. The NCRWA is also required to ensure that rates, fees, and other charges are identical between the residents of the communities. The NCRWA is allowed to own property, incur debt, levy special assessments, enter into agreements, contract for services, prepare and publicize water conservation and reuse plans, collect rates and fees, require connection within the Service Area, accept grants and loans, maintain an office, and sue and be sued.

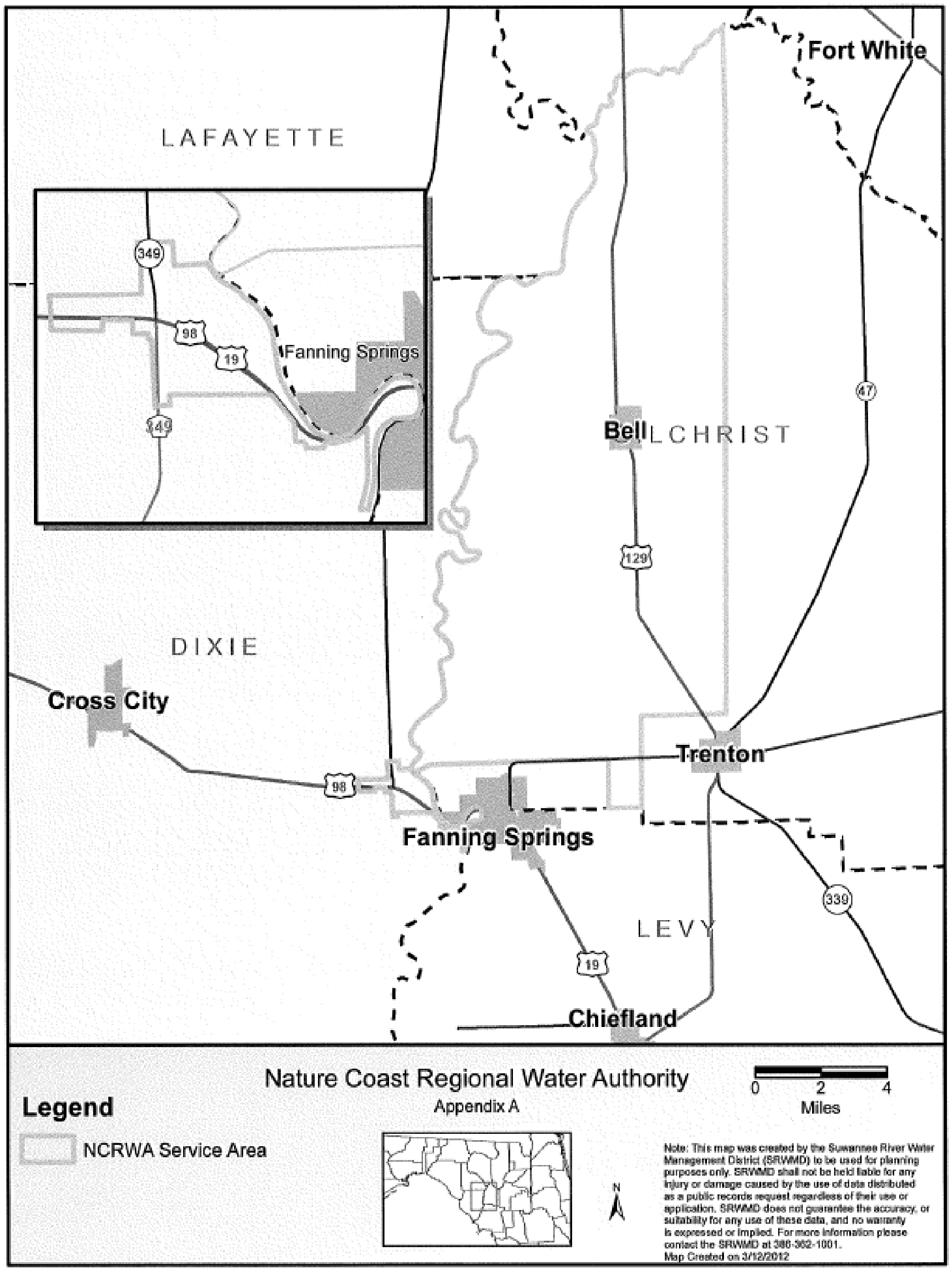

Figure 36. Nature Coast Regional Water Authority Service Area

The BBWA was formed in 2007 between Dixie and Taylor Counties. As with the NCRWA, the BBWA allows for provision of water and wastewater services within a defined Service Area. The specific areas served by the BBWA includes Steinhatchee in Taylor County and Jena and Rocky Creek in Dixie County. The BBWA has the exclusive authority and obligation to provide services within the Service Area shown in Figure 37. As part of the interlocal agreement, the BBWA transferred the Steinhatchee Water Association's Facilities and debt to the Authority. The BBWA is also required to ensure that rates, fees, and other charges are identical between residents of each county. As with the NCRWA the BBWA is allowed to own property, incur debt, levy special assessments, enter into agreements, contract for services, prepare and publicize water conservation and reuse plans, collect rates and fees, require connection within the Service Area, accept grants and loans, maintain an office, and sue and be sued.

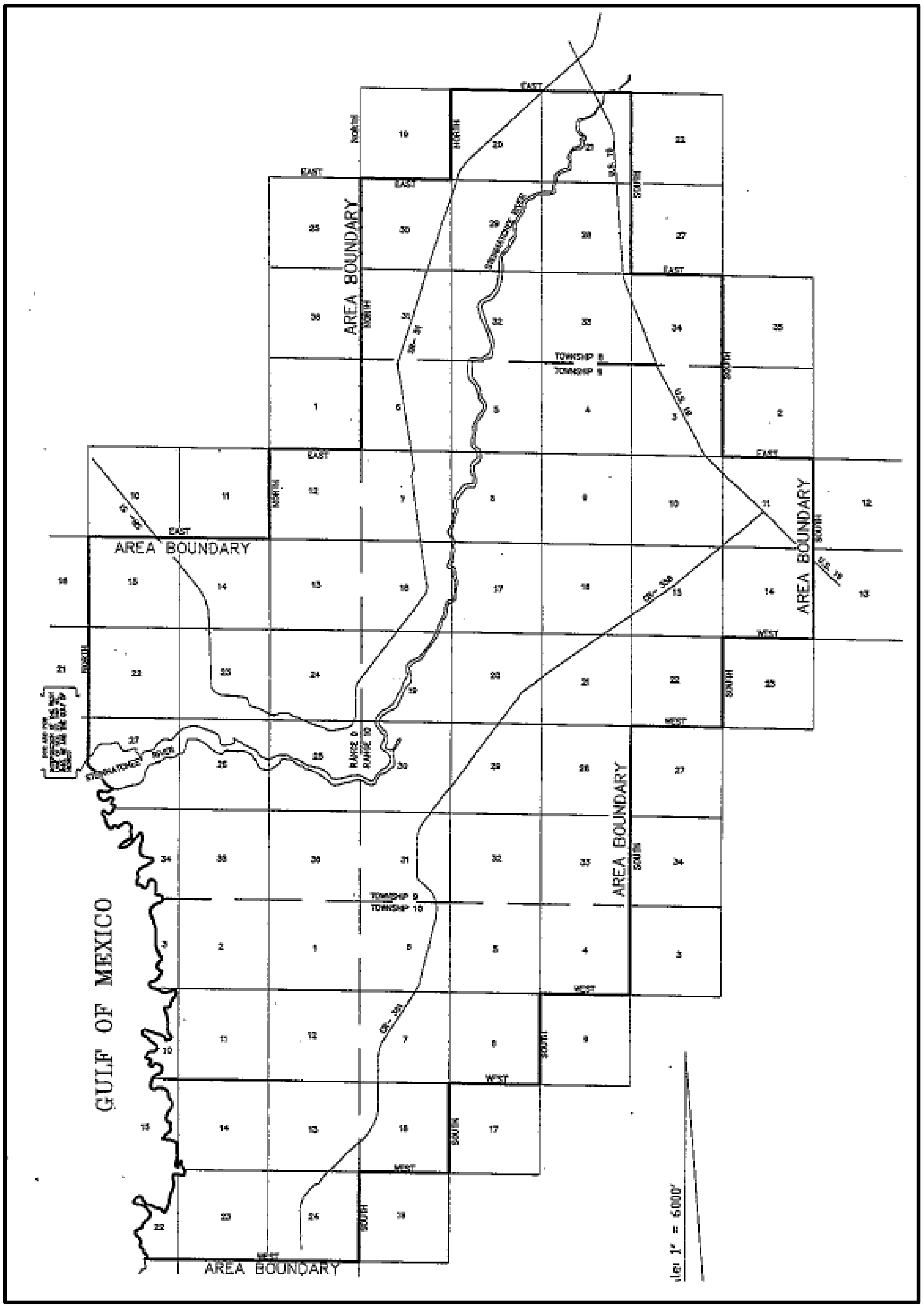

Figure 37. Big Bend Water Authority Service Area

7.1.3 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 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 and 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 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 an emergency is desirable in interlocal agreements and within operating protocols.
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 are not existing costs 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 utility to customer 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 the 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.

7.2 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 sources for both grants and loans. Non-match grant programs include legislative appropriations which tend to be an unreliable source of funding because of uncertainty in whether the appropriation is received and the final 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 funds 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). Potential project funding sources are discussed in the following sections.

7.2.1 State Appropriation Funding

It is not possible for every worthy project to be fully funded through agency and state programs. One of the challenges facing legislators is the task of dividing the available financial resources amongst the many competing interests. In part, this occurs through the appropriations process in legislative committee meetings, but also includes individual applications submitted to the House and Senate through individual appropriation request forms. Appropriations are not a guaranteed form of funding, but one that can occur on an annual basis for priority projects.

There are two separate appropriations forms, one for the House and one for the Senate, that local constituents fill out and submit through individual legislature members. These forms provide details describing the request, such as how and who benefits in the community, where the money would be allocated should it be approved, and how the funding investment would be evaluated for success. Forms must be filled out and submitted by the end of January for consideration in that year's legislative session. The stakeholders can submit collectively for regional improvements or through individual appropriations requests.

7.2.2 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 (SRF) 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 SRF.

7.2.2.1 Drinking Water State Revolving Fund

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) within the project service area. 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 20-90% of their loan principal forgiven. 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 with some restrictions on total loan forgiveness for a single project.

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.

7.2.2.2 Clean 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. General loan terms and principal forgiveness are the same as for the DWSRF. The types of projects that can be funded under this loan program include, but are not limited to:

1. Connection or upgrade of collection systems,
2. Construction or upgrade of treatment and disposal facilities,
3. Installation of reclaimed water lines,
4. Acquisition of land, if needed, for the purposes of location of eligible project components.

As with the DWSRF, disadvantaged communities can receive partial loan principal forgiveness.

7.2.2.2.1 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.

7.2.3 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 percentage 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. Miami-Dade County: Ocean Outfall Discharge Reduction and Resiliency Enhancement Project
2. City of Fort Lauderdale: Seven Neighborhood Stormwater Improvements
3. Toho Regional Water Authority: Kissimmee Accelerated Gravity Sewer Assessment and Rehabilitation Project

One of the 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).

7.2.3.1 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.

7.2.3.2 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.

7.2.3.3 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 a point of contact. The WIFIA website includes a LOI form for the applicant. There is no fee to submit an LOI. For small community projects (less than $5 million and a population less than 25,000) if the LOI is accepted there is no $100,000 application fee to apply for a loan. This form allows 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 assess the credit worthiness of the applicant, evaluate the feasibility of the project, and determine the project eligibility for a loan. The LOI includes an overview of the project readiness, organizational structure, and the financial status and experience in executing similar projects. Examples of specific supporting information includes applicant's 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 of project financials 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

7.2.3.4 Project Ranking

Following submission of an LOI, EPA evaluates the project based on the criteria detailed in Section VII of the NOFA. The details for this process are included in the WIFIA program handbook and include:

1. Regionally significant to economic and public health benefits: 10%
2. WIFIA assistance enables the project to proceed earlier: 5%
3. The use of innovative approaches: 10%
    - Green infrastructure
    - Development of alternate sources of drinking water
4. Project protects against extreme weather events: 10%
5. Maintains or protects the environment or public health: 10%
6. Serves regions with significant energy exploration, development, or production: 5%
7. Serves regions with significant water resource challenges: 10%
8. Addresses identified municipal, state, or regional priorities: 5%
9. Project readiness to proceed towards development with construction commencing within ninety days after the date a federal credit instrument is obligated: 5%
10. Project financing plan includes public or private financing in addition to WIFIA: 5%
11. The extent to which WIFIA assistance reduces project federal assistance contribution: 5%
12. Project addresses needs for repair, rehabilitation, or replacement of a treatment works, community water system, or aging water distribution or wastewater collection system: 10%
13. The extent to which the project serves economically stressed communities: 10%

When EPA completes the LOI evaluation, EPA notifies the applicant if the project is deemed eligible based on the information included in the LOI and as described in Section III of the NOFA. For prospective applicants that demonstrate project eligibility under WIFIA policy guidelines, the WIFIA selection committee will notify applicants to apply based on their preliminary engineering feasibility, selection criteria scoring, and the minimum project budget threshold. Other selection criteria include geographic and project diversity. The application package must be submitted within 365 days of the invitation to apply.

7.2.4 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.

7.2.5 Suwannee River Water Management District Cooperative Funding

The SRWMD facilitates and offers funding opportunities through several programs. Each of these programs is discussed below.

7.2.5.1 State Springs Grant Program

The SRWMD is responsible for selecting and forwarding potential projects to FDEP 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 15, 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 awards have been highly variable with some projects receiving more than $5 million.

7.2.5.2 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 AWSs to support natural systems and Florida's economy. 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 the Springs Grant Program with the same timelines for acceptance. Funding amounts and match requirements vary depending on the project type and entity seeking funding.

7.2.5.3 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, and/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.

7.2.6 Local Funding

Investments in local water, wastewater and reclaimed water infrastructure are driven by the needs of the community, as well as the revenue generated by 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 non-ad valorem and revenue bonding.

7.2.6.1 Non-Ad Valorem Assessments

Non-ad valorem assessments provide a recurring source of revenue and 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.

In the State of Florida, stormwater utility fees are a common non-ad valorem assessment. One popular methodology for assessment is the Average Equivalent Residential Unit (ERU), which is based on the impervious area of the average single-family home. The Apportionment Methodology can also be used and serves as a common index to compare runoff generated by different sized properties. This measure combines the developed ERU with additional impervious areas associated with a building footprint.

7.2.6.2 Revenue Bonds

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 the internal rate of return of the assets to be constructed would need to be evaluated. 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 initiate 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.

7.2.7 Public Private Partnerships

Even with the investment of local utility dollars, there are cases of inadequate investment in infrastructure with fiscal constraints on municipal budgets, thus opening an opportunity for a third-party collaborator. A public private partnership (P3) is defined as a partnership between an agency of the government and the private sector in the delivery of goods or services to the public.

There is a funding opportunity with these partnerships, with the private partner benefitting through the project model. The profit return is variable; in some simple agreements there is a fee for the financing and other agreements contain a more complex demand/revenue model. There are several models of partnerships with the defining factor of the assignment of risk. The largest perceived advantage to public partnerships is the transfer of risk. Risks include variables such as permitting, land acquisition, construction delays, demand, and operation/maintenance. Contracts for P3 operation and maintenance are structured in such a way to determine the condition of the utility at a point in the future when the owner takes possession of the assets. The better the asset condition at contract termination, the more P3 O&M will cost.

The P3 benefits to utilities can include the retention of ownership of infrastructure systems and capital investment in projects. The benefit to investors in the P3 model is access to the utility sector's technical expertise and water/wastewater infrastructure can be considered a stable low-risk investment. Among other risk considerations, private partners are exposed to political instability in decision making and permitting delays. Utility considerations to a P3 model include potential for higher financing costs, interest and availability payments, than traditional municipal financing sources such as SRF and municipal bonds. As noted above, the project model type can vary widely and is often based upon the assignment of risk. Not all P3s transfer the risk of demand/revenue to the private partner. One approach is the use of an availability payment. Availability payments may suit the project model if:

1. Project does not generate direct revenue,
2. Operational outcomes are easily defined and assessed,
3. Utility wishes to retain direct setting authority,
4. Revenue and demand are inconsistent,
5. Service and quality are valued higher than the generation of revenue.

The availability payment allows a government entity to structure the financing similar to public debt, with a specific commitment capping obligation and profit. Another advantage to an availability payment is that it builds upon the existing utility model, whereas the utility retains the risk of user demand, and exposes the public to rate volatility for the benefit of reducing the premium of private financing cost.

Section 8 Cost Estimation and Cost-Effectiveness for Identified Alternatives

Based on the water supply and wastewater treatment options considered in Sections 4 and 6, there were two regional project alternatives identified that could address the project objectives. This section presents estimated costs for these two project alternatives.

8.1 Cost Estimation Approach and Assumptions

This section is focused on developing cost estimates for the feasibility study to provide water and wastewater service to the region that includes Cedar Key, Bronson, Otter Creek, and unincorporated areas of Levy County including Rosewood and Sumner. The cost estimates for this project were developed at the study/feasibility level to be approximately consistent with a Class 4 estimate as described by the Association for the Advancement of Cost Engineering International (U.S. Department of Energy 2018). The level of refinement for these cost estimates is expected to have an accuracy of +50% to -30%. This section discusses the costing methodology and assumptions that were made in preparation of these cost estimates. It is expected that future phases of this project would include detailed engineering and refinement of project details, quantities, and costs. This section also presents estimated costs for related, non-regional project components and evaluates cost-effectiveness for wastewater treatment improvement and septic-to sewer conversion.

8.1.1 Costing Methodology

Costs were developed for this project based on a combination of historic cost data, cost estimates from manufacturers/installers, and professional judgment. As described above, this project is at the feasibility and alternatives evaluation stage. As such, the cost estimates developed for this study are valid for planning purposes only and should receive refinement as a specific project design advances.

8.1.2 Assumptions

A variety of assumptions were necessary for the development of these cost estimates. These assumptions were made based on the level of detail of this feasibility study and uncertainties associated with project aspects that will be refined as a specific alternative advances to detailed design. These assumptions included:

- Land and right-of-way acquisition were not included due to uncertainty associated with the final location of water and wastewater infrastructure and potential parcel availability. Furthermore, land transfer from one or more of the involved municipalities may be a part of development of a regional cooperative.
- No specific utility conflicts were considered, and the extent of conflicts in the project right-of-way is not fully known. Estimates for conventional pipe installation versus directionally drilled pipe installation lengths were based on a 75%:25% split between conventional and directionally drilled construction approaches.

- Cost-effectiveness calculations assumed all identified OSTDSs were converted to sewer.
- It was assumed that any wastewater treatment facility would be required to achieve an annual average TN concentration of 3 mg/L prior to disposal to be protective of groundwater quality.
- Costs associated with providing water to potential reuse customers were not included due to a current lack of identified reuse customers and sites, and the probable need for redundant storage and/or disposal associated with any flows to reuse customers. Reuse feasibility should be explored further during specific project design phases.
- Fixed percentages were used for estimating costs for engineering/geotechnical/ permitting, survey, construction oversight, mobilization/demobilization/bonding, and contingency for each project component.

8.2 Alternative 1: Cedar Key, Otter Creek, and Unincorporated Areas Regionalized

The first project alternative for which costs were estimated included: development of a new water supply for Cedar Key, Otter Creek, and the unincorporated areas of Rosewood and Sumner; and development of a wastewater treatment and disposal system for the same communities. This project did not include any costs associated with new water supply or wastewater treatment for the Town of Bronson. This cost estimate only includes the regional aspects of the project, not the ancillary costs associated with the individual communities. Costs associated with water supply distribution systems and septic-to-sewer conversion are presented later in this report.

This alternative included water supply development north of Otter Creek and south of Chiefland with wastewater treatment and disposal in the same general area (Figure 38). The anticipated served population for this alternative was 854 residents that are currently on a public water system (Cedar Key – 734, Otter Creek – 120) and potentially another 1,075 residents that are currently on individual wells. The additional potential residents were estimated assuming 2.5 people per home for the 430 identified OSTDSs within 1.5 miles of SR24. This estimate does not include Cedar Key's tourist population that potentially doubles or triples the population of the City, particularly on holiday weekends. This results in an anticipated population range of 1,929 residents and up to 3,397 people including tourists during holiday weekends as shown in Table 20. Assuming a planning level per capita water use of 130 gpcd (based on 2014-18 per capita water use in Bronson [Suwannee River Water Management District 2021, 2020–45]) anticipated water needs range between 0.25 and 0.44 MGD for the served population. Wastewater flows were estimated based on a flow of 100 gpcd with a range from 0.19 and 0.34 MGD for this alternative.

Table 20. Alternative 1: Project Area Population

Area	Population	Water Demand (MGD)	Wastewater Flows (MGD)
Cedar Key	734	0.095	0.073
Otter Creek	120	0.016	0.012
1.5-Mile Buffer	1,075	0.140	0.108
Total – No Tourists	**1,929**	**0.251**	**0.193**
Cedar Key Tourist	1,468	0.191	0.147
Total – w/ Tourists	**3,397**	**0.441**	**0.340**

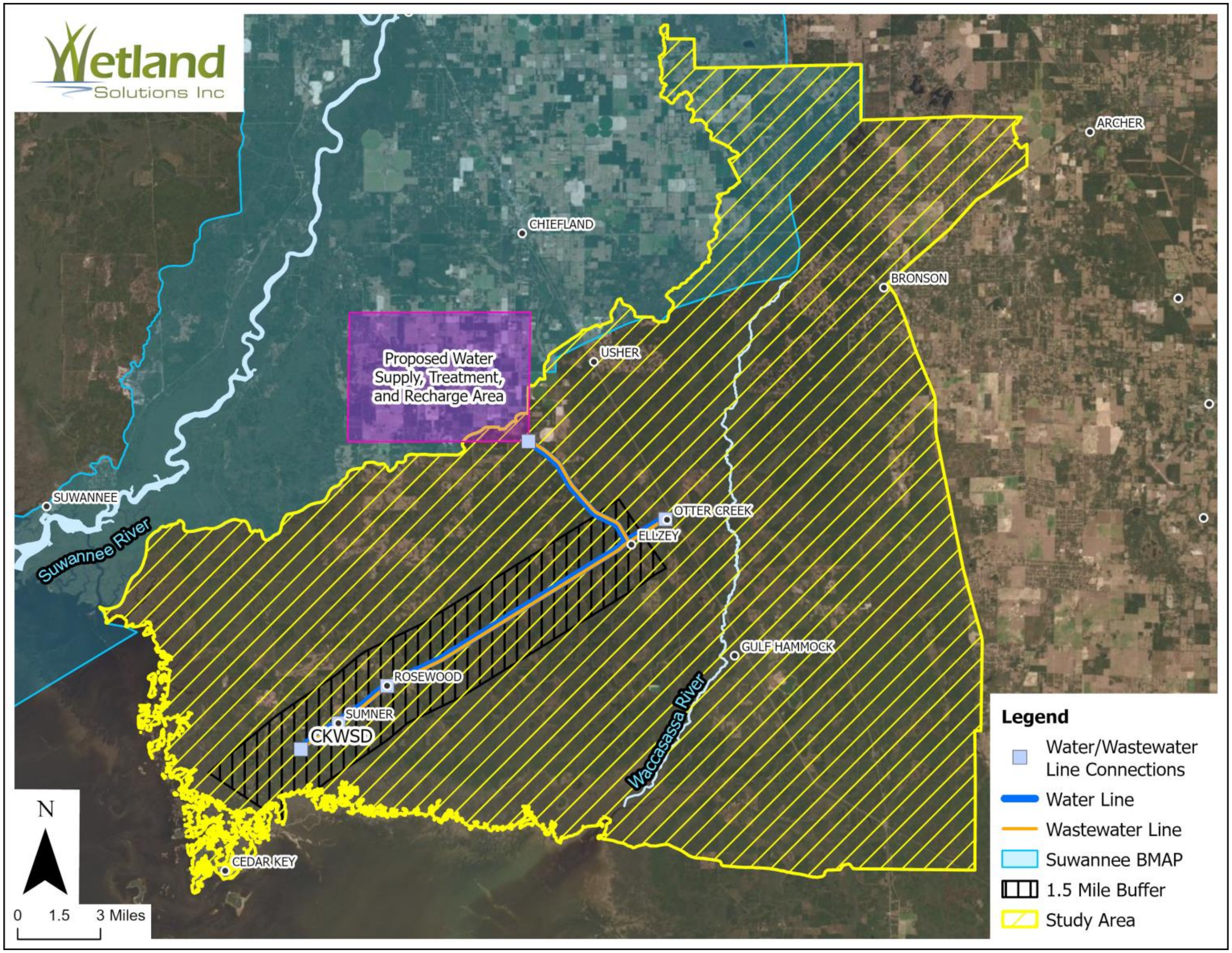

Figure 38. Alternative 1: Project Location

8.2.1 Alternative 1: Water System Costs

The water system for this alternative is comprised of the new infrastructure necessary to withdraw, treat, and distribute water to each of the served communities. It is expected that water would be delivered to each community into a storage tank with the community water systems then distributing water to customers. Currently, both Otter Creek and Cedar Key have water distribution systems. It is expected that water would be re-chlorinated in the regional system before being discharged into the community water systems. Unincorporated areas along SR24 do not currently have water distribution systems. The costs for these systems are not included as part of the regional project and are discussed later. This alternative also includes no new infrastructure or upgrades for Bronson. The estimated cost for this alternative is $25.6 million dollars with cost details shown in Table 21.

Table 21. Alternative 1: Estimated Water System Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
New Well & Pump	ea	$250,000	3	$750,000
Hydropneumatic Tanks	ea	$70,000	2	$140,000
Chlorination Facilities	ls	$100,000	1	$100,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Yard Piping at WTP	ls	$100,000	1	$100,000
8" Pipeline - Conventional	ft	$90	83,250	$7,493,000
8" Pipeline - HDD	ft	$120	27,750	$3,330,000
Valves and Boxes	ea	$3,000	110	$330,000
Air Release	ea	$8,000	60	$480,000
Master Meter and PSV	ea	$40,000	3	$120,000
Booster Pump Station and Rechlorination	ea	$500,000	2	$1,000,000
Storage Tank (Otter Creek)	ls	$100,000	1	$100,000
Storage Tank (Rosewood/Sumner, Cedar Key)	ls	$250,000	1	$250,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	25	$1,147,000
Restoration	ac	$45,000	25	$1,147,000
			Subtotal	$16,787,000
Engineering/Geotechnical/Permitting	%	13%		$2,182,310
Survey	%	1%		$167,870
CEI	%	8%		$1,342,960
Mobilization/Demobilization/Bonding	%	10%		$1,678,700
Contingency	%	20%		$3,357,400
			Subtotal	$8,729,240
Design & Construction Total				**$25,600,000**

8.2.2 Alternative 1: Wastewater System Costs

The proposed wastewater system for this alternative includes a new wastewater treatment facility to collect and treat wastewater from Cedar Key, Otter Creek, and the unincorporated communities of Rosewood and Sumner. This facility would be constructed north of Otter Creek in the vicinity of the water system proposed in the previous water supply section to ensure that this highly treated effluent would recharge the same area from which water was originally withdrawn. It is expected that the facility would be designed to achieve AWT standards to infiltrate less than 3 mg/L of TN as an annual average concentration. Disposal is expected to be via sprayfields, RIBs, or treatment wetlands/RIBs with costs presented for each option. Currently, only Cedar Key has an existing wastewater collection system. New collection systems would be required to serve Otter Creek and the unincorporated areas along SR24 (including Rosewood and Sumner). The costs for these collection systems are presented later in this report. This system would have raw wastewater conveyed from each of the communities back to a regional wastewater facility for treatment and disposal. The expected flow for the served areas is 0.19 MGD, although flows will be highly variable based on Cedar Key tourism and are expected to be as high as 0.34 MGD during holiday weekends. The proposed wastewater facility for this alternative would have an initial design capacity of 0.50 MGD. The estimated costs for the conveyance and treatment facility are $40.1 million with the cost breakdown shown in Table 22.

The proposed wastewater treatment facility is expected to discharge highly treated effluent back to the Floridan Aquifer. While there may be a potential reuse customer who could use the water for irrigation, it is still expected that complete disposal redundancy will be required given the firm need for disposal during wet periods or harvest/planting when irrigation may not be necessary or desirable. There are three primary ways of recharging this effluent: RIBs, sprayfields, and treatment wetland-RIB hybrids. RIBs will require the smallest site area with an expected footprint of approximately 7 acres (based on a 3 inch per day loading rate) and the lowest estimated cost of $1.59 million. Sprayfields will have the largest required footprint of approximately 65 acres (2 inches per week) and the highest estimated cost of $3.70 million. Both RIBs and sprayfields are primarily disposal mechanisms rather than effluent polishing systems. The incorporation of lined treatment wetlands will provide the ability to cost-effectively increase nitrogen removal to reduce nutrient loading to the aquifer. The anticipated footprint for wetlands will be the combination of the footprint of the RIBs with the addition of approximately 4 acres of lined wetland cells that will polish water before discharge. The anticipated footprint for this option is approximately 11 acres with an estimated cost of $2.82 million. Cost components are shown in Table 23 for RIBs, Table 24 for sprayfields, and Table 25 for the combination of treatment wetlands and RIBs.

Table 22. Alternative 1: Estimated Wastewater Treatment Facility Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
WWTF	MGD	$10,689,000	0.50	$10,700,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Piping at WWTF	ls	$100,000	1	$100,000
8" Pipeline - Conventional	ft	$90	83,250	$7,493,000
8" Pipeline - HDD	ft	$120	27,750	$3,330,000
Valves and Boxes	ea	$3,000	110	$330,000
Air Release	ea	$8,000	60	$480,000
Master Meter	ea	$40,000	3	$120,000
Booster Pump Station & Odor Control	ea	$600,000	2	$1,200,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	25	$1,147,000
Restoration	ac	$45,000	25	$1,147,000
			Subtotal	$26,347,000
Engineering/Geotechnical/Permitting	%	13%		$3,425,110
Survey	%	1%		$263,470
CEI	%	8%		$2,107,760
Mobilization/Demobilization/Bonding	%	10%		$2,634,700
Contingency	%	20%		$5,269,400
			Subtotal	$13,700,440
Design & Construction Total				**$40,050,000**

Table 23. Alternative 1: Estimated Costs for Rapid Infiltration Basins

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	lf	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	7.00	$70,000
Piping from WWTF	lf	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	54,300	$543,000
Berm Construction	cy	$15.00	10,900	$164,000
Sod	sy	$5.00	10,900	$55,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	2	$6,000
			Subtotal	$1,045,000
Engineering/Geotechnical/Permitting	%	13%		$135,850
Survey	%	1%		$10,450
CEI	%	8%		$83,600
Mobilization/Demobilization/Bonding	%	10%		$104,500
Contingency	%	20%		$209,000
			Subtotal	$543,400
Design & Construction Total				**$1,590,000**

Table 24. Alternative 1: Estimated Costs for Sprayfields

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	15,000	$30,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Pump Station	ls	$100,000	1.00	$100,000
Clear & Grub (includes buffer)	ac	$10,000	71	$710,000
Piping from WWTF	ft	$120	600	$72,000
Pump Station	ea	$50,000	2	$100,000
Field Piping (4")	ft	$40	10,552	$423,000
Field Piping (8")	ft	$70	3,517	$247,000
Sprinklers	ea	$100	140	$14,000
Seeding	sy	$2.00	343,640	$688,000
As-Built & Record Drawings	ea	$40,000	1	$40,000
			Subtotal	$2,429,000
Engineering/Geotechnical/Permitting	%	13%		$315,770
Survey	%	1%		$24,290
CEI	%	8%		$194,320
Mobilization/Demobilization/Bonding	%	10%		$242,900
Contingency	%	20%		$485,800
			Subtotal	$1,263,080
Design & Construction Total				**$3,700,000**

Table 25. Alternative 1: Estimated Costs for Treatment Wetlands with RIBs

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	11.00	$110,000
Piping from WWTF	ft	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	85,200	$852,000
Berm Construction	cy	$15.00	17,100	$257,000
Liner	ac	$50,000	4	$200,000
Sod	sy	$5.00	17,100	$86,000
Outflow Structure	ea	$40,000	2	$80,000
Outflow Pipeline	ft	$120	200	$24,000
Mitered End Section	ea	$2,500	2	$5,000
Wetland Planting	ac	$5,500	4	$22,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	4	$12,000
			Subtotal	$1,855,000
Engineering/Geotechnical/Permitting	%	13%		$241,150
Survey	%	1%		$18,550
CEI	%	8%		$148,400
Mobilization/Demobilization/Bonding	%	10%		$185,500
Contingency	%	20%		$371,000
			Subtotal	$964,600
Design & Construction Total				**$2,820,000**

8.2.3 Alternative 1: Total Water and Wastewater System Costs

Based on the costs estimated for the water system, wastewater system, and recharge, the total estimated project cost for Alternative 1 is between $67.2 million with RIBs for disposal and $69.3 million with sprayfields as disposal. As discussed above, the accuracy of this estimate is expected to have bounds of -30% to +50%. Considering these bounds, the low estimate for the project is $47.0 million and the high estimate is $100.8 million with RIBs as the disposal method. With sprayfields, the most expensive disposal option, the estimated cost range is between $48.5 million and $104.0 million. Project costs for evaluated alternatives are provided in Table 26.

Table 26. Alternative 1: Total Estimated Project Costs

Project	Cost (Million$)	Low Cost (-30%) (Million$)	High Cost (+50%) (Million$)
WTP, WWTF, RIBs	67.2	47.0	100.8
WTP, WWTF, Wetlands/RIBs	68.4	47.9	102.6
WTP, WWTF, Sprayfield	69.3	48.5	104.0

8.3 Alternative 2: All Communities Regionalized

The second alternative considered was regionalization of Bronson, Otter Creek, Cedar Key, and unincorporated areas along SR24. This alternative would have construction of a new water supply for all the communities and parcels currently on septic systems and a wastewater treatment facility that would receive wastewater from the communities and identified septic-to-sewer conversion. This alternative included water supply development in the vicinity of Bronson with wastewater treatment and disposal occurring in the same general area to partially offset the withdrawals (Figure 39). The anticipated served population for this alternative was 1,935 residents that are currently on a public water system (Cedar Key – 734, Otter Creek – 120, and Bronson – 1,081) and potentially another 3,220 residents assuming 2.5 people per home for the 1,288 identified OSTDSs within 1.5 miles of SR24, within the University Oaks PSA, and the identified area north of Bronson. As before, this estimate does not include the tourist population that visits Cedar Key, particularly on holiday weekends, potentially doubling or tripling the population of the City. This results in an anticipated population range of between 5,155 residents and 6,623 people including tourists during holiday weekends (Table 27). Assuming a planning level per capita water use of 130 gpcd (based on 2014-18 per capita water use in Bronson), anticipated water needs are between 0.67 and 0.86 MGD for the served population. Wastewater flows were estimated based on a flow of 100 gpcd with a range from 0.52 and 0.66 MGD.

Table 27. Alternative 2: Project Area Population

Area	Population	Water Demand (MGD)	Wastewater Flows (MGD)
Cedar Key	734	0.095	0.073
Otter Creek	120	0.016	0.012
Bronson	1,081	0.141	0.108
1.5-Mile Buffer	1,075	0.140	0.108
University Oaks	890	0.116	0.089
North Bronson	1,255	0.163	0.126
Total – No Tourists	**5,155**	**0.671**	**0.516**
Cedar Key Tourist	1,468	0.191	0.147
Total – w/ Tourists	**6,623**	**0.862**	**0.663**

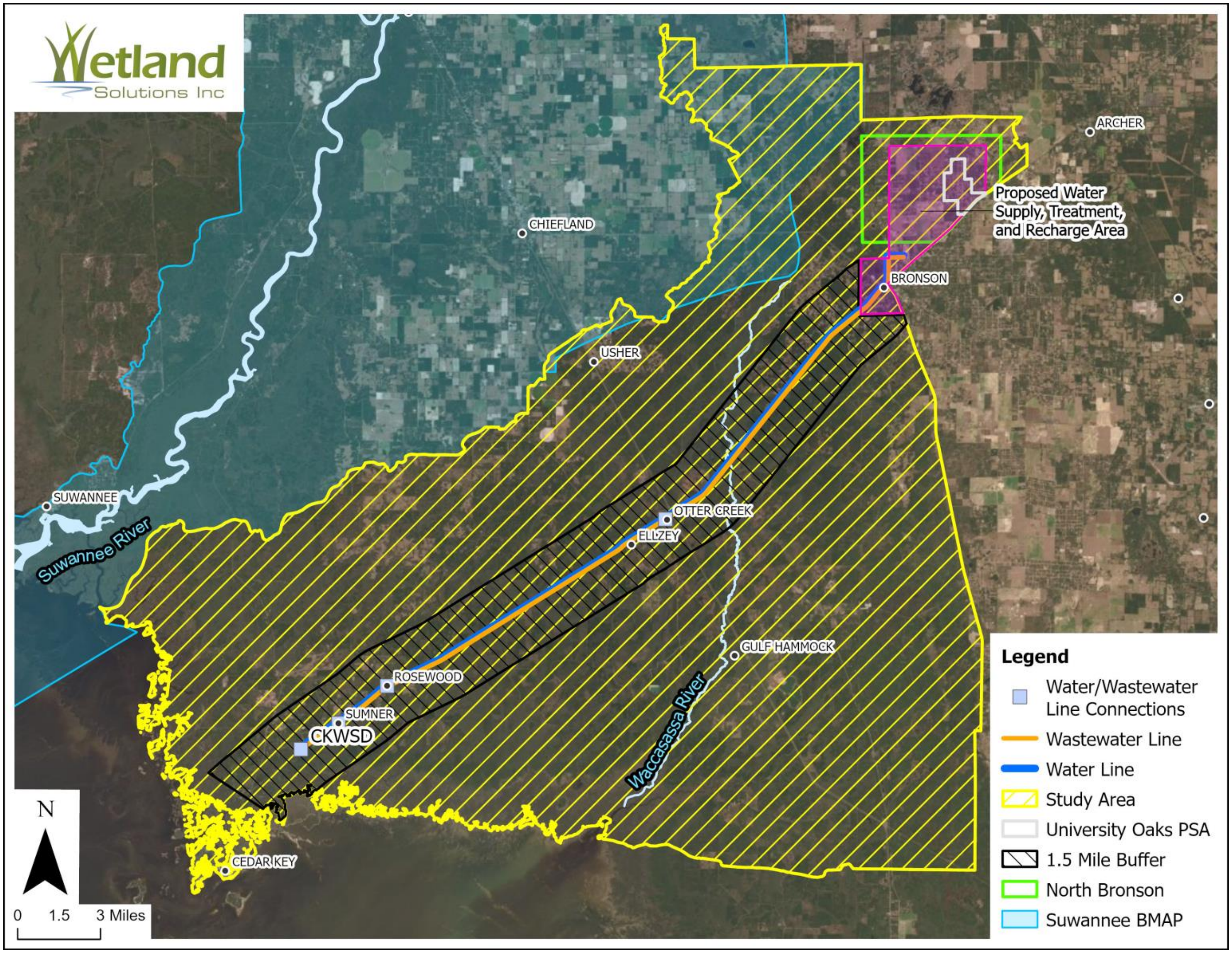

Figure 39. Alternative 2: Project Location

8.3.1 Alternative 2: Water System Costs

The water system proposed for this alternative would serve the identified communities and a large number of additional residents located north of Bronson. The water supply for this alternative would be located near Bronson with potable water produced in the regional facility and delivered to each community through a pipeline along SR24. Water would be delivered to each community into a storage tank with each of the community water systems then distributing water to their customers. Currently, Bronson, Otter Creek, and Cedar Key have water distribution systems. It is expected that water would be re-chlorinated before being discharged into the community water systems. Rosewood and the areas north of Bronson, outside of the University Oaks PSA, do not currently have water distribution systems. The cost for these systems is not part of the regional project and is discussed later. The anticipated cost for development of this regional water supply is $35.7 million with the cost breakdown shown in Table 28.

Table 28. Alternative 2: Estimated Water System Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
New Well & Pump	ea	$250,000	3	$750,000
Hydropneumatic Tanks	ea	$70,000	2	$140,000
Chlorination Facilities	ls	$100,000	1	$100,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Piping at WTP	ls	$100,000	1	$100,000
8" Pipeline - Conventional	ft	$90	115,250	$10,396,000
8" Pipeline - HDD	ft	$120	38,550	$4,620,000
Valves and Boxes	ea	$3,000	150	$450,000
Air Release	ea	$8,000	80	$640,000
Master Meter and PSV	ea	$40,000	4	$160,000
Booster Pump Station and Rechlorination	ea	$500,000	4	$2,000,000
Storage Tank at Bronson	ls	$250,000	1	$250,000
Storage Tank at Otter Creek	ls	$100,000	1	$100,000
Storage Tank at Cedar Key	ls	$250,000	1	$250,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	35	$1,591,000
Restoration	ac	$45,000	35	$1,591,000
			Subtotal	$23,438,000
Engineering/Geotechnical/Permitting	%	13%		$3,046,940
Survey	%	1%		$234,380
CEI	%	8%		$1,875,040
Mobilization/Demobilization/Bonding	%	10%		$2,343,800
Contingency	%	20%		$4,687,600
			Subtotal	$12,187,760
Design & Construction Total				**$35,700,000**

8.3.2 Alternative 2: Wastewater System Costs

The wastewater system for this alternative includes a new wastewater treatment facility to collect and treat wastewater from Cedar Key, Otter Creek, Bronson, the unincorporated areas of Rosewood and Sumner, the University Oaks PSA, and other areas north of Bronson that are currently on OSTDSs. This facility would be constructed near Bronson in the vicinity of the water system discussed in the water supply section to ensure that this highly treated effluent would recharge the area from which it was withdrawn. It is expected that the facility would be designed to achieve AWT standards to infiltrate less than 3 mg/L of TN, as an annual average to be protective of groundwater and local springs. Disposal is expected to be via sprayfield, RIB, or a treatment wetland/RIB system with costs presented for each.

Currently, only Bronson and Cedar Key have existing wastewater collection systems. New wastewater collection systems would be required to serve Otter Creek, Rosewood, and Sumner. University Oaks and areas north of Bronson could have new collection systems constructed or be designed to discharge to the Bronson collection system. The costs for these new collection systems are discussed later in this report. This system would have raw wastewater conveyed from each of the communities back to a regional wastewater facility for treatment and disposal. The expected flow for the served areas is 0.52 MGD although flows will be highly variable based on Cedar Key tourism and are expected to be as high as 0.66 MGD during holiday weekends. The proposed wastewater facility for this alternative would have an initial design capacity of 1.00 MGD. The estimated costs for the conveyance and treatment facility are $63.7 million with the cost breakdown shown in Table 29.

Following treatment, highly treated effluent will be recharged to the aquifer. As described for Alternative 1, there may be the opportunity for some water to be delivered to reuse, but it is expected that redundant disposal will still be required for all flows. Costs were developed for RIBs, sprayfields, and a hybrid wetland/RIB. RIBs will require approximately 13 acres and had an estimated cost of $2.85 million, with the cost breakdown shown in Table 30. Sprayfields are estimated to require approximately 129 acres and had an estimated cost of $6.23 million, with the cost breakdown shown in Table 31. Treatment wetlands with RIBs were estimated to require 21 acres with an estimated cost of $4.88 million, with the cost breakdown shown in Table 32.

Table 29. Alternative 2: Estimated Wastewater Treatment Facility Cost

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
WWTF	MGD	$20,178,000	1.00	$20,200,000
Electrical, Controls, and Generator	ls	$250,000	1	$250,000
Piping at WWTF	ls	$100,000	1	$100,000
8" Pipeline - Conventional	ft	$90	115,250	$10,396,000
8" Pipeline - HDD	ft	$120	38,550	$4,620,000
Valves and Boxes	ea	$3,000	150	$450,000
Air Release	ea	$8,000	80	$640,000
Master Meter	ea	$40,000	4	$160,000
Booster Pump Station & Odor Control	ea	$600,000	3	$1,800,000
As-Built & Record Drawings	ea	$50,000	1	$50,000
Erosion & Sediment Control	ac	$45,000	35	$1,591,000
Restoration	ac	$45,000	35	$1,591,000
			Subtotal	$41,848,000
Engineering/Geotechnical/Permitting	%	13%		$5,440,240
Survey	%	1%		$418,480
CEI	%	8%		$3,347,840
Mobilization/Demobilization/Bonding	%	10%		$4,184,800
Contingency	%	20%		$8,369,600
			Subtotal	$21,760,960
Design & Construction Total				**$63,700,000**

Table 30. Alternative 2: Estimated Costs for Rapid Infiltration Basins

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	lf	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	14.00	$140,000
Piping from WWTF	lf	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	108,500	$1,085,000
Berm Construction	cy	$15.00	21,700	$326,000
Sod	sy	$5.00	21,700	$109,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	2	$6,000
			Subtotal	$1,873,000
Engineering/Geotechnical/Permitting	%	13%		$243,490
Survey	%	1%		$18,730
CEI	%	8%		$149,840
Mobilization/Demobilization/Bonding	%	10%		$187,300
Contingency	%	20%		$374,600
			Subtotal	$973,960
Design & Construction Total				**$2,850,000**

Table 31. Alternative 2: Estimated Costs for Sprayfields

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	15,000	$30,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Pump Station	ls	$100,000	1.00	$100,000
Clear & Grub	ac	$10,000	142	$1,420,000
Piping from WWTF	ft	$120	600	$72,000
Pump Station	ea	$50,000	2	$100,000
Field Piping (4")	ft	$40	14,922	$597,000
Field Piping (8")	ft	$70	4,974	$349,000
Sprinklers	ea	$100	50	$5,000
Seeding	sy	$2.00	687,280	$1,375,000
As-Built & Record Drawings	ea	$40,000	1	$40,000
			Subtotal	$4,093,000
Engineering/Geotechnical/Permitting	%	13%		$532,090
Survey	%	1%		$40,930
CEI	%	8%		$327,440
Mobilization/Demobilization/Bonding	%	10%		$409,300
Contingency	%	20%		$818,600
			Subtotal	$2,128,360
Design & Construction Total				**$6,230,000**

Table 32. Alternative 2: Estimated Costs for Groundwater Recharge Wetlands

Item	Unit	Unit Cost ($)	Quantity	Total Cost ($)
Silt Fence	ft	$2.00	5,000	$10,000
Soil Tracking Device	ea	$5,000	1.00	$5,000
Clear & Grub	ac	$10,000	21.00	$210,000
Piping from WWTF	ft	$120	600	$72,000
Inflow Structures, Valves, & Meters	ea	$50,000	2	$100,000
Excavation	cy	$10.00	162,700	$1,627,000
Berm Construction	cy	$15.00	32,600	$489,000
Liner	ac	$50,000	7	$350,000
Sod	sy	$5.00	32,600	$163,000
Outflow Structure	ea	$40,000	2	$80,000
Outflow Pipeline	ft	$120	200	$24,000
Mitered End Section	ea	$2,500	2	$5,000
Wetland Planting	ac	$5,500	7	$39,000
As-Built & Record Drawings	ea	$20,000	1	$20,000
Level Recorder/Staff Gauge	ea	$3,000	4	$12,000
			Subtotal	$3,206,000
Engineering/Geotechnical/Permitting	%	13%		$416,780
Survey	%	1%		$32,060
CEI	%	8%		$256,480
Mobilization/Demobilization/Bonding	%	10%		$320,600
Contingency	%	20%		$641,200
			Subtotal	$1,667,120
Design & Construction Total				**$4,880,000**

8.3.3 Alternative 2: Total Water and Wastewater System Costs

Based on the costs estimated for the water system, wastewater system, and recharge, the total estimated project cost for Alternative 1 is between $102.2 million with RIBs for disposal and $105.5 million with sprayfields as disposal. The accuracy of this estimate is expected to have bounds of -30% to +50%. Considering these bounds the low estimate for the project is $71.5 million and the high estimate is $153.3 million with RIBs as the disposal method. With sprayfields, the most expensive disposal option, the estimated cost range is between $73.9 million and $158.3 million. Project costs for all evaluated recharge options are shown Table 33.

Table 33. Alternative 2: Total Estimated Project Costs

Project	Cost (Million$)	Low Cost (-30%) (Million$)	High Cost (+50%) (Million$)
WTP, WWTF, RIBs	102.2	71.5	153.3
WTP, WWTF, Wetlands/RIBs	104.2	72.9	156.3
WTP, WWTF, Sprayfield	105.5	73.9	158.3

8.4 Other Community Needs and Septic-to-Sewer

In addition to a regional water supply and regional wastewater treatment facility, this study also considered the other water and wastewater needs for each of the communities that are required for a full-service system. A portion of the communities in the study area have water or wastewater infrastructure, although some of these systems have current issues that need to be addressed. This section discusses the other system needs for the various areas and presents estimated costs for these additional project components. It is expected that these needs will be funded through specific projects that are not directly a part of the regional cooperative. Funding requests could originate from either the proposed cooperative or the individual communities. Timing for these projects is not expected to have an impact on the regional project, which can be developed with the consideration of potential future connections in identified areas. Table 34 shows the current water and wastewater infrastructure for each community.

Table 34. Current Water and Wastewater Infrastructure by Community

Community	Water Distribution	Wastewater Collection
Cedar Key	Yes	Yes
Bronson	Yes	Partial
Otter Creek	Yes	No
Rosewood	No	No
Sumner	No	No
University Oaks	Yes	No
North Bronson	No	No

Only four communities in the study area currently have water distribution systems and only two have wastewater collection systems. In the case of wastewater collection systems, Cedar Key is unique in that 100% of built properties on the island are already on sewer. Bronson currently only provides sewer service to a portion of their water customers within their PSA, although projects have been submitted for funding to expand sewer service to more of the homes that are still on OSTDSs. Detailed costs are not able to be determined without specific evaluation of individual areas, which is beyond the scope of this study. Each community is expected to have different charges for connections of new water systems and the costs discussed here are not necessarily the same for all communities. Rosewood and Sumner were lumped for these analyses as part of a 1.5-mile buffer along SR24.

8.4.1 Water Distribution System Costs

The communities of Rosewood, Sumner, and the area north of Bronson do not currently have water systems. The costs for developing local distribution systems that would serve these customers assumed a uniform cost for each connection. This assumption is only expected to be accurate if the systems are built-out for all connections at the same time. It is expected that these distributions systems will also have some costs associated with distribution of water after it is received from the regional water supply pipeline. The cost for a new connection was assumed to be $10,000 per home in the absence of an existing distribution system.

Based on this estimated cost per home the three communities that lack water service are expected to have distribution system costs of approximately $4.3 million for the Rosewood and Sumner areas along SR24 and $5.1 million for the unserved area north of Bronson.

8.4.2 Wastewater Collection System Costs

Only Cedar Key currently supplies sewer service to all their residents. The remaining communities provide service to some customers (Bronson) or none of their residents (Otter Creek, University Oaks, Rosewood, Sumner, and the area north of Bronson). Costs to develop collection systems for customers not currently served by a wastewater facility were estimated based on the cost for septic-to-sewer conversion presented in WSI 2022 (Wetland Solutions, Inc. 2022). This approach bases the cost of conversion on the parcel size as a surrogate for identifying actual pipe lengths needed to move wastewater from the residence to the collection main. For each of the considered communities, this was completed by determining the median parcel area and calculating the average septic-to-sewer conversion cost. This cost was then multiplied by the total number of OSTDSs to determine the total estimated project cost. Of note in this method is that larger parcels are significantly more expensive to serve than smaller parcels. For this reason, it is expected that with a more detailed design the decision may be made to only provide service in areas with smaller median parcel sizes. This is particularly true for the area north of Bronson where the median parcel size is 4.4 acres, and it may not be cost-effective to provide water or sewer service.

Estimated unit costs for each community and the total estimated costs for the collection systems are provided in Table 35. For all the communities, conversion of all OSTDSs is expected to cost approximately $98.2 million. As stated above, it is likely inefficient to target all homes for conversion, especially those on large lots that are more expensive to convert.

Table 35. Estimated Wastewater Collection System Costs

Community	Number of OSTDSs	Median Parcel (ac)	Unit Cost ($)	Total Cost ($)
Bronson	182	0.64	$33,000	$6,006,000
Otter Creek	79	1.00	$40,000	$3,160,000
SR24 1-Mile Buffer	353	1.25	$45,000	$15,885,000
SR24 1 to 1.5-Mile Buffer	77	1.38	$47,000	$3,619,000
University Oaks	356	1.33	$46,000	$16,376,000
North Bronson	502	4.40	$106,000	$53,212,000
Total	**1,549**			**$98,258,000**

In addition to costs associated with construction of new collection systems for wastewater there are expected to be costs to construct master lift stations that will introduce wastewater into the regional wastewater pipeline. These are expected to cost between $0.25 and $1.0 million depending on the flow generated by each community.

8.5 Cost-Effectiveness for Wastewater Conversion

A common metric for evaluating projects is the cost-effectiveness of the project relative to either improving water quality or increasing water quantity. For this project, the benefits of septic-to-sewer conversion were evaluated based on the flow of converted OSTDSs and the reduction in TN loading to the Floridan Aquifer. An additional cost-effectiveness calculation was made for addition of a treatment wetland to further reduce TN in water recharged to the Floridan Aquifer. To estimate the cost-effectiveness of conversion from OSTDSs to sewer the following assumptions were made:

- Wastewater flows of 100 gallons per person per day.
- Average of 2.5 people per home.
- Inflow TN concentration of 40 mg/L to OSTDS.
- Reduction in TN of 30% in an OSTDS (Lusk et al. 2020).
- OSTDS attenuation during infiltration to UFA of 57.5% (average value of range from 40 to 75% in FDEP Nitrogen Source Inventory Loading Tool [NSILT][1]).
- WWTF attenuation during infiltration to UFA of 42.5% (between 10 and 75% attenuation in NSILT).
- WWTF achieves AWT with TN of 3 mg/L.
- Treatment wetland achieves a TN of 2 mg/L based on modeling of performance for AWT inflow quality.
- Cost-effectiveness calculated for 30-year planning horizon.
- Cost of septic-to-sewer conversion based on lot size as discussed in previous section.

[1] https://floridadep.gov/dear/water-quality-restoration/content/nitrogen-source-inventory-and-loading-tool-nsilt-1

- Cost of treatment wetland assuming lined system proportional to flow contribution.
- Wetland modeling assumed TN of 3 mg/L with 1 mg/L of organic nitrogen, 0.5 mg/L of NH_4-N, and 1.5 mg/L of NO_X-N.

8.5.1 Wastewater Treatment Facility Cost-Effectiveness

The cost-effectiveness of septic-to-sewer was evaluated based on the cost to sewer and the reduction in load to the Floridan Aquifer. This approach assumed that the reduction in load was equal to the attenuated load from OSTDSs minus the attenuated load from a wastewater facility. Based on this approach, the OSTDSs were evaluated for each community separately since the cost to convert to sewer is different amongst communities. The range of cost-effectiveness values varied from $142 per pound of TN to $456 per pound of TN as shown in Table 36.

Table 36. Cost-Effectiveness for Conversion from an On-Site Treatment and Disposal System to an Advanced Wastewater Treatment Facility

Community	Number of OSTDSs	Total Cost ($)	OSTDS UFA Load (lb/yr)	WWTF UFA Load (lb/yr)	Load Reduction (lb/yr)	Cost-Effectiveness ($/lb)
Bronson	182	$6,006,000	1,649	239	1,410	$142
Otter Creek	79	$3,160,000	716	104	612	$172
SR24 1-Mile Buffer	353	$15,885,000	3,199	464	2,735	$194
SR24 1 to 1.5-Mile Buffer	77	$3,619,000	698	101	597	$202
University Oaks	356	$16,376,000	3,226	468	2,758	$198
North Bronson	502	$53,212,000	4,549	659	3,890	$456

8.5.2 Cost-Effectiveness of Tertiary Treatment Wetland

The concept of incorporating a treatment wetland as part of disposal was discussed earlier in the report. This approach also can provide a method to achieve additional TN removal. For evaluating the incorporation of a wetland, performance was modeled using the P-k-C* model (Kadlec and Wallace 2009). Based on the proposed loading rate, 6.2 acres were modeled for treatment of the entire facility capacity of 1.0 MGD. Following modeling, this showed a reduction in TN over an annual cycle to an average of 2 mg/L. Since the treatment wetland would be located at the regional facility, each community sending water was considered as having the same unit cost for treatment. This resulted in an estimated cost-effectiveness of $88 per pound of TN removed (Table 37). Not evaluated as part of this study is construction of a conventional WWTF (TN of ≤10 mg/L) with the reduction of TN to less than 3 mg/L occurring in a treatment wetland. This would likely substantially increase cost-effectiveness of treatment and reduce treatment plant capital and O&M costs.

Table 37. Cost-Effectiveness for a Tertiary Treatment Wetland at the Advanced Wastewater Treatment Facility

Community	Wetland Cost ($)	WWTF UFA Load (lb/yr)	Wetland UFA Load (lb/yr)	Load Reduction (lb/yr)	Cost-Effectiveness ($/lb)
Bronson	$211,500	239	159	80	$88
Otter Creek	$91,810	104	69	35	$88
SR24 1-Mile Buffer	$410,210	464	309	155	$88
SR24 1 to 1.5-Mile Buffer	$89,480	101	67	34	$88
University Oaks	$413,690	468	312	156	$88
North Bronson	$583,350	659	440	220	$88

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