May 2019

City of Belleview
Utility System
MASTER PLAN

Prepared for

CITY OF BELLEVIEW, FL. 1885

Prepared by

Kimley»Horn

OCA_042223012

City of Belleview

Utility System

Master Plan

Prepared for:

The City of Belleview

Prepared by:

Kimley-Horn and Associates, Inc.

042223012
May 2019

101 E Silver Springs Boulevard, Suite 400
Ocala, FL 34470
352 438 3000

THIS IS TO CERTIFY THAT THE ENCLOSED ENGINEERING CALCULATIONS WERE PERFORMED BY ME OR UNDER MY DIRECT SUPERVISION.

MALCOLM LEWIS BRYANT
LICENSE
No. 65582
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

MALCOLM L. BRYANT, P.E.

Florida Registration No. 65582
CA No. 00000696

Date: 5/22/19

EXECUTIVE SUMMARY

The City of Belleview is anticipating growth over the next 20 years. This growth will provide the City with an opportunity to expand their existing utility systems to provide potable water and sanitary sewer services to new customers. The City is planning to improve and expand their utility infrastructure to adequately meet these future needs. This master plan and accompanying hydraulic modeling was assembled to assist the City in identifying and selecting capital improvement projects (CIPs) needed to efficiently and cost-effectively meet the demands of the existing system and the projected 5,10, and 20-year demands.

Water System Analysis:

The City currently operates two water treatment plants (WTPs). Based on Florida Department of Environmental Protection (FDEP) monthly operating report data gathered from January 2018 to December 2018, the City's WTPs have exceeded their max day permitted capacity on multiple occasions and the system consistently exceeds 75% of the permitted capacity. Furthermore, the WTP capacity evaluation revealed the City will need additional treatment capacity prior to 2022. A hydraulic model was developed and calibrated for the City's existing water systems. The results of the base model were used to identify capital improvement projects that would improve the hydraulic performance of the City's existing, 5-year, 10-year, and 20-year water system. These improvements were added to the model and simulations were run to analyze the effectiveness of the improvements. The following is a summary of the model results.

PRESENT DAY SYSTEM DEMANDS (2018) - This scenario consisted of a present day (2018) analysis of the water distribution system. The hydraulic model results demonstrated that the system is operating at normal operating pressures and can meet existing demand. However, additional water capacity is required. If the City does not proceed with septic to sewer projects, construction of a new 1.20 MGD WTP (**PWS Improvement No.1A**) and accompanying water main to convey flows from the proposed WTP to the existing system (**PWS Improvement No.3**) are required. Should the City proceed with septic to sewer projects, construction of a new 2.46 MGD WTP (**PWS Improvement No.2A**) and accompanying water main to convey flows from the proposed WTP to the existing system (**PWS Improvement No.3**) are required.

5-YEAR DEMANDS (2022) - The 5-year demand scenario analysis modeled the City's water distribution system with the projected 2022 (5-year) water demands. The hydraulic model results demonstrated that the system is operating at normal operating pressures and can meet the projected demands assuming that the previously mentioned improvements have been constructed. Additionally, should the City proceed with septic to sewer regions 1 through 3, construction of the necessary septic to sewer driven water main expansions will be required to meet the projected growth.

10-YEAR DEMANDS (2027) - The 10-year demand scenario analysis modeled the City's water distribution system with the projected 2027 (10-year) water demands. If the City does not proceed with septic to sewer projects, the capacity of the new WTP will need to be increased from 1.20 MGD to 3.60 MGD (**PWS Improvement No.1B**). If the City does proceed with septic to sewer projects, the capacity of the new WTP will need to be increased from 2.46 MGD to 5.0 MGD (**PWS Improvement No.2B**). Additionally, a water main will need to be constructed so the City can provide potable water service along US 301 (**PWS Improvements No.4 and No.5)**. This will allow the City to expand their system east along US 301 to service septic to sewer regions 5 and 6 when constructed. The hydraulic model results demonstrated that the system is operating at normal operating pressures and can meet the projected demands assuming that the previously mentioned improvements have been constructed.

20-YEAR DEMANDS (2037) - The 20-year demand scenario analysis modeled the City's water distribution system with the projected 2037 (20-year) water demands. The hydraulic model results demonstrated that if the City proceeds with septic to sewer projects, a new water main will need to be constructed from the new WTP to the downtown distribution system (**PWS Improvement No.6**). This improvement is required to meet the projected 2037 water system demands of the City's service territory. Kimley-Horn has also identified two developer driven water mains that would be hydraulically needed should development along 132nd St occur (**PWS Improvements No.7 and No.8**).

Sanitary Sewer System and Reclaimed System Analysis:

The City currently operates one water reclamation facility (WRF). The City's WRF is currently averaging 0.429 MGD annual average daily flow which is within the FDEP permitted capacity of 0.760 MGD. A hydraulic model was developed and calibrated for the City's wastewater collection system. The model results were used to identify capital improvement projects needed to meet the present day and the 5-year, 10-year, and 20-year projected demands. The following is a summary of the model results.

PRESENT DAY SYSTEM DEMANDS (2018) – This scenario consisted of a present day (2018) analysis of the City's sanitary sewer collection system. The model results, along with discussions with City staff, demonstrated that pumps at several different lift stations must be upsized to meet the expected peak hour flow (**WW Improvements No.1, No.2, No.3 and No.4**). The analysis also identified that there are sections of the City's gravity sanitary sewer that are exceeding capacity. **WW Improvements No.5C and No.5D** were identified to alleviate flows from the gravity sewer system, prevent future sanitary sewer overflows (SSOs), reduce repumping, and increase system efficiency. These improvements consist of constructing a force main to redirect flows from the northern service area directly to the WRF and replacing the pumps in various lift stations. Kimley-Horn identified a portion of this force main as a developer driven project (**PWS Improvements No.5A and No.5B**) since the timing of its construction is dependent on the build out rate in Summer Crest.

5-YEAR DEMANDS (2022) - The 5-year demand scenario analysis modeled the City's sanitary sewer collection system with the projected 2022 (5-year) water demands. The model results, along with discussions with City staff, demonstrated that pumps at one lift station must be upsized to meet the projected 2022 peak hour flows (**WW Improvement No.6**). The model results showed that the City can meet the projected demands assuming that the previously mentioned improvements have been constructed.

10-YEAR DEMANDS (2027) - The 10-year demand scenario analysis modeled the City's sanitary sewer collection system with the projected 2027 (10-year) water demands. The model results, along with discussions with City staff, demonstrated that pumps at one lift station must be upsized to meet the projected 2022 peak hour flows (**WW Improvement No.7**). The model results showed that the City can meet the projected demands assuming that the previously mentioned improvements have been constructed.

20-YEAR DEMANDS (2037) - The 20-year demand scenario analysis modeled the City's sanitary sewer collection system with the projected 2037 (20-year) water demands. The model results showed that the City can meet the projected demands assuming that the previously mentioned improvements have been constructed.

Additionally, Kimley-Horn performed a facility assessment of the City's WRF and found the City will need to increase the existing wet-weather and reject storage capacity to satisfy FDEP requirements and future demands. Kimley-Horn identified five viable options for the City to choose from that will improve the storage capacity to meet existing, 5-year, 10-year and 20-year demands. **Option 1** involves rehabbing the existing 1.0 MG effluent storage basin and converting it into additional onsite reject storage. **Option 2** includes constructing a new 2.0 MG onsite reject storage pond. The City can also improve their effluent disposal capacity via deep well injection or by converting their spray field into rapid infiltration basins (RIBs) (**Options 3 and 4**). Additionally, the City can also explore potential new customers who can accept their reuse flow, such as the Perry Spray Field (**Option 5**). The model results indicate that such a partnership is hydraulically possible.

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INTRODUCTION

Background

The City of Belleview (City) is located in southeastern Marion County, Florida with a utility service area of approximately 27 square miles. The City is experiencing growth within and around the City's service area which has subsequently increased the water and sanitary sewer (wastewater) demands within the City's service area This master plan and accompanying hydraulic model updates were assembled to assist the City in identifying existing and potential system deficiencies, developing necessary capital improvement projects (CIP), and prioritizing the projects needed to meet future system demands.

Scope and Objectives

The primary objective of this utility master plan is to assess the performance of the existing potable water, sanitary sewer, and reclaimed water systems currently owned and operated by the City of Belleview and plan for system improvements that are needed to meet the anticipated future demands.

Water System Objectives:

- Identify the water supply, treatment, and storage capacity of the City's existing system.
- Develop potable water demand projections (5-year, 10-year, and 20-year).
- Update the hydraulic model of the City's potable water system to include recent distribution system modifications and demand information provided by the City.
- Evaluate the water distribution system under present year conditions and for 5-year, 10-year, and 20-year growth projections.
- Identify necessary improvements within the water supply, treatment, and storage capacity under the present year, 5-year, 10-year, and 20-year demand projections.
- Prepare a limited siting evaluation to determine a suitable site for a future WTP.

Sanitary Sewer System Objectives:

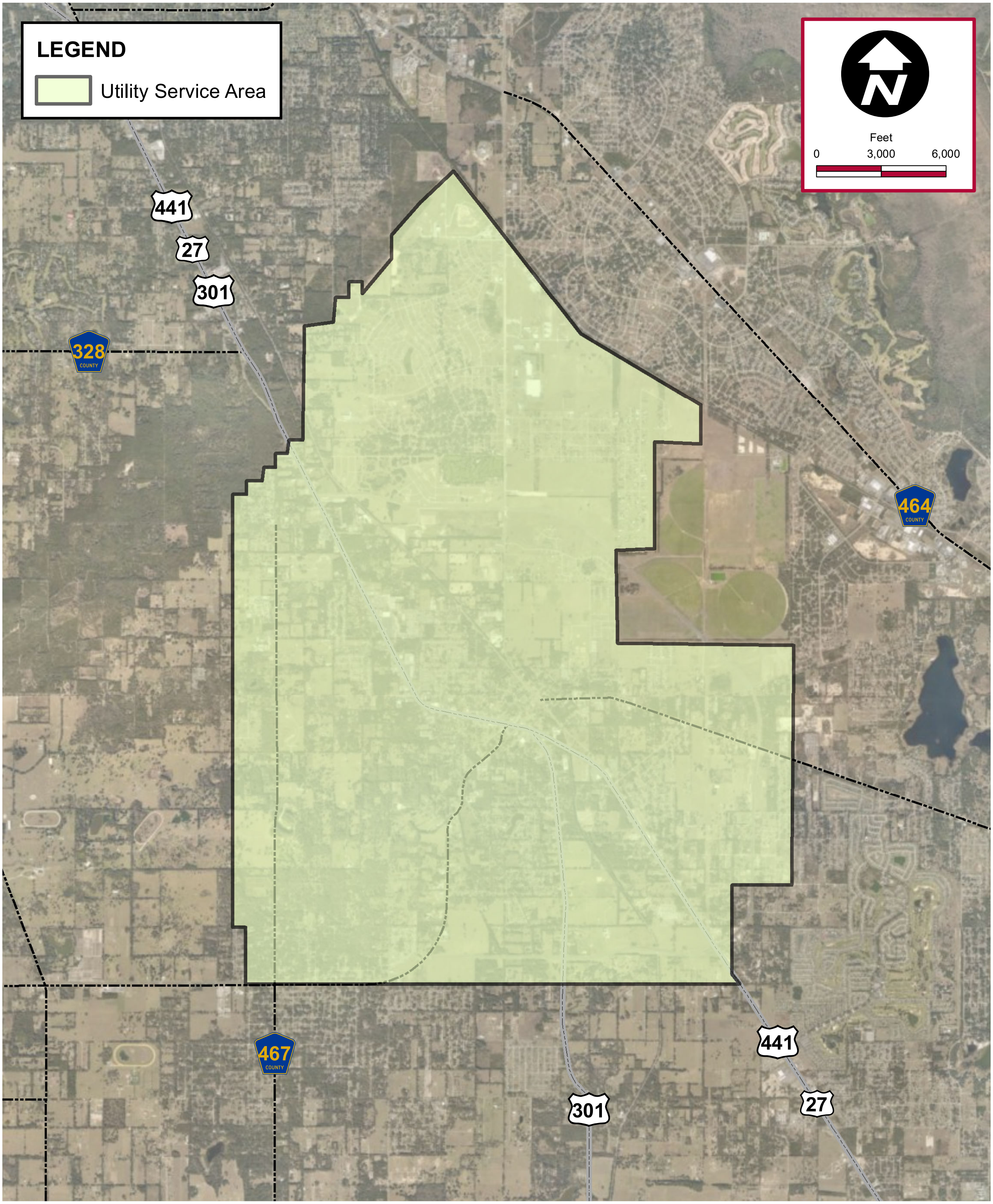
- Update the existing sanitary sewer lift station system inventory to include new lift stations and/or modifications to the existing lift stations.
- Update the City's existing sanitary sewer hydraulic pump station and force main model based on information provided by the City.
- Identify the sanitary sewer treatment and effluent disposal capacity of the City's existing sanitary sewer treatment system.
- Develop sanitary sewer flow projections (5-year, 10-year, and 20-year).
- Evaluate the City's existing lift station infrastructure under present year conditions and for the 5-year, 10-year, and 20-year growth projections.
- Identify necessary improvements within the wastewater collection system under the present year, 5-year, 10-year, and 20-year demand projections

Reclaim Water System Objectives:

- Develop a hydraulic model of the City's existing reclaimed water distribution system to identify potential system deficiencies in meeting the current and future demand projections.
- Make distribution system improvement recommendations that are required for the system to meet the current and future demands.

SERVICE AREA DESCRIPTION

The City of Belleview, in accordance with State Statute Chapter 180, established a water and sanitary sewer service territory (by City Ordinance 96-10) that generally extends 5 miles beyond the City limits. The City limits comprise approximately 3.8 square miles. The City's service area encompasses approximately 27 square miles. From north to south, the service area extends from the Baseline Landfill to SE 135th Street. From east to west, the service area extends from the Belleview Library to the Green Meadows subdivision. See **Figure 1** for a map of the present City of Belleview service area.



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CITY OF BELLEVIEW UTILITY SERVICE AREA

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

Kimley»Horn

101 E Silver Springs Blvd, Suite 400, Ocala FL 34470
Phone: (352) 438-3000
www.kimley-horn.com CA 00000696

Scale: As Noted	Project No.: 042223012	May 2019	Figure 1

DEMAND PROJECTIONS

Introduction

This section presents a discussion of the demand projections within the City of Belleview's utility service area. To determine the future demand projections, it is first necessary to understand the projected population growth within the City's service area. Identifying, quantifying, and locating this growth allows for proper analysis and planning of capital improvements that are necessary for an efficient and cost-effective system in the future.

Increases in demands within the City's utility distribution system was classified in one of four ways:

1. Existing and Infill Demands - growth within the areas currently served by the City where new connections will be made to the existing utility system. Infill demands were classified as *unoccupied* parcels located within 200 feet of existing utility infrastructure.
2. Expansion Demands - increased demands from the physical expansion of the utility system to bring currently non-served customers onto the network. This expansion can be driven by new development where customers along the expansion route may also be served.
3. Known Future Developments – increased demands resulting from new developments identified by the City that not currently served by existing utilities or not within 200 feet of existing utilities.
4. Septic to Sewer Demands – selected regions of high population density, currently using septic tanks for sanitary sewer disposal, were identified as target areas for septic to sewer conversion projects. The City has planned septic to sewer projects to further the initiatives set forth in the 2018 Silver Springs Basin Management Action Plan. These projects are predicated by the receipt of funding from the FDEP, SJRWMD, and others.

Methodology for Estimating Demands

The City's water and sanitary sewer demands are linked to population and land use. The City of Belleview's service territory was separated into four major land use categories:

1. Residential and Rural Land
2. Commercial and Industrial
3. Known future developments
4. Septic to Sewer

A specific demand calculation methodology was applied for each land use category. The following is a discussion of each methodology.

RESIDENTIAL AND RURAL LAND – Population growth in residential and rural land areas was quantified by spatially allocating the estimated population per parcel in the existing or proposed service area for each planning period (5, 10, or 20 years). The population projections for the City service area are based on the *Small-Area Population Projection Methodology provided by Southwest Florida Water Management District (SWFWMD)* (2014) (***See Appendix A)***. The following analysis was performed to determine the 5, 10, and 20-year population projections:

1. The population values for each parcel were obtained from the SWFWMD population projections GIS spatial data.
2. Population values were summarized for the years 2020, 2025, 2030, 2035 and 2040 for each parcel.
3. The total population values for each parcel were then interpolated to find the population values for the years 2022 (5-year), 2027 (10-year), and 2037 (20-year).

Approach 1 was used to assign estimated existing and future utility demands to each parcel if existing billing data was available. **Approach 2** was used if the existing billing data was not available.

Approach 1: Property with current billing data – For residential properties with current billing data, the present year average day demands were calculated based on the average of the March 2017 to February 2018 billing data provided by the City. It was assumed the parcel was fully developed therefore the existing and buildout demand was set equal to the calculated annual average demand for each specific parcel. As the billing data only quantifies the flow of water to each parcel, for the parcels that were identified by the City as having sewer service, it was assumed that the sanitary sewer demand was equal to half of the water demand. This assumption was based on Sec.6.14.4 of the Marion County Land Development Code which states that one ERU shall be equal to a flow of 400 gpd for water and 200 gpd for sanitary sewer.

Approach 2: Property without current billing data – Existing water and sanitary sewer demands were considered zero for residential properties without current billing data. To calculate the demand for 5, 10, and 20 years, the projected population for each parcel was divided by a value of 2.35 people per equivalent residential unit (ERU). The ERU value for each parcel was then multiplied by 400 gpd/ERU for water and 200 gpd/ERU for sanitary sewer, as specified in the Marion County Land Development Code Sec.6.14.4.

Projected Water Demand = [(Projected Population/2.35 people per ERU) x 400 (gpd/ERU)]

Projected Sanitary Sewer Demand = [(Projected Population/2.35 people per ERU) x 200 (gpd/ERU)]

COMMERCIAL AND INDUSTRIAL – Future land use designations were used as the basis for calculating future commercial water and sanitary sewer demands. Marion County future land use GIS mapping was used to determine the future land use for each commercial and industrial parcel. One of two approaches below were used to calculate the demands for Commercial and Industrial property demand calculations.

Approach 3: Commercial and Industrial property with current billing data – The parcel specific annual average demand from the City's billing information was used for commercial and industrial property with current billing data. It was assumed the parcel was fully developed and the existing and buildout demand was set equal to the calculated annual average demand for each specific parcel.

Approach 4: Commercial property with no current billing data – For commercial and industrial property without current billing data. Full buildout water demands were estimated by multiplying the annual average commercial demand by the parcels existing building area. The annual average commercial water demand per square foot of building was determined by dividing the total annual average commercial demand by the total square feet of commercial buildings served, which equated to 0.29 gpd per square foot. It was assumed that the sanitary sewer demand was equal to half of the estimated water demand. The resulting number of ERUs was then determined by dividing the resulting demand by the level of service specified in the Marion County Land Development Code Sec.6.14.4.

Buildout Water Demand = [Parcel Building ft^2 x 0.29 gpd per ft^2]

Buildout Sanitary Sewer Demand = Buildout Water Demand * (200gpd wastewater/ ERU /400 gpd water/ERU)

For parcels that did not have an existing building, the max floor to area ratio (FAR), according to the 2014 Marion County Comprehensive Plan, was used to determine the max building foot print that could be built on the parcel. The max FAR was then multiplied by the area of the parcel and by the annual average commercial demand of 0.29 gpd per square foot. It was assumed that the sanitary sewer demand was equal to half of the estimated water demand.

Buildout Water Demand = [Max FAR x Parcel Area (ft^2) x 0.29 gpd per ft^2]

Buildout Sanitary Sewer Demand = Buildout Water Demand * (200gpd wastewater/ ERU /400 gpd water/ERU)

The 5, 10, and 20-year demands were calculated by multiplying the buildout demand by the ratio of the 5, 10, or 20-year projected population growth as calculated using the SWFWMD population projections.

KNOWN FUTURE DEVELOPMENTS – Future demands were based on development projections provided by the City of Belleview Public Works Department. The future demands were then calculated by multiplying the Marion County level of service by the projected development equivalent residential units (ERU), unless otherwise specified by the City.

SEPTIC TO SEWER – In response to local ordinances, the City of Belleview in conjunction with Kimley-Horn has identified septic to sewer project regions throughout the City's service territory. These projects are intended to connect parcels with existing onsite sewage treatment and disposal systems (OSTDS) to central sewer by providing a sanitary sewer collection line within 400 feet of the residence. In addition to providing sanitary sewer service, the City also plans to expand the potable water distribution system to serve these areas. This series of septic to sewer phasing will translate to additional water and sanitary sewer demands until buildout. Demands were based on the estimated number of parcels that would be converted from septic to sewer. These values were calculated as part of a septic to sewer planning study completed by Kimley-Horn. The projected number of parcels were then multiplied by the Marion County Land Development Code water and sanitary sewer level of service.

Summary of Projected Flows

The potable water and sanitary sewer demands for each category were calculated using one or more of the approaches discussed above and summarized below.

EXISTING CUSTOMERS

To establish demands for existing customers, the present year average day demands for each individual parcel were calculated as the average of the March 2017 to February 2018 billing data provided by the City. Approach 1 was then used to calculate buildout, 5, 10, and 20-year demands for each parcel. **Table 1** summarizes the existing customer water demands and **Figure 2** shows the existing areas served. See ***Appendix B*** for the water demand allocation and calculation summary.

Table 1: Water Demand for Existing Customers Served

Development	Present Year Water Demands (ADD GPD)	Present Year Sanitary Demands (ADD GPD)
Existing Service Area	857,711	428,856

INFILL AREAS

To establish the infill demand growth, unoccupied parcels that were within 200 feet of existing water mains were selected and considered infill areas. The future infill area demands were calculated using either approach 2 or 4.

Table 2 summarizes the projected infill water demands and **Figure 2** shows the infill areas to be served. See ***Appendix B*** for the complete water demand allocation and calculation summary.

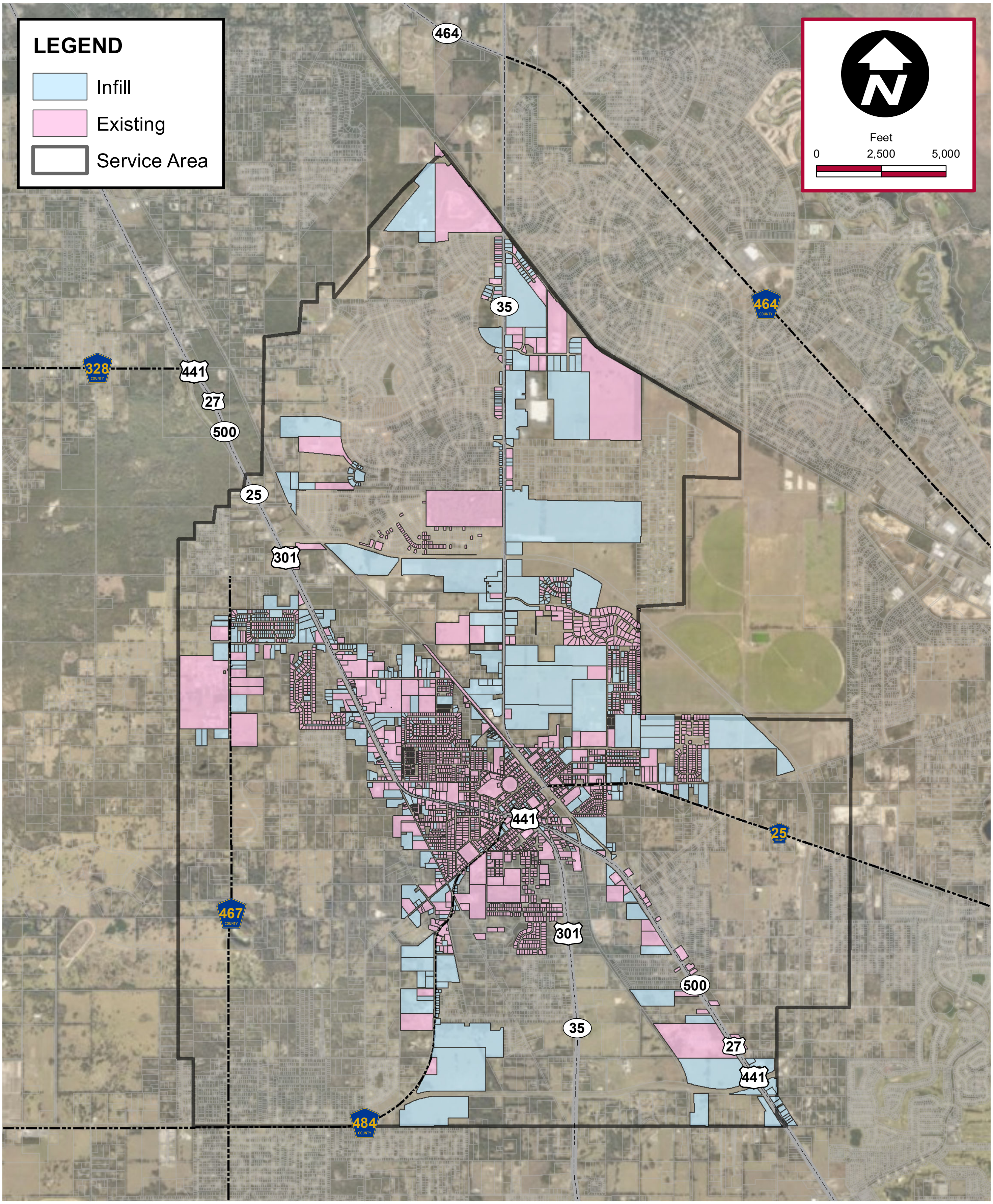
Table 2: Demand Projections for Infill Expansion in Existing Service Area			
Infill Demands	5-Year Demands (ADD GPD)	10-Year Demands (ADD GPD)	20-Year Demands (ADD GPD)
Water	41,412	96,349	184,794
Sanitary Sewer	20,706	48,175	92,397

EXPANSION AREAS

Expansion areas are parcels that will be served by future expansion of the distribution system but do not include known future developments (listed separately). The expansion area demands were calculated using either approach 2 or 4. Based on the specific condition for each separate parcel, the appropriate demand calculation approach was used to determine the future demand for each parcel. The expansion demands were categorized as parcels that will be within 200 feet of proposed water main extensions. These water main extensions are required to serve new developments and septic to sewer areas or improve system hydraulics. **Tables 3 and 4** summarize the projected expansion water and sanitary sewer demands and **Figure 3** shows the expansion areas to be served. See ***Appendix B*** for the complete water demand allocation and calculation summary.

Table 3: Water Demand Projections for Expansion Service Areas			
Expansion Area	5-Year Demands (ADD GPD)	10-Year Demands (ADD GPD)	20-Year Demands (ADD GPD)
132nd Street West	56,033	61,160	73,589
132nd Street East	74,045	80,149	95,785
Build Out Expansion Areas	-	-	36,090
Total =	**130,078**	**141,309**	**205,464**

Table 4: Sanitary Sewer Demand Projections for Expansion Service Areas			
Expansion Area	5-Year Demands (ADD GPD)	10-Year Demands (ADD GPD)	20-Year Demands (ADD GPD)
132nd Street West	28,016	30,580	36,794
132nd Street East	37,022	40,074	47,892
Build Out Expansion Areas	-	-	18,045
Total =	**65,038**	**70,654**	**102,731**



EXISTING AND INFILL DEMANDS

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Scale: As Noted	Project No.: 042223012	May 2019	Figure 2

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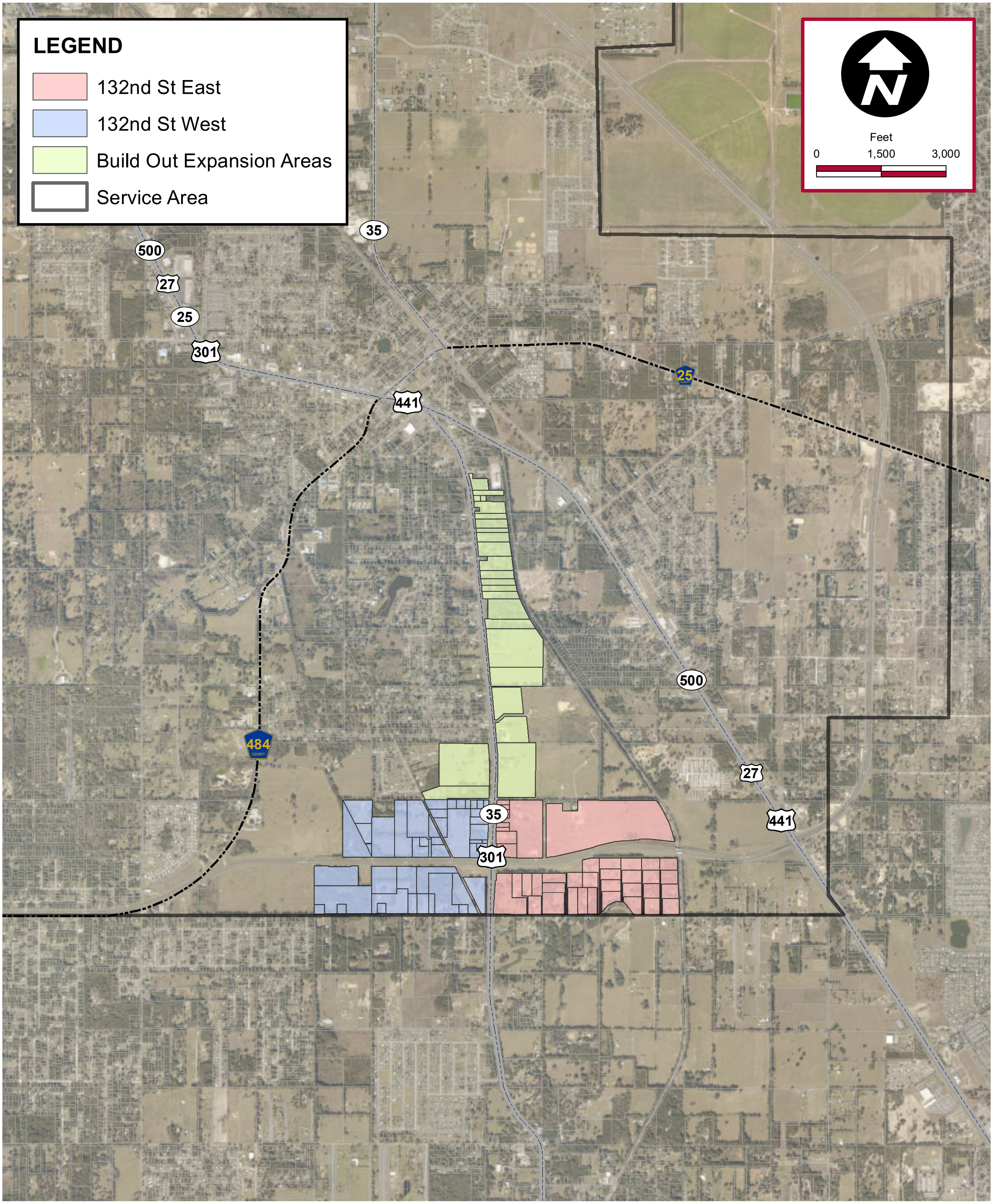

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EXPANSION DEMANDS

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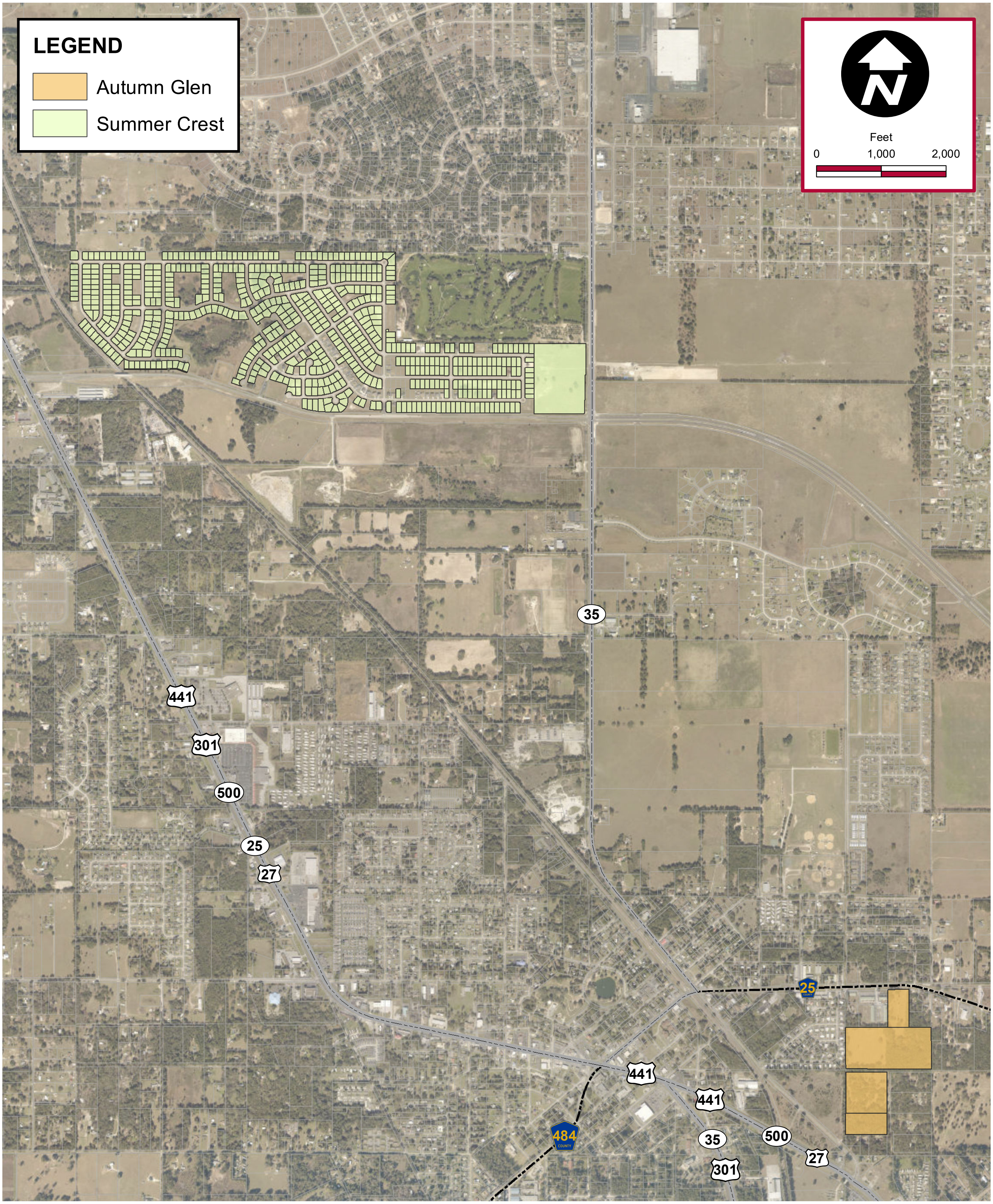
FUTURE DEVELOPMENTS

The City of Belleview's Public Works Department developed a list of residential and non-residential developments along with demand projections based on known project entitlements anticipated to start within 20 years. They identified two future developments: Summer Crest and Autumn Glen. Summer Crest is a development with 75 existing, occupied lots and is anticipating a growth rate of 50 new lots/year. The City provided an expected level of service of 450 gpd/ERU of water for Summer Crest. It was assumed that Summer Crest will maintain a level of service of 200 gpd/ERU for sanitary sewer. Autumn Glen is the second identified future development. While Autumn Glen has yet to be constructed, it is expected that it will be built out in the next five years. The Marion County level of service standards of 400 gpd/ERU for water and 200 gpd/ERU were used to calculate the buildout demand for Autumn Glen. **Tables 5 and 6** summarize the projected water and sanitary sewer demands. **Figure 4** shows the location of these two developments.

Table 5: Water Demand Projections for Future Known Developments			
Development	5-Year Demands (ADD GPD)	10-Year Demands (ADD GPD)	20-Year Demands (ADD GPD)
Autumn Glen	46,200	46,200	46,200
Summer Crest	67,500	180,000	281,250
Total =	**113,700**	**226,200**	**327,450**

Table 6: Sanitary Sewer Demand Projections for Future Known Developments			
Development	5-Year Demands (ADD GPD)	10-Year Demands (ADD GPD)	20-Year Demands (ADD GPD)
Autumn Glen	23,100	23,100	23,100
Summer Crest	30,000	80,001	125,000
Total =	**53,100**	**103,101**	**148,100**



K:\OCA_Utilities\Belleview\Projects\042223012 - Utility System Master Plan\doc\Master Plan Report\Figures\mxd\Figure 4 - Future Known Developments.mxd - 5/21/2019 12:15:41 PM - Savannah.Kirwan

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101 E Silver Springs Blvd, Suite 400, Ocala FL 34470
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FUTURE KNOWN DEVELOPMENTS

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Scale: As Noted	Project No.: 042223012	May 2019	Figure 4

SEPTIC TO SEWER PHASING

The City of Belleview has identified 11 Septic to Sewer regions. Regions 1 through 6 are planned to be completed over the next 20 years. Regions 7 through 11 are not expected to be completed in the next 20 years and are assumed to be completed at the time of buildout. This report is limited to analyzing the City's utility system over the next 20 years, therefore septic to sewer regions 7 through 11 were not modeled as a future scenario in this document. In addition to sanitary sewer, these areas will also connect to the City's potable water system with the expansion of new water mains. Assuming one parcel is equal to one ERU, the Marion County level of service values of 400 gpd/ERU for water and 200 gpd/ERU for sanitary sewer were used to calculate the demands. **Tables 7 and 8** summarize the projected water and sanitary sewer demands. **Figure 5** shows septic to sewer regions 1 through 6, and **Figure 6** shows septic to sewer regions 7 through 11, within the City's service area.

Table 7: Water Demand Projections for Septic to Sewer Areas

Region	5-Year Demands (ADD GPD)	10-Year Demands (ADD GPD)	20-Year Demands (ADD GPD)	Buildout Demands (ADD GPD)
Region 1	85,489	99,418	123,717	123,717
Region 2	29,150	39,860	58,491	58,491
Region 3	191,226	202,461	222,632	222,632
Region 4	-	1,991	2,844	2,844
Region 5	-	42,236	63,850	63,850
Region 6	-	93,091	100,326	100,326
Region 7	-	-	-	25,450
Region 8	-	-	-	169,147
Region 9	-	-	-	621,513
Region 10	-	-	-	186,287
Region 11	-	-	-	50,517
Total =	**305,865**	**479,058**	**571,860**	**1,624,775**

Table 8: Sanitary Sewer Demand Projections for Septic to Sewer Areas

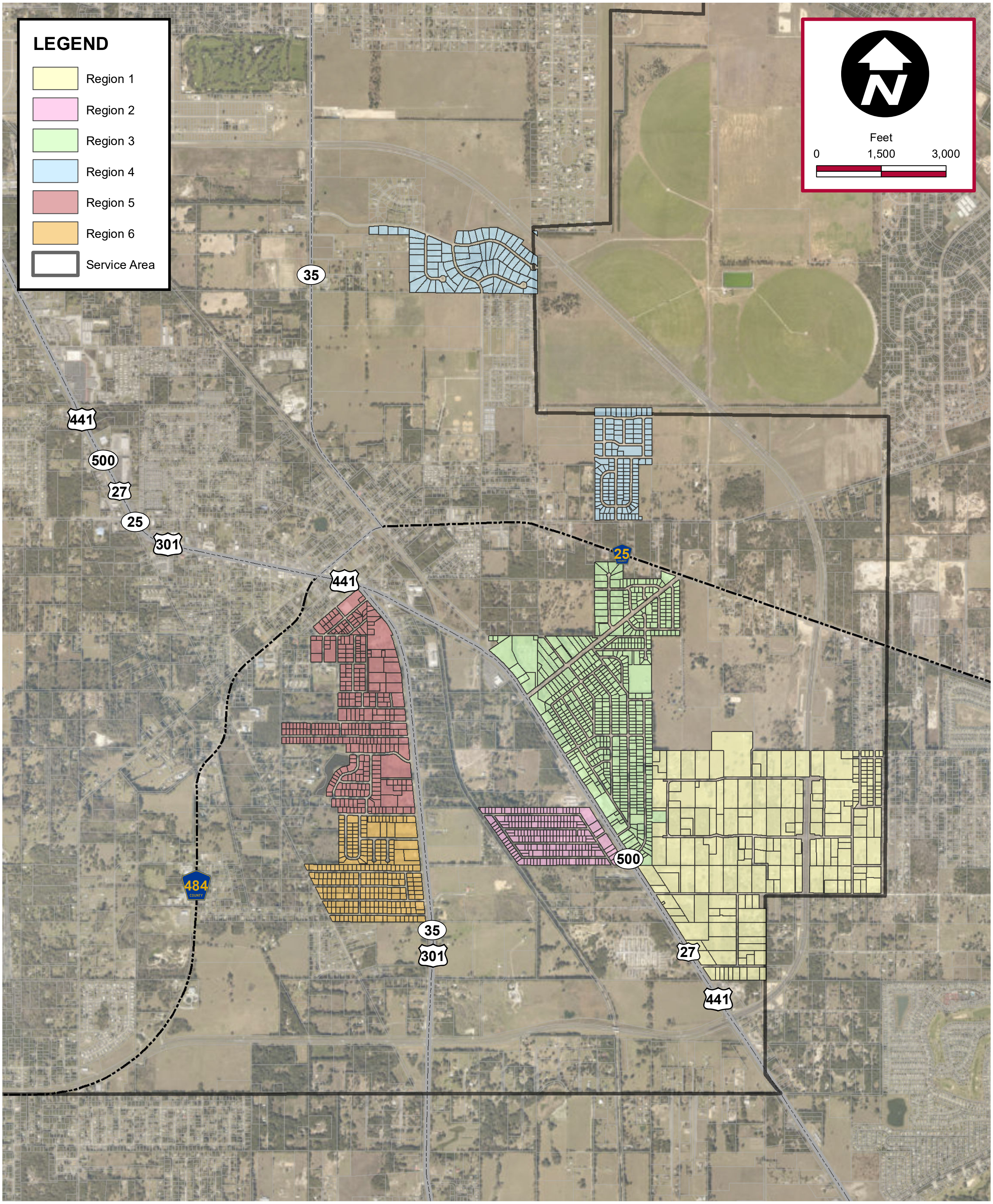
Region	5-Year Demands (ADD GPD)	10-Year Demands (ADD GPD)	20-Year Demands (ADD GPD)	Buildout Demands (ADD GPD)
Region 1	44,282	52,274	66,325	66,325
Region 2	14,787	20,284	29,862	29,862
Region 3	96,532	102,765	113,988	113,988
Region 4	-	15,516	15,942	15,942
Region 5	-	49,978	62,973	62,973
Region 6	-	47,566	51,941	51,941
Region 7	-	-	-	12,847
Region 8	-	-	-	86,149
Region 9	-	-	-	310,757
Region 10	-	-	-	93,615
Region 11	-	-	-	25,475
Total =	**155,601**	**288,382**	**341,031**	**869,874**

SUMMARY OF GROWTH PROJECTIONS

Tables 9 and 10 are summary tables of the projected utility system demands over the next 20 years.

Table 9: Water Demand Growth Projection Summary				
	Present (2018) (ADD GPD)	5-year (2022) (ADD GPD)	10-year (2027) (ADD GPD)	20-year (2037) (ADD GPD)
Existing Services	857,711	857,711	857,711	857,711
Infill Areas	-	41,412	96,349	184,794
Expansion Areas	-	130,078	141,309	205,464
Future Developments	-	113,700	226,200	327,450
Septic to Sewer	-	305,865	479,058	571,860
Total =	**857,711**	**1,448,766**	**1,800,627**	**2,147,279**

Table 10: Sanitary Sewer Demand Growth Projection Summary				
	Present (2018) (ADD GPD)	5-year (2022) (ADD GPD)	10-year (2027) (ADD GPD)	20-year (2037) (ADD GPD)
Existing Services	428,856	428,856	428,856	428,856
Infill Areas	-	20,704	48,175	92,397
Expansion Areas	-	65,038	70,654	102,731
Future Developments	-	53,100	103,101	148,100
Septic to Sewer	-	155,601	288,382	341,031
Total =	**428,856**	**723,299**	**939,168**	**1,113,115**



SEPTIC TO SEWER REGIONS 1 - 6

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

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Scale: As Noted	Project No.: 042223012	May 2019	Figure 5

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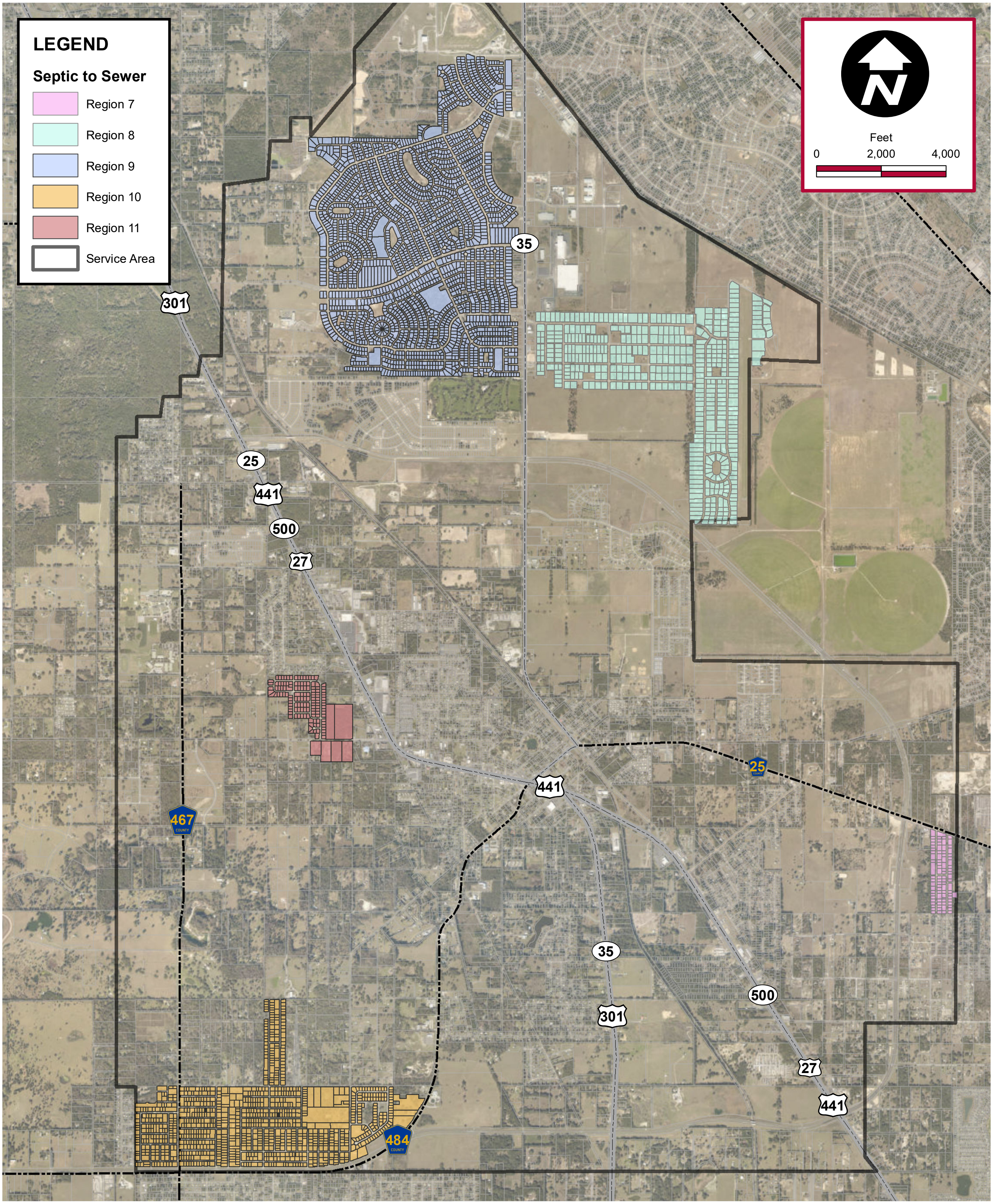

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SEPTIC TO SEWER REGIONS 7 - 11

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

Scale: As Noted	Project No.: 042223012	May 2019	Figure 6

EXISTING WATER SYSTEM

Introduction

This section discusses the location, condition, and capacity of the existing potable water systems owned and operated by the City of Belleview. Also included is a summary of the current permitting status and regulatory issues affecting water systems, including treatment limitations and regulatory concerns.

Water Supply Permitting Agencies

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP)

The Florida Department of Environmental Protection is responsible for permitting the design and construction of new potable water supply systems that provide water to 25 or more people for at least 60 days each year or serves 15 or more service connections. Very small water systems that do not fit the above description are regulated by the Florida Department of Health and individual county health departments. The construction of water wells, both public and private, and the quantities of water that may be extracted, are regulated by the Water Management Districts.

After water treatment plants have been built, FDEP is responsible for monitoring the plant for conformance with drinking water standards. Most notably, the FDEP inspects the plants at regular times and generates a Sanitary Survey Report. All the components of the plant are inspected during the sanitary survey, including the well heads, disinfection systems, storage facilities, high service pumps, treatment components (i.e. aeration equipment), and the records that are required on-site. Any deficiencies observed during the inspection are noted and included in the Sanitary Survey Report.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

The potable water supply wells are permitted by the St. Johns River Water Management District (SJRWMD). The SJRWMD issues consumptive use permits (CUP) that allocate an allowable groundwater withdrawal quantity for the system. The City currently operates under CUP No. 3137. **Table 11** below summarizes the permitted groundwater withdrawals under CUP No. 3137.

Table 11: Consumptive Use Permit

Permit Number	Permit Type	Issuing Agency	Wells	Permitted Withdrawal (MGD AAD)	Date of Issue	Date of Expiration
3137	Consumptive Use Permit	SJRWMD	2	1.022	10/12/2016	10/11/2036

Existing Water Distribution System

The City of Belleview's water distribution system primarily serves residential customers within the utility service area. The City's system is identified by the FDEP as PWS-ID No. 3420074. The system serves a total population of 8,483 residents with approximately 3,392 connections. The design capacity of the water treatment system is 2.084 MGD (2,084,000 GPD) (maximum daily demand).

The distribution network has approximately 90 miles of water main varying from 2" to 12" in diameter. The water main pipe material is variable but generally consists of PVC, ductile iron, cast iron, asbestos cement, or galvanized. See **Table 12** below for existing pipe lengths by diameter.

Table 12: Existing Pipe Lengths	
Pipe Size (diameter)	Total Length of Pipe (feet)
12 –inch	94,771
10 – inch	3,922
8 – inch	105,438
6 - inch	216,374
4 – inch	28,375
3 – inch	9,854
2 - inch	9,188

Existing Water Treatment and Storage Facilities

The City's water system consists of two active public supply wells, two water treatment plants (WTPs), two 10,000-gallon hydropneumatic tanks, and one 500,000-gallon elevated storage tank. The CUP allows the wells to withdraw an annual average flow of 1.022 MGD from the Upper Floridian Aquifer. See **Figure 7** for the location of the two WTPs.

WTP-1 (WELL #5)

WTP-1 is a Category 5 Class C facility located at CR 484 and SE 58th Terrace, Belleview, Florida with a permitted capacity of 1.368 MGD MDD. According to the monthly operating reports (MOR's), dated from May 2017 to April 2018, the plant produced an average daily flow of 0.544 MGD. The maximum flow of 1.424 MGD occurred during the month of June 2017 and exceeded the WTP's permitted capacity of 1.368 MGD MDD.

The plant is directly connected to the water distribution system and has one ground water well that pumps from the Upper Floridian Aquifer. Because an uninstalled backup well pump is not available for WTP-1, the firm pumping capacity (capacity assuming the largest pump is out of service) of WTP-1 is 0 MGD. See **Table 13** for a summary of the well and well pump.

Table 13: WTP-1 (Well #5)						
Well Number	Dia. (in.)	Total Depth (ft.)	Pump Type	Pump Horsepower	Pump Capacity (gpm)	Permitted Capacity (gpd) (MDD)
#5	8	250	Vertical Turbine	100	940	1,220,000

The raw ground water is treated with a flow proportional sodium hypochlorite liquid injection. Once disinfected with chlorine, the water is pumped into the distribution system. WTP-1 does not achieve sufficient onsite chlorine contact time (CT) to meet 4-log virus removal standards. The system was originally designed to send the finished water directly to the 500,000-gallon elevated storage tank (E-1) which floats on the distribution system. This would provide the necessary chlorine CT for 4-log standards prior to reaching the first customer connection point after E-1. However, connections have been made between WTP-1 and E-1 resulting in insufficient chlorine CT.

WTP-2 (WELL #6)

WTP-2 is a Category 5 Class C facility located at 4505 SE 100th Street, Belleview, Florida with a permitted capacity of 0.864 MGD MDD. According to the MOR's, dated from May 2017 to April 2018, the plant produced an average daily flow of 0.295 MGD. The maximum flow of 0.963 MGD occurred during the month of August 2017 and exceeded the WTP's permitted capacity of 0.864 MGD MDD.

The plant is directly connected to the water distribution system and has one ground water well that pumps from the upper Floridan aquifer. Because an uninstalled backup well pump is not available for WTP-2, the firm pumping capacity of WTP-2 is 0 MGD. The plant is equipped with two hydropneumatic tanks and one ground water well that pumps from the Upper Floridan Aquifer. See **Table 14** for a summary of the well and well pump.

Table 14: WTP-2 (Well #6)

Well Number	Dia. (in.)	Total Depth (ft.)	Well Yield (gpm)	Pump Type	Pump Horsepower	Pump Capacity (gpm)	Permitted Capacity (gpd) (MDD)
#6	16	300	950	Vertical Turbine	75	950	864,000

The raw ground water is treated with a flow proportional sodium hypochlorite liquid injection. Once disinfected, the water is transferred to the plant's two on-site 10,000-gallon hydropneumatic tanks.

The raw ground water is treated with a flow proportional sodium hypochlorite liquid injection. Once injected with chlorine, the water is pumped into the distribution system. WTP-2 does not achieve sufficient onsite chlorine contact time (CT) to meet 4-log virus removal standards. The system currently sends the finished water directly through two 10,000-gallon hydropneumatic tanks which float on the distribution system. Despite this configuration, the system achieves insufficient chlorine CT to meet 4-log standards prior to reaching the first customer connection point.

Flow Data

The water demand for each of the existing water treatment plants was determined from the MOR data submitted to the FDEP for the period of January 2018 to December 2018. See **Table 15** below for a summary of the City's average daily flow and maximum daily flow for this time-period.

Table 15: Existing Potable Water Flows				
WTP	Flows (gpd)		Permitted Capacity (gpd) (MDD)	Percentage of Permitted Flow
	Annual Average Day Demand	Maximum Day Demand		
#5	545,130	1,280,000	1,220,000	105%
#6	278,509	866,000	864,000	101%
PWS	755,002	1,763,000	2,084,000	85%

According to Rule 62-555.348(3)(a), F.A.C. the City shall submit a capacity analysis report the FDEP "within six months after the month in which the total maximum-day quantity of finished water produced by the treatment plant first exceeds 75% of the total permitted maximum-day operating capacity of the plant." **Table 16** shows that the City has exceeded this 75% threshold and is currently exceeding the FDEP permitted capacity.

Capacity Evaluation

As part of the analysis of Belleview's Utility System Master Plan, a capacity evaluation of the system was performed. Typically, where multiple treatment facilities are connected to a single water system, the FDEP assumes the total system capacity to be the sum of the individual treatment facility capacities. Using FDEP criteria, Kimley-Horn performed a rating analysis of the City's WTP-1 and WTP-2, each as a standalone facility, and then as an interconnected system.

According to FDEP Rule 62-555.320(15) *well pump installations shall be considered high-service pumping stations if the well pumps serve as high-service pumps*. This is the case for both of the City's WTPs. FDEP Rule 62-555.320(15)(c) continues that each high-service pumping station *that is connected to a community water system (CWS) serving, or designed to serve, 350 or more persons or 150 or more service connections, the supplier of water shall provide an installed or uninstalled standby pump of sufficient capacity to replace the largest pump.* Assuming the City has uninstalled standby pumping capacity available, the total design capacity for both WTPs is 2.254 MGD. These calculations are included in ***Appendix D.*** Projected future demands will exceed the consolidated City's PWS capacity based on the above method.

Table 16: City of Belleview PWS 3420074 Capacity Evaluation	
WTP	Evaluated Design Capacity (MGD)
WTP-1	1.234
WTP-2	1.020
Total	**2.254**

The 1.234 MGD capacity available from WTP-1 is largely due to the storage associated with E-1. Likewise, since the hydraulic modelling demonstrates E-1 is also hydraulically connected to WTP-2, the total capacity for WTP-2 was calculated to be 1.020 MGD. **Table 17** below summarizes the existing FDEP permitted capacity as well as the future permitted capacity of the City's PWS and compares it to the projected water system demands. The demand projections included in **Table 17** do not include septic to sewer demands. This allowed us to conservatively determine when the existing system will run out of capacity should the City decide not to proceed with septic to sewer phasing. Based on the capacity analysis, the City's PWS will not have sufficient capacity to meet the projected demands in 2022.

Table 17: City of Belleview PWS 3420074 (Rated Capacity)

Water System	MDD Rated Capacity by Year			
	2018	2022	2027	2037
Current Permitted Capacity (MDD)	**2,254,000**	**2,254,000**	**2,254,000**	**2,254,000**
Total Water System Demand (MDD) (No Septic to Sewer)	**1,763,000**	**2,571,527**	**2,973,530**	**3,544,693**
Projected Remaining Permitted Capacity	**491,000**	**(317,527)**	**(719,530)**	**(1,29,693)**

Since the existing PWS will not have sufficient capacity to meet potable water demands by 2022, increased system capacity is required. To achieve this, the City will need to construct a new water treatment plant to meet the projected future demands. Additionally, the City has identified six septic to sewer regions that may be constructed within the next ten years which are contingent upon awarded grant funding. Should the City receive this funding, construction of regions 1 through 3 is expected to be complete within the next five years and 4 through 6 in the next ten years. Whether the City pursues these septic to sewer projects will affect the required capacity of the new water treatment plant as well as the timing of future plant expansions. The plant sizing was determined based on two criteria, (1) the proposed WTP must provide the necessary capacity to meet projected demands and (2) the capacity must be able to hydraulically support the City's PWS.

Without Septic to Sewer

PWS Improvement No.1A – Construct a new 1.20 MGD MDD WTP. This plant will consist of one 16" upper Floridan well equipped with a 1,750 gpm well pump and two 10,000-gallon baffled hydropneumatic tanks. The design and permitting for this project will begin in 2019 and transition to bidding and construction in the beginning of 2020. Construction is expected to be completed by the end of 2021.

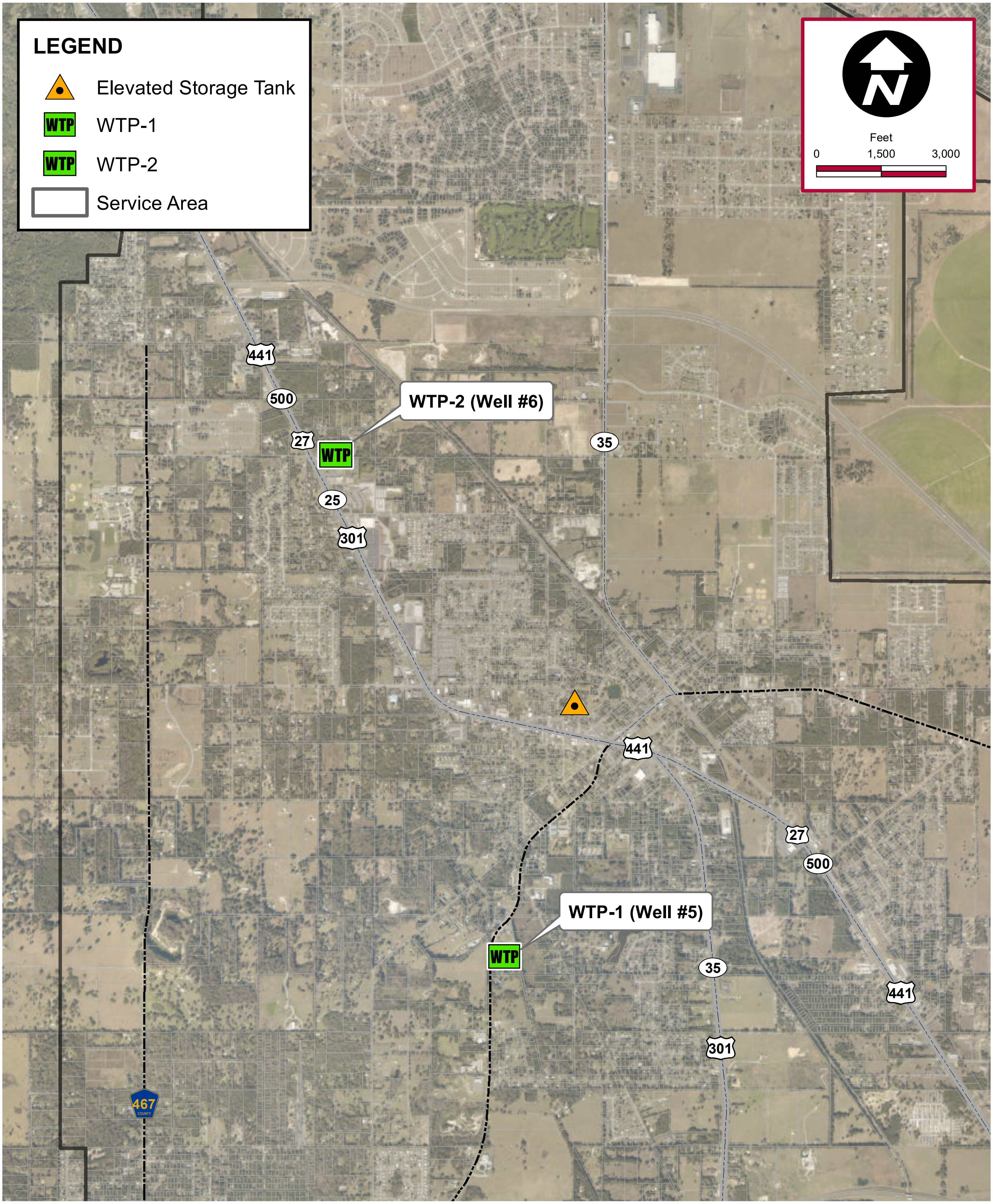
PWS Improvement No.1B – Upsize the WTP **(PWS Improvement No.1A)** from a permitted capacity of 1.20 MGD MDD to 3.60 MGD MDD. This upgrade includes the construction of a second 16" upper Floridan well equipped with a 1,750 gpm well pump, a 1.0 MG ground storage tank (GST) and four 1,750 gpm high service pumps. This project will be needed by August 2027.

With Septic to Sewer

PWS Improvement No.2A – Construct a new 2.46 MGD MDD WTP. This plant will consist of two 16" upper Floridan wells each equipped with a 1,750 gpm well pump. The plant will also include two 10,000-gallon baffled hydropneumatic tanks. The design and permitting for this project will begin in 2019 and transition to bidding and construction in the beginning of 2020. Construction is expected to be completed by the end of 2021.

PWS Improvement No.2B – Upsize the WTP **(PWS Improvement No.2A)** from a permitted capacity of 2.46 MGD MDD to 5.00 MGD MDD. This upgrade includes the construction of a 1.5 MG ground storage tank (GST) and five 1,750 gpm high service pumps. This project will be needed by February 2028.

Kimley-Horn completed a lower Floridan aquifer well feasibility analysis whereby numerical ground water scenarios were modeled to evaluate the feasibility of using a lower Floridan aquifer well to supply potable water at the existing Public Works Building in Belleview. The report also analyzed the effects of withdrawing water from the lower Floridan aquifer compared to the upper Floridan aquifer. The report concludes that in both scenarios, the impacts to wetlands, surface water bodies and users of the ground water are acceptable under SJRWMD guidelines. However, predicted drawdown in the upper Floridan aquifer would be reduced by constructing the proposed wells within the lower Floridan aquifer. See ***Appendix E*** for the Lower Floridian Aquifer Well Feasibility Modeling report.



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101 E Silver Springs Blvd, Suite 400, Ocala FL 34470
Phone: (352) 438-3000
www.kimley-horn.com CA 00000696

EXISTING WTP LOCATIONS

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

Scale: As Noted	Project No.: 042223012	May 2019	Figure 7

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WATER SYSTEM ANALYSIS AND METHODOLOGY

Introduction

This section provides an overview of the methodologies that were used in developing the hydraulic model. The hydraulic model allows for the analysis of the existing system and the system as it might exist in the future. The future system is likely to be different from the existing system because of increased demands and/or changes in the water treatment plant configuration or distribution system configuration. An analysis of the distribution system was performed to assess the improvements that will be necessary to accommodate the changes in demand and the system configuration.

Also included in this section is a detailed analysis of the existing distribution system for the Present, 5-Year, 10-Year, and 20-Year planning time lines. Analyzing the improvements and system configurations over time allows for selecting projects and configurations that make sense for the long term and that most efficiently utilize funds for capital improvements.

Hydraulic Model Development

The software used for the model development was Bentley WaterCAD V8i (SELECTseries 1). WaterCAD is a computer-based program that, with user input, calculates a wide variety of system parameters. The most useful output from the calculations is the pressure and available fire flow results. These results assist designers in identifying locations in the system where the pressures or available fire flows are below minimum acceptable values. The model can be used to assess the existing system as it is to date and how the system will respond to future increases in demand. It also allows the designer to modify or add/remove system components and establish how the water system responds to the changes. This feature is very useful for identifying capital improvement projects that will help the system's hydraulic performance.

The model operates primarily based on user input. All the elements of the existing system (i.e. - pipes, valves, junctions, water treatment plants, demands, etc.) must be input into the model. The water treatment plants provide the water sources for the model and the piping network distributes the water throughout the system to meet the demands. Calibration of the model is accomplished using fire hydrant flow and pressure information gathered in the field. The fire flow demands are input into the model and the corresponding pressures are checked to ensure that the model is reasonably predicting what was observed in the field. In the calibration process, elements within the model (i.e. - pipe frictional coefficients) may be adjusted to truth the model against field observations.

The hydraulic model was developed using the steps listed below:

1. The existing pipe network layout of each of the public water supply systems was determined using previously developed GIS mapping.
2. The existing demand distribution was determined in the following manner:
   - The City provided approximately one year of billing information.
   - The existing billing data provided the demands per active water service. To avoid over complicating the model, groups of individual demands within the vicinity of a junction nodes was assigned to that junction.
3. The operating pressures were obtained from City Utility Staff and actual plant data. The following operating pressures were used in the model:

Table 18: Existing System Operating Pressures			
WTP	Operating Pressures		Model Pressure
	Minimum	Maximum	
#5 (WTP-1)	62	66	66
#6 (WTP-2)	62	66	66

Before proposed improvements could be evaluated for the system, the hydraulic model had to be calibrated to ensure that it accurately reflected the conditions of the system in the field. The follow steps were taken to calibrate the model:

- Data Collection:
  - City staff conducted fire hydrant flow/pressure tests which were assumed to be completed during average day demand conditions. Kimley-Horn staff were present during the testing and recorded the pressures and flow readings for each of the tests. Each test used two hydrants (one pressure hydrant, one flow hydrant). Three readings were recorded for each pair of hydrants. First, the flow hydrant was completely closed and a static pressure reading was taken at the pressure hydrant. Second, the flow hydrant was opened partially. A flow reading and the residual pressure measurement were recorded for the partial flow condition. Finally, the flow hydrant was opened fully and the corresponding flow rate and residual pressure was recorded.
- Model Calibration:
  - The fire hydrant flow data was entered into the model and the pipe C values were adjusted to accurately reflect the pressure readings that were observed in the field. Model predictions that were within 10% of the actual collected data were considered acceptable. The data that fell out of that acceptable range were analyzed to determine the cause of the variation and supplemental data collection was performed to truth the model.

Peaking Factors

For the modeling analysis, maximum daily flow (MDF) and peak hour flow (PHF) conditions needed to be approximated. It is common practice to approximate the MDF and PHF conditions by multiplying the ADF demands by a factor. The FDEP estimates these factors as 2.25 for the ADF to MDF conversion and 2.0 for the MDF to PHF conversion. The FDEP factors may be used when little or no information is available for the system being analyzed. The FDEP allows alternative factors to be used provided sufficient historical information is available to accurately determine more appropriate factors. These factors have a significant impact on the modeling results and on the sizing of future components.

For the purposes of this analysis and report, a review of the historic MOR data from the past year was used to approximate the ADF to MDF factor. The MOR data revealed a historical ADF to MDF conversion factor of 2.27, therefore the FDEP factor of 2.25 was applied. Additionally, the FDEP MDF to PHF factor of 2.0 was used for the modeling analysis.

System Hydraulic Standards

Before identifying system deficiencies, system hydraulic standards needed to be established. The following hydraulic standards were used to evaluate the hydraulic model for deficiencies:

- Minimum System Pressure with Fire Flow Demand: 20 psi
- Minimum System Pressure with Peak Hour Demand: 35 psi
- Typical Network Operating Pressure Range: 45-70 psi
- Fire Flow Demand: 1,000 gpm (minimum)

Methodology

One of the primary objectives of this report is to identify the water treatment plant and distribution system improvements needed to meet future potable water demands. To ensure that future distribution system and water treatment improvements are made with the future system in mind, the analysis first establishes the 20-year demands. The hydraulic model was then used to identify the distribution and treatment improvements required to meet the 20-year demands. After establishing the required improvement sizes (i.e. water mains and plants), the intermediate demands for the 5-year and 10-year scenarios were modeled. The required system improvements for each time step were then identified using the hydraulic model while taking the future needs into account.

The approach for modeling the system was to consider as many reasonable system configurations as possible for the 20-year demand scenario and evaluate the required improvements. This evaluation included the plant capacities and distribution line sizes. The minimum system pressures and available fire flows for each scenario were compared to the hydraulic standards presented above to determine adequacy of the system components and sizes. Once the optimal 20-year system configuration was decided, the model was then loaded with the 5-year and 10-years demands to evaluate the intermediate system performance.

In the model analysis, special attention was paid to the net flows coming from each plant in the various scenarios. Since each plant has a fixed existing capacity, the model results were checked against those capacities to ensure the scenario stayed within those limits. Any scenario allowing flow greater than capacity represented a situation where the plant would need to be expanded to accommodate the additional demand or a new plant would need to be built. The model was utilized to assess the required plant expansions and/or capacities of new facilities. In addition, the impacts of water main sizes on plant capacities was reviewed to ensure that water mains were sized as efficiently as possible given the treatment plants that were online.

A total of 47 physical scenarios were modeled to evaluate the impact of adding water treatment plants, various proposed system improvements, and physical expansion and growth of the City. The relevant model scenarios are discussed in the following sections. The discussions are organized chronologically for the present; 5-year, 10-year, and 20-year design time frames. A summary is included at the end to summarize the results of the analysis and how it may impact the water distribution system.

Present Year (2018) Analysis

Included in this section are the results of scenarios for the present system configuration. All scenario results are reported for the MDF demand condition unless otherwise noted. The following scenario analyses are described in detail below:

Scenario 1: Present System

This scenario is the basis for analyzing other scenarios for deficiencies or improvements resulting from modifying the City's system. In this scenario, all existing water treatment plants are connected to the distribution system and are operating at the normal operating pressures. **Table 19** below summarizes the results of Scenario 1.

Table 19: Model Results for Scenario 1

Present Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	75.7	55.9	-	-
MDD + FF	76.9	56.6	693	3
PHD	75.9	55.9	-	-

Overall, the system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total, there are three locations in the present-day scenario that have fire flows below the minimum of 1,000 gpm.

5-Year (2022) Analysis

Significant growth within the identified infill areas, expansion areas, future known developments, and septic to sewer regions (1 through 3) are anticipated to occur within the 5-year planning horizon. The increase in total demands from the present year to the 5-year timeline is 0.591 MGD ADD. The projected septic to sewer demands are primarily responsible for driving the increasing water system demands, however the 132nd St expansion and Autumn Glen and Summer Crest developments were also contributing factors. These projected water demands were input into the model and analyzed. Multiple scenarios were analyzed based with and without anticipated septic to sewer growth. Each scenario was analyzed at maximum day, maximum day plus fire flow, and peak hour demand conditions. A total of four alternative scenarios were modeled for this analysis.

Scenario 2: 5-Year Demands (No Septic to Sewer)

This scenario analyzes the existing system infrastructure with projected 5-year demands (not including septic to sewer) to determine if any deficiencies are anticipated from the increased demand on the system. In this scenario, no changes have been made to the present-day distribution system. **Table 20** below summarizes the results of **Scenario 2.**

Table 20: Model Results for Scenario 2				
5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	75.3	55.7	-	-
MDD + FF	76.6	56.4	695	3
PHD	75.3	55.9	-	-

The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are three locations that have fire flows below the minimum of 1,000 gpm. Although the system is hydraulically functioning without any issues, additional water capacity is needed by 2020 to meet the required FDEP capacity as previously described in the Capacity Evaluation section of this report. This is achieved with the following improvements:

- **PWS Improvement No.1A:** Construct a new 1.20 MGD capacity WTP at the existing Public Works building.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484. This project is intended to deliver the water from the new WTP to the City's distribution system.

Scenario 3: 5-Year Demands with New 1.20 MGD WTP (No Septic to Sewer)

This scenario models the City's projected 5-year demands (not including septic to sewer) with a new 1.20 MGD WTP and a 12" water main extending from the new WTP to an 8" water main running along CR 484. These specific water system improvements are required to meet the projected capacity of the City's potable water system. They are summarized below:

- **PWS Improvement No.1A:** Construct a new 1.20 MGD capacity WTP at the existing Public Works building.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 21** below.

Table 21: Model Results for Scenario 3				
5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	75.6	56.2	-	-
MDD + FF	75.4	56.2	963	2
PHD	73.1	56.1	-	-

The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are two locations that have fire flows below the minimum of 1,000 gpm.

Scenario 4: 5-Year Demands (Including Septic to Sewer Regions 1-3)

This scenario analyzes the existing system infrastructure with projected 5-year demands (including septic to sewer regions 1 through 3) to determine if any deficiencies are anticipated from the increased demand on the system. In this scenario, no changes have been made to the present-day distribution system. **Table 22** below summarizes the results of **Scenario 4.**

Table 22: Model Results for Scenario 4				
5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	68.8	53.8	-	-
MDD + FF	75.9	56.2	692	3
PHD	*Failed*	*Failed*	-	-

This scenario cannot hydraulically support the projected 5-year demands (including septic to sewer). When analyzing the maximum day demands, the system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall, but the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are three locations that have fire flows below the minimum of 1,000 gpm. Although the pressures are acceptable in the MDD and MDD+FF scenarios, the system cannot hydraulically support peak hour flow.

Scenario 5: 5-Year Demands with New 2.46 MGD WTP (Including Septic to Sewer Regions 1-3)

This scenario models the City's projected 5-year demands (including septic to sewer regions 1 through 3) with a new 2.46 MGD WTP and a 12" water main extending from the new WTP to an 8" water main running along CR 484. These specific water system improvements are required to meet the projected capacity of the City's potable water system. They are summarized below:

- **PWS Improvement No.2A:** Construct a new 2.46 MGD capacity WTP at the existing Public Works building.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 23** below.

Table 23: Model Results for Scenario 5

5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	73.2	56.1	-	-
MDD + FF	74.7	56.2	934	5
PHD	69.5	47.6	-	-

The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are five locations that have fire flows below the minimum of 1,000 gpm.

10-Year (2027) Analysis

Significant growth within the identified infill areas, expansion areas, future known developments and septic to sewer regions (1 through 6) are anticipated to occur within the 10-year planning horizon. The increase in total demands from the present year to the 10-year timeline is 0.943 MGD ADD. The projected septic to sewer demands are primarily responsible for driving the increasing water system demands; however, the 132nd St expansion, along with the Autumn Glen and Summer Crest developments are also contributing to the increased demands. These projected water demands were input into the model and analyzed. Multiple scenarios were analyzed based on the assumption that either there was no septic to sewer growth or the septic to sewer regions 1 through 3 are complete. This will provide the City with several options should they choose to delay their plans for septic to sewer phasing. Each scenario was analyzed at maximum day, maximum day plus fire flow, and peak hour demand conditions. A total of three alternative scenarios were modeled for this analysis.

Scenario 6: 10-Year Demands (No Septic to Sewer)

This scenario analyzes the existing system infrastructure with projected 10-year demands (not including septic to sewer) to determine if any deficiencies are anticipated from the increased demand on the system. In this scenario, no changes have been made to the present-day distribution system. **Table 24** below summarizes the results of **Scenario 6.**

Table 24: Model Results for Scenario 6

5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	72.7	54.9	-	-
MDD + FF	76.4	56.2	693	3
PHD	72.3	55.1	-	-

The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are three locations that have fire flows below the minimum of 1,000 gpm. Although the system is hydraulically functioning without any issues, additional water capacity is needed by 2020 to meet the required FDEP capacity as previously described in the Capacity Evaluation section of this report. This is achieved with the following improvements:

- **PWS Improvement No.1A:** Construct a new 1.20 MGD capacity WTP at the existing Public Works building.
- **PWS Improvement No.3:** Construct 1,600 LF of 12” water main from the proposed WTP at the Public Works building to the 8” water main located along CR 484.

Scenario 7: 10-Year Demands with New 1.20 MGD WTP (No Septic to Sewer)

This scenario models the City's projected 10-year demands (not including septic to sewer) with a new 1.20 MGD WTP and a 12" water main extending from the new WTP to an 8" water main running along CR 484. These specific water system improvements are required to meet the projected capacity of the City's potable water system. The improvements are summarized below:

- **PWS Improvement No.1A:** Construct a new 1.20 MGD capacity WTP at the existing Public Works building.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 25** below.

Table 25: Model Results for Scenario 7

5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	75.0	56.1	-	-
MDD + FF	75.2	56.2	956	2
PHD	71.6	56.0	-	-

The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are two locations that have fire flows below the minimum of 1,000 gpm.

Scenario 8: 10-Year Demands with New 2.46 MGD WTP (Including Septic to Sewer Regions 1-6)

This scenario models the City's projected 10-year demands (including septic to sewer regions 1 through 6) with a new 2.46 MGD WTP. In addition to the water main extension to CR 484, a water main will extend from the new WTP, south along US 301 to Belmar Rd. This is necessary to provide service to septic to sewer regions 5 and 6. The intent of this scenario is to determine whether this configuration can hydraulically support the potable water system. These improvements are summarized below:

- **PWS Improvement No.2A:** Construct a new 2.46 MGD capacity WTP at the existing Public Works building.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.
- **PWS Improvement No.4:** Construct 3,650 LF of 20" water main from the proposed WTP at the Public Works building east along SE 119th St to US 301.
- **PWS Improvement No.5:** Construct 4,700 LF of 12" water main extension southbound along US 301 to Belmar Rd.
- Construct septic to sewer driven water main expansions as required by each septic to sewer development to meet the projected growth. See the Septic to Sewer Planning Study prepared by Kimley-Horn.

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 26** below.

Table 26: Model Results for Scenario 8				
5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	71.9	55.9	-	-
MDD + FF	74.4	56.1	894	12
PHD	66.6	40.7	-	-

The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. The minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are twelve locations that have fire flows below the minimum of 1,000 gpm.

20-Year (2037) Analysis

Significant growth within the identified infill areas, expansion areas, future known developments and septic to sewer regions (1 through 6) are anticipated to occur within the 20-year planning horizon. The increase in total demands from the present year to the 20-year timeline is 1.299 MGD ADD. The projected septic to sewer demands are primarily responsible for driving the increasing water system demands, however the 132nd St expansion, along with the Autumn Glen and Summer Crest developments are also contributing to the increased demands. These projected water demands were input into the model and analyzed. Multiple scenarios were analyzed based on the assumption either there was no septic to sewer growth or that septic to sewer regions 1 through 6 are complete. This will provide the City with several options should plans for septic to sewer phasing are delayed. Each scenario was analyzed at maximum day, maximum day plus fire flow, and peak hour demand conditions. A total of five alternative scenarios were modeled for this analysis.

Scenario 9: 20-Year Demands (No Septic to Sewer)

This scenario analyzes the existing system infrastructure with projected 20-year demands (not including septic to sewer) to determine if any deficiencies are anticipated from the increased demand on the system. In this scenario, no changes have been made to the present-day distribution system. **Table 27** below summarizes the results of **Scenario 9.**

Table 27: Model Results for Scenario 9				
5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	67.0	52.1	-	-
MDD + FF	76.3	56.2	690	3
PHD	*Failed*	*Failed*	-	-

This scenario cannot hydraulically support the projected 20-year demands (not including septic to sewer). When analyzing the maximum day demands, the system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall, but the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are three locations that have fire flows below the minimum of 1,000 gpm. Although the pressures are acceptable in the MDD and MDD+FF scenarios, the system cannot hydraulically support peak hour flow.

Scenario 10: 20-Year Demands with Upsized 3.60 MGD WTP (No Septic to Sewer)

This scenario models the City's projected 20-year demands (not including septic to sewer). The proposed WTP at the Public Works building has been upsized to a 3.60 MGD capacity to meet the additional water capacity required for projected future demands. This upgrade is required by August 2027. The capacity of the WTP is described in more detail in the Capacity Evaluation section of this report. There is also a 12" water main extending from the new WTP to an 8" water main running along CR 484. The intent of this scenario to determine whether this configuration can hydraulically support the potable water system, or if additional water mains are required. These improvements are summarized below:

- **PWS Improvement No.1B:** Upsize the new WTP at the existing Public Works building from a capacity of 1.20 MGD MDD to 3.60 MGD MDD.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 28** below.

Table 28: Model Results for Scenario 10

5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	72.5	56.0	-	-
MDD + FF	74.7	56.2	946	3
PHD	68	51.8	-	-

This scenario can hydraulically support the projected 20-year demands (not including septic to sewer). The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are three locations that have fire flows below the minimum of 1,000 gpm.

Scenario 11: 20-Year Demands with Upsized 5.0 MGD WTP (Including Septic to Sewer Regions 1-6)

This scenario models the City's projected 20-year demands (including septic to sewer regions 1 through 6). The proposed WTP at the Public Works building has been upsized to a 5.0 MGD capacity to meet the additional water capacity required for projected future demands. This upgrade is required by February 2028. The capacity of the WTP is described in more detail in the Capacity Evaluation section of this report. In addition to the water main extension to CR 484, a water main will extend from the new WTP, south along US 301 to Belmar Rd. This is necessary to provide service to septic to sewer regions 5 and 6. The intent of this scenario is to determine whether this configuration can hydraulically support the potable water system or if additional water mains are required. These improvements are summarized below:

- **PWS Improvement No.2B:** Upsize the new WTP at the existing Public Works building from a capacity of 2.46 MGD MDD to 5.0 MGD MDD.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.
- **PWS Improvement No.4:** Construct 3,650 LF of 20" water main from the proposed WTP at the Public Works building east along SE 119th St to US 301.
- **PWS Improvement No.5:** Construct 4,700 LF of 12" water main extension southbound along US 301 to Belmar Rd.
- Construct septic to sewer driven water main expansions as required by each septic to sewer development to meet the projected growth. See the Septic to Sewer Planning Study prepared by Kimley-Horn.

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 29** below.

Table 29: Model Results for Scenario 11				
5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	67.6	52.6	-	-
MDD + FF	74.8	56.2	881	25
PHD	*Failed*	*Failed*	-	-

This scenario cannot hydraulically support the projected 20-year demands (including septic to sewer regions 1 through 6). When analyzing the maximum day demands, the average system pressure is below the typical operating pressure of 55 psi. The minimum pressure is also barely above the 20-psi minimum. Available fire flow coverage is poor. In total there are 25 locations that have fire flows below the hydraulic minimum of 1,000 gpm. Additionally, the system cannot hydraulically support peak hour flow. Therefore, additional water mains are required to better deliver flow from the new WTP throughout the distribution system.

Scenario 12: 20-Year Demands with Upsized 5.0 MGD WTP and Downtown Water Main Connection (Including Septic to Sewer Regions 1-6)

This scenario models the City's projected 20-year demands (including septic to sewer regions 1 through 6). The proposed WTP at the Public Works building has been upsized to a 5.0 MGD capacity to meet the additional water capacity required for projected future demands. This upgrade is required by February 2028. The capacity of the WTP is described in more detail in the Capacity Evaluation section of this report. In addition to the water main extension to CR 484, a water main will extend from the new WTP, north along US 301, and connect to an existing 12" water main along SE Baseline Rd downtown. The intent of this scenario is to determine whether this configuration can hydraulically support the potable water system. These improvements are summarized below:

- **PWS Improvement No.2B:** Upsize the new WTP at the existing Public Works building from a capacity of 2.46 MGD MDD to 5.0 MGD MDD.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.
- **PWS Improvement No.4:** Construct 3,650 LF of 20" water main from the proposed WTP at the Public Works building east along SE 119th St to US 301.
- **PWS Improvement No.5:** Construct 4,700 LF of 12" water main extension southbound along US 301 to Belmar Rd.
- **PWS Improvement No.6:** Construct 4,650 LF of 12" water main northbound along US 301 and northeast along SE Babb Rd to tie into the existing 12" water main along SE Baseline Rd.

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 30** below.

Table 30: Model Results for Scenario 12

5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	73.0	56.2	-	-
MDD + FF	75.8	56.2	880	2
PHD	67.1	51.0	-	-

This scenario can hydraulically support the projected 20-year demands (not including septic to sewer). The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are two locations that have fire flows below the minimum of 1,000 gpm. Kimley-Horn determined that the addition of **PWS Improvement No.6** will be needed by 2036.

Scenario 13: 20-Year Demands with Upsized 5.0 MGD WTP and 132nd St Water Main Connection (Including Septic to Sewer Regions 1-6)

This scenario models the City's projected 20-year demands (including septic to sewer regions 1 through 6). The proposed WTP at the Public Works building has been upsized to a 5.0 MGD capacity to meet the additional water capacity required for projected future demands. This upgrade is required by February 2028. The capacity of the WTP is described in more detail in the Capacity Evaluation section of this report. This scenario offers an alternative water main route to **Scenario 12** that will also hydraulically support the system. In addition to the water main extension to CR 484, a water main will extend from the new WTP, south along US 301, and connect to another proposed water main along 132nd St. This 132nd St water main will connect to an existing 12" water main at 132nd St and US 441. The intent of this scenario is to determine whether this configuration can hydraulically support the potable water system. These improvements are summarized below:

- **PWS Improvement No.2B:** Upsize the new WTP at the existing Public Works building from a capacity of 2.46 MGD MDD to 5.0 MGD MDD.
- **PWS Improvement No.3:** Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484.
- **PWS Improvement No.4:** Construct 3,650 LF of 20" water main from the proposed WTP at the Public Works building east along SE 119th St to US 301.
- **PWS Improvement No.5:** Construct 4,700 LF of 12" water main extension southbound along US 301 to Belmar Rd.
- **PWS Improvement No.7:** Construct 2,900 LF of 12" water main extension southbound along US 301 from Belmar Rd to SE 132nd St.
- **PWS Improvement No.8**: 132nd St WM Extension. (Construct 13,400 LF of 12" PVC water main along SE 132nd St from US 441 west to CR 484)

The above improvements are shown in the overall water system improvements map, see **Figure 8**. The resulting system performance is summarized in **Table 31** below.

Table 31: Model Results for Scenario 13				
5-Year	Avg. System Pressure (psi)	Min. System Pressure (psi)	Min. Available Fire Flow (gpm)	Number of Fire Flows Less Than 1,000 gpm
MDD	70.1	55.1	-	-
MDD + FF	75.5	56.2	880	2
PHD	59.7	42.9	-	-

This scenario can hydraulically support the projected 20-year demands (not including septic to sewer). The system is operating within the minimum system pressure standard established by FDEP. The average system pressure is above the typical operating pressure of 55 psi. The minimum pressure is also above the 20-psi minimum. Available fire flow coverage is good overall. However, the minimum fire flow is below the 1,000 gpm hydraulic standard. In total there are two locations that have fire flows below the minimum of 1,000 gpm. Kimley-Horn determined that the addition of **PWS Improvements No.7 and No.8** will be needed by 2036.

Buildout Analysis (Septic to Sewer Regions 7 – 11)

Assuming the City constructs the potable water system improvements proposed in the previous section, the City's system still cannot support the buildout demand scenario when modeled. The additional demands associated with septic to sewer regions 7 through 11 require additional capacity that is not supported by WTP-1, WTP-2 and the proposed WTP at the Public Works Building. Additionally, the City cannot hydraulically meet the demands in the buildout scenario as their existing infrastructure is not suited to supply such large flows to these identified septic to sewer areas. Kimley-Horn concluded that an additional WTP and the required piping will be needed to meet buildout capacity and satisfy system requirements. It is recommended that this WTP be located along Baseline Rd to better supply the northern portion of the City's service area.

RECOMMENDED WATER SYSTEM CAPITAL IMPROVEMENT PROJECTS

Introduction

This section provides a discussion of the capital improvement projects that are recommended to address current deficiencies and meet future potable water demands. Included in this section is a project list of recommended projects at the present year, 5-year, 10-year, and 20-year planning projections. The proposed capital improvement projects were discussed with City staff and prioritized. See **Figure 8** for an overall map of recommended water system improvements. See ***Appendix C*** for an opinion of probable cost for each individual improvement listed below.

WITHIN THE NEXT 5 YEARS:

Should the City proceed with septic to sewer regions 1 through 3 in the next five years as expected, they will need to construct the necessary septic to sewer driven water main expansions as required by each septic to sewer development to meet the projected growth. See the Septic to Sewer Planning Study prepared by Kimley-Horn.

PWS Improvement No.1A:

Construct a new 1.20 MGD MDD WTP if septic to sewer is not constructed. This plant will consist of one 16" upper Floridan well equipped with a 1,750 gpm well pump and two 10,000-gallon baffled hydropneumatic tanks. The design and permitting for this project will begin in 2019 and transition to bidding and construction in the beginning of 2020. Construction is expected to be completed by the end of 2021.

PWS Improvement No.2A:

Construct a new 2.46 MGD MDD WTP if the City proceeds with septic to sewer construction. This plant will consist of two 16" upper Floridan wells each equipped with a 1,750 gpm well pump. The plant will also include two 10,000-gallon baffled hydropneumatic tanks. The design and permitting for this project will begin in 2019 and transition to bidding and construction in the beginning of 2020. Construction is expected to be completed by the end of 2021.

PWS Improvement No.3:

Construct 1,600 LF of 12" water main from the proposed WTP at the Public Works building to the 8" water main located along CR 484. This project is intended to deliver the water from the new WTP to the City's distribution system. The design and permitting for this project will begin in 2019 and transition to bidding and construction in the beginning of 2020. Construction is expected to be completed by the end of 2021.

WITHIN THE NEXT 10 YEARS:

Should the City proceed with septic to sewer regions 1 through 6 in the next ten years as expected, they will need to construct the necessary septic to sewer driven water main expansions as required by each septic to sewer development to meet the projected growth. See the Septic to Sewer Planning Study prepared by Kimley-Horn.

PWS Improvement No.4:

Construct 3,650 LF of 20" water main from the proposed WTP at the Public Works building east along SE 119th St to US 301. If the Septic to Sewer regions 1 through 6 are constructed, this improvement is needed within the next 10 years.

PWS Improvement No.5:

Construct 4,700 LF of 12" water main southbound along US 301 from SE 119th St to Belmar Rd. If septic to sewer regions 1 through 6 are constructed, this improvement is needed within the next 10 years. If **PWS Improvements No.7 and No.8** are constructed as well, the City can connect the new WTP to the distribution system via an existing 12" water main along 132nd St. This would hydraulically satisfy the potable water system throughout 2037. An alternative to this would be **PWS Improvement No.6**.

WITHIN THE NEXT 20 YEARS:

Should the City proceed with septic to sewer regions 1 through 6 in the next ten years as expected, they will need to construct the necessary septic to sewer driven water main expansions as required by each septic to sewer development to meet the projected growth. See the Septic to Sewer Planning Study prepared by Kimley-Horn.

PWS Improvement No.1B:

Upsize the new WTP **(PWS Improvement No.1A)** from a permitted capacity of 1.20 MGD MDD to 3.60 MGD MDD if septic to sewer is not constructed. This upgrade includes the construction of a second 16" upper Floridan well equipped with a 1,750 gpm well pump, a 1.0 MG ground storage tank (GST) and four 1,750 gpm high service pumps. This project will be needed by August 2027.

PWS Improvement No.2B:

Upsize the new WTP **(PWS Improvement No.2A)** from a permitted capacity of 2.46 MGD MDD to 5.00 MGD MDD if the City proceeds with septic to sewer construction. This upgrade includes the construction of a 1.5 MG ground storage tank (GST) and five 1,750 gpm high service pumps. This project will be needed by February 2028.

PWS Improvement No.6:

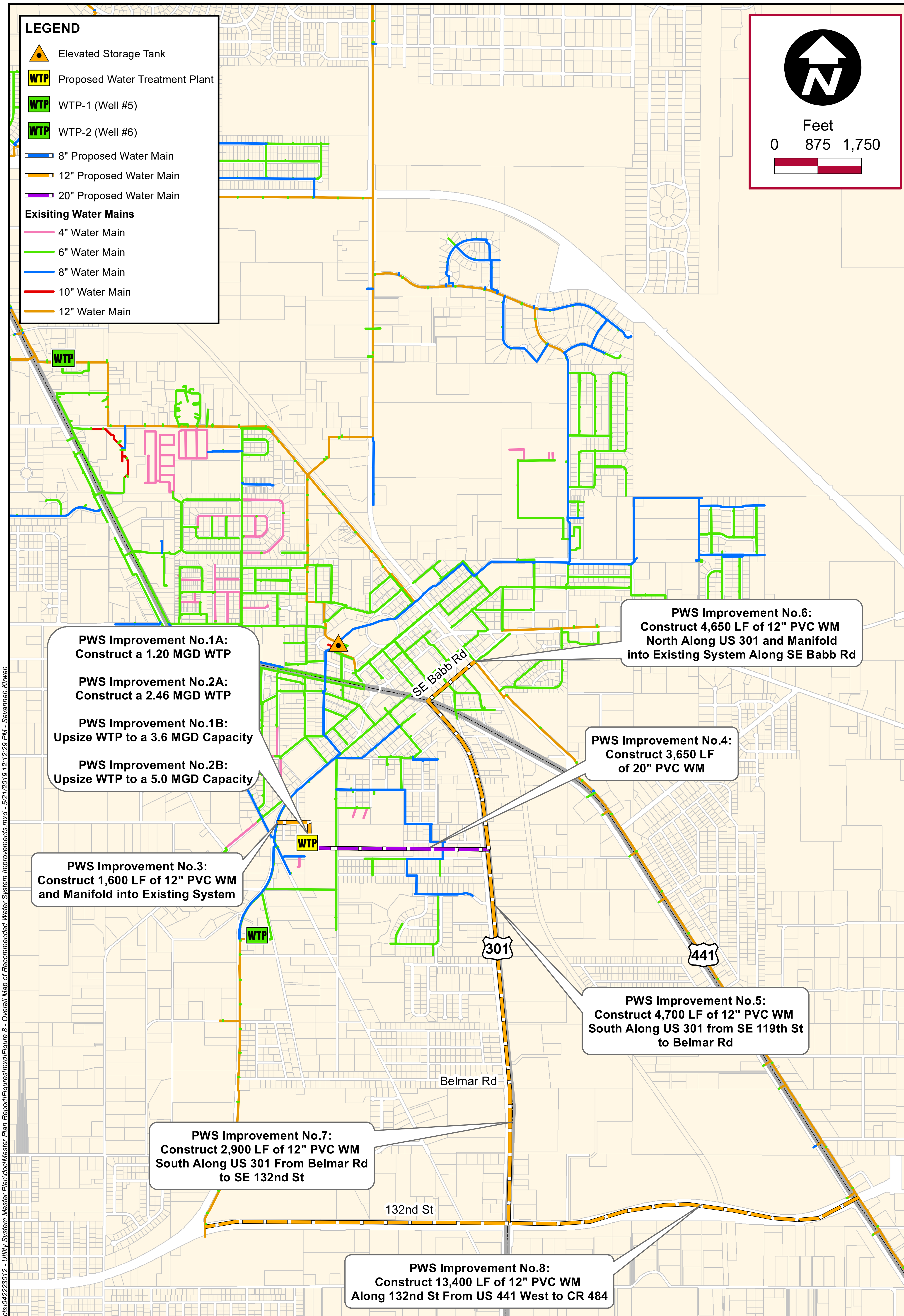
Construct 4,650 LF of 12" water main northbound along US 301 and northeast along SE Babb Rd to tie into the existing 12" water main along SE Baseline Rd. This project is intended to provide a better route to deliver the water from the new WTP directly to the City's distribution system. If the City proceeds with septic to sewer, this project will need to be constructed by 2036.

PWS Improvement No.7:

Construct 2,900 LF of 12” water main southbound along US 301 from Belmar Rd to SE 132nd St. This improvement should be constructed if the City proceeds with septic to sewer as well as the 132nd St water main extension (**PWS Improvement No.8**) as it would loop the system and hydraulically satisfy the service area. This is a developer driven project as it is contingent of the development along 132nd St.

PWS Improvement No.8:

Construct the 132nd St water main extension which consists of constructing 13,400 LF of 12” PVC water main extension along 132nd St from US 441 west to CR 484. This improvement is intended to convey water to new customers along 132nd St. This is a developer driven project as it is contingent of the development along 132nd St.



Kimley»Horn

OVERALL MAP OF RECOMMENDED WATER SYSTEM IMPROVEMENTS

UTILITY MASTER PLAN
BELLEVIEW, FL

May 2019	Project No. 042223012	Figure 8

K:\OCA_Utilities\Belleview\Projects\042223012 - Utility System Master Plan\doc\Master Plan Report\Figures\mxd\Figure 8 - Overall Map of Recommended Water System Improvements.mxd - 5/21/2019 12:12:29 PM - Savannah.Kirwan

SANITARY SEWER SYSTEM

Introduction

This section discusses the existing sanitary sewer collection and treatment system owned and operated by the City of Belleview. The information includes an evaluation of the collection systems and sanitary sewer treatment systems. Effluent disposal and reclaimed water are described and discussed in the next section.

Existing Sanitary Sewer Treatment and Collection System Overview

The City of Belleview's sanitary sewer collection and transmission system consists of the following components (approximately):

- Approximately 19.5 miles of force main
- Approximately 50 miles of gravity sewer main
- 28 existing lift stations maintained by the City
- 4 existed in-active lift stations maintained by the City (2 for future use)
- 4 existing Lift Stations privately maintained (1 in-active)
- 955 manholes maintained by the City
- 61 manholes privately maintained
- Belleview Wastewater Treatment Facility

The City currently operates one water reclamation facility (WRF) located near the intersection of SE 116th St and SE 58th Ave. The Belleview WRF is currently operating under FDEP Permit No. FLA010678. The facility has a permitted capacity of 0.760 MGD Annual Average Daily Flow (AADF). Effluent disposal is either by restricted access land application or public access reuse. Land Application R-001 consists of a 19.5-acre restricted access spray field with a permitted capacity of 0.300 MGD AADF and a three day (3.48 million gallon) wet weather lined holding pond. Land Application R-002 is a public access reuse system consisting of the 70-acre Baseline Golf Course with permitted capacity of 0.300 MGD AADF and the 374-acre Spruce Creek Golf Course with permitted capacity of 1.0 MGD AADF.

The FDEP is responsible for issuing the permits for construction and operation of domestic sanitary sewer treatment facilities in the State of Florida. The following is a list of the City's current sanitary sewer permits.

Table 32: Sanitary Sewer System Permit

Permit Number	Permit Type	Issuing Agency	Service Area	Date of Issue	Date of Expiration
FLA010678	Domestic WWTF Permit	FDEP	City of Belleview	October 22, 2014	October 21, 2019

The Belleview WRF provides primary biological wastewater treatment utilizing sequencing batch reactors (SBR) as manufactured by Fluidyne. There are two SBR's at the City's facility. The SBR's combine treatment processes, biological nutrient reduction and clarification, into a single tank. The bio-solids (sludge) produced from the process are dewatered on site and then disposed of at the Marion County Landfill.

SANITARY SEWER SYSTEM ANALYSIS AND METHODOLOGY

Introduction

This section provides an overview of the City's sanitary sewer collection system, sanitary sewer system modeling and scenario analysis, wastewater treatment facility (WWTF) capacities, and sanitary sewer system infrastructure improvements. The City's existing sanitary sewer collection system is shown in **Figure 9**. The sanitary sewer system analysis described in this section addresses future population growth and the corresponding system demand within the City's service area as well as the existing sanitary sewer infrastructure operations required to make the system run efficiently.

Hydraulic Model Development

A hydraulic model using SewerCAD modeling software was created for the City's pressurized sewer system (lift stations and force mains). The model was used to evaluate the performance of the sanitary sewer collection system under current and future sanitary sewer flow conditions. For master planning purposes, a system-wide SewerCAD model was completed by incorporating parcel level sanitary sewer demands into individual sewersheds to create the model. The City provided Kimley-Horn with existing lift station information including lift station name and number, wet well depth, pump model, pump horsepower, design point, pump run time, and impeller size. The system-wide model was used to (1) evaluate the available capacity in the existing sanitary sewer collection system under future flow scenarios and (2) evaluate short-term and long-term system improvements.

Methodology

The sanitary sewer system hydraulic model was used to analyze and aid in sizing various elements of the collection system to meet the existing, 5-year, 10-year, and 20-year projected demands. Existing, infill, expansion, and future development flow scenarios were analyzed by steady-state modeling of the pressurized sanitary sewer collection system. Two different methods of steady-state modeling were used: the "pump model" method and the "flow model" method.

PUMP MODEL

The pump model option was used to simulate the pressurized collection system by incorporating the actual pump curves for the pumps at each lift station. Each lift station is individually modeled to determine if the modeled results match the anticipated point on the pump curve. The steady-state model simulation was then applied with either all the pumps or a portion of the pumps in a manifold force main running concurrently. The pump model was used to flag existing and future lift stations that could not pump against the system head produced when all pumps are active. These lift stations received closer scrutiny in the flow model for both existing and future conditions.

FLOW MODEL

The flow model option was used for evaluation of the lift stations and pressurized collection system. The flow model ignores pump curve information. Instead, parcel level flow estimates are assigned to specific "sewersheds" created for each lift station. Then, the hydraulic performance of the force main during peak hour demand is compared to the level of service and design standards for pressurized pipes.

The sanitary sewer system hydraulic standards and operating guidelines were developed from the City's land development code, FDEP standards, and with information provided by the City. The sanitary sewer system hydraulic standards are described below.

- Minimum force main design velocity: 2 fps
- Maximum force main design velocity: 7 fps
- 80% pipe flow for 8” gravity sewer: 273.8 cfs
- 80% pipe flow for 10” gravity sewer: 498.2 cfs
- Peak Hour Factor: 4.0

The flows into each lift station sewershed were multiplied by the peaking factor designated by the sanitary sewer system hydraulic standards to estimate the loading rates of each lift station and the hydraulic performance of the force mains. The lift stations that do not pump directly to the WRF were added to the flows of the appropriate downstream lift station. The results of the flow model are summarized in ***Appendix F.***

Collection System

The City’s collection system consists of a gravity sewer system and a pressurized system (lift stations and force mains). An analysis of the City’s gravity system revealed that they are currently exceeding their gravity system capacity where several force mains are simultaneously discharging flow to the north portion of the gravity system. **Figure 10** shows the analysis of the existing gravity system and highlights the portions which are exceeding capacity.

Four groups of lift stations manifold together into various force mains. Group 1 is composed of Lift Stations No. 32, 11, and 9. Group 1 manifolds into a 6-inch force main and ultimately discharges into a manhole located at 116th St, near the WRF. Group 2 is composed of Lift Stations No. 35 and 22. Group 2 manifolds into a 6-inch force main and is discharged into a manhole along Baseline Rd south of SE 96th Place Rd. Group 3 is composed of Lift Stations No. 34, 5, 19, and 20. Group 3 manifolds into a 6-inch force main and is discharged into a manhole along SE Babb Rd. Group 4 is composed of Lift Stations No. 43 and 44. Group 4 manifolds into a 6-inch force main which is later upsized to an 8-inch force main and discharges into gravity sewer near the WRF. For a summary of the lift stations that manifold into force mains, see **Table 33** below. All other lift stations are either re-pumped or discharge directly to gravity. For a list of active lift stations that re-pump flow, see **Table 34** below.

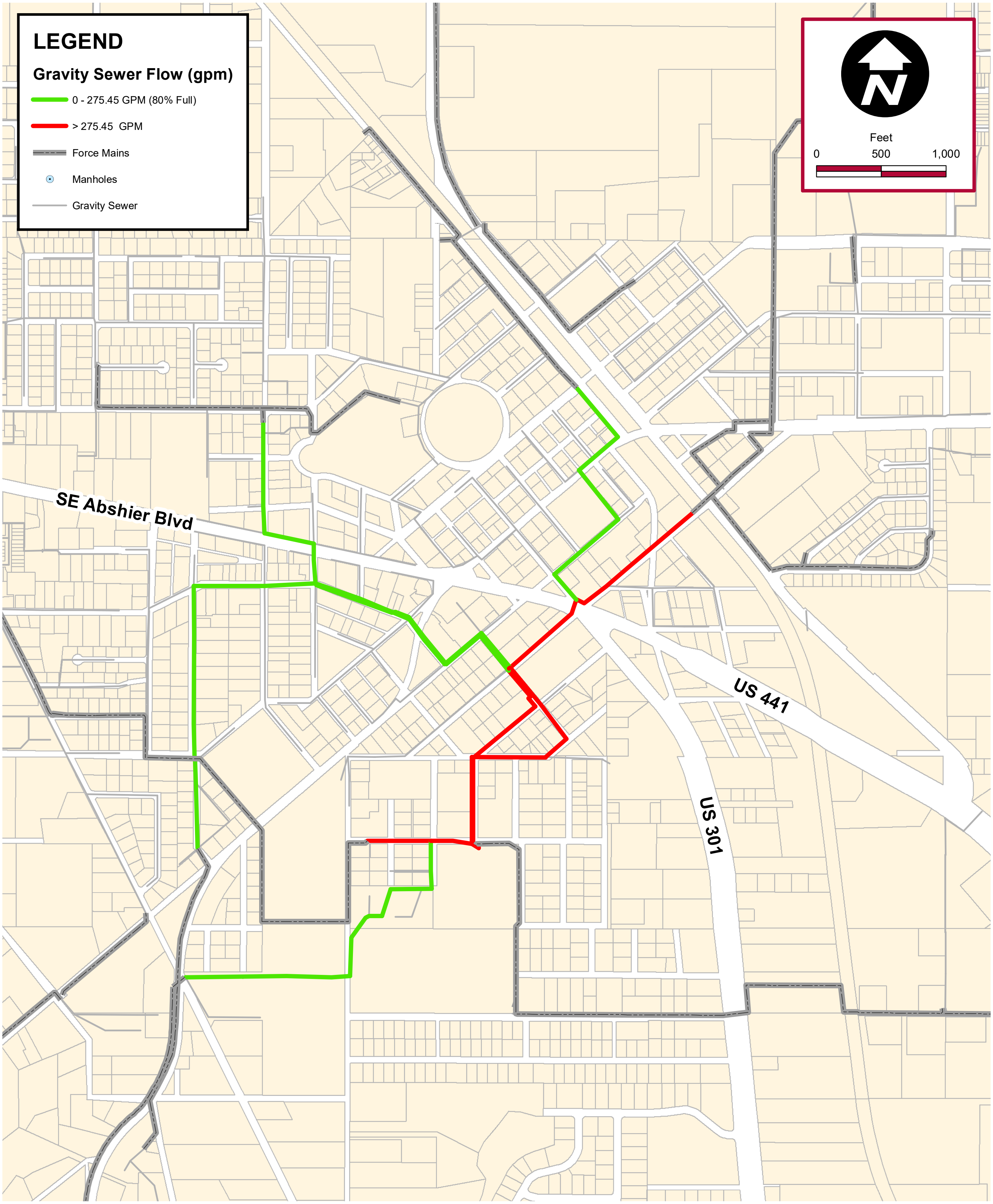
Table 33: Manifolding Force Main Systems

Group No.	Contributing Lift Stations
1	32, 11, 9
2	35, 22
3	34, 5, 19, 20
4	43, 44

Table 34: Re-Pump Lift Stations	
Lift Station No.	Contributing Lift Stations
1	4, 5, 6, 9, 11, 15, 19, 20, 32, 34, 39, 43, 44
4	21
5	7, 10, 26
6	8, 12, 13, 14
9	16
11	33
21	22, 35
22	23, 37
23	24
31	30
32	31
37	38
44	45

Demand Distribution

The sanitary sewer demands were determined from previous billing data provided by the City as well as population projection data. This methodology is described in the Demand Projection section of this report. The demands used in in the Flow Model include the expected future flows from Septic to Sewer regions 1 through 6, as well as other expansion areas including Autumn Glen and SE 132nd St. These demands were assigned to individual parcels which are grouped into “sewersheds.” Each sewershed represents a collection of parcels which all contribute sanitary sewer flows to a specific lift station. A map of all the sewer sheds can be seen in **Figure 11.**



K:\OCA_Utilities\Belleview\Projects\042223012 - Utility System Master Plan\doc\Master Plan Report\Figures\mxd\Figure 10 - Existing Gravity Sewer System Capacity.mxd - 5/21/2019 12:30:04 PM - Savannah.Kirwan

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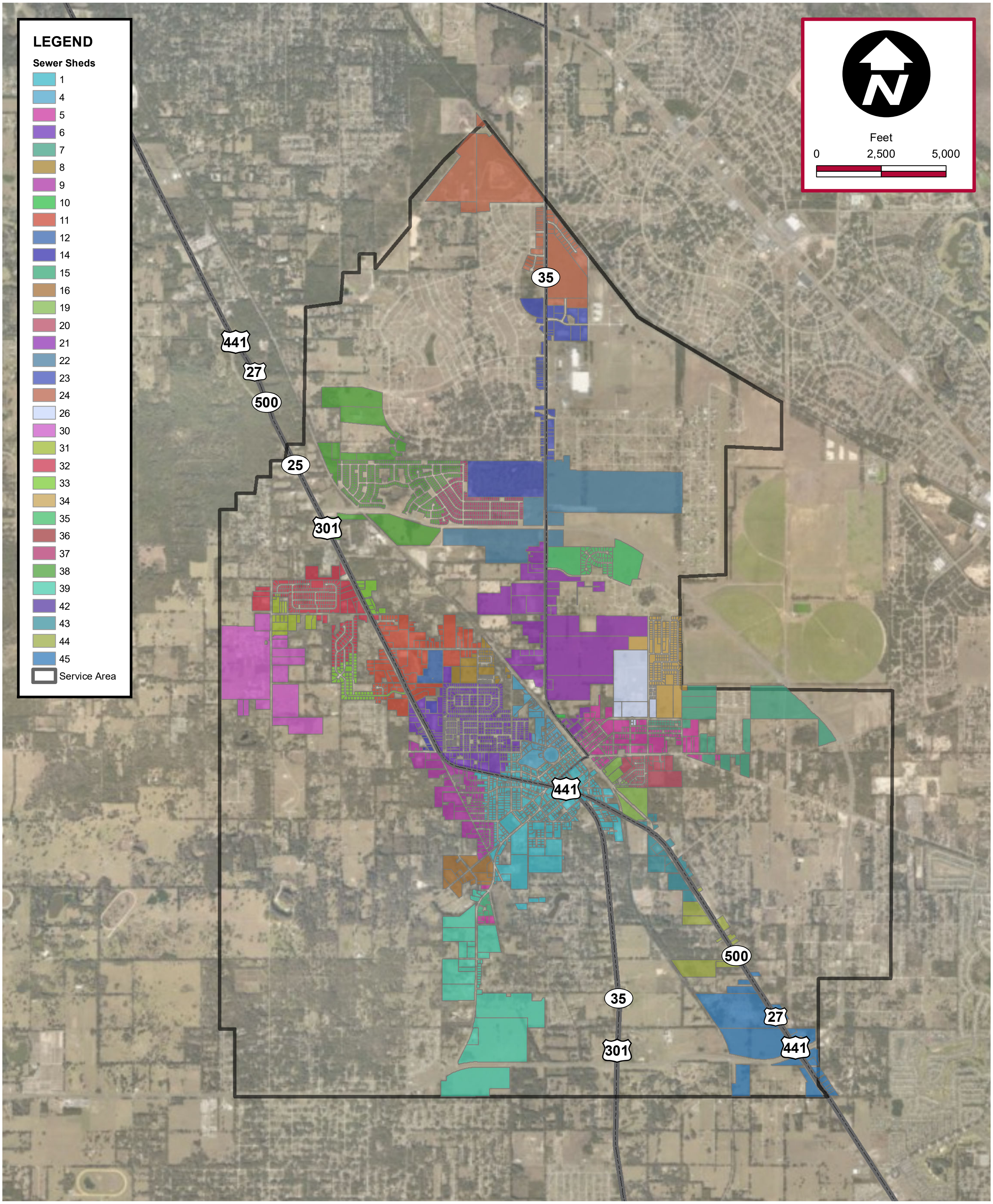
Phone: (352) 438-3000
www.kimley-horn.com CA 00000696

EXISTING GRAVITY SEWER SYSTEM CAPACITY

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

Scale: As Noted	Project No.: 042223012	May 2019	Figure 10



K:\OCA_Utilities\Belleview\Projects\042223012 - Utility System Master Plan\doc\Master Plan Report\Figures\mxd\Figure 11 - Sewer Sheds.mxd - 5/21/2019 12:21:14 PM - Savannah.Kirwan

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101 E Silver Springs Blvd, Suite 400, Ocala FL 34470
Phone: (352) 438-3000
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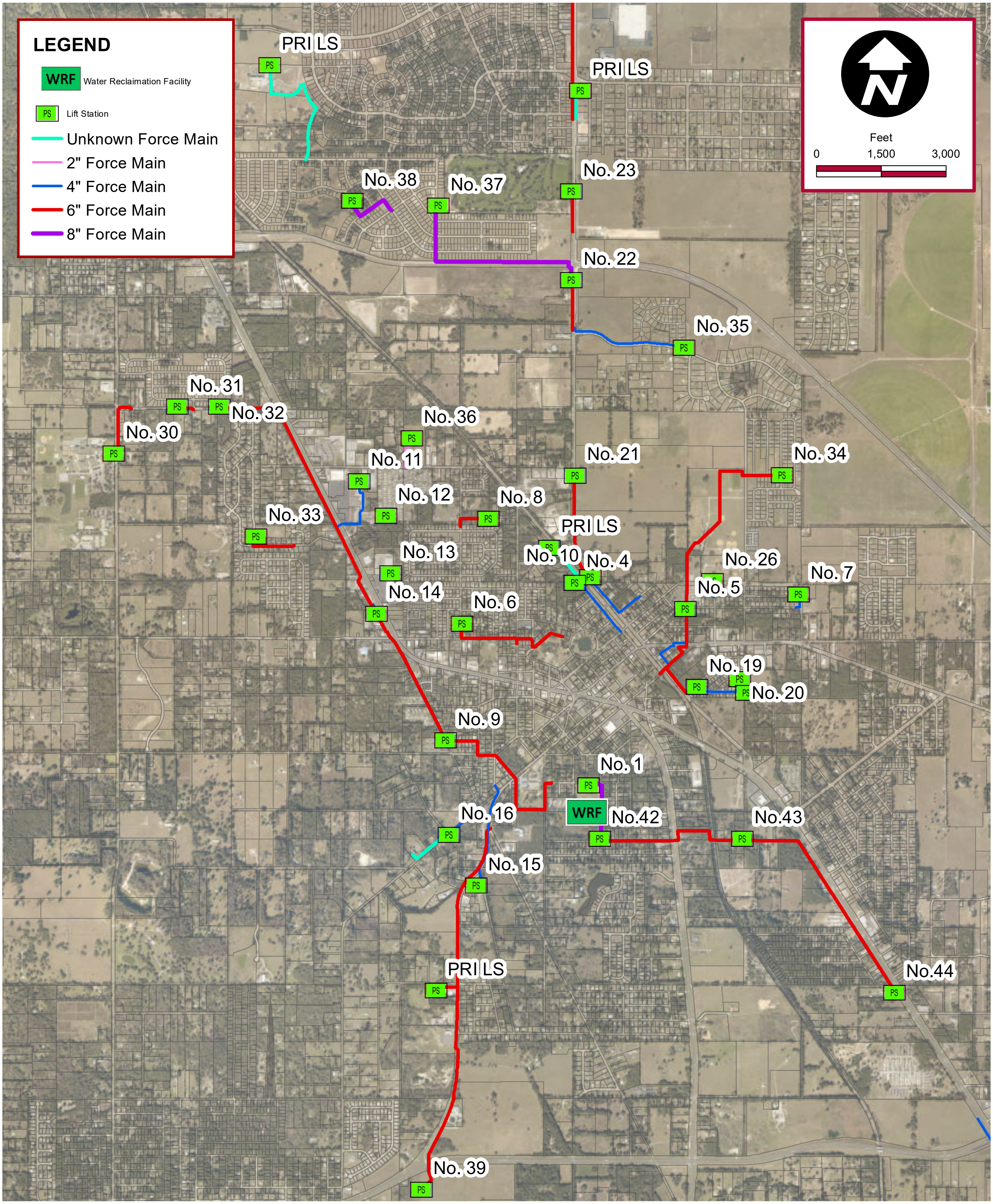
SEWER SHEDS

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

Scale: As Noted	Project No.: 042223012	May 2019	Figure 11



K:\OCA_Utilities\Belleview\Projects\042223012 - Utility System Master Plan\doc\Master Plan Report\Figures\mxd\Figure 9 - Existing Sanitary Sewer System.mxd - 5/21/2019 12:29:32 PM - Savannah.Kirwan

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EXISTING SANITARY SEWER COLLECTION SYSTEM

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

Scale: As Noted	Project No.: 042223012	May 2019	Figure 9

Model Results

The “flow” and “pump” modeling methods were used to evaluate system performance for each of the flow scenarios against specific hydraulic standards, evaluation criteria, or operating guidelines. If an evaluation criterion was not met, then a proposed system improvement was identified.

PRESENT YEAR (2018) ANALYSIS

LIFT STATIONS

The flow model results indicate that four lift stations do not have sufficient capacity and are unable to pump the estimated influent peak hour flows (PHFs). These results are described in **Table 35**.

Table 35: Present Day Scenario - Lift Stations with Insufficient Pumping Capacity

	Pump 1 Capacity (gpm)	Pump 2 Capacity (gpm)	PHF (gpm)	Pump 1 Deficiency (gpm)	Pump 2 Deficiency (gpm)
LS No.6	172	194	187.2	15.19	-
LS No.11	132	246	132.2	0.17	-
LS No.32	88	111	102.0	14.01	-
LS No.39	0	44	3.95	3.95	-

Based on the above results, LS No.6, LS No.11, LS No.32 and LS No.39 all require new pumps to meet the present-day flows. For this analysis, if the first and second pump in a lift station require replacement in less than 5 years from each other, Kimley-Horn recommends replacing both pumps at once. This avoids needing to resize the capacity of the lift station and avoids repeating electrical upgrades. **WW Improvement No.1** replaces both pumps at LS No.6. They will be sized to meet a 20-year PHF of 215.1 gpm. **WW Improvement No.2** will install a second pump in LS No.39. It will be sized to meet a 20-year PHF of 11.8 gpm.

Since LS No.11 and No.32 are a part of a manifolding system with LS No.9, the 20-year projected sanitary sewer flows were input into the SewerCAD model as fixed capacity pumps. The model was run and used to determine the required pump head necessary to pump the estimated flows to their outfall location. The recommended pump improvements were then simulated in the model. The results were used to determine if any additional lift stations or force mains would be impacted from the increase in flows. **WW Improvement No.3** involves the replacement of both pumps at LS No. 32. Based on the flow and pump models, both pumps must be sized to meet a 20-year PHF of 171.8 gpm with a TDH of 207.3 ft. **WW Improvement No.4** involves the replacement of both pumps at LS No.11. Based on the flow and pump models, both pumps must be sized to meet a 20-year PHF of 170.3 gpm with a TDH of 226.6 ft.

WW Improvements No.5A, 5B, 5C and 5D involve constructing a new force main to alleviate demand on the City's gravity system. These projects will connect LS No. 22, 35, 21, 34, 5, 19, 20, 43 and 44 into a single manifolded system. **WW Improvements 5A and 5B** include the design, permitting and construction of an 8-inch force main south along Baseline Rd to Babb Rd as well as lift station modifications at LS No. 22, 35 and 21. These improvements are developer driven meaning the timing of when they are needed is directly dependent on the development rate of Summer Crest. Summer Crest currently has 75 lots occupied, and it is assumed to increase at 50 lots/year. When modeled, these improvements require the replacement of each pump at LS No. 22, 35 and 21. The pump sizing will be based on the following:

- Both pumps at LS No.22 must meet a 20-year PHF of 463.8 gpm with a TDH of 108.5 ft
- Both pumps at LS No.35 must meet a 20-year PHF of 27.3 gpm with a TDH of 163.7 ft
- Both pumps at LS No.21 must meet a 20-year PHF of 13.6 gpm with a TDH of 152.3 ft

WW Improvements 5C and 5D include the design, permitting and construction of the 8-inch proposed force main south along Baseline Rd from Babb Rd and then west along SE 119th St directly to the City's WRF. These projects also include lift station modifications at LS No. 34, 5, 19, 20, 43 and 44. These projects are not developer driven and are needed now to alleviate the existing demand on the City's gravity system. When modeled, these improvements require the replacement of each pump at LS No. 34, 5, 19, 20, 43 and 44. The pump sizing will be based on the following:

- Both pumps at LS No.34 must meet a 20-year PHF of 101.26 gpm with a TDH of 124.1 ft
- Both pumps at LS No.5 must meet a 20-year PHF of 117.8 gpm with a TDH of 136.9 ft
- Both pumps at LS No.19 must meet a 20-year PHF of 2.04 gpm with a TDH of 111.0 ft
- Both pumps at LS No.20 must meet a 20-year PHF of 52.6 gpm with a TDH of 107.0 ft
- Both pumps at LS No.43 must meet a 20-year PHF of 361.7 gpm with a TDH of 92.2 ft
- Both pumps at LS No.44 must meet a 20-year PHF of 192.9 gpm with a TDH of 111.0 ft

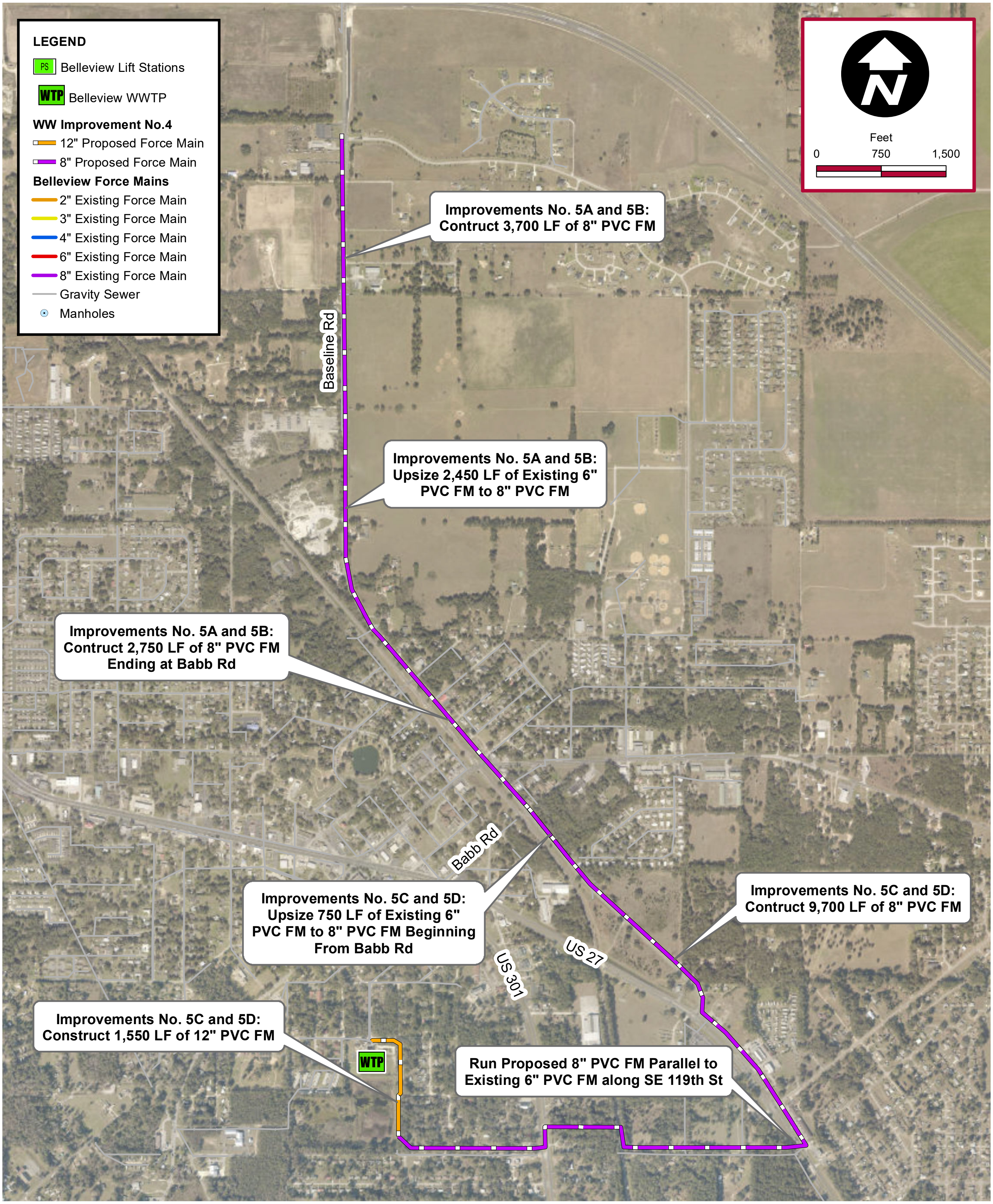
FORCE MAINS

The City's existing force mains have sufficient capacity to meet the present day demands and the proposed pumping improvements. **WW Improvements No.5A, 5B, 5C and 5D** were identified due to a lack of available capacity in the City's existing gravity sewer system to meet existing and projected PHFs. They can be seen in **Figure 12. Improvements No.5A and 5B** consist of constructing 6,450 LF of new 8-inch force main and upsizing 2,450 LF of existing 6-inch force main to 8-inch force main. In addition to redirecting north flows from the City's gravity system, these improvements will also redirect these flows from LS No.4 which will not have capacity to pump these flows by 2022. As a result, these projects prevent any future upgrades needed in LS No.4. **Improvements No.5A and 5B** are developer driven.

Improvements No.5C and 5D consist of constructing 9,700 LF of new 8-inch force main, 1,550 LF of new 12-inch force main and upsizing 750 LF of existing 6-inch force main to 8-inch force main. These improvements will redirect flows from LS No. 34, 5, 19 and 20 from the City's gravity system directly to the WRF.

GRAVITY SEWER

The evaluation of the City's gravity system was limited to evaluating the gravity mains that conveyed flows from lift stations directly to the WRF. The evaluation was performed based on the hydraulic standards described above. Based on the analysis that was performed, the City's gravity system is currently exceeding capacity. The portions of the City's gravity system that are exceeding capacity are shown in **Figure 9**. To alleviate existing demand on the system, some flows must be rerouted directly to the WRF. This is achieved with **WW Improvements No.5A, 5B, 5C and 5D**.



Kimley»Horn

101 E Silver Springs Blvd, Suite 400, Ocala FL 34470
Phone: (352) 438-3000
www.kimley-horn.com CA 00000696

WW IMPROVEMENTS NO.5A, 5B, 5C AND 5D

UTILITY MASTER PLAN
CITY OF BELLEVIEW, FLORIDA

Scale: As Noted	Project No.: 042223012	May 2019	Figure 12

K:\OCA_Utilities\Belleview\Projects\042223012 - Utility System Master Plan\doc\Master Plan Report\Figures\mxd\Figure 12 - WW Improvement No.5A, 5B, 5C and 5D.mxd - 5/21/2019 1:05:49 PM - Savannah.Kirwan

5-YEAR (2022) ANALYSIS

LIFT STATIONS

The flow model results indicate that four lift stations do not have sufficient capacity and are unable to pump the estimated influent PHFs. These results are described in **Table 36**.

Table 36: 5-Year Scenario - Lift Stations with Insufficient Pumping Capacity					
	Pump 1 Capacity (gpm)	Pump 2 Capacity (gpm)	PHF (gpm)	Pump 1 Deficiency (gpm)	Pump 2 Deficiency (gpm)
LS No.4	169	169	211.0	42.0	42.0
LS No.6	172	194	196.7	24.7	2.69
LS No.32	88	111	128.3	40.2	17.2
LS No.43	302	302	311.4	9.44	9.44

WW Improvement No.1 includes the replacement of both pumps at LS No.6 as previously mentioned. Therefore, no pump replacement is required at LS No.6 in 2022. **WW Improvement No.3** includes the replacement of both pumps at LS No.32 as previously mentioned. Therefore, no pump replacement is required at LS No.32 in 2022. **WW Improvements No. 5C and 5D** includes the replacement of both pumps at LS No.43 as previously mentioned. Therefore, no pump replacement is required at LS No.43 in 2022.

LS No.4 currently receives flow from its surrounding sewer shed as well as flow from LS No.21, 22, 35, 23, 37 and 38. **WW Improvements No.5A and 5B** will alter the system so that LS No.4 will only receive and pump flow received from its surrounding sewer shed. This will reduce the 2022 PHF from 211.0 gpm to 19.3 gpm. As a result, pump replacements will not be required.

Additionally, LS No.42 is currently offline and does not house any pumps. With the construction of septic to sewer regions 1 through 3, Kimley-Horn has recommended this lift station come on-line by 2023 to pump a portion of the expected future demand. **WW Improvement No.6** involves the installation of two pumps at LS No.42. This lift station will manifold into a proposed 12-inch force main prior to reaching the City's WRF. Based on the modeling results, the pump sizing will be based on a 20-year PHF of 38.13 gpm with a TDH of 11.1 ft.

FORCE MAINS

Assuming **WW Improvements No.5A, 5B, 5C and 5D** have been constructed, no additional force main improvements are expected.

GRAVITY SEWER

The evaluation of the City's gravity system was limited to evaluating the gravity mains that conveyed flows from lift stations directly to the WRF. The evaluation was performed based on the hydraulic standards described above. Assuming **WW Improvements No.5A, 5B, 5C and 5D** have been constructed, no additional gravity sewer improvements are recommended.

10-YEAR (2027) ANALYSIS

LIFT STATIONS

The flow model results indicate that three lift stations do not have sufficient capacity and are unable to pump the estimated influent PHFs. These results are described in **Table 37**.

Table 37: 10-Year Scenario - Lift Stations with Insufficient Pumping Capacity					
	Pump 1 Capacity (gpm)	Pump 2 Capacity (gpm)	PHF (gpm)	Pump 1 Deficiency (gpm)	Pump 2 Deficiency (gpm)
LS No.21	220	407	344.6	124.6	-
LS No.22	209	405	324.9	115.9	-
LS No.37	253	366	288.8	35.76	-

Based on the above results, LS No.37 requires new pumps to meet the projected 2027 PHF. For this analysis, if the first and second pump in a lift station require replacement in less than 5 years from each other, Kimley-Horn recommends replacing both pumps at once. This avoids needing to resize the capacity of the lift station and avoids repeating electrical upgrades. **WW Improvement No.7** replaces both pumps at LS No.37. They will be sized to meet a 20-year PHF of 288.8 gpm. **WW Improvements No.5A and 5B** include the replacement of both pumps at LS No.21 and No.22 as previously mentioned. Therefore, no pump replacement is required at LS No.21 or No.22 in 2027.

FORCE MAINS

Assuming **WW Improvements No.5A, 5B, 5C and 5D** have been constructed, no additional force main improvements are expected.

GRAVITY SEWER

The evaluation of the City's gravity system was limited to evaluating the gravity mains that conveyed flows from lift stations directly to the WRF. The evaluation was performed based on the hydraulic standards described above. Assuming **WW Improvements No.5A, 5B, 5C and 5D** have been constructed, no additional gravity sewer improvements are recommended.

20-YEAR (2037) ANALYSIS

LIFT STATIONS

The flow model results indicate that three lift stations do not have sufficient capacity and are unable to pump the estimated influent PHFs. These results are described in **Table 38**.

Table 38: 20-Year Scenario - Lift Stations with Insufficient Pumping Capacity					
	Pump 1 Capacity (gpm)	Pump 2 Capacity (gpm)	PHF (gpm)	Pump 1 Deficiency (gpm)	Pump 2 Deficiency (gpm)
LS No.21	220	407	492	272.2	85.7
LS No.22	209	405	464	254.8	58.8
LS No.37	253	366	416	163.3	50.3

WW Improvements No.5A and 5B include the replacement of both pumps at LS No.21 and LS No.22 as previously mentioned. Therefore, no pump replacement is required at LS No.21 or LS No.22 in 2037. **WW Improvement No.7** includes the replacement of both pumps at LS No.37 as previously mentioned. Therefore, no pump replacement is required at LS No.37 in 2037.

FORCE MAINS

Assuming **WW Improvements No.5A, 5B, 5C and 5D** have been constructed, no additional force main improvements are expected.

GRAVITY SEWER

The evaluation of the City's gravity system was limited to evaluating the gravity mains that conveyed flows from lift stations directly to the WRF. The evaluation was performed based on the hydraulic standards described above. Assuming **WW Improvements No.5A, 5B, 5C and 5D** have been constructed, no additional gravity sewer improvements are recommended.

BUILDOUT ANALYSIS (SEPTIC TO SEWER REGIONS 7 – 11)

Assuming the City constructs **WW Improvements No.1, No.2, No.3, No.4, No.5A, No.5B, No.5C, No.5D, No.6 and No.7,** the City's system still cannot support the buildout demand scenario when modeled. The additional demands associated with septic to sewer regions 7 through 11 require additional capacity that is not supported by the City's WRF. Additionally, the City cannot hydraulically meet the demands in the buildout scenario as their existing infrastructure is not suited to supply such large flows to these identified septic to sewer areas. Kimley-Horn concluded that an additional WRF, and the required piping, will be needed to meet buildout capacity and satisfy system requirements. It is recommended that this WRF be located north along Baseline Rd to better supply the northern portion of the City's service area.

RECOMMENDED SANITARY SEWER SYSTEM CAPITAL IMPROVEMENT PROJECTS

Introduction

This section provides a discussion of the capital improvement projects that are recommended to address current deficiencies and meet future sanitary sewer demands. Included in this section is a project list of recommended projects at the present year, 5-year, 10-year, and 20-year planning projections. The proposed capital improvement projects were discussed with City staff and prioritized. See **Figure 13** for an overall map of recommended sanitary sewer system improvements. See ***Appendix C*** for an opinion of probable cost for each individual improvement listed below. The following capital projects should be considered for improving the existing system for the safety and reliability of the sanitary sewer service throughout the City.

To properly plan for expansion of the City's Sanitary sewer transmission system, the following variables were considered:

1. The overall expected growth anticipated over the next 20 years, including new developments, expansion of the existing service territory and septic to sewer phasing.
2. The timing of the growth.
3. The spatial orientation of the growth.
4. Given the timing, spatial orientation of the growth, and the existing infrastructure, evaluate the most effective route for future flows.

Sanitary Sewer System Improvements

EXISTING SYSTEM IMPROVEMENTS:

WW Improvement No.1

To meet existing PHF demand, both the pumps at LS No.6 will need to be replaced. They will be sized to meet a 20-year PHF of 215.1 gpm. Since this lift station is currently under capacity, this improvement will be needed in 2019.

WW Improvement No.2

To meet existing PHF demand, a second pump will need to be installed at LS No.39. It will be sized to meet a 20-year PHF of 11.8 gpm. Since this lift station is currently under capacity, this improvement will be needed in 2019.

WW Improvement No.3

To meet existing PHF demand, both the pumps at LS No.32 will need to be replaced. Based on the flow and pump models, both pumps must be sized to meet a 20-year PHF of 171.8 gpm with a TDH of 207.3 ft. Since this lift station is currently under capacity, this improvement will be needed in 2019.

WW Improvement No.4

To meet existing PHF demand, both the pumps at LS No.11 will need to be replaced. Based on the flow and pump models, both pumps must be sized to meet a 20-year PHF of 170.3 gpm with a TDH of 226.6 ft. Since this lift station is currently under capacity, this improvement will be needed in 2019.

WW Improvement No.5A

This project involves the design and permitting of a proposed force main south along Baseline Rd to Babb Rd as well as lift station modifications at LS No. 22, 35 and 21. This force main will connect LS No. 22, 35 and 21 into a single manifolding system by constructing 6,450 LF of new 8-inch force main and upsizing 2,450 LF of existing 6-inch force main to 8-inch force main. This improvement is developer driven meaning the timing of when it is needed is directly dependent on the development rate of Summer Crest. Once this project is completed it will connect to the proposed force main in **WW Improvement No.5C and No.5D** which will deliver the flow directly to the City's WRF. When modeled, this improvement also requires the replacement of each pump at LS No. 22, 35 and 21. The pump sizing will be based on the following:

- Both pumps at LS No.22 must meet a 20-year PHF of 463.8 gpm with a TDH of 108.5 ft
- Both pumps at LS No.35 must meet a 20-year PHF of 27.3 gpm with a TDH of 163.7 ft
- Both pumps at LS No.21 must meet a 20-year PHF of 13.6 gpm with a TDH of 152.3 ft

WW Improvement No.5B

This project involves the bid process, construction and construction administration for **WW Improvement No.5A.** This improvement is developer driven meaning the timing of when it will occur is directly dependent on the development rate of Summer Crest. Summer Crest currently has 75 lots occupied, and it is assumed to increase at 50 lots/year. At this rate, this project will need to be completed by fall of 2022.

WW Improvements No.5C

This project involves the design and permitting of a proposed force main south along Baseline Rd from Babb Rd and then west along SE 119th St directly to the City's WRF. This project also includes lift station modifications at LS No. 34, 5, 19, 20, 43 and 44. This force main will connect LS No. 34, 5, 19, 20, 43 and 44 into a single manifolding system by constructing 9,700 LF of new 8-inch force main, 1,550 LF of new 12-inch force main and upsizing 750 LF of existing 6-inch force main to 8-inch force main. This project is not developer driven and is required at this time to alleviate the existing demand on the City's gravity system which is out of capacity. When modeled, these improvements require the replacement of each pump at LS No. 34, 5, 19, 20, 43 and 44. The pump sizing will be based on the following:

- LS No.34 - Both pumps must meet a 20-year PHF of 101.26 gpm with a TDH of 124.1 ft
- LS No.5 - Both pumps must meet a 20-year PHF of 117.8 gpm with a TDH of 136.9 ft
- LS No.19 - Both pumps must meet a 20-year PHF of 2.04 gpm with a TDH of 111.0 ft
- LS No.20 - Both pumps must meet a 20-year PHF of 52.6 gpm with a TDH of 107.0 ft
- LS No.43 - Both pumps must meet a 20-year PHF of 361.7 gpm with a TDH of 92.2 ft
- LS No.44 - Both pumps must meet a 20-year PHF of 192.9 gpm with a TDH of 111.0 ft

The timeline for this project will extend from FY 2019 to 2020. Planning will start the end of 2019 and be completed in early 2020. Design will start the beginning of 2020 and be completed at the end of 2020.

WW Improvement No.5D

This project involves the bid process, construction and construction administration for **WW Improvement No.5C.** The bid process will start in the beginning of 2021 followed by the start of construction in summer of 2021. Construction is expected to be completed in summer of 2022.

WITHIN THE NEXT 5 YEARS:

WW Improvement No.6

This project involves the installation of two pumps at LS No.42. This lift station will manifold into a proposed 12-inch force main prior to reaching the City's WRF. Based on the flow and pump models, both pumps must be sized to meet a 20-year PHF of 38.13 gpm with a TDH of 11.1 ft. Since this lift station will primarily be used to meet septic to sewer regions 1 through 3 expected flows, this improvement will be needed in 2023. See the Kimley-Horn Septic to Sewer Planning Study for more information.

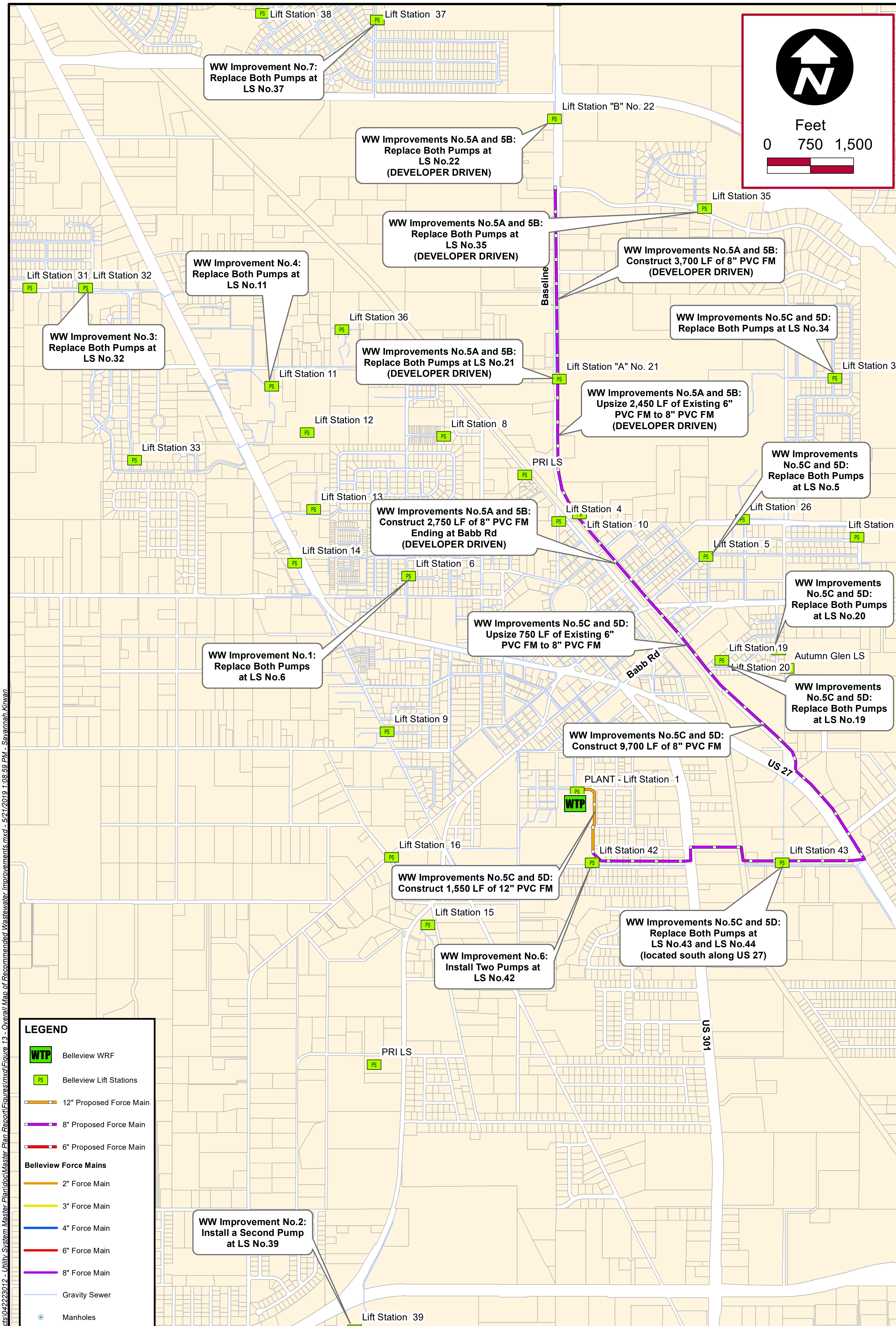
WITHIN THE NEXT 10 YEARS:

WW Improvement No.7

To meet existing PHF demand, both the pumps at LS No.37 will need to be replaced. They will be sized to meet a 20-year PHF of 288.8 gpm. This improvement is primarily needed due to the expansion of the Summer Crest development. Based on a growth rate of approximately 50 lots/year in Summer Crest, this improvement will be needed in early 2027.

WITHIN THE NEXT 20 YEARS:

No WW Improvements were identified.



K:\OCA_Utilities\Belleview\Projects\042223012 - Utility System Master Plan\doc\Master Plan Report\Figures\mxd\Figure 13 - Overall Map of Recommended Wastewater Improvements.mxd - 5/21/2019 1:08:59 PM - Savannah Kirwan

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OVERALL MAP OF RECOMMENDED SANITARY SEWER SYSTEM IMPROVEMENTS

UTILITY MASTER PLAN
BELLEVIEW, FL

May 2019	Project No. 042223012	Figure 13

RECLAIMED WATER SYSTEM

Introduction

This section discusses the reclaimed water systems owned and operated by the City's WRF. The WRF is currently operated under FDEP Permit No. FLA010678 and has a permitted capacity of 0.76 MGD AADF. The WRF provides preliminary and secondary, sanitary sewer treatment to produce reclaimed water suitable for slow-rate restricted and unrestricted public access land application systems as defined in Rule 62-610.460 FAC. The plant is required to meet Class I Reliability standards in accordance with FAC 62-600 and FAC 62-610.

The combined total capacity of the City's effluent disposal system is 1.60 MGD AADF. Any reclaimed water not reused or not meeting the required effluent standards is repumped back to the headworks of the plant. The City's reclaimed water transmission and distribution system either sends restricted public access reuse to a 19.5-acre sprayfield or supplies water for commercial users. These users include the Baseline Golf Course and the Spruce Creek Golf Course.

Existing Reclaimed Water Systems

This section contains a detailed discussion of the existing reclaim water system.

REUSE AND EFFLUENT DISPOSAL

The City's permitted effluent disposal methods has two components:

R-001

This reclaim water system has a 0.30 MGD AADF capacity for slow-rate restricted public access (subsurface) reuse. The system consists of a 19.5-acre sprayfield with a three-day wet weather (3.48 million gallon) lined holding pond having a capacity of 0.30 MGD.

R-002

This effluent disposal system has a total permitted capacity of 1.30 MGD AADF for slow-rate public access reuse. The system consists of the 70-acre Baseline Gold Course with a permitted capacity of 0.30 MGD AADF and the 374-acre Spruce Creek Golf Course with a permitted capacity of 1.00 MGD AADF.

PROJECTED FLOWS

The projected reuse flows including septic to sewer regions 1 through 6 are summarized in **Table 39** and the projected flows without septic to sewer are summarized in **Table 40**.

Table 39: WRF Reuse Flow Projections with Septic to Sewer 1-6

Reuse Flow Projections	2018	2022 (5-Year)	2027 (10-Year)	2037 (20-Year)
WRF Future Flows (ADF MGD)	0.429	0.723	0.939	1.113

Table 40: WRF Reuse Flow Projections without Septic to Sewer

Reuse Flow Projections	2018	2022 (5-Year)	2027 (10-Year)	2037 (20-Year)
WRF Future Flows (ADF MGD)	0.429	0.568	0.651	0.772

DISPOSAL CAPACITY

This section of the disposal capacity analysis examines the future disposal capacity of the City's WRF reclaimed system. **Table 41** provides a summary of the permitted capacity.

Table 41: WRF Disposal Capacity Analysis

FDEP Site Number	Name	Permitted Capacity (MGD)
R-001	Spray Field	0.30
R-002	Baseline Golf Course	0.30
R-002	Spruce Creek Golf Course	1.00
	Total	**1.60**

As shown in **Table 41,** the total disposal capacity of the City's reclaimed system will be 1.60 MGD which is sufficient to meet the projected 20-year flows including septic to sewer regions 1 through 6.

RECLAIMED WATER SYSTEM OPERATION

The reclaimed water system functions as follows:

- The reclaimed water from the chlorine contact basins flow by gravity to the WRF reuse pump station.
- Effluent that doesn't meet the public access parameters outlined in permit FLA010678 is sent to the 3.48 MG lined holding pond at R-001 where it is applied to the 19.5-acre spray field. Once reclaimed flow has been discharged into the R-001 holding pond it cannot be repumped to either the Baseline or Spruce Creek Golf Courses.
- Effluent that meets public access parameters outlined in permit FLA010678 is sent to either the Baseline Gold Course or the Spruce Creek Golf Course.
- Effluent that doesn't meet either R-001 or R-002 standards is directed to the onsite effluent storage basin.
- Based on FDEP monthly discharge monitoring reports (DMRs) from September 2017 through August 2018, the AADF through the Belleview WRF was 0.417 MGD. Per current operational procedures, the Belleview WRF has discharged approximately 0.378 MGD AADF (91% of total) of reclaimed water to R-002. Of this flow, 0.257 MGD AADF was sent to Baseline Golf Course while the remaining 0.122 MGD AADF was sent to Spruce Creek Golf Course. Approximately 0.039 MGD AADF (9% of total) of the WRF effluent was sent to the lined holding pond at R-001.

WET WEATHER STORAGE REQUIREMENTS

For this analysis, the reclaimed system capacity was evaluated based on FAC Rule 62-610.414(2)(c) which requires storage for at least three times the average daily flow capacity of the wastewater treatment facility or "three days of wet weather storage." **Table 42** summarizes the total storage capacity of the City's reclaimed system.

For this analysis it was assumed that the storage capacity for both Spruce Creek and Baseline Golf Courses were equal to their respective permitted disposal capacities since they are required to reserve the storage amount equal to their contracted disposal requirements.

Table 42: City of Belleview Reclaimed Storage Capacity	
Site	Volume (MG)
Influent Storage Pond at WRF	0.44
Effluent Storage Basin at WRF	0.76
Effluent Pond Storage at R-001	3.48
Baseline Golf Course	0.30
Spruce Creek Golf Course	1.00
Total	**4.78**

There is 4.78 MG of storage capacity for the City's reclaimed system. The required existing effluent storage volume is 2.28 MG which is defined as the volume needed to store 3 days' worth of the total permitted capacity of the wastewater treatment facility (3 Days x 0.76 MGD = 2.28 MG). Therefore, the City has 52% (2.50 MG) of their total storage available or 0.83 MG of ADF capacity remaining (2.50 MGD/3 Days).

The City of Belleview WRF Facility Plan prepared by Kimley-Horn has identified three demand scenarios depending on whether the City proceeds with septic to sewer.

- **No Septic to Sewer (2036)** – Rerate the City's WRF to a 0.8 MGD permitted capacity address future flows (not including septic to sewer).
- **Septic to Sewer Regions 1-6 (2031)** – Expand the City's WRF to a 1.2 MGD permitted capacity to meet future flows including septic to sewer regions 1 through 6.
- **Septic to Sewer Regions 1-11 (2036)** – Expand the City's WRF to a 1.8 MGD permitted capacity to meet future flows including septic to sewer regions 1 through 11.

The wet-weather storage requirements for each alternative are outlined in **Table 43**.

Table 43: Belleview WRF Wet-Weather Storage				
Alternative	Permitted Capacity (MGD)	Wet-Weather Storage Requirement (MGD)	Existing Wet-Weather Storage (MGD)	Surplus (MGD)
No Septic to Sewer (2036)	0.8	2.4	5.22	2.82
Septic to Sewer Regions 1-6 (2031)	1.2	3.6	5.22	1.62
Septic to Sewer Regions 1-11 (2036)	1.8	5.4	5.22	**(0.18)**

Based on the above WRF alternatives, the City has sufficient wet weather storage until 2036, assuming they proceed with septic to sewer regions 1 through 11. If the City constructs septic to sewer regions 1 through 11, they will need to provide an additional 0.18 MG of wet-weather storage to satisfy FAC Rule 62-610.414(2)(c). Therefore, they will need to expand their existing system by approximately 4% or 0.06 MG of ADF capacity (0.18 MGD/3 Days).

REJECT STORAGE REQUIREMENTS

Since the City provides public access reclaimed water they must meet the reject storage requirements for a public access reuse system. Per FAC 62-610.464(3) *In addition, a separate, off-line system for storage of reject water shall be provided, unless another permitted reclaim system or effluent disposal system is capable of discharging the reject water in accordance with requirements of Chapter 62-600, FAC. Reject water storage shall have sufficient capacity to ensure the retention of reclaimed water of unacceptable quality. At a minimum, this capacity shall be the volume equal to one day flow at the average daily design flow of the treatment plant or the average daily permitted flow of the reclaim system, whichever is less.*

The City can dispose of reject effluent that does not meet the requirements of the public access reclaimed system but does meet restricted access requirements at their R-001 (sprayfield). Although the system can dispose of rejected effluent that meets restricted access requirements, this capacity analysis was performed as if the system did not have the ability to dispose of restricted access effluent. An analysis of the WRF shows the facility does not have any reject storage on-site. **Table 44** summarizes the existing and future reject storage capacity required.

Table 44: Belleview WRF Reject Storage

	Permitted Capacity (MGD)	Reject Storage Requirement (MGD)	Existing Reject Storage (MGD)	Surplus (MGD)
Present Year (2018)	0.76	0.76	0.00	**(-0.76)**
No Septic to Sewer (2036)	0.80	0.80	0.00	**(-0.80)**
Septic to Sewer Regions 1-6 (2031)	1.20	1.20	0.00	**(-1.20)**
Septic to Sewer Regions 1-11 (2036)	1.80	1.80	0.00	**(-1.80)**

EFFLUENT STORAGE OPTIONS

To meet the necessary reject storage and wet-weather storage requirements set forth by FAC 62-610.464(3) and FAC 62-610.414(2)(c) respectively, the City must expand their existing storage capacity. **Table 45** summarizes the additional storage capacity the City will require.

Table 45: Additional Storage Capacity Requirements

	Additional Reject Storage (MGD)	Additional Wet-Weather Storage (MGD)	Total (MGD)
Present Year (2018)	0.76	-	0.76
No Septic to Sewer (2036)	0.80	-	0.80
Septic to Sewer Regions 1-6 (2031)	1.20	-	1.20
Septic to Sewer Regions 1-11 (2036)	1.80	0.18	1.98

Kimley-Horn has identified five options for the City to increase both their reject and wet-weather storage. See ***Appendix C*** for an opinion of probable cost for options 1 and 2 listed below. The following options should be considered for improving the existing system for the safety and reliability of the reclaimed service throughout the City.

- **Option 1** – 1.00 MG of on-site reject storage. The City would rehab their existing 1.00 MG effluent storage basin, construct piping modifications and a new reject pump station to pump the rejected effluent back to the plant headworks. This improvement is detailed in the City of Belleview WRF Facility Plan.
- **Option 2** – The City can construct a new 2.00 MG on-site storage pond. This storage pond would function as reject storage. The contained volume will then be repumped back to the plant headworks to be treated again. This improvement is detailed in the City of Belleview WRF Facility Plan.
- **Option 3** – The City can discharge effluent flows via deep well injection. There could be an opportunity for public partnership, such as Marion County, should the City peruse this option.
- **Option 4** – The City can convert their spray field into rapid infiltration basins (RIBs) to increase their effluent disposal capacity of the site.
- **Option 5** – The City can explore potential new customers who are able to accept their reuse flow. Specifically, this may include the Perry Spray Field which is currently accepting restricted public access reuse from the City of Ocala’s water reclamation facilities.

RECLAIMED WATER SYSTEM ANALYSIS AND METHODOLOGY

Introduction

This section provides an overview of the methodologies used to develop the reclaimed water system hydraulic model. The model was used to evaluate the existing system for current and future demands.

System Hydraulic Standards

Prior to identifying deficiencies in the existing system, it is necessary to establish system hydraulic standards to determine acceptable hydraulic parameters for the distribution network. The following hydraulic standards were used to evaluate the model for deficiencies:

Minimum system pressure:	20 psi
Maximum system pressure:	90 psi
Design peak flow, R-001:	0.30 MGD (250 gpm)
Design peak flow, R-002:	1.30 MGD (1,084 gpm)
Design maximum velocity:	7 fps

Hydraulic Model Development

The software used for model development was Bentley WaterCAD V8i (SELECTseries 1).

The existing model was developed using the following steps:

- The pipe network layout of the reclaimed water system was determined using previously developed GIS mapping.
  - The reclaimed water flow was determined by the City provided data of approximately three years of effluent discharge and pumping information.
- The operating pressures and flows were obtained from City Utility Staff and actual plant data. The following operating pressures were used in the model:
- Before proposed improvements could be evaluated for the system, the hydraulic model was calibrated to ensure that it accurately reflected the conditions of the system in the field. The following steps were taken to calibrate the model:
  - Data Collection:
    - City staff provided pump information and conducted sites visits with Kimley-Horn to the WRF to verify the reuse pump station information.
  - Model Calibration:
    - The flow and pressure data were entered into the model and the pipe C values were adjusted to accurately reflect the pressure readings that were observed in the field.

Methodology

With the model properly calibrated, the proposed system configurations could be modeled. The model was analyzed using different disposal methods, system pressures, and flows out of the WRF.

Scenario Analysis

SCENARIO 1: TO R-001 (SPRAYFIELD)

This scenario is sending the reclaimed flow from the WRF to the City's spray field. **Table 46** below summarizes the results of Scenario 1.

Table 46: Scenario 1	
Model Conditions Summary	Average Day Conditions and Results
Effluent Lift Station (ft)	53.0
Spray field Water Level (ft)	64.0
C value	130
Total Flow (gpm)	1,316
Total Flow (MGD)	1.90
Total Head (ft)	66.6
Number of Pumps Operating	1

The model results show that the WRFF reuse pump station can provide the effluent disposal and reclaimed water required by WRF permitted capacity.

SCENARIO 2: TO BASELINE GOLF COURSE

This scenario is sending the reclaimed flow from the WRF to the Baseline Golf Course. **Table 47** below summarizes the results of Scenario 2.

Table 47: Scenario 2	
Model Conditions Summary	Average Day Conditions and Results
Effluent Lift Station (ft)	53.0
Baseline Gold Course Water Level (ft)	79.0
C value	130
Total Flow (gpm)	1,091
Total Flow (MGD)	1.57
Total Head (ft)	78.1
Number of Pumps Operating	1

The model results show that the WRF reuse pump station can provide the effluent disposal and reclaimed water required by the WRF permitted capacity.

SCENARIO 3: TO SPRUCE CREEK GOLF COURSE

This scenario is sending the reclaimed flow from the WRF to the Spruce Creek Golf Course. **Table 48** below summarizes the results of Scenario 3.

Table 48: Scenario 3	
Model Conditions Summary	Average Day Conditions and Results
Effluent Lift Station (ft)	53.0
Spruce Creek Golf Course Water Level (ft)	73.0
C value	130
Total Flow (gpm)	1,093
Total Flow (MGD)	1.57
Total Head (ft)	78.0
Number of Pumps Operating	1

The model results show that the WRF reuse pump station can provide the effluent disposal and reclaimed water required by WRF permitted capacity.

SCENARIO 4: TO PERRY SPRAY FIELD

This scenario is sending the reclaimed flow from the WRF to the Perry Spray field. The Perry Spray field was identified as a potential new customer and Kimley-Horn wanted to analyze whether the City's existing system infrastructure (effluent lift station) could properly supply flow to this new site. **Table 49** below summarizes the results of Scenario 4.

Table 49: Scenario 4	
Model Conditions Summary	Average Day Conditions and Results
Effluent Lift Station (ft)	53.0
Perry Sprayfield Water Level (ft)	80.0
C value	130
Total Flow (gpm)	339
Total Flow (MGD)	0.49
Total Head (ft)	118.1
Number of Pumps Operating	1

The model results show that the existing WRF reuse pump station cannot provide the effluent disposal and reclaimed water required by the WRF permitted capacity. However, the existing reuse pump station could be upgraded to provide enough flow to meet the WRF permitted capacity.

CAPITAL IMPROVEMENT PLAN FUNDING RESOURCES

Introduction

This section will discuss the various state and federal funds that may be available to fund some of the capital improvement plan projects through grants and/or loans. Each program has limitations and requirements that should be considered while evaluating projects for funding opportunities. While the City may be capable of applying for many of the programs listed below, some programs are competitive and require complex substantial application information. Specialized grant and funding consultants should be considered as resources for assisting with funding opportunity evaluations and application package preparations.

Water and Sanitary Sewer Funding Sources

Community Development Block Grant (CDBG) Grant Funding – The U.S. Department of Housing and Urban Development administers CDBG nationwide. The CDBG program was established to “develop viable communities by providing decent housing and a suitable living environment and by expanding economic opportunities, principally for persons of low- and moderate-income.” Community activities that qualify for CDBG funding assistance include:

- Acquisition of property for public purposes
- Construction of reconstruction of streets, water and sewer facilities, neighborhood centers, recreation facilities, and other public works
- Demolition
- Rehabilitation of public and private buildings
- Public services
- Planning activities
- Assistance to non-profit entities for community development activities
- Assistance to private, for profit entities to carry out economic development activities (including assistance to micro-enterprises)

The CDBG program segregates communities into two types: entitled and non-entitled. Entitled communities are larger and have populations greater than 50,000. Non-entitled communities have populations less than 50,000. The City of Wildwood currently falls into non-entitled classification. The non-entitled community benefits are administered locally by the states that participate in the CDBG program. Currently, the City qualifies for a maximum of $600,000 per year of CDBG funding.

Florida Department of Environmental Protection (FDEP) State Revolving Fund (SRF) - SRF programs provide financial savings for projects that benefit the environment, including protection of public health and conservation of local watersheds. Federal and state contributions fund loans for a wide variety of water quality projects, including all types of stormwater, watershed protection or restoration, and estuary management projects, as well as more traditional municipal water and sanitary sewer treatment projects, including water reuse and conservation projects.

The program allows states to provide funding for their highest-priority water quality needs. Funds to establish or capitalize the SRF programs are provided through federal government grants and state matching funds that are equal to 20 percent of federal government grants. SRF monies are loaned to communities at lower than market rate interest rates, and loan repayments are recycled back into the program to fund additional water quality protection projects. The revolving nature of these programs provides for an ongoing funding source that will last far into the future.

U.S. Department of Agriculture (USDA) Rural Development – The USDA offers several financial assistance programs for rural communities, including loan and loan/grant programs. Below are some specific grant programs in which the City may be eligible for participation. Each program has specific requirements for eligibility and level of assistance available. Specific information on each program can be found on the USDA website at http://www.rurdev.usda.gov/Home.html.

- **Direct Loans and Grants** – To develop water and waste disposal systems in rural areas and towns with a population not in excess of 10,000. The funds are available to public bodies, non-profit corporations, and Indian tribes.
- **Guaranteed Loans** – To provide a loan guarantee for the construction or improvement of water and waste disposal projects serving financially needy communities in rural areas. This purpose is achieved through bolstering the existing private credit structure through the guarantee of quality loans which will provide lasting benefits. The water and waste disposal guarantee loans are to serve a population not in excess of 10,000 in rural areas.
- **Emergency Community Water Assistance Grants** – To assist rural communities that have experienced a significant decline in quantity or quality of drinking water due to an emergency, or in which such decline is considered imminent, to obtain or maintain adequate quantities of water that meets the standards set by the Safe Drinking Water Act. This emergency is considered an occurrence of an incident such as, but not limited to, a drought, earthquake, flood, tornado, hurricane, disease outbreak or chemical spill, leakage, or seepage.
- **Pre-development Planning Grants** – Predevelopment planning grants may be available, if needed, to assist in paying costs associated with developing a complete application for a proposed project.
- **Loans for Very Small Projects –** To assist communities with water and sanitary sewer systems. Qualified private non-profit organizations will receive Request for Proposal (RFP) grant funds to establish a lending program for eligible entities. This grant program is to serve a rural area with a population not in excess of 10,000.
- **Opportunities for Lenders** – The Utilities Programs works with private lenders to guarantee loans to borrowers for the construction of water and waste systems in rural areas. Loan guarantees can be issued for up to 90% on any loss of interest and principal on a loan.
- **Revolving Fund Program** – To assist communities with water and sanitary sewer systems. Qualified private non-profit organizations will receive RFP grant funds to establish a lending program for eligible entities. This grant program is to serve a rural area with a population not in excess of 10,000.

FDEP Small Community Sanitary Sewer Facilities Grants Program –This is a grant program to assist small communities in the planning, designing, and constructing of sanitary sewer management facilities. An eligible small community must be an incorporated municipality, have a total population and a service area population of 10,000 or less, and have a per capita income (PCI) less than the State of Florida average PCI of $26,503. Projects shall compete separately for Preconstruction planning Grants and Construction and design Grants. Projects must be associated with sanitary sewer collection, transmission, treatment, or disposal facilities. This includes facilities to reuse reclaimed water from sanitary sewer treatment plants. Storm water projects are not eligible. The highest priority is given to projects that address the most serious risks to public health, are necessary to achieve compliance, or assist systems most in need based on an affordability index. A partial match of local funds will be required. Funding of the local match may be obtained through the State Revolving Fund Program.

SJRWMD Cooperative Funding Initiative –The Cooperative Funding Initiative (CFI) covers up to 50 percent of the cost of projects that help create sustainable water resources, enhance conservation efforts, restore natural systems and provide flood protection. All CFI funding decisions are made by volunteer Governing Board members who are well informed on the specific resources and challenges within their areas.

REVENUE SUFFICIENCY ANALYSIS

Kimley-Horn utilized the nationally recognized utility rate consultants, Raftelis Financial Consultants, Inc. to conduct a utility revenue sufficiency analysis. The revenue sufficiency analysis consisted of the input of all financial, statistical, capital, and operational data and assumptions into the Raftelis financial model, preparation of a comparative rate survey, two interactive work sessions with City staff to review the analysis and develop scenarios, participation in public workshops, and preparation of a report documenting the results of the analysis. The analysis was conducted in conjunction with the master plan and used to refine the City's 10-year capital improvement program. Additionally, the revenue sufficiency analysis was used to assist the City with the following elements. A copy of the final report is included in ***Appendix G***.

- Evaluating the impact of key capital improvement projects (in terms of both cost and timing) under various scenarios as appropriate during the master plan process.
- Understanding the future impacts of the City's FY 18/19 operating and capital improvement funding requirements.
- Quantifying the rate impacts of alternative renewal and replacement, operation and maintenance, and system expansion programs.
- Quantifying the amount of renewal and replacement, operation and maintenance, and system expansion funding provided under various rate adjustment options.
- Developing alternative growth forecasts, inclusive of revenue, operating cost, and capital improvement plan requirements.
- Evaluating the impact of alternative borrowing scenarios to meet future capital improvement requirements.

APPENDICES

APPENDIX A:
Small Area Population Projection Methodology (SWFWMD)

The Small Area Population Projection Methodology Used by the Southwest Florida Water Management District

Prepared for

Southwest Florida Water Management District
Contract 10CC0000002
Work Order Number 1

Prepared by

GIS Associates, Inc.
806 NW 16th Avenue, Suite A
Gainesville, Florida 32601

October 3, 2013

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INTRODUCTION

The purpose of this document is to describe the methodologies used by the Southwest Florida Water Management District (SWFWMD) to develop small area population projections in support of water supply planning and water use permitting. Accurately projecting future water demand for water utility potable service areas requires more precision than is offered by the county level projections available from the Bureau of Economic and Business Research (BEBR) at the University of Florida, the generally accepted standard throughout the State of Florida. In addition, the Census Population Cohort projected by BEBR does not include important non-permanent populations, such as seasonal residents, tourists or commuters. For these reasons, SWFWMD contracted with GIS Associates, Inc. (GISA), to provide small area population projections for the 16 counties located partly or entirely within SWFWMD. This was achieved by implementing GIS Associates' Small Area Population Projection Model (GISA Projection Model), which makes Census Population Cohort projections at the 2010 Census Tract level, and distributes those projections to individual land parcels to facilitate aggregation by utility or other boundaries. In addition, GISA applied SWFWMD methods for projecting non-permanent population to the Census Population Cohort projections derived from the GISA Projection Model. This document describes these projection methodologies and their use to project future populations. Ultimately, these small area population projections were used as a basis for making future water demand projections for SWFWMD.

SMALL AREA POPULATION PROJECTION MODEL OVERVIEW

The geographic information system (GIS) based small area population projection model used by SWFWMD projected future Census Population Cohort population growth at the parcel level, and normalized those projections to BEBR's latest county level forecasts. Figure 1 on the following page shows a process flow chart of the population projection and distribution methodology. First, a County Build-out Model was developed by GISA from the base parcel data. The purpose of the County Build-out Model is to develop maximum residential development potential at the parcel level. A detailed description of this model is included in the chapter titled County Build-out Models. Current permanent population was estimated and then the maximum population to which a county can grow was modeled by the County Build-out Models. Areas which cannot physically or lawfully sustain residential development (built-out areas, water bodies, public lands, commercial areas, etc.) were excluded from the County Build-out Model. Conversely, the model identified areas where growth is more likely to occur based on proximity to existing infrastructure. This is discussed in detail in chapter titled Growth Drivers Model.

Next, population growth was modeled between the current estimated population and the build-out population. Projections are based on a combination of historic growth trends (using an approach similar to that used by BEBR for its county level projections), and spatial constraints and influences, which restrict or direct growth. This process is described in detail in the chapter titled Population Projection Model. Population growth calculations were limited by

BEBR's 2013 medium projections, which are BEBR's latest population forecasts for the years 2015 through 2040, which were available in five-year increments. The source of this data is the BEBR publication *Projections of Florida Population by County, 2015-2040, with Estimates for 2012.* (Florida Population Studies, Bulletin 165, March 2013). The process for limiting growth is described in the chapter titled Population Projection Model.

The launch year for the version of the model described in this document was 2012, which was calibrated to the 2012 BEBR estimates of county population. Projections were made through the year 2040 in the following increments:

1. April 2, 2012 through April 1, 2015
2. April 2, 2015 through April 1, 2020
3. April 2, 2020 through April 1, 2025
4. April 2, 2025 through April 1, 2030
5. April 2, 2030 through April 1, 2035
6. April 2, 2035 through April 1, 2040

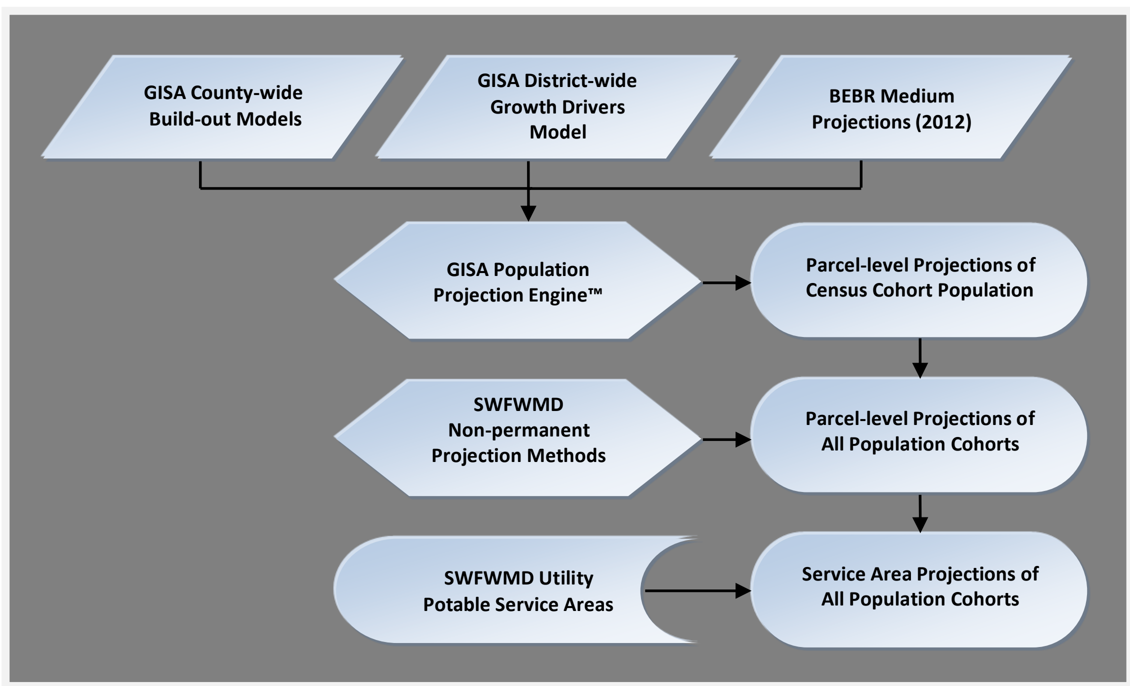

Figure 1. SWFWMD population projection process flowchart

Finally, the parcel level projections are summarized by any set of boundaries desired (utility service areas, municipalities, watersheds, etc.). For SWFWMD planning efforts, parcel projections were summarized by water utility service area boundaries that SWFWMD maintains in a spatial (GIS) database. These summaries were exported to a Microsoft Excel spreadsheet with separate tabs for each county to facilitate the review and distribution of the results.

COUNTY BUILD-OUT MODELS

The County Build-out Models are composed of multiple GIS data elements. Each model is based on each county property appraiser's GIS parcel database, including the associated tax roll information. Other elements incorporated into each build-out model include the 2010 US Census data, SWFWMD wetland data, local government future land use maps, and Development of Regional Impact (DRI) plans for the county of interest.

Parcels

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

2010 US Census Data

Some of the essential attribute information to translate parcels to population in the County Build-out Models was derived from data from the 2010 Census. Average population per housing unit by census tract was calculated and then transferred to each county's parcel data. No adjustment for vacant units was required, as the calculation was made using total housing units (not limited to occupied units). This average population per housing unit enabled parcel level estimation of population from parcel based housing unit estimates. In cases where property appraiser data were missing or incomplete, other data were used. For example, because mobile home parks with units not individually platted typically do not contain the number of units within the property appraiser data, the number of residential units for parks larger than five acres was estimated using a hand count from recent imagery.

Water Management District Boundaries

Each parcel in the County Build-out Models was also attributed with water management district boundaries (from SWFWMD), which enabled the county models for any counties split between two or more water management districts to be summarized for the respective district.

Wetlands

Wetlands (including surface water) are an important consideration when modeling a county's build-out. SWFWMD maintains a detailed GIS database of wetlands within its boundaries. This database contains the location and spatial extent of the wetlands, as well as the specific types of wetlands as defined by SWFWMD land cover classifications. Certain wetland types were identified that would be difficult and expensive to convert to residential development. These areas were identified in the SWFWMD wetland database and applied to the appropriate County Build-out Model. The wetland types are listed in Table 1.

Table 1. Wetland land cover codes and descriptions used in the County Build-out Models

Code	Description	Code	Description
5100	Streams and waterways	5600	Slough waters
5200	Lakes	6110	Wetland Hardwood Forests
5250	Marshy Lakes	6120	Mangrove swamp
5300	Reservoirs	6170	Mixed wetland hardwoods
5400	Bays and estuaries	6180	Cabbage palm wetland
6181	Cabbage palm hammock	6410	Freshwater marshes
6200	Wetland Coniferous Forest	6420	Saltwater marshes
6210	Cypress	6430	Wet prairies
6220	Pond pine	6440	Emergent aquatic vegetation
6250	Hydric pine flatwoods	6460	Mixed scrub-shrub wetland
6300	Wetland Forested Mixed	6500	Non-vegetated Wetland

Wetland GIS data (using the above classifications) were overlaid with a county's land parcels. The area of wetlands within parcels were calculated and recorded as the water area for that parcel. If the area covered by water within a parcel exceeded 0.5 acres, it was subtracted from the total area of the parcel feature to determine the relative developable area in that parcel. There were exceptions to this rule. In some cases, parcels with little or no developable area after wetlands were removed were already developed, thus the estimated unit total was not reduced by the wetland acreage. In other cases, inaccurate wetland delineations were overridden, such as when a newly platted residential parcel was shown to be covered by a wetland (Figure 2). In such a case, the parcel was considered developable by the model.

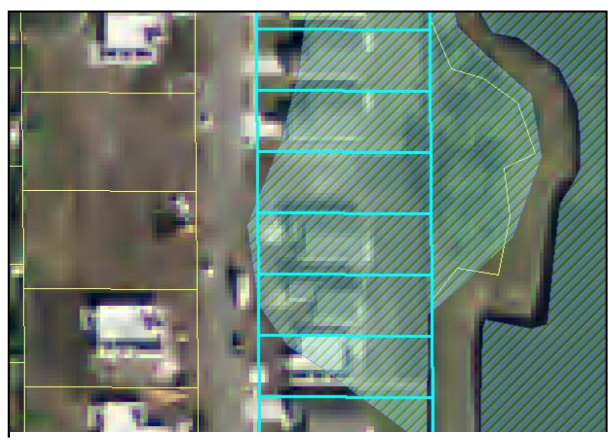

Figure 2. Example of inconsistencies between wetland delineation and residential parcels (outlined here in light blue)

Future Land Use

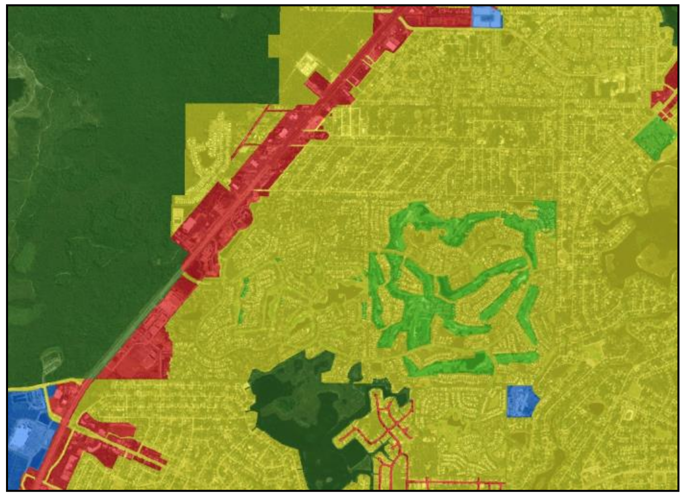

Figure 3. Future land use helps identify future residential areas (here shaded in yellow)

Future land use maps were essential elements of the County Build-out Models. These maps helped guide where and at what density residential development could occur within a county (Figure 3). Future land use maps are a part of the local government comprehensive plans required for all local governments by Chapter 163, Part II, F S. They are typically developed by the local government's planning department, or, in some cases, a regional planning council. The latest available future land use maps were obtained and applied to the build-out model. The planning horizons for these are a minimum of 10 years, and they often extend for 15 to 20 years into the future. Table 2 shows which future land use map classes were assigned residential densities in the County Build-out Models. Future land use map classifications for residential land uses are assigned maximum housing unit densities (per acre) or density ranges. These ranges were intended to guide the type and density of development. However, development does not always occur at densities consistent with future land use maps.

Table 2. Generalized future land use classes allowed by the County Build-out Model to project future residential development

Generalized Future Land Use Classes	Whether Residential Development Is Allowed by the Model
Agricultural	Yes
Low Density Residential	Yes
Medium Density Residential	Yes
High Density Residential	Yes
Mixed Use	Yes
Commercial	No
Recreation / Open Space	No
Conservation / Preservation	No
Industrial	No
Institutional	No
Right of Way	No
Water	No

For this reason, County Build-out Models reflect the current average density for each future land use category in the specific incorporated place instead of the maximum density allowed by the future land use designation. It was assumed that densities of recent development are a better indicator of future densities than the maximum allowable density. For example, if a city's medium density residential future land use designation allows up to 8 housing units per acre, but the average density of units built is 5.7 housing units per acre, the model assumed future densities at 5.7 housing units per acre for that future land use designation in that city.

As an exception, some future land use categories had insufficient sample size to create average density values. In such cases, countywide average density was applied for that future land use class. Vacant or open parcels less than one acre in size were considered single family residential, with 1 housing unit as the maximum allowable density.

Each land parcel in the County Build-out Models received a future land use designation. In places where parcels overlapped multiple future land use areas, the parcel was assigned the future land use class within which its center fell. Build-out population was modeled only for future land use classes designated to allow residential development (which include agriculture and mixed use).

Build-out Density Calculation

Using GIS overlay techniques, attributes of the census, political boundary, wetlands, and future land use data were attributed to each county's parcel data to develop the County Build-out Models. These models forecast the maximum residential population by parcel at build-out (Figure 4).

Figure 4. Example of Build-out Density Model shaded by housing units per acre

Census tracts where the 2010 population was zero, and therefore the average persons per housing unit was zero, were assigned the county's average persons per housing unit. Also, if there were tracts with 2010 census values for persons per housing unit greater than zero that were based on a small number of homes with greater than five persons per housing unit, the county's average persons per housing unit was typically used.

Developments of Regional Impact

Developments of Regional Impact (DRI) are defined by Section 380.06(1), F.S., as "any development that, because of its character, magnitude or location, would have a substantial effect on the health, safety or welfare of citizens in more than one county." DRI plans are another component of Florida's growth management legislation required by Chapter 380, F.S. The final step in the development of the County Build-out Models was adjusting build-out densities to correspond with approved DRIs, or other large development plans (where available). The state annually updates population-based thresholds by county to determine when a development must undergo the DRI review process. For residential DRIs, housing unit thresholds range from 250 units (in counties with fewer than 25,000 people) to 3,000 units (in counties with more than 500,000 people). A DRI plan delineates the boundaries of a DRI, the number of housing units within the boundaries, and the projected timing of when these units will be built. Figure 7 shows an example of a DRI with the planned units at build-out. Although DRIs often do not develop as originally planned by the developer, the total number of units planned (regardless of timing) is likely to be a better forecast of the units at build-out than the average historic densities. Therefore, in each of the build-out models, parcels that were within a DRI were attributed with the name of the DRI. The build-out densities for parcels within a particular DRI were adjusted, if necessary, to be consistent with the DRI development plan, and the build-out population for that area was recalculated.

GROWTH DRIVERS MODEL

The Growth Drivers Model is a district-wide, raster (cell-based) GIS model representing development potential. The model is a continuous surface of 10-meter cells containing values of 0-100, with '100' having the highest development potential and '0' having the lowest development potential. It influences the GISA Projection Model by factoring in the attraction of certain spatial features, or growth drivers on development. These drivers were identified from transportation and land use/land cover data. They included the following:

1. Proximity to roads and interchanges prioritized by level of use (with each road type modeled separately, but then combined into a single model)
2. Proximity to existing residential development
3. Proximity to existing commercial development (based on parcels with commercial land use codes deemed attractors to residential growth)
4. Proximity to coastal and inland waters
5. Proximity to active Developments of Regional Impact and Planned Units Developments

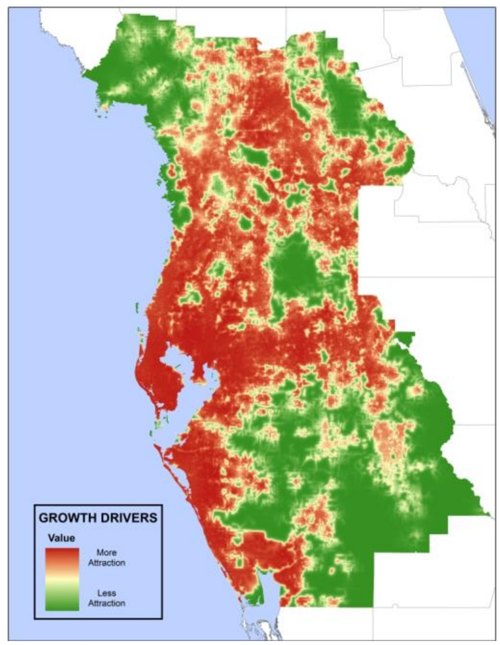

Figure 5. Growth Drivers Model

Figure 5 depicts the Growth Drivers Model for SWFWMD, with high development potential in red, moderate development potential in white and low development potential in green. Data used for generating the Growth Drivers Model and their sources are listed in Table 3 on the following page.

Table 3. GIS datasets used in the Growth Drivers Model

Growth Driver	Data Source
Roads and Limited Access Road Interchanges	Florida Department of Transportation (FDOT) Major Roads: Functional Classification (FUNCLASS), and FDOT Limited Access Road Interchanges
Existing Residential Land Uses	County Property Appraiser Parcel Data
Selected Existing Commercial Land Uses	County Property Appraiser Parcel Data
Coastal and Inland Waters	SWFWMD Land Cover Data, and Florida Geographic Data Library (FGDL) Coastline Data
Active DRIs and PUDs	Multiple sources, including Regional Planning Councils, local governments, and GIS Associates

Each of the drivers listed in Table 3 were used as independent variables in a logistic regression equation. Dependent variables included existing residential units built during or after 1995 as the measure of “presence”, and large undeveloped vacant parcels outside of DRIs or PUDs were used to measure “absence”. The resulting equation could then be applied back to each of the regional grids resulting in a single regional grid with values 0 through 100, for which a value of 0 represented the lowest relative likelihood of development, and a value of 100 represented the highest relative likelihood of development.

This seamless, “regional” model covers all the counties all or partially within the Southwest Florida Water Management District, plus a one-county buffer to eliminate “edge effects”. In this case, the edge effects refer to the presence or absence of growth drivers outside the District that could influence growth within the District. This model was then used by the GISA Projection Model to rank undeveloped parcels based on their development potential, which is explained in the Growth Calculation Methodology section.

SMALL AREA POPULATION PROJECTION MODEL

The GISA Small Area Population Projection Model (GISA Projection Model) integrates the County Build-out Models and the Growth Drivers Model with the GISA Population Projection Engine™, which makes the projection calculations using a combination of those models with the historic growth trends and county level population controls from BEBR.

Historic Growth Trends

The historic growth trends were derived from historic census population estimates for 1990, 2000, and 2010. For 1990 and 2000, census tract population estimates from the Florida House of Representatives Redistricting Data website (http://www.floridaredistricting.org/FredsData.html, 2002) were summarized at the 2010 tract level, and combined with the 2010 tract population estimates. These estimates were used to produce seven tract level projections using five different methods. The minimum and maximum calculations were discarded to moderate the effects of extreme projections (Smith and Rayer 2004). The remaining projections were then averaged.

The five statistical methods for population projection utilized by the model were:

1. Linear
2. Exponential
3. Share-of-Growth
4. Shift-Share
5. Constant Population

The Linear, Exponential, and Constant Population techniques employ a bottom-up approach, extrapolating the historic growth trends or population of each census tract with no consideration for the county's overall growth. The Share-of-Growth and Shift-Share techniques employ a ratio allocation, or top-down approach, allocating a portion of the total projected county growth to each census tract based on that census tract's percentage of county growth over the historical period. Each of the five methods is a good predictor of growth in different situations and growth patterns, so using a combination of all five was the best way to avoid the largest possible errors resulting from the least appropriate techniques for each census tract within the 16-county area (Sipe and Hopkins 1984). This methodology is based on BEBR's population projection methodology and is well suited for small area population projections.

The calculations associated with the five statistical methods are described below.

1. **Linear Projection Method:** The Linear Projection Method assumes that future population change for each census tract will be the same as over the base period (Smith and Rayer, 2013). Two linear growth rate calculations were made, one from 1990 through 2010 (20-year period), and one from 2000 through 2010 (10-year period). In the two Linear methods (LIN), population growth was calculated using the following formulas:

$$LIN_1 = \frac{(TractPop2010 - TractPop1990)}{20} * 5$$

$$LIN_2 = \frac{(TractPop2010 - TractPop2000)}{10} * 5$$

2. **Exponential Projection Method:** The Exponential Projection Method assumes that population will continue to change at the same annual growth rate as over the historic period. In the Exponential method (EXP), population growth was calculated using the following formula:

$$EXP = (TractPop2010 * e^{5r}) - TractPop2010$$

$$where,$$

$$r = \frac{\ln \frac{TractPop2010}{TractPop2000}}{10}$$

3. **Share-of-Growth Projection Method:** The Share-of-Growth Projection Method assumes that each census tract's percentage of the county's total growth will be the same as over the base period (Smith and Rayer, 2013). Two Share-of-Growth calculations were made, one from 1990 through 2010 (20-year period), and one from 2000 through 2010 (10-year period). In the two Share-of-Growth calculations (SOG), population growth was calculated using the following formulas (using the five years from 2015–2020 as an example):

$$SOG_1 = \frac{(TractPop2010 - TractPop1990)}{(CountyPop2010 - CountyPop1990)} * (CountyPop2020 - CountyPop2015)$$

$$SOG_2 = \frac{(TractPop2010 - TractPop2000)}{(CountyPop2010 - CountyPop2000)} * (CountyPop2020 - CountyPop2015)$$

4. **Shift-Share Projection Method:** The Shift-Share Projection Method assumes that each census tract's percentage of the county's total annual growth will change by the same annual amount as over the base period (Smith and Rayer, 2013). In the Shift-Share Projection Method (SSH), population growth was calculated with the following formula (using the five years from 2015–2020 as an example):

$$SSH = \begin{bmatrix} \frac{(TractPop2010 - TractPop2000)}{(CountyPop2010 - CountyPop2000)} \\ + \\ \begin{bmatrix} \frac{(TractPop2010 - TractPop2000)}{(CountyPop2010 - CountyPop2000)} \\ - \\ \frac{(TractPop2000 - TractPop1990)}{(CountyPop2000 - CountyPop1990)} \end{bmatrix} \\ /10*5 \end{bmatrix} * (CountyPop2020 - CountyPop2015)$$

The Shift-Share Method is an appropriate method when the historic growth trend at the tract and county levels are consistent (both are positive, or both are negative). If the growth trend at the tract level is negative and the growth trend at the county level is positive (or vice versa), the Shift-Share method is <u>not</u> an appropriate technique according to BEBR (Stanley Smith, Ph.D., personal communication, 2011). For any tracts where the historic growth trend was the opposite of the county's growth trend, the Shift-Share Method was replaced with the Constant Population Method, which a technique that has been newly adopted by BEBR.

5. **Constant Population Method:** The Constant Population Method assumes that future population will remain constant at its 2010 value (Smith and Rayer, 2013). This technique was only used as a substitute for the Shift-Share Method for tracts with a historic growth trend that was inconsistent with the county growth trend over the same period. In the Constant Population (CON), population was held to its 2010 value, so there was no growth calculated.

6. **Average of the Projection Extrapolations:** The minimum and maximum of the six calculations for each census tract were dropped to reduce errors resulting from the least appropriate techniques. The four remaining calculations were averaged to account for the considerable variation in growth rates and patterns over all of the census tracts within the 16-county area (Sipe and Hopkins 1984). All four remaining methods were weighted equally. The average was calculated using the following formula:

$$AVG = \frac{(LIN_1 + LIN_2 + EXP + SOG_1 + SOG_2 + SSH - MIN - MAX)}{4}$$

where,

MIN = method resulting in minimum growth for each tract

and,

MAX = method resulting in maximum growth for each tract

and,

CON was used in place of SSH for tracts with historical growth trends that were inconsistent with the historic county growth trends

Growth Calculation Methodology

After the development of the County Build-out Models and the Growth Drivers Model, the GISA Population Projection Engine™ was used to make the growth calculations. The methodology for calculating growth for each projection increment included the following steps:

1. Applying census tract level average historical growth rate to parcels within a particular tract.
2. Checking growth projections against build-out population, and reducing any projections exceeding build-out to the build-out numbers.
3. After projecting growth for all census tracts within a particular county, summarizing the resulting growth and comparing it against countywide BEBR target growth. This step led to two scenarios:
    a. If the Small Area Population projection model's projections exceeded the BEBR target, projected growth for all tracts was reduced by the percentage that the projections exceeded the BEBR target.
    b. If the Small Area Population projection model's projections were less than the BEBR target (which is more common due to high growth areas building out), the model would continue growing the county using the Growth Drivers Model until

the BEBR target growth for each five-year increment was reached. This process involved developing parcels in undeveloped census tracts with the highest growth driver values.

4. Summarizing growth and checking against build-out.
5. Continuing this process until the county growth target was met. (Note that this BEBR-based target growth was a countywide number. Counties that are partially within another water management district were processed in their entirety and controlled to the BEBR-based target growth. The proportion of the county population within SWFWMD was dictated by the Small Area Population projection model, not by BEBR.)

NON-PERMANENT POPULATION PROJECTIONS

In addition to the Census Population Cohort projections generated by the GISA Projection Model, projections of non-permanent population were also made. Those projections include peak seasonal population, functionalized seasonal population, tourist population and net commuter population. The methods derived by SWFWMD and implemented by GIS Associates for projecting those population types are described in this section.

Peak Seasonal Population Cohort

Seasonal population was estimated using a combination of 2010 census data and emergency room admissions data, both at the Zip Code Tabulation Area (ZCTA) level. Average 2009 - 2011 emergency room admissions data was utilized for a population cohort typical of seasonal residents (between the ages of 55 and 84).

A "Seasonal Resident Ratio" was calculated by ZCTA to estimate the proportion of peak (including seasonal) to permanent population. The ratio was derived using the following steps:

1. Subtract total 2009 - 2011 total third quarter (Q3, or July, August and September) hospital admissions from first quarter (Q1, or January, February and March) admissions.
2. Calculate the average annual difference between Q1 and Q3 by dividing above result by three.
3. Calculate a seasonal population estimate for ZCTA by dividing above difference by the probability of the population in the 45-74 age cohort of being admitted to the emergency room (approximately 2.23%). [Note that the selection of 45-74 age cohort probability (instead of 55-84 age cohort probability) is based on literature indicating that seasonal residents are generally healthier that their year-round counterparts.]
4. Calculate the Seasonal Resident Ratio by adding the seasonal population to the permanent population and dividing that total by the permanent population.

The number of seasonal households was then estimated using the following steps:

1. Multiply the permanent population in households (from the 2010 census) by the Seasonal Resident Ratio.
2. Subtract the permanent population in households from above result.

3. Divide above result by the lesser of SWFWMD's seasonal persons per household (1.95) or the census permanent persons per household for each ZCTA.

The ratio of seasonal to total households was then calculated by dividing seasonal households by the sum of seasonal and permanent households. Seasonal peak population was then calculated using the following steps:

1. Subtract vacant housing units for reasons other than seasonal, recreational, or occasional use from total housing units (from the 2010 census).
2. Multiply above result times the seasonal to total household ratio.
3. Multiply above result times the lesser of SWFWMD's seasonal persons per household (1.95) or the census permanent persons per household for each ZCTA.

Because the Census Population Cohort contains some non-permanent residents who complete the census forms in Florida but reside for part of the year outside of Florida, it was also necessary to calculate the permanent population. Permanent population was calculated using the following steps:

1. Subtract vacant housing units for reasons other than seasonal, recreational, or occasional use from total housing units (from the 2010 census).
2. Multiply above result times one minus the seasonal to total household ratio.
3. Multiply above result times the census permanent persons per household for each ZCTA.

The ratio of total unadjusted peak population to total census population was then calculated by dividing the sum of the seasonal peak population, the permanent population, and the group quarters population (from the 2010 census) by the total census population. This ratio was then applied to the future projections of the Census Population Cohort from the GISA Projection Model to derive parcel level peak population projections.

Functionalized Seasonal Population Cohort

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

1. Utilize the following metrics previously derived by SWFWMD:
    a. The appropriate proportion of the year seasonal residents spend in Florida, which varies from beach destination counties (44.2%) to non-beach destination counties (56.7%).
    b. The seasonal resident adjustment based on average per capita water use.
        i. The five-year District-wide average per capita use is 132 gallons per person per day, and 69.3 gallons is estimated indoor use and 62.7 gallons for outdoor use.
        ii. The adjustment factor is calculated using the following equation for "beach destination" counties (Charlotte, Manatee, Pinellas and Sarasota): ((0.442 x 132 gpd) + ((1 – 0.442) x 62.7 gpd)) / 132 gpd = 0.707

iii. The adjustment factor is calculated using the following equation for “non-beach destination counties”:
((0.567 x 132 gpd) + ((1 – 0.567) x 62.7 gpd)) / 132 gpd = 0.773

2. Calculate “functionalized” seasonal population by multiplying the seasonal peak population by the appropriate seasonal resident adjustment factor for the particular county (0.707 or 0.773).

The ratio of total functional to total census population was then calculated by dividing the sum of the functionalized seasonal population, the permanent population, and the group quarters population (from the 2010 census) by the total census population. This ratio was then applied to the future projections of the Census Population Cohort from the GISA Projection Model to derive parcel level functional population projections.

Tourist Population Cohort

The tourist population projections were based on 17 years (1996-2012) of county level lodging room data from the Florida Department of Business and Professional Regulation (DBPR). The SWFWMD methodology for projecting future tourist rooms by county utilizes two different methods and averages the two results for each county.

The first method projects the increase in rooms by county by extrapolating the linear trend using the least squares method derived from the last 17 years of county total room estimates. This was the method used by the District for the past several years.

A second method projects future rooms based on projections of employment in the Accommodation and Food Services industries (from 2013 data from Woods and Poole). This is also an extrapolation of a linear trend using the least squares method, but rooms by county are projected as a function of a county’s employment projections rather than time.

SWFWMD staff tested both methods by projecting values for the years 2007-2012 using room estimates from 1996-2006. Based on the differences between actual room estimates and projected values for 2007-2012, neither method was clearly superior to the other. For that reason, SWFWMD staff opted to use both methods. The results of both methods were averaged, but only after adjusting for the average 2007-2012 error for each projection in each county.

These projections of future rooms were then converted to “functionalized” tourist population by applying various county level average unit occupancy and party size ratios. These ratios were provided by SWFWMD, who also updated the values associated with locations identified as short term rentals for this projection set based on SWFWMD research.

These projections of tourist population were joined to the existing lodging facility locations. No attempt was made to project future locations of lodging facilities, as:

1. The precise locations would be highly speculative.
2. It was assumed that lodging facilities often are built in the general vicinity of existing lodging facilities, or at least in close enough proximity to be within the same utility service area.

Net Commuter Population Cohort

The net commuter population projections were based on net commuter data provided by SWFWMD. A census tract ratio was developed of net commuters to total census population. This ratio was then applied to the future projections of the Census Population Cohort from the GISA Projection Model to derive parcel level projections for net commuter population. That population was then "functionalized" with the following ratios:

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

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

Note that the net commuter population projection summaries by utility service area were often negative, as many utilities serve "bedroom communities" and other areas where more residents work outside the utility service area than the population (residents and non-residents) employed within it. Only positive net commuter populations were included in the SWFWMD service area population totals.

UTILITY SERVICE AREA POPULATION SUMMARIES

The parcel level population projections for all population cohorts discussed above were then summarized by water utility service area boundaries for all utilities in SWFWMD that averaged more than 0.1 million gallons per day (mgd) of total water use. These service areas, maintained by SWFWMD, were overlain with each county's parcel level results, and each parcel within a service area was assigned a unique identifier for that service area. The projected population was then summarized by that identifier and joined to SWFWMD's public service area boundary database to produce tabular and spatial output. Note that these service areas change over time, so it is important to match this projection set only with the service areas included in the GIS deliverables for this project.

Spatial Incongruity of Boundaries

Due to mapping errors, the service area boundaries often bisect parcel boundaries (Figure 6). In the present modeling activity, parcels were deemed to be within a given service area if their center points (or "centroids") fell inside the service area boundaries. The error associated with this spatial incongruity at the parcel level was much smaller than would be the case with census tract level data. This is one of the main reasons for disaggregating census tract level data to the parcel level. The percentage of parcels erroneously attributed or excluded from a service area by this process is insignificant.

Figure 6. Parcel centroids (yellow points) used in summarizing parcels (yellow) to utility service area boundaries (blue)

PROJECTION DELIVERABLES

The final population projections were delivered in multiple formats, including:

1. GIS – Esri's file geodatabase, with feature classes for both parcel level results and utility service area summaries.
2. Tabular – Excel spreadsheet summaries by utility service area

The GIS outputs are useful for quality assuring the results and inputs, for maintaining the projection inputs over time, and for graphically depicting projected patterns of future population growth (Figure 7).

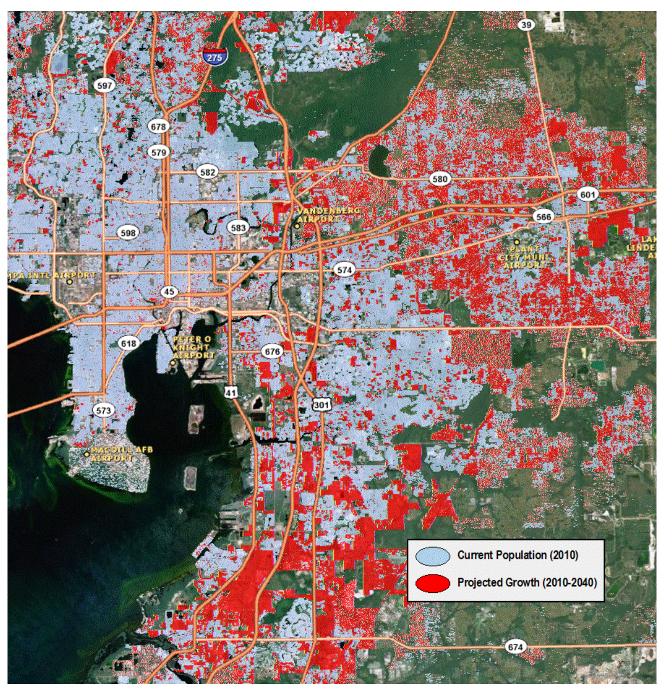

Figure 7. Dot density symbolization of GIS data reflecting parcel level population growth in Hillsborough County. The 2010 population is in gray, and the 2010-2040 growth is in red.

The tabular deliverables were parcel summaries at the utility level. Figure 8 on the next page shows the service area population projection summaries table for Manatee County.

The population summaries for "OUTSIDE SERVICE AREAS" include population considered to be domestic self supply (DSS) or small utilities without a service area boundary in SWFWMD's database. Small utilities are generally defined as those utilities permitted for less than 100,000 gallons per day (gpd). However, there are some small utilities in that category that are included here because their service area boundary is in SWFWMD's database.

Note that these service area population summaries may include some self-supplied populations (or populations with private wells) that reside within the service areas. In some cases, the population projections utilized for SWFWMD's Regional Water Supply Plan (RWSP) may vary from the raw functional population projections developed with the model due to service area boundary changes after raw model output, DSS identified after raw model output, 2012 population served reported by utility using the required population estimation methodology in Part D of the Water Use Permitting Manual, etc.

BEBR / Census Population Cohort							
Utility Name	POP12	POP15	POP20	POP25	POP30	POP35	POP40
OUTSIDE SERVICE AREAS	9,663	10,161	11,342	12,543	13,791	14,991	16,041
CITY OF BRADENTON PUBLIC WORKS	48,531	48,735	49,144	49,252	49,427	49,629	49,858
CITY OF PALMETTO PUBLIC WORKS	14,056	14,155	14,400	14,695	15,070	15,462	15,888
MANATEE CO PUBLIC WORKS DPT	255,476	269,072	297,537	324,028	347,116	367,206	385,376
TOWN OF LONGBOAT KEY	2,576	2,576	2,577	2,582	2,595	2,613	2,636

Peak Seasonal Population Cohort (Includes BEBR / Census Cohort)							
Utility Name	POP12_P	POP15_P	POP20_P	POP25_P	POP30_P	POP35_P	POP40_P
OUTSIDE SERVICE AREAS	9,872	10,385	11,599	12,834	14,114	15,342	16,407
CITY OF BRADENTON PUBLIC WORKS	51,499	51,715	52,143	52,256	52,440	52,652	52,893
CITY OF PALMETTO PUBLIC WORKS	15,641	15,750	16,023	16,352	16,769	17,204	17,678
MANATEE CO PUBLIC WORKS DPT	285,242	299,891	330,347	358,597	383,276	404,844	424,431
TOWN OF LONGBOAT KEY	5,493	5,493	5,495	5,506	5,534	5,571	5,622

Functionalized Seasonal Population Cohort (Includes BEBR / Census Cohort)							
Utility Name	POP12_F	POP15_F	POP20_F	POP25_F	POP30_F	POP35_F	POP40_F
OUTSIDE SERVICE AREAS	9,798	10,306	11,511	12,736	14,007	15,225	16,283
CITY OF BRADENTON PUBLIC WORKS	50,520	50,732	51,152	51,263	51,443	51,651	51,888
CITY OF PALMETTO PUBLIC WORKS	15,203	15,310	15,575	15,894	16,300	16,723	17,184
MANATEE CO PUBLIC WORKS DPT	278,779	293,158	323,057	350,790	374,983	396,123	415,300
TOWN OF LONGBOAT KEY	5,106	5,106	5,108	5,118	5,144	5,178	5,226

Functionalized Tourist Population Cohort							
Utility Name	POP12_T	POP15_T	POP20_T	POP25_T	POP30_T	POP35_T	POP40_T
OUTSIDE SERVICE AREAS	-	-	-	-	-	-	-
CITY OF BRADENTON PUBLIC WORKS	755	792	861	935	1,012	1,093	1,178
CITY OF PALMETTO PUBLIC WORKS	10	10	11	12	13	14	15
MANATEE CO PUBLIC WORKS DPT	13,876	14,560	15,824	17,155	18,556	20,030	21,583
TOWN OF LONGBOAT KEY	1,270	1,331	1,448	1,572	1,701	1,838	1,982

Functionalized Net Commuter Population Cohort							
Utility Name	POP12_NC	POP15_NC	POP20_NC	POP25_NC	POP30_NC	POP35_NC	POP40_NC
OUTSIDE SERVICE AREAS	(627)	(652)	(709)	(771)	(841)	(913)	(989)
CITY OF BRADENTON PUBLIC WORKS	1,572	1,568	1,561	1,565	1,580	1,601	1,632
CITY OF PALMETTO PUBLIC WORKS	(351)	(358)	(375)	(394)	(416)	(438)	(461)
MANATEE CO PUBLIC WORKS DPT	(6,051)	(6,445)	(7,302)	(8,078)	(8,557)	(8,888)	(9,323)
TOWN OF LONGBOAT KEY	120	120	120	121	121	122	123

Total Functional Population Cohort (Functionalized Seasonal + Tourist + Positive Net Commuter)							
Utility Name	POP12_TF	POP15_TF	POP20_TF	POP25_TF	POP30_TF	POP35_TF	POP40_TF
OUTSIDE SERVICE AREAS	9,798	10,306	11,511	12,736	14,007	15,225	16,283
CITY OF BRADENTON PUBLIC WORKS	52,847	53,092	53,574	53,762	54,035	54,345	54,699
CITY OF PALMETTO PUBLIC WORKS	15,213	15,320	15,587	15,906	16,313	16,737	17,199
MANATEE CO PUBLIC WORKS DPT	292,655	307,718	338,881	367,945	393,539	416,153	436,883
TOWN OF LONGBOAT KEY	6,496	6,558	6,677	6,810	6,966	7,138	7,330

Figure 8. Utility service area population projection summaries table for Manatee County

CONCLUSIONS

Small area population projections have become increasingly important for various regional planning efforts. With ever changing population dynamics and requirements for water supply planning and permitting, it is critical for SWFWMD to be able to accurately forecast population and water demand at a much finer resolution than at the county level, and to be able to update these projections regularly and in an efficient, cost-effective manner. To achieve this, SWFWMD again utilized GIS Associates' Small Area Population Projection Model and GISA's implementation of SWFWMD methods for projecting seasonal, tourist and net commuter populations. The model was updated with current data to project population in an efficient and consistent manner throughout the entire 16-county region. Controlling the projections to BEBR's county level forecasts provided consistency with other projections made by state and local governments, while at the same time providing the spatial precision needed for water supply planning and permitting.

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APPENDIX B:
Growth Allocation and Calculation Summary

CITY OF BELLEVIEW
UTILITY MASTER PLAN
ERU, WATER, SANITARY SEWER DEMAND PROJECTIONS

Kimley»Horn

	AREA	2018			2022			2027			2037		
		ERUs[4]	WATER ADD (GPD)[2]	WW ADD (GPD)[3]	ERUs[4]	WATER ADD (GPD)[2]	WW ADD (GPD)[3]	ERUs[4]	WATER ADD (GPD)[2]	WW ADD (GPD)[3]	ERUs[4]	WATER ADD (GPD)[2]	WW ADD (GPD)[3]
EXISTING	Existing WTP/WRF Service Area[1]	2,144	857,711	428,856	2,451	857,711	428,856	2,144	857,711	428,856	2,144	857,711	428,856
INFILL	Infill	0	0	0	104	41,412	20,706	241	96,349	48,175	462	184,794	92,397
	Subtotal	0	0	0	104	41,412	20,706	241	96,349	48,175	462	184,794	92,397
EXPANSION & DEVELOPMENT	132nd Street West[6]	0	0	0	159	56,033	28,016	172	61,160	30,580	206	73,589	36,794
	132nd Street East[6]	0	0	0	212	74,045	37,022	229	80,149	40,074	274	95,785	47,892
	Autumn Glen Development	0	0	0	132	46,200	23,100	132	46,200	23,100	132	46,200	23,100
	Summer Crest[5]	0	0	0	150	67,500	30,000	400	180,000	80,001	625	281,250	125,000
	Water Only (Expansion)	0	0	0	0	0	0	0	0	0	90	36,090	18,045
	Subtotal	0	0	0	653	243,778	118,139	934	367,508	173,755	1,327	532,914	250,832
SEPTIC TO SEWER	Septic to Sewer Region 1	0	0	0	214	85,489	44,282	249	99,418	52,274	309	123,717	66,325
	Septic to Sewer Region 2	0	0	0	73	29,150	14,787	100	39,860	20,284	146	58,491	29,862
	Septic to Sewer Region 3	0	0	0	478	191,226	96,532	506	202,461	102,765	557	222,632	113,988
	Septic to Sewer Region 4	0	0	0	0	0	0	5	1,991	15,516	7	2,844	15,942
	Septic to Sewer Region 5	0	0	0	0	0	0	106	42,236	49,978	160	63,850	62,973
	Septic to Sewer Region 6	0	0	0	0	0	0	233	93,091	47,566	251	100,326	51,941
	Future Septic Region 7	0	0	0	0	0	0	0	0	0	64	25,450	12,847
	Future Septic Region 8	0	0	0	0	0	0	0	0	0	423	169,147	86,149
	Future Septic Region 9	0	0	0	0	0	0	0	0	0	1,554	621,513	310,757
	Future Septic Region 10	0	0	0	0	0	0	0	0	0	466	186,287	93,615
	Future Septic Region 11	0	0	0	0	0	0	0	0	0	126	50,517	25,475
	Subtotal	0	0	0	765	305,865	155,601	1,198	479,058	288,383	4,062	1,624,775	869,874
	Total (No OSTDS)	2,144	857,711	428,856	3,207	1,142,901	567,700	3,319	1,321,568	650,785	3,933	1,575,419	772,084
	Total with OSTDS Region 1-6				3,972	1,448,765	723,302	4,516	1,800,626	939,168	5,363	2,147,278	1,113,115
	Total with OSTDS Region 1-11										7,995	3,200,193	1,641,958

1. Based on 2017 FDEP MOR data
2. 400 gpd/ERU per the Marion County Land Development Code level of service for potable water
3. 200 gpd/ERU per the Marion County Land Development Code level of service for wastewater
4. Assumed 2.35 people per ERU
5. Assumed 450 gpd/ERU. Currently 75 lots occupied, to increase at 50 lots/year. Does not include existing customers
6. 50% of buildout in 2037, 2% growth rate. Values used from Project No. 042417005 Abshier SE 132nd Utility Ext.

Peak Hour Factor	4.5
Max Day Factor	2.25

	ADD	MDD	PHF
Current Water System Capacity	0.547	1.23	2.46
Current Wastewater System Capactiy	0.76	1.71	1.71

APPENDIX C: Capital Improvement Project Timeline and Detailed Cost Opinions

City of Belleview
Utility System Master Plan
Capital Improvement Program No Septic to Sewer

Kimley»Horn

Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	ERU Trigger (Project Start)
WATER DISTRIBUTION					
PWS Improvement No.3	WM from Proposed WTP to CR 484 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 290,000	2019	2021	2,287
PWS Improvement No.7	US 301 WM South From Belmar Rd to SE 132nd St (Design, Permitting, Bidding, Construction and Construction Administration)	$ 520,000	Developer Driven		N/A
PWS Improvement No.8	132nd St East WM Extension From US 441 West to CR 484 (Bidding, Construction and Construction Administration)	$ 2,190,000	Developer Driven		N/A
WATER TREATMENT					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	ERU Trigger (Project Start)
PWS Improvement No.1A1	Construct a 1.20 MGD MDD WTP at the Public Works Building (Construct 1 UFA well and 2 Hydropneumatic Tanks) (Design and Permitting)	$ 255,000	2019	2020	2,287
PWS Improvement No.1A2	Construct a 1.20 MGD MDD WTP at the Public Works Building (Construct 1 UFA well and 2 Hydropneumatic Tanks) (Bidding, Construction and Construction Administration)	$ 2,295,000	2020	2021	2,429
PWS Improvement No.1B1	Upsize New WTP to a 3.60 MGD MDD Capacity (Second UFA well, GST, HSPs, HSP Building and Electrical) (Design and Permitting)	$ 750,000	2024	2024	3,036
PWS Improvement No.1B2	Upsize New WTP to a 3.60 MGD MDD Capacity (Second UFA well, GST, HSPs, HSP Building and Electrical) (Bidding, Construction and Construction Administration)	$ 6,750,000	2025	2027	3,484
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WASTEWATER COLLECTION					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	ERU Trigger (Project Start)
WW Improvement No.1	Replace Both Pumps at LS No.6	$ 40,000	As Required		N/A
WW Improvement No.2	Install a Second Pump at LS No.39	$ 20,000	As Required		N/A
WW Improvement No.3	Replace Both Pumps at LS No.32	$ 40,000	2019	2019	2,287
WW Improvement No.4	Replace Both Pumps at LS No.11	$ 40,000	As Required		N/A
WW Improvement No.5A	FM to Manifold LS No.22, 35 and 21 to Redirect Flows from the City's Gravity Sewer System to the WRF. Replace Both Pumps at LS No. 22, 35 and 21. (Design and Permitting)	$ 145,500	Developer Driven		N/A
WW Improvement No.5B	FM to Manifold LS No.22, 35 and 21 to Redirect Flows from the City's Gravity Sewer System to the WRF. Replace Both Pumps at LS No. 22, 35 and 21. (Bidding, Construction and Construction Administration)	$ 1,314,500	Developer Driven		N/A
WW Improvement No.5C	FM to Manifold LS No. 34, 5, 19, 20, 43 and 44 to Redirect Flows from the City's Gravity Sewer System to the WRF. Replace Both Pumps at LS No. 34, 5, 19, 20, 43 and 44. (Design and Permitting)	$ 213,000	2020	2020	2,429
WW Improvement No.5D	FM to Manifold LS No. 34, 5, 19, 20, 43 and 44 to Redirect Flows from the City's Gravity Sewer System to the WRF. Replace Both Pumps at LS No. 34, 5, 19, 20, 43 and 44. (Bidding, Construction and Construction Administration)	$ 1,917,000	2021	2022	2,572
WW Improvement No.7	Replace Both Pumps at LS No.37	$ 40,000	As Required		N/A
Project Already Budgeted	LS No.4 Pump Replacement and Rehabilitation	$ 200,000	2020	2020	2,429
Project Already Budgeted	LS No.5 Pump Replacement and Rehabilitation	$ 200,000	2021	2021	2,429
WW Misc. Improvement	Lift Station Renewal and Replacement	$100,000/year	As Required		N/A
WW Misc. Improvement	Gravity Collection System Renewal and Replacement	$100,000/year	As Required		N/A
WASTEWATER TREATMENT					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	ERU Trigger (Project Start)
WRF Improvement No.1A1	Required Capital Improvements to Existing WRF (Design and Permitting)	$ 100,000	2019	2020	2,287
WRF Improvement No.1A2	Required Capital Improvements to Existing WRF (Bidding, Construction and Construction Administration)	$ 870,000	2020	2021	2,429
WRF Improvement No.1B	Optional Capital Improvements to Existing WRF (Based off of City's requests)	$ 1,600,000	2022	2023	N/A
WRF Improvement No.2A1	Rerate Existing WRF to 0.8 MGD (Design and Permitting)	$ 100,000	2034	2034	5,249
WRF Improvement No.2A2	Rerate Existing WRF to 0.8 MGD (Bidding, Construction and Construction Administration)	$ 900,000	2035	2036	5,527
See the City of Belleview WRF Facility Plan prepared by Kimley-Horn					
RECLAIMED WATER TRANSMISSION AND DISPOSAL					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	ERU Trigger (Project Start)
Reclaimed Storage Option 1	Rehab Existing 1.00 MG Effluent Storage Basin to Function as a Reject Storage Pond	$ 870,000	2034	2035	5,249
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City of Belleview
Utility System Master Plan
Capital Improvement Program with Septic to Sewer

Kimley»Horn

WATER DISTRIBUTION					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	Septic to Sewer Region Trigger (Project Start)
PWS Improvement No.4	SE 119th St WM from proposed WTP to US 301 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 960,000	2023	2024	Region 5
PWS Improvement No.5	US 301 WM South From SE 119th St to Belmar Rd (Design, Permitting, Bidding, Construction and Construction Administration)	$ 860,000	2023	2024	Region 5
PWS Improvement No.6	US 301 WM North From SE 119th St to Baseline Rd (Design, Permitting, Bidding, Construction and Construction Administration)	$ 1,180,000	2033	2035	Region 6
WATER TREATMENT					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	Septic to Sewer Region Trigger (Project Start)
PWS Improvement No.2A1	Construct a 2.46 MGD MDD WTP at the Public Works Building (2 UFA wells, GST, HSPs, HSP Building and Electrical) (Design and Permitting)	$ 745,500	2019	2020	Region 1
PWS Improvement No.2A2	Construct a 2.46 MGD MDD WTP at the Public Works Building (2 UFA wells, GST, HSPs, HSP Building and Electrical) (Bidding, Construction and Construction Administration)	$ 6,714,500	2020	2021	Region 1
PWS Improvement No.2B1	Upsize New WTP to a 5.00 MGD MDD Capacity (Additional GST and Additional HSPs) (Design and Permitting)	$ 312,000	2025	2026	Region 6
PWS Improvement No.2B2	Upsize New WTP to a 5.00 MGD MDD Capacity (Additional GST and Additional HSPs) (Bidding, Construction and Construction Administration)	$ 2,808,000	2026	2028	Region 6
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WASTEWATER COLLECTION					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	Septic to Sewer Region Trigger (Project Start)
WW Improvement No.6	Replace Both Pumps at LS No.42	$ 150,000	2023	2023	Region 3
WASTEWATER TREATMENT					
Project No.	Project	Amount	Project Start Year (Fiscal Year Ending)	Anticipated Project End Year (Fiscal Year Ending)	Septic to Sewer Region Trigger (Project Start)
WRF Improvement No.2B1	Expand WRF to 1.2 MGD (Design and Permitting)	$ 1,310,000	2019	2020	Region 1
WRF Improvement No.2B2	Expand WRF to 1.2 MGD (Bidding, Construction and Construction Administration)	$ 11,360,000	2021	2022	Region 1
See the City of Belleview WRF Facility Plan prepared by Kimley-Horn					
SEPTIC TO SEWER					
Project No.	Project	Amount	Budget Fiscal Year		Septic to Sewer Region Trigger (Project Start)
SS OSTDS Region 1	SS OSTDS Region 1 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 14,923,374	2019-2020		Region 1
SS OSTDS Region 2	SS OSTDS Region 2 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 4,848,771	2020-2021		Region 2
SS OSTDS Region 3	SS OSTDS Region 3 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 22,254,273	2021-2022		Region 3
SS OSTDS Region 4	SS OSTDS Region 4 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 7,825,887	2022-2023		Region 4
SS OSTDS Region 5	SS OSTDS Region 5 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 9,209,064	2023-2024		Region 5
SS OSTDS Region 6	SS OSTDS Region 6 (Design, Permitting, Bidding, Construction and Construction Administration)	$ 11,829,369	2024-2025		Region 6
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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.1A: Construct a 1.20 MGD MDD WTP at the Public Works Building

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Construct one new 16" Upper Floridan Well.	LS	1	$ 200,000	$ 200,000
2	Construct a 1.20 MGD WTP at the City of Belleview Public Works Building (One 1,750 gpm well pump and two baffled 10,000-gallon hydropneumatic tanks).	Gallons	1,200,000	$ 1.25	$ 1,500,000
				SUBTOTAL	$ 1,700,000
				SURVEY, DESIGN AND CONSTRUCTION COST (15%)	$ 255,000
				CONSTRUCTION ADMINISTRATION (5%)	$ 85,000
				CONTINGENCY (30%)	$ 510,000
				TOTAL	$ 2,550,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.1B: Upsize New WTP to a 3.60 MGD MDD Capacity

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Construct one new 16" Lower Floridan Wells.	LS	1	$ 200,000	$ 200,000
2	Upsize capacity from 1.20 MGD MDD to 3.60 MGD MDD (Second 1,750 gpm well pump, 1.0 MG GST and four 1,750 gpm high service pumps).	Gallons	2,400,000	$ 2.00	$ 4,800,000
				SUBTOTAL	$ 5,000,000
				SURVEY, DESIGN AND CONSTRUCTION COST (15%)	$ 750,000
				CONSTRUCTION ADMINISTRATION (5%)	$ 250,000
				CONTINGENCY (30%)	$ 1,500,000
				TOTAL	$ 7,500,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.2A: Construct a 2.46 MGD MDD WTP at the Public Works Building

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	MOBILIZATION	1	LS	$ 150,000	150,000.00
2	SURVEY LAYOUT AND RECORD DRAWINGS	1	LS	$ 50,000	50,000.00
3	SITE CIVIL	1	LS	$ 450,000	450,000.00
4	LANDSCAPING	1	LS	$ 100,000	100,000.00
5	WATER TREATMENT PLANT CONTROL BUILDING	1	LS	$ 750,000	750,000.00
6	CONTROL BUILDING OUTFITTING AND FURNISHING	1	AL	$ 150,000	150,000.00
7	JOCKEY PUMPS	2	EA	$ 50,000	100,000.00
8	HIGH SERVICE PUMPS	3	EA	$ 75,000	225,000.00
9	CONSTRUCT 16" UPPER FLORIDAN AQUIFER WELLS	2	EA	$ 120,000	240,000.00
10	WELL PUMPS	2	EA	$ 100,000	200,000.00
11	CHLORINATION SYSTEM	1	LS	$ 150,000	150,000.00
12	1.0 MG GROUND STORAGE TANK	1	LS	$ 750,000	750,000.00
13	YARD PIPING	1	LS	$ 400,000	400,000.00
14	DISTRIBUTION PIPING	1	LS	$ 200,000	200,000.00
15	ELECTRICAL AND INSTRUMENTATION	1	LS	$ 850,000	850,000.00
16	GENERATOR AND AUTOMATIC TRANSFER SWITCH	1	LS	$ 200,000	200,000.00
				SUBTOTAL	$ 4,970,000
				SURVEY, DESIGN AND CONSTRUCTION COST (15%)	$ 745,500
				CONSTRUCTION ADMINISTRATION (5%)	$ 248,500
				CONTINGENCY (30%)	$ 1,491,000
				TOTAL	$ 7,460,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.2B: Upsize New WTP to a 5.0 MGD MDD Capacity

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	MOBILIZATION	1	LS	$ 150,000	150,000.00
3	SURVEY LAYOUT AND RECORD DRAWINGS	1	LS	$ 25,000	25,000.00
6	SITE CIVIL	1	LS	$ 100,000	100,000.00
8	LANDSCAPING	1	LS	$ 100,000	100,000.00
12	HIGH SERVICE PUMPS	2	EA	$ 75,000	150,000.00
20	1.0 MG GROUND STORAGE TANK	1	LS	$ 750,000	750,000.00
21	YARD PIPING	1	LS	$ 300,000	300,000.00
23	ELECTRICAL AND INSTRUMENTATION	1	LS	$ 500,000	500,000.00
				SUBTOTAL	$ 2,080,000
				SURVEY, DESIGN AND CONSTRUCTION COST (15%)	$ 312,000
				CONSTRUCTION ADMINISTRATION (5%)	$ 104,000
				CONTINGENCY (30%)	$ 624,000
				TOTAL	$ 3,120,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.3: WM from Proposed WTP to CR 484

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 1,600 LF of 12" PVC DR-18 Water Main and appurtenances and connect to existing 8" Water Main.	LF	1,600	$ 125	$ 200,000
				SUBTOTAL	$ 200,000
				DESIGN AND PERMITTING (15%)	$ 30,000
				CONTINGENCY (30%)	$ 60,000
				TOTAL	$ 290,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.4: SE 119th St WM from Proposed WTP to US 301

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 3,650 LF of 20" PVC DR-18 Water Main and appurtenances.	LF	3,650	$ 180	$ 657,000
				SUBTOTAL	$ 660,000
				DESIGN AND PERMITTING (15%)	$ 100,000
				CONTINGENCY (30%)	$ 198,000
				TOTAL	$ 960,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.5: US 301 WM South From SE 119th St to Belmar Rd

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 4,700 LF of 12" PVC DR-18 Water Main and appurtenances.	LF	4,700	$ 125	$ 587,500
				SUBTOTAL	$ 590,000
				DESIGN AND PERMITTING (15%)	$ 90,000
				CONTINGENCY (30%)	$ 177,000
				TOTAL	$ 860,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.6: US 301 WM North to Baseline Rd

	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 4,650 LF of 12" PVC DR-18 Water Main and appurtenances and connect to existing 12" Water Main.	LF	4,650	$ 175	$ 813,750
				SUBTOTAL	$ 810,000
				DESIGN AND PERMITTING (15%)	$ 120,000
				CONTINGENCY (30%)	$ 243,000
				TOTAL	$ 1,180,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.7: US 301 WM South From Belmar Rd to SE 132nd St

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 2,900 LF of 12" PVC DR-18 Water Main and appurtenances.	LF	2,900	$ 125	$ 362,500
				SUBTOTAL	$ 360,000
				DESIGN AND PERMITTING (15%)	$ 50,000
				CONTINGENCY (30%)	$ 108,000
				TOTAL	$ 520,000

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CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

PWS Improvement No.8: 132nd St WM Extension From US 441 West to CR 484

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 13,400 LF of 12" PVC DR-18 Water Main and appurtenances and connect to existing 12" Water Main.	LF	13,400	$ 125	$ 1,675,000
				SUBTOTAL	$ 1,680,000
				CONTINGENCY (30%)	$ 504,000
				TOTAL	$ 2,190,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.1: Replace Both Pumps at LS No.6

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Replace Both Pumps in LS No.6.	LS	1	$ 25,000	$ 25,000
				SUBTOTAL	$ 25,000
				DESIGN AND PERMITTING (15%)	$ 4,000
				CONTINGENCY (30%)	$ 7,500
				TOTAL	$ 40,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.2: Install a Second Pump at LS No.39

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install a Second Pump at LS No.9.	LS	1	$ 12,500	$ 12,500
				SUBTOTAL	$ 13,000
				DESIGN AND PERMITTING (15%)	$ 2,000
				CONTINGENCY (30%)	$ 4,000
				TOTAL	$ 20,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.3: Replace Both Pumps at LS No.32

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Replace Both Pumps in LS No.32.	LS	1	$ 25,000	$ 25,000
				SUBTOTAL	$ 25,000
				DESIGN AND PERMITTING (15%)	$ 4,000
				CONTINGENCY (30%)	$ 7,500
				TOTAL	$ 40,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.4: Replace Both Pumps at LS No.11

Kimley»Horn

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Replace Both Pumps in LS No.11.	LS	1	$ 25,000	$ 25,000
				SUBTOTAL	$ 25,000
				DESIGN AND PERMITTING (15%)	$ 4,000
				CONTINGENCY (30%)	$ 7,500
				TOTAL	$ 40,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.5A and 5B: FM to Manifold LS No.22, 35 and 21 to Redirect Flows from the City's Gravity Sewer System to the WRF

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 6,450 LF of 8" PVC DR-18 Force Main and appurtenances.	LF	6,450	$ 100	$ 645,000
2	Upsize 2,450 LF of existing 6" PVC DR-18 Force Main and appurtenances to 8" PVC DR-18 Force Main.	LF	2,450	$ 80	$ 196,000
3	Replace Both Pumps in LS No.22.	LS	1	$ 50,000	$ 50,000
4	Replace Both Pumps in LS No.35.	LS	1	$ 50,000	$ 50,000
5	Replace Both Pumps in LS No.21.	LS	1	$ 30,000	$ 30,000
				SUBTOTAL	$ 970,000
				SURVEY, DESIGN AND CONSTRUCTION COST (15%)	$ 145,500
				CONSTRUCTION ADMINISTRATION (5%)	$ 48,500
				CONTINGENCY (30%)	$ 291,000
				TOTAL	$ 1,460,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.5C and 5D: FM to Manifold LS No. 34, 5, 19, 20, 43 and 44 to Redirect Flows from the City's Gravity Sewer System to the WRF

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install 9,700 LF of 8" PVC DR-18 Force Main and appurtenances.	LF	9,700	$ 100	$ 970,000
2	Upsize 750 LF of existing 6" PVC DR-18 Force Main and appurtenances to 8" PVC DR-18 Force Main.	LF	750	$ 80	$ 60,000
3	Install 1,550 LF of 12" PVC DR-18 Force Main and appurtenances.	LF	1,550	$ 120	$ 186,000
4	Replace Both Pumps in LS No.34.	LS	1	$ 30,000	$ 30,000
5	Replace Both Pumps in LS No.5.	LS	1	$ 30,000	$ 30,000
6	Replace Both Pumps in LS No.19.	LS	1	$ 30,000	$ 30,000
7	Replace Both Pumps in LS No.20.	LS	1	$ 30,000	$ 30,000
8	Replace Both Pumps in LS No.43.	LS	1	$ 30,000	$ 30,000
9	Replace Both Pumps in LS No.44.	LS	1	$ 50,000	$ 50,000
				SUBTOTAL	$ 1,420,000
				SURVEY, DESIGN AND CONSTRUCTION COST (15%)	$ 213,000
				CONSTRUCTION ADMINISTRATION (5%)	$ 71,000
				CONTINGENCY (30%)	$ 426,000
				TOTAL	$ 2,130,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.6: Install Two Pumps at LS No.42

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Install Two Pumps and a Generator at LS No.42. Rehab LS No.42.	LS	1	$ 100,000	$ 100,000
				SUBTOTAL	$ 100,000
				DESIGN AND PERMITTING (15%)	$ 20,000
				CONTINGENCY (30%)	$ 30,000
				TOTAL	$ 150,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

WW Improvement No.7: Replace Both Pumps at LS No.37

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Replace Both Pumps at LS No.37.	LS	1	$ 25,000	$ 25,000
				SUBTOTAL	$ 25,000
				DESIGN AND PERMITTING (15%)	$ 4,000
				CONTINGENCY (30%)	$ 7,500
				TOTAL	$ 40,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

CITY OF BELLEVIEW UTILITY MASTER PLAN

ENGINEER'S OPINION OF PROBABLE COST

FOR

The City of Belleview

Reclaimed Storage Option 1: Rehab Existing 1.00 MG Effluent Storage Basin to Function as a Reject Storage Pond

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Rehab the existing 1.00 MG Effluent Storage Basin (overexcavate, remove and replace concrete liner with HDPE liner or cover concrete liner with HDPE liner).	LS	1	$ 250,000	$ 250,000
2	Construct a Reject Pump Station.	LS	1	$ 250,000	$ 250,000
3	Yard Piping and valving modifications.	LS	1	$ 100,000	$ 100,000
				SUBTOTAL	$ 600,000
				DESIGN AND PERMITTING (15%)	$ 90,000
				CONTINGENCY (30%)	$ 180,000
				TOTAL	$ 870,000

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

APPENDIX D:
Potable Water Capacity Analysis Calculations

WTP-1 Capacity Analysis
Facility Type - Well and Elevated Storage Tank

SYSTEM PARAMETERS

Fire Flow Rate	1,000	gpm
Fire Flow Duration	2	hrs
Fire Flow Demand	120,000	gallons
Fire Flow Replenishment Rate	83.33	gpm
Average Day Demand (from 2017-2018 MORs)	545,130	gpd
Average Day Demand	379	gpm
Maximum Day Demand (Calculated)	1,226,543	gpd
Maximum Day Demand (from 2016-2017 MORs)	1,280,000	gpd
Maximum Day Demand	852	gpm
Max Day Factor (MDF/ADF)	2.25	
Peak Hour Factor	4.50	
Peak Hour Demand (PHF x ADF)	1,704	gpm
Number of Connections (total system)	unknown	connections
Population Served (total system)	unknown	capita
Is Elevated Storage Available?	yes	"yes" or "no"
Total EST Storage Available to WTP's Service Area	500,000	gallons

NOTE:
Fire-flow demand as defined by 62-555.520(4)(a)3c is fire-flow rate times duration.
Fire replenishment rate is the fire-flow demand divided by 24 hours.

WELL CAPACITY

Criteria #1 — According to FDEP Rule 62-555.315 (3), the total well capacity for a water system using only ground water shall equal at least the system's design maximum day water demand (including design fire flow demand if fire protection is being provided).

Criteria #2 — In addition, for community systems serving 350 or more persons (or 150 or more service connections), the total well capacity with the largest producing well out of operation shall be equal to the design average daily flow (ADF) and preferably the design maximum daily flow (MDF).

Well Name		Pumping Capacity (gpm)
Well #5		940

Criteria #1

Total Available Well Capacity	940	gpm
Fire-flow Demand (EST replenishment rate)	83	gpm
Net Available Total Well Capacity	857	gpm
Available Max Day Demand	1,233,600	gpd
Rated Capacity (MDF)	857	gpm
Rated Capacity (MDF)	1,233,600	gpd

Criteria #2

Total Well Capacity	940	gpm
Largest Well	940	gpm
Well Capacity w/ Largest Well Out of Service	0	gpm
Rated Capacity (ADF or MDF)	-	gpm
Rated Capacity Assuming ADF is met with largest well out of service (MDF)	-	GPD
Rated Capacity Assuming MDF is met with largest well out of service (MDF)	-	GPD

FINISHED WATER STORAGE CAPACITY

Criteria #1 — According to FDEP Rule 62-555.320 (19), the total useful finished-water storage capacity (excluding any storage capacity for fire protection) connected to a water system shall at least equal 25 percent of the system's maximum-day water demand, excluding any design fire-flow demand.

Criteria #2 — FDEP Rule 62-555.320 (19) also requires additional finished water storage capacity to meet the design fire flow rate for the design fire flow duration.

Storage Tank Name	Type of Storage	Capacity (gallons)
1	Elevated Storage	500,000

Criteria #1

Total Finished Water Storage Available	500,000	gallons
Fire Flow Storage Required	120,000	gallons
Useful Finished Water Storage Capacity	380,000	gallons
Rated Capacity (Based on 25% of MDF)	1,520,000	gpd

Criteria #2

Fire-flow Demand (Rate x Duration)	120,000	gallons
Total Storage Capacity	500,000	gallons
Net Available Storage Capacity	380,000	gallons
Rated Capacity (MDF)	1,520,000	gpd

PUMPING CAPACITY

Criteria #1

According to FDEP Rule 62-555.320 (15) (a), unless elevated finished drinking water storage is provided, the total capacity of all high-service pumping stations connected to a water system, or the capacity of booster pumping stations, shall be sufficient to meet at least the water system's, or booster station services area's, peak-hour water demand (and if fire protection is being provided, meet at least the water system's, or booster station service area's, design fire-flow rate plus a background water demand equivalent to the maximum-day demand other than fire-flow demand); and maintain a minimum system pressure of 20 pounds per square inch.

Criteria #2

According to FDEP Rule 62-555.320 (15) (b), where elevated finished drinking water storage is provided, the total capacity of all high service pumping stations shall be sufficient to meet the maximum day water demand (including design fire flow demand) and to maintain a minimum system pressure of 20 pounds per square inch.

Criteria #3

In addition, per FDEP Rule 62-555.320 (15) (b), the total capacity of the high-service pumping stations, or the capacity of the booster pumping station, *combined* with the useful elevated finished-water storage capacity shall be sufficient to meet the water system's, or the booster station service area's, peak-hour water demand for at least four consecutive hours (and if fire protection is being provided, shall be sufficient to meet the water system's, or the booster station service area's, design fire-flow rate plus a background water demand equivalent to the maximum-day demand other than fire-flow demand for the design fire-flow duration).

HSP Name	Location	Capacity (gpm)
1	WTP-1	940

Criteria #1	Total HSP Pumping Capacity	N/A	gpm
	HSP Pumping Capacity with Largest Unit Out of Service	N/A	gpm
	Fire Flow Rate	N/A	gpm
	Max Day Factor	N/A	
	Peak Hour Factor	N/A	
	Capacity Based on Meeting Peak Hour Demand (MDF)	N/A	gpm
	Capacity Based on Meeting Fire Flow @ Max Day Demand	N/A	gpm
Criteria #2	Total HSP Pumping Capacity	940	gpm
	HSP Pumping Capacity with Largest Unit Out of Service	940	gpm
	Fire Flow Demand (Replenishment Rate)	83	gpm
	Net Available Pumping Capacity	857	gpm
	Potential Rated Capacity (MDF)	1,233,600	gpd
Criteria #3a	Total HSP Pumping Capacity	940	gpm
	HSP Pumping Capacity with Largest Unit Out of Service		gpm
	Useful EST Storage Capacity (Total)	500,000	gallons
	Useful EST Storage Capacity (gpm for 4 hours)	2,083	gpm
	Combined Useful EST and HSP Capacity Available for Peak Hour Flow for 4 Hours	2,083	gpm
	Capacity Based on Meeting Peak Hour Flow for 4 Consecutive Hours (MDF)	1,500,000	gpd
Criteria #3b	Total HSP Pumping Capacity	940	gpm
	HSP Pumping Capacity with Largest Unit Out of Service	940	gpm
	Elevated Storage Available to WTP's Service Area	500,000	gallons
	Useful EST Storage Capacity Available for Max Day Demand for the Fire Flow Duration	4,167	gpm
	ıbined Useful EST and HSP Capacity Available for MDF and Fire Flow Rate for Fire Flow Duration	5,107	gpm
	Capacity Based on Meeting Fire Flow Rate plus MDF for Fire Flow Duration (MDF)	7,353,600	gpd

WTP-2 Capacity Analysis
Facility Type - Well and Hydropneumatic Tanks

SYSTEM PARAMETERS

Fire Flow Rate	1,000	gpm
Fire Flow Duration	2	hrs
Fire Flow Demand	120,000	gallons
Fire Flow Replenishment Rate	83.33	gpm
Average Day Demand (from 2016-2017 MORs)	278,509	gpd
Average Day Demand	193	gpm
Maximum Day Demand (Calculated)	626,645	gpd
Maximum Day Demand (from 2016-2017 MORs)	1,763,000	gpd
Maximum Day Demand	435	gpm
Max Day Factor (MDF/ADF)	2.25	
Peak Hour Factor	4.50	
Peak Hour Demand (PHF x ADF)	870	gpm
Peak Instantaneous Factor	7	
Peak Instantaneous Demand (PIF x ADF)	1,354	gpm
Tank Low Pressure (Well Pump On)	50	psi
Tank High Pressure (Well Pump Off)	65	psi
Number of Connections (total system)	unknown	connections
Population Served (total system)	unknown	capita
Is Elevated Storage Available?	yes	"yes" or "no"
Total EST Storage Available to WTP's Service Area	500,000	gallons

NOTE:
Fire-flow demand as defined by 62-555.520(4)(a)3c is fire-flow rate times duration.
Fire replenishment rate is the fire-flow demand divided by 24 hours.

WELL CAPACITY

Criteria #1 According to FDEP Rule 62-555.315 (3), the total well capacity for a water system using only ground water shall equal at least the system's design maximum day water demand (including design fire flow demand if fire protection is being provided).

Criteria #2 In addition, for community systems serving 350 or more persons (or 150 or more service connections), the total well capacity with the largest producing well out of operation shall be equal to the design average daily flow (ADF) and preferably the design maximum daily flow (MDF).

Well Name	Pumping Capacity (gpm)
Well #6	950

Criteria #1

Total Available Well Capacity	950	gpm
Fire-flow Demand	83	gpm
Net Available Total Well Capacity	867	gpm
Available Max Day Demand	1,248,000	gpd
Rated Capacity (MDF)	867	gpm
Rated Capacity (MDF)	1,248,000	gpd

Criteria #2

Total Well Capacity	950	gpm
Largest Well	-	gpm
Well Capacity w/ Largest Well Out of Service	950	gpm
Rated Capacity (ADF or MDF)	950	gpm
Rated Capacity Assuming ADF is met with largest well out of service (MDF)	3,078,000	GPD
Rated Capacity Assuming MDF is met with largest well out of service (MDF)	1,368,000	GPD

FINISHED WATER STORAGE CAPACITY

Criteria #1

According to FDEP Rule 62-555.320 (19)(b)2, A demonstration showing that, in conjunction with the capacity of the water system's source, treatment, and finished-water pumping facilities, the water system's total useful finished-water storage capacity (excluding any storage capacity for fire protection) is sufficient to meet the water system's peak-hour water demand for at least four consecutive hours. For small water systems with hydropneumatic tanks that are installed under a construction permit for which the Department receives a complete application on or after August 28, 2003, the supplier of water or construction permit applicant also shall demonstrate that, in conjunction with the capacity of the water system's source, treatment, and finished-water pumping facilities, the water system's total useful finished-water storage capacity (i.e., the water system's total effective hydropneumatic tank volume) is sufficient to meet the water system's peak instantaneous water demand for at least 20 consecutive minutes.

According to FDEP Rule 62-555.320 (20), hydropneumatic tanks shall be designed and constructed in accordance with Section 7.2 of the 10 States Standards.

Criteria #2

Section 7.2 of the 10 States Standards requires the gross volume of a hydropneumatic tank to be 10 times the capacity of the largest pump, rated in gallons per minute. For example, a 250 gpm pump should have a 2,500 gallon pressure tank.

Hydro Tank Name	Type of Storage	Total Volume (gallons)	Useable Volume (gallons)
H1	Hydro Tank	10,000	1,882
H2	Hydro Tank	10,000	1,882

Criteria #1

Well Pumping Capacity	950	gpm
Hydropneumatic Tank Useful Storage Volume	3,764	gallons
Useful Hydropneumatic Tank Storage Capacity (gpm for 4 hours)	16	gpm
Total Combined Capacity Available for Peak Hour Flow (4 hours) Excluding Fire Flow	(34)	gpm
Useful Hydropneumatic Tank Storage Capacity (gpm for 20 minutes)	1,255	gpm
Total Combined Capacity Available for Peak Instantaneous Flow (20 minutes)	2,205	gpm
Capacity Based on Meeting Peak Hour Flow for 4 Consecutive Hours (MDF)	(24,708)	gpd
Capacity Based on Meeting Peak Instantaneous Demand for 20 Minutes (MDF)	1,020,464	gpd

Criteria #2

Total Gross Hydropneumatic Tank Volume	20,000	gallons
Allowable Pumping Rate Based on Hydropneumatic Tank Gross Volume	2,000	gpm
Largest Well Pump	950	gpm
Controlling Pumping Rate	950	gpm
Capacity Based on Hydropneumatic Tank Gross Volume Limitations (MDF)	1,368,000	gpd

PUMPING CAPACITY

Criteria #1

According to FDEP Rule 62-555.320 (15) (a), unless elevated finished drinking water storage is provided, the total capacity of all high-service pumping stations connected to a water system, or the capacity of booster pumping stations, shall be sufficient to meet at least the water system's, or booster station services area's, peak-hour water demand (and if fire protection is being provided, meet at least the water system's, or booster station service area's, design fire-flow rate plus a background water demand equivalent to the maximum-day demand other than fire-flow demand); and maintain a minimum system pressure of 20 pounds per square inch.

Criteria #2

According to FDEP Rule 62-555.320 (15) (b), where elevated finished drinking water storage is provided, the total capacity of all high service pumping stations shall be sufficient to meet the maximum day water demand (including design fire flow demand) and to maintain a minimum system pressure of 20 pounds per square inch.

Criteria #3

In addition, per FDEP Rule 62-555.320 (15) (b), the total capacity of the high-service pumping stations, or the capacity of the booster pumping station, *combined* with the useful elevated finished-water storage capacity shall be sufficient to meet the water system's, or the booster station service area's, peak-hour water demand for at least four consecutive hours (and if fire protection is being provided, shall be sufficient to meet the water system's, or the booster station service area's, design fire-flow rate plus a background water demand equivalent to the maximum-day demand other than fire-flow demand for the design fire-flow duration).

HSP Name	Pumping Capacity (gpm)	
WTP-2		950

Criteria #1	Total HSP Pumping Capacity	N/A	gpm
	HSP Pumping Capacity with Largest Unit Out of Service	#VALUE!	gpm
	Fire Flow Rate	N/A	gpm
	Max Day Factor	N/A	
	Peak Hour Factor	N/A	
	Capacity Based on Meeting Peak Hour Demand (MDF)	N/A	gpm
	Capacity Based on Meeting Fire Flow @ Max Day Demand	N/A	gpm
Criteria #2	Total HSP Pumping Capacity	950	gpm
	HSP Pumping Capacity with Largest Unit Out of Service	950	gpm
	Fire Flow Demand (Replenishment Rate)	83	gpm
	Net Available Pumping Capacity	867	gpm
	Potential Rated Capacity (MDF)	1,248,000	gpd
Criteria #3a	Total HSP Pumping Capacity	950	gpm
	HSP Pumping Capacity with Largest Unit Out of Service	950	gpm
	Elevated Storage Available to WTP's Service Area	500,000	gallons
	Useful EST Storage Capacity (gpm for 4 hours)	1,583	gpm
	Combined Useful EST and HSP Capacity Available for Peak Hour Flow for 4 Hours	2,533	gpm
	Capacity Based on Meeting Peak Hour Flow for 4 Consecutive Hours (MDF)	1,824,000	gpd
Criteria #3b	Total HSP Pumping Capacity	950	gpm
	HSP Pumping Capacity with Largest Unit Out of Service	950	gpm
	Elevated Storage Available to WTP's Service Area	500,000	gallons
	Useful EST Storage Capacity Available for Max Day Demand for the Fire Flow Duration	3,167	gpm
	ined Useful EST and HSP Capacity Available for MDF and Fire Flow Rate for Fire Flow Duration	4,117	gpm
	Capacity Based on Meeting Fire Flow Rate plus MDF for Fire Flow Duration (MDF)	5,928,000	gpd

APPENDIX E:
Lower Floridan Aquifer Well Feasibility Modeling Report

Kimley»Horn

MEMORANDUM

To: Cara Keller, E.I.

From: Jason C. Sheasley, P.G.

Date: November 19, 2018

RE: Lower Floridan Aquifer Well Feasibility Modeling
Belleview, Marion County, Florida

Kimley-Horn performed numerical ground water modeling to evaluate the feasibility of using a lower Floridan aquifer well to supply potable water for the City of Belleview, Florida. Our modeling methodology, assumptions and results are presented in the following memorandum.

BACKGROUND

The City of Belleview maintains a consumptive use permit (CUP Number 3137-5) through the St Johns River Water Management District, which allocated the use of 373 million gallons per year (1.022 million gallons per day (MGD) annual average) of ground water from the Upper Floridan Aquifer (UFA) for public supply use. The 20-year permit expires on October 12, 2036.

Belleview is considering the construction of a new water treatment plant (WTP) to meet increasing water use demands within its service area. It is anticipated that the water use demand in 2037 will be more than 4 MGD. The City is considering constructing a new water well (Well № 7) at the WTP site to meet the anticipated future water use demands (**Figure 1**). The purpose of this study is to evaluate the effects of completing the proposed well into the UFA or the Lower Floridan Aquifer (LFA).

METHODOLOGY

The numerical modeling was performed using the District-Wide Regulation Model, Version 3 (DWRM3), which was developed for the Southwest Florida Water Management District (SWFWMD) by Environmental Simulations, Inc. (ESI). The DWRM3 is a MODFLOW-based numerical model that is run using the ground water modeling software program Groundwater Vistas. The six-layer model simulates ground water flow within the surficial aquifer, UFA and LFA. It is used by the SWFWMD for water use permitting.

The DWRM3 it does not specifically account for ground water withdrawals permitted by the SJRWMD. Nevertheless, the model domain includes the City of Belleview. Unlike SWFWMD, SJRWMD does not maintain a district-wide model used specifically for water use permitting. The SJRWMD typically relies on project or site-specific ground water models for impact analyses. In lieu of developing a site-specific numerical ground water model for this feasibility study, which would require significant time and effort, Kimley-Horn decided to use the DWRM3 for this feasibility analysis. Our decision was based on the following:

- The model is calibrated and peer reviewed.
- It simulates ground water withdrawals from both the UFA and LFA
- The model accounts for wetlands, streams, rivers and lakes
- The model results are based on a 365-day transient simulation
- The corresponding model results will be adequate for planning purposes

If the City intends to proceed with modifying its existing CUP and constructing a new well, it will be necessary to prepare a formal impact analysis. The impact analysis may require additional numerical ground water modeling per the SJRWMD.

Model Simulations

Two model simulations were prepared using the DWRM 3 to evaluate the proposed wellfield. The first simulation (*UFA Simulation*) assumes that the proposed well (Well № 7) will be constructed into the UFA. The second simulation (*LFA Simulation*) assumes that Well № 7 is installed into the LFA. In both simulations, the proposed well (Well № 7) was pumped at a rate of 2.46 MGD. The two existing wells, Well № 5 and Well № 6, were pumped at 0.595 MGD and 1.370 MGD, respectively, to coincide with the anticipated maximum daily demand for the two wells (**Table 1**).

TABLE 1
Model Simulation Pumping Rates

Well №	UFA Simulation		LFA Simulation	
	UFA (MGD)	LFA (MGD)	UFA (MGD)	LFA (MGD)
5	0.595	0	0.595	0
6	1.370	0	1.370	0
7	2.46	0	0	2.46
TOTAL	**4.425**	**0**	**1.965**	**2.46**

RESULTS

The following is a concise discussion of the model simulation results.

UFA Simulation

The *UFA Simulation* assumes that a total of 4.425 MGD is withdrawn from the UFA. Under this simulation 0.595 MGD and 1.370 MGD are withdrawn from Well № 5 and Well № 6, respectively. The simulation includes withdrawing 2.46 MGD from the proposed well (Well № 7).

The model simulation predicts that less than 0.05 feet of additional drawdown will occur in the surficial aquifer as a result of the increased ground water withdrawals (**Figure 2**). The impact to wetlands and surface water bodies is anticipated to be negligible under this scenario.

The model results suggest that up to 7 feet of additional drawdown will occur in the UFA in response to the increased ground water withdrawals (**Figure 3**). The greatest drawdown is focused in the vicinity of Well № 5 and Well № 7. Approximately 5 feet of additional drawdown is anticipated to occur at Well № 6. There are approximately 24 existing wells within the 1-foot drawdown contour within the UFA. However, there is only one existing well within the 2-foot drawdown contour within the UFA. The impact to the legal users of the ground water resource is expected to be minimal under this withdrawal scenario.

LFA Simulation

The *LFA Simulation* assumes that 1.965 MGD is withdrawn from the UFA and 2.46 MGD is withdrawn from the LFA (Well № 7).

Similar to the *UFA Simulation,* less than 0.05 feet of additional drawdown is predicted to occur in the surficial aquifer under the *LFA Simulation* (**Figure 4**). As a result, the impact to wetlands and surface water bodies is anticipated to be negligible.

Up to 3-feet of additional drawdown is predicted to occur in the UFA under this scenario. The greatest amount of drawdown is concentration at Well № 6 (**Figure 5**). This is expected since the proposed withdrawal from Well № 6 is nearly three times that of Well № 5. Approximately 2-feet of drawdown is anticipated to occur at Well № 5. Approximately 11 existing wells are situated within the 1-foot drawdown contour. The anticipated impacts to the existing legal users of the ground water resource is not anticipated to be significant.

Approximately 1-foot of additional drawdown within the LFA is anticipated to occur under this scenario (**Figure 6**). There are no existing withdrawals from the LFA within the 0.1-foot contour interval. As such, no impacts are anticipated to occur.

DISCUSSION

Under both model scenarios the impacts to wetlands, surface water bodies and legal users of the ground water resource appear acceptable under the SJRWMD's guidelines. However, under the *UFA Simulation*, more than 7-feet of additional drawdown is predicted to occur within the UFA. While the impacts to the legal ground water users under the scenario are minimal, the SJRWMD and SWFWMD are both concerned about increased stress within the UFA in this area. For instance, the Districts may require further evaluation to localized spring flow as a result of the proposed ground water withdrawals.

The LFA Simulations suggest that the predicted drawdown in the UFA would be significantly reduced by constructing the proposed well within the LFA. Under this scenario, drawdown within the UFA is decreased by approximately 5 feet. Given the increased scrutiny of additional withdrawals from the UFA, both Water Management Districts would be amenable to shifting withdrawals to the LFA whenever feasible. In doing soil the City could potentially avoid having to further evaluate impacts to spring flows as a result of increased withdrawals from the UFA. Furthermore, recent hydrogeologic data from the LFA in and around Marion County suggest that the water quality of the upper portions of the LFA is good and acceptable for potable supply with minimal treatment.

FIGURES

WELL LOCATIONS

Well Feasibility Study
City of Belleview, Florida

Legend

Belleview Wells

Belleview

0 0.5 1 1.5
Miles

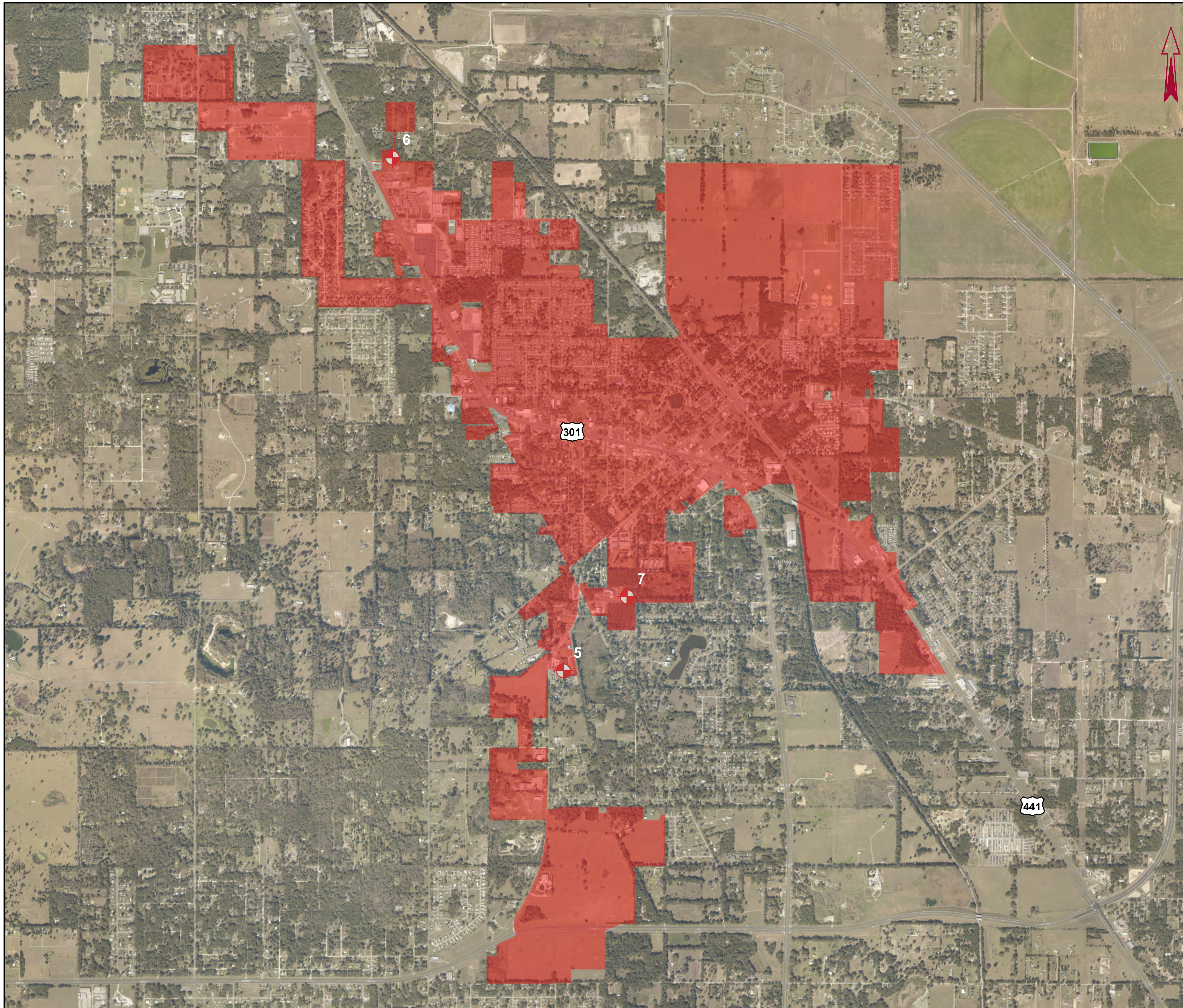

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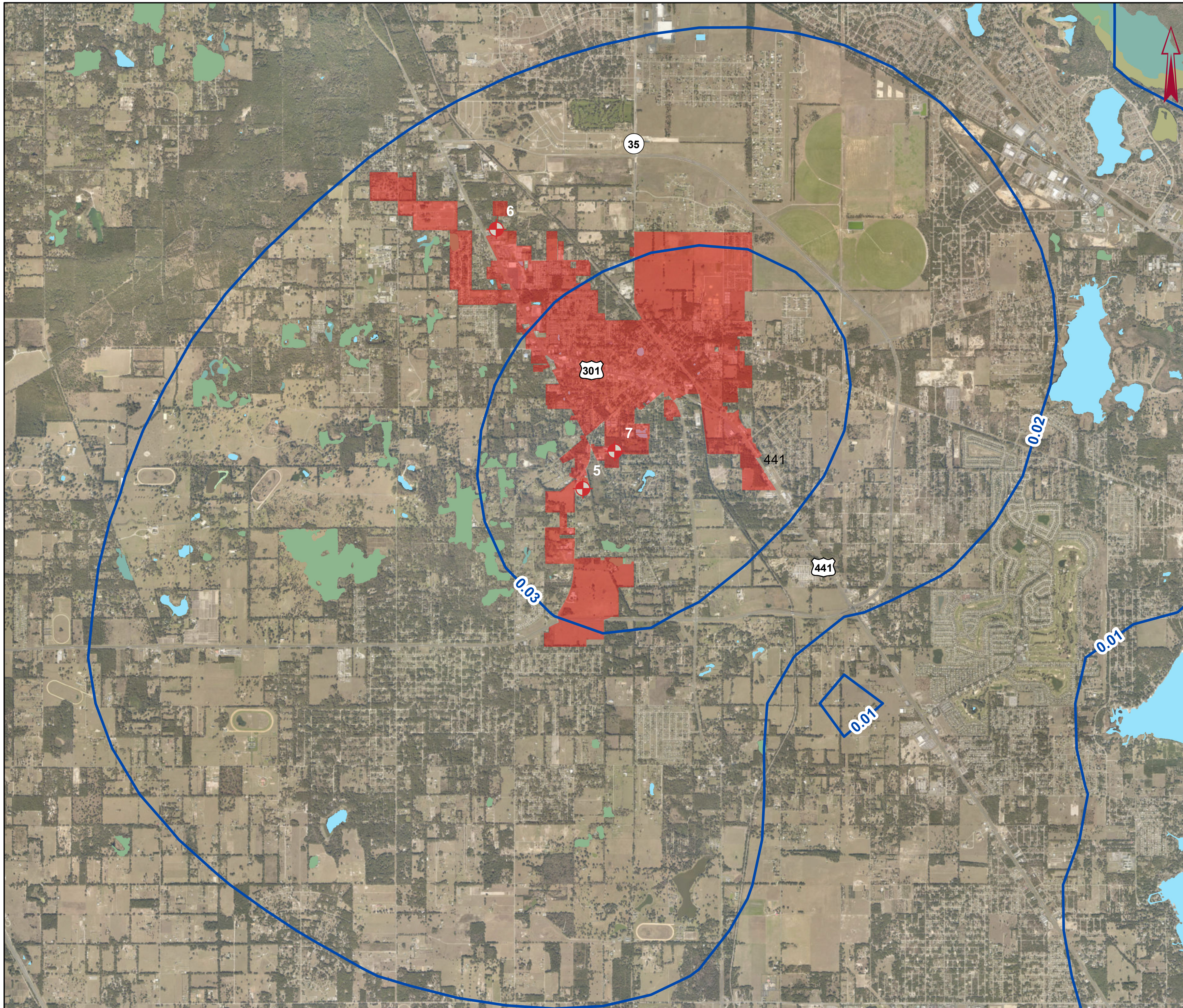
Figure Nº 1

SURFICIAL AQUIFER DRAWDOWN

UFA Simulation

Well Feasibility Study
City of Belleview, Florida



Legend

Belleview Wells
Drawdown (feet)
Wetlands Vegetation
Cypress
Hardwood Swamp
Bayhead; Baygall
Bayhead; Baygall
Hydric Hammock
Hydric Hammock
Surace Water

0 1 2 3
Miles

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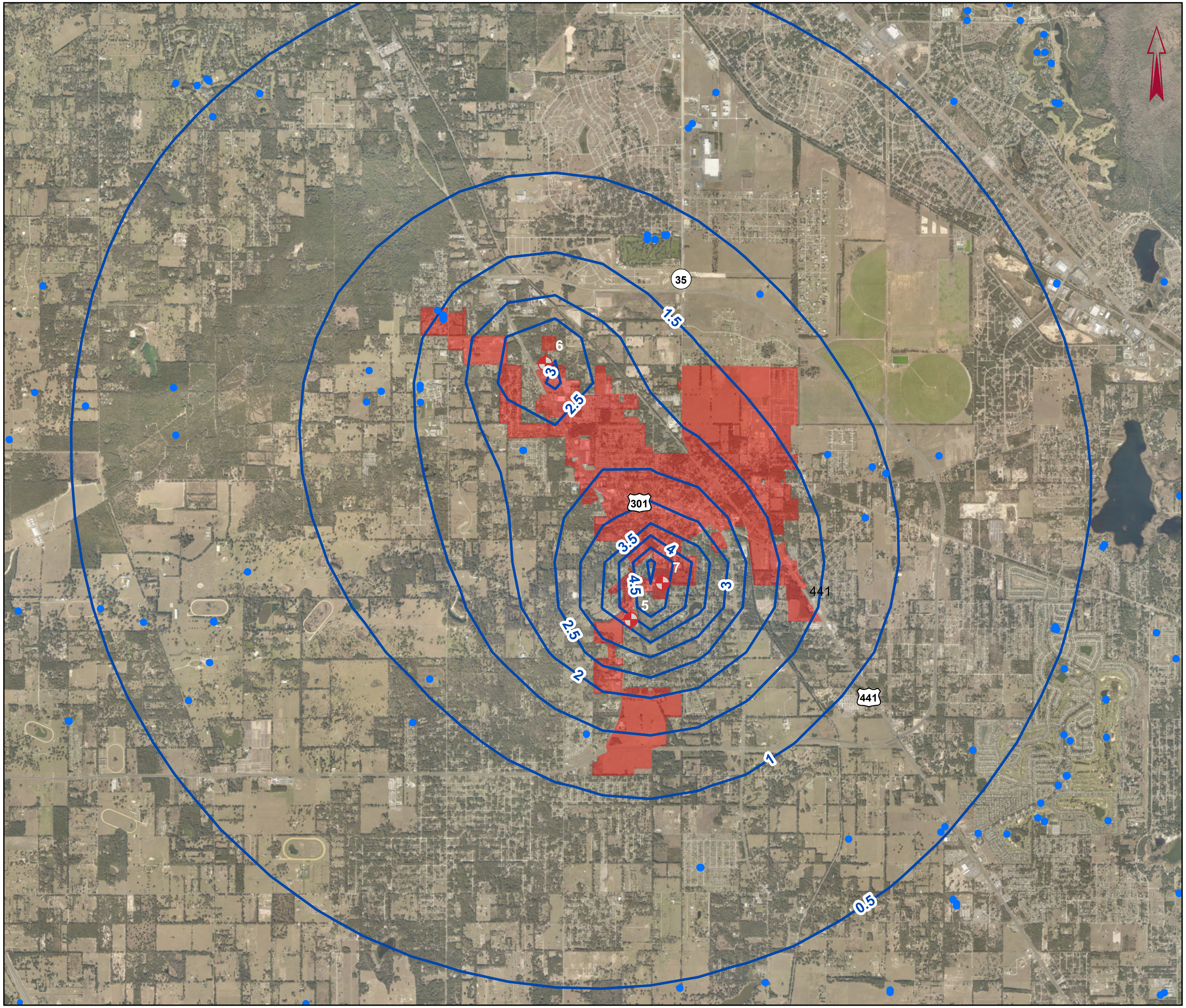
Figure Nº 2

UPPER FLORIDAN AQUIFER DRAWDOWN

UFA Simulation

Well Feasibility Study
City of Belleview, Florida



Legend

Belleview Wells

Existing Legal Withdrawals

Drawdown (feet)

0 1 2 3
Miles

Kimley»Horn

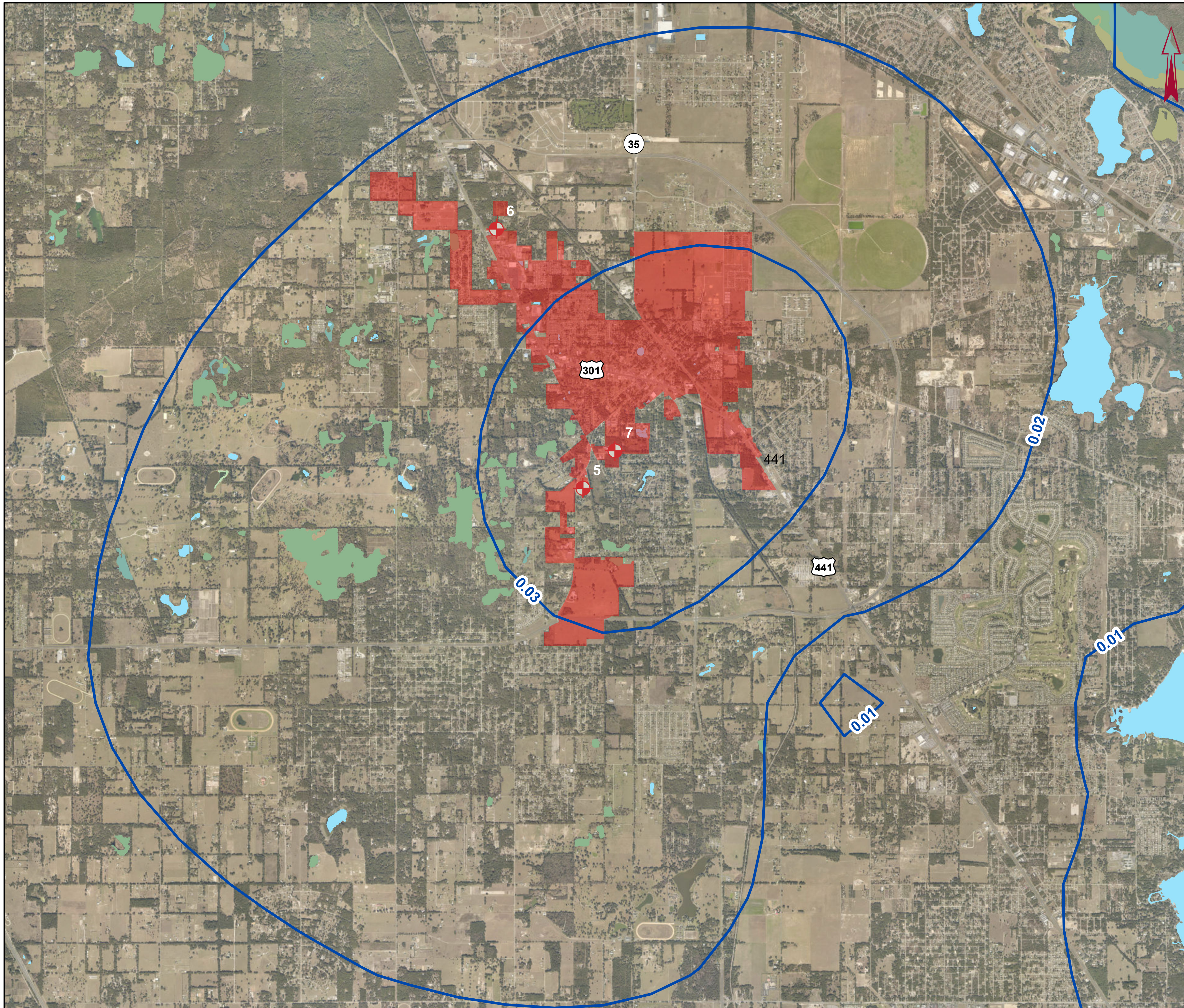
042223009

Figure Nº 3

SURFICIAL AQUIFER DRAWDOWN

UFA Simulation

Well Feasibility Study
City of Belleview, Florida



Legend

- Belleview Wells
- Drawdown (feet)

Wetlands Vegetation

- Cypress
- Hardwood Swamp
- Bayhead; Baygall
- Bayhead; Baygall
- Hydric Hammock
- Hydric Hammock
- Surace Water

0 1 2 3
Miles

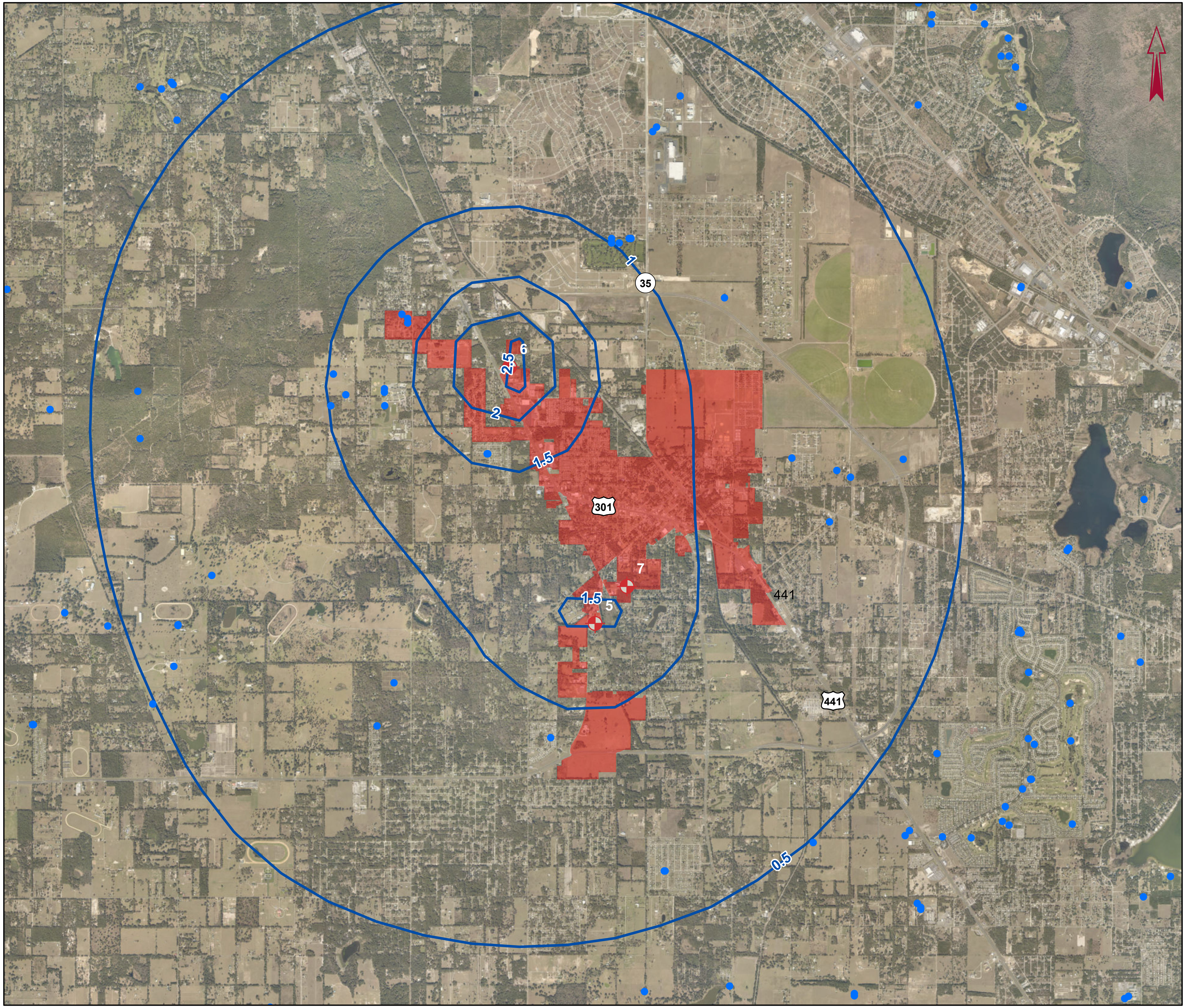
Kimley»Horn

042223009
Figure Nº 4

UPPER FLORIDAN AQUIFER DRAWDOWN

LFA Simulation

Well Feasibility Study
City of Belleview, Florida



Legend

Belleview Wells

Existing Legal Withdrawals

Drawdown (feet)

0 1 2 3

Miles

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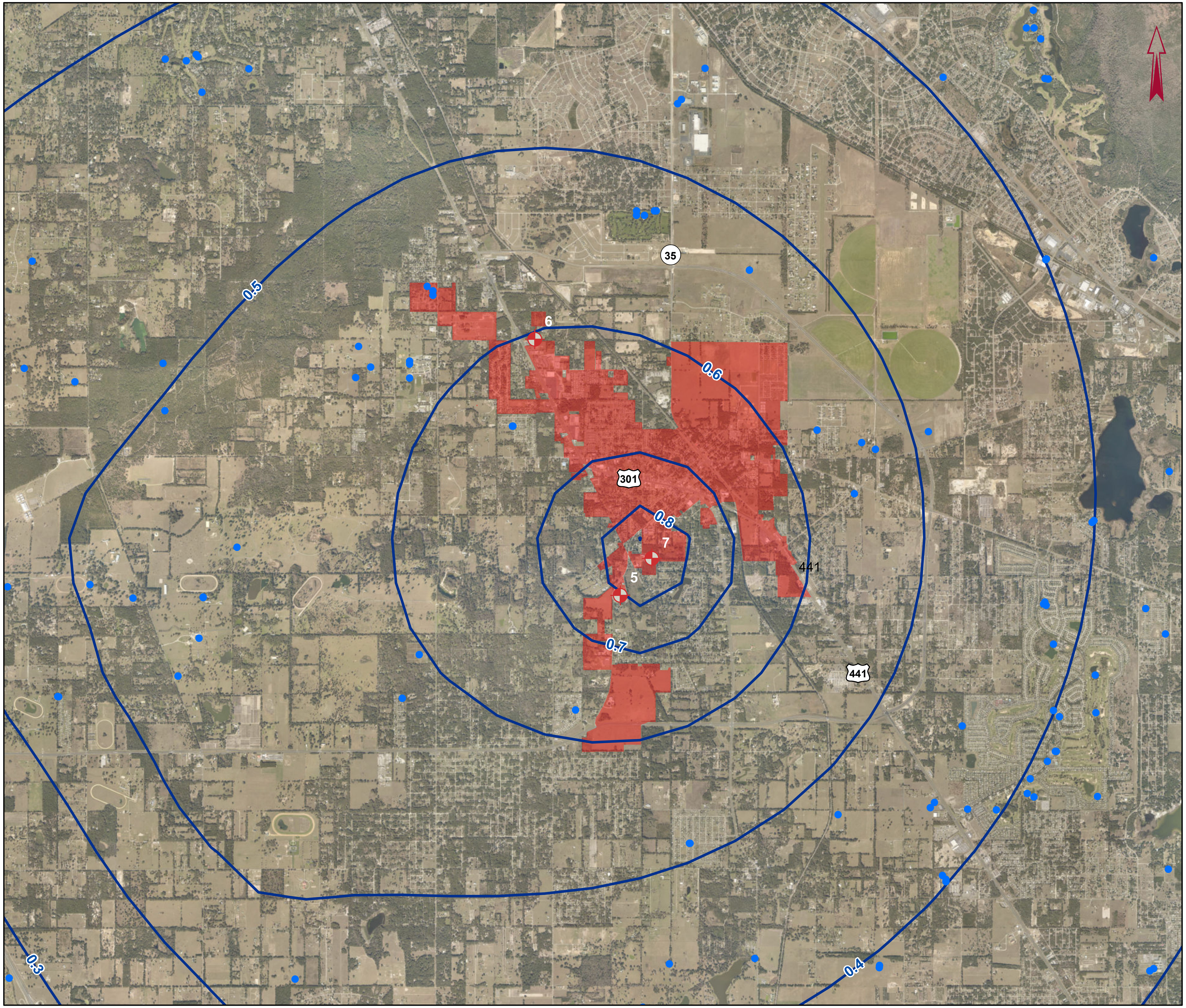
Figure Nº 5

LOWER FLORIDAN AQUIFER DRAWDOWN

LFA Simulation

Well Feasibility Study
City of Belleview, Florida



Legend

- Belleview Wells
- Existing Legal Withdrawals
- Drawdown (feet)

0 1 2 3
Miles

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042223009

Figure Nº 6

APPENDIX F:
Sanitary Sewer Flow Model

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
EXISTING CONDITIONS

			Existing						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	42.707	254.196	1016.784	1486	1648	469.22	631.22
4	Front Road	21	4.338	18.262	73.048	169	169	95.95	95.95
5	Cemetery	7,10,26	9.287	23.423	93.692	199	338	105.10	244.25
6	52nd CT	8,9,13,14	37.841	46.797	187.188	172	194	(15.19)	6.81
7	Fern Meadows	N/A	0.911	0.911	3.645	165	227	160.87	223.54
8	Palm Tree Villas	N/A	3.349	3.349	13.395	70	88	56.60	74.60
9	55th Ave Road	16	13.296	16.271	65.086	123	238	57.91	172.91
10	Flower Shop	N/A	0.000	0.000	0.000	147	147	146.50	146.50
11	K-Mart	33	23.286	33.043	132.171	132	246	(0.56)	113.83
12	Goldern Oaks MHP	N/A	8.956	8.956	35.824	82	82	46.18	46.18
14	Northside	N/A	0.653	0.653	2.610	74	86	71.81	83.57
15	Scruggle	N/A	0.859	0.859	3.436	11	43	7.56	39.56
16	Kwik King	N/A	2.975	2.975	11.901	106	176	93.86	164.37
19	Wooded Acres	N/A	0.350	0.350	1.400	149	160	147.45	158.60
20	Wooded Acres	N/A	4.400	4.400	17.600	176	278	158.40	260.40
21	Baseline A - Repump Station	22,35	0.718	13.924	55.697	220	407	164.30	350.80
22	Baseline B - Repump Station	23,37	0.000	12.143	48.571	209	405	160.43	356.43
23	Baseline C - Repump Station	24	1.786	3.812	15.249	105	176	89.75	160.75
24	Baseline D	N/A	2.027	2.027	8.107	26	163	18.33	154.89
26	Ball Park	N/A	13.224	13.224	52.897	65	176	12.10	123.10
30	High School	N/A	7.986	7.986	31.944	202	202	170.06	170.06
31	100th St. West	30	0.277	8.263	33.052	76	99	42.74	65.66
32	100th St. East	31	17.240	25.503	102.012	88	111	(14.01)	8.99
33	Cobblestone	N/A	9.757	9.757	39.029	88	110	48.97	70.97
34	Diamond Rose	N/A	18.021	18.021	72.084	105	148	32.92	75.98
35	Golf Park	N/A	1.063	1.063	4.252	155	164	150.75	159.75
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	6.522	8.330	33.322	253	366	219.68	332.68
38	Summer Crest PH II	N/A	1.808	1.808	7.234	275	275	267.77	267.77
39	Library	N/A	0.986	0.986	3.946	0	44	(3.95)	40.05
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	2.104	2.104	8.416	302	302	293.58	293.58
44	12540 US441	45, Septic Phase 1	0.000	0.000	0.000	241	241	241.00	241.00
45	8001 SE 135th St	N/A	0.000	0.000	0.000	111	111	111.00	111.00
Tract A LS	Inactive No Pumps	N/A	0.000	0.000	0.000	Inactive	Inactive	Inactive	Inactive

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
EXISTING CONDITIONS

Kimley»Horn

			5-Year (2022)						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	44.139	462.177	1848.710	1486	1648	(362.71)	(200.71)
4	Front Road	21	4.823	52.747	210.990	169	169	(41.99)	(41.99)
5	Cemetery	7,10,26	10.719	25.588	102.353	199	338	96.44	235.59
6	52nd CT	8,9,13,14	40.180	49.172	196.688	172	194	(24.69)	(2.69)
7	Fern Meadows	N/A	1.433	1.433	5.730	165	227	158.79	221.46
8	Palm Tree Villas	N/A	4.120	4.120	16.481	70	88	53.52	71.52
9	55th Ave Road	16	14.744	18.584	74.337	123	238	48.66	163.66
10	Flower Shop	N/A	0.016	0.016	0.065	147	147	146.44	146.44
11	K-Mart	33	25.256	38.908	155.631	132	246	(24.02)	90.37
12	Goldern Oaks MHP	N/A	8.992	8.992	35.967	82	82	46.03	46.03
14	Northside	N/A	0.744	0.744	2.975	74	86	71.45	83.21
15	Scruggle	N/A	0.877	0.877	3.507	11	43	7.49	39.49
16	Kwik King	N/A	3.840	3.840	15.361	106	176	90.40	160.91
19	Wooded Acres	N/A	0.386	0.386	1.544	149	160	147.31	158.46
20	Wooded Acres	N/A	12.701	12.701	50.805	176	278	125.19	227.19
21	Baseline A - Repump Station	22,35	1.902	47.924	191.698	220	407	28.30	214.80
22	Baseline B - Repump Station	23,37	0.086	44.366	177.464	209	405	31.54	227.54
23	Baseline C - Repump Station	24	3.399	7.189	28.755	105	176	76.24	147.24
24	Baseline D	N/A	3.789	3.789	15.158	26	163	11.28	147.84
26	Ball Park	N/A	13.420	13.420	53.681	65	176	11.32	122.32
30	High School	N/A	8.112	8.112	32.448	202	202	169.55	169.55
31	100th St. West	30	0.569	8.681	34.725	76	99	41.06	63.98
32	100th St. East	31	23.375	32.057	128.227	88	111	(40.23)	(17.23)
33	Cobblestone	N/A	13.652	13.652	54.606	88	110	33.39	55.39
34	Diamond Rose	N/A	21.393	21.393	85.573	105	148	19.43	62.49
35	Golf Park	N/A	1.656	1.656	6.625	155	164	148.38	157.38
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	21.589	37.091	148.364	253	366	104.64	217.64
38	Summer Crest PH II	N/A	15.503	15.503	62.010	275	275	212.99	212.99
39	Library	N/A	1.397	1.397	5.587	0	44	(5.59)	38.41
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	2.802	77.859	311.435	302	302	(9.44)	(9.44)
44	12540 US441	45, Septic Phase 1	0.436	31.665	126.660	241	241	114.34	114.34
45	8001 SE 135th St	N/A	0.478	0.478	1.910	111	111	109.09	109.09
Tract A LS	Inactive No Pumps	N/A	0.214	0.214	0.854	Inactive	Inactive	Inactive	Inactive

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
EXISTING CONDITIONS

			10-Year (2027)						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	46.914	571.239	2284.956	1486	1648	(798.96)	(636.96)
4	Front Road	21	5.467	94.559	378.236	169	169	(209.24)	(209.24)
5	Cemetery	7,10,26	11.483	27.067	108.268	199	338	90.52	229.68
6	52nd CT	8,9,13,14	41.897	50.937	203.747	172	194	(31.75)	(9.75)
7	Fern Meadows	N/A	2.124	2.124	8.496	165	227	156.02	218.69
8	Palm Tree Villas	N/A	4.931	4.931	19.724	70	88	50.28	68.28
9	55th Ave Road	16	16.199	20.206	80.823	123	238	42.18	157.18
10	Flower Shop	N/A	0.016	0.016	0.065	147	147	146.44	146.44
11	K-Mart	33	26.449	40.315	161.259	132	246	(29.65)	84.74
12	Goldern Oaks MHP	N/A	9.040	9.040	36.158	82	82	45.84	45.84
14	Northside	N/A	0.791	0.791	3.166	74	86	71.25	83.01
15	Scruggle	N/A	0.901	0.901	3.603	11	43	7.40	39.40
16	Kwik King	N/A	4.007	4.007	16.029	106	176	89.73	160.24
19	Wooded Acres	N/A	0.434	0.434	1.735	149	160	147.12	158.27
20	Wooded Acres	N/A	12.868	12.868	51.473	176	278	124.53	226.53
21	Baseline A - Repump Station	22,35	2.474	89.092	356.368	220	407	(136.37)	50.13
22	Baseline B - Repump Station	23,37	0.211	81.235	324.940	209	405	(115.94)	80.06
23	Baseline C - Repump Station	24	4.282	8.834	35.337	105	176	69.66	140.66
24	Baseline D	N/A	4.553	4.553	18.210	26	163	8.23	144.79
26	Ball Park	N/A	13.444	13.444	53.776	65	176	11.22	122.22
30	High School	N/A	8.279	8.279	33.115	202	202	168.88	168.88
31	100th St. West	30	0.903	9.182	36.728	76	99	39.06	61.98
32	100th St. East	31	26.356	35.538	142.154	88	111	(54.15)	(31.15)
33	Cobblestone	N/A	13.866	13.866	55.465	88	110	32.54	54.54
34	Diamond Rose	N/A	22.395	23.662	94.648	105	148	10.35	53.41
35	Golf Park	N/A	2.443	5.383	21.530	155	164	133.47	142.47
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	34.082	72.189	288.757	253	366	(35.76)	77.24
38	Summer Crest PH II	N/A	38.107	38.107	152.427	275	275	122.57	122.57
39	Library	N/A	1.993	1.993	7.972	0	44	(7.97)	36.03
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	2.968	82.354	329.415	302	302	(27.42)	(27.42)
44	12540 US441	45, Septic Phase 1	0.484	37.692	150.768	241	241	90.23	90.23
45	8001 SE 135th St	N/A	0.907	0.907	3.627	111	111	107.37	107.37
Tract A LS	Inactive No Pumps	N/A	0.428	0.428	1.713	Inactive	Inactive	Inactive	Inactive

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
EXISTING CONDITIONS

Kimley»Horn

			20-Year (2037)						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	50.277	690.549	2762.2	1486	1648	(1276.19)	(1114.19)
4	Front Road	21	6.503	132.651	530.6	169	169	(361.60)	(361.60)
5	Cemetery	7,10,26	12.711	29.447	117.8	199	338	81.00	220.16
6	52nd CT	8,9,13,14	44.661	53.778	215.1	172	194	(43.11)	(21.11)
7	Fern Meadows	N/A	3.237	3.237	12.9	165	227	151.57	214.24
8	Palm Tree Villas	N/A	6.236	6.236	24.9	70	88	45.06	63.06
9	55th Ave Road	16	18.540	22.816	91.3	123	238	31.73	146.73
10	Flower Shop	N/A	0.016	0.016	0.1	147	147	146.44	146.44
11	K-Mart	33	28.368	42.580	170.3	132	246	(38.71)	75.68
12	Goldern Oaks MHP	N/A	9.116	9.116	36.5	82	82	45.53	45.53
14	Northside	N/A	0.868	0.868	3.5	74	86	70.95	82.71
15	Scruggle	N/A	0.939	0.939	3.8	11	43	7.24	39.24
16	Kwik King	N/A	4.276	4.276	17.1	106	176	88.66	159.17
19	Wooded Acres	N/A	0.510	0.510	2.0	149	160	146.81	157.96
20	Wooded Acres	N/A	13.137	13.137	52.5	176	278	123.45	225.45
21	Baseline A - Repump Station	22,35	3.396	126.147	504.6	220	407	(284.59)	(98.09)
22	Baseline B - Repump Station	23,37	0.375	115.940	463.8	209	405	(254.76)	(58.76)
23	Baseline C - Repump Station	24	5.702	11.483	45.9	105	176	59.07	130.07
24	Baseline D	N/A	5.781	5.781	23.1	26	163	3.32	139.88
26	Ball Park	N/A	13.482	13.482	53.9	65	176	11.07	122.07
30	High School	N/A	10.362	10.362	41.4	202	202	160.55	160.55
31	100th St. West	30	1.441	11.803	47.2	76	99	28.58	51.50
32	100th St. East	31	31.155	42.958	171.8	88	111	(83.83)	(60.83)
33	Cobblestone	N/A	14.212	14.212	56.8	88	110	31.15	53.15
34	Diamond Rose	N/A	24.007	25.315	101.3	105	148	3.74	46.80
35	Golf Park	N/A	3.710	6.812	27.2	155	164	127.75	136.75
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	45.344	104.082	416.3	253	366	(163.33)	(50.33)
38	Summer Crest PH II	N/A	58.738	58.738	235.0	275	275	40.05	40.05
39	Library	N/A	2.953	2.953	11.8	0	44	(11.81)	32.19
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	3.237	90.416	361.7	302	302	(59.67)	(59.67)
44	12540 US441	45, Septic Phase 1	0.561	48.217	192.9	241	241	48.13	48.13
45	8001 SE 135th St	N/A	1.598	1.598	6.4	111	111	104.61	104.61
Tract A LS	Inactive No Pumps	N/A	0.774	0.774	3.1	Inactive	Inactive	Inactive	Inactive

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
ADJUSTED BASED ON WW IMPROVEMENTS NO.3 AND NO.4

Kimley»Horn

			Existing						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	42.707	232.009	928.035	1486	1648	557.96	719.96
4	Front Road	N/A	4.338	4.338	17.351	169	169	151.65	151.65
5	Cemetery	7,10,26	9.287	23.423	93.692	199	338	105.10	244.25
6	52nd CT	8,9,13,14	37.841	46.797	187.188	172	194	(15.19)	6.81
7	Fern Meadows	N/A	0.911	0.911	3.645	165	227	160.87	223.54
8	Palm Tree Villas	N/A	3.349	3.349	13.395	70	88	56.60	74.60
9	55th Ave Road	16	13.296	16.271	65.086	123	238	57.91	172.91
10	Flower Shop	N/A	0.000	0.000	0.000	147	147	146.50	146.50
11	K-Mart	33	23.286	33.043	132.171	132	246	(0.56)	113.83
12	Goldern Oaks MHP	N/A	8.956	8.956	35.824	82	82	46.18	46.18
14	Northside	N/A	0.653	0.653	2.610	74	86	71.81	83.57
15	Scruggle	N/A	0.859	0.859	3.436	11	43	7.56	39.56
16	Kwik King	N/A	2.975	2.975	11.901	106	176	93.86	164.37
19	Wooded Acres	N/A	0.350	0.350	1.400	149	160	147.45	158.60
20	Wooded Acres	N/A	4.400	4.400	17.600	176	278	158.40	260.40
21	Baseline A - Repump Station	N/A	0.718	0.718	2.873	220	407	217.13	403.63
22	Baseline B - Repump Station	23,37	0.000	12.143	48.571	209	405	160.43	356.43
23	Baseline C - Repump Station	24	1.786	3.812	15.249	105	176	89.75	160.75
24	Baseline D	N/A	2.027	2.027	8.107	26	163	18.33	154.89
26	Ball Park	N/A	13.224	13.224	52.897	65	176	12.10	123.10
30	High School	N/A	7.986	7.986	31.944	202	202	170.06	170.06
31	100th St. West	30	0.277	8.263	33.052	76	99	42.74	65.66
32	100th St. East	31	17.240	17.240	68.960	88	111	19.04	42.04
33	Cobblestone	N/A	9.757	9.757	39.029	88	110	48.97	70.97
34	Diamond Rose	N/A	18.021	18.021	72.084	105	148	32.92	75.98
35	Golf Park	N/A	1.063	1.063	4.252	155	164	150.75	159.75
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	6.522	8.330	33.322	253	366	219.68	332.68
38	Summer Crest PH II	N/A	1.808	1.808	7.234	275	275	267.77	267.77
39	Library	N/A	0.986	0.986	3.946	0	44	(3.95)	40.05
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	2.104	2.104	8.416	302	302	293.58	293.58
44	12540 US441	45, Septic Phase 1	0.000	0.000	0.000	241	241	241.00	241.00
45	8001 SE 135th St	N/A	0.000	0.000	0.000	111	111	111.00	111.00
Tract A LS	Inactive No Pumps	N/A	0.000	0.000	0.000	Inactive	Inactive	Inactive	Inactive

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
ADJUSTED BASED ON WW IMPROVEMENTS NO.3 AND NO.4

Kimley»Horn

			5-Year (2022)						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	44.139	405.572	1622.287	1486	1648	(136.29)	25.71
4	Front Road	N/A	4.823	4.823	19.292	169	169	149.71	149.71
5	Cemetery	7,10,26	10.719	25.588	102.353	199	338	96.44	235.59
6	52nd CT	8,9,13,14	40.180	49.172	196.688	172	194	(24.69)	(2.69)
7	Fern Meadows	N/A	1.433	1.433	5.730	165	227	158.79	221.46
8	Palm Tree Villas	N/A	4.120	4.120	16.481	70	88	53.52	71.52
9	55th Ave Road	16	14.744	18.584	74.337	123	238	48.66	163.66
10	Flower Shop	N/A	0.016	0.016	0.065	147	147	146.44	146.44
11	K-Mart	33	25.256	38.908	155.631	132	246	(24.02)	90.37
12	Goldern Oaks MHP	N/A	8.992	8.992	35.967	82	82	46.03	46.03
14	Northside	N/A	0.744	0.744	2.975	74	86	71.45	83.21
15	Scruggle	N/A	0.877	0.877	3.507	11	43	7.49	39.49
16	Kwik King	N/A	3.840	3.840	15.361	106	176	90.40	160.91
19	Wooded Acres	N/A	0.386	0.386	1.544	149	160	147.31	158.46
20	Wooded Acres	N/A	12.701	12.701	50.805	176	278	125.19	227.19
21	Baseline A - Repump Station	N/A	1.902	1.902	7.609	220	407	212.39	398.89
22	Baseline B - Repump Station	23,37	0.086	44.366	177.464	209	405	31.54	227.54
23	Baseline C - Repump Station	24	3.399	7.189	28.755	105	176	76.24	147.24
24	Baseline D	N/A	3.789	3.789	15.158	26	163	11.28	147.84
26	Ball Park	N/A	13.420	13.420	53.681	65	176	11.32	122.32
30	High School	N/A	8.112	8.112	32.448	202	202	169.55	169.55
31	100th St. West	30	0.569	8.681	34.725	76	99	41.06	63.98
32	100th St. East	31	23.375	23.375	93.502	88	111	(5.50)	17.50
33	Cobblestone	N/A	13.652	13.652	54.606	88	110	33.39	55.39
34	Diamond Rose	N/A	21.393	21.393	85.573	105	148	19.43	62.49
35	Golf Park	N/A	1.656	1.656	6.625	155	164	148.38	157.38
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	21.589	37.091	148.364	253	366	104.64	217.64
38	Summer Crest PH II	N/A	15.503	15.503	62.010	275	275	212.99	212.99
39	Library	N/A	1.397	1.397	5.587	0	44	(5.59)	38.41
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	2.802	77.859	311.435	302	302	(9.44)	(9.44)
44	12540 US441	45, Septic Phase 1	0.436	31.665	126.660	241	241	114.34	114.34
45	8001 SE 135th St	N/A	0.478	0.478	1.910	111	111	109.09	109.09
Tract A LS	Inactive No Pumps	N/A	0.214	0.214	0.854	Inactive	Inactive	Inactive	Inactive

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
ADJUSTED BASED ON WW IMPROVEMENTS NO.3 AND NO.4

Kimley»Horn

			10-Year (2027)						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	46.914	472.965	1891.860	1486	1648	(405.86)	(243.86)
4	Front Road	N/A	5.467	5.467	21.868	169	169	147.13	147.13
5	Cemetery	7,10,26	11.483	27.067	108.268	199	338	90.52	229.68
6	52nd CT	8,9,13,14	41.897	50.937	203.747	172	194	(31.75)	(9.75)
7	Fern Meadows	N/A	2.124	2.124	8.496	165	227	156.02	218.69
8	Palm Tree Villas	N/A	4.931	4.931	19.724	70	88	50.28	68.28
9	55th Ave Road	16	16.199	20.206	80.823	123	238	42.18	157.18
10	Flower Shop	N/A	0.016	0.016	0.065	147	147	146.44	146.44
11	K-Mart	33	26.449	40.315	161.259	132	246	(29.65)	84.74
12	Goldern Oaks MHP	N/A	9.040	9.040	36.158	82	82	45.84	45.84
14	Northside	N/A	0.791	0.791	3.166	74	86	71.25	83.01
15	Scruggle	N/A	0.901	0.901	3.603	11	43	7.40	39.40
16	Kwik King	N/A	4.007	4.007	16.029	106	176	89.73	160.24
19	Wooded Acres	N/A	0.434	0.434	1.735	149	160	147.12	158.27
20	Wooded Acres	N/A	12.868	12.868	51.473	176	278	124.53	226.53
21	Baseline A - Repump Station	N/A	2.474	2.474	9.898	220	407	210.10	396.60
22	Baseline B - Repump Station	23,37	0.211	81.235	324.940	209	405	(115.94)	80.06
23	Baseline C - Repump Station	24	4.282	8.834	35.337	105	176	69.66	140.66
24	Baseline D	N/A	4.553	4.553	18.210	26	163	8.23	144.79
26	Ball Park	N/A	13.444	13.444	53.776	65	176	11.22	122.22
30	High School	N/A	8.279	8.279	33.115	202	202	168.88	168.88
31	100th St. West	30	0.903	9.182	36.728	76	99	39.06	61.98
32	100th St. East	31	26.356	26.356	105.426	88	111	(17.43)	5.57
33	Cobblestone	N/A	13.866	13.866	55.465	88	110	32.54	54.54
34	Diamond Rose	N/A	22.395	23.662	94.648	105	148	10.35	53.41
35	Golf Park	N/A	2.443	5.383	21.530	155	164	133.47	142.47
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	34.082	72.189	288.757	253	366	(35.76)	77.24
38	Summer Crest PH II	N/A	38.107	38.107	152.427	275	275	122.57	122.57
39	Library	N/A	1.993	1.993	7.972	0	44	(7.97)	36.03
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	2.968	82.354	329.415	302	302	(27.42)	(27.42)
44	12540 US441	45, Septic Phase 1	0.484	37.692	150.768	241	241	90.23	90.23
45	8001 SE 135th St	N/A	0.907	0.907	3.627	111	111	107.37	107.37
Tract A LS	Inactive No Pumps	N/A	0.428	0.428	1.713	Inactive	Inactive	Inactive	Inactive

CITY OF BELLEVIEW
UTILITY MASTER PLAN
SANITARY SEWER FLOW MODEL
ADJUSTED BASED ON WW IMPROVEMENTS NO.3 AND NO.4

Kimley»Horn

			20-Year (2037)						
Lift Station No.	Lift Station Name	Contributing Inflow	Sewer Shed Inflow ADF (gpm)	Contributing Sewer Shed Total Inflow ADF (gpm)	Peak Total Inflow (gpm)*	Min Pumping Capacity (gpm)	Max Pumping Capacity (gpm)	Min Pumping Surplus (gpm)	Max Pumping Surplus (gpm)
1	WWTP	4,5,6,9,11,15,19,20,32,39,43,44, 132nd E, 132nd W, Septic Phase 2, Septic Phase 6	50.277	552.598	2210.4	1486	1648	(724.39)	(562.39)
4	Front Road	N/A	6.503	6.503	26.0	169	169	142.99	142.99
5	Cemetery	7,10,26	12.711	29.447	117.8	199	338	81.00	220.16
6	52nd CT	8,9,13,14	44.661	53.778	215.1	172	194	(43.11)	(21.11)
7	Fern Meadows	N/A	3.237	3.237	12.9	165	227	151.57	214.24
8	Palm Tree Villas	N/A	6.236	6.236	24.9	70	88	45.06	63.06
9	55th Ave Road	16	18.540	22.816	91.3	123	238	31.73	146.73
10	Flower Shop	N/A	0.016	0.016	0.1	147	147	146.44	146.44
11	K-Mart	33	28.368	42.580	170.3	132	246	(38.71)	75.68
12	Goldern Oaks MHP	N/A	9.116	9.116	36.5	82	82	45.53	45.53
14	Northside	N/A	0.868	0.868	3.5	74	86	70.95	82.71
15	Scruggle	N/A	0.939	0.939	3.8	11	43	7.24	39.24
16	Kwik King	N/A	4.276	4.276	17.1	106	176	88.66	159.17
19	Wooded Acres	N/A	0.510	0.510	2.0	149	160	146.81	157.96
20	Wooded Acres	N/A	13.137	13.137	52.5	176	278	123.45	225.45
21	Baseline A - Repump Station	N/A	3.396	3.396	13.6	220	407	206.42	392.92
22	Baseline B - Repump Station	23,37	0.375	115.940	463.8	209	405	(254.76)	(58.76)
23	Baseline C - Repump Station	24	5.702	11.483	45.9	105	176	59.07	130.07
24	Baseline D	N/A	5.781	5.781	23.1	26	163	3.32	139.88
26	Ball Park	N/A	13.482	13.482	53.9	65	176	11.07	122.07
30	High School	N/A	10.362	10.362	41.4	202	202	160.55	160.55
31	100th St. West	30	1.441	11.803	47.2	76	99	28.58	51.50
32	100th St. East	31	31.155	31.155	124.6	88	111	(36.62)	(13.62)
33	Cobblestone	N/A	14.212	14.212	56.8	88	110	31.15	53.15
34	Diamond Rose	N/A	24.007	25.315	101.3	105	148	3.74	46.80
35	Golf Park	N/A	3.710	6.812	27.2	155	164	127.75	136.75
36	Densan Ct	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
37	Summer Crest	38	45.344	104.082	416.3	253	366	(163.33)	(50.33)
38	Summer Crest PH II	N/A	58.738	58.738	235.0	275	275	40.05	40.05
39	Library	N/A	2.953	2.953	11.8	0	44	(11.81)	32.19
42	5945 SE 119th St	N/A	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
43	6705 SE 119th St	Autumn Glen, Septic Phase3	3.237	90.416	361.7	302	302	(59.67)	(59.67)
44	12540 US441	45, Septic Phase 1	0.561	48.217	192.9	241	241	48.13	48.13
45	8001 SE 135th St	N/A	1.598	1.598	6.4	111	111	104.61	104.61
Tract A LS	Inactive No Pumps	N/A	0.774	0.774	3.1	Inactive	Inactive	Inactive	Inactive

APPENDIX G:
Revenue Sufficiency Analysis

To: Lewis Bryant
Kimley Horn

From: Tony Hairston
Raftelis Financial Consultants

Date: May 20, 2019

Re: City of Belleview, FL Master Plan Revenue Sufficiency

As a subconsultant to Kimley Horn for the City of Belleview (City) Master Plan project, Raftelis Financial Consultants, Inc. (Raftelis) is pleased to provide this revenue sufficiency analysis. The objective of this revenue sufficiency analysis is to forecast future water and sewer rates necessary to fund the capital projects identified in the Master Plan. Raftelis previously developed a customized interactive model for the City's utility system to accommodate a rate study in 2018. The revenue sufficiency for this Master Plan relies on that interactive financial model with updates to reflect recent historic and budget data including the adopted FY 2018/2019 budget.

Summary 10-year Financial Forecast

At the end of this technical report are several exhibits with detailed calculations including capital improvement plan (CIP) funding by project, reserve balances, revenue sufficiency for water and sewer, and other information. A dashboard at the end of this letter provides a summary of the projected water and sewer rates and fiscal health for the utility system over the next ten years. An analysis of the 10-year forecast for the first five-year period followed by the second five-year period is provided below.

FY 2019 – FY 2023 Capital Improvement Funding
Exhibit 1 at the end of this technical memorandum provides a detail of each project and funding source over the ten-year period. A funding plan has been created for two scenarios, one without septic to sewer conversion projects and the other version with septic to sewer conversions. The following summarizes the project funding identified during the first five years of the Master Plan assuming no septic to sewer projects:

Table 1 – FY 2019 – FY 2023 Capital Improvement Funding (No Septic to Sewer) [1]

Source	Projects	Total (2018 Costs)	Total with Inflation [2]
Water			
Pay-Go (Rates)	Minor Capital	$48,000	$51,700
2019 SRF Loan	1.2 MGD WTP Expansion, Watermains	2,840,000	3,005,100
2022 SRF Loan	Watermain Extension	2,190,000	2,464,900
Impact Fees	Watermain Extension	520,000	585,300
Grants		0	0
Total Water		**$5,598,000**	**$6,107,000**
Sewer			
Pay-Go (Rates)	Minor Capital, R&R, Sprayfield Pond	$510,500	$549,500
2019 SRF Loan	Force Main, Pumps, WRF Improvements	3,680,000	3,962,800
2022 SRF Loan	WRF Improvements	1,600,000	1,800,800
Impact Fees	Force Main, Pumps, WWTP Office/Lab Upgrades	1,710,000	1,900,700
Grants	SE 132nd St. Road Infrastructure Construction	2,000,000	2,121,800
Total Sewer		**$9,500,500**	**$10,335,600**
Total Water and Sewer FY 2019 - 2023		**$15,098,500**	**$16,442,600**

Footnotes:

[1] The full Capital Improvement Plan with project descriptions, timing, and costs can be found in Exhibit 1.

[2] The total costs with inflation shown above are based on 2018 project costs escalated by 3% per year to account for inflation.

The total project costs for the first five years (FY 2019 through 2023) is $15.1 million based on 2018 cost estimates. Assuming 3.0% per year inflation, the inflated costs during this period is $16.4 million. As shown above, funding sources include pay-go, SRF loans, impact fees, and grants. Pay-go represents projects that are directly funded from current year water or sewer rate revenue or reserves accumulated from prior years. SRF loans fund larger projects where it is not prudent or feasible to use pay-go funding and the project benefit will occur over at least a 20-year period since the term of SRF loans are typically 20 years. Impact fee projects are funded by fees paid by developers and therefore do not negatively affect ratepayers. Finally grants are funded from sources outside the utility system and do not negatively affect ratepayers. Based on discussions with City staff and Kimley Horn, no significant increases to operating expenses beyond moderate inflationary cost increases are projected due to new capital projects or changes to the utility configuration.

FY 2019 – FY 2023 Projected Rate Impacts

The financial projection model assumes on average approximately 3.5% annual operating expense increases through FY 2023. Water and wastewater customer growth is assumed to be on average 2.8% and 3.5% per year, respectively, during this first five-year period. Based on these assumptions, revenue from adopted rates do not sufficiently fund the Master Plan projects over the next five years. Revenue is insufficient due to the use of rate revenue, reserves, and additional debt service on new debt as indicated above.

Exhibits 2 and 3 provide the projected revenue requirements for the water and sewer systems, respectively. These exhibits indicate the projected water revenue under the existing (adopted) rates and additional revenue from projected future rate increases necessary to fully fund the capital improvement plan. It is estimated that a typical residential bill using 4,000 gallons will need to increase by $11.18 from $59.79 in FY 2020 to $70.97 by FY 2023 to fund the Master Plan improvements over the next five years.[1] This increase is based on a series of three (3) water rate increases of 4.0% each and three (3) wastewater rate increases of 7.0% each. However, these rate levels are not proposed until further evaluation in FY 2020 as part of the City's annual rate update.

A separate scenario with analysis of projects to be funded with a septic to sewer (S2S) program has been evaluated. Based on City discussions, the advancement of S2S projects is assumed only if grants are received in sufficient amounts so that existing City ratepayers are not adversely affected. Therefore, under any S2S scenario the projected water and sewer rates would be the same or lower than the projected rates discussed above under this assumption.

FY 2024 – 2028 Capital Improvement Funding and Projected Rate Impacts

The following summarizes the project funding identified during the remaining five years of the Master Plan assuming no septic to sewer projects:

[1] The City has adopted rates through FY 2020 whereby a typical 4,000 gallon bill will be $59.79 once these adopted rates are implemented.

Table 2 – FY 2024 – FY 2028 Capital Improvement Funding (No Septic to Sewer) [1]

Source	Projects	Total (2018 Costs)	Total with Inflation [2]
Water			
Pay-Go (Rates)	Minor Capital	$37,500	$47,600
2024 SRF Loan	3.6 MGD WTP Expansion	7,500,000	9,448,600
Impact Fees		0	0
Grants		0	0
Total Water		**$7,537,500**	**$9,496,200**
Sewer			
Pay-Go (Rates)	Minor Capital, R&R	$767,500	$985,400
Impact Fees		0	0
Grants		0	0
Total Sewer		**$767,500**	**$985,400**
Total Water and Sewer FY 2024 - 2028		**$8,305,000**	**$10,481,600**

Footnotes:

[1] The full Capital Improvement Plan with project descriptions, timing, and costs can be found in Exhibit 1.

[2] The total costs with inflation shown above are based on 2018 project costs escalated by 3% per year to account for inflation.

The total project costs for the remaining five years (FY 2024 through 2028) is $8.3 million based on 2018 cost estimates. Assuming 3.0% per year inflation, the inflated costs during this period is $10.5 million.

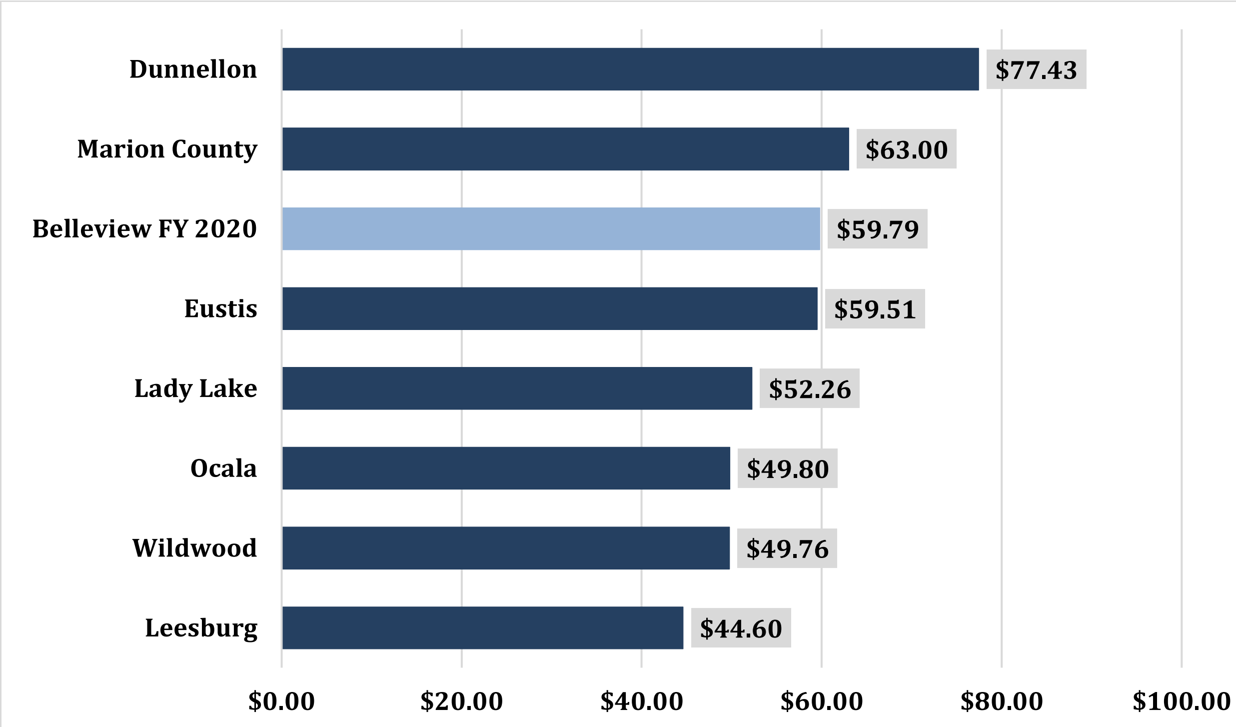
FY 2024 – FY 2028 Projected Rate Impacts

Water and wastewater customer growth is assumed to be on average 2.9% and 3.5% per year, respectively during the remaining five-year period. Based on detailed analysis shown on Exhibit 2 and Exhibit 3, a typical residential bill using 4,000 gallons will need to increase by $13.36 from $70.97 in FY 2023 to $84.33 by FY 2028 to fund the Master Plan improvements over the remaining five years. This increase is based on a water rate increase of 2.0% in FY 2024, followed by a series of three (3) 9.0% increases in FYs 2025 through 2027, and another 2.0% increase in FY 2028. For wastewater, the increase is based on five (5) wastewater rate increases of 2.0% each. Figure 2 at the end of this letter includes a financial dashboard that summarizes the ten-year forecast.

Comparison Chart

The figure below provides a comparison of the inside-City residential customer class to other local utilities at 4,000 gallons of usage based on existing rates. While future increases are projected for the City, these other providers will likely increase rates, so it is appropriate to keep the comparison at existing rates with the only exception that the City's rates are shown at the adopted FY 2020 levels.

Figure 1 – Residential Water and Sewer Rate Comparison (4,000 Gallons)



Note: Average of other local utilities (excluding the City of Belleview) = $56.62

Conclusions:

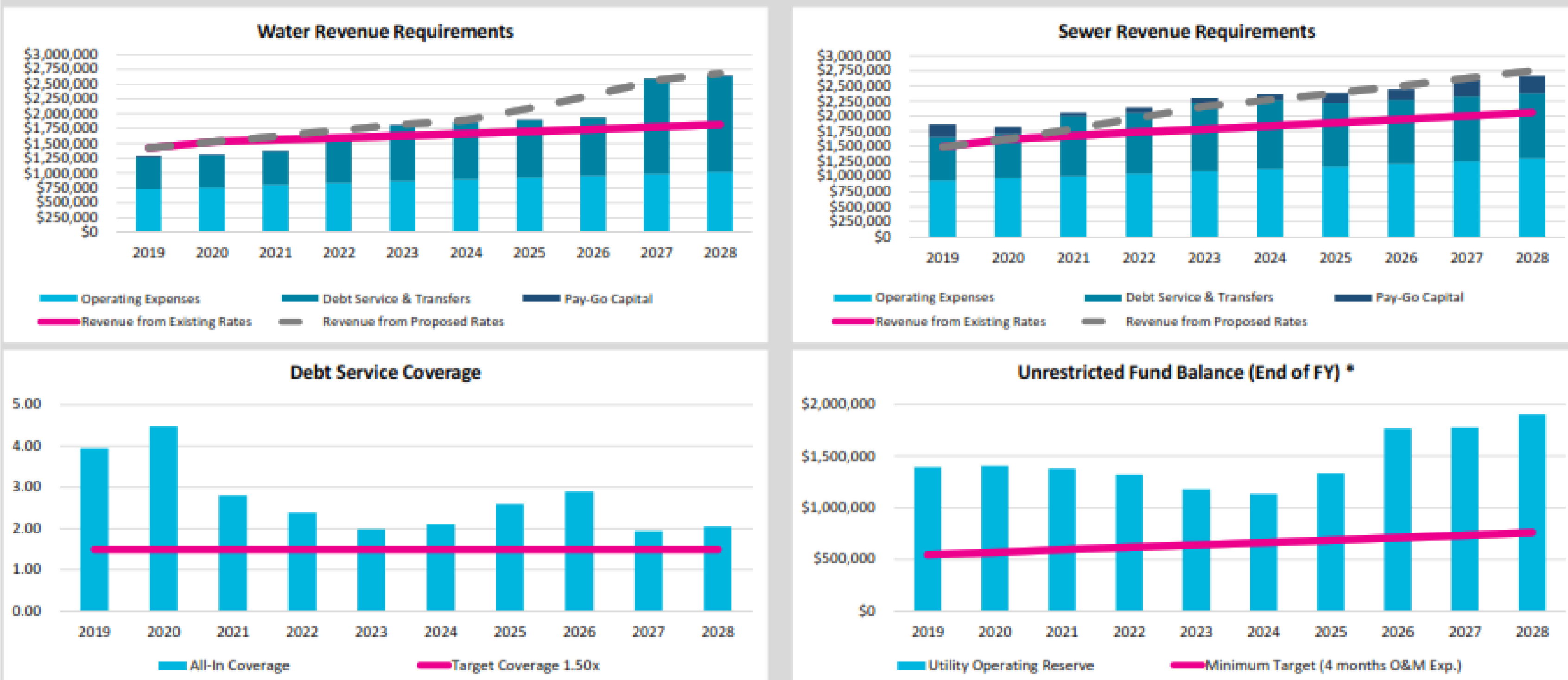
Based upon the considerations and assumptions used to derive the results of our analyses, we conclude the following:

1. The City's adopted rates through FY 2020 are not sufficient to fund the Master Plan capital improvements. Rate increases are projected beginning FY 2021 to accommodate capital improvement funding.
2. The City's existing rates are slightly above the average of other nearby water and sewer providers. While the City's rates are projected to increase, other utility rates are also projected to increase in the future.
3. The City should review its rates and rate structure during FY 2020 to align with an updated five-year capital improvement plan including updated costs and project timing.
4. The City should begin the SRF application process for those projects in the Master Plan that require debt financing.

Figure 2 - Financial Dashboard

Inside-City Residential Bill at 4,000 Gallons:

	Fiscal Year									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Water Bill	$20.89	$21.92	$22.78	$23.66	$24.61	$25.10	$27.36	$29.82	$32.50	$33.15
Sewer Bill	36.08	37.87	40.50	43.33	46.36	47.29	48.24	49.20	50.18	51.18
Total Bill	$56.97	$59.79	$63.28	$66.99	$70.97	$72.39	$75.60	$79.02	$82.68	$84.33
$ Difference		$2.82	$3.49	$3.71	$3.98	$1.42	$3.21	$3.42	$3.66	$1.65
% Difference		4.9%	5.8%	5.9%	5.9%	2.0%	4.4%	4.5%	4.6%	2.0%
Rate Adjustments:										
Water	0.00%	0.00%	4.00%	4.00%	4.00%	2.00%	9.00%	9.00%	9.00%	2.00%
Sewer	0.00%	0.00%	7.00%	7.00%	7.00%	2.00%	2.00%	2.00%	2.00%	2.00%



LIST OF EXHIBITS

Exhibit 1
City of Belleview
2019 Master Plan
Capital Improvement Plan

Scenario
No S2S

Project No.	Capital Project Description	Project Identifier	Included in Analysis	Proposed Funding Source	Fiscal Year 2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
WATER TREATMENT & DISTRUBUTION PROJECTS/NEEDS															
	Abandon Wells 1, 2, 3	3	Yes	W_Pay-Go	$20,000										$20,000
	Rate/Financial Analysis (Water)	3	Yes	W_Pay-Go		5,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	65,500
PWS Improvement No. 3	WM from Proposed WTP to CR 484	3	Yes	W_SRF_2019	96,667	96,667	96,667								290,001
PWS Improvement No. 4	SE 119th St WM from proposed WTP to US 301	2	No	W_SRF_2022					960,000						960,000
PWS Improvement No. 5	US 301 WM South From SE 119th St to Belmar Rd	2	No	Grant					860,000						860,000
PWS Improvement No. 6	US 301 WM North from SE 119th St to Baseline Rd	2	No	Beyond 2028											0
PWS Improvement No. 7	US 301 WM South from Belmar Rd to SE 132nd St	3	Yes	W_Impact Fees				520,000							520,000
PWS Improvement No. 8	132rd St East WM Extension From US 441 West to CR 484	3	Yes	W_SRF_2022				2,190,000							2,190,000
PWS Improvement No. 1A1	Construct a 1.20 MGD MDD WTOP at the Public Works Building	1	Yes	W_SRF_2019	255,000										255,000
PWS Improvement No. 1A2	Construct a 1.20 MGD MDD WTOP at the Public Works Building	1	Yes	W_SRF_2019		2,295,000									2,295,000
PWS Improvement No. 1B1	Upsize New WTP to a 3.60 MGD MDD Capacity	1	Yes	W_SRF_2024						750,000					750,000
PWS Improvement No. 1B2	Upsize New WTP to a 3.60 MGD MDD Capacity	1	Yes	W_SRF_2024							2,250,000	2,250,000	2,250,000		6,750,000
PWS Improvement No. 2A1	Construct a 2.46 MGD MDD WTP at the Public Works Building	2	No	W_SRF_2019	745,500										745,500
PWS Improvement No. 2A2	Construct a 2.46 MGD MDD WTP at the Public Works Building	2	No	W_SRF_2019		6,714,500									6,714,500
PWS Improvement No. 2B1	Upsize New WTP to a 5.00 MGD MDD Capacity	2	No	W_SRF_2024							312,000				312,000
PWS Improvement No. 2B2	Upsize New WTP to a 5.00 MGD MDD Capacity	2	No	W_SRF_2024								936,000	936,000	936,000	2,808,000
	Design Well #7 Lower Floridan	2	No	Grant				150,000							150,000
	Construct Well # 7	2	No	Grant					2,000,000						2,000,000
WATER/SEWER VEHICLES & EQUIPMENT															
	Vehicles	3	Yes	W_Pay-Go											$0
	Mini Escavator	3	Yes	W_Pay-Go											0
WASTEWATER, COLLECT, TRANSMIT, TREAT & DISPOSE PROJECTS/NEEDS															
	SCADA-5 Lift Stations	3	Yes	S_Pay-Go	$40,000										$40,000
	Upgrade WWTP Office & Lab	3	Yes	S_Impact Fees	250,000										250,000
	Replace Polymer System	3	Yes	S_Pay-Go		5,000									5,000
	Replace Diffusers and Piping	3	Yes	S_Pay-Go		7,000									7,000
	Repair and/or replace WWTP Railing	3	Yes	S_Pay-Go	10,000										10,000
	Belleview Sprayfield Pond	3	Yes	S_Pay-Go	150,000										150,000
	Repair Wall in Overflow Basin	3	Yes	S_Pay-Go		7,500									7,500
	Repave area for Dumpster Pickup at WWTP	3	Yes	S_Pay-Go		30,000									30,000
	New Crane for Existing truck	3	Yes	S_Pay-Go		13,000									13,000
	Rate/Financial Analysis (Sewer)	3	Yes	S_Pay-Go		5,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	65,500
	SE 132nd St Rd Infrastructure Construction	3	Yes	Grant		2,000,000									2,000,000
WW Improvement No. 1	Replace both Pumps at LS No. 6	3	Yes	S_SRF_2019	40,000										40,000
WW Improvement No. 2	Install a Second Pump at LS No. 39	3	Yes	S_SRF_2019	20,000										20,000
WW Improvement No. 3	Replace Both Pumps at LS No. 32	3	Yes	S_SRF_2019	40,000										40,000
WW Improvement No. 4	Replace Both Pumps at LS No. 11	3	Yes	S_SRF_2019	40,000										40,000
WW Improvement No. 5A	FM to Mainfold LS No. 22, 35, and 21 to Redirect Flows from City's G	3	Yes	S_Impact Fees				145,500							145,500
WW Improvement No. 5B	FM to Mainfold LS No. 22, 35, and 21 to Redirect Flows from City's G	3	Yes	S_Impact Fees				1,314,500							1,314,500
WW Improvement No. 5C	FM to Mainfold LS No. 34, 5, 19, 20, 43, 44 to Redirect Flows from Ci	3	Yes	S_SRF_2019		213,000									213,000
WW Improvement No. 5D	FM to Mainfold LS No. 34, 5, 19, 20, 43, 44 to Redirect Flows from Ci	3	Yes	S_SRF_2019			1,917,000								1,917,000
WW Improvement No. 6	Replace both Pumps at LS No. 42	2	No	S_SRF_2019					150,000						150,000
WW Improvement No. 7	Replace Both Pumps at LS No. 37	3	Yes	S_SRF_2019	40,000										40,000
Project Already Budgeted	LS No. 4 Pump Replacement and Rehabilitation	3	Yes	S_SRF_2019		200,000									200,000
Project Already Budgeted	LS No. 5 Pump Replacement and Rehabilitation	3	Yes	S_SRF_2019			200,000								200,000
WW Misc. Improvement	Lift Station Renewal and Replacement	3	Yes	S_Pay-Go		30,000	30,000	50,000	50,000	50,000	80,000	80,000	100,000	100,000	570,000
WW Misc. Improvement	Gravity Collection and Replacement	3	Yes	S_Pay-Go		10,000	10,000	20,000	20,000	20,000	50,000	50,000	100,000	100,000	380,000
WRF Improvement No. 1A1	Required Capital Improvements to Existing WRF	1	Yes	S_SRF_2019	100,000										100,000
WRF Improvement No. 1A2	Required Capital Improvements to Existing WRF	1	Yes	S_SRF_2019		870,000									870,000
WRF Improvement No. 1B	Optional Capital Improvements to Existing WRF	1	Yes	S_SRF_2022				1,600,000							1,600,000
WRF Improvement No. 2A1	Rerate Existing WRF to 0.8 MGD	1	Yes	Beyond 2028											0
WRF Improvement No. 2A2	Rerate Existing WRF to 0.8 MGD	1	Yes	Beyond 2028											0
WRF Improvement No. 2B1	Expand WRF to 1.2 MGD	2	No	Grant	1,310,000										1,310,000
WRF Improvement No. 2B2	Expand WRF to 1.2 MGD	2	No	Grant			11,360,000								11,360,000
SS OSTDS Region 1	SS OSTDS Region 1	2	No	Grant		14,923,374									14,923,374

Exhibit 1
City of Belleview
2019 Master Plan
Capital Improvement Plan

Scenario
No S2S

Project No.	Capital Project Description	Project Identifier	Included in Analysis	Proposed Funding Source	Fiscal Year 2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
SS OSTDS Region 2	SS OSTDS Region 2	2	No	Grant			4,848,771								4,848,771
SS OSTDS Region 3	SS OSTDS Region 3	2	No	Grant				22,254,273							22,254,273
SS OSTDS Region 4	SS OSTDS Region 4	2	No	Grant					7,825,887						7,825,887
SS OSTDS Region 5	SS OSTDS Region 5	2	No	Grant						9,209,064					9,209,064
SS OSTDS Region 6	SS OSTDS Region 6	2	No	Grant							11,829,369				11,829,369
Reclaimed Storage Option 1	Rehab Existing 1.00 MG Effluent Storage Basin to Function as a Reject	3	Yes	Beyond 2028											0

Septic-to-Sewer Identifier:
1 = No Septic-to-Sewer only
2 = Septic-to-Sewer only
3 = Project required in both scenarios

Annual Project Funding Analysis (Current Costs)

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Water Revenues	W_Pay-Go	$20,000	$5,500	$7,500	$7,500	$7,500	$7,500	$7,500	$7,500	$7,500	$7,500	$85,500
Sewer Revenues	S_Pay-Go	200,000	108,000	47,500	77,500	77,500	77,500	137,500	137,500	207,500	207,500	1,278,000
Utility Operating Reserves	Reserves	0	0	0	0	0	0	0	0	0	0	0
Water Impact Fees	W_Impact Fees	0	0	0	520,000	0	0	0	0	0	0	520,000
Sewer Impact Fees	S_Impact Fees	250,000	0	0	1,460,000	0	0	0	0	0	0	1,710,000
2019 Drinking Water SRF Loan	W_SRF_2019	351,667	2,391,667	96,667	0	0	0	0	0	0	0	2,840,001
2022 Drinking Water SRF Loan	W_SRF_2022	0	0	0	2,190,000	0	0	0	0	0	0	2,190,000
2024 Drinking Water SRF Loan	W_SRF_2024	0	0	0	0	0	750,000	2,250,000	2,250,000	2,250,000	0	7,500,000
2027 Drinking Water SRF Loan	W_SRF_2027	0	0	0	0	0	0	0	0	0	0	0
2019 Clean Water SRF Loan	S_SRF_2019	280,000	1,283,000	2,117,000	0	0	0	0	0	0	0	3,680,000
2022 Clean Water SRF Loan	S_SRF_2022	0	0	0	1,600,000	0	0	0	0	0	0	1,600,000
Revenue Bond 1	Rev Bond 1	0	0	0	0	0	0	0	0	0	0	0
After Forecast Period	Beyond 2028	0	0	0	0	0	0	0	0	0	0	0
Grants	Grant	0	2,000,000	0	0	0	0	0	0	0	0	2,000,000
Total Funding Sources		$1,101,667	$5,788,167	$2,268,667	$5,855,000	$85,000	$835,000	$2,395,000	$2,395,000	$2,465,000	$215,000	$23,403,501
Construction Cost Index		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	
Cumulative Construction Cost Index		3.0%	6.1%	9.3%	12.6%	15.9%	19.4%	23.0%	26.7%	30.5%	34.4%	

Annual Project Funding Analysis (Escalated Costs)

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Water Revenues	W_Pay-Go	$20,600	$5,800	$8,200	$8,400	$8,700	$9,000	$9,200	$9,500	$9,800	$10,100	$99,300
Sewer Revenues	S_Pay-Go	206,000	114,600	51,900	87,200	89,800	92,500	169,100	174,200	270,700	278,900	1,534,900
Utility Operating Reserves	Reserves	0	0	0	0	0	0	0	0	0	0	0
Water Impact Fees	W_Impact Fees	0	0	0	585,300	0	0	0	0	0	0	585,300
Sewer Impact Fees	S_Impact Fees	257,500	0	0	1,643,200	0	0	0	0	0	0	1,900,700
2019 Drinking Water SRF Loan	W_SRF_2019	362,200	2,537,300	105,600	0	0	0	0	0	0	0	3,005,100
2022 Drinking Water SRF Loan	W_SRF_2022	0	0	0	2,464,900	0	0	0	0	0	0	2,464,900
2024 Drinking Water SRF Loan	W_SRF_2024	0	0	0	0	0	895,500	2,767,200	2,850,200	2,935,700	0	9,448,600
2027 Drinking Water SRF Loan	W_SRF_2027	0	0	0	0	0	0	0	0	0	0	0
2019 Clean Water SRF Loan	S_SRF_2019	288,400	1,361,100	2,313,300	0	0	0	0	0	0	0	3,962,800
2022 Clean Water SRF Loan	S_SRF_2022	0	0	0	1,800,800	0	0	0	0	0	0	1,800,800
Revenue Bond 1	Rev Bond 1	0	0	0	0	0	0	0	0	0	0	0
After Forecast Period	Beyond 2028	0	0	0	0	0	0	0	0	0	0	0
Grants	Grant	0	2,121,800	0	0	0	0	0	0	0	0	2,121,800
Total Funding Sources		$1,134,700	$6,140,600	$2,479,000	$6,589,800	$98,500	$997,000	$2,945,500	$3,033,900	$3,216,200	$289,000	$26,924,200

Exhibit 2
City of Belleview
2019 Master Plan
Water System Revenue Requirements

Description	Fiscal Year Ending September 30,									
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Operating Expenses	$730,700	$757,000	$809,500	$837,600	$866,300	$895,200	$924,900	$956,300	$988,200	$1,021,500
Water System Debt Service										
CB&T 2013 Loan	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
SRL - Sewer Treatment Plant	0	0	0	0	0	0	0	0	0	0
SRL - South Water Main Extentions	6,894	6,894	6,894	6,894	6,894	6,894	6,894	6,894	6,894	6,894
SRL - North Water Main Extentions	36,070	36,070	36,070	36,070	36,070	36,070	36,070	36,070	36,070	36,070
SRL - Meters	23,538	23,538	23,538	23,538	23,538	23,538	23,538	23,538	23,538	23,538
2019 Drinking Water SRF Loan	0	0	0	193,200	193,200	193,100	193,100	193,200	193,200	193,100
2022 Drinking Water SRF Loan	0	0	0	0	155,300	155,300	155,300	155,300	155,300	155,300
2024 Drinking Water SRF Loan	0	0	0	0	0	0	0	0	607,000	607,100
2027 Drinking Water SRF Loan	0	0	0	0	0	0	0	0	0	0
Revenue Bond 1	0	0	0	0	0	0	0	0	0	0
Total Debt Service	$66,503	$66,503	$66,503	$259,703	$415,003	$414,903	$414,903	$415,003	$1,022,003	$1,022,003
Other Expense/Transfer										
CIP Funding	$20,600	$5,800	$8,200	$8,400	$8,700	$9,000	$9,200	$9,500	$9,800	$10,100
Transfer to General Fund	471,100	483,400	496,000	508,400	521,200	533,200	545,500	558,100	571,000	584,200
Other	0	0	0	0	0	0	0	0	0	0
Total Other Expense/Transfers	$491,700	$489,200	$504,200	$516,800	$529,900	$542,200	$554,700	$567,600	$580,800	$594,300
Gross Water System Revenue Requirements	$1,288,903	$1,312,703	$1,380,203	$1,614,103	$1,811,203	$1,852,303	$1,894,503	$1,938,903	$2,591,003	$2,637,803
Other Income										
Interest Income	$3,000	$3,100	$3,200	$3,300	$3,400	$3,500	$3,600	$3,700	$3,800	$3,900
Miscellaneous Income	121,437	123,300	125,300	127,300	129,300	131,400	133,500	135,800	138,100	140,500
Use of Impact Fees toward Debt Service	0	0	0	0	0	0	0	0	0	0
Total Other Income	$124,437	$126,400	$128,500	$130,600	$132,700	$134,900	$137,100	$139,500	$141,900	$144,400
Net Water System Revenue Requirements	$1,164,466	$1,186,303	$1,251,703	$1,483,503	$1,678,503	$1,717,403	$1,757,403	$1,799,403	$2,449,103	$2,493,403
Water System Rate Revenues										
Projected Revenue from Adopted Rates	$1,303,000	$1,399,400	$1,434,500	$1,469,900	$1,499,500	$1,532,200	$1,564,600	$1,599,500	$1,634,600	$1,672,000
Revenue from Prior Increases	0	0	0	58,800	122,400	191,300	230,600	400,900	593,700	812,400
Total Revenue before Current Year Adjustment	$1,303,000	$1,399,400	$1,434,500	$1,528,700	$1,621,900	$1,723,500	$1,795,200	$2,000,400	$2,228,300	$2,484,400
Current Year Rate Adjustment			4.0%	4.0%	4.0%	2.0%	9.0%	9.0%	9.0%	2.0%
Effective Month			October	October	October	October	October	October	October	October
% of Year Effective			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Revenue from Current Year Adjustment	$0	$0	$57,400	$61,100	$64,900	$34,500	$161,600	$180,000	$200,500	$49,700
Total Water Rate Revenue	$1,303,000	$1,399,400	$1,491,900	$1,589,800	$1,686,800	$1,758,000	$1,956,800	$2,180,400	$2,428,800	$2,534,100
Net Surplus/(Deficit)	**$138,534**	**$213,097**	**$240,197**	**$106,297**	**$8,297**	**$40,597**	**$199,397**	**$380,997**	**($20,303)**	**$40,697**

Exhibit 3
City of Belleview
2019 Master Plan
Sewer System Revenue Requirements

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	Fiscal Year Ending September 30,									
Operating Expenses	$930,600	$967,900	$1,006,300	$1,046,000	$1,085,300	$1,124,400	$1,165,500	$1,208,600	$1,252,400	$1,298,000
Sewer System Debt Service										
CB&T 2013 Loan	$114,330	$112,540	$110,750	$108,960	$107,170	$105,380	$0	$0	$0	$0
SRL - Sewer Treatment Plant	138,930	138,930	138,930	138,930	138,930	138,930	138,930	138,930	138,930	138,930
SRL - South Water Main Extentions	0	0	0	0	0	0	0	0	0	0
SRL - North Water Main Extentions	0	0	0	0	0	0	0	0	0	0
2019 Clean Water SRF Loan	0	0	252,100	252,100	252,100	252,100	252,100	252,100	252,100	252,100
2022 Clean Water SRF Loan	0	0	0	0	113,400	113,500	113,400	113,500	113,400	113,500
Revenue Bond 1	0	0	0	0	0	0	0	0	0	0
Total Debt Service	$253,260	$251,470	$501,780	$499,990	$611,600	$609,910	$504,430	$504,530	$504,430	$504,530
Other Expense/Transfer										
CIP Funding	$206,000	$114,600	$51,900	$87,200	$89,800	$92,500	$169,100	$174,200	$270,700	$278,900
Transfer to General Fund	471,100	483,400	496,000	508,400	521,200	533,200	545,500	558,100	571,000	584,200
Other	0	0	0	0	0	0	0	0	0	0
Total Other Expense/Transfers	$677,100	$598,000	$547,900	$595,600	$611,000	$625,700	$714,600	$732,300	$841,700	$863,100
Gross Sewer System Revenue Requirements	$1,860,960	$1,817,370	$2,055,980	$2,141,590	$2,307,900	$2,360,010	$2,384,530	$2,445,430	$2,598,530	$2,665,630
Other Income										
Interest Income	$3,000	$3,100	$3,200	$3,300	$3,400	$3,500	$3,600	$3,700	$3,800	$3,900
Miscellaneous Income	87,037	87,900	88,800	89,700	90,600	91,500	92,400	93,400	94,400	95,400
Use of Impact Fees toward Debt Service	0	0	0	0	0	0	0	0	0	0
Use of NPR Fund toward CB&T 2013 Loan	0	0	0	0	0	0	0	0	0	0
Total Other Income	$90,037	$91,000	$92,000	$93,000	$94,000	$95,000	$96,000	$97,100	$98,200	$99,300
Net Sewer System Revenue Requirements	$1,770,923	$1,726,370	$1,963,980	$2,048,590	$2,213,900	$2,265,010	$2,288,530	$2,348,330	$2,500,330	$2,566,330
Sewer System Rate Revenues										
Projected Revenue from Adopted Rates	$1,404,600	$1,529,300	$1,584,100	$1,643,600	$1,690,700	$1,742,300	$1,794,100	$1,850,200	$1,906,400	$1,962,600
Revenue from Prior Increases	0	0	0	115,100	245,000	392,100	447,700	507,900	572,000	639,900
Total Revenue before Current Year Adjustment	$1,404,600	$1,529,300	$1,584,100	$1,758,700	$1,935,700	$2,134,400	$2,241,800	$2,358,100	$2,478,400	$2,602,500
Current Year Rate Adjustment			7.0%	7.0%	7.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Effective Month			October	October	October	October	October	October	October	October
% of Year Effective			100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Revenue from Current Year Adjustment	$0	$0	$110,900	$123,100	$135,500	$42,700	$44,800	$47,200	$49,600	$52,100
Total Sewer Rate Revenue	$1,404,600	$1,529,300	$1,695,000	$1,881,800	$2,071,200	$2,177,100	$2,286,600	$2,405,300	$2,528,000	$2,654,600
Net Surplus/(Deficit)	**($366,323)**	**($197,070)**	**($268,980)**	**($166,790)**	**($142,700)**	**($87,910)**	**($1,930)**	**$56,970**	**$27,670**	**$88,270**

Exhibit 4
City of Belleview
2019 Master Plan
Combined System Debt Service Coverage Projections

	Fiscal Year Ending September 30,									
Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
System Rate Revenue										
Water System	$1,303,000	$1,399,400	$1,491,900	$1,589,800	$1,686,800	$1,758,000	$1,956,800	$2,180,400	$2,428,800	$2,534,100
Sewer System	1,404,600	1,529,300	1,695,000	1,881,800	2,071,200	2,177,100	2,286,600	2,405,300	2,528,000	2,654,600
Total Rate Revenue	$2,707,600	$2,928,700	$3,186,900	$3,471,600	$3,758,000	$3,935,100	$4,243,400	$4,585,700	$4,956,800	$5,188,700
Other Income										
Interest Income	$6,000	$6,200	$6,400	$6,600	$6,800	$7,000	$7,200	$7,400	$7,600	$7,800
Miscellaneous Income	208,474	211,200	214,100	217,000	219,900	222,900	225,900	229,200	232,500	235,900
Total Other Income	$214,474	$217,400	$220,500	$223,600	$226,700	$229,900	$233,100	$236,600	$240,100	$243,700
Operating Expenses										
Water System	$730,700	$757,000	$809,500	$837,600	$866,300	$895,200	$924,900	$956,300	$988,200	$1,021,500
Sewer System	930,600	967,900	1,006,300	1,046,000	1,085,300	1,124,400	1,165,500	1,208,600	1,252,400	1,298,000
Total Operating Expenses	$1,661,300	$1,724,900	$1,815,800	$1,883,600	$1,951,600	$2,019,600	$2,090,400	$2,164,900	$2,240,600	$2,319,500
Net Operating Revenue	$1,260,774	$1,421,200	$1,591,600	$1,811,600	$2,033,100	$2,145,400	$2,386,100	$2,657,400	$2,956,300	$3,112,900
Debt Service										
CB&T 2013 Loan	$114,324	$112,535	$110,746	$108,957	$107,168	$105,379	$0	$0	$0	$0
SRL - Sewer Treatment Plant	138,930	138,930	138,930	138,930	138,930	138,930	138,930	138,930	138,930	138,930
SRL - South Water Main Extentions	6,894	6,894	6,894	6,894	6,894	6,894	6,894	6,894	6,894	6,894
SRL - North Water Main Extentions	36,070	36,070	36,070	36,070	36,070	36,070	36,070	36,070	36,070	36,070
SRL - Meters	23,538	23,538	23,538	23,538	23,538	23,538	23,538	23,538	23,538	23,538
Future Senior Debt	0	0	0	0	0	0	0	0	0	0
Future SRL Debt	0	0	252,100	445,300	714,000	714,000	713,900	714,100	1,321,000	1,321,100
Total Debt Service	$319,757	$317,968	$568,278	$759,690	$1,026,601	$1,024,812	$919,333	$919,533	$1,526,433	$1,526,533
Debt Service Coverage:										
Senior Achieved	11.03	12.63	14.37	16.63	18.97	20.36	N/A	N/A	N/A	N/A
Subordinate Achieved (Min. Required = 1.15x)	6.30	7.19	3.41	2.71	2.15	2.28	2.66	2.97	1.97	2.07
All-In Coverage Achieved (Min. Target = 1.50x)	3.94	4.47	2.80	2.38	1.98	2.09	2.60	2.89	1.94	2.04
Other Expense/Transfer										
CIP Funding	$226,600	$120,400	$60,100	$95,600	$98,500	$101,500	$178,300	$183,700	$280,500	$289,000
Transfer to General Fund	942,200	966,800	992,000	1,016,800	1,042,400	1,066,400	1,091,000	1,116,200	1,142,000	1,168,400
Other	0	0	0	0	0	0	0	0	0	0
Total Other Expense/Transfers	$1,168,800	$1,087,200	$1,052,100	$1,112,400	$1,140,900	$1,167,900	$1,269,300	$1,299,900	$1,422,500	$1,457,400
Net Surplus/(Deficit) before Transfers In	**($227,783)**	**$16,032**	**($28,778)**	**($60,490)**	**($134,401)**	**($47,312)**	**$197,467**	**$437,967**	**$7,367**	**$128,967**
Use of Impact Fees toward Debt Service	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Use of NPR Fund toward CB&T 2013 Loan	0	0	0	0	0	0	0	0	0	0
Net Surplus/(Deficit)	**($227,783)**	**$16,032**	**($28,778)**	**($60,490)**	**($134,401)**	**($47,312)**	**$197,467**	**$437,967**	**$7,367**	**$128,967**

Exhibit 5
City of Belleview
2019 Master Plan
Combined System Fund Balance Projections

Description	Fiscal Year Ending September 30,										
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Unrestricted Operating Fund											
Beginning Balance		$1,616,150	$1,388,361	$1,404,388	$1,375,605	$1,315,112	$1,180,709	$1,133,396	$1,330,864	$1,768,831	$1,776,198
Net Operating Surplus/(Deficit)		(227,789)	16,027	(28,783)	(60,493)	(134,403)	(47,313)	197,467	437,967	7,367	128,967
Used for CIP		0	0	0	0	0	0	0	0	0	0
Adj. In from Water Dev. Fee Fund		0	0	0	0	0	0	0	0	0	0
Adj. In from Sewer Dev. Fee Fund		0	0	0	0	0	0	0	0	0	0
Ending Fund Balance	$1,616,150	$1,388,361	$1,404,388	$1,375,605	$1,315,112	$1,180,709	$1,133,396	$1,330,864	$1,768,831	$1,776,198	$1,905,165
Minimum Target = 120 days O&M Exp.		*546,200*	*567,100*	*597,000*	*619,300*	*641,700*	*664,000*	*687,300*	*711,800*	*736,700*	*762,600*
Water Development Fees											
Beginning Balance		$470,151	$557,651	$645,151	$741,651	$252,851	$344,851	$445,751	$546,651	$656,551	$766,451
Income from New Customers		87,500	87,500	96,500	96,500	92,000	100,900	100,900	109,900	109,900	118,800
Used for CIP		0	0	0	(585,300)	0	0	0	0	0	0
Used for Debt Service		0	0	0	0	0	0	0	0	0	0
Adj. Out to Unrestricted Op. Fund		0	0	0	0	0	0	0	0	0	0
Ending Fund Balance	$470,151	$557,651	$645,151	$741,651	$252,851	$344,851	$445,751	$546,651	$656,551	$766,451	$885,251
Sewer Development Fees											
Beginning Balance		$836,548	$846,748	$1,114,448	$1,382,148	$33,948	$315,348	$624,048	$932,748	$1,268,748	$1,604,748
Income from New Customers		267,700	267,700	267,700	295,000	281,400	308,700	308,700	336,000	336,000	336,000
Used for CIP		(257,500)	0	0	(1,643,200)	0	0	0	0	0	0
Used for Debt Service		0	0	0	0	0	0	0	0	0	0
Adj. Out to Unrestricted Op. Fund		0	0	0	0	0	0	0	0	0	0
Ending Fund Balance	$836,548	$846,748	$1,114,448	$1,382,148	$33,948	$315,348	$624,048	$932,748	$1,268,748	$1,604,748	$1,940,748

Exhibit 6
City of Belleview
2019 Master Plan
Bill Impacts

Water Bill Impacts by Class and Meter Size

Residential - Inside

Avg. Mo. Use: 3.8

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$11.64	$12.10	$0.46	4.0%		
1	$14.21	$14.77	$0.56	3.9%	$14.21	$14.77
2	$16.78	$17.44	$0.66	3.9%	$8.39	$8.72
3	$19.35	$20.11	$0.76	3.9%	$6.45	$6.70
4	$21.92	$22.78	$0.86	3.9%	$5.48	$5.70
5	$24.49	$25.45	$0.96	3.9%	$4.90	$5.09
6	$27.06	$28.12	$1.06	3.9%	$4.51	$4.69
7	$29.63	$30.79	$1.16	3.9%	$4.23	$4.40
8	$32.72	$34.00	$1.28	3.9%	$4.09	$4.25
10	$38.90	$40.42	$1.52	3.9%	$3.89	$4.04

Residential - Outside

Avg. Mo. Use: 4.7

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$17.46	$18.15	$0.69	4.0%		
1	$21.32	$22.15	$0.83	3.9%	$21.32	$22.15
2	$25.18	$26.15	$0.97	3.9%	$12.59	$13.08
3	$29.04	$30.15	$1.11	3.8%	$9.68	$10.05
4	$32.90	$34.15	$1.25	3.8%	$8.23	$8.54
5	$36.76	$38.15	$1.39	3.8%	$7.35	$7.63
6	$40.62	$42.15	$1.53	3.8%	$6.77	$7.03
7	$44.48	$46.15	$1.67	3.8%	$6.35	$6.59
8	$49.12	$50.96	$1.84	3.7%	$6.14	$6.37
10	$58.40	$60.58	$2.18	3.7%	$5.84	$6.06

Commercial - Inside

Avg. Mo. Use: 8.1

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$11.64	$12.10	$0.46	4.0%		
2	$16.78	$17.44	$0.66	3.9%	$8.39	$8.72
5	$24.49	$25.45	$0.96	3.9%	$4.90	$5.09
10	$38.90	$40.42	$1.52	3.9%	$3.89	$4.04
20	$69.80	$72.52	$2.72	3.9%	$3.49	$3.63
30	$109.90	$114.22	$4.32	3.9%	$3.66	$3.81

Sewer Bill Impacts by Class and Meter Size

Residential - Inside

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$23.39	$25.02	$1.63	7.0%		
1	$27.01	$28.89	$1.88	7.0%	$27.01	$28.89
2	$30.63	$32.76	$2.13	7.0%	$15.32	$16.38
3	$34.25	$36.63	$2.38	6.9%	$11.42	$12.21
4	$37.87	$40.50	$2.63	6.9%	$9.47	$10.13
5	$41.49	$44.37	$2.88	6.9%	$8.30	$8.87
6	$45.11	$48.24	$3.13	6.9%	$7.52	$8.04
7	$48.73	$52.11	$3.38	6.9%	$6.96	$7.44
8	$53.16	$56.85	$3.69	6.9%	$6.65	$7.11
10	$62.02	$66.33	$4.31	6.9%	$6.20	$6.63

Residential - Outside

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$35.09	$37.53	$2.44	7.0%		
1	$40.52	$43.33	$2.81	6.9%	$40.52	$43.33
2	$45.95	$49.13	$3.18	6.9%	$22.98	$24.57
3	$51.38	$54.93	$3.55	6.9%	$17.13	$18.31
4	$56.81	$60.73	$3.92	6.9%	$14.20	$15.18
5	$62.24	$66.53	$4.29	6.9%	$12.45	$13.31
6	$67.67	$72.33	$4.66	6.9%	$11.28	$12.06
7	$73.10	$78.13	$5.03	6.9%	$10.44	$11.16
8	$79.75	$85.24	$5.49	6.9%	$9.97	$10.66
10	$93.05	$99.46	$6.41	6.9%	$9.31	$9.95

Commercial - Inside

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$23.39	$25.02	$1.63	7.0%		
2	$30.63	$32.76	$2.13	7.0%	$15.32	$16.38
5	$41.49	$44.37	$2.88	6.9%	$8.30	$8.87
10	$62.02	$66.33	$4.31	6.9%	$6.20	$6.63
20	$106.32	$113.73	$7.41	7.0%	$5.32	$5.69
30	$150.62	$161.13	$10.51	7.0%	$5.02	$5.37

Combined Bill Impacts by Class and Meter Size

Residential - Inside

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$35.03	$37.12	$2.09	6.0%		
1	$41.22	$43.66	$2.44	5.9%	$41.22	$43.66
2	$47.41	$50.20	$2.79	5.9%	$23.71	$25.10
3	$53.60	$56.74	$3.14	5.9%	$17.87	$18.91
4	$59.79	$63.28	$3.49	5.8%	$14.95	$15.82
5	$65.98	$69.82	$3.84	5.8%	$13.20	$13.96
6	$72.17	$76.36	$4.19	5.8%	$12.03	$12.73
7	$78.36	$82.90	$4.54	5.8%	$11.19	$11.84
8	$85.88	$90.85	$4.97	5.8%	$10.74	$11.36
10	$100.92	$106.75	$5.83	5.8%	$10.09	$10.68

Residential - Outside

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$52.55	$55.68	$3.13	6.0%		
1	$61.84	$65.48	$3.64	5.9%	$61.84	$65.48
2	$71.13	$75.28	$4.15	5.8%	$35.57	$37.64
3	$80.42	$85.08	$4.66	5.8%	$26.81	$28.36
4	$89.71	$94.88	$5.17	5.8%	$22.43	$23.72
5	$99.00	$104.68	$5.68	5.7%	$19.80	$20.94
6	$108.29	$114.48	$6.19	5.7%	$18.05	$19.08
7	$117.58	$124.28	$6.70	5.7%	$16.80	$17.75
8	$128.87	$136.20	$7.33	5.7%	$16.11	$17.03
10	$151.45	$160.04	$8.59	5.7%	$15.15	$16.00

Commercial - Inside

		Rate Design			Avg Cost/1,000 gal	
Usage (1,000s)	Nov. 2019 (FY 2020)	FY 2021 Bill	$ Change	% Change	Existing	Rate Design
0	$35.03	$37.12	$2.09	6.0%		
2	$47.41	$50.20	$2.79	5.9%	$23.71	$25.10
5	$65.98	$69.82	$3.84	5.8%	$13.20	$13.96
10	$100.92	$106.75	$5.83	5.8%	$10.09	$10.68
20	$176.12	$186.25	$10.13	5.8%	$8.81	$9.31
30	$260.52	$275.35	$14.83	5.7%	$8.68	$9.18

Exhibit 6
City of Belleview
2019 Master Plan
Bill Impacts

Water Bill Impacts by Class and Meter Size

Irrigation - Inside

Avg. Mo. Use: 7.4

Usage (1,000s)	Nov. 2019 (FY 2020)	Rate Design FY 2021 Bill	$ Change	% Change	Avg Cost/1,000 gal Existing	Rate Design
0	$11.64	$12.10	$0.46	4.0%		
1	$14.21	$14.77	$0.56	3.9%	$14.21	$14.77
2	$16.78	$17.44	$0.66	3.9%	$8.39	$8.72
5	$24.49	$25.45	$0.96	3.9%	$4.90	$5.09
10	$38.90	$40.42	$1.52	3.9%	$3.89	$4.04

Sewer Bill Impacts by Class and Meter Size

Irrigation - Inside

Usage (1,000s)	Nov. 2019 (FY 2020)	Rate Design FY 2021 Bill	$ Change	% Change	Avg Cost/1,000 gal Existing	Rate Design
0	$0.00	$0.00	$0.00	0.0%		
1	$0.00	$0.00	$0.00	0.0%	$0.00	$0.00
2	$0.00	$0.00	$0.00	0.0%	$0.00	$0.00
5	$0.00	$0.00	$0.00	0.0%	$0.00	$0.00
10	$0.00	$0.00	$0.00	0.0%	$0.00	$0.00

Combined Bill Impacts by Class and Meter Size

Irrigation - Inside

Usage (1,000s)	Nov. 2019 (FY 2020)	Rate Design FY 2021 Bill	$ Change	% Change	Avg Cost/1,000 gal Existing	Rate Design
0	$11.64	$12.10	$0.46	4.0%		
1	$14.21	$14.77	$0.56	3.9%	$14.21	$14.77
2	$16.78	$17.44	$0.66	3.9%	$8.39	$8.72
5	$24.49	$25.45	$0.96	3.9%	$4.90	$5.09
10	$38.90	$40.42	$1.52	3.9%	$3.89	$4.04