Septic to Sewer Conversion Study

(Final Report)

Project No. 15145

November 2016

Prepared by

COASTAL ENGINEERING ASSOCIATES, INC.
966 Candlelight Blvd
Brooksville, Florida 34601

Leggette Brashears & Graham, Inc.
Orlando, Florida

Fish and Wildlife Foundation of Florida, Inc. – Grant # PFS 1516-13

Table of Contents

BACKGROUND 1
PROJECT DESCRIPTION 1

1. DATA MINING AND GIS LAYERS 4

DATA MINING AND GIS LAYER METHODOLOGY 4
N-M WWTF'S DATA MINING AND GIS LAYER 4
LOTS WITH SEPTIC SYSTEMS DATA MINING AND GIS LAYER 5
PLANNING LEVEL ANALYSIS FOR CONVERTING N-M WWTF'S TO MASTER PUMP STATIONS 6

2. WEEKI WACHEE NUTRIENT IMPACTS 10

HYDROGEOLOGIC CONDITIONS 10
PUBLIC SUPPLY WELLS AND AREA SPRINGS 10
GROUNDWATER BASIN CHARACTERISTICS 14
FLORIDAN AQUIFER POTENTIOMETRIC LEVELS 14
SEPTIC TANKS AND NUTRIENT LOADS 17
GROUNDWATER VELOCITY AND TRAVEL TIMES 17
TRAVEL TIMES AND SEPTIC TANK DISTRICTS 20

3. DISTRICT PLANNING APPROACH 22

DEFINING DISTRICT APPROACH 22
DIFFERENT METHODS TO CONVERT FROM SEPTIC TO SEWER 24
CONVENTIONAL GRAVITY 24
SHALLOW GRAVITY 24
VACUUM SEWER 25
LOW PRESSURE SYSTEM 26
SEPTIC TANK EFFLUENT PUMPING (STEP) 27
SCREENING OF COLLECTION SYSTEM ALTERNATIVES 27
PLANNING LEVEL COST ESTIMATES FOR EACH DISTRICT 28
DEFINE A PLANNING UNIT 29
ESTIMATE COSTS 30
EXISTING INFRASTRUCTURE IMPACTS 31
FINDINGS 36

4. FINAL HYDRAULIC MODELING OF TOP THREE (3) DISTRICTS 38

RANKING DISTRICTS 38
NITROGEN LOADING 38
TRAVEL TIME 39
OTHER PARAMETERS 39
SELECTION OF TOP 3 DISTRICTS 39
COST TO BENEFIT ANALYSIS 39

HYDRAULIC ANALYSIS OF TOP 3 DISTRICTS **41**
TOPOGRAPHY ANALYSIS 41
EXISTING INFRASTRUCTURE MODEL SETUP 41
EXISTING INFRASTRUCTURE MODELING RESULTS DISCUSSION 46
EXISTING WWTF IMPACT 47
CONCLUSION **47**

5. REFERENCES **48**

EXHIBIT A
GIS LAYER DEPICTIONS **A**

EXHIBIT B
WWTF INFORMATION **B**

EXHIBIT C
PARCEL MAP FIELD DESCRIPTIONS **C**

EXHIBIT D
PLANNING UNIT ANALYSIS **D**

EXHIBIT E
ENGINEERS OPINION OF PROBABLE CONSTRUCTION COST **E**

EXHIBIT F
SUMMARY OF CONVERSION TO CONVENTIONAL GRAVITY SEWER **F**

EXHIBIT G
FORCE MAIN ANALYSIS **G**

EXHIBIT H
NITROGEN INPUT FROM WWTF'S **H**

EXHIBIT I
SEWERCAD MODEL INPUT & RESULTS **I**

Background

Hernando County is home to Weeki Wachee Springs one of the largest springs in the state. The spring is located in the western part of the County, just west of US 19 and provides environmental benefits as well as economic support to the local community and the state. The Weeki Wachee springshed, which contributes groundwater to Weeki Wachee Springs, is approximately 260 square miles of urbanized areas, agricultural lands and forested uplands. This springshed covers portions of Hernando and Pasco counties.

One of the challenges facing the spring is elevated nitrate [as nitrogen] levels, which can be harmful to the overall health of the springs. Nitrogen comes from many sources both natural and man-made. One source of nitrogen to the Weeki Wachee springshed is wastewater effluent. Wastewater effluent comes from waste water treatment facilities (WWTF's) and on-site storage treatment and disposal systems (OSTDS), also known as septic systems. Currently almost all OSTDS's around the spring are conventional OSTDS.

WWTF's treat wastewater through a series of physical and chemical processes. The effleuent is then typically land applied and infiltrates into the soil. These facilities are regulated and monitored regularly to ensure minimum treatment standards are being met. They are maintained by either private or municipal entities. Typically large municipally maintained facilities achieve higher and more consistent levels of treatment than the smaller, privately maintained WWTF's.

The conventional OSTDS consist of three major components: 1) septic tank, 2) drain field, 3) unsaturated soil beneath the drain field. Wastewater flows from the source to the tank where the solids settle out and the effluent flows to the drain field, then to the unsaturated soil underneath the drain field, and eventually to the groundwater. While these types of systems protect human health, typical systems are not designed to provide high rates of denitrification.

Project Description

The Hernando County Utility Department (HCUD) has authorized Coastal Engineering Associates, Inc. (Coastal) to perform a study to identify the best options for converting approximately 30,000 lots with OSTDS's and any non-municipal wastewater treatment facilities (N-M WWTF's) within the study area to central collection. This project was developed with financial assistance provided by the Fish and Wildlife Foundation of Florida, Inc. through the Protect Florida Spring program.

One of the primary benefits of converting to central collection would be to reduce the nitrogen loading to the Weeki Wachee Springshed from OSTDS's. The study area for this project is approximately 50 square miles located to the south and east of the spring as shown on Figure 1. The study will consider the reduction in the amount of nutrients discharged from the septic tanks and non-municipal WWTF's to the Weeki Wachee springshed. It will provide options for how to construct the needed infrastructure based on a cost to benefit ratio.

While conventional OSTDS's constitute most if not all of the OSTDS's in the area it is worth noting that recent advances in treatment technologies have led to what are considered advanced OSTDS's that can achieve higher reduction rates for nitrogen removal. While these systems are not considered in this report the reader should be aware that this

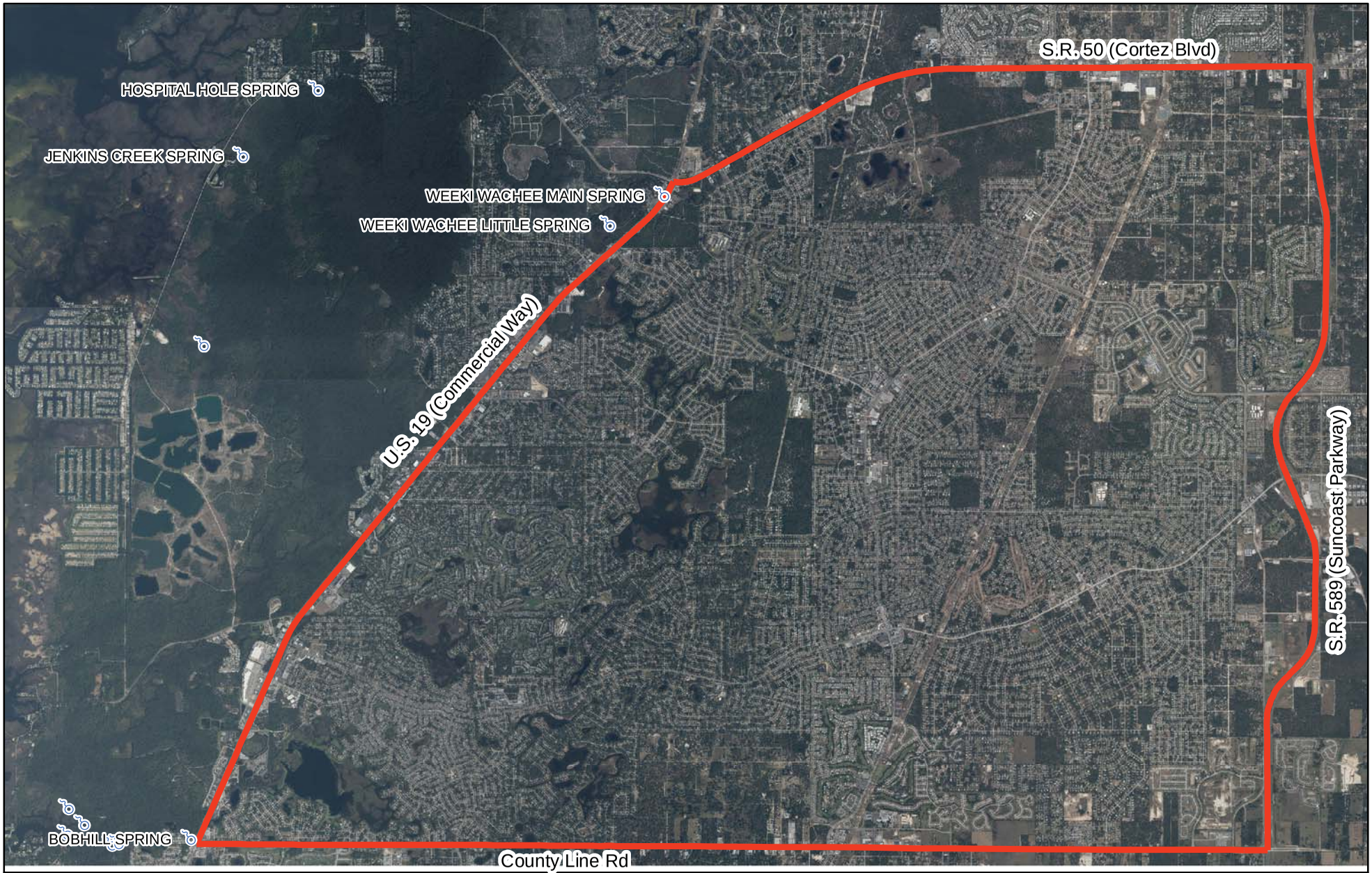


Figure 1. Study Area

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

technology is available and is encouraged to refer to the numerous studies by the Florida Health Department for information and cost of these systems.

The study was developed around five (5) primary tasks as follows:

Tasks:

1. Data Mining and GIS layers
    A. Determine the number of N-M WWTF's in the area that could potentially be converted to master pump stations and connected to the County's sewer system.
    B. Determine the number of lots with septic tanks in the study area that are on the Hernando County's municipal water system.
    C. Create GIS layer of lots with septic tanks. Layer to include: address, septic system installation date, septic system repair dates, and type of septic system installed.
    D. Create GIS layer of N-M WWTF's. Layer to include: Facility ID number, permitted capacity, permit expiration date, and permitted effluent nitrogen concentration (Total Nitrogen).
    E. Perform planning level analysis for taking plants offline and sending flows to County WWTF(s)
2. Weeki Wachee Nutrient Impacts
    A. Determine the hydrologic conditions that exist within the Weeki Wachee spring basin by researching existing hydrological studies, if available.
    B. Determine the amount of nutrients from septic tanks in the one (1), five (5) and ten (10) year travel times. If the studies and travel times are not readily available the distance from the spring to the septic tank can be used to determine the load within that distance range or other methods approved by the HCUD that will achieve the intent of the study.
3. District Planning Analysis
    A. Define a district approach of conversions by identifying clusters of homes which may be part of one or multiple subdivisions in a central collection system.
    B. Determine the different methods to convert from septic to sewer with identifiable pros and cons for comparison from an initial investment and long term maintenance cost standpoint, i.e. low pressure systems, gravity systems or vacuum systems.
    C. Perform planning level estimates for each district considering the direct and indirect cost associated with design and construction of collection systems and expansion of treatment plants as needed.
4. Final Hydraulic Modeling of Top Three (3) Districts
    A. Prepare a matrix of district comparable documentation related to capital cost, long term maintenance cost, regulating environmental social impacts for ranking of the top three (3) districts where septic to central sewer provides the most benefit(s).
    B. Perform hydraulic analysis necessary to determine preliminary sizing of infrastructure necessary to connect the top three (3) districts, as determined by the HCUD based criteria developed in Task 3, to existing infrastructure. Analysis to include assessment of existing infrastructure capacity and recommendations for capacity expansion.
5. Final Report
    A. Incorporate technical memorandums

B. Determine sequenced approach to using the cost per district vs. nutrient removal benefit criteria
C. Identify the benefits of central sewer treatment
D. Identify all funding alternatives, available grants and feasibility

1. DATA MINING AND GIS LAYERS

Data Mining and GIS Layer Methodology

N-M WWTF's Data Mining and GIS Layer

GIS Layer: HC_WAFR (WWTF's)
In order to determine the N-M WWTF's in Hernando County the FDEP GIS layer showing all WWTF's statewide (WAFR_IMS_SP) was utilized as a starting point. This layer was then modified to show only the facilities in Hernando County. Additionally, two new columns were added to the layers attribute table:

1. Perm_Exp = Permit Expiration Date
2. Perm_Eff_N = Permitted effluent nitrogen concentration (Total Nitrogen).

The new layer is named HC_WAFR. See Exhibit A Figure 8 for depiction of layer.

Findings:
There are five (5) WWTF's that are within or immediately adjacent to the study area. Two (2) of which are County facilities and one (1) is an industrial facility (a wash water recycling facility at a golf course). The remaining two (2) are domestic WWTF's for RV resorts, which could potentially be converted to master pump stations. A summary of their information is provided in Table 1.

Table 1. Summary of N-M WWTF's in Study Area

Facility Name	FID #	Permitted Capacity (MGD)	Permitted Effluent Nitrogen (mg/L)	Permit Expiration Date
Topics RV Community WWTF	FLA012065	0.025	12.0	7/21/2026
Holiday Springs RV Resort WWTF	FLA012070	0.027	12.0	11/30/2016

A review of the Discharge Monitoring reports, from September thru November 2015, for the two N-M WWTF's show that Topics WWTF exceeded their permitted total nitrogen limit with a grab sample of 19 mg/L in October 2015, but was in compliance the other months. Also, a cursory review of legal actions against the plants revealed that Holiday Springs WWTF was under a consent order from February 12, 2011 to November 15, 2012 for wastewater disposal issues (Consent Order OGC File No. 10-1619). See Exhibit B for additional information related to these plants.

Lots with Septic Systems Data Mining and GIS Layer

GIS Layers:

The purpose of this task was to identify the lots with septic systems that were also connected to the County's municipal water system. In the process of doing this it was necessary to create several additional GIS layers which contained useful information related to this study. All of these layers have been provided with this report. A description of the layers is included in Table 2.

We started with the Hernando County Property Appraisers parcel map. This GIS layer contains over 100 attributes maintained by the Property Appraisers office. It was largely through the use of several of these attributes that the subsequent layers were able to be created (refer to the Field Description included in Exhibit C). These layers were then further refined using additional data from the sources listed below.

The first step was to reduce the parcel map to include just the parcels within the study area. Then using the attribute PCA1_CONST, the map could be reduced to lots that had a building. This eliminated all undeveloped lots. Then, using attribute PCA3_LIVIN, the map could be subdivided into residential parcels and commercial parcels. The residential parcels, in this layer, includes apartments, assisted living facilities, and other commercial properties, as defined by the Property Appraisers Office. However, for the purposes of this study, it is reasonable to classify these lots as residential since what we are looking for is the estimated nitrogen loading from these lots. After identifying the developed residential and commercial lots the layers were further divided into categories depending on their water and sewer facilities. This resulted in the layers shown in Table 2. See Exhibit A for depictions of the layers.

Table 2. Summary of GIS Layers for Lots with County Water and Septic Systems along with Other Related Layers

Description	Shape File	GIS Layer Name	# of Lots	Exhibit A Figure
Residential Lots with Municipal Water and Sewer	ResWaterSewer.shp	Residential w/Water&Sewer	14,008	2
Residential Lots with Municipal Water and Private Septic Systems	ResWaterSEPTIC.shp	Residential w/Water&SEPTIC	26,238	3
Lots with Private Wells and Septic Systems	ResWELLSEPTIC.shp	Residential w/WELL&SEPTIC	1,222	4
Commercial Lots with Municipal Water and Sewer	CommWaterSewer.shp	Comm w/Water&Sewer	437	5
Commercial Lots with Municipal Water and Private Septic Systems	CommWaterSEPTIC.shp	Comm w/Water&SEPTIC	188	6
Commercial Lots with Private Wells and Septic Systems	CommWELLSEPTIC.shp	Comm w/WELL&SEPTIC	29	7
Undeveloped Parcels	UnDevLots.shp	UnDeveloped Lots	5,478	9

One of the goals for this task was to include in the GIS layer the following information: septic system installation date, septic system repair dates, and type of septic system installed. However, there is not a reasonable source for this data other than to research the paper files of the County Health Dept. for each of the approximately 30,000 lots. This task is beyond the scope of this project.

It should be noted that there is a GIS layer being developed by the Florida Department of Health as part of the Statewide Inventory of Onsite Sewage Treatment and Disposal Systems in Florida Project that would provide this information. However, this data currently only covers from 2000 thru 2015 and is still early in development. This portion of the state's project has stalled due to budget cuts but in time will become a useful resource for identifying lots with septic systems.

Planning Level Analysis for Converting N-M WWTF's to Master Pump Stations

The following is a brief analysis of the infrastructure and work required to convert the two domestic WWTF's identified above. This also includes a discussion of potential benefits from converting, a Cost Opinion for the proposed work, and a cost to benefit analysis.

As described in above there are two (2) facilities in the study area. Both facilities are permitted for approximately 250,000 gallons per day (gpd). Converting each plant will require a new pump station consisting of a wetwell with dual pumps, telemetry, generator, odor control, and other appurtenances built to County standards. They will also need approximately 2,000 lf of 4"-6" forcemains through existing residential areas in order to get to existing County forcemains. Both facilities will pump to the Hernando Airport WWTF, based on scheduled force main improvements which will be completed within the next few years. Additionally, this analysis assumes that the Hernando Airport Subregional WWTF can handle the extra flow. If not additional cost will be incurred upgrading the facility which were not considered in this analysis.

Both existing facilities appear to have enough room for the proposed facilities, so additional land shouldn't be required. Finally, both existing facilities will need to be demolished and the area restored properly. All activities described above will require design and permitting which are included in the total cost for each item presented in Table 3 below. See figures 2 & 3 for conceptual plan of proposed work.

Table 3. Cost Opinion for Converting Existing WWTF to Master Pump Stations

Description	Cost
125,000 gpd Pump Station Built to Hernando County Standards, Complete	$500,000
2,200 LF of Force Main	$50,000
Demolition of Existing Facility	$250,000
TOTAL	$800,000

- Cost for single site
- Cost to design and permit is included in the overall cost for the item.

One of the benefits of this conversion would be to reduce nitrogen being discharged to the environment. The South West Florida Water Management District (SWFWMD) has recently completed an analysis and estimated that by converting the package plants and sending the effluent to the County's Airport WWTF, which can provide enhanced

nitrogen removal capabilities that typical package plants cannot, there would be a reduction of approximately 437 lbs/yr for the Holiday Springs WWTF and 233 lbs/yr for Topics WWTF. These estimates are based on an average reduction of 7 mg/L nitrates in the effluent for wastewater treated at the larger County facility instead of the smaller package facilities.

A cost to benefit analysis was performed to determine the cost per pound of nitrogen removed. The cost to benefit ratio is calculated based on construction cost only. It doesn't factor in annual maintenance cost. Also, it only considers one years' worth of nitrogen removal. Conversion to central collection would actually provide an annual reduction in nitrogen for years to come. The cost to benefit ratio for Holiday Springs, which has an estimated 437 lbs/yr reduction after converting and for Topics with a 233 lb/yr reduction, is $1,830/lb and $3,433/lb respectively.

Figure 2. **Holiday Springs RV Resort WWTF - Conversion Plan**

Septic to Sewer Conversion Study

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

Figure 3. **Topics RV Community WWTF - Conversion Plan**

Septic to Sewer Conversion Study

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

PFS-1516-13

2. WEEKI WACHEE NUTRIENT IMPACTS

Hydrogeologic conditions in the area are described here to demonstrate how reductions in septic system discharges may reduce nutrient loading and improve water quality within the Floridan aquifer. Groundwater flow rates and average travel times are generally characterized using regional scale water level and hydrogeological data available for the study area. The Floridan aquifer is the source for drinking water within the study area and for groundwater discharging from area Springs.

Hydrogeologic Conditions

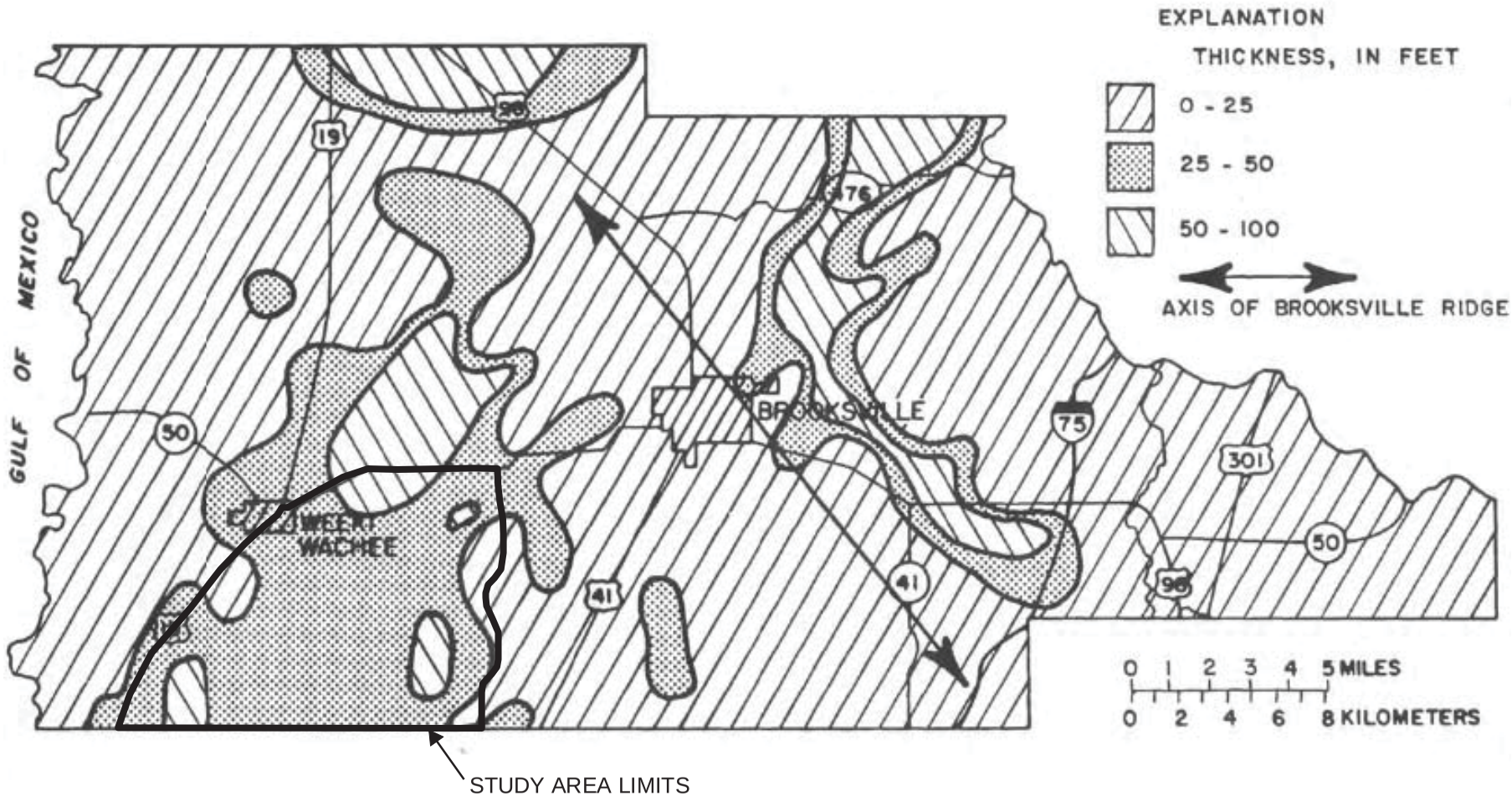
Geologic units exposed at land surface within the study area consist of relict sand dunes with near surface limestone bordering the west side of the study area (SWFWMD, 1987). Underlying clays of the Hawthorn Formation that occur throughout much of Hernando County are missing within the study area. Below the surficial sand aquifer is a thick limestone sequence comprising the Floridan aquifer system. The Floridan aquifer limestone is approximately 750 feet thick in the study area and is the principal water supply source for public supply, domestic, and agricultural uses in western Hernando County.

Soils within the study area are predominantly hydrologic group A, well drained to somewhat poorly drained sands associated with upland ridges (Figure 4). Figure 5 shows the surficial sand aquifer is from 25 feet to 50 feet thick as reported by the U.S. Geological Survey (1985). High permeability soils in contact with the underlying Floridan aquifer result in a high recharge potential for the area. The surficial aquifer in the study area is typically unsaturated and may periodically contain water only during the wet season suggesting a direct hydraulic connection with the Floridan aquifer. The surficial aquifer in the southwest part of the study area adjacent to Hunters Lake is believed to be perennially saturated because it is maintained by the water table from the Floridan aquifer.

The top of the Floridan aquifer system is at land surface near the coast and is generally more than 50 feet below land surface in the study area. A highly developed secondary porosity system exists in the vicinity of Weeki Wachee Springs where dissolution of limestone produced cavities and channels. Small passages in the limestone coalesced until water from many successively larger passages began moving through a single major channel toward a discharge point or spring. While groundwater movement within the Floridan aquifer is characterized as diffuse flow through a limestone matrix, conduit flow can be expected adjacent to Weeki Wachee Springs and to Weeki Wachee Little Spring approximately one-half mile to the southwest.

Public Supply Wells and Area Springs

Public supply wells within the study area withdraw water from the underlying Floridan aquifer.
The aquifer is protected from direct contact with surface contaminants by thick surficial sediments overlying the Floridan aquifer. Large diameter supply wells are constructed with casings set into limestone further impeding direct contact with surface contaminants. Hernando County maintains more than 20 active large capacity wells within the study area (Figure 6). According to estimates from Coastal Engineering (2016), more than 1,200 homes within the study area obtain potable water supplies from privately owned wells. Homes with private potable wells also have onsite septic systems.



(from U.S. Geological Survey WRI Report 85-4242)

DATE	REVISED
FILE NAME: FIGURE02.MXD	

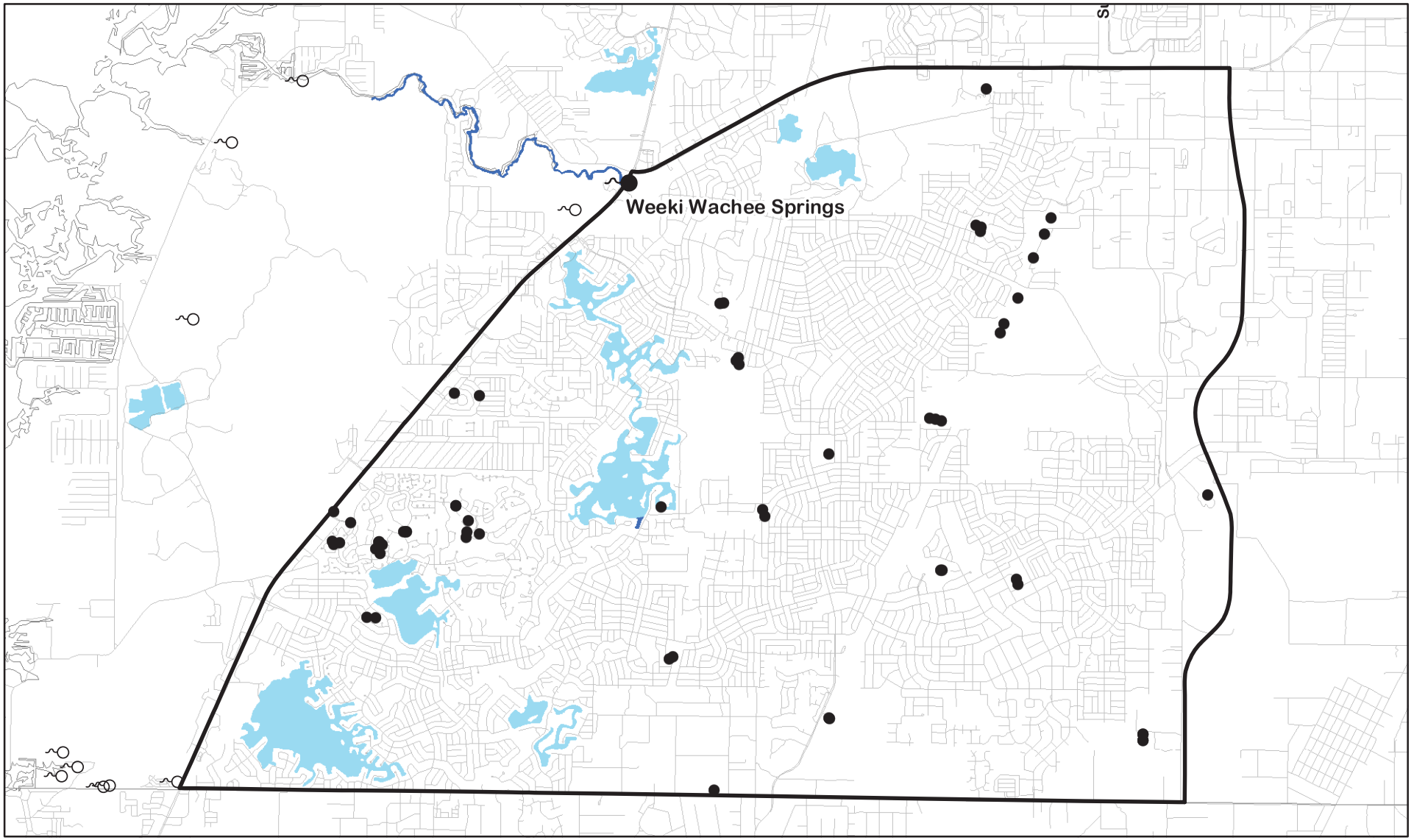
☐ Acad ☑ GIS ☐ Corel

ONSITE SEPTIC SYSTEM STUDY
HERNANDO COUNTY, FL

SURFICIAL AQUIFER SAND THICKNESS

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
Cypress Point Office Park
10014 North Dale Mabry Highway, Suite 205
Tampa, FLorida 33618
(813) 968-5882

DRAWN BY:	TDH
CHECKED BY:	RS
DATE:	Feb. 2016
FIGURE NO.:	5



DATE	REVISED

FILE NAME: FIGURE04.MXD

Acad ☐ GIS ☑ Corel ☐

ONSITE SEPTIC SYSTEM STUDY
HERNANDO COUNTY, FL

HERNANDO COUNTY PUBLIC SUPPLY WELLS

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
Cypress Point Office Park
10014 North Dale Mabry Highway, Suite 205
Tampa, FLorida 33618
(813) 968-5882

DRAWN BY:	TDH
CHECKED BY:	RS
DATE:	Feb. 2016
FIGURE NO.:	6

Eleven springs occur in western Hernando County (Figure 7) with Weeki Wachee Springs having one of the largest magnitude discharges in the state (FGS, 2004). Weeki Wachee has an average flow rate of 175 cubic feet per second (cfs) and is classified as a first-order magnitude spring. Two other springs in western Hernando County are classified as second-order springs and discharge more than 10 cfs. The remaining area springs have average flow rates of more than 1 cfs and are considered third order. All eleven springs discharge water from the Floridan aquifer originating in recharge areas within the immediate study area and east and south of the Brooksville ridge in eastern Hernando County and north-central Pasco County.

Groundwater Basin Characteristics

The surface drainage area of the Weeki Wachee basin covers approximately 38 square miles. The groundwater basin contributing flow to the Springs, referred to as the springshed, extends over a much larger area of approximately 260 square miles (SWFWMD, 2008). The groundwater basin depicted in Figure 8 indicates that groundwater contribution is approximately evenly distributed between Hernando and Pasco Counties. The southwestern-most portion of the study area does not contribute groundwater flow to Weeki Wachee Springs or to one of the smaller area springs. Basin boundaries based on interpretation of potentiometric surface maps may shift somewhat seasonally and annually depending on recharge and groundwater withdrawal rates.

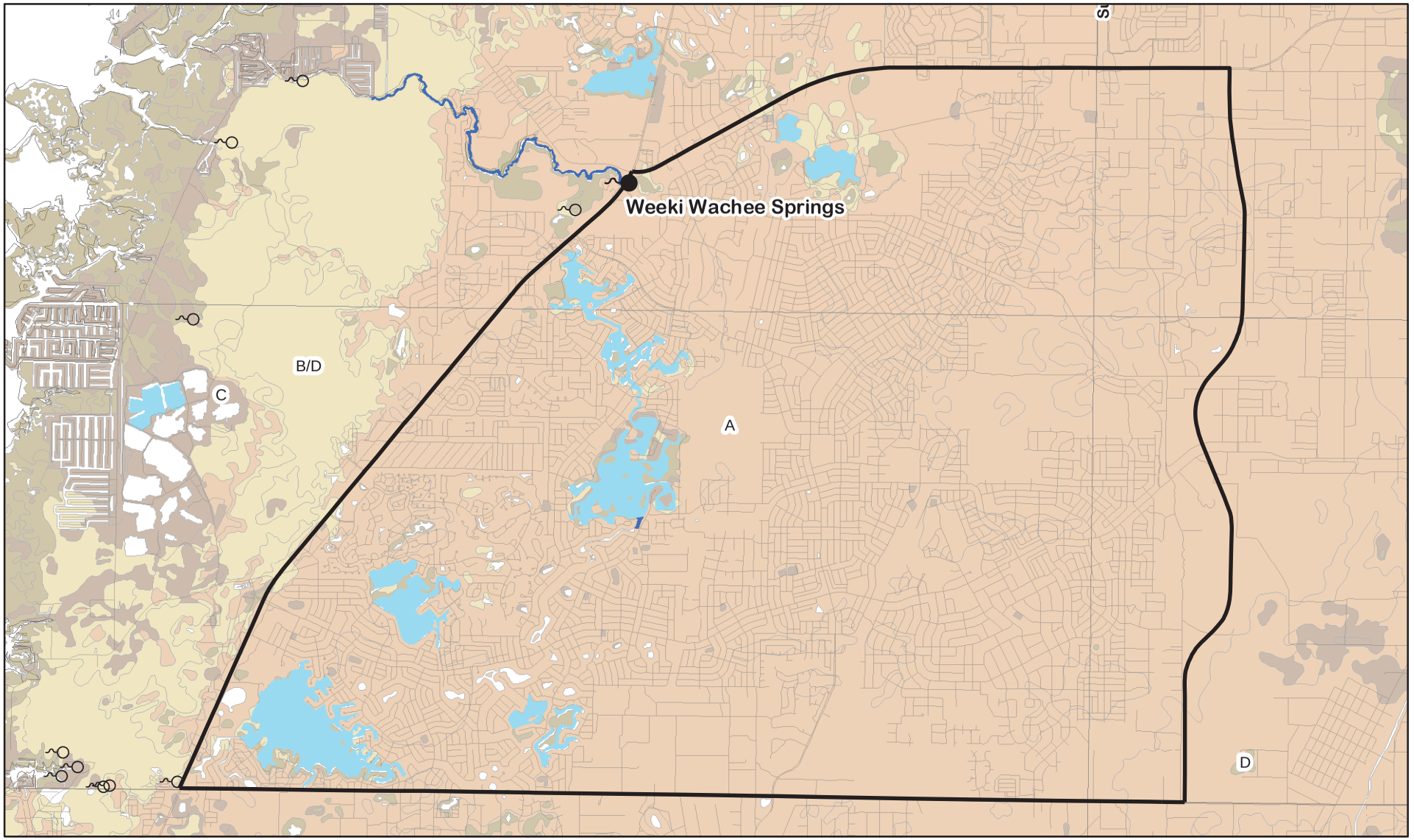
The water table aquifer is commonly found to be unsaturated in western Hernando County and throughout much of the groundwater basin where low-permeability clays and fines comprising the Hawthorn formation are absent. The lack of significant water volumes stored in the surficial aquifer indicates the potential for rainfall recharge to move relatively rapidly through surficial sediments into the underlying Floridan aquifer.

A review of water level records conducted by SWFWMD (2008) indicate minimal lag between seasonal changes in rainfall and flow rate responses of the Springs. The relatively rapid flow response demonstrates that groundwater circulation in the Floridan aquifer is vigorous and that recharge to the springs from precipitation is in close proximity, within a distance of five to ten miles.

Floridan Aquifer Potentiometric Levels

Figure 8 shows the potentiometric surface of the Floridan aquifer for May 2005 taken from a regional scale map prepared by the U.S. Geological Survey. Although the potentiometric surface fluctuates seasonally and annually in response to changes in rainfall and withdrawals, potentiometric levels in the study area are considered representative since historical records indicate very little fluctuation.

The orientation of potentiometric levels is governed by recharge from rainfall and other sources, discharges from springs and wells, and by ground surface elevation. Groundwater moves from potentiometric surface highs such as in central Pasco County toward the coast where the surface is lowest. The potentiometric surface high above levels of 80 feet NGVD in Pasco County indicates the upgradient limit east of the study area for groundwater flow within the Floridan aquifer. Reentrants of the contours depicted at Weeki Wachee Springs (Figure 8) are characteristic of concentrated discharge points associated with first order springs. Recharge to the aquifer occurs downgradient of the potentiometric high generally through highly permeable surficial sands as demonstrated within the study area.



DATE	REVISED

FILE NAME: FIGURE02.MXD

Acad ☐ GIS ☑ Corel ☐

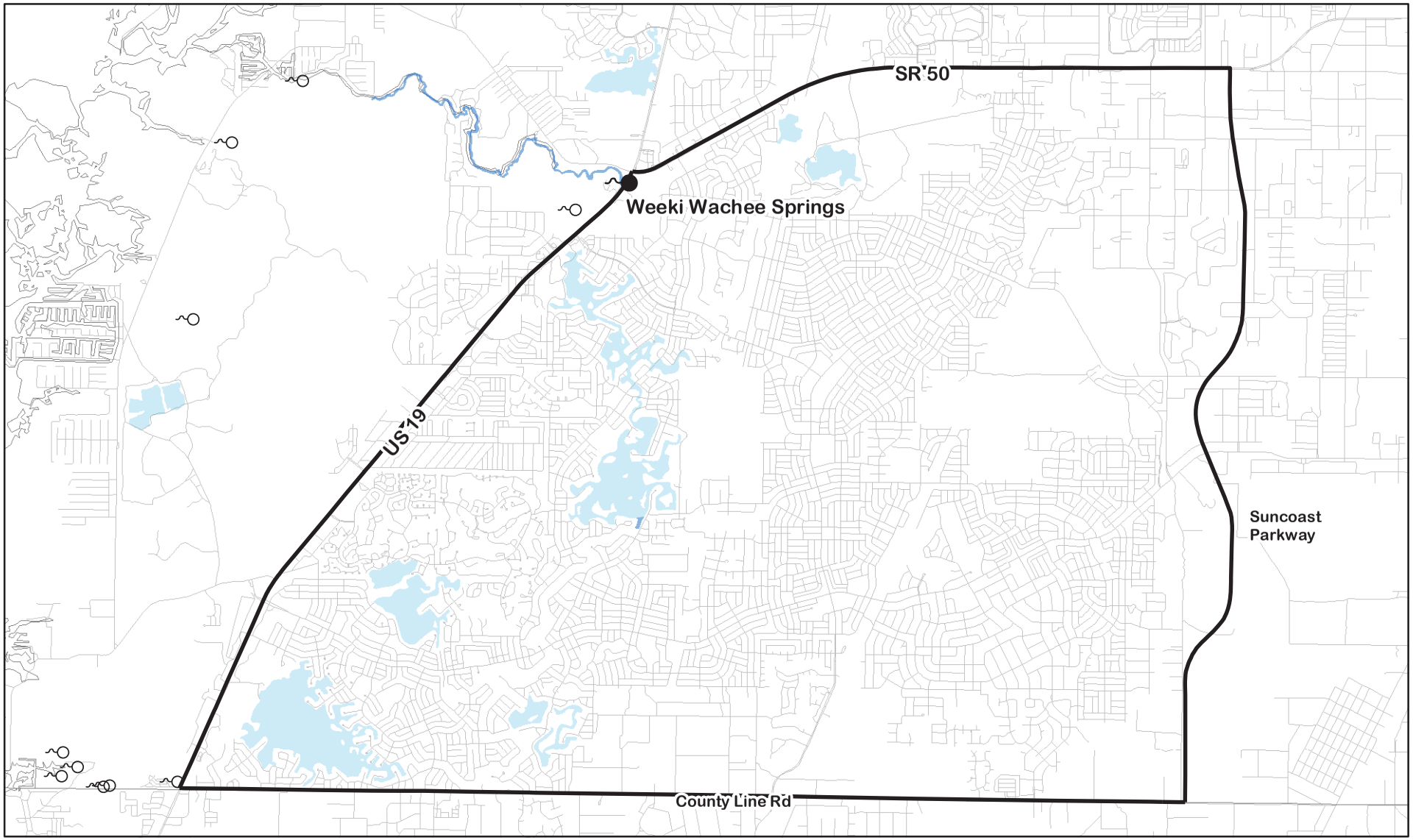
ONSITE SEPTIC SYSTEM STUDY
HERNANDO COUNTY, FL

SOILS CLASSIFICATION

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
Cypress Point Office Park
10014 North Dale Mabry Highway, Suite 205
Tampa, FLorida 33618
(813) 968-5882

DRAWN BY:	TDH
CHECKED BY:	RS
DATE:	Feb. 2016
FIGURE NO.:	4



N

0 3,500 7,000

Feet

2nd and 3rd Order Magnitude Spring

DATE	REVISED

FILE NAME: FIGURE01.MXD

Acad ☐ GIS ☑ Corel ☐

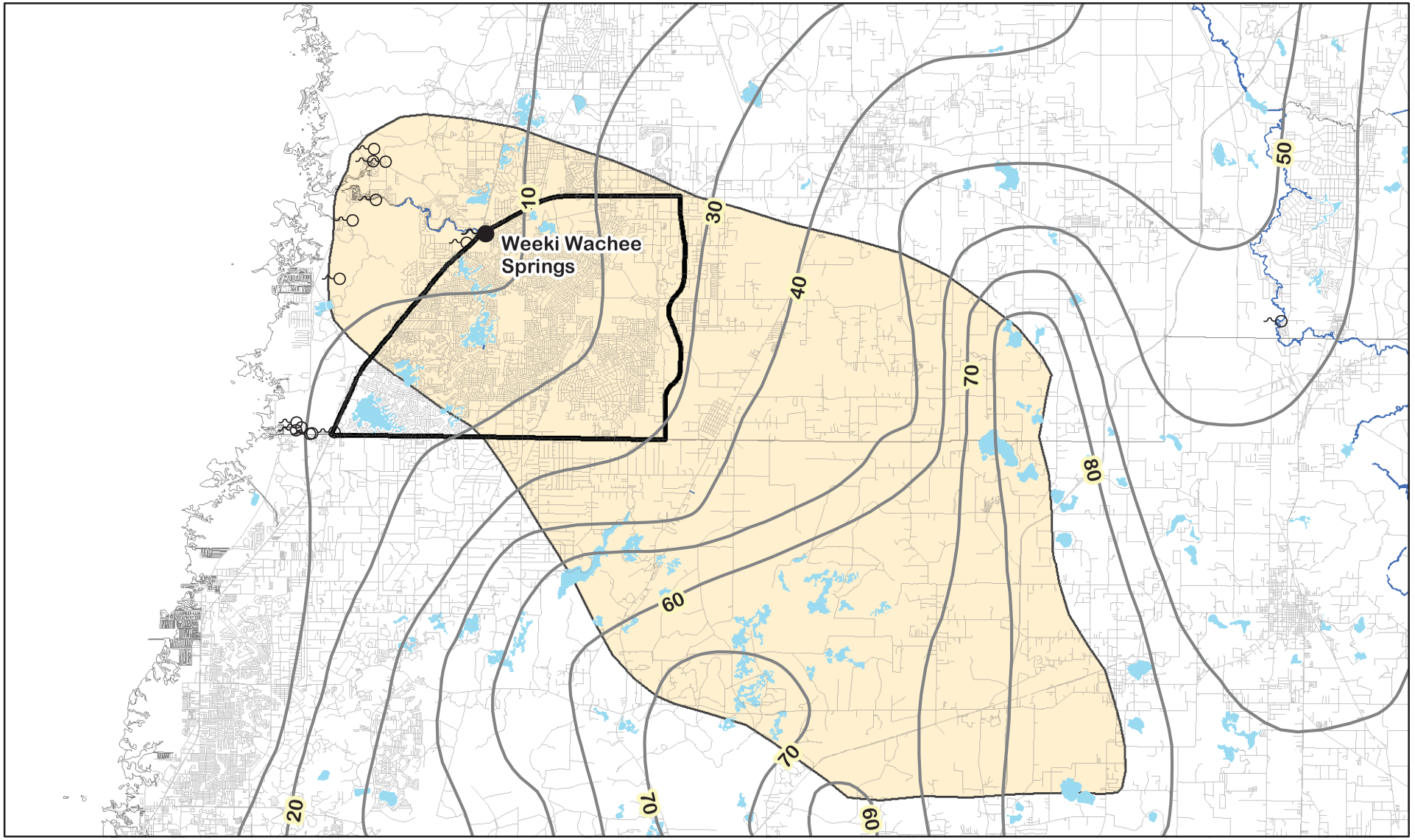
ONSITE SEPTIC SYSTEM STUDY
HERNANDO COUNTY, FL

STUDY AREA LIMITS

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
Cypress Point Office Park
10014 North Dale Mabry Highway, Suite 205
Tampa, FLorida 33618
(813) 968-5882

DRAWN BY:	TDH
CHECKED BY:	RS
DATE:	Feb. 2016
FIGURE NO.:	7



DATE	REVISED

FILE NAME: FIGURE05.MXD

Acad ☐ GIS ☑ Corel ☐

ONSITE SEPTIC SYSTEM STUDY
HERNANDO COUNTY, FL

WEEKI WACHEE SPRINGSHED

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
Cypress Point Office Park
10014 North Dale Mabry Highway, Suite 205
Tampa, FLorida 33618
(813) 968-5882

DRAWN BY:	TDH
CHECKED BY:	RS
DATE:	Feb. 2016
FIGURE NO.:	8

Septic Tanks and Nutrient Loads

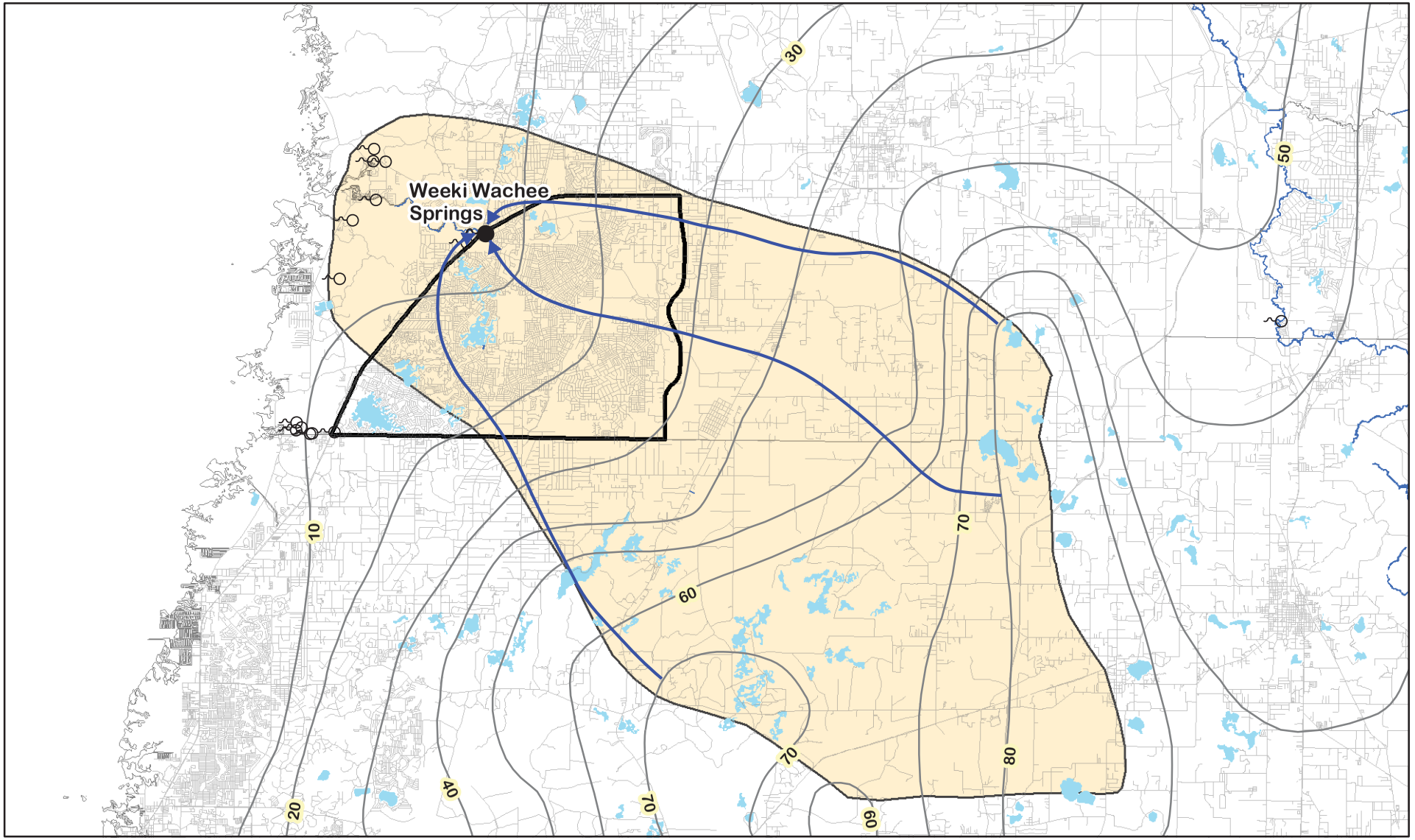
FDEP (2016) estimates that 10 percent of the annual average nitrogen loading to land surface within the Weeki Wachee basin is from onsite septic tanks, 30 percent from turf fertilizer, and 40 percent from farm fertilizer and livestock waste. After accounting for biochemical and hydrogeological processes, the 2016 Nitrogen Source Inventory and Loading Estimates study estimates nitrogen contribution from septic tanks at 28 percent, turf fertilizer at 33 percent, and 25 percent from farm fertilizer and livestock waste. Although the overall nitrogen load applied to land surface is reduced by natural processes, the percent contribution from septic tanks reaching the groundwater surface is higher when compared to land surface percentages due to the lesser natural treatment attributes of onsite systems.

An estimated 27,500 septic systems have been identified by Coastal Engineering (2016) within the study area divided into 19 planning districts. Each district represents approximately 500 to 3,500 septic systems. Four districts include less than 25 systems. Onsite septic tanks within the Pasco County portion of the basin number approximately 25,000 according to FDEP (2014).

An average nitrogen input of approximately 11 lbs per person year cited by FDEP (2007) is typical for household septic systems studied in the Wekiva River basin in central Florida. FDEP (2016) cites several national and state studies reporting an average nitrogen input of 9 lbs per person. A nitrogen load of 11 lbs per person equates to 26 lbs per household using 2.39 persons per household reported by CEA (2016) for Hernando County. High density residential settings such as within the study area contribute nitrogen inputs of approximately 105 lbs per acre per year. The Wekiva basin study demonstrated nitrogen loading to groundwater after treatment in the drainfield and in ambient soils of from 50 percent to 75 percent, or an average input of 70 lbs per acre per year. Nitrate concentrations at the three test systems in the Wekiva basin study exceeded 10 mg/l to depths of approximately 10 to 15 feet below the water table.

Nitrate concentrations typically are less than 1.0 mg/l from supply wells within the study area that are completed into the Floridan aquifer. Nitrate sampled at Weeki Wachee Springs exhibits a steady increase from less than 0.2 mg/l when first measured beginning in the 1970's to slightly above 1.0 mg/l in this decade (FDEP, 2014). Nitrate concentrations in this range and associated nitrogen levels have led to deleterious growth of nuisance vegetation in the riverine system. This regular rise in nitrate concentration is primarily attributed to inorganic fertilizers applied to residential and golf course landscape within the springshed (SWFWMD, 2011). Nitrogen isotope analyses indicate that ammonium fertilizer nitrate sources are relatively far from the Springs, distances of more than several thousand feet.

Basin studies such as the Wekiva River investigation (FDEP, 2007) and the Nitrogen Source Inventory and Loading Estimates study (FDEP, 2016) typically characterize overall mass loadings within a watershed while chemical isotope studies aid in identifying the source and its associated distance. The fate and movement of nutrients discharged from onsite septic systems is governed principally by denitrification processes in the underlying soil, soil organic content, water table depth, and advective transport in the direction of flow. Nutrients move vertically from drainfield discharges until the water table or a low-permeability confining unit is encountered. Because the shallow surficial aquifer is largely unsaturated within the study area and confining units are absent, nutrients from drainfield flows travel through approximately 50 feet of surficial sands before encountering the Floridan aquifer. Nutrients not taken up through denitrification in the sands will be available for horizontal



N

0 2 4

Miles

DATE	REVISED

FILE NAME: FIGURE06.MXD

Acad ☐ GIS ☑ Corel ☐

ONSITE SEPTIC SYSTEM STUDY
HERNANDO COUNTY, FL

GROUNDWATER FLOW LINES

PREPARED BY:

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
Cypress Point Office Park
10014 North Dale Mabry Highway, Suite 205
Tampa, FLorida 33618
(813) 968-5882

DRAWN BY:	TDH
CHECKED BY:	RS
DATE:	Feb. 2016
FIGURE NO.:	9

movement in the principal direction of groundwater flow within the Floridan aquifer. The potential for lateral movement within the surficial aquifer normally occurs adjacent to lakes and to sinkhole features primarily in the southwestern portion of the study area.

Groundwater Velocity and Travel Times

Groundwater movement follows flow lines (Figure 9) perpendicular to potentiometric surface contours. Groundwater flow lines superimposed on potentiometric contours terminate at Weeki Wachee Springs demonstrating the regional influence typically imposed by large magnitude springs. Groundwater flow velocities and associated travel times may be estimated along flow lines when aquifer hydraulic properties and potentiometric levels are known with reasonable certainty.

For purposes of this investigation, the following expression is used to estimate average linear velocities:

$V = (K\ i) / n$

where V = average velocity, ft/day
K = hydraulic conductivity, ft/day
i = hydraulic gradient, ft/ft
n = aquifer porosity, unitless

Hydraulic conductivity is a measure of an aquifer's ability to transmit water, and is generally highest at springs. Hydraulic conductivity of 2,000 ft/day was determined by the U.S. Geological Survey (1985) at Weeki Wachee Springs from flow net analyses. Reported transmissivity values were divided by an aquifer saturated thickness of 750 feet to derive hydraulic conductivity. The Geological Survey reported hydraulic conductivity values of approximately 1,000 ft/day in the western-most portion of the County excluding the immediate area of the Springs. No other significant hydraulic conductivity distinctions are reported in the area.

Conduit flow has been documented in the immediate area surrounding Weeki Wachee Springs by SWFWMD (2011). Under karst conditions described in the immediate vicinity of the Springs, groundwater movement mimics flow through fractures or conduits. Caves mapped by divers at the nearby Weeki Wachee Little Spring cavern system contain circuitous tunnels more than 2,500 feet in length. The hydraulic conductivity range reported for the Floridan aquifer strongly suggests karst flow conditions within the study area. No investigation documenting conduit or fracture flow conditions east of U.S. 19 has been referenced in publications cited for this report.

Limestone porosity is reported to range from 0.15 to 0.30. Higher porosity values can be expected where limestone is subject to secondary permeability and porosity processes forming karst features such as conduits and sinkholes. The hydraulic gradient along flow lines shown in Figure 9 averages 20 feet over an average distance of 6 miles as measured between the 10 ft and 30 ft potentiometric level contours immediately upgradient from Weeki Wachee Springs.

An average velocity of 2 ft/day using hydraulic parameters reported above is considered representative of groundwater flow conditions within the study area bounded by the 30-foot and 10-foot potentiometric contours. The velocity estimate would increase with a reduction

in porosity should additional data become available to justify further analysis. Higher velocities associated with conduit flow can be expected adjacent to Weeki Wachee Spring and to Weeki Wachee Little Spring located approximately one-half mile to the southwest. It is not possible to otherwise distinguish flow velocity variations on a local scale within the study area using available water level gradient and hydraulic conductivity data. Water level gradients are very shallow and relatively uniform based on available potentiometric level maps encompassing the study area. Aquifer hydraulic conductivity is consistently high and thought to be relatively homogeneous within the study area.

Travel times from upgradient to downgradient areas, or southeast to northwest across the study area, may be estimated using the following expression:

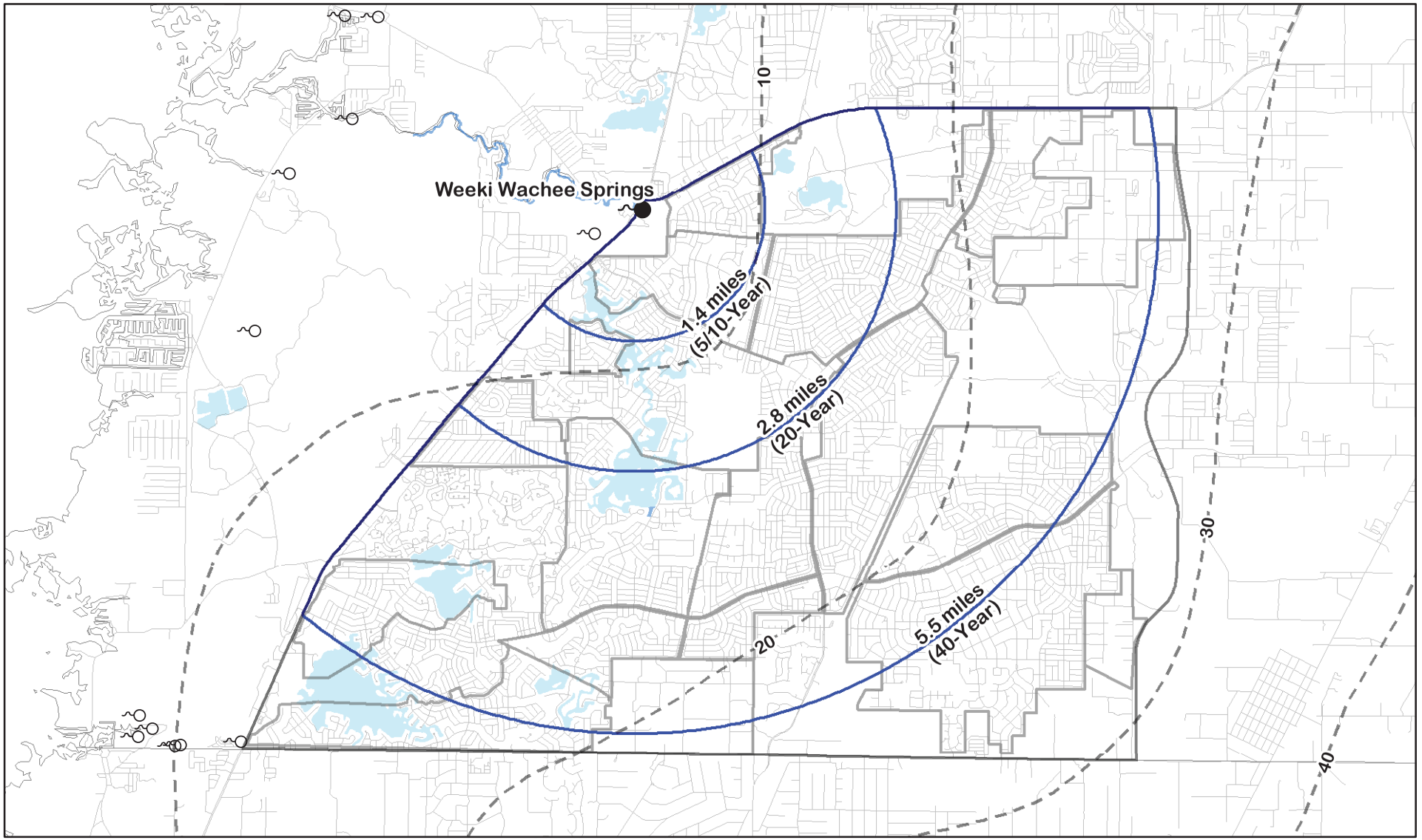
$T = L / V$

where T = travel time, days
L = distance, ft
V = average velocity, 2 ft/day

Travel times within the study area are affected only by flow path distance since measurable differences in flow velocity cannot be discerned on a local scale. A travel time of approximately seven years, for example, would be required for groundwater to move laterally a distance of one mile through the Floridan aquifer limestone matrix above the 10-foot potentiometric level. A travel distance of one-half mile would require one-half the time. Travel time estimates do not account for additional time to move vertically through overlying surficial sediments before reaching the Floridan aquifer.

Travel Times and Septic Tank Districts

Soils are relatively uniform and are widely unsaturated within the study area resulting in equivalent travel times through the surficial aquifer. Once nutrients discharged from septic systems move vertically to the underlying Floridan aquifer, lateral travel times may be estimated for a uniform flow field. Approximately 20 years travel time is estimated from a distance of 2.8 miles upgradient of the Springs (Figure 10). A distance of 5.5 miles from the Springs requires approximately 40 years travel time. A 10-year travel time depicted in Figure 10 is denoted as a 5/10-Year line to indicate uncertainties associated with conduit flow conditions that predominate in closer proximity to the Springs. Septic tank district groups closest to Weeki Wachee Springs shown in Figure 10 have the smallest travel times and the greatest potential for contributing nitrogen loads. Of the districts in close proximity to the Springs, the larger districts with the greatest number of septic systems may be considered early for wastewater system improvements.



DATE	REVISED
FILE NAME: FIGURE07.MXD	

☐ Acad ☑ GIS ☐ Corel

ONSITE SEPTIC SYSTEM STUDY
HERNANDO COUNTY, FL

TRAVEL DISTANCES AND ASSOCIATED TRAVEL TIMES

PREPARED BY:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
Cypress Point Office Park
10014 North Dale Mabry Highway, Suite 205
Tampa, FLorida 33618
(813) 968-5882

DRAWN BY:	TDH
CHECKED BY:	RS
DATE:	Apr. 2016
FIGURE NO.:	10

3. DISTRICT PLANNING APPROACH

Defining District Approach

District boundaries were created based on geographic and physiographic features. Features considered include: study area boundaries, areas with existing central sewer, large undeveloped areas, and roadways that create convenient boundaries. It should be noted that not all the lots that are in the study area are included in a district. In most instances there are only a few lots in a particular category that are not included in a district and this is due mainly to the isolated location of those few lots which make including them in a planning district difficult. There is, however, a large number of undeveloped lots that are not included in a planning district. This is due to the fact that, in many instances, the undeveloped lots represent large tracts of land that in the future will be subdivided into smaller lots when they are developed. In future development areas it is difficult to estimate the number of potential sewer connections that will be required. Therefore, these lots have been left out of the planning districts. Additionally, for this level of planning analysis topography was not considered. Part of Task 4 will be to do a more detailed analysis of the top three districts. As part of the Task 4 analysis the districts may be further refined to take advantage of topography. See Figure 11 for district boundaries and Table 4 for itemization of lots in each district.

Table 4. District Itemization

District	Undev (Lots)	Residential Water/Septic (Lots)	Residential Well/Septic (Lots)	Commercial Water/Septic (Lots)	Commercial Well/Septic (Lots)
A	166	717	0	12	4
B	219	1085	0	10	0
C	61	397	0	0	0
D	339	471	615	12	0
E	618	3506	0	13	0
F	211	979	0	3	2
G	586	3310	4	11	0
H	272	1943	1	18	0
I	299	2611	8	6	0
J	136	1195	3	12	1
K	147	2	360	3	5
L	11	24	0	0	0
M	501	2388	0	29	0
N	118	943	0	12	0
O	131	987	0	1	0
P	584	3649	0	30	0
Q	89	0	113	0	10
R	316	1980	0	7	0
S	74	0	61	1	0
TOTAL	**4,878**	**26,187**	**1,165**	**180**	**22**
TOTAL LOTS = 32,432					

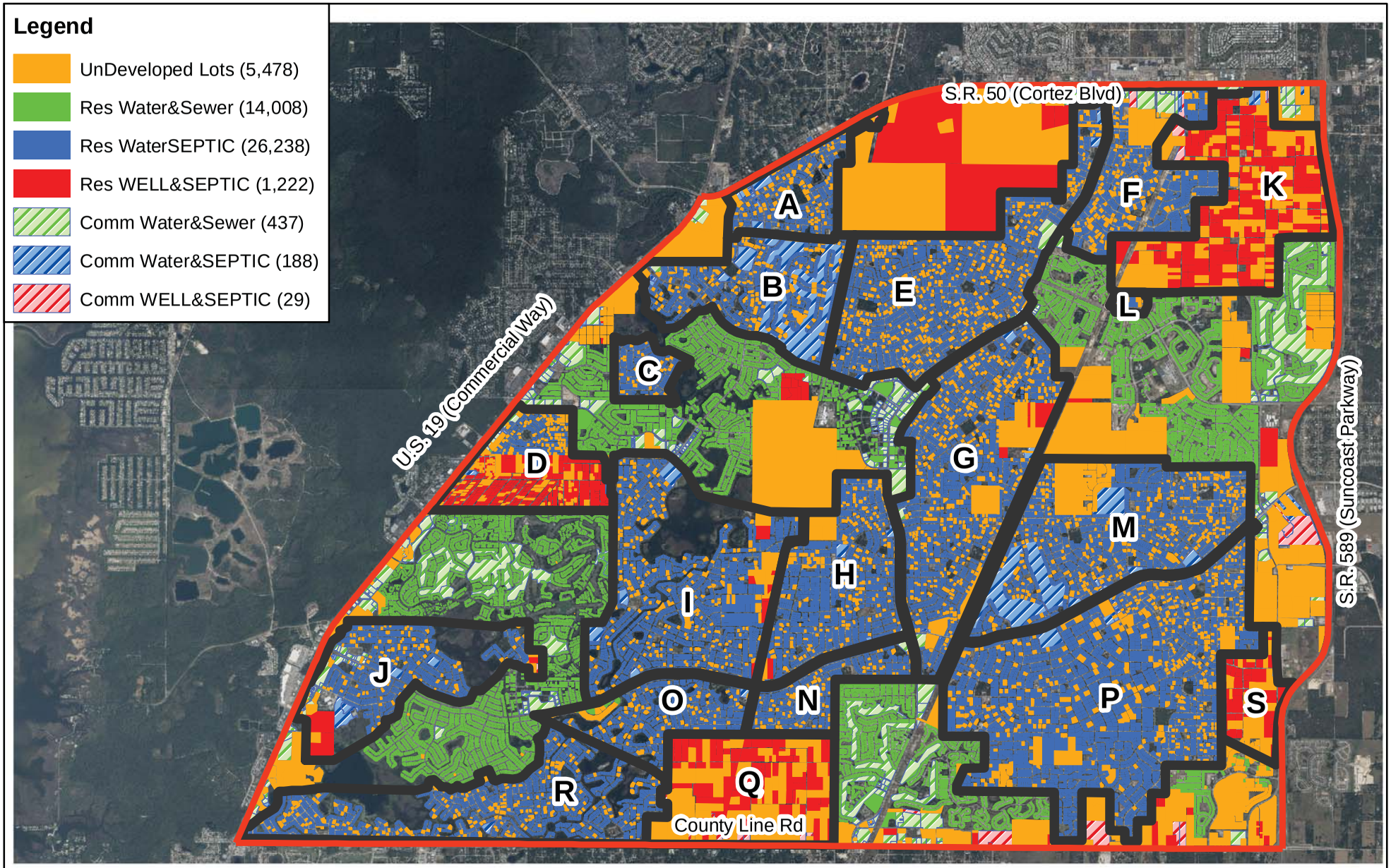


Figure 11. **Planning Districts**

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

Another item of note are the areas west of U.S. 19, within the Weeki Wachee Springshed, but not included in the original study area established by the County. Based on their close proximity to the spring it should be assumed that septic systems in this area also have the potential to impact the spring. It is not the intent of this report to imply that these areas are less significant than those in the study area.

Different Methods to convert from Septic to Sewer

The following is a brief discussion of various methods of sewage collection. They include: conventional gravity, shallow gravity, vacuum sewer, low pressure sewer, and septic tank effluent pumping (STEP). The different methods are then reviewed based on how their application will meet the goal of cost effectively converting septic systems to sanitary sewer. The methods along with their pros and cons are presented below.

Conventional Gravity

Typical gravity wastewater systems consist of a service lateral that connects the property to the main lines in the gravity system. The main lines are made of PVC pipes with concrete manholes used to change grade or pipe alignments. When gravity flow is no longer achievable, due to elevation or space restrictions, a pump station is used to receive the flow and pump it to a wastewater treatment facility (WWTF) for treatment and ultimate disposal.

Pros:

- Very reliable, has a proven track record
- System works passively (except for pump stations)
- Flexibility to expand
- Most cost effective for areas with topographic relief
- County operators are already familiar with, and using, this type of system
- Operating costs are mainly for the equipment at the pump stations
- Large storage volumes exist with the system, making them more forgiving of variable flows
- Does not require individual property Owner's attention and maintenance

Cons:

- Roadway rebuild is typically required due to large open cut trenches, resulting in high installation costs
- Infiltration & Inflow from stormwater/groundwater can be high
- Requires multiple sites for pump stations. This will require County ownership and/or easements
- After customers are removed from septic systems there will be a longer sewer lateral from the building to the proposed gravity system that will need to be maintained by the property owner.

Shallow Gravity

A shallow gravity system is the same basic concept as conventional gravity except: smaller package lift stations are used, and the maximum depth of pipe before pumping is about 8 – 10 feet. This creates a series of short runs with pumps located in manholes to lift the sewage up to a shallower elevation to start the next run of gravity flow. Their

operation is essentially identical to conventional gravity systems but with smaller pumps and shallower manholes.

Pros:

- Very reliable, has a proven track record
- System works passively (except for pump stations)
- Flexibility to expand
- Most cost effective for areas with topographic relief
- County operators are already familiar with this type of system
- Operating costs are mainly for the equipment at the pump stations
- Large storage volumes exist with the system, making them more forgiving of variable flows
- Does not require individual property Owner's attention and maintenance

Cons:

- Roadway rebuild is typically required due to large open cut trenches, resulting in high installation costs.
- Infiltration & Inflow from stormwater/groundwater can be high
- Requires multiple sites for pump stations. This will require County ownership and/or easements
- Requires more pump stations than Conventional Gravity
- After customers are removed from septic systems there will be a longer sewer lateral from the building to the proposed gravity system that will need to be maintained by the property owner.

Vacuum Sewer

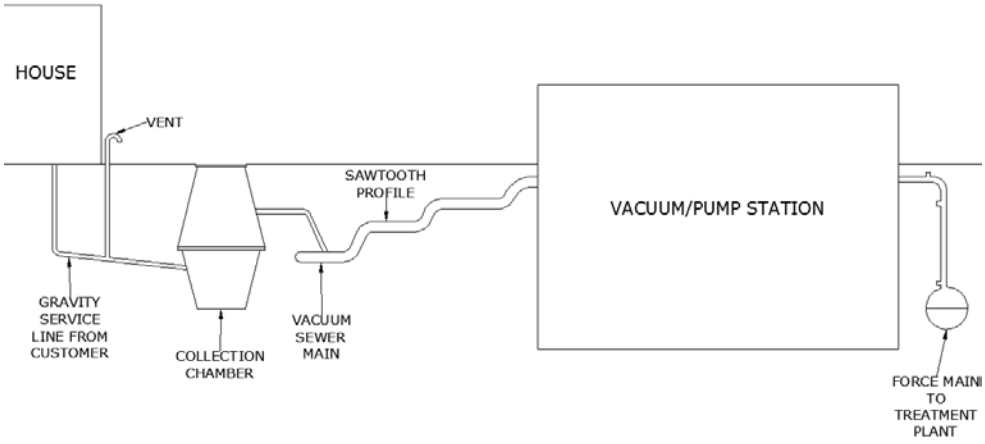


FIGURE 12. VACUUM SEWER SYSTEM
NTS

A vacuum sewer system consists of a central vacuum/pump station inducing flow into the network from 'vacuum pits' located in the right-of-way in close proximity to each property. Typically between 1 and 4 properties are connected to each vacuum pit. When wastewater in the pit reaches a certain level a vacuum valve is actuated sucking the wastewater into the piping system. The piping system is installed relatively shallow (4-6 ft) in a sawtooth type long section. The saw tooth long section has long runs of slightly falling grade, with a short lift section.

Pros:

- Shallow construction yields greatly reduced roadway repair requirements
- Typically, fewer vacuum/pump stations are required versus conventional gravity. One station can pull vacuum in the main at up to 10,000 linear ft.
- Small pipe diameters
- Infiltration is minimized
- Integrity of the entire system can be monitored in one location.
- Better suited for areas with poor soils and/or high groundwater

Cons:

- Vacuum/Pumps stations have two sets of pumps which will increase O&M costs at the pump station
- Operators will require training on how to operate new system
- Operators will be required to respond to low vacuum alarms in a timely fashion.
- Operators will spend more time in the field performing maintenance
- Will require purchasing and maintaining a spare parts inventory
- Not as flexible as conventional gravity for future expansion
- Storage in system is much less than conventional gravity
- Stations typically run in a batch cycle so WWTF's may see unsteady flows as a result
- If not sufficient room to install vacuum pit in right-of way then they will have to be installed on private property which will require easements to allow access
- After customers are removed from septic systems there will be a longer sewer lateral from the building to the proposed gravity system that will need to be maintained by the property owner.

Low Pressure System

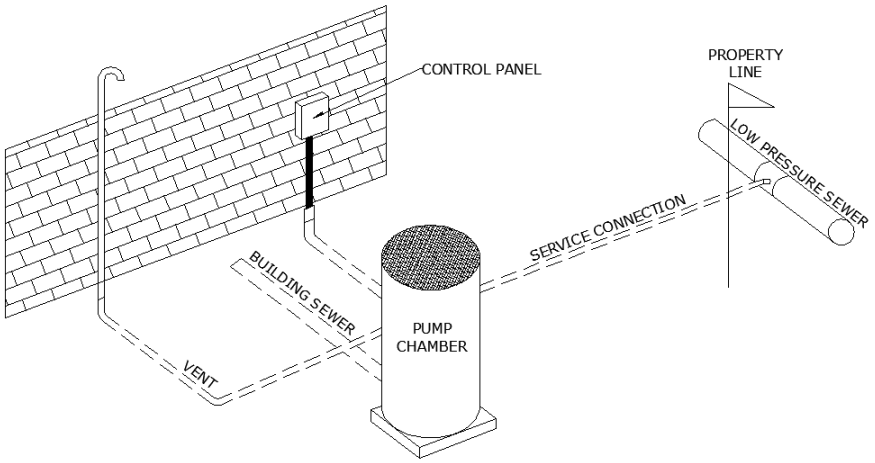


FIGURE 13. LOW PRESSURE SEWER CONNECTION
NTS

A low pressure system consists of individual grinder pump stations located on each property that are all connected to a common force main. Mechanical and electrical components are required on each property which must be maintained and paid for by the individual property owners. The force main would be located in the right-of-way and maintained by the County.

Pros:

- Shallow construction yields reduced roadway repair requirements. Pipes can even be installed using trenchless technology.
- Small pipe diameters
- Infiltration & Inflow is minimized
- Individual small pump maintenance is generally easier than larger higher horsepower pumps associated with conventional gravity or vacuum systems, plus there isn't a need for hoisting equipment or special tools.

Cons:
- Property owner may be required to provide power and maintain the system
- Annual maintenance is generally required and paid for by the Property Owner
- Property owners will need to be relied on to not flush sand or hard debris into system which could damage the grinder pumps
- System doesn't work if power is interrupted

Septic Tank Effluent Pumping (STEP)

A STEP system uses a septic tank to collect the sewage. Then effluent that would have gone to the drain field is instead pumped to a central sewer system then to a WWTF for treatment. The solids settle out in the tank and, similar to a conventional septic tank, have to be pumped out periodically (varies but typically 5-10) years by the property owner. Also, just like the Low Pressure System, mechanical and electrical components are required on each property which must be maintained and paid for by the individual property owners.

Pros:
- Shallow construction yields reduced roadway repair requirements.
- If pressure collection system used then pipes could be installed using trenchless technology.
- Small pipe diameters
- Infiltration & Inflow is minimized
- Individual small pump maintenance is generally easier than larger higher horsepower pumps associated with conventional gravity or vacuum systems, plus there isn't a need for hoisting equipment or special tools.

Cons:
- Property Owner required to provide power and maintain the system
- Annual maintenance is generally required and paid for by the Property Owner.
- System doesn't work if power to home is interrupted
- Effluent will be septic and corrosive to collection system

Screening of Collection System Alternatives

The various sewer collection methods presented above were evaluated to determine which one(s) were the most likely candidates for use in the study area. Conventional gravity is already being used in the study area and has proven to be an acceptable and reliable method. The other methods are considered below.

Vacuum sewers, while relatively new, are proving to be reliable and provide a lot of advantages to other systems. They are well suited for areas with high groundwater, poor or rocky soils and in environmentally sensitive areas. While the study area typically doesn't have high groundwater or poor soils, as part of the springshed, it is an environmentally sensitive area. Also, they typically are not well suited for areas that have a lot of topographic relief, which the study area does have. They are limited in their ability to 'lift' wastewater and therefore could require more vacuum/pump stations, significantly increasing both installation and operational costs.

Initially, the topography for the study area doesn't appear to make vacuum systems an ideal alternative. To fully investigate this system to determine if it could be utilized for this area Coastal contacted a vacuum system manufacturer representative to review the districts and provide planning level analysis to determine if vacuum could be an option for this area. The results they have provided for Districts A and B appear to be competitive with the installation cost estimated for conventional gravity. Additionally, installing vacuum would reduce the amount of road repairs required. This would reduce total project costs and create less disruption of local traffic.

Additionally, the previously mentioned areas west of U.S. 19 that are outside of the study area but within the springshed have the characteristics (flatter terrain and closer proximity to ground water) that make them even more suitable for consideration of vacuum sewer systems. Particularly as you go further west of U.S. 19. This is evidenced by the increasing number of vacuum systems that are being installed in similar conditions all along Florida's coast.

Both the Low Pressure and STEP systems require equipment to be installed and maintained on private property. Alternatively, the County could own and maintain the physical components of the system, but to do so would require easements and coordination with the property owners to allow access. Additionally, the property owner would be responsible for the electrical costs to operate the system.

Additionally, the STEP system still utilizes onsite treatment of the solids which then must be pumped from the tank for additional treatment and disposal, which again incurs additional maintenance effort and cost. Lastly, the effluent from the STEP system is septic which would be damaging to downstream collection infrastructure further increasing the County's' operation and maintenance costs. Overall the low pressure and STEP system options don't appear to meet the County's objective of cost effectively and reliably improving the quality of the treated waste before disposal.

The conclusion of the collection system screening is that conventional gravity with its current use in the area and long term track record is a viable option. The vacuum system also appears to be a viable alternative that deserves more investigation. Lastly, while the low pressure may provide small scale solutions to difficult to access areas. It, along with the STEP system, do not appear to be viable alternatives as large scale systems for meeting the County's overall objective of reducing nutrient loading to the springshed.

Planning Level Cost Estimates for each District

Cost estimates were developed for the options discussed above. The gravity sewer cost estimates are based on a "Planning Unit" that utilized information from existing utilities in the area. See definition of Planning Unit below. This same planning unit was then utilized to

estimate the cost of a low pressure system. Due to the potentially damaging septic effluent of a STEP system a cost estimate for this system was not performed but construction costs and impacts to existing roads are assumed to be similar in scale and nature to low pressure.

The vacuum sewer cost estimates utilize information provided by the vacuum system manufacturer representative based on preliminary design performed by them for Districts A and B. Only districts A & B were investigated as these two districts are close to Weeki Wachee spring and therefore are likely to have a larger potential for impact on the spring than other districts. Vacuum wasn't looked at on a planning unit basis because it is uncertain if it would be possible to install this system in all areas of the study area. Therefore, only the specific areas where it has been determined possible to install this system are investigated. Discussions with the vacuum system representative indicate that the system could be used for most if not all of the study area but further analysis would be necessary before this determination could be made. This analysis is time and labor intensive so before this analysis is performed the County would need to decide if it wants to pursue this option any further, as this analysis would need to be part of a future study.

Cost estimates for the methods were evaluated carefully to ensure that relative costs could be evaluated on an equal basis. However, every construction project is unique with respect to location, existing site conditions, and geotechnical considerations. Therefore, no estimate can be considered final until complete construction plans and specifications have been created. These estimates are appropriate for comparison, but should be evaluated appropriately. Additional detail would be required for site specific construction estimates.

Define a Planning Unit

In order to estimate construction cost for the proposed districts a representative planning unit was defined. The reason for using a Planning Unit is that it represents a logical unit with enough size that cost can be estimated for it instead of using a per lot approach.

A cost was estimated for the Planning Unit. Then a representative number of Planning Units in each district is estimated based on number of residential lots with septic tanks that are proposed to be converted to central collection. Next, a cost to construct each district was estimated.

The existing utilities in the study area were also used as a reference to help determine proposed utilities for the districts. Calculations were based off of existing residential lots only, both for calculating existing utilities and for estimating proposed utilities. The justification for using only residential lots is that residential lots represent over 98% of the developed lots in the study area.

Sewer:
Using the total number of existing residential lots on central sewer and the total number of pump stations in the study area an average number of homes per pump station was calculated. A basic cross pattern with the pump station at the middle was used to represent the typical planning unit layout. From this an even number of residential lots was placed on each leg, and using the average lot size for homes with septic in the study area, the length of gravity sewer is estimated. This number was then compared to the total length of gravity sewer in the study area divided by the number of residential lots with sewer. An average of the two values was used for the Planning Unit. The number of existing manholes divided by the number of existing lots with sewer was used

to estimate the proposed number of manholes for the Planning Unit. Finally, using the total length of existing forcemain divided by lots with sewer an average length of forcemain per lot was estimated. From this a typical Planning Unit was defined, see Exhibit D.

Water:
There are approximately 1,200 lots, mostly residential, that currently have both a well and a septic tank. While it is not required that central water be provided along with central sewer the reason for including it in the cost estimate is that there may be some advantages, both to the county and the customer, for connecting. First there may be some cost saving with installing water along with the sewer. Because the Contractor will already be mobilized and restoration will only have to be paid for once. For the customer it may be advantageous because there will be a reliable source of water and fire service can be provided. These may increase property values and lower insurance rates. Plus without a typical metered connection to provide water consumption history, which is what the sewer bill are based on, it will be necessary to either have a meter installed on each well or have the customer pay a standard fee for sewer. For existing sewer customers in the County that don't have meters on their wells they are typically charged the maximum sewer fee so having central water may also lower their sewer bills.

Using a similar methodology as used above the length of water main divided by the number of existing residential lots with water service is used to estimate an average length of water main per lot. Then the number of fire hydrants, number of gate valves, and number of blow-off/sample points is calculated based on maximum spacing required by code and compared to the number of existing appurtenances per lot in the study area and from these two values a representative number is selected, See Exhibit D.

Roads:
For road replacement associated with installing conventional gravity sewer infrastructure it is assumed that the entire width of the existing road will need to be removed and replaced. The new road is assumed to be built to the County's major local road standards with 24 ft road width, two inches of asphalt, 25 ft width of eight inch limerock base, 28 ft width of twelve inch stabilized base, and 4' of sod on both sides of the road.

For the other collection systems the road impacts are based on the number of road and driveway crossings. Road crossings are assumed to be 10' wide and 24' long and Driveway crossings are assumed to be 10' wide and 20' long. Additionally, since there are a large number of crossings a 1" overlay of the entire length of road is included to restore the road to a smooth continuous driving surface.

Estimate Costs

Using the Planning Unit described above the cost to install conventional gravity was estimated on a per unit basis, See Exhibit E for Engineers Opinion of Probable Construction Cost. The engineers' opinion of probable cost is based on a number of similar projects that have been performed in Hernando County. This per unit cost was then applied to the districts to estimate construction costs for each district, see Exhibit F for Summary of Conversion to conventional gravity.

A planning unit cost estimate for paving and conventional gravity, including General Conditions, was calculated first, since all districts will have these facilities installed. A

similar planning unit estimate was performed for low pressure sewer. Another cost that is included for consideration, for the reasons stated above, is the cost to install central water in areas that have wells. Lastly, the cost for converting from septic to central sewer was also estimated. This cost will include an abandonment permit from the Health Department, decommissioning the existing septic tanks, rerouting the sewer from the septic tank to the central sewer system, and the County connection fees.

To compare the cost for conventional gravity to low pressure sewer a planning unit cost estimate was calculated, see Exhibit E. To compare the cost of vacuum the cost estimate provided by the vacuum system manufacturer representative was utilized to create a cost estimate for all of District A and District B, see Exhibit E. These cost were then divided by the number of lots within the District and the average of these two costs were multiplied by 128 to estimate an equivalent planning unit cost. Table 5 below presents a comparison of the different methods.

Table 5. Cost Comparison

Planning Unit Cost Comparison			
	Conventional	**Low Pressure**	**Vacuum**
General Conditions	$141,169	$141,169	$141,165
Paving/ Earthwork	$594,375	$275,125	$125,062
Sewer	$758,950	$1,247,850	$660,028
SUBTOTAL	$1,494,494	$1,664,144	$926,255
10% Contingency	$149,449	$166,414	$92,625
TOTAL	**$1,643,943**	**$1,830,558**	**$1,018,880**
District A Cost Comparison			
	Conventional	**Low Pressure**	**Vacuum**
General Conditions	$991,006	$991,006	$991,006
Paving/ Earthwork	$4,172,513	$1,931,378	$877,990
Sewer	$5,327,829	$8,759,907	$4,564,300
SUBTOTAL	$10,491,348	$11,682,291	$6,433,296
10% Contingency	$1,049,135	$1,168,229	$643,330
TOTAL	**$11,540,483**	**$12,850,520**	**$7,076,626**
District B Cost Comparison			
	Conventional	**Low Pressure**	**Vacuum**
General Conditions	$1,449,806	$1,449,806	$1,449,806
Paving/ Earthwork	$6,104,231	$2,825,534	$1,284,390
Sewer	$7,794,417	$12,815,420	$6,879,910
SUBTOTAL	$15,348,453	$17,090,759	$9,614,106
10% Contingency	$1,534,845	$1,709,076	$961,411
TOTAL	**$16,883,299**	**$18,799,835**	**$10,575,516**

Existing Infrastructure Impacts

In addition to the new infrastructure required to be installed within the districts; the proposed systems will need to be connected to WWTF's for treatment and disposal of the wastewater.

This will involve connecting to the existing force mains within the County's collection system. The next step of the investigation looked at the capacity of the existing force mains and estimated the cost of upgrading. The impact to the receiving WWTF's is also estimated. The WWTF impact only considered the impact to the current permitted treatment capacity and not the cost to upgrade the WWTF, since the cost for upgrading WWTF's is already accounted for in the County connection fees.

To determine the impacts to existing force mains the flow from each district was estimated based on peak flow rates from that district. Then the most likely point of connection from the proposed force main to an existing force main was determined and the proposed flow was added to the existing flow at this point. The force mains from that point to the final discharge at the WWTF were then evaluated to determine if the additional flow would exceed the capacity of the pipe. The criteria to determine if an existing force main could accommodate the proposed flow was based on velocity of the combined flow not exceeding 5 fps at peak flows. Existing peak flows are based on the SewerCAD model created as part of the Hernando County Sewer Master Plan (2011 updates). See Exhibit G for details on how the force main analysis was performed. Figure 14 shows schematics of the pipes from SewerCAD that were included in the analysis. Table 6 shows a summary of the pipe segments from the SewerCAD model along with estimated pipe diameters and cost, assuming full build out of all districts. The cost is only for installation of the proposed force mains based on linear foot and includes fittings, pipe and restoration but does not include design, permitting, removal of existing force mains, relocation of other existing utilities, or other existing conditions that may increase installation costs. Also, the cost is based on installation of pipe of sufficient diameter to carry all flows in a single pipe. It does not consider optional methods of piping, which could potentially reduce costs, such as a smaller diameter force main parallel to an existing force main. Therefore, this costs should only be used as a reference to represent the magnitude of the potential costs and not as a cost estimate for budgeting purposes.

To determine the impacts to the WWTF's the total flows from each District are calculated and compared to the existing capacity of the WWTF. Additional flow calculated assumes all lots to be residential and peak flow is based on HC Water, Reclaimed Water, and Wastewater Construction Specifications 4A.4.3.1 for a residential lot of 200 GPD. Table 7 summarizes the permitted flow capacity of the WWTF's that will receive flow from the districts along with the estimated flow from each district.

For all but two districts the existing WWTF could handle the estimated flow from the individual district without exceeding the permitted capacity. However, once the flow exceeds 50% of the permitted capacity the County will be required to monitor, plan for, and possibly permit and construct facility upgrades. This will depend on the estimated rate of growth of the systems. Assuming the districts are constructed in order (A-S0 the Glen WWTF will need to be upgraded before District E could be completely converted. The Airport WWTF would exceed capacity with the first district on the list proposed to pump to it (District G).

Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

Coastal
engineering associates, inc.

Septic to Sewer Conversion Study

Figure 14. **Sewer CAD Pipe Schematic**

PFS-1516-13

Table 6. Impacts to Existing Force Mains

Label	Diameter (in)	All Districts That share pipe segment	Combined Flow from All Districts	Min Pipe Size Needed (in)	Exist Pipe Size Meets Min	Est Min Pipe Size (in)	/LF Cost of Pipe	Total Estimated Pipe Cost
FM-632	16	A, B, E, F, K, L	4,769	19.7	No	20	$80.00	$518,080
FM-845	16	A, B, C, D, E, F, K, L	6,003	22.1	No	24	$94.00	$396,586
FM-846	20	A, B, C, D, E, F, K, L	6,591	23.2	No	24	$94.00	$51,418
FM-613	18	A, B, C, D, E, F, K, L	6,149	22.4	No	24	$94.00	$183,206
FM-615	18	A, B, C, D, E, F, K, L	6,149	22.4	No	24	$94.00	$433,058
FM-616	18	A, B, C, D, E, F, K, L	6,149	22.4	No	24	$94.00	$1,122,736
n_FM-42	20	A, B, C, D, E, F, K, L	6,612	23.2	No	24	$94.00	$549,336
FM-579	20	A, B, C, D, E, F, K, L	6,623	23.3	No	24	$94.00	$547,550
FM-580	24	A, B, C, D, E, F, K, L	6,623	23.3	Yes			
n_FM-43	24	A, B, C, D, E, F, K, L	7,374	24.5	No	26	$94.00	$27,636
FM-639	6	C	512	6.5	No	8	$27.00	$12,123
FM-640	6	C	780	8.0	No	10	$31.00	$5,735
FM-688	6	C	780	8.0	No	10	$31.00	$5,890
FM-689	8	C	877	8.5	No	10	$31.00	$72,044
FM-642	10	C, D	1,475	11.0	No	12	$38.00	$14,098
FM-646	8	C, D	1,475	11.0	No	12	$38.00	$13,946
FM-650	8	C, D	1,475	11.0	No	12	$38.00	$11,286
FM-651	6	C, D	1,475	11.0	No	12	$38.00	$760
FM-652	10	C, D	1,969	12.7	No	14	$47.00	$15,933
FM-653	10	C, D	1,969	12.7	No	14	$47.00	$470
FM-749	10	C, D	1,969	12.7	No	14	$47.00	$102,460
FM-750	10	C, D	2,298	13.7	No	14	$47.00	$201,207
FM-782	10	C, D	2,298	13.7	No	14	$47.00	$5,217
FM-833	10	C, D	2,298	13.7	No	14	$47.00	$12,126
FM-630	12	E, F, L, M	4,052	18.2	No	20	$80.00	$200,960
FM-631	12	E, F, L, M	4,052	18.2	No	20	$80.00	$192,560
FM-817	16	G, H, I, J, M, N, O, P, Q, R	11,459	30.6	No	32	$114.00	$1,200,534
FM-819	16	G, H, I, J, M, N, O, P, Q, R	11,459	30.6	No	32	$114.00	$950,646
FM-824	16	G, H, I, J, M, N, O, P, Q, R	11,459	30.6	No	32	$114.00	$695,058
FM-823	16	G, H, I, J, M, N, O, P, Q, R, S	11,515	30.7	No	32	$114.00	$555,408
FM-814	16	G, H, I, J, M, N, O, P, Q, R, S	14,860	34.8	No	36	$135.00	$5,130
FM-262	10	J	1,811	12.2	No	14	$47.00	$123,140
FM-263	10	J	1,811	12.2	No	14	$47.00	$13,771
FM-665	10	J	1,811	12.2	No	14	$47.00	$32,806
FM-666	10	J	1,912	12.5	No	14	$47.00	$24,628
FM-208	16	J	3,576	17.1	No	18	$68.00	$11,560

FM-671	16	J	3,576	17.1	No	18	$68.00	$150,144
FM-673	16	J	3,576	17.1	No	18	$68.00	$105,672
FM-777	16	J	3,901	17.9	No	18	$68.00	$70,516
FM-789	16	J	3,901	17.9	No	20	$80.00	$90,480
FM-788	16	J	2,682	14.8	Yes			
FM-778	16	J	2,682	14.8	Yes			
FM-199	16	J	2,682	14.8	Yes			
FM-465	16	J	2,682	14.8	Yes			
FM-808	16	J, R	2,739	15.0	Yes			
FM-811	16	J, R	2,739	15.0	Yes			
FM-812	16	J, R	2,739	15.0	Yes			
FM-836	16	J, R	2,739	15.0	Yes			
FM-809	16	J, R, S	3,699	17.4	No	18	$68.00	$502,792
							TOTAL	**$9,228,706**

Table. 7. Impacts to WWTF's

AIRPORT WWTF CAPACITY SUMMARY:

Airport WWTF Permitted Capacity:	3,000,000	gpd
Current Flows:	800,000	gpd
Committed Capacity:	115,000	gpd
Anticipated Flow from Spring Hill Flow Diversion:	1,500,000	gpd
Available Capacity:	585,000	gpd peak flow
Additional Flow to WWTF:	4,488,000	gpd
Additional Capacity needed for all districts:	3,903,000	gpd

THE GLEN WWTF CAPACITY SUMMARY:

Glen Permitted Capacity:	3,000,000	gpd
Current Flows:	700,000	gpd
Committed Capacity:	1,726	gpd
Anticipated Flow from Spring Hill Flow Diversion:	700,000	gpd
Anticipated Flow from Brookridge Decomm:	356,000	gpd peak flow
Available Capacity:	1,242,274	gpd
Additional Flow to WWTF:	1,998,400	gpd
Additional Capacity needed for all districts:	756,126	gpd

Table. 7. Impacts to WWTF's (Continued)

District	Lots	Additional Peak flows created[5] (gpd)	Receiving WWTF	Receiving WWTF Available Capacity after District Constructed
A	899	179,800	Glen	1,062,474
B	1314	262,800	Glen	979,474
C	458	91,600	Glen	1,150,674
D	1437	287,400	Glen	954,874
E	4137	827,400	Glen	414,874
F	1195	239,000	Glen	1,003,274
G	3911	782,200	Airport	-197,200
H	2234	446,800	Airport	138,200
I	2924	584,800	Airport	200
J	1347	269,400	Airport	315,600
K	517	103,400	Glen	1,138,874
L	35	7,000	Glen	1,235,274
M	2918	583,600	Airport	1,400
N	1073	214,600	Airport	370,400
O	1119	223,800	Airport	361,200
P	4263	852,600	Airport	-267,600
Q	212	42,400	Airport	542,600
R	2303	460,600	Airport	124,400
S	136	27,200	Airport	557,800
TOTAL	**32,432**	**6,486,400**		

Findings

Conventional gravity sewer systems are a proven and effective means for collection and transport of sewage in the study area. Construction and related cost of this system is complicated when retrofitted into an existing development which requires complete street removal and replacement. This disrupts traffic and adds significant cost to the new sewage collection system. For example Districts A & B were evaluated and estimated for conventional gravity versus vacuum systems and found to be similar in cost related to required infrastructure, but significantly different once the restoration cost for roadways were factored into the estimated cost. Specifically, gravity infrastructure cost were 13% higher but 30% higher once restoration cost of existing roads were included.

Vacuum systems while 30% less expensive to construct create other operational issues that will need to be analyzed with County staff before implementation. The new technology

is not currently used by County staff which will require training, new equipment, spare parts and a learning curve for implementation of the new vacuum sewage system.

Low pressure and STEP systems are recommended for no further analysis due to their high cost and infrastructure issues.

Please refer to exhibit F for a summary of all District cost to convert from septic to conventional gravity sewer collection.

4. FINAL HYDRAULIC MODELING OF TOP THREE (3) DISTRICTS

Ranking Districts

The first part of this task is to rank the districts to determine which three will provide the most benefit from converting to central collection. To do this a number of factors were considered but, based on the findings in Task 2, the lots closest to the spring are considered to have the largest potential for impacting the spring.

Nitrogen Loading

To determine a districts impact to the spring the estimated nitrogen loading to the springshed was calculated. The calculation is based on a typical Hernando County household input. An input is defined as the amount of nitrogen that is released into the environment. A load is the amount of nitrogen that reaches the ground water. For the purposes of this study only the input from the septic system is considered. Nitrogen reduction that may occur after the effluent travels from the drain field through the underlying soil to the groundwater and ultimately to the spring is not considered here.

The U.S. EPA Onsite Wastewater Treatment Systems Manual estimates 11.2 grams of nitrogen per person per day as the average total nitrogen contribution to wastewater (Table 3-8, EPA, 2002). The average household size for Hernando County is 2.39 persons (BEBR, 2015). This gives an estimated nitrogen input to the on-site storage treatment and disposal system (OSTDS) of 26.77 grams per day per household or 21.5 lb/year.

The next step is to factor in the nitrogen reduction from the OSTDS. Since this process is dependent on a number of factors, including the type of wastewater coming to the system as well as physical, biological, and chemical processes within and after the system, this value can vary. However, a 10% reduction in the septic tank is a reasonable estimate based on studies of septic tank effluent flow and quality in Florida performed as part of the Florida Onsite Sewage Disposal System Research Project from Sherman and Anderson, 1991 (as cited in Anderson 2006). Assuming a 10% reduction, the nitrogen input after the septic tank is estimated to be 24.09 grams per day per household.

Next, the effluent flows into the drain field where an additional reduction in nitrogen occurs. The amount of reduction in the drain field is even more variable than what occurs in the tank and a range from 10% to 74% has been reported in the literature: Sikora and Corey, 1976; Reneau, 1977; Harkin et. Al, 1979; Jensen and Siegrist, 1988; 1991; Degan, et. Al., 1991; Mote and Buchanan, 1994; Duncan et. Al., 1994; Anderson et. Al., 1994; Chen and Harkin, 1998; Anderson, 1998; Anderson and Otis, 2000; EPA 2002 (as cited in Anderson 2006). The Anderson study estimated a reduction of 25% for their study area, the Wekiva area, which is an area in central Florida on well drained fine sands, such as Candler Fine Sand, conditions similar to the conditions found within the area of study for this report. Using a 25% reduction gives an estimated input of 18.07 grams per day per household. Therefore, the estimated annual average household nitrogen input leaving the septic system is 14.5 lb/yr, a 32.6% reduction.

At this point the loading to the water table could have been estimated. A literature search didn't reveal any site specific data on the amount of reduction of nitrogen in the soils in the study area. However, a study by FDEP indicated an 18% reduction in nitrogen between the

septic tank and the ground water table (Ursin, et. al. 2007). While this is a significant reduction in nitrogen after the drain field it will not be considered in this analysis. For this report we are comparing the benefit of converting to central sewer for treatment at a WWTF so the same reduction in nitrogen could be assumed to occur after discharge from the WWTF's as well. Therefore, this analysis will consider the inputs to the springshed and not the loadings at the springs from the different sources. Table 8 tabulates total estimated nitrogen input per district.

Travel Time

Based on the discussion of travel times from Section 2 *Weeki Wachee Nutrient Impacts* of this study "Septic Tank district groups closest to Weeki Wachees Springs shown in Figure 10. have the smallest travel times and the greatest potential for contributing nitrogen loads. Of the districts in close proximity to the springs, the larger districts with the greatest number of septic systems may be considered early for wastewater system improvements".

Other Parameters

There are other parameters, such as capital and maintenance costs, regulating environment, social impacts, etc, that were initially selected to be included in the analysis of the top three districts. However, after further consideration they were determined to not play a significant role in the determination of which districts will have the biggest impact to the springs and therefore were not included in the analysis.

Selection of Top 3 Districts

As shown in Figure 10 districts A and B are closest to the spring both within the 5-10 year estimated travel time to the springs and are, therefore, included in the top three districts to be analyzed. The next zone, the estimated 20 year travel time, indicated in figure 10, partially includes several districts. However, District E is the largest district with the largest area of that district mostly within the 20 year travel time and therefore is selected as the third district that will be analyzed.

Lastly, it should be noted that the areas to the north and west of the spring, that are outside of the study area but also within close proximity to the spring, can be assumed to have a similar level of importance for impacting the spring as the districts selected here.

Cost to Benefit Analysis

One of the primary goals of this study is to provide a cost to benefit analysis of implementing central collection to reduce nitrogen loading. In order to do this it was necessary to compare the nitrogen input from the OSTDS with the potential reduced input from the WWTF's.

Based on existing infrastructure, wastewater from the study area could potentially be sent to one of two WWTF's. Districts in the northern half of the study area would go to the Glen WWTF. Districts in the southern half will likely go to the Airport WWTF. To estimate the per lot nitrogen input to the springshed after the wastewater is treated at one of the WWTF's the same nitrogen input per household as described in Section 2 (26.77 grams per day per household) was used. This, along with the average wastewater flow per household (as determined from the Hernando County 2005 Sewer Master Plan) of 180 gallons per day,

gives a nitrogen concentration in the effluent of 39.3 mg/L. Comparing this to the average effluent nitrogen concentration after treatment of approximately 4 mg/L (Based on 2015 daily monitoring reports (DMR's)) results in approximately 2.2 lbs of nitrogen per household per year, a 91.8% reduction. An almost 60% increase in nitrogen removal as compared to OSTDS's. The benefit of converting to central collection is an estimated input reduction of 12.3 lb of nitrogen per household per year. This equates to over 398,000 lb/year of nitrogen that would not be released into the spring shed from the study area. See Table 8 for a summary of the benefits and cost for central collection. Refer to Exhibit H for details on this analysis.

Table 8 Summary of Nitrogen Inputs & Cost/Benefit for Converting to Central collection

District	Total lots to be converted to Central Sewer	Total Cost to Design, Construct, and Permit Road, and Sewer Utilities + Abandon Septic System + Connection Fees	Total Nitrogen Input from Lots NO TREATMENT (lb/yr)	Estimated Nitrogen Input to Groundwater from Lots AFTER SEPTIC TREATMENT (lb/yr)	Estimated Nitrogen Input to ground water from Lots AFTER WWTF (lb/yr)	Additional lbs of nitrogen per year that could be removed before input into springshed if central collection utilized	Cost to benefit = $/lb of Nitrogen reduced for First Year
A	899	$19,146,577	24064.4	13035.5	1977.8	11057.7	$1,732
B	1314	$27,985,097	35173.2	19053.0	2890.8	16162.2	$1,732
C	458	$9,754,318	12259.7	6641.0	1007.6	5633.4	$1,801
D	1437	$30,604,707	38465.6	20836.5	3161.4	17675.1	$1,753
E	4137	$88,108,331	110739.2	59986.5	9101.4	50885.1	$1,772
F	1195	$25,450,678	31987.8	17327.5	2629.0	14698.5	$1,732
G	3911	$83,295,065	104689.6	56709.5	8604.2	48105.3	$1,774
H	2234	$47,578,925	59799.7	32393.0	4914.8	27478.2	$1,732
I	2924	$62,274,295	78269.6	42398.0	6432.8	35965.2	$1,788
J	1347	$28,687,919	36056.5	19531.5	2963.4	16568.1	$1,769
K	517	$11,010,879	13839.1	7496.5	1137.4	6359.1	$1,732
L	35	$745,417	936.9	507.5	77.0	430.5	$1,732
M	2918	$62,146,509	78109.0	42311.0	6419.6	35891.4	$1,788
N	1073	$22,852,366	28722.1	15558.5	2360.6	13197.9	$1,732
O	1119	$23,832,058	29953.4	16225.5	2461.8	13763.7	$1,732
P	4263	$90,791,833	114112.0	61813.5	9378.6	52434.9	$1,770
Q	212	$4,515,099	5674.8	3074.0	466.4	2607.6	$1,732
R	2303	$49,048,462	61646.7	33393.5	5066.6	28326.9	$1,732
S	136	$2,896,479	3640.4	1972.0	299.2	1672.8	$1,732
TOTAL	**32432**	**$690,725,015**	**868139.8**	**470264.0**	**71350.4**	**398913.6**	

[1.] Total cost does not include off-site force main upgrades that may be needed. Off-site force main upgrades are for existing force mains and would be in addition to the force mains included in the cost estimate for the individual district. Refer to *Section 3 District Planning Approach subsection Existing Infrastructure Impacts* and Exhibit G for additional information.

Hydraulic Analysis of Top 3 Districts

Hydraulic analysis of the top three districts selected above were performed to determine preliminary sizing of the infrastructure needed to connect to the County's existing system, as well as assess the existing infrastructure's capacity and recommend expansion where required.

Topography Analysis

To perform the analysis of the proposed central collection system LIDAR data was used to represent the existing surface for the districts. Then using Hernando County minimum design requirements of: maximum pipe length of 350 feet between manholes; minimum pipe cover of 4 feet; and maximum manhole depth of 20 feet, a preliminary sewer system was laid out and potential pump station locations identified, see Figures 15-17. This analysis was also performed to validate the assumptions used to create the Planning Unit method defined in Task 3. As shown in Table 9 the Districts, when analyzed using the Planning Unit method, are in close agreement with the analysis performed using existing topography. The only exception is the estimated number of pump stations for District E. Using the Planning Unit method 32 pump stations were estimated. However, the topography in this area was such that as few as eleven pump stations would be needed. However, using fewer pump stations will require that the gravity mains and pump stations be larger and may warrant additional pump stations to reduce size of the facilities. Therefore, for this level of preliminary planning, the Planning Unit method appears to be valid.

Existing Infrastructure Model Setup

To evaluate the impacts to the existing infrastructure the Hernando County Sewer Master Plan 2011 updates (2011 SMP) along with the SewerCAD model that was developed for this report were used. Please refer to the 2011 SMP for a detailed explanation of how the model was developed. It is assumed that no significant changes to the existing system have been made since the model was created.

Locations for a single master pump station for each district were identified. Locations were based on pump station locations identified during the topography analysis described above. SewerCAD model inputs for the proposed pump stations were calculated, See Exhibit I. Flows to the pump stations for Districts A & B were assumed to be the full flow rate from the District. The flow rate for the District E pump station was estimated at half of the total flow. This was done because modeling a master pump station using total flow would have created a pump station that was unrealistically large and the flows from the station would overwhelm the existing force mains, which are 12 inch and larger. Therefore, for District E the assumption is made that at least 2 master pump stations will be required. Additionally, the pump stations will have to be controlled in such a way that they both don't pump at the same time.

Figure 15. **District A**

Septic to Sewer Conversion Study

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

PFS-1516-13

Figure 16. **District B**

Septic to Sewer Conversion Study

Coastal engineering associates, inc.

Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

PFS-1516-13

Figure 17. **District E**

Septic to Sewer Conversion Study

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

PFS-1516-13

Table 9. Summary of infrastructure for gravity collection system from topography analysis and comparison to Planning Unit analysis method.

DISTRICT	Pump Station	Lots	flow (gpd)	flow (gpm)	# of Manholes	Length of Gravity Sewer (lf)
A	1	90	54,000	37.5	30	7,317
	2	196	117,600	81.7	50	11,832
	3	45	27,000	18.8	13	3,106
	4	225	135,000	93.8	51	13,501
	5	83	49,800	34.6	21	4,520
	6	175	105,000	72.9	40	9,373
Total (Topography)	**6**	**814**	**488,400**	**339.2**	**205**	**49,649**
Total (Planning Unit)	**7**	**899**	**539,136**	**374.4**	**246**	**56,160**
B	1	266	159,600	110.8	93	21,837
	2	102	61,200	42.5	36	7,805
	3	181	108,600	75.4	46	11,415
	4	300	180,000	125.0	11	1,894
	5	50	30,000	20.8	17	3,386
	6	56	33,600	23.3	17	3,299
	7	127	76,200	52.9	47	9,327
	8	20	12,000	8.3	8	1,182
	9	43	25,800	17.9	17	3,166
	10	83	49,800	34.6	20	4,921
	11	151	90,600	62.9	44	9,813
	12	97	58,200	40.4	27	6,557
	13	16	9,600	6.7	4	803
	14	14	8,400	5.8	6	833
Total (Topography)	**14**	**1506**	**903,600**	**627.5**	**393**	**86,239**
Total (Planning Unit)	**10**	**1315**	**788,736**	**547.7**	**359**	**82,160**
E	1	125	75,000	52.1	42	8,942
	2	135	81,000	56.3	38	8,253
	3	126	75,600	52.5	37	8,815
	4	456	273,600	190.0	106	27,183
	5	540	324,000	225.0	119	31,086
	6	60	36,000	25.0	12	2,946
	7	573	343,800	238.8	130	33,668
	8	634	380,400	264.2	122	33,475
	9	513	307,800	213.8	106	29,031
	10	841	504,600	350.4	180	47,669
	11	112	67200	46.7	25	6,135
Total (Topography)	**11**	**4115**	**2,469,000**	**1714.6**	**917**	**237,203**
Total (Planning Unit)	**32**	**4137**	**2,482,176**	**1723.7**	**1131**	**258,560**

Analyses of the proposed impacts are evaluated by adding the proposed lift station and force main to the SewerCAD model and then running a peak hour analysis of the new configuration. The criteria used to determine if the proposed system will impact the existing system are:

1. Does the max velocity in the force mains from the proposed lift station to the outfall exceed 6 fps?
2. Do the hydraulic grade line, pump head, and flows of the affected lift stations indicate the potential for exceeding wet well capacity or creating excessive pump cycling?

If the answer to these two questions is “no” then no detrimental impacts to the system are expected. In addition to the three proposed pump stations there is one existing master pump station (LS28) located at the intersection of U.S. 19 and S.R 50. All three districts will pump to this pump station which is also included in the analysis. See Exhibit I for model results.

Existing Infrastructure Modeling Results Discussion

The County’s existing wastewater infrastructure has been modeled in SewerCAD to determine if existing force mains and pump stations could handle additional flows from new sewer districts. The analysis indicates that the existing force mains could handle the estimated increased flows from each district or a combination of all three districts without exceeding six (6) feet per second (fps) velocity in existing pipes. This would be acceptable under current regulatory criteria.

Pump stations have been evaluated in SewerCAD based on the worst case scenario of all pump stations receiving peak flows at the same time for a two-hour period. While this is a conservative and typical assumption used for design it does not necessarily reflect actual conditions. Also, it tends to oversize the equipment required. Additionally, it doesn’t take advantage of remote telemetry controls that could be used to operate the system more efficiently. For example, SCADA systems, which are standard on almost all County pump stations, can send data to a computer model which can analyze the data and run predictive models to identify and address problems before they happen. It would also give more control over the system and allow for smaller infrastructure to be designed and operated more efficiently. It is recommended the County look into this type of control and modeling system to assist with design and operation of the sewer system as it expands.

Existing pump station LS28 has been modeled under the above scenario. Based on this flow the existing pump station does not meet the County minimum five minutes of fill time at peak flow. However, since this model is based on the worst case scenario of all pumps in the system pumping at the same time. We recommend that the County evaluate actual conditions at the pump station, using pump run times recorded by the SCADA system along with pump drawdown tests at peak flows, to determine if the station really is performing as modeled or if the model is over predicting the results. Using this information the County will be able to determine if upgrades to the existing station are required at this time. Additionally, the data collected during the analysis can be used to modify the model to more accurately reflect what is happening in the system. This updated model could then be used when the Districts are designed.

Existing WWTF Impact

All three districts will pump to the Glen WWTF, which is currently permitted for 3.0 million gallons per day (mgd). As determined in Task 3 current flows to the facility are approximately 700,000 gallons per day (gpd), there is also an estimated 2,000 gpd of committed capacity and an additional 700,000 gpd of flow that will come to the facility when the Spring Hill WWTF is decommissioned. This will put flows to the Glen at about 1.4 mgd. This leaves approximately 1.6 mgd of capacity available. Estimated flows from the top three districts will be approximately 1.3 mgd. While this is below the current permitted capacity it will put the facility at about 90% of the permitted capacity. This will require that the County monitor, plan for, permit, and possibly construct facility upgrades. This will be affected by the rate of growth of areas outside the Study area that also pump to the Glen.

Conclusion

In conclusion conversion of the existing OSTDS within the study area to central collection will have an estimated reduction to the springshed of 12.3 lb per household per year or over 380,000 lb of nitrogen per year, for the Study area. Furthermore, the input will be moved further from the spring. This will allow more time for natural processes to further reduce nitrogen before it reaches the spring.

The top three districts identified as having the highest potential for impacting the springs are Districts A, B, and E. A topography analysis performed on these districts identified sub-districts and estimated the infrastructure needed for each district. Comparison of the infrastructure estimated using the topography analysis versus the Planning Unit method shows that the assumptions developed for the Planning Unit method appear to be valid for preliminary estimating purposes.

The existing infrastructure was also hydraulically analyzed and it was determined that the existing force mains could handle all three districts. With District E operated under the assumption that at least two master pump stations, each handling half the flow, are controlled so that both pump stations do not pump at the same time.

An existing master pump station, which all three districts pump to, was determined to potentially be able to handle the flow from Districts A or B independently. Field testing is recommended to confirm the model. Districts A and B together or District E, even with the two pump station assumption will likely require upgrades to the existing pump station.

For all three districts the Glen WWTF will be able to handle all of the flows. However, it will put the facility so close to its permitted capacity that upgrades will likely be required during construction of District E.

5. References

Florida Department of Environmental Protection, undated; Springs Coast Basin Management Action Plan, On-Site Treatment and Disposal System Initiative

Anderson, D. L., 2006; A Review of Nitrogen Loading and Treatment Performance Recommendations for Onsite Wastewater Treatment Systems (OWTS) in the Wekiva Study Area

Florida Department of Environmental Protection, 2016; Nitrogen Source Inventory and Loading Estimate For The Weeki Wachee Spring And River Contributing Area

Florida Department of Environmental Protection, undated; Springs Coast Basin Management Action Plan, On-Site Treatment and Disposal System Initiative

Florida Department of Environmental Protection, 2007; An Assessment of Nitrogen Contribution from Onsite Wastewater Treatment Systems (OWTS) in the Wekiva Study Area of Central Florida

Florida Department of Environmental Protection, 2014; Nutrient TMDLs for Weeki Wachee Spring and Weeki Wachee River

Florida Geological Survey, 2004; Springs of Florida, Bulletin No. 66, Scott, T. M., et. al.

Florida Department of Health, 2009; Statewide Inventory of Onsite Sewage Treatment and Disposal Systems in Florida, prepared by EarthSTEPS, LLC and GlobalMind

Southwest Florida Water Management District, 1987; Ground-Water Resource Availability Inventory: Hernando County, Florida

Southwest Florida Water Management District, 2008; Weeki Wachee River System Recommended Minimum Flows and Levels

Southwest Florida Water Management District, 2011; Water-Quality and Hydrology of the Homosassa, Chassahowitzka, Weeki Wachee, and Aripeka Spring Complexes, Citrus and Hernando Counties, Florida

Southwest Florida Water Management District, 2011; The Hydrology and Water Quality of Select Springs in the Southwest Florida Water Management District

U.S. Geological Survey, 1969; Large Springs of Florida's Sun Coast, Leaflet No. 9, Mann, J. A. and R. N. Cherry

U.S. Geological Survey, 1985; Water Resources and Effects of Development in Hernando County, Florida; Water-Resources Investigations Report 84-4320

U.S. Geological Survey, 1986; Hydrology of Hunters Lake, Hernando County, Florida, Water-Resources Investigations Report 85-4242

U.S. Geological Survey, 2006; Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida, May 2005; Open File Report 2006-1009

Coastal Engineering Associates, Inc.; 2012; Hernando County Sewer Master Plan (2011 Updates)

BEBR; 2015; Households and Average Household Size in Florida: April 1, 2015

U.S. Environmental Protection Agency; 2002; Onsiet Wastewater Treatment Systems Manual

Ursin, Elke L. and Roeder, Eberhard; 2007; An Assessment of Nitrogen Contribution from Onsite Wastewater Treatment Systems (OWTS) I the Wekiva Study Area of Central Florida

Exhibit A
GIS Layer Depictions

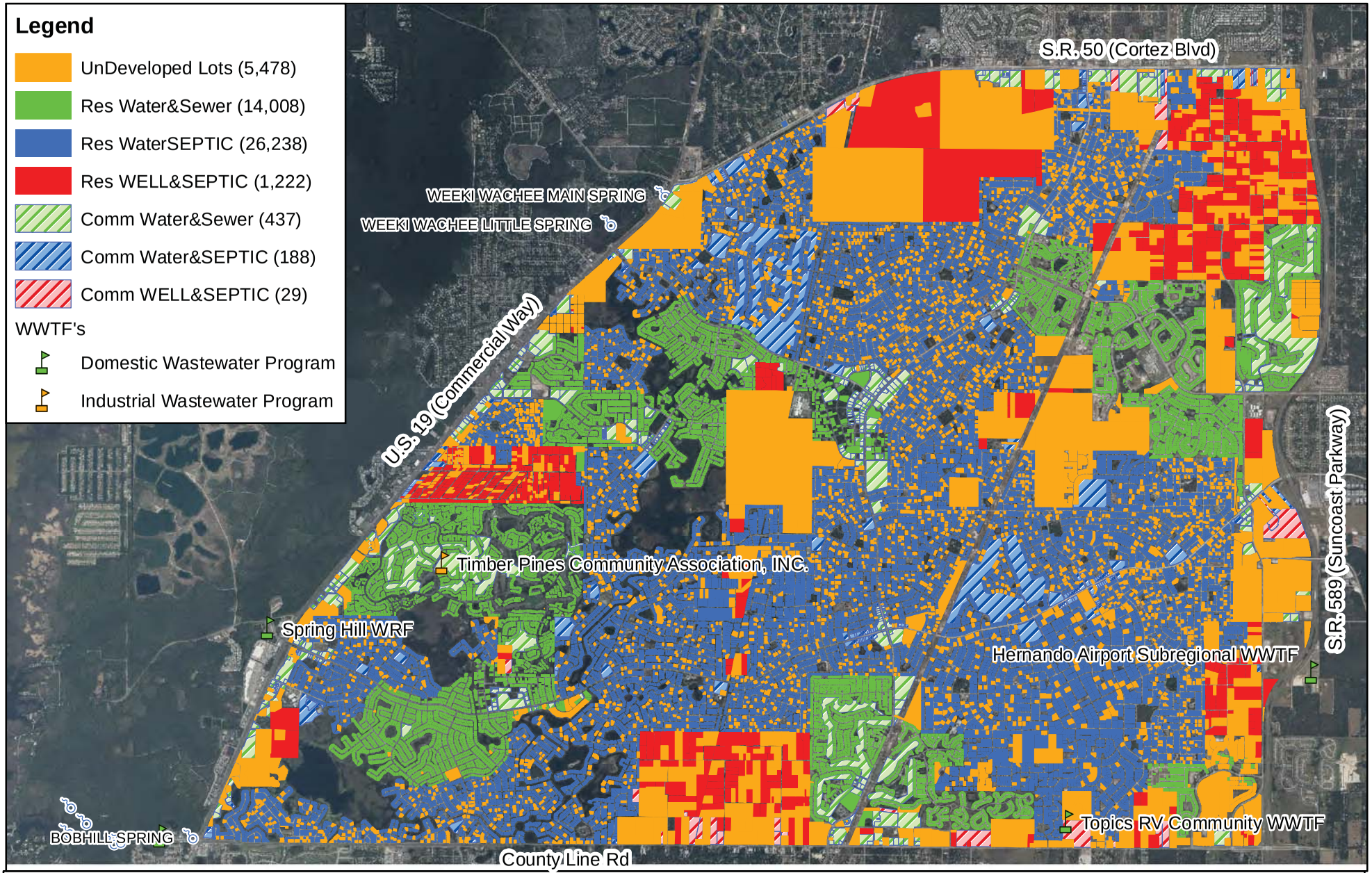


Figure 1. Developed Lots with Water/Sewer Service Identified

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

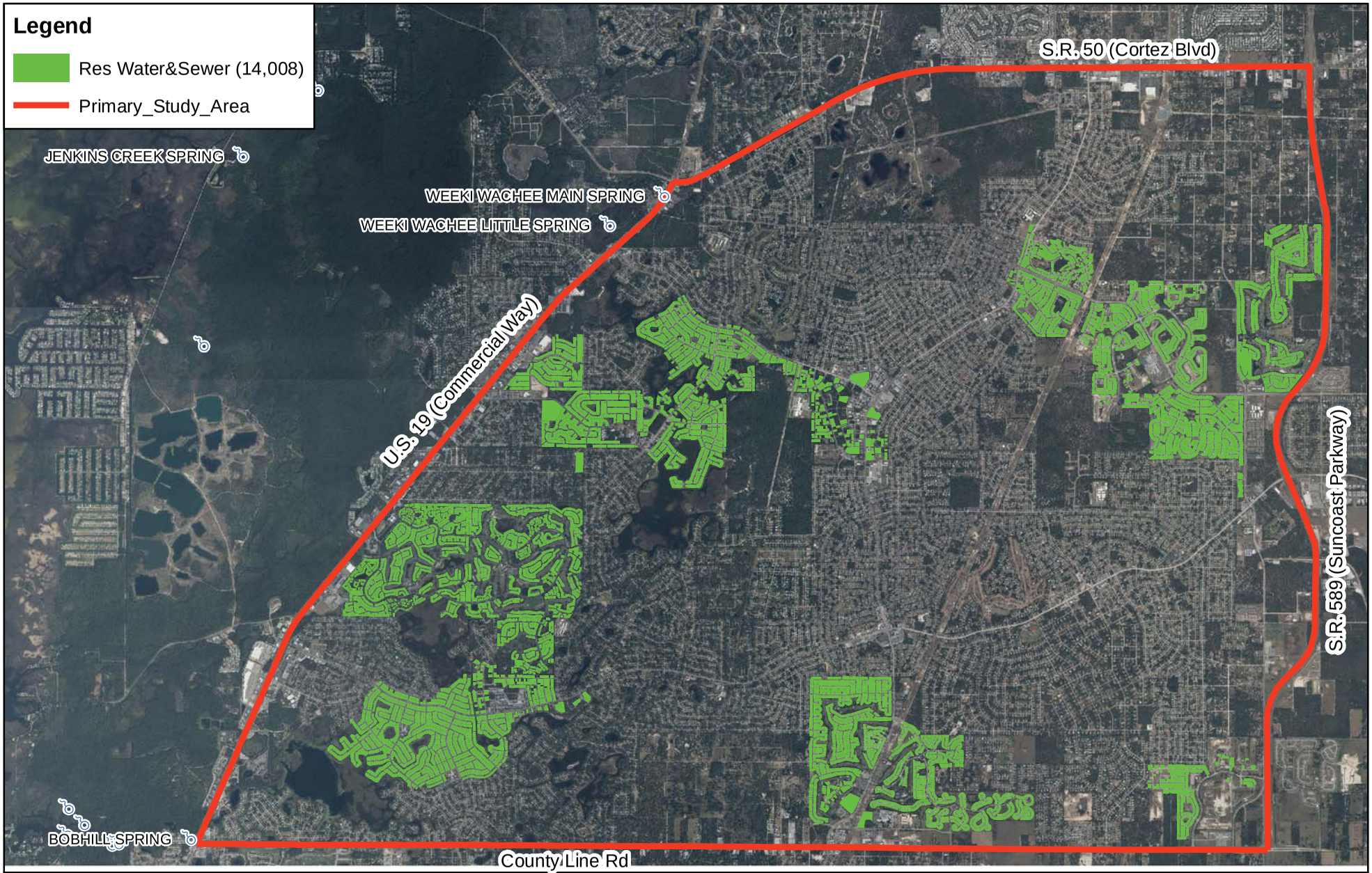


Figure 2. Residential Lots with Municipal Water & Sewer

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

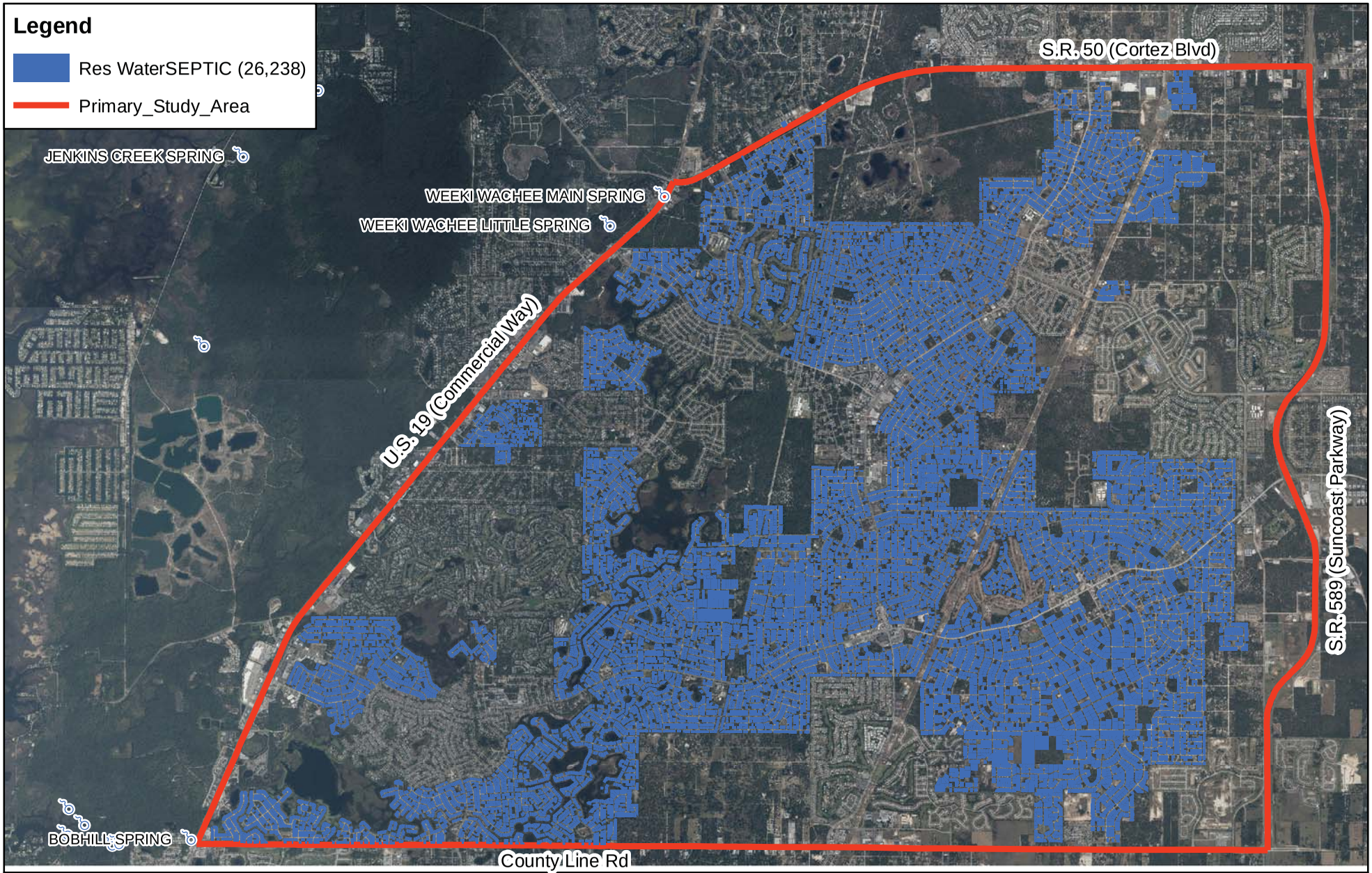


Figure 3. Residential Lots with Municipal Water and Private Septic

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

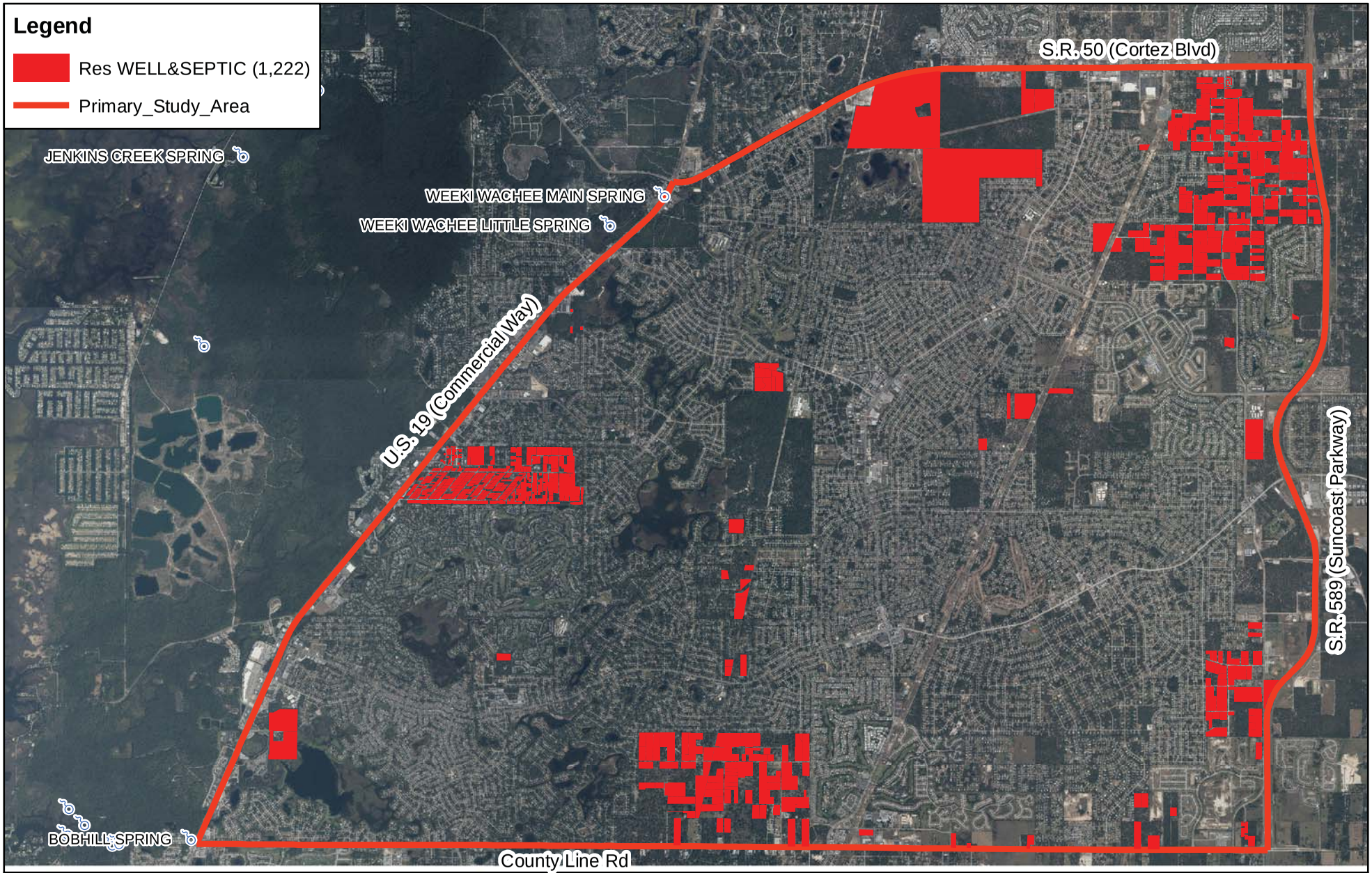


Figure 4. Residential Lots with Private Well and Private Septic

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

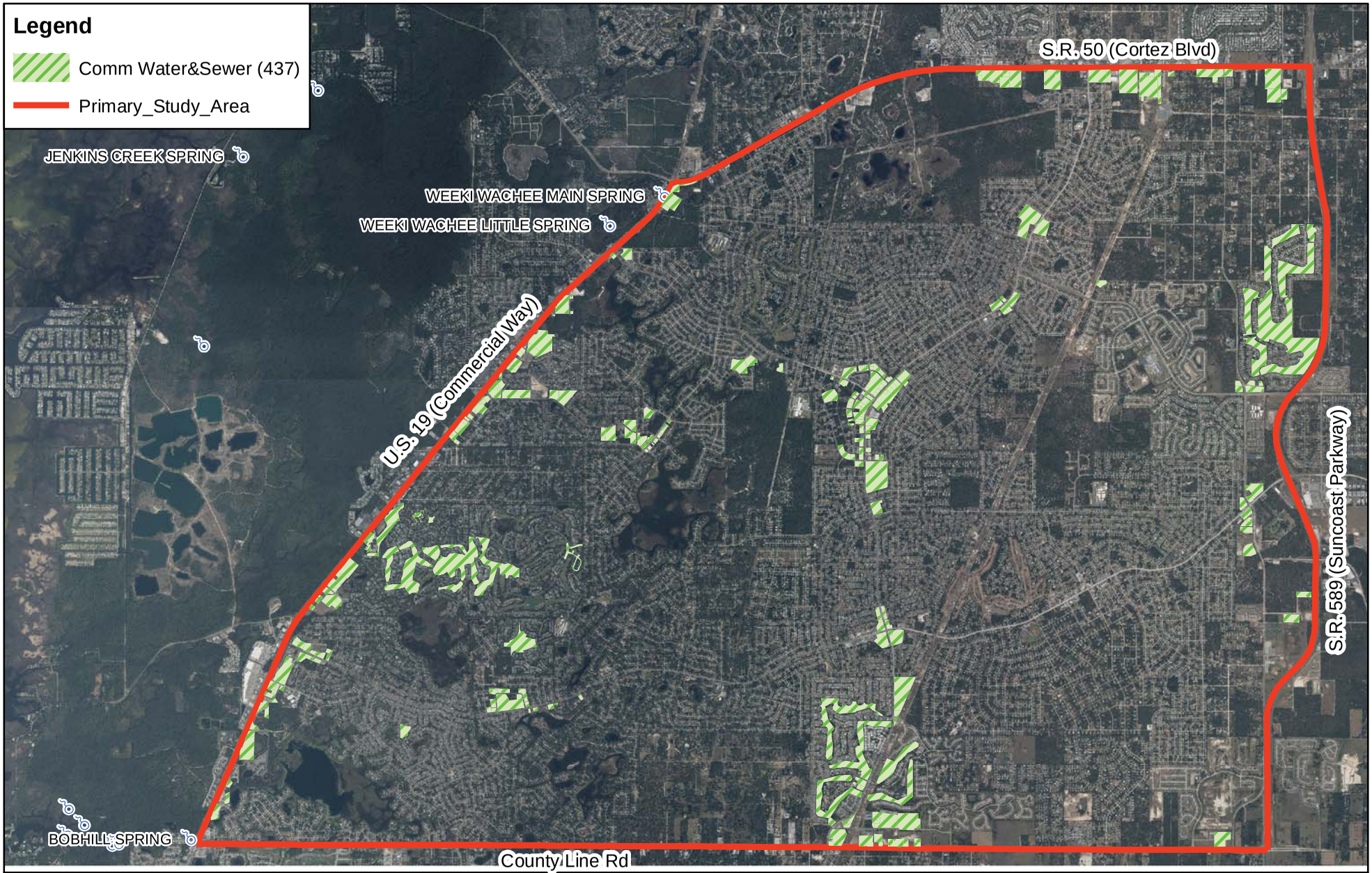


Figure 5. Commercial Lots with Municipal Water and Municipal Sewer

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

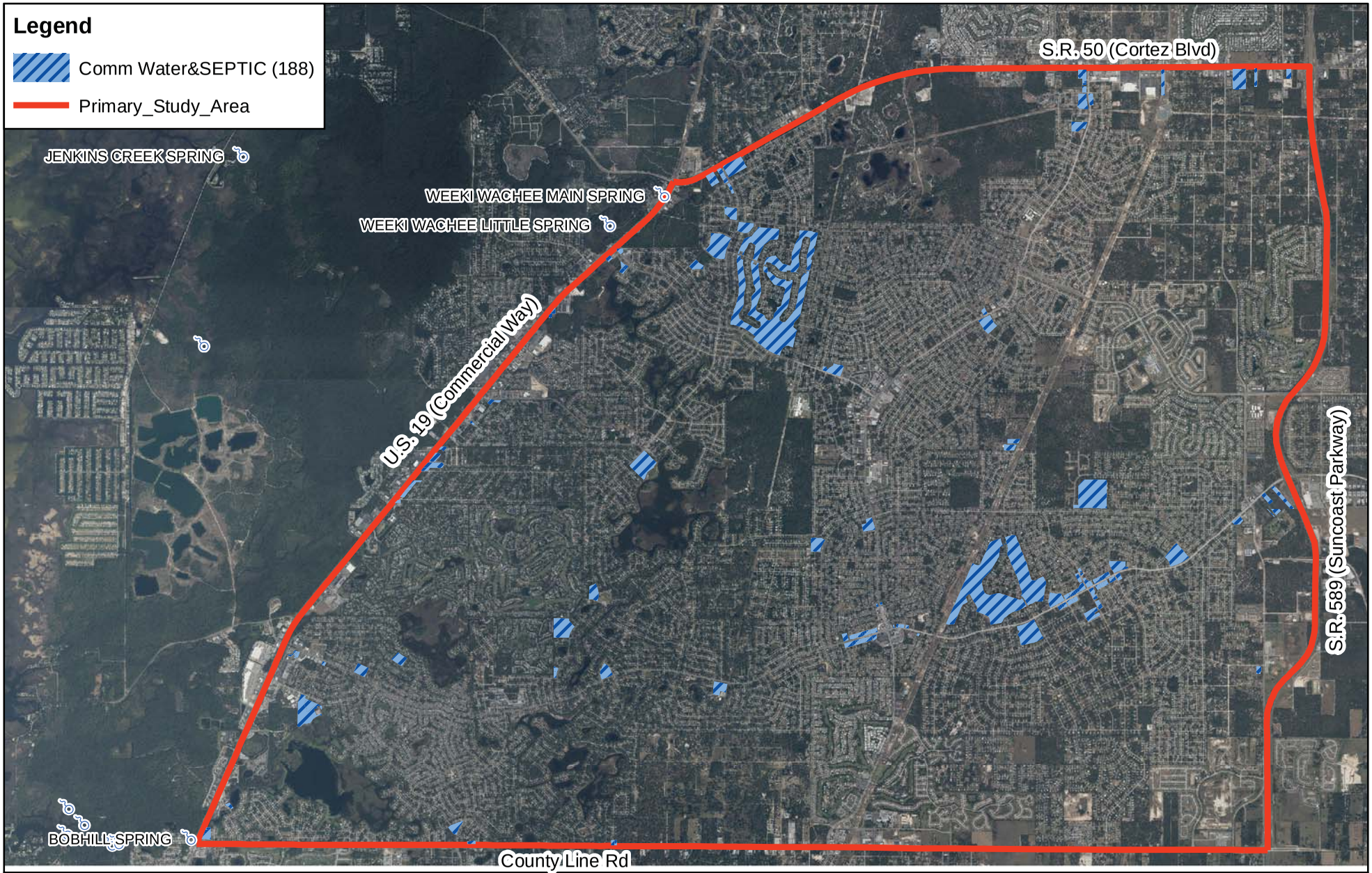


Figure 6. Commercial Lots with Municipal Water and Private Septic

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

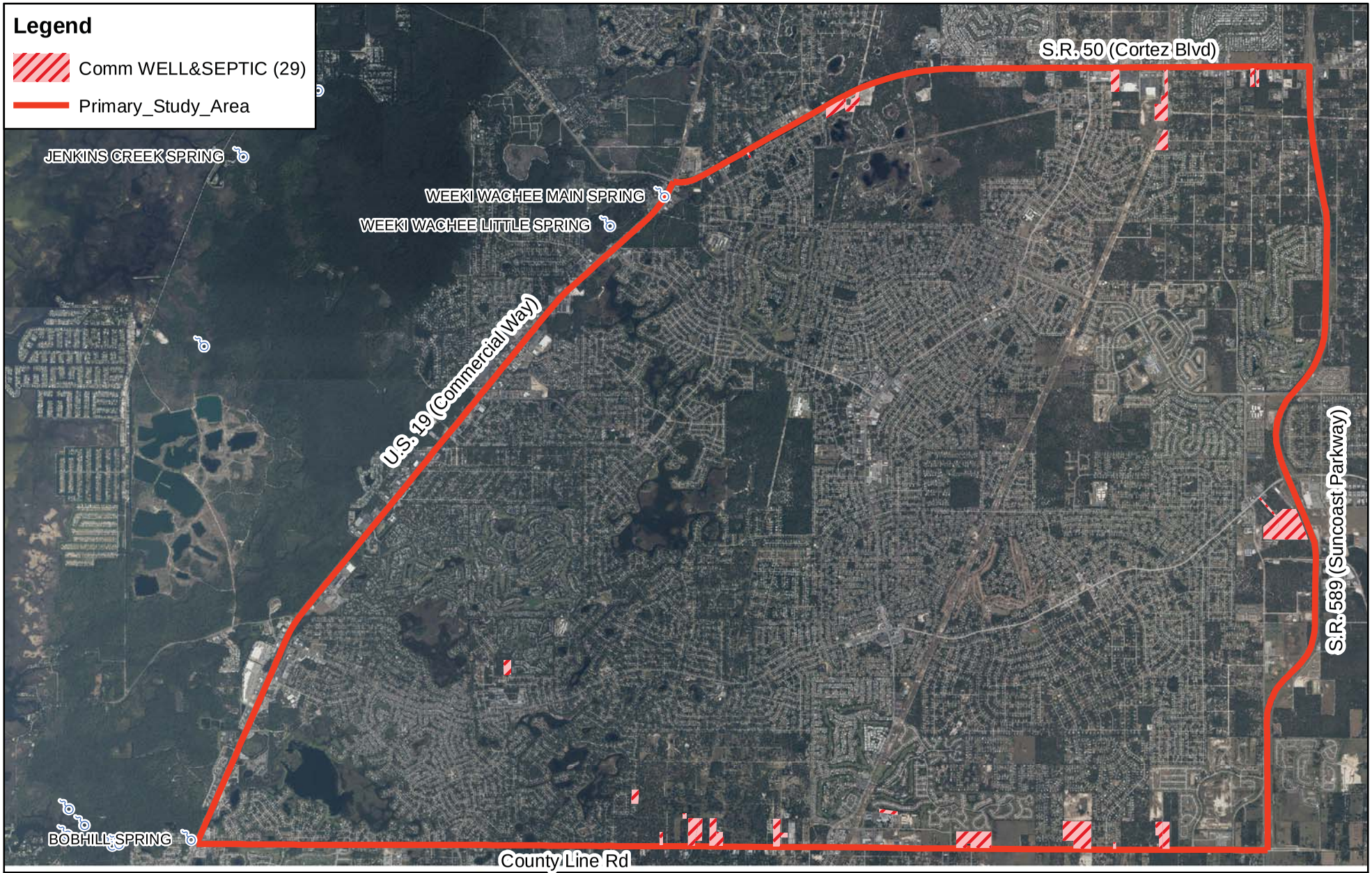


Figure 7. Commercial Lots with Private Well and Private Septic

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

Figure 8. Hernando County WWTF's

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

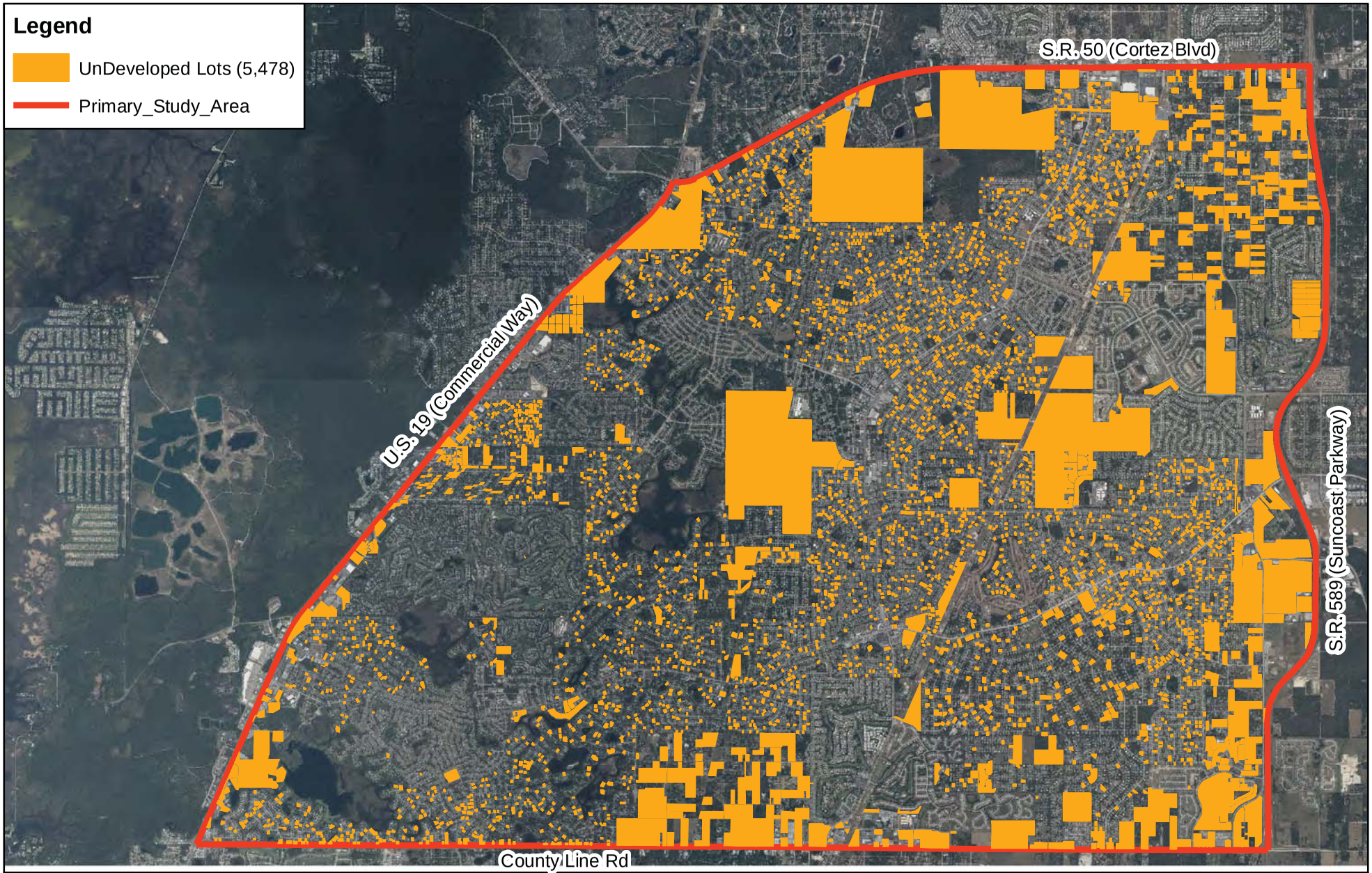


Figure 9. Undeveloped Parcels

0 0.5 1 Miles

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Traffic
Transportation
Construction Management

Exhibit B
WWTF Information

HOLIDAY SPRINGS RV RESORT WWTF

- FDEP Permit (Partial)
- Monthly Operating Reports (Sep – Nov)
- Consent Order Closure (OGC File No 10-1619)

Florida Department of
Environmental Protection
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Herschel T. Vinyard Jr.
Secretary

STATE OF FLORIDA
DOMESTIC WASTEWATER FACILITY PERMIT

PERMITTEE:
Holiday Springs RV, LLC

RESPONSIBLE AUTHORITY:

Lamont Garber , President
1211 Orange Avenue, Suite 102
Winter Park, FL 32789
(407) 740-8773
eastergeneralrealty@yahoo.com

PERMIT NUMBER: FLA012070
PA FILE NUMBER: FLA012070-004-DW3P/NR
ISSUANCE DATE: December 1, 2011
EXPIRATION DATE: November 30, 2016

FACILITY:

Holiday Springs RV Resort WWTF
138 Travel Park Drive
Spring Hill, FL 34607
Hernando County
Latitude: 28° 26’ 05” N Longitude: 82° 38’ 43” W

This permit is issued under the provisions of Chapter 403, Florida Statutes, and applicable rules of the Florida Administrative Code (F.A.C.). This permit does not constitute authorization to discharge wastewater other than as expressly stated in this permit. The above-named permittee is hereby authorized to operate the facilities in accordance with the documents attached hereto and specifically described as follows:

TREATMENT FACILITIES:
Operation of an existing 0.027 million gallons per day (MGD) Three-Month Rolling Average Daily Flow (3MRADF), Type III, extended aeration domestic wastewater treatment plant consisting of: one aeration basin of 27,000 gallons total volume, one clarifier of 10,700 gallons and 113 square feet of surface area, one chlorine contact chamber of 1,570 gallons total volume, and one digester of 5,100 gallons. This plant is operated to provide secondary treatment with basic disinfection.

REUSE:

Land Application: An existing Part IV rapid-rate land application system (R-001). R-001 consists of a single-cell Rapid Infiltration Basin (RIB) of 17,000 square feet of bottom surface area. R-00l is located approximately at latitude 28° 26’ 05” N, longitude 82° 38’ 43” W.

Land Application: An existing Part II slow-rate restricted public access land application system (R-002). R-002 consists of a sprayfield of 10,000 square feet total surface area. R-002 is located approximately at latitude 28° 26’ 05” N, longitude 81° 24’ 02” W.

The combined capacity of R-001 and R-002 is 0.027 MGD AADF

MODIFICATION:
Construction of a sprayfield pump system which allows R-002 to operate independently of R-001 and expansion of the existing sprayfield of 10,000 square feet total surface area to 14,000 square feet total surface area, the permitted capacity of the wastewater reuse system will remain the same.

REUSE AFTER MODFICATION:

Land Application: An existing Part IV rapid-rate land application system (R-001). R-001 consists of a single-cell Rapid Infiltration Basin (RIB) of 17,000 square feet of bottom surface area. R-00l is located approximately at latitude 28° 26' 05" N, longitude 82° 38' 43" W.

Land Application: An existing Part II slow-rate restricted public access land application system (R-002). R-002 consists of a sprayfield of 14,000 square feet total surface area. R-002 is located approximately at latitude 28° 26' 05" N, longitude 81° 24' 02" W.

The combined capacity of R-001 and R-002 is 0.027 MGD AADF

IN ACCORDANCE WITH: The limitations, monitoring requirements, and other conditions set forth in Pages 1 through 18 of this permit.

I. RECLAIMED WATER AND EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Reuse and Land Application Systems

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to direct reclaimed water to Reuse System R-001 & R-002. Such reclaimed water shall be limited and monitored by the permittee as specified below and reported in accordance with Condition I.B.9

			Reclaimed Water Limitations		Monitoring Requirements			
Parameter	Units	Max/Min	Limit	Statistical Basis	Frequency of Monitoring	Sample Type	Monitoring Site Number	Notes
Flow to R-001 and R-002	MGD	Max	0.027 Report	Annual Average Monthly Average	5 Days/Week	Elapsed Time Meter	FLW-01	See I.A.3
Flow to R-001	MGD	Max	Report Report	Annual Average Monthly Average	5 Days/Week	Calculation	FLW-02	See I.A.3
Flow to R-002	MGD	Max	Report Report	Annual Average Monthly Average	5 Days/Week	Flow Meter	FLW-03	See I.A.3
BOD, Carbonaceous 5 day, 20C	mg/L	Max	20.0 30.0 60.0	Annual Average Monthly Average Single Sample	Monthly Monthly Monthly	Calculation Calculation Grab	EFA-01	
Solids, Total Suspended	mg/L	Max	20.0 30.0 60.0	Annual Average Monthly Average Single Sample	Monthly Monthly Monthly	Calculation Calculation Grab	EFA-01	
Coliform, Fecal	#/100mL	Max	200 800	Annual Average Single Sample	Monthly Monthly	Calculation Grab	EFA-01	See I.A.4
pH	s.u.	Min Max	6.0 8.5	Single Sample Single Sample	5 Days/Week	Grab	EFA-01	
Chlorine, Total Residual (For Disinfection)	mg/L	Min	0.5	Single Sample	5 Days/Week	Grab	EFA-01	See I.A.5
Nitrogen, Nitrate, Total (as N)	mg/L	Max	12.0	Single Sample	Monthly	Grab	EFA-01	

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed mail this report to: Department of Environmental Protection, Domestic Wastewater Section, 13051 North Telecom Parkway, Temple Terrace, FL 33637-0926

PERMITTEE NAME: Holiday Springs RV, LLC
MAILING ADDRESS: 1211 Orange Avenue, Suite 102
Winter Park, FL 32789
eastergeneralrealty@yahoo.com
FACILITY: Holiday Springs RV Resort WWTF
LOCATION: 138 Travel Park Drive
Spring Hill, FL 34607
COUNTY: Hernando
OFFICE: SWD

PERMIT NUMBER FLA012070
LIMIT: Final
CLASS SIZE:
MONITORING GROUP Number: R-001 & R-002
MONITORING GROUP DESC: R-001 & R-002, including Influent
RE-SUBMITTED DMR
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: November 1, 2015 TO: November 30, 2015

REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, (Total Flow)	Sample Measurement	.0181		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-01	Permit Requirement	0.027 (AADF)		MGD						Monthly	Calculation
Flow, (Total Flow)	Sample Measurement		.0186	MGD					0	5 Days/Week	Elapsed Time Meter
PARM Code 50050 1 Mon.Site No. FLW-01	Permit Requirement		Report (Mo.Avg.)	MGD						5 Days/Week	Elapsed Time Meter
Flow, To R-001	Sample Measurement	.0171		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-02	Permit Requirement	Report (AADF)		MGD						Monthly	Calculation
Flow, To R-001	Sample Measurement		.0121						0	5 Days/Week	Calculation
PARM Code 50050 I Mon.Site No. FLW-02	Permit Requirement		Report (Mo.Avg.)	MGD						5 Days/Week	Calculation
Flow, (To R-002)	Sample Measurement	.0028		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-03	Permit Requirement	Report (AADF)		MGD						Monthly	Calculation
Flow, (To R-002)	Sample Measurement		.0065	MGD					0	5 Days/Week	Flow Meter
PARM Code 50050 Q Mon.Site No. FLW-03	Permit Requirement		Report (Mo Avg)	MGD						5 Days/Week	Flow Meter

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (YY/MM/DD)
Eric Karl C 8687	Eric Karl	352-848-5415	15/12/27

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

Roff_N Digitally signed by Roff_N DN: o=Florida Dept of Environmental Protection, email=Nick.Roff@dep.state.fl.us, cn=Roff_N Date: 2015.12.29 13:51:45 -05'00'

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Holiday Springs RV Resort WWTF
COUNTY: Hernando
MONITORING GROUP NUMBER: R-001 & R-002
MONITORING PERIOD From: November 1, 2015
PERMIT NUMBER: FLA012070
TO: November 30, 2015

Parameter		Quantity or Loading,		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
BOD, Carbonaceous 5 day, 20C	Sample Measurement				8.7			mg/L	0	Monthly	Calculation
PARM Code 80082 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An Avg)			mg/L		Monthly	Calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				4		4	mg/L	0	Monthly	Grab
PARM Code 80082 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo Avg)		60.0 (Max)	mg/L		Monthly	Grab
Solids, Total Suspended	Sample Measurement				3.4			mg/L	0	Monthly	Calculation
PARM Code 00530 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An Avg)			mg/L		Monthly	Calculation
Solids, Total Suspended	Sample Measurement				3.2		3.2	mg/L	0	Monthly	Grab
PARM Code 00530 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo Avg)		60.0 (Max)	mg/L		Monthly	Grab
pH	Sample Measurement				7.6		7.7	SU	0	5 Days/Week	Grab
PARM Code 00400 A Mon.Site No. EFA-01	Permit Requirement				6.0 (Min)		8.5 (Max)	SU		5 Days/Week	Grab
Coliform, Fecal	Sample Measurement				1			#/100mL	0	Monthly	Calculation
PARM Code 74055 Y Mon Site No EFA-01	Permit Requirement				200 (An Avg)			#/100mL		Monthly	Calculation
Coliform, Fecal	Sample Measurement				1		1	#/100mL	0	Monthly	Grab
PARM Code 74055 Y Mon Site No EFA-01	Permit Requirement				Report (Mo. Geo. Mean)		800 (Max)	#/100mL		Monthly	Grab
Total Chlorine Residual (For Disinfection)	Sample Measurement				1.6			mg/L	0	5 Days/Week	Grab
PARM Code 50060 A Mon.Site No. EFA-01	Permit Requirement				0.5 (Min)			mg/L		5 Days/Week	Grab
Nitrogen, Nitrate, Total (as N)	Sample Measurement						8.79	mg/L	0	Monthly	Grab
PARM Code 00620 A Mon.Site No. EFA-01	Permit Requirement						12.0 (Max)	mg/L		Monthly	Grab
	Sample Measurement										
	Permit Requirement										

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Holiday Springs RV Resort WWTF
COUNTY: Hernando
MONITORING GROUP NUMBER: R-001 & R-002
MONITORING PERIOD From: November 1, 2015
PERMIT NUMBER: FLA012070
TO: November 30, 2015

Parameter		Quantity or Loading.		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, Total Plant	Sample Measurement	.0182	.0186	MGD					0	Monthly	Calculation
PARM Code 50050 Q Mon.Site No. FLW-01	Permit Requirement	0.027 (3MRADF)	Report (Mo. Avg.)	MGD						Monthly	Calculation
Percent Capacity, (3MRADF/Permitted Capacity) x 100	Sample Measurement				67%			%	0	Monthly	Calculation
PARM Code 00180 1 Mon.Site No. FLW-01	Permit Requirement				Mo (Total Report)			%		Monthly	Calculation
BOD, Carbonaceous 5 day, 20 C	Sample Measurement				374			mg/L	0	Annually (February)	Grab
PARM Code 80082 G Mon.Site No. INF-01	Permit Requirement				Report (Mo Avg)			mg/L		Annually (February)	Grab
Solids, Total Suspended	Sample Measurement				264			mg/L	0	Annually (February)	Grab
PARM Code 00530 G Mon.Site No. INF-01	Permit Requirement				Report (Mo Avg)			mg/L		Annually (February)	Grab
Biosolids Quantity (Transferred to BTF)	Sample Measurement		0.25	dry tons					0	Monthly	Calculation
PARM Code B0007 + Mon.Site No. RMP-1	Permit Requirement		Report (Mo Total)	dry tons						Monthly	Calculation
Biosolids Quantity (Landfilled)	Sample Measurement		0	dry tons					0	Monthly	Calculation
PARM Code B0008 + Mon Site No RMP-2	Permit Requirement		Report (Mo Total)	dry tons						Monthly	Calculation
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed mail this report to: Department of Environmental Protection, Domestic Wastewater Section, 13051 North Telecom Parkway, Temple Terrace, FL 33637-0926

PERMITTEE NAME: Holiday Springs RV, LLC
MAILING ADDRESS: 1211 Orange Avenue, Suite 102
Winter Park, FL 32789
eastergeneralrealty@yahoo.com
FACILITY: Holiday Springs RV Resort WWTF
LOCATION: 138 Travel Park Drive
Spring Hill, FL 34607
COUNTY: Hernando
OFFICE: SWD

PERMIT NUMBER FLA012070
LIMIT: Final
CLASS SIZE:
MONITORING GROUP Number: R-001 & R-002
MONITORING GROUP DESC: R-001 & R-002, including Influent
RE-SUBMITTED DMR
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: October1, 2015 TO: October31, 2015

REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, (Total Flow)	Sample Measurement	.018		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-01	Permit Requirement	0.027 (AADF)		MGD						Monthly	Calculation
Flow, (Total Flow)	Sample Measurement		.0169	MGD					0	5 Days/Week	Elapsed Time Meter
PARM Code 50050 1 Mon.Site No. FLW-01	Permit Requirement		Report (Mo.Avg.)	MGD						5 Days/Week	Elapsed Time Meter
Flow, To R-001	Sample Measurement	.017		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-02	Permit Requirement	Report (AADF)		MGD						Monthly	Calculation
Flow, To R-001	Sample Measurement		.014						0	5 Days/Week	Calculation
PARM Code 50050 I Mon.Site No. FLW-02	Permit Requirement		Report (Mo.Avg.)	MGD						5 Days/Week	Calculation
Flow, (To R-002)	Sample Measurement	.0026		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-03	Permit Requirement	Report (AADF)		MGD						Monthly	Calculation
Flow, (To R-002)	Sample Measurement		.0028	MGD					0	5 Days/Week	Flow Meter
PARM Code 50050 Q Mon.Site No. FLW-03	Permit Requirement		Report (Mo Avg)	MGD						5 Days/Week	Flow Meter

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (YY/MM/DD)
Eric Karl C 8687	Eric Karl	352-848-5415	15/11/25

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Holiday Springs RV Resort WWTF
COUNTY: Hernando
MONITORING GROUP NUMBER: R-001 & R-002
MONITORING PERIOD From: October1, 2015
PERMIT NUMBER: FLA012070
TO: October31, 2015

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
BOD, Carbonaceous 5 day, 20C	Sample Measurement				9.6			mg/L	0	Monthly	Calculation
PARM Code 80082 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An Avg)			mg/L		Monthly	Calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				10		10	mg/L	0	Monthly	Grab
PARM Code 80082 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo Avg)		60.0 (Max)	mg/L		Monthly	Grab
Solids, Total Suspended	Sample Measurement				3.3			mg/L	0	Monthly	Calculation
PARM Code 00530 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An Avg)			mg/L		Monthly	Calculation
Solids, Total Suspended	Sample Measurement				0.6		0.6	mg/L	0	Monthly	Grab
PARM Code 00530 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo Avg)		60.0 (Max)	mg/L		Monthly	Grab
pH	Sample Measurement				7.6		7.8	SU	0	5 Days/Week	Grab
PARM Code 00400 A Mon.Site No. EFA-01	Permit Requirement				6.0 (Min)		8.5 (Max)	SU		5 Days/Week	Grab
Coliform, Fecal	Sample Measurement				1			#/100mL	0	Monthly	Calculation
PARM Code 74055 Y Mon Site No EFA-01	Permit Requirement				200 (An Avg)			#/100mL		Monthly	Calculation
Coliform, Fecal	Sample Measurement				1		1	#/100mL	0	Monthly	Grab
PARM Code 74055 Y Mon Site No EFA-01	Permit Requirement				Report (Mo. Geo. Mean)		800 (Max)	#/100mL		Monthly	Grab
Total Chlorine Residual (For Disinfection)	Sample Measurement				1.9			mg/L	0	5 Days/Week	Grab
PARM Code 50060 A Mon.Site No. EFA-01	Permit Requirement				0.5 (Min)			mg/L		5 Days/Week	Grab
Nitrogen, Nitrate, Total (as N)	Sample Measurement						0.55	mg/L	0	Monthly	Grab
PARM Code 00620 A Mon.Site No. EFA-01	Permit Requirement						12.0 (Max)	mg/L		Monthly	Grab
	Sample Measurement										
	Permit Requirement										

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Holiday Springs RV Resort WWTF
COUNTY: Hernando
MONITORING GROUP NUMBER: R-001 & R-002
MONITORING PERIOD From: October1, 2015
PERMIT NUMBER: FLA012070
TO: October31, 2015

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, Total Plant	Sample Measurement	.02	.0169	MGD					0	Monthly	Calculation
PARM Code 50050 Q Mon.Site No. FLW-01	Permit Requirement	0.027 (3MRADF)	Report (Mo. Avg.)	MGD						Monthly	Calculation
Percent Capacity, (3MRADF/Permitted Capacity) x 100	Sample Measurement				74%			%	0	Monthly	Calculation
PARM Code 00180 1 Mon.Site No. FLW-01	Permit Requirement				Mo (Total Report)			%		Monthly	Calculation
BOD, Carbonaceous 5 day, 20 C	Sample Measurement				MNR			mg/L	0	Annually (February)	Grab
PARM Code 80082 G Mon.Site No. INF-01	Permit Requirement				Report (Mo Avg)			mg/L		Annually (February)	Grab
Solids, Total Suspended	Sample Measurement				MNR			mg/L	0	Annually (February)	Grab
PARM Code 00530 G Mon.Site No. INF-01	Permit Requirement				Report (Mo Avg)			mg/L		Annually (February)	Grab
Biosolids Quantity (Transferred to BTF)	Sample Measurement		0	dry tons					0	Monthly	Calculation
PARM Code B0007 + Mon.Site No. RMP-1	Permit Requirement		Report (Mo Total)	dry tons						Monthly	Calculation
Biosolids Quantity (Landfilled)	Sample Measurement		0	dry tons					0	Monthly	Calculation
PARM Code B0008 + Mon Site No RMP-2	Permit Requirement		Report (Mo Total)	dry tons						Monthly	Calculation
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed mail this report to: Department of Environmental Protection, Domestic Wastewater Section, 13051 North Telecom Parkway, Temple Terrace, FL 33637-0926

PERMITTEE NAME: Holiday Springs RV, LLC
MAILING ADDRESS: 1211 Orange Avenue, Suite 102
Winter Park, FL 32789
eastergeneralrealty@yahoo.com
FACILITY: Holiday Springs RV Resort WWTF

LOCATION: 138 Travel Park Drive
Spring Hill, FL 34607
:

COUNTY: Hernando
OFFICE: SWD

PERMIT NUMBER FLA012070

LIMIT: Final
CLASS SIZE:
MONITORING GROUP Number: R-001 & R-002
MONITORING GROUP DESC: R-001 & R-002, including Influent
RE-SUBMITTED DMR

NO DISCHARGE FROM SITE: ☐

MONITORING PERIOD From: September 1, 2015 TO: September 30, 2015

REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Roff_N Digitally signed by Roff_N DN: o=Florida Dept of Environmental Protection, email=Nick.Roff@dep.state.fl.us, cn=Roff_N Date: 2015.10.26 09:21:55 -04'00'

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, (Total Flow)	Sample Measurement	.018		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-01	Permit Requirement	0.027 (AADF)		MGD						Monthly	Calculation
Flow, (Total Flow)	Sample Measurement		.019	MGD					0	5 Days/Week	Elapsed Time Meter
PARM Code 50050 1 Mon.Site No. FLW-01	Permit Requirement		Report (Mo.Avg.)	MGD						5 Days/Week	Elapsed Time Meter
Flow, To R-001	Sample Measurement	.017		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-02	Permit Requirement	Report (AADF)		MGD						Monthly	Calculation
Flow, To R-001	Sample Measurement		.0158						0	5 Days/Week	Calculation
PARM Code 50050 1 Mon.Site No. FLW-02	Permit Requirement		Report (Mo.Avg.)	MGD						5 Days/Week	Calculation
Flow, (To R-002)	Sample Measurement	.0027		MGD					0	Monthly	Calculation
PARM Code 50050 Y Mon.Site No. FLW-03	Permit Requirement	Report (AADF)		MGD						Monthly	Calculation
Flow, (To R-002)	Sample Measurement		.0033	MGD					0	5 Days/Week	Flow Meter
PARM Code 50050 Q Mon.Site No. FLW-03	Permit Requirement		Report (Mo Avg)	MGD						5 Days/Week	Flow Meter

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (YY/MM/DD)
Eric Karl C 8687	Eric Karl	352-848-5415	15/10/25

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Holiday Springs RV Resort WWTF
COUNTY: Hernando
MONITORING GROUP NUMBER: R-001 & R-002
MONITORING PERIOD From: September 1, 2015
PERMIT NUMBER: FLA012070
TO: September 30, 2015

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
BOD, Carbonaceous 5 day, 20C	Sample Measurement				8.9			mg/L	0	Monthly	Calculation
PARM Code 80082 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An Avg)			mg/L		Monthly	Calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				12		12	mg/L	0	Monthly	Grab
PARM Code 80082 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo Avg)		60.0 (Max)	mg/L		Monthly	Grab
Solids, Total Suspended	Sample Measurement				3.7			mg/L	0	Monthly	Calculation
PARM Code 00530 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An Avg)			mg/L		Monthly	Calculation
Solids, Total Suspended	Sample Measurement				0.2		0.2	mg/L	0	Monthly	Grab
PARM Code 00530 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo Avg)		60.0 (Max)	mg/L		Monthly	Grab
pH	Sample Measurement				7.5		7.8	SU	0	5 Days/Week	Grab
PARM Code 00400 A Mon.Site No. EFA-01	Permit Requirement				6.0 (Min)		8.5 (Max)	SU		5 Days/Week	Grab
Coliform, Fecal	Sample Measurement				1			#/100mL	0	Monthly	Calculation
PARM Code 74055 Y Mon Site No EFA-01	Permit Requirement				200 (An Avg)			#/100mL		Monthly	Calculation
Coliform, Fecal	Sample Measurement				1		1	#/100mL	0	Monthly	Grab
PARM Code 74055 Y Mon Site No EFA-01	Permit Requirement				Report (Mo. Geo. Mean)		800 (Max)	#/100mL		Monthly	Grab
Total Chlorine Residual (For Disinfection)	Sample Measurement				1.6			mg/L	0	5 Days/Week	Grab
PARM Code 50060 A Mon.Site No. EFA-01	Permit Requirement				0.5 (Min)			mg/L		5 Days/Week	Grab
Nitrogen, Nitrate, Total (as N)	Sample Measurement						1.57	mg/L	0	Monthly	Grab
PARM Code 00620 A Mon.Site No. EFA-01	Permit Requirement						12.0 (Max)	mg/L		Monthly	Grab
	Sample Measurement										
	Permit Requirement										

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Holiday Springs RV Resort WWTF
COUNTY: Hernando

MONITORING GROUP NUMBER: R-001 & R-002
MONITORING PERIOD From: September 1, 2015

PERMIT NUMBER: FLA012070
TO: September 30, 2015

Parameter		Quantity or Loading.		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, Total Plant	Sample Measurement	.02	.019	MGD					0	Monthly	Calculation
PARM Code 50050 Q Mon.Site No. FLW-01	Permit Requirement	0.027 (3MRADF)	Report (Mo. Avg.)	MGD						Monthly	Calculation
Percent Capacity, (3MRADF/Permitted Capacity) x 100	Sample Measurement				74%			%	0	Monthly	Calculation
PARM Code 00180 1 Mon.Site No. FLW-01	Permit Requirement				Mo (Total Report)			%		Monthly	Calculation
BOD, Carbonaceous 5 day, 20 C	Sample Measurement				MNR			mg/L	0	Annually (February)	Grab
PARM Code 80082 G Mon.Site No. INF-01	Permit Requirement				Report (Mo Avg)			mg/L		Annually (February)	Grab
Solids, Total Suspended	Sample Measurement				MNR			mg/L	0	Annually (February)	Grab
PARM Code 00530 G Mon.Site No. INF-01	Permit Requirement				Report (Mo Avg)			mg/L		Annually (February)	Grab
Biosolids Quantity (Transferred to BTF)	Sample Measurement		0.25	dry tons					0	Monthly	Calculation
PARM Code B0007 + Mon.Site No. RMP-1	Permit Requirement		Report (Mo Total)	dry tons						Monthly	Calculation
Biosolids Quantity (Landfilled)	Sample Measurement		0	dry tons					0	Monthly	Calculation
PARM Code B0008 + Mon Site No RMP-2	Permit Requirement		Report (Mo Total)	dry tons						Monthly	Calculation
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										
	Sample Measurement										
	Permit Requirement										

From: Defoe, Catherine on behalf of Gucciardo, Tom
Sent: Thursday, November 15, 2012 11:51 AM
To: 'eastergeneralrealty@yahoo.com'; Roughton, Laurie; 'erickarl63@yahoo.com'; 'julian@excelengineers.com'; 'holidayspring@aol.com'; Holland, Kathryn
Cc: Gucciardo, Tom
Subject: Case Closure Ltr 11-14-12 Holiday Springs RV Resort
Attachments: 1. Case Closure Ltr 11-14-12 Holiday Springs RV Resort _ Hernando Co..pdf

Good Morning,

Attached please find the subject letter. This is the only copy that you will receive.

Acrobat Reader 6.0 or greater is required to read this document. It is available for downloading at: http://www.adobe.com/products/acrobat/readstep.html.

If you have any questions concerning the contents of this letter, please contact Tom Gucciardo at Tom.Gucciardo@dep.state.fl.us. If you have any difficulty reading and/or printing the document, please contact me.

Thanks,
Catherine

Catherine Defoe
Industrial Wastewater
Department of Environmental Protection
13051 North Telecom Parkway
Temple Terrace, FL 33637-0926

The Department of Environmental Protection values your feedback as a customer. DEP Secretary Herschel T. Vinyard Jr. is committed to continuously assessing and improving the level and quality of services provided to you. Please take a few minutes to comment on the quality of service you received. Simply click on this link to the DEP Customer Survey. Thank you in advance for completing the survey.

Florida Department of
Environmental Protection
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Hershel T. Vineyard Jr.
Secretary

November 15, 2012

Mr. Lamont Garber, President
Holiday Springs RV, LLC
1211 Orange Avenue, Suite 102
Winter Park, FL 32789
eastergeneralrealty@yahoo.com

Re: Case Closure
OGC File No. 10-1619
Holiday Springs RV Resort WWTF
Facility ID No. FLA012070
Hernando County

Dear Mr. Garber:

Consent Order OGC File No. 10-1619 addressed wastewater disposal issues at the wastewater treatment facility at the Holiday Springs RV Resort. The effective date of the Consent Order was February 8, 2011. The corrective actions necessary to return the above-referenced facility to compliance were completed. The Department is in receipt of the payment of civil penalties and costs totaling $6,000.00.

The Department shall, therefore, close the case on this matter. Your efforts to return this facility to compliance are greatly appreciated. Should you have any questions, please contact Thomas Gucciardo at (813) 632-7600, extension 280, or via e-mail: tom.gucciardo@dep.state.fl.us.

Sincerely,

Joe Squitieri
Environmental Manager
Compliance/Enforcement
Domestic Wastewater Program

JS/tg/cd

cc: Laurie Roughton, FDEP, laurie.roughton@dep.state.fl.us
Eric Karl , Operator, erickarl63@yahoo.com
Julian Coto, Excel Engineering, julian@excelengineers.com
Rich Rehkopf, holidayspring@aol.com
Susan Rehkopf, holidayspringsrvresort.com

CASE CLOSURE REQUEST FORM: ENFORCEMENT

To: Larry Morgan, OGC Enforcement Section
From: Tom Gucciardo, SWD
Through: Joe Squitieri, SWD
Date: November 13, 2012
Subject: Case Closure Request
Holiday Springs RV, LLC, OGC No. 10-1619

The District requests the above referenced case be closed for the following reason(s):

☑ All terms and conditions of the Consent Order entered on February 8, 2011 have been satisfactorily completed.

☐ Compliance without formal enforcement.

☐ District decision not to pursue further enforcement. *Explanation:*
INSERT A BRIEF EXPLANATION HERE.

☐ OGC Case No. xx-xxxx issued in error; case being tracked under OGC No. xx-xxxx

☐ Other. *Explanation:*
INSERT A BRIEF EXPLANATION.

CORRECTIVE ACTIONS:

☐ No corrective actions or restoration are required.

☑ Corrective actions or restoration completed as required.

ASSESSMENTS:

☐ No monies assessed. ☑ Monies paid in full.

☐ Choose one ▾ project allowed in lieu of civil penalties. *Project description, including status:*
INSERT A BRIEF DESCRIPTION OF THE PROJECT HERE.

Costs paid in the amount of	$ 500.00	
Penalties paid in the amount of	$5,500.00	Lease fees/arrears
In-kind or P2 completed at value of	$ xx.xx	paid in the amount of $ xx.xx

Please note: *Closure requests for cases awaiting write-off or collection will become a part of OGC's file but will not be closed in LCT until OGC receives notification from the Department of Financial Services that write-off or collection has occurred. In any case requiring corrective actions/restoration, you must confirm of completion of corrective actions/restoration before the case will be closed in LCT.*

----------**FOR OGC USE ONLY**----------

OGC COMMENTS:

TOPICS RV COMMUNITY WWTF

- FDEP Permit (Partial)
- Monthly Operating Reports (Sep – Nov)

Florida Department of
Environmental Protection
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Herschel T. Vinyard Jr.
Secretary

STATE OF FLORIDA
DOMESTIC WASTEWATER FACILITY PERMIT

PERMITTEE:
Equity Lifestyle Properties, Inc./Topics RVP, LLC

RESPONSIBLE AUTHORITY:

Brad Nelson
Vice President
5100 W. Lemon Street, Suite 308
Tampa, FL 33609
Brad_Nelson@equitylifestyle.com

(813) 282-6754

PERMIT NUMBER: FLA012065
PA FILE NUMBER: FLA012065-004-DW3P/NR
ISSUANCE DATE: July 22. 2011
EXPIRATION DATE: July 21, 2016

FACILITY:

Topics RV Community WWTF
13063 County Line Road
Spring Hill, FL 34609
Hernando County
Latitude: 28° 26' 14" N Longitude: 82° 30' 51" W

This permit is issued under the provisions of Chapter 403, Florida Statutes, and applicable rules of the Florida Administrative Code (F.A.C.). This permit does not constitute authorization to discharge wastewater other than as expressly stated in this permit. The above named permittee is hereby authorized to operate the facilities in accordance with the documents attached hereto and specifically described as follows:

TREATMENT FACILITIES:
Operation of an existing 0.025 million gallons per day (MGD) Three-Month Rolling Average Daily Flow (3MRADF), Type III, extended aeration domestic wastewater treatment plant consisting of: one equalization basin of 15,000 gallons total volume, one aeration basin of 25,000 gallons total volume, one clarifier of 7,300 gallons total volume and 136 square feet of surface area, one chlorine contact chamber of 700 gallons total volume, and three aerobic digesters of 10,179 gallons total volume. This plant is operated to provide secondary treatment with basic disinfection.

REUSE:

Land Application: An existing 0.025 MGD Annual Average Daily Flow (AADF) permitted capacity Part IV rapid-rate land application system (R-001). R-001 consists of a two-cell Rapid Infiltration Basin (RIB) of 8,265 square feet of bottom surface area. R-001 is located approximately at latitude 28° 26' 14" N, longitude 82° 30' 51" W.

IN ACCORDANCE WITH: The limitations, monitoring requirements and other conditions set forth in Pages 1 through 16 of this permit.

I. RECLAIMED WATER AND EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Reuse and Land Application Systems

1. During the period beginning on the issuance date and lasting through the expiration date of this permit, the permittee is authorized to direct reclaimed water to Reuse System R-001. Such reclaimed water shall be limited and monitored by the permittee as specified below and reported in accordance with condition I.B.9

			Reclaimed Water Limitations				Monitoring Requirements			
Parameter	Units	Max/Min	Annual Average	Monthly Average	Weekly Average	Single Sample	Monitoring Frequency	Sample Type	Monitoring Location Site Number	Notes
Flow, to R-001	MGD	Maximum	0.025	Report	-	-	5 Days/Week	Elapsed Time Meter	FLW-01	See Cond.I.A.3
BOD, Carbonaceous 5 day, 20C	MG/L	Maximum	20.0	30.0	-	60.0	Monthly	Grab	EFA-01	
Solids, Total Suspended	MG/L	Maximum	20.0	30.0	-	60.0	Monthly	Grab	EFA-01	
pH	SU	Range	-	-	-	6.0 to 8.5	5 Days/Week	Grab	EFA-01	
Coliform, Fecal	#/100ML	Maximum	200	-	-	800	Monthly	Grab	EFA-01	See Cond.I.A.4
Total Chlorine Residual (For Disinfection)	MG/L	Minimum	-	-	-	0.5	5 Days/Week	Grab	EFA-01	See Cond.I.A.5
Nitrogen, Nitrate, Total (as N)	MG/L	Maximum	-	-	-	12.0	Monthly	Grab	EFA-01	

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed mail this report to: Department of Environmental Protection, Wastewater Compliance Evaluation Section, 13051 North Telecom Parkway, Temple Terrace, FL 33637-0926

PERMITTEE NAME: Equity Lifestyle Properties, Inc./Topics RVP, LLC
MAILING ADDRESS: 5100 W. Lemon Street, Suite 308
Tampa, FL 33609
Brad_Nelson@equitylifestyle.com

FACILITY: Topics RV Community WWTF

LOCATION: 13063 County Line Road
Spring Hill, FL 34609

COUNTY: Hernando
OFFICE: SWD

PERMIT NUMBER: FLA012065
LIMIT: Final
CLASS SIZE:
MONITORING GROUP NUMBER: R-001
MONITORING GROUP DESCRIPTION: RIB, including Influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: 1 SEPT 2015 through: 30 SEPT 2015

Expiration Date: 21 July 16
REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Dept. Of Environmental Protection
OCT 26 2015
Southwest District

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, To R-001	Sample Measurement	0.01		mgd					0	monthly	calculation
PARM Code 50050 Y Mon.Site No. FLW-01	Permit Requirement	0.025 (AADF)		mgd						monthly	calculation
Flow, To R-001	Sample Measurement	0.014		mgd					0	5 days/week	elapsed time meter
PARM Code 50050 1 Mon.Site No. FLW-01	Permit Requirement	Report (Mo.Avg.)		mgd						5 days/week	elapsed time meter
BOD, Carbonaceous 5 day, 20C	Sample Measurement				8.6			mg/l	0	monthly	calculation
PARM Code 80082 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An.Avg.)			mg/l		monthly	calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				9.0		9.0	mg/l	0	monthly	grab
PARM Code 80082 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo.Avg.)		60.0 (Max.)	mg/l		monthly	grab
Solids, Total Suspended	Sample Measurement				1.3			mg/l	0	monthly	calculation
PARM Code 00530 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An.Avg.)			mg/l		monthly	calculation
Solids, Total Suspended	Sample Measurement				2.8		2.8	mg/l	0	monthly	grab
PARM Code 00530 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo.Avg.)		60.0 (Max.)	mg/l		monthly	grab

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (MM/DD/YYYY)
T. Felton/Operator		3527872493	10/10/2015

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Topics RV Community WWTF

Hernando County

MONITORING GROUP NUMBER: R-001

PERMIT NUMBER: FLA012065

MONITORING PERIOD From: 1 SEPT 2015 through: 30 SEPT 2015

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
pH	Sample Measurement				7.3		7.5	su	0	5 days/week	grab
PARM Code 00400 A Mon.Site No. EFA-01	Permit Requirement				6.0 (Min.)		8.5 (Max.)	su		5 days/week	grab
Coliform, Fecal	Sample Measurement				1			#/100ml	0	monthly	calculation
PARM Code 74055 Y Mon.Site No. EFA-01	Permit Requirement				200 (An.Avg.)			#/100ml		monthly	calculation
Coliform, Fecal	Sample Measurement				3		3	#/100ml	0	monthly	grab
PARM Code 74055 A Mon.Site No. EFA-01	Permit Requirement				Report (Mo.Geo.Mean)		800 (Max.)	#/100ml		monthly	grab
Total Chlorine Residual (For Disinfection)	Sample Measurement				2.2			mg/l	0	5 days/week	grab
PARM Code 50060 A Mon.Site No. EFA-01	Permit Requirement				0.5 (Min.)			mg/l		5 days/week	grab
Nitrogen, Nitrate, Total (as N)	Sample Measurement						0.12	mg/l	0	monthly	grab
PARM Code 00620 A Mon.Site No. EFA-01	Permit Requirement						12.0 (Max.)	mg/l		monthly	grab
Flow, Total Plant	Sample Measurement	0.01	0.014	mgd					0	monthly	calculation
PARM Code 50050 Q Mon.Site No. FLW-01	Permit Requirement	0.025 (3MRADF)	Report (Mo. Avg.)	mgd						monthly	calculation
Percent Capacity, (3MRADF/Permitted Capacity) x 100	Sample Measurement				40			%	0	monthly	calculation
PARM Code 00180 1 Mon.Site No. FLW-01	Permit Requirement				Report (Mo. Total)			%		monthly	calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				MNR			mg/l	0	annually (february) ✓	grab
PARM Code 80082 G Mon.Site No. INF-01	Permit Requirement				Report (Mo. Avg.)			mg/l		annually (february)	grab
Solids, Total Suspended	Sample Measurement				MNR			mg/l	0	annually (february) ✓	grab
PARM Code 00530 G Mon.Site No. INF-01	Permit Requirement				Report (Mo. Avg.)			mg/l		annually (february)	grab
Biosolids Quantity (Transferred to BTF)	Sample Measurement		0	dry tons					0	monthly	calculation
PARM Code B0007 + Mon. Site No. RMP-1	Permit Requirement		Report (Mo.Total)	dry tons						monthly	calculation
Biosolids Quantity (Landfilled)	Sample Measurement		0	dry tons					0	monthly	calculation
PARM Code B0008 + Mon. Site No. RMP-2	Permit Requirement		Report (Mo.Total)	dry tons						monthly	calculation

DAILY SAMPLE RESULTS - PART B (R-001)

Permit Number: FLA012065
Monitoring Period From: 1 SEPT 2015 through: 30 SEPT 2015
Facility: Topics RV Community WWTF
County: Hernando

	Flow (MGD) X 1000 Gallons R-001 & Total Plant	CBOD5 (mg/L)	TSS (mg/L)	Fecal Coliform Bacteria (#/100mL)	PH (SU)	TCR (For Disinfect.) (mg/L)	Nitrogen, Nitrate, Total (as N) (mg/L)	Gallons of liquid biosolids hauled
Code	50050	80082	00530	74055	00400	50060	00620	
Mon. Site	FLW-01	EFA-01	EFA-01	EFA-01	EFA-01	EFA-01	EFA-01	
1	0.008				7.4	2.2		
2	0.010				7.4	2.2		
3	0.018				7.3	2.2		
4	0.019				7.4	2.2		
5	0.019							
6	0.020				7.4	2.2		
7	0.014				7.4	2.2		
8	0.010				7.4	2.2		
9	0.010				7.4	2.2		
10	0.007				7.3	2.2		
11	0.016				7.3	2.2		
12	0.016							
13	0.017				7.4	2.2		
14	0.011				7.4	2.2		
15	0.006	9	2.8	3	7.5	2.2		
16	0.011				7.5	2.2	0.12	
17	0.010				7.4	2.2		
18	0.008				7.4	2.2		
19	0.012							
20	0.012				7.4	2.2		
21	0.014				7.4	2.2		
22	0.015				7.4	2.2		
23	0.016				7.3	2.2		
24	0.019				7.3	2.2		
25	0.019				7.4	2.2		
26	0.017							
27	0.018				7.4	2.2		
28	0.014				7.4	2.2		
29	0.014				7.4	2.2		
30	0.015				7.4	2.2		
31								
Total	0.415							
Mo. Avg.	0.014	9	2.8	3			0.12	

PLANT STAFFING:

Day Shift Operator	Class:	C	Certificate No:	0012637	Name:	T Levi
Evening Shift Operator	Class:	A	Certificate No:	0014107	Name:	D Harris
Night Shift Operator	Class:	B	Certificate No:	0015074	Name:	L Bing
Lead Operator	Class:	C	Certificate No:	002817	Name:	T Felton

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed mail this report to: Department of Environmental Protection, Wastewater Compliance Evaluation Section, 13051 North Telecom Parkway, Temple Terrace, FL 33637-0926

PERMITTEE NAME: Equity Lifestyle Properties, Inc./Topics RVP, LLC
MAILING ADDRESS: 5100 W. Lemon Street, Suite 308
Tampa, FL 33609
Brad_Nelson@equitylifestyle.com

FACILITY: Topics RV Community WWTF

LOCATION: 13063 County Line Road
Spring Hill, FL 34609

COUNTY: Hernando
OFFICE: SWD

PERMIT NUMBER: FLA012065
LIMIT: Final
CLASS SIZE:
MONITORING GROUP NUMBER: R-001
MONITORING GROUP DESCRIPTION: RIB, including Influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: 1 OCT 2015 through: 31 OCT 2015

Expiration Date: **21 July 16**
REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, To R-001	Sample Measurement	0.011		mgd					0	monthly	calculation
PARM Code 50050 Y Mon.Site No. FLW-01	Permit Requirement	0.025 (AADF)		mgd						monthly	calculation
Flow, To R-001	Sample Measurement	0.016		mgd					0	5 days/week	elapsed time meter
PARM Code 50050 1 Mon.Site No. FLW-01	Permit Requirement	Report (Mo.Avg.)		mgd						5 days/week	elapsed time meter
BOD, Carbonaceous 5 day, 20C	Sample Measurement				8.9			mg/l	0	monthly	calculation
PARM Code 80082 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An.Avg.)			mg/l		monthly	calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				10.0		10.0	mg/l	0	monthly	grab
PARM Code 80082 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo.Avg.)		60.0 (Max.)	mg/l		monthly	grab
Solids, Total Suspended	Sample Measurement				1.5			mg/l	0	monthly	calculation
PARM Code 00530 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An.Avg.)			mg/l		monthly	calculation
Solids, Total Suspended	Sample Measurement				3.0		3.0	mg/l	0	monthly	grab
PARM Code 00530 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo.Avg.)		60.0 (Max.)	mg/l		monthly	grab

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (MM/DD/YYYY)
T. Felton/Operator		3527872493	11/10/2015

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

D.E.P
SOUTHWEST DISTRICT
NOV 20 2015
TAMPA

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Topics RV Community WWTF
Hernando County

MONITORING GROUP NUMBER: R-001
MONITORING PERIOD From: 1 OCT 2015 through: 31 OCT 2015

PERMIT NUMBER: FLA012065

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
pH	Sample Measurement				7.3		7.4	su	0	5 days/week	grab
PARM Code 00400 A Mon.Site No. EFA-01	Permit Requirement				6.0 (Min.)		8.5 (Max.)	su		5 days/week	grab
Coliform, Fecal	Sample Measurement				2			#/100ml	0	monthly	calculation
PARM Code 74055 Y Mon.Site No. EFA-01	Permit Requirement				200 (An.Avg.)			#/100ml		monthly	calculation
Coliform, Fecal	Sample Measurement				2		2	#/100ml	0	monthly	grab
PARM Code 74055 A Mon.Site No. EFA-01	Permit Requirement				Report (Mo.Geo.Mean)		800 (Max.)	#/100ml		monthly	grab
Total Chlorine Residual (For Disinfection)	Sample Measurement				2.2			mg/l	0	5 days/week	grab
PARM Code 50060 A Mon.Site No. EFA-01	Permit Requirement				0.5 (Min.)			mg/l		5 days/week	grab
Nitrogen, Nitrate, Total (as N)	Sample Measurement						19	mg/l	1	monthly	grab
PARM Code 00620 A Mon.Site No. EFA-01	Permit Requirement						12.0 (Max.)	mg/l		monthly	grab
Flow, Total Plant	Sample Measurement	0.013	0.016	mgd					0	monthly	calculation
PARM Code 50050 Q Mon.Site No. FLW-01	Permit Requirement	0.025 (3MRADF)	Report (Mo. Avg.)	mgd						monthly	calculation
Percent Capacity, (3MRADF/Permitted Capacity) x 100	Sample Measurement				52			%	0	monthly	calculation
PARM Code 00180 1 Mon.Site No. FLW-01	Permit Requirement				Report (Mo. Total)			%		monthly	calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				MNR			mg/l	0	annually (february)	grab
PARM Code 80082 G Mon.Site No. INF-01	Permit Requirement				Report (Mo. Avg.)			mg/l		annually (february)	grab
Solids, Total Suspended	Sample Measurement				MNR			mg/l	0	annually (february)	grab
PARM Code 00530 G Mon.Site No. INF-01	Permit Requirement				Report (Mo. Avg.)			mg/l		annually (february)	grab
Biosolids Quantity (Transferred to BTF)	Sample Measurement		0	dry tons					0	monthly	calculation
PARM Code B0007 + Mon. Site No. RMP-1	Permit Requirement		Report (Mo.Total)	dry tons						monthly	calculation
Biosolids Quantity (Landfilled)	Sample Measurement		0	dry tons					0	monthly	calculation
PARM Code B0008 + Mon. Site No. RMP-2	Permit Requirement		Report (Mo.Total)	dry tons						monthly	calculation

DAILY SAMPLE RESULTS - PART B (R-001)

Permit Number: FLA012065 Facility: Topics RV Community WWTF
Monitoring Period From: 1 OCT 2015 through: 31 OCT 2015 County: Hernando

	Flow (MGD) X 1000 Gallons R-001 & Total Plant	CBOD5 (mg/L)	TSS (mg/L)	Fecal Coliform Bacteria (#/100mL)	PH (SU)	TCR (For Disinfect.) (mg/L)	Nitrogen, Nitrate, Total (as N) (mg/L)	Gallons of liquid biosolids hauled
Code	50050	80082	00530	74055	00400	50060	00620	
Mon. Site	FLW-01	EFA-01	EFA-01	EFA-01	EFA-01	EFA-01	EFA-01	
1	13				7.4	2.2		
2	18				7.3	2.2		
3	16							
4	17				7.4	2.2		
5	14				7.3	2.2		
6	14				7.3	2.2		
7	20				7.4	2.2		
8	18				7.3	2.2		
9	21				7.4	2.2		
10	23							
11	23				7.4	2.2		
12	17				7.3	2.2		
13	14				7.3	2.2		
14	13				7.4	2.2		
15	13				7.4	2.2		
16	13				7.4	2.2		
17	19							
18	20				7.4	2.2		
19	13	10.0	3.0	2	7.4	2.2		
20	14				7.4	2.2		
21	11				7.4	2.2		
22	11				7.4	2.2		
23	14				7.3	2.2		
24	16							
25	17				7.4	2.2		
26	17				7.3	2.2		
27	13				7.3	2.2	19	
28	15				7.4	2.2		
29	14				7.3	2.2		
30	16				7.4	2.2		
31	15							
Total	492							
Mo. Avg.	16	10.0	3.0	2			19	

D.E.P. SOUTHWEST DISTRICT NOV 20 2015 TAMPA

PLANT STAFFING:

Day Shift Operator	Class:	C	Certificate No:	0012637	Name:	T Levi
Evening Shift Operator	Class:	A	Certificate No:	0014107	Name:	D Harris
Night Shift Operator	Class:	B	Certificate No:	0015074	Name:	L Bing
Lead Operator	Class:	C	Certificate No:	002817	Name:	T Felton

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

When Completed mail this report to: Department of Environmental Protection, Wastewater Compliance Evaluation Section, 13051 North Telecom Parkway, Temple Terrace, FL 33637-0926

PERMITTEE NAME: Equity Lifestyle Properties, Inc./Topics RVP, LLC
MAILING ADDRESS: 5100 W. Lemon Street, Suite 308
Tampa, FL 33609
Brad_Nelson@equitylifestyle.com

FACILITY: Topics RV Community WWTF

LOCATION: 13063 County Line Road
Spring Hill, FL 34609

COUNTY: Hernando
OFFICE: SWD

PERMIT NUMBER: FLA012065
LIMIT: Final
CLASS SIZE:
MONITORING GROUP NUMBER: R-001
MONITORING GROUP DESCRIPTION: RIB, including Influent
RE-SUBMITTED DMR: ☐
NO DISCHARGE FROM SITE: ☐
MONITORING PERIOD From: 1 NOV 2015 through: 30 NOV 2015

Expiration Date: **21 July 16**
REPORT FREQUENCY: Monthly
PROGRAM: Domestic

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow, To R-001	Sample Measurement	0.013		mgd					0	monthly	calculation
PARM Code 50050 Y Mon.Site No. FLW-01	Permit Requirement	0.025 (AADF)		mgd						monthly	calculation
Flow, To R-001	Sample Measurement	0.026		mgd					0	5 days/week	elapsed time meter
PARM Code 50050 1 Mon.Site No. FLW-01	Permit Requirement	Report (Mo.Avg.)		mgd						5 days/week	elapsed time meter
BOD, Carbonaceous 5 day, 20C	Sample Measurement				8.8			mg/l	0	monthly	calculation
PARM Code 80082 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An.Avg.)			mg/l		monthly	calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				8.0		8.0	mg/l	6	monthly	grab
PARM Code 80082 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo.Avg.)		60.0 (Max.)	mg/l		monthly	grab
Solids, Total Suspended	Sample Measurement				1.5			mg/l	0	monthly	calculation
PARM Code 00530 Y Mon.Site No. EFA-01	Permit Requirement				20.0 (An.Avg.)			mg/l		monthly	calculation
Solids, Total Suspended	Sample Measurement				1.6		1.6	mg/l	0	monthly	grab
PARM Code 00530 A Mon.Site No. EFA-01	Permit Requirement				30.0 (Mo.Avg.)		60.0 (Max.)	mg/l		monthly	grab

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME/TITLE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE NO	DATE (MM/DD/YYYY)
T. Felton/Operator		3527872493	12/10/2015

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here):

Dept. of Environmental Protection
DEC 21 2015
Southwest District

DISCHARGE MONITORING REPORT - PART A (Continued)

FACILITY: Topics RV Community WWTF
Hernando County

MONITORING GROUP NUMBER: R-001
MONITORING PERIOD From: 1 NOV 2015 through: 30 NOV 2015

PERMIT NUMBER: FLA012065

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
pH	Sample Measurement				7.2		7.3	su	0	5 days/week	grab
PARM Code 00400 A Mon.Site No. EFA-01	Permit Requirement				6.0 (Min.)		8.5 (Max.)	su		5 days/week	grab
Coliform, Fecal	Sample Measurement				1			#/100ml	0	monthly	calculation
PARM Code 74055 Y Mon.Site No. EFA-01	Permit Requirement				200 (An.Avg.)			#/100ml		monthly	calculation
Coliform, Fecal	Sample Measurement				3		3	#/100ml	0	monthly	grab
PARM Code 74055 A Mon.Site No. EFA-01	Permit Requirement				Report (Mo.Geo.Mean)		800 (Max.)	#/100ml		monthly	grab
Total Chlorine Residual (For Disinfection)	Sample Measurement				2.2			mg/l	0	5 days/week	grab
PARM Code 50060 A Mon.Site No. EFA-01	Permit Requirement				0.5 (Min.)			mg/l		5 days/week	grab
Nitrogen, Nitrate, Total (as N)	Sample Measurement						4.2	mg/l	0	monthly	grab
PARM Code 00620 A Mon.Site No. EFA-01	Permit Requirement						12.0 (Max.)	mg/l		monthly	grab
Flow, Total Plant	Sample Measurement	0.019	0.026	mgd					0	monthly	calculation
PARM Code 50050 Q Mon.Site No. FLW-01	Permit Requirement	0.025 (3MRADF)	Report (Mo. Avg.)	mgd						monthly	calculation
Percent Capacity, (3MRADF/Permitted Capacity) x 100	Sample Measurement				75			%	0	monthly	calculation
PARM Code 00180 1 Mon.Site No. FLW-01	Permit Requirement				Report (Mo. Total)			%		monthly	calculation
BOD, Carbonaceous 5 day, 20C	Sample Measurement				MNR			mg/l	0	annually (february)	grab
PARM Code 80082 G Mon.Site No. INF-01	Permit Requirement				Report (Mo. Avg.)			mg/l		annually (february)	grab
Solids, Total Suspended	Sample Measurement				MNR			mg/l	0	annually (february)	grab
PARM Code 00530 G Mon.Site No. INF-01	Permit Requirement				Report (Mo. Avg.)			mg/l		annually (february)	grab
Biosolids Quantity (Transferred to BTF)	Sample Measurement		0	dry tons					0	monthly	calculation
PARM Code B0007 + Mon. Site No. RMP-1	Permit Requirement		Report (Mo.Total)	dry tons						monthly	calculation
Biosolids Quantity (Landfilled)	Sample Measurement		0	dry tons					0	monthly	calculation
PARM Code B0008 + Mon. Site No. RMP-2	Permit Requirement		Report (Mo.Total)	dry tons						monthly	calculation

Dept. of Environmental Protection
DEC 21 2015
Southwest District

DAILY SAMPLE RESULTS - PART B (R-001)

Permit Number: FLA012065 Facility: Topics RV Community WWTF
Monitoring Period From: 1 NOV 2015 through: 30 NOV 2015 County: Hernando

	Flow (MGD) X 1000 Gallons R-001 & Total Plant	CBOD5 (mg/L)	TSS (mg/L)	Fecal Coliform Bacteria (#/100mL)	PH (SU)	TCR (For Disinfect.) (mg/L)	Nitrogen, Nitrate, Total (as N) (mg/L)	Gallons of liquid biosolids hauled
Code	50050	80082	00530	74055	00400	50060	00620	
Mon. Site	FLW-01	EFA-01	EFA-01	EFA-01	EFA-01	EFA-01	EFA-01	
1	20				7.3	2.2		
2	19				7.3	2.2		
3	23				7.2	2.2		
4	24				7.3	2.2		
5	24				7.3	2.2		
6	22				7.3	2.2		
7	24							
8	24				7.3	2.2		
9	25				7.3	2.2		
10	27				7.4	2.2		
11	26				7.4	2.2	4.2	
12	22				7.4	2.2		
13	30				7.3	2.2		
14	34							
15	34				7.3	2.2		
16	27				7.3	2.2		
17	26				7.3	2.2		
18	24				7.3	2.2		
19	24				7.2	2.2		
20	29				7.3	2.2		
21	29							
22	29				7.2	2.2		
23	26				7.3	2.2		
24	21	8.0	1.6	3	7.3	2.2		
25	21				7.3	2.2		
26	22				7.3	2.2		
27	23				7.3	2.2		
28	36							
29	36				7.3	2.2		
30	22				7.3	2.2		
31								
Total	773							
Mo. Avg.	26	8.0	1.6	3			4.2	

Dept. of Environmental Protection
DEC 21 2015
Southwest District

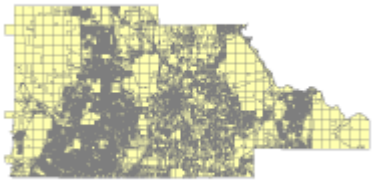
PLANT STAFFING:

Day Shift Operator	Class:	C	Certificate No:	0012637	Name:	T Levi
Evening Shift Operator	Class:	A	Certificate No:	0014107	Name:	D Harris
Night Shift Operator	Class:	B	Certificate No:	0015074	Name:	L Bing
Lead Operator	Class:	C	Certificate No:	002817	Name:	T Felton

Exhibit C
Parcel Map Field Descriptions

GIS.V_PARCELS
SDE Feature Class

Description | Spatial | Attributes



Keywords
Theme: Property, Appraiser, Parcel, CAMA

Description
Abstract
V_PARCELS is a spatial view that combines the GIS.Parcels polygon layer with CAMA attribute information from the Hernando County Property Appraiser's CATSSYS System.
V_PARCELS is a spatial view that combines the GIS.Parcels polygon layer with CAMA attribute information from the Hernando County Property Appraiser's CATSSYS System.

Purpose
The V_PARCELS view can be used to analyze real properties using well over 100 attributes maintained by the Property Appraiser's Office
The V_PARCELS view can be used to analyze real properties using well over 100 attributes maintained by the Property Appraiser's Office

Supplementary Information
V_PARCELS Field Identifer

#	FIELD NAME	FIELD DESCRIPTION
1	PARCEL_KEY	Parcel Key Number
2	PARCEL_SHORTNUM	Short Parcel Number (Lot Number in Subdivision or Split/Merge Identifier for Acreage)
3	PARCEL_TYPE	R = Real Property, P = Personal Property, M = Mobile Home
4	PARCEL_NUMBER	Parcel Number - Displayable Version
5	PARCEL_SORTNUM	Parcel Number - Sortable Version
6	PARCEL_EFFDATE	Effective Date of the parcel
7	PARENT_KEY	Parent Parcel Key Number (if applicable)
8	LOC_ADDRESS	Location Address
9	LOC_HOUSENO	Location Address House Number
10	LOC_PREDIR	Location Address Street Directional Prefix
11	LOC_STREET	Location Address Street Name
12	LOC_STRTYPE	Location Address Street Type (e.g. ST, AVE, BLVD, etc)
13	LOC_SUFFDIR	Location Address Street Directional Suffix
14	LOC_SECTYPE	Location Address Secondary Locator Type (e.g. Apt, Ste)
15	LOC_SECLOC	Location Address Secondary Locator Code (e.g. 100, 200, 300)

16 LOC_CITY Location Address City (assigned and validated by the Post Office)
17 LOC_ZIP5 Location Address Zip Code (assigned and validated by the Post Office)
18 LOC_ZIP4 Location Address Plus4 portion of Zip Code (assigned and validated by the Post Office)
19 LEGAL1 Legal Description from Deed - Line 1 of 4
20 LEGAL2 Legal Description from Deed - Line 2 of 4
21 LEGAL3 Legal Description from Deed - Line 3 of 4
22 LEGAL4 Legal Description from Deed - Line 4 of 4
23 CONFIDENTIAL Confidential Data Y/N Flag (If 'Y', Owner Information Not Available)
24 OWNER_NAME Parcel Owner Name(s) - Line 1 of 2
25 OWNER_NAME2 Parcel Owner Name(s) - Line 2 of 2
26 MAIL_ADDR1 Mailing Address - Line 1 of 4
27 MAIL_ADDR2 Mailing Address - Line 2 of 4
28 MAIL_ADDR3 Mailing Address - Line 3 of 4
29 MAIL_ADDR4 Mailing Address - Line 4 of 4
30 MAIL_PRURBAN Mailing Address - Puerto Rican Urbanization Code (Neighborhood)
31 MAIL_CITY Mailing Address City
32 MAIL_STATE Mailing Address State
33 MAIL_POSTALCODE Mailing Address Postal Code
34 MAIL_COUNTRY Mailing Address Country
35 MAIL_CNTRY_CODE Mailing Address ISO 3166 Two Digit Country Code
36 MAIL_EFFDATE Mailing Address Effective Date
37 MAIL_FLAG Mailing Address Flag (Y=Yes, N=No, G=Government)
38 MAIL_HERN_FLAG Mailing Address Hernando County Flag (Y/N)
39 MAIL_VALID_FLAG Mailing Address Validated by USPS/Canadian Postal System (Y/N)
40 MAP_LABEL Short Parcel Number
41 MAP_CODE Aerial Photo Square Mile Map Number
42 GIS_MAP_CODE GIS Map Book and Page Number
43 SUBDIVISION_CODE Subdivision Code
44 AREA_CODE Market Area Code for Cost Appraisal Approach to Valuation
45 MARKET_AREA Market Area Code for Market Appraisal Approach to Valuation
46 DOR_MARKET_AREA DOR Market Area Code for DOR Sales Comparisons
47 APPRAISAL DISTRICT PA Appraisal Districts for assignment to PA field inspectors
48 ZONING_CODE Not Used
49 CENSUS_TRACT Not Used
50 CENSUS_BLOCK Not Used
51 CENSUS_SUBDV Not Used
52 PCA1_LAND_USE 0=Vacant,1=Conv.Const.,2=MobileHome,3=Misc,4=Conv.Const&MH
53 PCA2_LAND_TYPE 1=Non-waterfront,2=Waterfront,3=Golf Course
54 PCA3_LIVING_UNITS Number of Dwelling Units (0 to 9, 9 means 9 or more)
55 PCA4_LAND_SIZE 1=.1-1.99ac,2=2-4.99ac,3=5-10.99ac,4=11-39.99ac,5=40-79.99ac,6=80-159.99ac,7=160+ac,8=Multifamily,9=Commercial
56 TAX_DISTRICT1 Tax District 1 Code (e.g. 36 = Fire)
57 TAX_DISTRICT2 Tax District 2 Code (e.g. 36 = Fire)
58 TAX_DISTRICT3 Tax District 3 Code (e.g. 36 = Fire)
59 TAX_DISTRICT4 Tax District 4 Code (e.g. 36 = Fire)
60 TAX_DISTRICT5 Tax District 5 Code (e.g. 36 = Fire)
61 TAX_DISTRICT6 Tax District 6 Code (e.g. 36 = Fire)
62 ACRES Acres if assessed as an acreage property
63 TPP_COUNT Number of PA Personal Property Accounts (Businesses or Mobile Homes) on the Parcel
64 STRUC1_ACT_YEAR Year structure #1 received its certificate of occupancy
65 STRUC1_EFF_YEAR Year structure #1's depreciation starts for appraisal pruposes
66 STRUC1_CLASS Structure #1's Building Classification for Appraisal Purposes (A-E=Best to Worst, S=Special)

67 STRUC1_QUALITY Structure #1's Construction Quality (1-4=Best to Worst)
68 STRUCTURE_COUNT Total number of structures on parcel
69 LAND_CODES Land Codes (space delimited, e.g. 02=Residential, S4=Seawall)
70 LAND_ACRES Acres of all Land Codes assessed as acreage property
71 LAND_FRONT_FEET Front Feet of all Land Codes assessed as front feet property
72 LAND_SQFT Square Footage of all Land Codes assessed as Square Footage property
73 LAND_UNITS Number of Units of all Land Codes assessed in Units of property
74 LAND_ADJ_FLAG Y=Shape or Size Adjustment has been made, N=No Adjustment Made
75 LSALE_DATE Last Sale Date
76 LSALE_ORBK Last Sale Official Record Book Number
77 LSALE_ORPG Last Sale Official Record Book Page Number
78 LSALE_QUAL Last Sale Qualified for use in a sales comparsion for appraisal purposes?
79 LSALE_VORI Last Sale Vacant or Improved?
80 LSALE_PRICE Last Sale Price
81 PRYR_PERM_ISSDTE Issue Date of last open, inactive or finaled permit since January 1 of previous year
82 PRYR_PERM_FINDTE Final Date of last open, inactive or finaled permit since January 1 of previous year
83 PRYR_PERMIT_VALUE Value of last open, inactive or finaled permit since January 1 of previous year
84 PRYR_TOTPERMSVAL Value of all permits open, inactive or finaled since January 1 of previous year
85 LAST_INSPECTION Date of last PA Inspection for assessment purposes
86 LAST_INSPECTED_BY Inspector Number of last PA Inspector to inspect the property for assessment purposes
87 INVESTIGATED_ON Date of Last Investigation for possible homestead fraud
88 INVESTIGATED_BY Investigator Number of last PA Employee who last investigated property for possible homestead fraud
89 CER_ROLL_YEAR Certified Tax Roll: Year
90 CER_ROLL_SEQ_NUM Certified Tax Roll: Number (1=Preliminary, 2=Final)
91 CER_ROLL_ADJ_NUM Certified Tax Roll: Adjustment Sequence Number (Number of times value was adjusted)
92 CER_JURISDICTION Certified Tax Roll: Jurisdiction Code (B=Brooksville, C=County, W=Weeki Wachee)
93 CER_LEVY_CODE Certified Tax Roll: PA Tax Levy Code (reference Levy Code Map on PA website)
94 CER_DOR_CODE Certified Tax Roll: Florida Department of Revenue Land Use Codes (00 to 99)
95 CER_SUBSURFACE Certified Tax Roll: Subsurface Mineral Rights Flag (Y=Yes,N=No)
96 CER_APPR_METHOD Certified Tax Roll: PA Appraisal Method (A=Cost,B=Market,C=Income)
97 CER_LAND_VALUE Certified Tax Roll: Value of Land
98 CER_BLDG_VALUE Certified Tax Roll: Value of Buildings
99 CER_FEAT_VALUE Certified Tax Roll: Value of Features (Seawalls, Pools, etc)
100 CER_JUST_VALUE Certified Tax Roll: Just Value
101 CER_CLASS_JVALUE Certified Tax Roll: Just Value of Classified Use Property (e.g. Agricultural Land)
102 CER_CLASS_CVALUE Certified Tax Roll: Classified Use Value of Classified Use Property (e.g. Agricultural Land)
103 CER_CLASS_DIFF Certified Tax Roll: Classified Use Differential
104 CER_TOTASD_B4CAP Certified Tax Roll: Total Assessed Value Before Application of Amendment 10 Cap
105 CER_ASDINELG4CAP Certified Tax Roll: Total Assessed Value Ineligible for Amendment 10 Cap
106 CER_ASDELG_B4CAP Certified Tax Roll: Total Assessed Value Eligible for Amendment 10 Cap Before Application of Cap
107 CER_SOH_CAP_DIFF Certified Tax Roll: Amendment 10 (Save Our Homes) Cap Differential
108 CER_ASDELGAFTCAP Certified Tax Roll: Total Assessed Value Eligible for Amendment 10 Cap After Application of Cap
109 CER_TOTASDAFTCAP Certified Tax Roll: Total Assessed Value After Application of Amendment 10 Cap (Bottom Line Assessed Value)
110 CER_EXEMPT_VALUE Certified Tax Roll: Total Value of all Exemptions
111 CER_TAXBLE_VALUE Certified Tax Roll: Total Taxable Value

112 CER_ADDITIONS Certified Tax Roll: Total Value of All Additions to Existing Improvements that Occurred During the TaxYear
113 CER_DELETIONS Certified Tax Roll: Total Value of All Deletions to Existing Improvements that Occurred During the TaxYear
114 CER_NEW_CONST Certified Tax Roll: Total Value of All New Construction that Occurred During the TaxYear
115 CER_SQUARE_FEET Certified Tax Roll: Square Feet of Improvements
116 CER_EXEM_CODES Certified Tax Roll: Exemption Codes (Delimited by spaces, e.g. HXX=Homestead, WX=Widow)
117 CER_EXEM_MARKER Certified Tax Roll: Common Area Flag (property value divied up amoung surrounding properties that use this property)
118 CER_EXEM_NALCODE Certified Tax Roll: DOR 12D8 (NAL) File Exemption Code
119 CER_EXEM_PERSONAL Certified Tax Roll: Personal Exemption Flag (N=Commercial/Industrial/Institutional/Government)
120 CER_EXEM1_CODE Certified Tax Roll: Code for Exemption 1
121 CER_EXEM1_EFFDTE Certified Tax Roll: Effective Date of Exemption 1
122 CER_EXEM1_A10YR Certified Tax Roll: Amendment 10 Effective Year of Exemption 1
123 CER_EXEM1_GROSS Certified Tax Roll: Gross Value of Exemption 1
124 CER_EXEM1_NET Certified Tax Roll: Net Value of Exemption 1
125 CER_EXEM2_CODE Certified Tax Roll: Code for Exemption 2
126 CER_EXEM2_EFFDTE Certified Tax Roll: Effective Date of Exemption 2
127 CER_EXEM2_A10YR Certified Tax Roll: Amendment 10 Effective Year of Exemption 2
128 CER_EXEM2_GROSS Certified Tax Roll: Gross Value of Exemption 2
129 CER_EXEM2_NET Certified Tax Roll: Net Value of Exemption 2
130 CER_EXEM3_CODE Certified Tax Roll: Code for Exemption 3
131 CER_EXEM3_EFFDTE Certified Tax Roll: Effective Date of Exemption 3
132 CER_EXEM3_A10YR Certified Tax Roll: Amendment 10 Effective Year of Exemption 3
133 CER_EXEM3_GROSS Certified Tax Roll: Gross Value of Exemption 3
134 CER_EXEM3_NET Certified Tax Roll: Net Value of Exemption 3
135 CER_EXEM4_CODE Certified Tax Roll: Code for Exemption 4
136 CER_EXEM4_EFFDTE Certified Tax Roll: Effective Date of Exemption 4
137 CER_EXEM4_A10YR Certified Tax Roll: Amendment 10 Effective Year of Exemption 4
138 CER_EXEM4_GROSS Certified Tax Roll: Gross Value of Exemption 4
139 CER_EXEM4_NET Certified Tax Roll: Net Value of Exemption 4
140 CER_EXEM5_CODE Certified Tax Roll: Code for Exemption 5
141 CER_EXEM5_EFFDTE Certified Tax Roll: Effective Date of Exemption 5
142 CER_EXEM5_A10YR Certified Tax Roll: Amendment 10 Effective Year of Exemption 5
143 CER_EXEM5_GROSS Certified Tax Roll: Gross Value of Exemption 5
144 CER_EXEM5_NET Certified Tax Roll: Net Value of Exemption 5
145 CER_AD_VAL_TAXES Certified Tax Roll: Total Ad Valorem Taxes
146 CER_NAD_TAX1_AMT Certified Tax Roll: Non-Ad Valorem Tax 1 Amount
147 CER_NAD_TAX1_DSC Certified Tax Roll: Non-Ad Valorem Tax 1 Description
148 CER_NAD_TAX2_AMT Certified Tax Roll: Non-Ad Valorem Tax 2 Amount
149 CER_NAD_TAX2_DSC Certified Tax Roll: Non-Ad Valorem Tax 2 Description
150 CER_NAD_TAX3_AMT Certified Tax Roll: Non-Ad Valorem Tax 3 Amount
151 CER_NAD_TAX3_DSC Certified Tax Roll: Non-Ad Valorem Tax 3 Description
152 CER_NAD_TAX4_AMT Certified Tax Roll: Non-Ad Valorem Tax 4 Amount
153 CER_NAD_TAX4_DSC Certified Tax Roll: Non-Ad Valorem Tax 4 Description
154 CER_NAD_TAX5_AMT Certified Tax Roll: Non-Ad Valorem Tax 5 Amount
155 CER_NAD_TAX5_DSC Certified Tax Roll: Non-Ad Valorem Tax 5 Description
156 CER_NAD_TAX6_AMT Certified Tax Roll: Non-Ad Valorem Tax 6 Amount
157 CER_NAD_TAX6_DSC Certified Tax Roll: Non-Ad Valorem Tax 6 Description
158 CUR_ROLL_YEAR Current Tax Roll: Year

159 CUR_ROLL_SEQ_NUM Current Tax Roll: Number (1=Preliminary, 2=Final)
160 CUR_ROLL_ADJ_NUM Current Tax Roll: Adjustment Sequence Number (Number of times value was adjusted)
161 CUR_JURISDICTION Current Tax Roll: Jurisdiction Code (B=Brooksville, C=County, W=Weeki Wachee)
162 CUR_LEVY_CODE Current Tax Roll: PA Tax Levy Code (reference Levy Code Map on PA website)
163 CUR_DOR_CODE Current Tax Roll: Florida Department of Revenue Land Use Codes (00 to 99)
164 CUR_SUBSURFACE Current Tax Roll: Subsurface Mineral Rights Flag (Y=Yes,N=No)
165 CUR_ADDITIONS Current Tax Roll: Total Value of All Additions to Existing Improvements that Occurred During the TaxYear
166 CUR_DELETIONS Current Tax Roll: Total Value of All Deletions to Existing Improvements that Occurred During the TaxYear
167 CUR_NEW_CONST Current Tax Roll: Total Value of All New Construction that Occurred During the TaxYear
168 CUR_SQUARE_FEET Current Tax Roll: Square Feet of Improvements
169 TAX_YEAR1 This Tax Year
170 TAXES_YEAR1 This Year's Total Taxes
171 TAX_YEAR2 Last Tax Year
172 TAXES_YEAR2 Last Year's Total Taxes
173 TAX_YEAR3 Two Years Ago Tax Year
174 TAXES_YEAR3 Two Years Ago Total Taxes
175 TAX_YEAR4 Three Years Ago Tax Year
176 TAXES_YEAR4 Three Years Ago Total Taxes
177 PHOTO UNC Path Hyperlink to a Digital Photo of the Main Structure on the Property
178 LAST_CAMA_UPDATE Date the CAMA (Appraisal/Tax) Data Was Last Updated
179 CHAKEY Key Number Specified as a String Padded to the Left with Zeros
180 OBJECTID ArcGIS Field - Object's Unique Key
181 SHAPE ArcGIS Field - Feature Type (e.g. Polygon, Point, etc.)
182 SHAPE.AREA ArcGIS Field - Area of Polygon Feature
183 SHAPE.LEN ArcGIS Field - Perimeter of Polygon Feature or Length of Line Feature
184 SHAPE.FID ArcGIS Field - Internal ArcSDE Feature Class ID

Exhibit D
Planning Unit Analysis

Planning Unit Analysis

Study Area Data:

5,478	Undeveloped Lots
14,008	Residential Lots with County Water and Sewer
26,238	Residential Lots with County Water but Private Septic Systems
1,222	Residential Lots with Private Wells and Septic Systems
437	Commercial Lots with County Water and Sewer
188	Commercial Lots with County Water but Private Septic Systems
29	Commercial Lots with Private Wells and Septic Systems

Note: Data in this table represents all lots within the study area. These values vary slightly from the values presented in Table 1 which represents lots that were included in districts. See Technical Memorandum *Task 1 Data Mining and GIS Layers* for additional information on how the values in this table were determined.

Total # of Developed Lots	42,122
Total # of Developed Residential Lots	41,468
Total # of Developed Commercial Lots	654
% of total that is commercial	1.6%

Determine Residential Lots per Pump Station in Study Area:

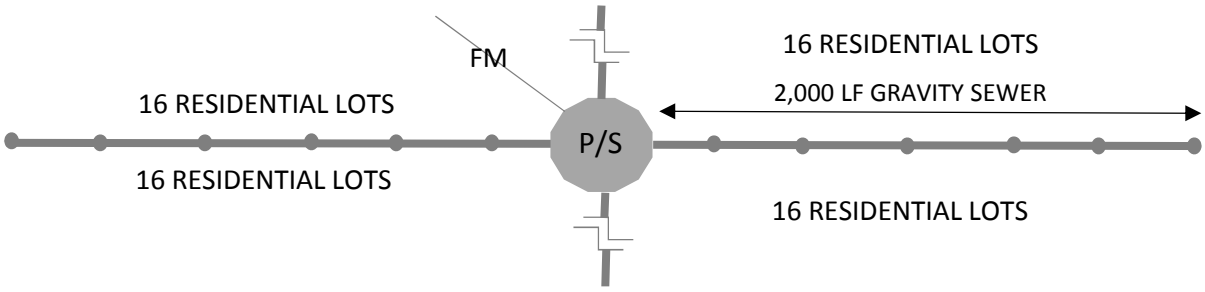
Total # of Res Lots w/Sewer in Study Area:	14,008
Total # of Pump Stations in Study Area:	115
# of Res Lots per pump station:	121.8

Estimate Planning Unit Layout & Infrastructure:

# of Res Lots per Planning Unit Leg:	30.5	Rounded up to 32
Residential lots in Planning Unit:	**128.0**	

Avg lot size of Developed Res Lots w/Septic Tanks: 0.38 acres

Assuming lots are square gives 128.5' of frontage



To determine what value to use for the the cost estimate two sets of calculations are made, when possible. The first, called Planning Unit Calcs, is based on the planning unit as depicted above. The second, called Study Area Calcs, is made using the facilities as recorded in County's GIS, which are based off of the actual facilities in the study area and therefore should be a reasonable representation of what is actually there.

Calculations are presented either by writing them out or the terms are presented with a letter designation. This letter designation is then used to represent the calculation performed and is shown in brackets to the right of the calculated value.

After one or both calculations were made a final value to use for estimating was determined and is presented in bold below the calculations. The final value used represents either the most reasonable of the two calculations or an estimate based on the calculated value and the Engineer's opinion of a reasonable number based on his experience with these types of projects.

Gravity Sewer Calcs:

Planning Unit Calcs:

Length of gravity sewer leg = the average lot frontage x # of lots on one leg of planning unit:

128.5'x16 lots= 2,056 LF

Use:	2,056	LF
Total length of gravity sewer for all four legs:	8,224	LF

Study Area Calcs:

A. Total length of gravity sewer in study area:	845,026	
B. Residential Lots with Sewer In Study Area:	14,008	
C. Length of gravity sewer per 1 Res Lot:	60.3	{= A/B}
Total length of gravity sewer:	7,722	{= C x # lots in planning unit (128)}

Use 8,000 lf of gravity sewer for planning unit cost estimate

Manhole Calcs:

Planning Unit Calcs:

# of Manholes = total length of sewer / maximum manhole spacing (350' per County Code)

8,000' / 350' = 23

Study Area Calcs:

A. Total number of Manholes in Study Area:	3,835	
B. Residential Lots with Sewer In Study Area:	14,008	
C. Manholes per 1 Res Lot:	0.27	{= A/B}
Total # of Manholes:	35	{= C x # lots in planning unit (128)}

Max manhole spacing for entire area is not likely.
There fore, use 35 manholes for planning unit cost estimate

Force Main Calcs:

Study Area Calcs:

A. Total length of force main in study area:	312,743	
B. Residential Lots with Sewer In Study Area:	14,008	
C. Length of gravity sewer per 1 Res Lot:	22	{= A/B}
Total length of force main:	2,858	{= C x # lots in planning unit (128)}
Weighted average forcemain diameter:	5.81	in

Weighted averge calculated from force main diameters and corresponding lengths from GIS

Use 3,000 lf of 6" forcemain for planning unit cost estimate

Water Main Calcs:

Study Area Calcs:

A. Total length of water main in study area:	3,493,615	
B. # of Res Lots with water in study area:	40,246	{Includes lots with central sewer and septic}
C. Length of water main per 1 Res Lot:	86.8	{= A/B}
Total length of force main:	11,111	{= C x # lots in planning unit (128)}
Weighted Average forcemain diameter:	5.98	in

Weighted averge calculated from water main diameters and corresponding lengths from GIS

Use 11,140 lf of 6" water main for planning unit cost estimate

Fire Hydrant Calcs:

Planning Unit Calcs:

# of Fire Hydrants = total length of water main / maximum fire hydrant spacing (500' per NFPA Code)
Assume water main length is equal to gravity sewer length for planning unit (8,000 lf)

8,000' / 500' = 16

Study Area Calcs:

A. Total number of Fire Hydrants:	2,489	
B. # of Res Lots with water in study area:	40,246	{Includes lots with central sewer and septic}
C. Fire Hydrants per 1 Res Lot:	0.06	{= A/B}
Total # of Fire Hydrants:	7.9	{= C x # lots in planning unit (128)}

Use 16 Fire Hydrants for planning unit cost estimate

Gate Valve Calcs:

Planning Unit Calcs:

# of Gate Valves = total length of water main / maximum gate valve spacing (800' per County Code)
Assume water main length is equal to gravity sewer length for planning unit (8,000 lf)

8,000' / 800' = 10

Study Area Calcs:

A. Total number of Valves:	7,059	
B. # of Res Lots with water in study area:	40,246	
C. Valves per 1 Res Lot:	0.18	{= A/B}
Total # of Valves:	22.5	{= C x # lots in planning unit (128)}

Use 23 Valves for planning unit cost estimate

Blow Off Sampling Point Calcs:

Planning Unit Calcs:

# of Sample Points = total length of water main / max sample point spacing (1,200' per County Code)
Assume water main length is equal to gravity sewer length for planning unit (8,000 lf)

8,000' / 1,200' = 6.7

Use 10 Blow Off/Sample Points for planning unit cost estimate

Roads:

Planning Unit Calcs:

Road Length:	8,000	ft
Asphalt Width:	24	ft
Limerock Base Width:	25	ft
Subgrade Width:	28	ft

Asphalt Area = Road Length x Asphalt Width =	21,333	Area (yd^2)
Limerock Base Area = Road Length x Base Width =	22,222	Area (yd^2)
Subgrade Area = Road Length x Subgrade Width =	24,889	Area (yd^2)

Exhibit E
Engineers Opinion of Probable Construction Cost

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Conventional Gravity

GENERAL CONDITIONS

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Mobilization, Bond, & Insurance	LS	1	$64,835	$64,835
Material Testing	LS	1	$21,384	$21,384
Survey Layout / As-builts	LS	1	$24,950	$24,950
NPDES Monitoring	LS	1	$14,000	$14,000
Erosion Control Installation & Maintenance	LS	1	$16,000	$16,000
			SUBTOTAL:	$141,169

PAVING/EARTHWORK

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Existing Asphalt Demo and Disposal	SY	21,333	$3	$64,000
2" Asphalt Type SP-12.5 Traffic Level C	SY	21,333	$10	$213,333
8" Limerock Base LBR 100	SY	22,222	$9	$200,000
12" Type B Stabilized Subgrade	SY	24,889	$3	$74,667
Pavement/Stripings/Markings/Signage	LS	1	$12,000	$12,000
Sod Right of Way	SY	7,350	$3	$18,375
Maintenance of Traffic	LS	1	$12,000	$12,000
			SUBTOTAL:	$594,375

SEWER

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
8" PVC Gravity Sewer	LF	8,000	$30	$240,000
48" Manholes	EA	35	$2,900	$101,500
6" Service Laterals w/Clean-out	EA	128	$1,200	$153,600
Video, Lamp, Leak Test	LS	1	$4,000	$4,000
Duplex Pump Station Including 8' Wetwell, valve vault, 60gpm pumps, piping, hardware,electric controls, telemetry, water service & incidentals	EA	1	$200,000	$200,000
6" FM to connect to existing System	LF	2850	$21	$59,850
			SUBTOTAL	$758,950

SUMMARY

GENERAL CONDITIONS……	$141,169
PAVING/EARTHWORK……	$594,375
SANITARY SEWER……	$758,950
SUBTOTAL SITE COST……	**$1,494,494**
Contingency @ 10%.....	**$149,449**
TOTAL ESTIMATED SITE COST……	**$1,643,943**
	Cost per 128 lots

This opinion of probable site construction cost is based on 2016 dollars. Actual cost will depend on labor & material cost, competitive market conditions at the time of bidding, final project scope, and other variable factors not necessarily under the control of Coastal Engineering Associates, Inc. Above costs do not include professional or permit fees,

Prepared by: Coastal Engineering Associates, Inc.
Date: JUNE, 2016

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

WATER

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
6" PVC C-900 incl fittings	LF	11,140	$20	$222,800
6" Gate Valves	EA	23	$1,500	$34,500
Fire Hydrant Assembly	EA	16	$4,000	$64,000
Blow Off & Sample Point	EA	10	$1,500	$15,000
Residential Meters	EA	128	$250	$32,000
Flush, Chlorinate, Bac't & Pressure Test	LS	1	$5,000	$5,000
			SUBTOTAL	**$373,300**

Cost per 128 lots

CONVERSION COSTS

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Abandonment Permit (HC Health Dept)	LS	1	$50	$50
Pump out tank, Collapse Tank, Fill Remaining Hole w/Sand, Sod	LS	1	$750	$750
Route existing sewer to Central System	LS	1	$3,750	$3,750
Connection Fee w/Existing water meter	LS	1	$100	$100
			SUBTOTAL:	**$4,650**

Cost per 1 lot

This opinion of probable site construction cost is based on 2016 dollars. Actual cost will depend on labor & material cost, competitive market conditions at the time of bidding, final project scope, and other variable factors not necessarily under the control of Coastal Engineering Associates, Inc. Above costs do not include professional or permit fees,

Prepared by: Coastal Engineering Associates, Inc.
Date: JUNE, 2016

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Low Pressure Sewer

GENERAL CONDITIONS

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Mobilization, Bond, & Insurance	LS	1	$64,835	$64,835
Material Testing	LS	1	$21,384	$21,384
Survey Layout / As-builts	LS	1	$24,950	$24,950
NPDES Monitoring	LS	1	$14,000	$14,000
Erosion Control Installation & Maintenance	LS	1	$16,000	$16,000
			SUBTOTAL:	$141,169

PAVING/EARTHWORK

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Existing Asphalt Demo and Disposal	SY	1,707	$3	$5,121
2" Asphalt Type SP-12.5 Traffic Level C	SY	1,707	$10	$17,070
8" Limerock Base LBR 100	SY	1,707	$9	$15,363
12" Type B Stabilized Subgrade	SY	1,707	$3	$5,121
Pavement/Stripings/Markings/Signage	LS	1.00	$12,000	$12,000
Sod Right of Way	SY	8,900	$3	$22,250
Driveway Restoration	SY	2,850	$15	$42,750
Maintenance of Traffic	LS	1	$6,000	$6,000
1" Asphalt Overlay of all roads	LS	21,350	$7	$149,450
			SUBTOTAL:	$275,125

SEWER

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
4" PVC FM	LF	8,000	$12	$96,000
Grinder P/S, Complete, Installed	EA	128	$8,500	$1,088,000
FM pressure Testing	EA	1	$4,000	$4,000
6" FM to connect to existing System	LF	2850	$21	$59,850
			SUBTOTAL	$1,247,850

SUMMARY

GENERAL CONDITIONS……	$141,169
PAVING/EARTHWORK……	$275,125
SANITARY SEWER……	$1,247,850
SUBTOTAL SITE COST……..	**$1,664,144**
Contingency @ 10%.....	**$166,414**
TOTAL ESTIMATED SITE COST……..	**$1,830,558**
	Cost per 128 lots

This opinion of probable site construction cost is based on 2016 dollars. Actual cost will depend on labor & material cost, competitive market conditions at the time of bidding, final project scope, and other variable factors not necessarily under the control of Coastal Engineering Associates, Inc. Above costs do not include professional or permit fees,

Prepared by: Coastal Engineering Associates, Inc.
Date: JUNE, 2016

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Vacuum Sewer

GENERAL CONDITIONS **Cost is for all of District A**

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Mobilization, Bond, & Insurance	LS	7.02	$64,835	$455,142
Material Testing	LS	7.02	$21,384	$150,116
Survey Layout / As-builts	LS	7.02	$24,950	$175,149
NPDES Monitoring	LS	7.02	$14,000	$98,280
Erosion Control Installation & Maintenance	LS	7.02	$16,000	$112,320
			SUBTOTAL:	$991,006

PAVING/EARTHWORK

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Existing Asphalt Demo and Disposal	SY	13,250	$3	$39,750
2" Asphalt Type SP-12.5 Traffic Level C	SY	13,250	$10	$132,500
8" Limerock Base LBR 100	SY	13,250	$9	$119,250
12" Type B Stabilized Subgrade	SY	13,250	$3	$39,750
Pavement/Stripings/Markings/Signage	LS	7.02	$12,000	$84,240
Sod Right of Way	SY	65,000	$3	$162,500
Driveway Restoration	SY	20,000	$15	$300,000
Maintenance of Traffic	LS	1	$18,000	$18,000
1" Asphalt Overlay of all roads	SY	156000	$7	$1,092,000
			SUBTOTAL:	$877,990

SEWER

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
Vacuum System, Complete, Installed	LS	1	$4,393,900	$4,393,900
8"-10"FM to connect to existing system	LF	7,100	$24	$170,400
			SUBTOTAL	$4,564,300

SUMMARY

GENERAL CONDITIONS……	$991,006
PAVING/EARTHWORK……	$877,990
SANITARY SEWER……	$4,564,300
SUBTOTAL SITE COST……	**$6,433,296**
Contingency @ 10%.....	**$643,330**
TOTAL ESTIMATED SITE COST……	**$7,076,626**

for all of District A

This opinion of probable site construction cost is based on 2016 dollars. Actual cost will depend on labor & material cost, competitive market conditions at the time of bidding, final project scope, and other variable factors not necessarily under the control of Coastal Engineering Associates, Inc. Above costs do not include professional or permit fees,

Prepared by: Coastal Engineering Associates, Inc.
Date: JUNE, 2016

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Vacuum Sewer

GENERAL CONDITIONS **Cost is for all of District B**

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Mobilization, Bond, & Insurance	LS	10.27	$64,835	$665,855
Material Testing	LS	10.27	$21,384	$219,614
Survey Layout / As-builts	LS	10.27	$24,950	$256,237
NPDES Monitoring	LS	10.27	$14,000	$143,780
Erosion Control Installation & Maintenance	LS	10.27	$16,000	$164,320
			SUBTOTAL:	$1,449,806

PAVING/EARTHWORK

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
Existing Asphalt Demo and Disposal	SY	19,170	$3	$57,510
2" Asphalt Type SP-12.5 Traffic Level C	SY	19,170	$10	$191,700
8" Limerock Base LBR 100	SY	19,170	$9	$172,530
12" Type B Stabilized Subgrade	SY	19,170	$3	$57,510
Pavement/Stripings/Markings/Signage	LS	10.27	$12,000	$123,240
Sod Right of Way	SY	97,560	$3	$243,900
Driveway Restoration	SY	29,200	$15	$438,000
Maintenance of Traffic	LS	1	$26,000	$26,000
1" Asphalt Overlay of all roads	LS	234,150	$7	$1,639,050
			SUBTOTAL:	$1,284,390

SEWER

DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL COST
Vacuum System, Complete, Installed	LS	1	$6,687,910	$6,687,910
8"-10"FM to connect to existing system	LF	8,000	$24	$192,000
			SUBTOTAL	$6,879,910

SUMMARY

GENERAL CONDITIONS……	$1,449,806
PAVING/EARTHWORK……	$1,284,390
SANITARY SEWER……	$6,879,910
SUBTOTAL SITE COST……	**$9,614,106**
Contingency @ 10%.....	**$961,411**
TOTAL ESTIMATED SITE COST……	**$10,575,516** for all of District B

This opinion of probable site construction cost is based on 2016 dollars. Actual cost will depend on labor & material cost, competitive market conditions at the time of bidding, final project scope, and other variable factors not necessarily under the control of Coastal Engineering Associates, Inc. Above costs do not include professional or permit fees,

Prepared by: Coastal Engineering Associates, Inc.
Date: JUNE, 2016

Exhibit F
Summary of Conversion to Conventional Gravity Sewer

Table F.1 Summary of Conversion to Conventional Gravity Sewer

District Itemization						Sewer System Infrastructure Costs					Additional Costs						Force Main	WWTF Impact		
District	Undev (Lots)	Residential Water/ Septic (Lots)	Residential Well/ Septic (Lots)	Commercial Water/ Septic (Lots)	Commercial Well/ Septic (Lots)	Total lots to be converted to Central Sewer	Planning Units per District	Road & Sewer Construction Cost	Design/Permit Costs[2]	**Total Cost to Design, Construct, and Permit Road, and Sewer Utilities[1]**	Costs for Abandoning Septic Tank[3]	County Sewer Connection Fee ($2,520/lot)[7]	**Total Cost to Design, Construct, and Permit Road, and Sewer Utilities + Abandon Septic System + Connection Fees**	Additional Construction Cost for Adding Water Service[4]	Additional Connection Fees for lots w/Wells Converting to Water[5]	**Total Cost to Design, Construct, and Permit Road, and Sewer Utilities + Abandon Septic System + Connection Fees + Convert from Wells to Central Water[2]**	Additional Flow from Individual District will Require Up-sizing of Existing Force Mains	Additional Peak flows created[6] (gpd)	Receiving WWTF	Receiving WWTF Available Capacity after District Constructed
A	166	717	0	12	4	899	7.02	$11,546,134	$1,154,613	**$12,700,747**	$4,180,350	$2,265,480	**$19,146,577**	$11,666	$400	$19,158,643	No	179,800	Glen	1,062,474
B	219	1085	0	10	0	1314	10.27	$16,876,106	$1,687,611	**$18,563,717**	$6,110,100	$3,311,280	**$27,985,097**			$27,985,097	No	262,800	Glen	979,474
C	61	397	0	0	0	458	3.58	$5,882,235	$588,223	**$6,470,458**	$2,129,700	$1,154,160	**$9,754,318**			$9,754,318	Yes	91,600	Glen	1,150,674
D	339	471	615	12	0	1437	11.23	$18,455,833	$1,845,583	**$20,301,417**	$6,682,050	$3,621,240	**$30,604,707**	$1,793,590	$61,500	$32,459,797	Yes	287,400	Glen	954,874
E	618	3506	0	13	0	4137	32.32	$53,132,764	$5,313,276	**$58,446,041**	$19,237,050	$10,425,240	**$88,108,331**			$88,108,331	Yes	827,400	Glen	414,874
F	211	979	0	3	2	1195	9.34	$15,347,753	$1,534,775	**$16,882,528**	$5,556,750	$3,011,400	**$25,450,678**	$5,833	$200	$25,456,711	No	239,000	Glen	1,003,274
G	586	3310	4	11	0	3911	30.55	$50,230,177	$5,023,018	**$55,253,195**	$18,186,150	$9,855,720	**$83,295,065**	$11,666	$400	$83,307,130	Yes	782,200	Airport	-197,200
H	272	1943	1	18	0	2234	17.45	$28,691,950	$2,869,195	**$31,561,145**	$10,388,100	$5,629,680	**$47,578,925**	$2,916	$100	$47,581,941	No	446,800	Airport	138,200
I	299	2611	8	6	0	2924	22.84	$37,553,832	$3,755,383	**$41,309,215**	$13,596,600	$7,368,480	**$62,274,295**	$23,331	$800	$62,298,426	Yes	584,800	Airport	200
J	136	1195	3	12	1	1347	10.52	$17,299,936	$1,729,994	**$19,029,929**	$6,263,550	$3,394,440	**$28,687,919**	$11,666	$400	$28,699,985	Yes	269,400	Airport	315,600
K	147	2	360	3	5	517	4.04	$6,639,990	$663,999	**$7,303,989**	$2,404,050	$1,302,840	**$11,010,879**	$1,064,488	$36,500	$12,111,867	No	103,400	Glen	1,138,874
L	11	24	0	0	0	35	0.27	$449,516	$44,952	**$494,467**	$162,750	$88,200	**$745,417**			$745,417	No	7,000	Glen	1,235,274
M	501	2388	0	29	0	2918	22.80	$37,476,772	$3,747,677	**$41,224,449**	$13,568,700	$7,353,360	**$62,146,509**			$62,146,509	Yes	583,600	Airport	1,400
N	118	943	0	12	0	1073	8.38	$13,780,869	$1,378,087	**$15,158,956**	$4,989,450	$2,703,960	**$22,852,366**			$22,852,366	No	214,600	Airport	370,400
O	131	987	0	1	0	1119	8.74	$14,371,661	$1,437,166	**$15,808,828**	$5,203,350	$2,819,880	**$23,832,058**			$23,832,058	No	223,800	Airport	361,200
P	584	3649	0	30	0	4263	33.30	$54,751,021	$5,475,102	**$60,226,123**	$19,822,950	$10,742,760	**$90,791,833**			$90,791,833	Yes	852,600	Airport	-267,600
Q	89	0	113	0	10	212	1.66	$2,722,781	$272,278	**$2,995,059**	$985,800	$534,240	**$4,515,099**	$358,718	$12,300	$4,886,117	No	42,400	Airport	542,600
R	316	1980	0	7	0	2303	17.99	$29,578,138	$2,957,814	**$32,535,952**	$10,708,950	$5,803,560	**$49,048,462**			$49,048,462	No	460,600	Airport	124,400
S	74	0	61	1	0	136	1.06	$1,746,690	$174,669	**$1,921,359**	$632,400	$342,720	**$2,896,479**	$177,901	$6,100	$3,080,480	No	27,200	Airport	557,800
TOTAL	**4,878**	**26,187**	**1,165**	**180**	**22**	**32,432**	**253.4**	**$416,534,159**	**$41,653,416**	***$458,187,575***	**$150,808,800**	**$81,728,640**	***$690,725,015***	**$3,461,774**	**$118,700**	**$694,305,489**		**6,486,400**		

Notes:

1. Total cost should also consider force main upgrades that may be needed. Force main upgrades are for existing force mains and would be in addition to the force mains included in the cot estimate for the district. Refer to Task 3 Section 5 and Task 3 Exhibit D for additional information.
2. Design/Permit cost assumed to be 10% of construction cost.
3. See Conversion Cost from Exhibit B Engineer's Opinion of Construction Cost. $4,650 per lot
4. Cost for adding water service for water facilities only. Assumes mobilization, insurance, restoration, etc is covered by the Sewer Cost. See Exhibit B Engineer's Opinion of Construction Cost.
5. There is an additional $100 connection fee for connecting water and sewer together
6. Additional flow created assumes all lots to be residential and based on HC Water, Reclaimed Water, and Wastewater Construction Specifications 4A.4.3.1 a residential lot produces 200 GPD.
7. Cost for Subregional wastewater offsite transmission facilities is not included since this cost is included in the cost estimate for the district and the cost estimate for upgrading the existing force mains. Additionally, the cost for upgrading the existing force mains is not included in the cost presented in this table. Because the pipe segments to be upgraded is dependent on which districts are constructed and in some cases is not required until several districts are constructed.

Exhibit G
Force Main Analysis

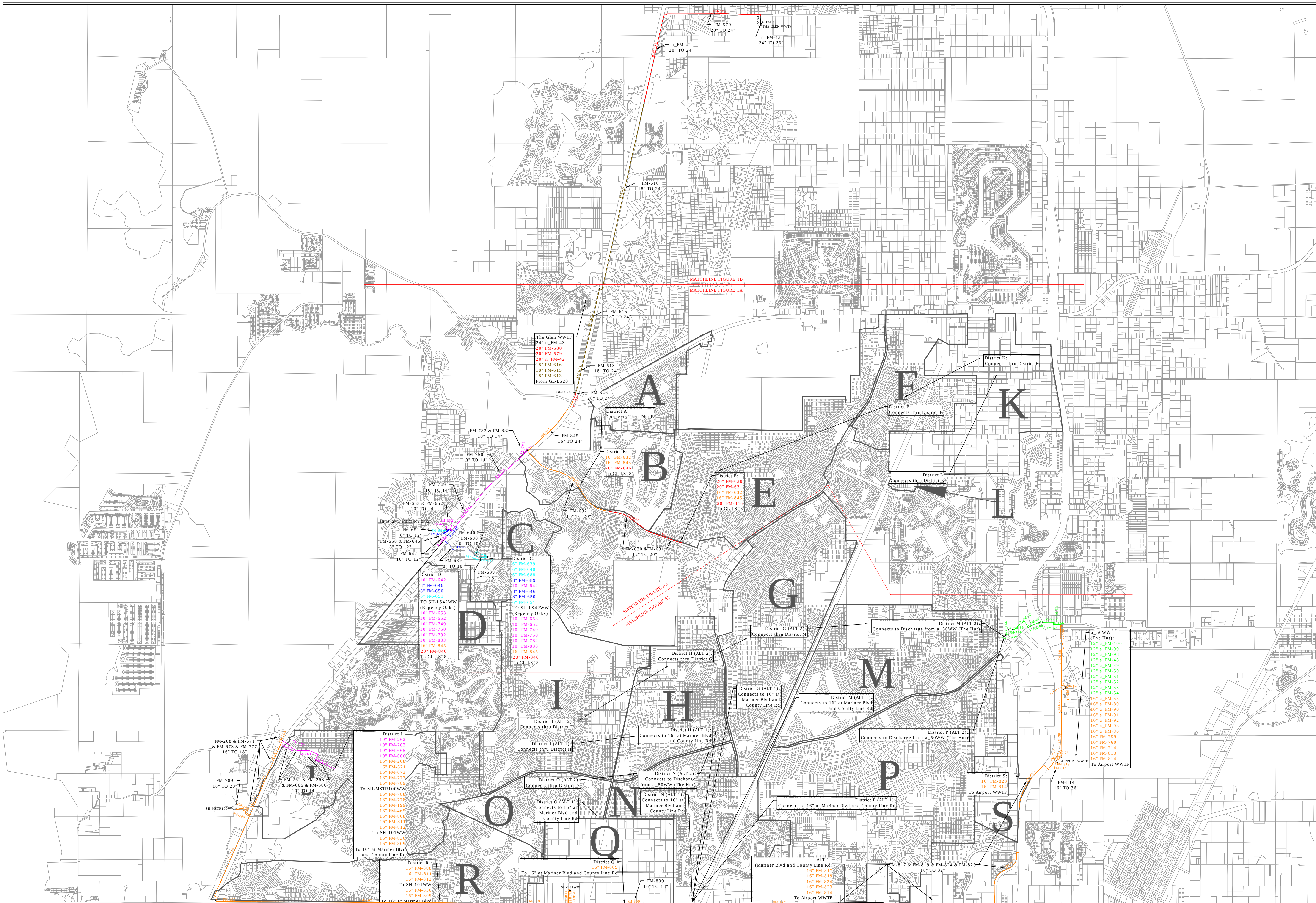
Force Main Analysis:

The following worksheets were developed to analyze the potential impacts to the existing force mains. The SewerCAD model developed for the 2011 Sewer Master Plan was utilized to estimate current peak flows in the pipes. The results of the model for each pipe segment connected to a District are presented in a table, along with the estimated peak flow from the district. Refer to Figures A thru A3 for schematics of the pipes from the SewerCAD model included in the analysis. The peak flow is calculated based on the total number of lots to be developed and assumes all lots are residential with a flow of 600 gpd (per HCUD 2013 Water, Reclaimed Water, and Wastewater Construction Specifications). This value is assumed to be added to the existing force main all at once. It does not factor in travel times from the multiple pumps stations that would be likely in each district and therefore this value represents a conservative estimate of potential flows.

Next the individual SewerCAD pipe segments were analyzed to determine if developing that district would exceed the capacity of the existing pipe. If it did then the minimum pipe size needed to meet that flow at 5 fps was determined. Only the nominal diameter of the pipe was calculated and it should be noted that actual pipe sizes may vary due to pipe wall thicknesses. Once the minimum pipe size was determined the cost to install the minimum size pipe based on length of the SewerCAD pipe was estimated. The estimate was based on the following pipe installation cost table. These cost include fittings, pipe, and restoration and assumes that ideal installation conditions exist. It does not include design, permitting, or real actual field conditions such as existing utilities or structures that may warrant special installation procedures. Installation procedures such as directional drill, jack & bore, special pipe materials, etc.

Pipe Size	Pipe Cost/LF Installed
8	$27.00
10	$31.00
12	$38.00
14	$47.00
16	$57.00
18	$68.00
20	$80.00
24	$94.00
30	$114.00
36	$135.00

Then, a table summarizing the SewerCAD pipe segments along with the districts that could potentially connect to that segment was created and the cost to upgrade each district was tabulated. Finally, the cost to upgrade to pipe if all districts were connected was estimated.



Coastal
engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

Figure G. Sewer CAD Pipe Schematic of Northern Districts (The Glen WWTF)

Septic to Sewer Conversion Study

PFS-1516-13

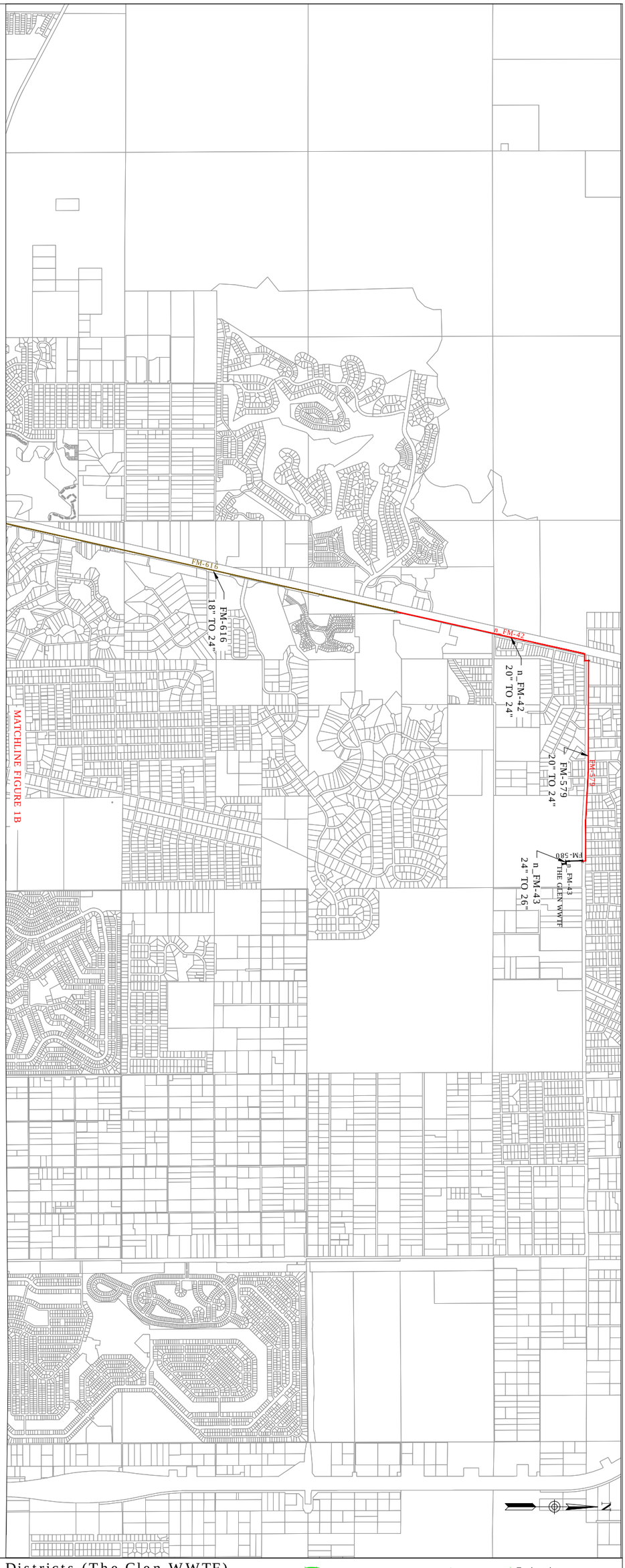


Figure G1. Sewer CAD Pipe Schematic of Northern Districts (The Glen WWTF)

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.

Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

N

MATCHLINE FIGURE 1A

The Glen WWTF
24" n_FM-43
20" FM-580
20" FM-579
20" n_FM-42
18" FM-616
18" FM-615
18" FM-613
From GL-LS28

FM-615
18" TO 24"

FM-613
18" TO 24"

GL-LS28

FM-846
20" TO 24"

FM-845
16" TO 24"

FM-782 & FM-833
10" TO 14"

FM-750
10" TO 14"

FM-749
10" TO 14"

FM-653 & FM-652
10" TO 14"

SH-LS42WW (REGENCY OAKS)

FM-651
6" TO 12"

FM-650 & FM-646
8" TO 12"

FM-642
10" TO 12"

FM-640 &
FM-688
6" TO 10"

FM-689
8" TO 10"

FM-639
6" TO 8"

FM-632
16" TO 20"

FM-630 &FM-631
12" TO 20"

A

B

C

D

E

F

K

L

District A:
Connects Thru Dist B

District B:
16" FM-632
16" FM-845
20" FM-846
To GL-LS28

District C:
6" FM-639
6" FM-640
6" FM-688
8" FM-689
10" FM-642
8" FM-646
8" FM-650
6" FM-651
TO SH-LS42WW
(Regency Oaks)
10" FM-653
10" FM-652
10" FM-749
10" FM-750
10" FM-782
10" FM-833
16" FM-845
20" FM-846
To GL-LS28

District D:
10" FM-642
8" FM-646
8" FM-650
6" FM-651
TO SH-LS42WW
(Regency Oaks)
10" FM-653
10" FM-652
10" FM-749
10" FM-750
10" FM-782
10" FM-833
16" FM-845
20" FM-846
To GL-LS28

District E:
20" FM-630
20" FM-631
16" FM-632
16" FM-845
20" FM-846
To GL-LS28

District F:
Connects thru District E

District K:
Connects thru District F

District L:
Connects thru District K

MATCHLINE FIGURE A3

Coastal engineering associates, inc.
Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

Septic to Sewer Conversion Study

Figure G2. Sewer CAD Pipe Schematic of Northern Districts (The Glen WWTF)

PFS-1516-13

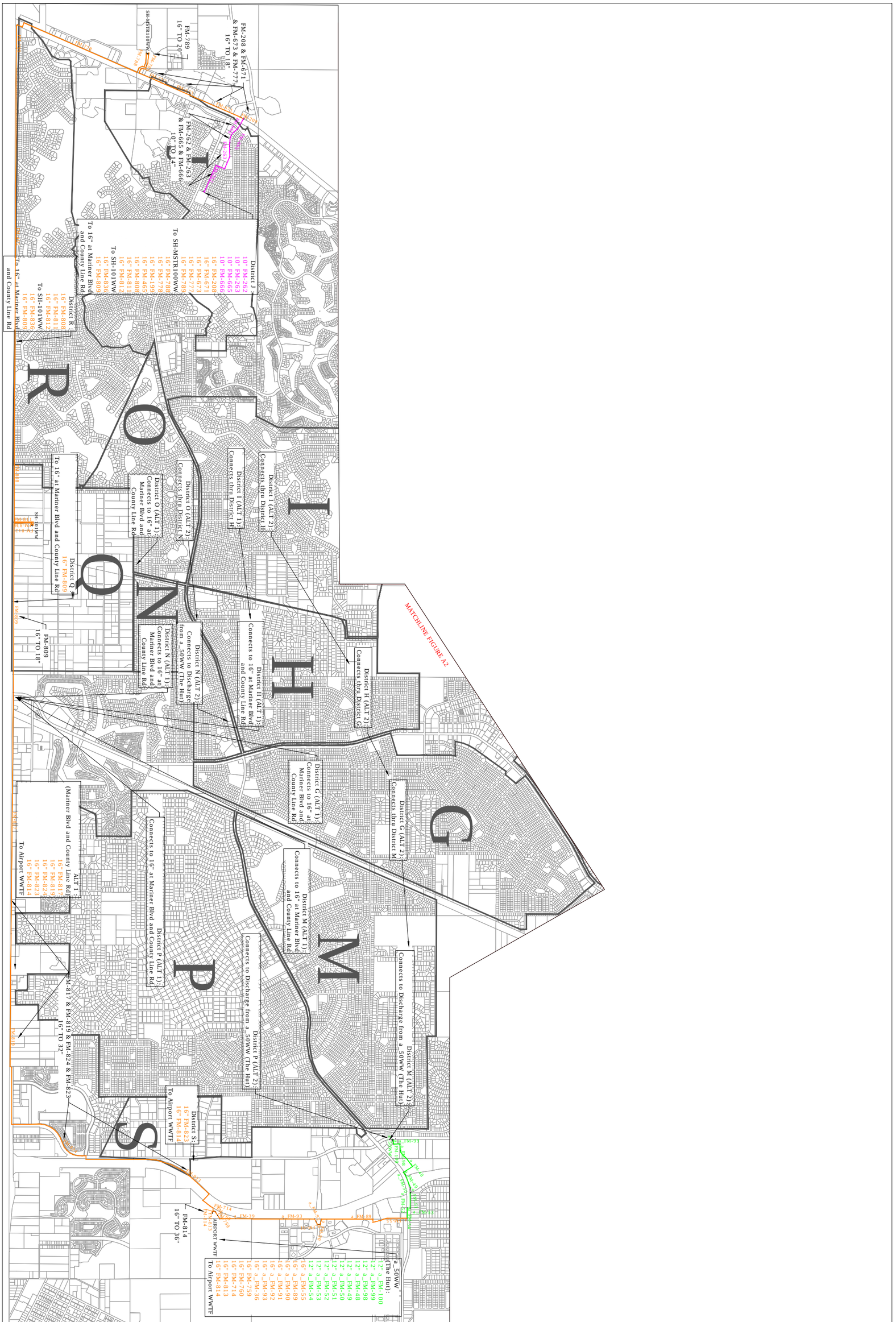


Figure G3. Sewer CAD Pipe Schematic of Southern Districts (The Airport WWTF)

Septic to Sewer Conversion Study

PFS-1516-13

Coastal engineering associates, inc.

Engineering
Planning
Surveying
Environmental
Transportation
Construction Management

Exhibit H
Nitrogen Input from WWTF's

Nitrogen Input from WWTF's

- Per Capita Nitrogen Input = 11.2 grams/day (Table 3-8 Onsite Wastewater Treatment Manual, EPA 2002)
- Average Hernando County Household = 2.39 persons (BEBR 2015)
- Average Sewer Flow per Household = 180 gallons per day (gpd)*

  * Hernando County Sewer Master Plan 2005 determined household flows of 190 gpd for the Airport WWTF and 170 gpd for the Glen WWTF. An average of 180 gpd is used for the calculations. It should be noted that while the Hernando County Water, Reclaimed Water, and Wastewater Construction Specifications call for a flow of 200 gpd for design it was determined that using the 180 gpd value as determined from actual flows would be a more accurate representation of the flows for calculating the nitrogen loading. Therefore, 200 gpd is used when estimating future design requirements and 180 gpd is used when estimating actual nutrient loading.

1. Calculate nitrogen input per household

   Daily Input:
   11.2 grams/day/person/household x 2.39 persons/household = 26.77 grams/day/household

   Annual input (converted to pounds):
   26.77 grams/day/household * 2.2x10-3 lb/gram * 365 day/yr = 21.5 lb/year/household

2. Calculate effluent Concentration of nitrogen per household

$$\frac{26.77 \frac{\text{grams of nitrogen}}{\frac{\text{day}}{\text{household}}} * 1{,}000 \text{mg/g}}{180 \text{ gpd} * 3.78541 \text{ L/gal}} = 39.3 \text{ mg/L}$$

3. Estimate average annual effluent nitrogen concentration from WWTF's (after treatment)

To estimate effluent nitrogen concentration the 2015 Discharge Monitoring Reports (DMR's) were evaluated, see Table A. Concentrations ranged from 0.2 to 15.0 mg/L with average annual effluent nitrogen concentrations for the Airport and The Glen WWTF's of 4.1 and 3.8 mg/L respectively for a combined average of 4.0 mg/L.

4. Estimate Annual Household Input to Springshed

4.0 mg/L x 180 gpd x 365 day/year x 2.2×10^{-6} lb/mg x 3.785 L/gal = 2.2 lb/year/household

Exhibit I
SewerCAD Model Input & Results

PIPING CALCULATIONS

PROJECT:
District A PS:4 (MASTER)

WETWELL SIZING & FORCEMAIN CALCULATIONS

A. DETERMINATION OF FLOW:

	162,800	GPD
PROPOSED LIFT STATION FLOW =	0.162800	MGD
	6,783	GPH
	113.06	GPM

NOTES: {{Describe/Justify where this flow comes from}}
all stationsw in District A pumping to this station which is used as a Master

B. PUMP OUT RATE:

PEAK HOUR FACTOR = 3

NOTES: {{Describe/Justify where this PF comes from}}
Peaking Factor used in original design used here to maintain consistenc

Calculate Peak Flow Rate 339.17 GPM Peak flow <750 gpm Duplex Station per Section 4D.2.4 OF HC Const Spec

Input Desired PUMPOUT FLOW RATE (q) 345 GPM
0.8 CFS

Size Wetwell

Input Desired WETWELL DIAMETER =		10.00	FEET
WETWELL SURFACE AREA =		78.54	SQ. FT.
Input Desired Max time between pump starts at average flows (t)		30	min
determine design volume based on V=tq/4		848	gal
Input Desired WETWELL OPER. DEPTH =		3.00	FEET
WETWELL OPER VOLUME =		1,762	GALS
WETWELL FILL TIME (@ PEAK) =		5.2	MINUTES
WETWELL FILL TIME (@ AVE) =		15.6	MINUTES

C. DETERMINATION OF FORCEMAIN CROSS-SECTIONAL AREA:

Input minimum Design FORCEMAIN VELOCITY (MIN) =		2.00	FPS
Input Maximum Design FORCEMAIN VELOCITY (MIN) =		4.00	FPS
CALCULATED AREA (MIN) = Q/V	A =	0.384	SQ. FT.
F.M. INTERNAL DIAMETER (MAX)	ID =	8.39	INCHES
CALCULATED AREA (MAX) = Q/V	A =	0.192	SQ. FT.
F.M. INTERNAL DIAMETER (MIN)	ID =	5.94	INCHES

D. DETERMINATION OF FORCEMAIN VELOCITY:

Input Desired Nominal Pipe Diameter 8

ACTUAL FORCEMAIN OUT. DIA.	OD =	9.05	INCHES	PVC, CL 150 (SDR 18), 4" TO 12" PVC, CL 150 (SDR 25), 14" TO 24"
ACTUAL FORCEMAIN INT. DIA.	ID =	8.044	INCHES	
ACTUAL FORCEMAIN WALL THICKNESS	T =	0.503	INCHES	
FORCEMAIN VELOCITY	V =	2.18	FPS	

Pipe Diameter Acceptable!

2.0 - FORCEMAIN FRICTION LOSS

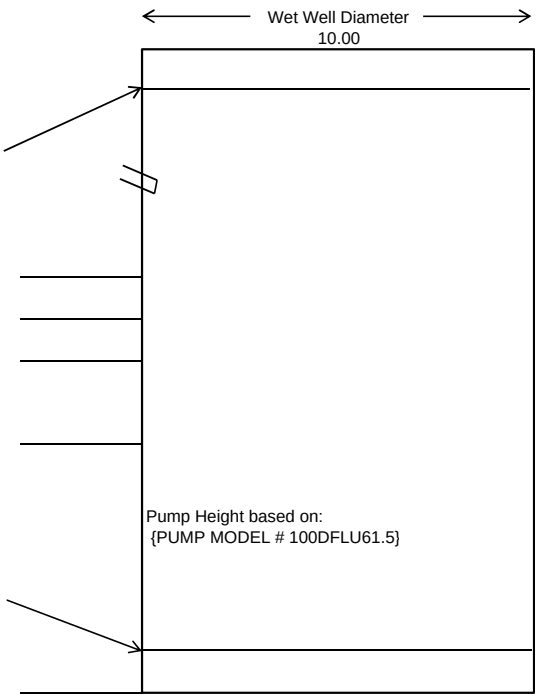
A. STATIC HEAD

HIGHEST FORCEMAIN DISCHARGE ELEV. (H2)	H2 =	40.00	FEET	Approximate high point along route

WETWELL PUMP OFF FLOAT ELEV. (H1)	H2 =	5.50	FEET	Elevation of pump off calculated below
STATIC HEAD =		34.50	FEET	
B. FORCEMAIN PIPE HEAD LOSS (HAZEN-WILLIAMS FORMULA):				
FRICTION FACTOR (C)	C =	120		
LENGTH OF FORCEMAIN (L)	L =	5,700	FEET	Approximate length from SewerCAD model
FORCEMAIN FRICTION LOSS (FP) = 0.2083(L/100)(100/C)^1.85(Q^1.85/D^4.87)				
	FP =	16.69	FEET	
C. FORCEMAIN TOTAL DESIGN HEAD LOSS (HAZEN-WILLIAMS FORMULA):				
TOTAL DESIGN HEAD (TDH)M = SH+FP+FM	TDH =	51.59	FEET	
MIN. PUMP DISCHARGE PRESSURE (P) = TDH*0.4335	P =	22.36	PSI	
PUMP CHARACTERISTICS:	**345**	**GPM @**	**51.59 TDH**	
ACTUAL PUMP OUT TIME (@PEAK):		5.11	MINUTES	
PUMP STARTS PER HOUR		5.8		

Calculate Pump Control Levels

Top of Wetwell Elevation *{Elevation (Ground) (ft) for SewerCAD}*	From CAD	22	ELEV	
Top of wetwell thickness		8	inches	
Inside top of Wetwell Elevation		21.3333333	ELEV	
Input Influent Invert Elevation	from CAD	10	ELEV.	
Elevation (Maximum) (ft) (for SewerCAD Only)		*9.6*		
Alarm Signal On Elevation		**9.5**	ELEV.	
Second Pump On Elevation		**9**	ELEV.	
First Pump On Elevation		**8.5**	ELEV.	
Elevation (Initial) (ft) (for SewerCAD Only)		*8.4*		
Pumps Off Elevation		**5.50**	ELEV.	
Elevation (Minimum) (ft) (for SewerCAD Only)		*5.40*		
Pump Height (in feet) (Required for Design but not for SewerCAD)	Assumed	3	ft	
PUMP Elevation (Invert) (ft) (for SewerCAD Only)		*3.25*		
Top of Slab Elevation *{Elevation (Base) (ft) for SewerCAD}*		**2.25**	ELEV.	
Slab Thickness (inches)		10	inches	
Bottom of Slab Elevation		1.42	ELEV	
Pipe length from discharge of pump to connection point (SewerCAD Only)		*5,836*		



PIPING CALCULATIONS

PROJECT:
District B PS:10 (MASTER)

WETWELL SIZING & FORCEMAIN CALCULATIONS

A. DETERMINATION OF FLOW:

	301,200	GPD
PROPOSED LIFT STATION FLOW =	0.301200	MGD
	12,550	GPH
	209.17	GPM

NOTES: {{Describe/Justify where this flow comes from}}
District B pumping to this station which is used as a Master

B. PUMP OUT RATE:

PEAK HOUR FACTOR = 3

NOTES: {{Describe/Justify where this PF comes from}}
Peaking Factor used in original design used here to maintain consistenc

Calculate Peak Flow Rate 627.50 GPM Peak flow <750 gpm Duplex Station per Section 4D.2.4 OF HC Const Spec

Input Desired PUMPOUT FLOW RATE (q) 630 GPM
1.4 CFS

Size Wetwell

Input Desired WETWELL DIAMETER =		12.00	FEET
WETWELL SURFACE AREA =		113.10	SQ. FT.
Input Desired Max time between pump starts at average flows (t)		30	min
determine design volume based on V=tq/4		1569	gal
Input Desired WETWELL OPER. DEPTH =		4.00	FEET
WETWELL OPER VOLUME =		3,384	GALS
WETWELL FILL TIME (@ PEAK) =		5.4	MINUTES
WETWELL FILL TIME (@ AVE) =		16.2	MINUTES

C. DETERMINATION OF FORCEMAIN CROSS-SECTIONAL AREA:

Input minimum Design FORCEMAIN VELOCITY (MIN) =		2.00	FPS
Input Maximum Design FORCEMAIN VELOCITY (MIN) =		4.00	FPS
CALCULATED AREA (MIN) = Q/V	A =	0.702	SQ. FT.
F.M. INTERNAL DIAMETER (MAX)	ID =	11.34	INCHES
CALCULATED AREA (MAX) = Q/V	A =	0.351	SQ. FT.
F.M. INTERNAL DIAMETER (MIN)	ID =	8.02	INCHES

D. DETERMINATION OF FORCEMAIN VELOCITY:

Input Desired Nominal Pipe Diameter 8

ACTUAL FORCEMAIN OUT. DIA.	OD =	9.05	INCHES	PVC, CL 150 (SDR 18), 4" TO 12" PVC, CL 150 (SDR 25), 14" TO 24"
ACTUAL FORCEMAIN INT. DIA.	ID =	8.044	INCHES	
ACTUAL FORCEMAIN WALL THICKNESS	T =	0.503	INCHES	
FORCEMAIN VELOCITY	V =	3.98	FPS	

Pipe Diameter Acceptable!

2.0 - FORCEMAIN FRICTION LOSS

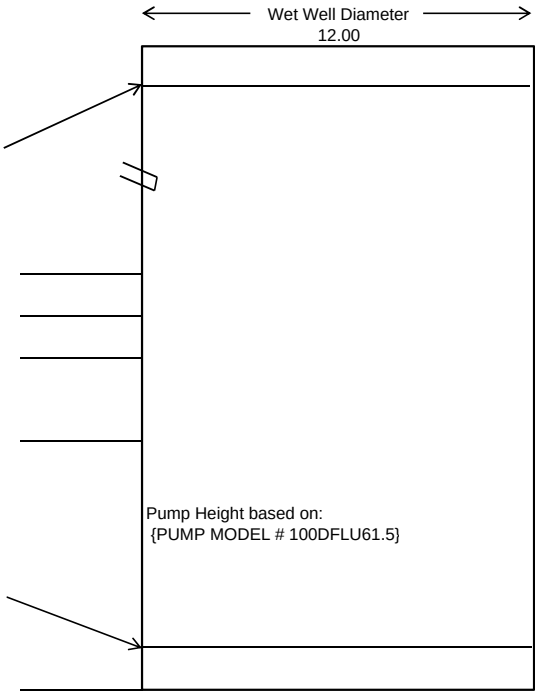
A. STATIC HEAD

HIGHEST FORCEMAIN DISCHARGE ELEV. (H2) H2 = 30.00 FEET Approximate high point along route.

WETWELL PUMP OFF FLOAT ELEV. (H1)	H2 =	7.00	FEET	Elevation of pump off calculated below
STATIC HEAD =		23.00	FEET	
B. FORCEMAIN PIPE HEAD LOSS (HAZEN-WILLIAMS FORMULA):				
FRICTION FACTOR (C)	C =	120		
LENGTH OF FORCEMAIN (L)	L =	700	FEET	Approximate length from CAD
FORCEMAIN FRICTION LOSS (FP) = 0.2083(L/100)(100/C)^1.85(Q^1.85/D^4.87)				
	FP =	6.25	FEET	
C. FORCEMAIN TOTAL DESIGN HEAD LOSS (HAZEN-WILLIAMS FORMULA):				
TOTAL DESIGN HEAD (TDH)M = SH+FP+FM	TDH =	30.47	FEET	
MIN. PUMP DISCHARGE PRESSURE (P) = TDH*0.4335	P =	13.21	PSI	
PUMP CHARACTERISTICS:	**630**	**GPM @**	**30.47 TDH**	
ACTUAL PUMP OUT TIME (@PEAK):		5.37	MINUTES	
PUMP STARTS PER HOUR		5.6		

Calculate Pump Control Levels

Top of Wetwell Elevation *{Elevation (Ground) (ft) for SewerCAD}*	From CAD	22	ELEV
Top of wetwell thickness		8	inches
Inside top of Wetwell Elevation		21.3333333	ELEV
Input Influent Invert Elevation	from CAD	12.5	ELEV.
Elevation (Maximum) (ft) (for SewerCAD Only)		*12.1*	
Alarm Signal On Elevation		**12**	ELEV.
Second Pump On Elevation		**11.5**	ELEV.
First Pump On Elevation		**11**	ELEV.
Elevation (Initial) (ft) (for SewerCAD Only)		*10.9*	
Pumps Off Elevation		**7.00**	ELEV.
Elevation (Minimum) (ft) (for SewerCAD Only)		*6.90*	
Pump Height (in feet) (Required for Design but not for SewerCAD)	Assumed	4	ft
PUMP Elevation (Invert) (ft) (for SewerCAD Only)		*3.75*	
Top of Slab Elevation *{Elevation (Base) (ft) for SewerCAD}*		**2.75**	ELEV.
Slab Thickness (inches)		10	inches
Bottom of Slab Elevation		1.92	ELEV
Pipe length from discharge of pump to connection point (SewerCAD Only)		*836*	



PIPING CALCULATIONS

PROJECT:
District E PS:8 (MASTER)

WETWELL SIZING & FORCEMAIN CALCULATIONS

A. DETERMINATION OF FLOW:

	411,500	GPD	205750
PROPOSED LIFT STATION FLOW =	0.411500	MGD	
	17,146	GPH	
	285.76	GPM	

NOTES: {{Describe/Justify where this flow comes from}}
District E pumping to this station which is used as a Master. Flow cut in half because single pump station would exceed capacity of all downstream infrastructure. Will need to employ telemetry to time pumps to prevent overflow

B. PUMP OUT RATE:

PEAK HOUR FACTOR = 3

NOTES: {{Describe/Justify where this PF comes from}}
Peaking Factor used in original design used here to maintain consistenc

Calculate Peak Flow Rate 857.29 GPM Peak flow >750 gpm Triplex Station per Section 4D.2.4 OF HC Const Spec

Input Desired PUMPOUT FLOW RATE (q) 860 GPM
1.9 CFS

Size Wetwell

Input Desired WETWELL DIAMETER =	12.00	FEET	
WETWELL SURFACE AREA =	113.10	SQ. FT.	
Input Desired Max time between pump starts at average flows (t)	30	min	
determine design volume based on V=tq/4	2143	gal	
Input Desired WETWELL OPER. DEPTH =	5.10	FEET	
WETWELL OPER VOLUME =	4,314	GALS	
WETWELL FILL TIME (@ PEAK) =	5.0	MINUTES	
WETWELL FILL TIME (@ AVE) =	15.1	MINUTES	

C. DETERMINATION OF FORCEMAIN CROSS-SECTIONAL AREA:

Input minimum Design FORCEMAIN VELOCITY (MIN) =		2.00	FPS
Input Maximum Design FORCEMAIN VELOCITY (MIN) =		4.00	FPS
CALCULATED AREA (MIN) = Q/V	A =	0.958	SQ. FT.
F.M. INTERNAL DIAMETER (MAX)	ID =	13.25	INCHES
CALCULATED AREA (MAX) = Q/V	A =	0.479	SQ. FT.
F.M. INTERNAL DIAMETER (MIN)	ID =	9.37	INCHES

D. DETERMINATION OF FORCEMAIN VELOCITY:

Input Desired Nominal Pipe Diameter 12

ACTUAL FORCEMAIN OUT. DIA.	OD =	12.20	INCHES	PVC, CL 150 (SDR 18), 4" TO 12" PVC, CL 150 (SDR 25), 14" TO 24"
ACTUAL FORCEMAIN INT. DIA.	ID =	10.734	INCHES	
ACTUAL FORCEMAIN WALL THICKNESS	T =	0.733	INCHES	
FORCEMAIN VELOCITY	V =	3.05	FPS	

Pipe Diameter Acceptable!

2.0 - FORCEMAIN FRICTION LOSS

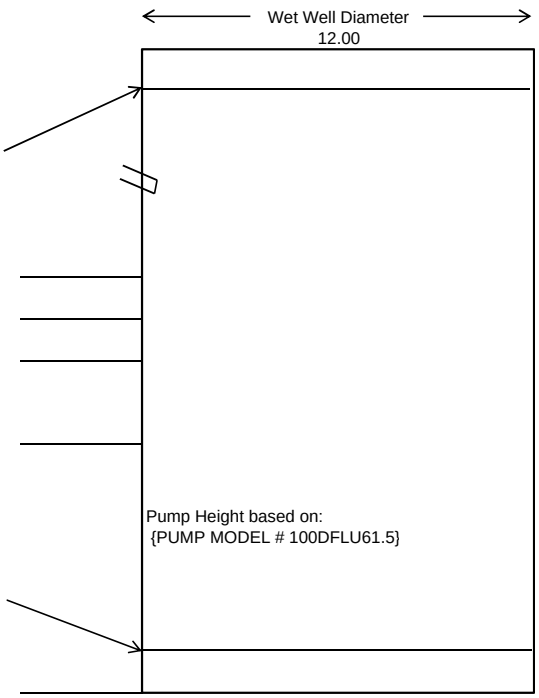
A. STATIC HEAD

HIGHEST FORCEMAIN DISCHARGE ELEV. (H2) H2 = 31.33 FEET Used connection point from SewerCAD model

WETWELL PUMP OFF FLOAT ELEV. (H1)	H2 =	8.40	FEET	Elevation of pump off calculated below
STATIC HEAD =		22.93	FEET	
B. FORCEMAIN PIPE HEAD LOSS (HAZEN-WILLIAMS FORMULA):				
FRICTION FACTOR (C)	C =	120		
LENGTH OF FORCEMAIN (L)	L =	700	FEET	Approximate length from CAD
FORCEMAIN FRICTION LOSS (FP) = 0.2083(L/100)(100/C)^1.85(Q^1.85/D^4.87)				
	FP =	2.73	FEET	
C. FORCEMAIN TOTAL DESIGN HEAD LOSS (HAZEN-WILLIAMS FORMULA):				
TOTAL DESIGN HEAD (TDH)M = SH+FP+FM	TDH =	26.19	FEET	
MIN. PUMP DISCHARGE PRESSURE (P) = TDH*0.4335	P =	11.36	PSI	
PUMP CHARACTERISTICS:	**860**	**GPM @**	**26.19 TDH**	
ACTUAL PUMP OUT TIME (@PEAK):		5.02	MINUTES	
PUMP STARTS PER HOUR		6.0		

Calculate Pump Control Levels

Top of Wetwell Elevation *{Elevation (Ground) (ft) for SewerCAD}*	From CAD	24	ELEV	
Top of wetwell thickness		8	inches	
Inside top of Wetwell Elevation		23.3333333	ELEV	
Input Influent Invert Elevation	from CAD the	15	ELEV.	
Elevation (Maximum) (ft) (for SewerCAD Only)		*14.6*		
Alarm Signal On Elevation		**14.5**	ELEV.	
Second Pump On Elevation		**14**	ELEV.	
First Pump On Elevation		**13.5**	ELEV.	
Elevation (Initial) (ft) (for SewerCAD Only)		*13.4*		
Pumps Off Elevation		**8.40**	ELEV.	
Elevation (Minimum) (ft) (for SewerCAD Only)		*8.30*		
Pump Height (in feet) (Required for Design but not for SewerCAD)	Assumed	4	ft	
PUMP Elevation (Invert) (ft) (for SewerCAD Only)		*5.15*		
Top of Slab Elevation *{Elevation (Base) (ft) for SewerCAD}*		**4.15**	ELEV.	
Slab Thickness (inches)		10	inches	
Bottom of Slab Elevation		3.32	ELEV	
Pipe length from discharge of pump to connection point (SewerCAD Only)		*836*		



PIPING CALCULATIONS

PROJECT:
GL-LS28

WETWELL SIZING & FORCEMAIN CALCULATIONS

A. DETERMINATION OF FLOW:

	1,866,845	GPD
PROPOSED LIFT STATION FLOW =	1.866845	MGD
	77,785	GPH
	1,296.42	GPM

NOTES: {{Describe/Justify where this flow comes from}}
1,866845 gpd Estimated from SewerCAD using know flow of 41.7 gpm at pump station and peak flow through gravity pipe draining to wetwell of 1254.72 gpm

B. PUMP OUT RATE:

PEAK HOUR FACTOR = 1

NOTES: {{Describe/Justify where this PF comes from}}
Peaking factor not used. Flow is estimated from SewerCAD model which represents the peak flow

Calculate Peak Flow Rate	1296.42	GPM	
Input Desired PUMPOUT FLOW RATE (q)	1500	GPM	1,500 gpm is design point from SewerCAD model
	3.3	CFS	

Size Wetwell

Input Desired WETWELL DIAMETER =	12.00	FEET	Wetwell info page D.2-2 of 2011 SMP
WETWELL SURFACE AREA =	113.10	SQ. FT.	
Input Desired Max time between pump starts at average flows (t)	30	min	
determine design volume based on V=tq/4	9723	gal	
Input Desired WETWELL OPER. DEPTH =	3.92	FEET	Wetwell info page D.2-2 of 2011 SMP
WETWELL OPER VOLUME =	3,316	GALS	
WETWELL FILL TIME (@ PEAK) =	2.6	MINUTES	
WETWELL FILL TIME (@ AVE) =	2.6	MINUTES	
ACTUAL PUMP OUT TIME (@PEAK):	2.21	MINUTES	
PUMP STARTS PER HOUR	12.6		

Table I1. Force main velocities from SewerCAD model

Current Model			District A		District B		District E		District A & B		District A, B & E	
Label	Current Model Flow (Maximum) (gal/min)	Current Model Velocity (Maximum Calculated) (ft/s)	Flow (Maximum) (gal/min)	Velocity (Maximum Calculated) (ft/s)	Flow (Maximum) (gal/min)	Velocity (Maximum Calculated) (ft/s)	Flow (Maximum) (gal/min)	Velocity (Maximum Calculated) (ft/s)	Flow (Maximum) (gal/min)	Velocity (Maximum Calculated) (ft/s)	Flow (Maximum) (gal/min)	Velocity (Maximum Calculated) (ft/s)
FM-630	599.43	1.70					1,537.68	4.36			1,411.93	4.01
FM-631	599.43	1.70					1,537.68	4.36			1,411.93	4.01
FM-632	1,394.96	2.23	1,742.78	2.78	1,947.16	3.11	2,113.26	3.37	2,156.42	3.44	2,557.40	4.08
FM-845	2,438.55	3.89	2,856.51	4.56	2,957.66	4.72	3,236.99	5.17	3,090.50	4.93	3,418.92	5.46
FM-846	3,026.21	3.09	3,223.49	3.29	3,401.25	3.47	3,590.93	3.67	3,572.42	3.65	3,995.08	4.08
FM-613	2,584.43	3.26	2,583.99	3.26	2,584.14	3.26	2,584.09	3.26	3,295.93	4.16	3,324.11	4.19
FM-615	2,584.43	3.26	2,583.99	3.26	2,584.14	3.26	2,584.09	3.26	3,295.93	4.16	3,324.11	4.19
FM-616	2,584.43	3.26	2,583.99	3.26	2,584.14	3.26	2,584.09	3.26	3,295.93	4.16	3,324.11	4.19
n_FM-42	3,047.84	3.11	3,047.64	3.11	3,055.91	3.12	3,074.86	3.14	3,576.05	3.65	3,687.44	3.77
FM-579	3,058.67	3.12	3,058.47	3.12	3,066.74	3.13	3,085.70	3.15	3,586.88	3.66	3,698.27	3.78
FM-580	3,058.67	2.17	4,362.81	3.09	4,371.04	3.10	4,376.29	3.10	4,376.33	3.10	4,383.48	3.11
n_FM-43	3,809.85	2.70	4,586.90	3.25	4,585.43	3.25	4,586.32	3.25	4,586.36	3.25	4,591.36	3.26