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# City of St. Augustine West Augustine CRA

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## Water and Sewer Master Plan

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**PREPARED BY:**

**APPLIED TECHNOLOGY AND MANAGEMENT, INC.**

**ST. AUGUSTINE, FL**

**CERTIFICATION No. 00004669**

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## EXECUTIVE SUMMARY

Located partially within St. Augustine, Florida and partially within the unincorporated area of St. Johns County is West Augustine. Historically, West Augustine has suffered from social and economic issues that have hampered financial investment and economic development. To begin addressing these issues and focus on the unique challenges and opportunities in the area, the West Augustine Community Development Area (CRA) was developed.

A significant challenge to economic development in the West Augustine area is the lack of infrastructure and specifically the lack of sewer service or transmission capacity. Without this basic service, businesses are unwilling to locate along the existing commercial corridor and the environmental impacts of clustered septic tanks continue to pose an even greater risk. This Water & Sewer Master Plan (Plan) evaluates the technical feasibility and costs of providing centralized sewer service to all of West Augustine.

The City of St. Augustine currently provides sewer service to the eastern portion of the CRA and water service to the majority of the CRA. The areas without centralized sewer service have individual septic tanks. The first step in expanding sewer service to the remainder of West Augustine is to expand the wastewater transmission capacity along the major commercial corridor, King Street. Transmission capacity on King Street allows business expansion along the corridor and provides a major collector for sewage within the residential extremities of the CRA.

Once transmission capacity is in place, sewer service can expand into the residential areas of West Augustine. To evaluate expanding sewer service to all areas of the CRA, ATM divided the area into sub-basins or zones. In general, each zone represents the area that would be served by a new pumping station. The conceptual design developed in the Plan not only provides sewer service for current conditions, but also includes capacity and costs for build-out conditions within the CRA. In all, there are currently approximately 1,250 homes without centralized sewer service in the CRA.

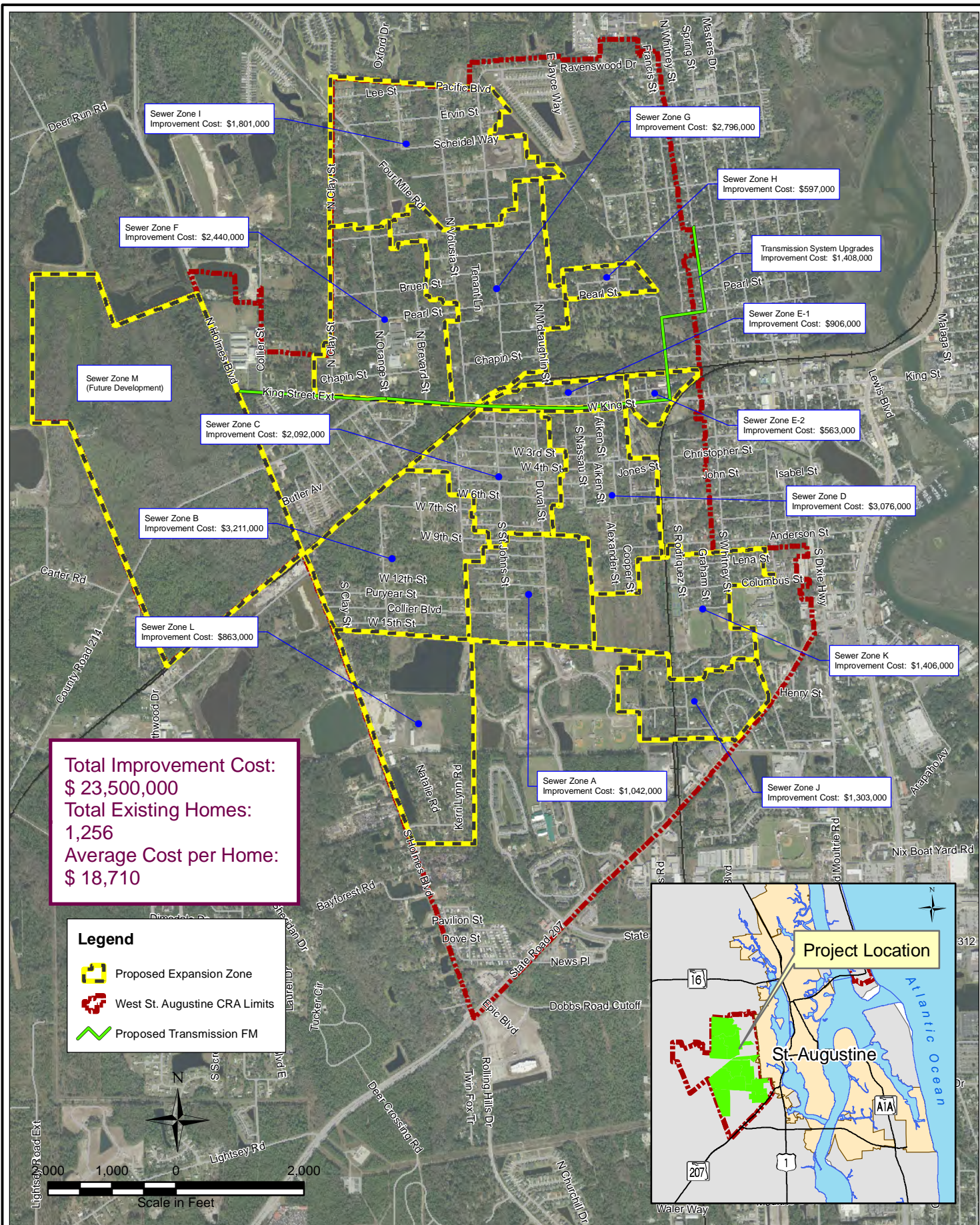
Most of the CRA already receives water service from the City of St. Augustine. However, certain pipelines are small in diameter and may not provide optimal flow or pressure, or may not provide adequate fire protection. As part of this master planning effort, ATM included costs for increasing the size of small diameter pipelines in areas that would be impacted through construction of the sewer improvements.

Table ES-1 below provides the overall Opinion of Probable Cost for the construction of the water and sewer improvements identified in the Plan and broken down by zone. The costs presented in the Table are in 2009 dollars and do not account for future inflation.

Table ES-1      Opinion of Probable Construction Cost	
Project Area	Capital Cost <sup>1</sup>
Transmission Upgrades	\$ 1,408,000
Zone A	\$ 1,042,000
Zone B	\$ 3,211,000
Zone C	\$ 2,092,000
Zone D	\$ 3,076,000
Zone E-1	\$ 906,000
Zone E-2	\$ 563,000
Zone F	\$ 2,440,000
Zone G	\$ 2,796,000
Zone H	\$ 597,000
Zone I	\$ 1,801,000
Zone J	\$ 1,303,000
Zone K	\$ 1,406,000
Zone L	\$ 863,000
Zone M	N/A
<b>Total</b>	<b>\$ 23,500,000</b>
<i>1 – Costs are based on August 2009 representative bid costs. August 2009 Engineering News and Record Construction Cost Index at 8563.8.</i>	

As shown in the Table above, the costs to provide sewer service to all of the CRA is approximately \$23,500,000. The zones and cost breakdown are presented geographically in Figure ES-1 below. A 24" by 36" copy of this figure is provided in Appendix E. Due to the significant capital cost associated with these improvements, they will likely be phased over a number of years. As indicated, the Transmission Upgrades should be constructed first. The last section of the Plan provides guidance on construction phasing for the remaining zones.





# West Augustine Community Redevelopment Area Sewer Master Plan Opinion of Costs Breakdown

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.

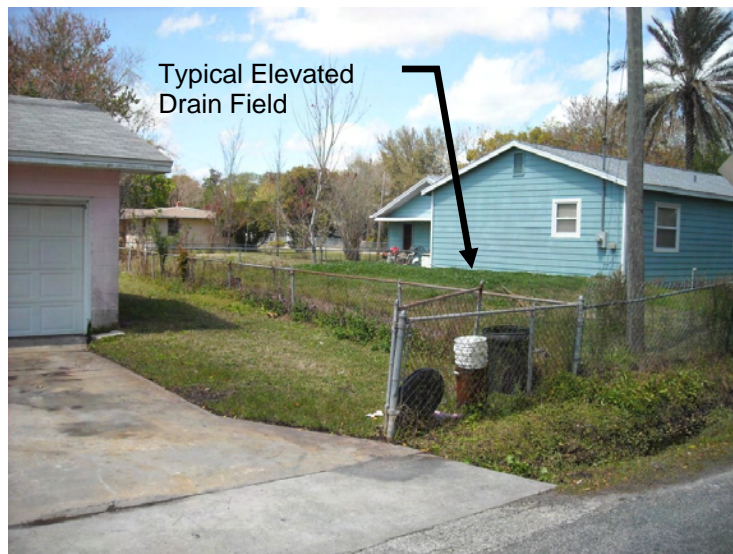




## 1.0 BACKGROUND

West Augustine is located in St. Johns County, Florida and is partially within the City of St. Augustine city limits as shown in Figure 1-1. Historically, the area has been economically depressed and lacked significant infrastructure investment. St. Johns County formed a Community Redevelopment Agency (CRA), known as the West Augustine CRA, to help address some of the challenges in West Augustine. One goal in particular is to improve infrastructure in the CRA. Improved infrastructure will not only improve the quality of life of the West Augustine residents, but it will also attract businesses and spur economic development in the area.

The City of St. Augustine provides water and sewer service to areas in and around the City limits. The West Augustine CRA is partially within the City limits and forms the western boundary of the area served by the City's utility. Currently, a large percentage of West Augustine receives water service from the City, but only a small portion of the area receives sewer service. Most homes in the area use septic tanks for wastewater treatment, shown in the picture below.



Typical elevated drainfield associated  
with a septic tank in West Augustine

Recognizing the need for improved infrastructure, in August 2009, the City and County entered into a joint resolution, provided in Appendix A, to work cooperatively to support funding initiatives for improved public sanitary sewer and water infrastructure in the West Augustine CRA. The first step of the strategy is to develop this Water & Sewer Master Plan (herein termed the "Plan") for the CRA.



Figure 1-1  
Project Location Map  
West Augustine CRA

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## 1.1 PLANNING AREA

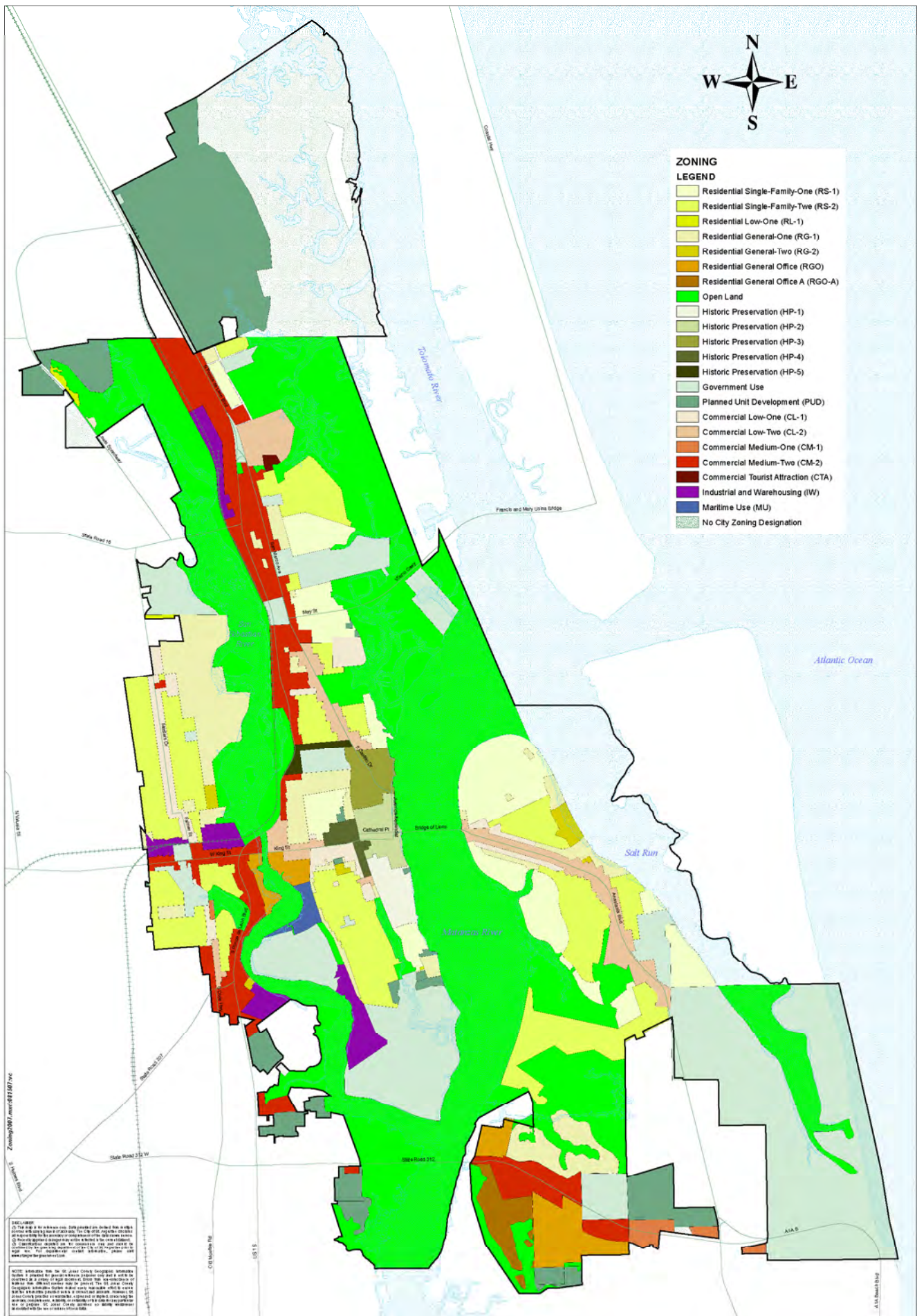
This Plan provides conceptual level engineering information for water and sewer infrastructure within the West Augustine CRA, the borders of which are shown in Figure 1-3. The additional wastewater load from the CRA area will have impacts on pump stations and wastewater treatment outside of the CRA limits. The ability of those systems outside of the CRA limits to handle the additional impacts have been verified by the City of St. Augustine and are referenced where applicable in this Plan.

The West Augustine CRA lies partially within the St. Augustine City limits, with the other part remaining in the unincorporated portion of St. Johns County. Figures 1-2 and 1-3 show the zoning for the City and County respectively in this area. As shown by the zoning maps and indicated in the picture below, W King Street serves as the commercial corridor through West Augustine and entrance to St. Augustine. The remaining areas of West Augustine are mostly residential, with some less intense commercial zoning and Industrial zoning along some of the Florida East Coast Railway track corridor. The zoning maps also show that the majority of residential areas in West Augustine contain small parcels with limited street right-of-ways (ROWs).



King Street corridor





**FIGURE 1-2 CITY OF ST. AUGUSTINE ZONING**



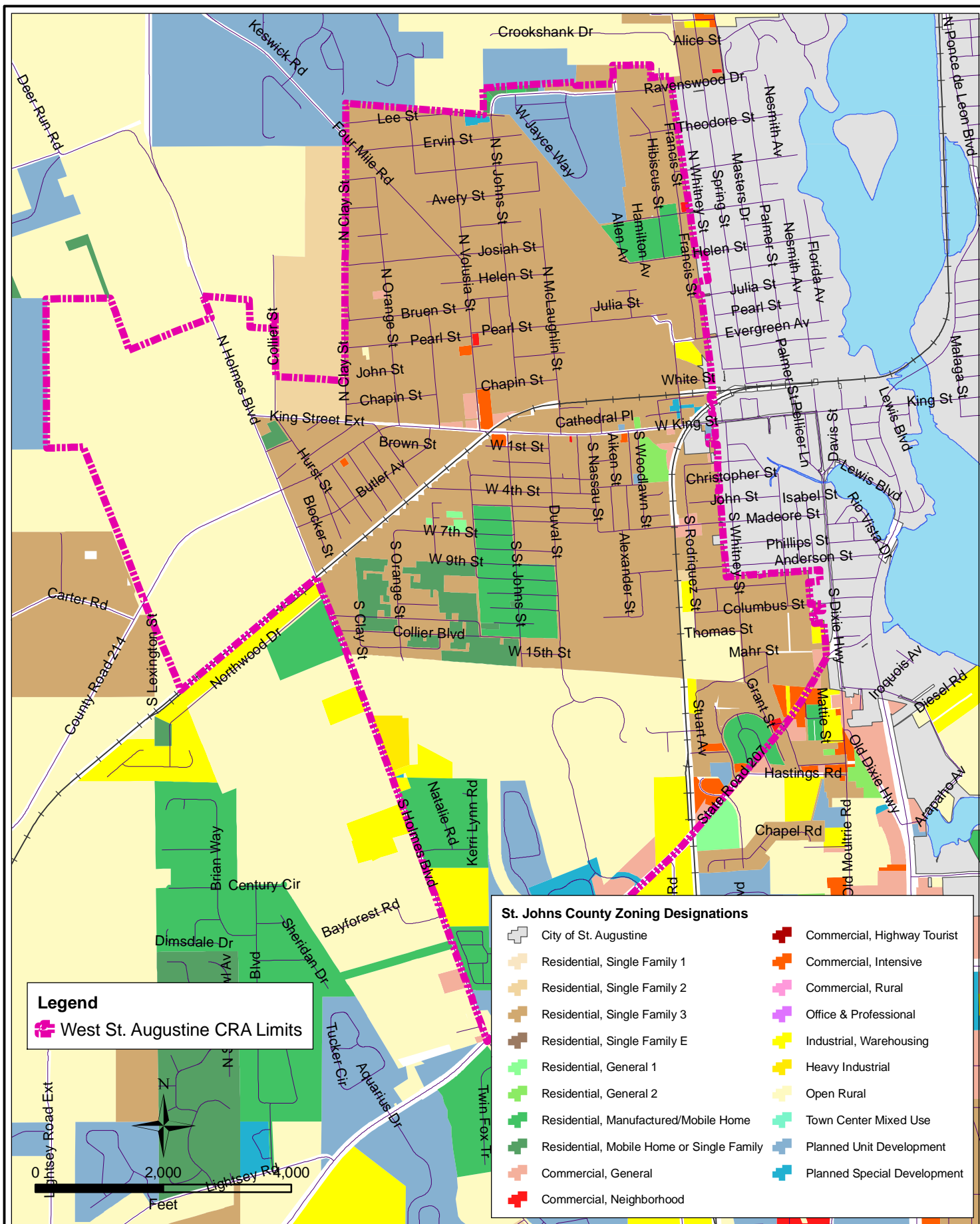


Figure 1-3  
County Zoning  
West Augustine CRA

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The West Augustine area is fairly low lying as Figure 1-4 shows. This figure provides general topographical information obtained from Light Detection and Ranging (LIDAR) data which is sufficient for conceptual infrastructure planning. Figure 1-5 shows the wetlands inventory for the area. The low lying areas, combined with minimal existing infrastructure and limited ROWs will make construction difficult in West Augustine. Some residential roads have steep stormwater swales at the edge of the street as shown in the picture below. Construction in these areas will have impacts to traffic flow during construction.



Typical limited ROW and stormwater swales

## 1.2 NEED FOR PROJECT

The addition of sewer infrastructure in West Augustine is necessary to promote economic development in the area and address environmental and health issues. Providing centralized sewer will help to stimulate commercial growth along the West King Street corridor and will replace existing residential septic systems. The City and County are currently working jointly with the Health Department to conduct a comprehensive assessment of the environmental and health impacts from the aged septic systems in West Augustine. The analysis is currently underway, but is not yet complete and not yet available for inclusion into this Plan.



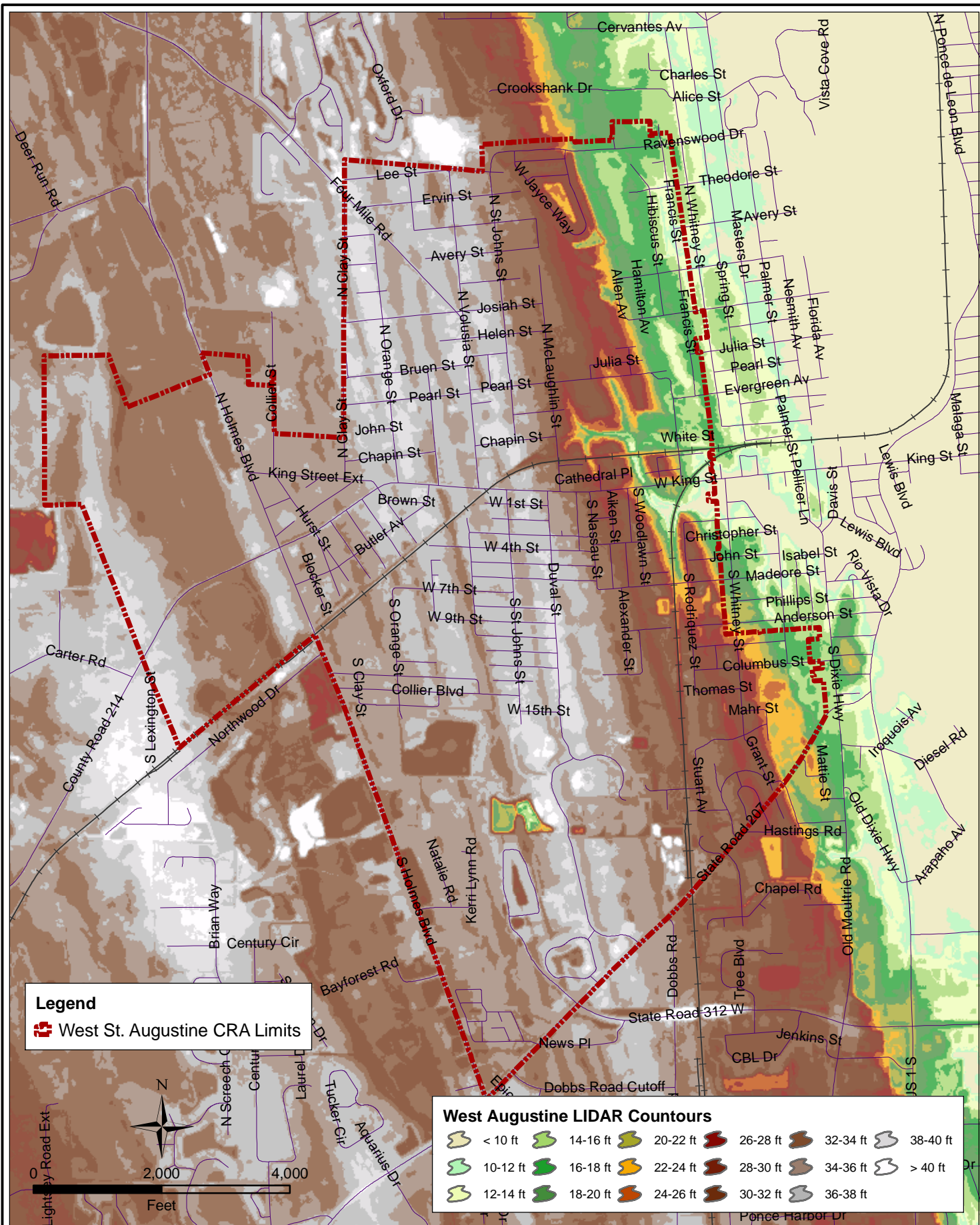
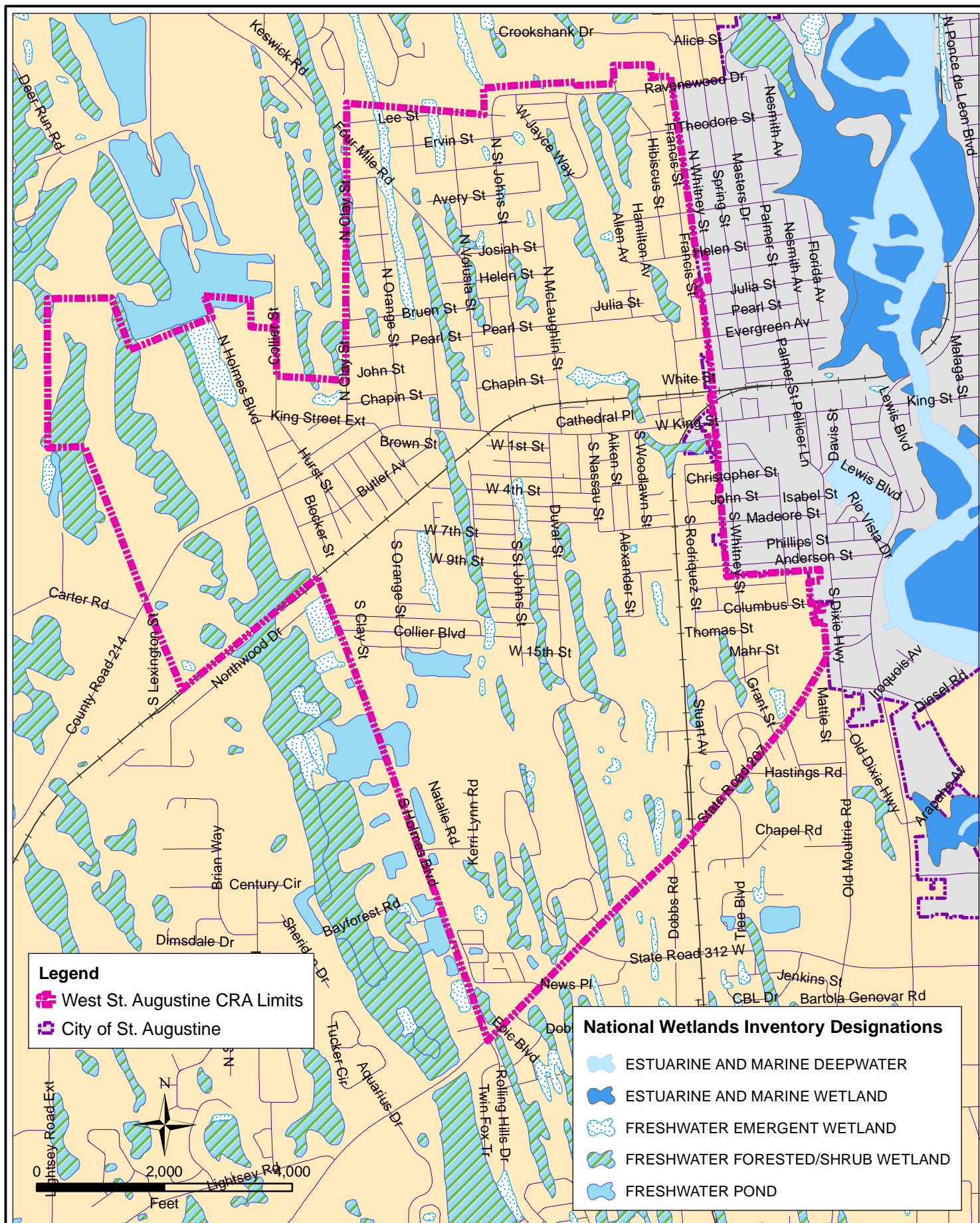


Figure 1-4  
Topographic Map  
West Augustine CRA

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## 2.0 EXISTING SYSTEM

The City of St. Augustine's Public Works Department is responsible for the operation and maintenance of the City's water and wastewater utility. The following sections provide additional information on each of these systems.

### 2.1 WASTEWATER SYSTEM

The City's wastewater system consists of approximately 85 miles of gravity pipe, 77 pump stations, 60 miles of forcemain, and a single wastewater treatment plant (WWTP). The West Augustine CRA is partially served by the City's sewer system, which consists of the gravity sewer system, pump stations, and forcemains. The majority of the area already sewered is along the eastern boundary of the CRA. Other pockets of service exist where new development has occurred or where there is a larger anchor customer. The remaining areas do not have centralized sewer service and are served by septic tanks.

#### 2.1.1 Wastewater Treatment Plant

The City's WWTP is located approximately a mile south of downtown St. Augustine at the southern end of Riberia Street. It provides secondary treatment and discharges treated effluent to the Matanzas River. Table 2-1 provides information on the capacity of the WWTP.

Table 2-1 St. Augustine WWTP <sup>1</sup>		
Capacity	Value (MGD <sup>2</sup> )	Note
Design	5.0	None
Permitted	4.95	None
12-month AADF <sup>3</sup>	3.685	As of 11/30/2009
Committed Capacity	0.7605	Includes 0.147 MGD for development near CRA
Available Capacity	0.504	None
1 – Data provided by the City of St. Augustine		
2 – Million Gallons Per Day (MGD)		
3 – Annual Average Daily Flow (AADF)		

### 2.1.2 Wastewater Collection System

The City of St. Augustine's existing sanitary sewer collection system consists of 82 collection basins, each with a dedicated City or private pump station. Of the 82 basins, sewer expansion in West Augustine will impact a total of nine basins with four being impacted by additional wastewater loads and five by additional forcemain flow. Since this Plan focuses on the West Augustine CRA, additional discussion on the City's existing wastewater system focuses on these impacted basins. The existing sewer infrastructure associated with the planning area is shown in Figure 2-1.

General information provided by the City for each of the impacted pump stations is summarized in Table 2-2. Note that pump station inspections or tests were not conducted as part of this Plan.

Table 2-2 Existing Pump Station Information				
Pump Station	Location	Pump Make and Model	Motor HP	Capacity (gpm)
PS - 7	Helen St.	Flygt 3152	20	500
PS - 9	Lewis Blvd.	Flygt 3152	20	1000
PS - 38	Orange St WES	Flygt	3	Not provided
PS - 39	N Holmes MMS	Flygt	3	Not provided
PS - 57	Osceola school	Flygt 3102	5	575
PS - 65	Ferry Place	Flygt 3127	10	350
PS - 66	Butler Blvd.	Flygt 3085	3	230
PS - 81	Schiedel Way	Flygt 3085	3	92
PS - 82	Solomon Calhoun	Flygt 3127	10	200

Information on the impacted pump stations is provided in Table 2-3. The build-out flows are estimated using sewer lateral GIS data provided by the City and the City's 210 gallon per day per dwelling wastewater load standard. Peak flows (PF) for build-out conditions are calculated for each basin using Ten State Standards recommended residential peaking factors and assume a population of 2.5 persons per dwelling unit.



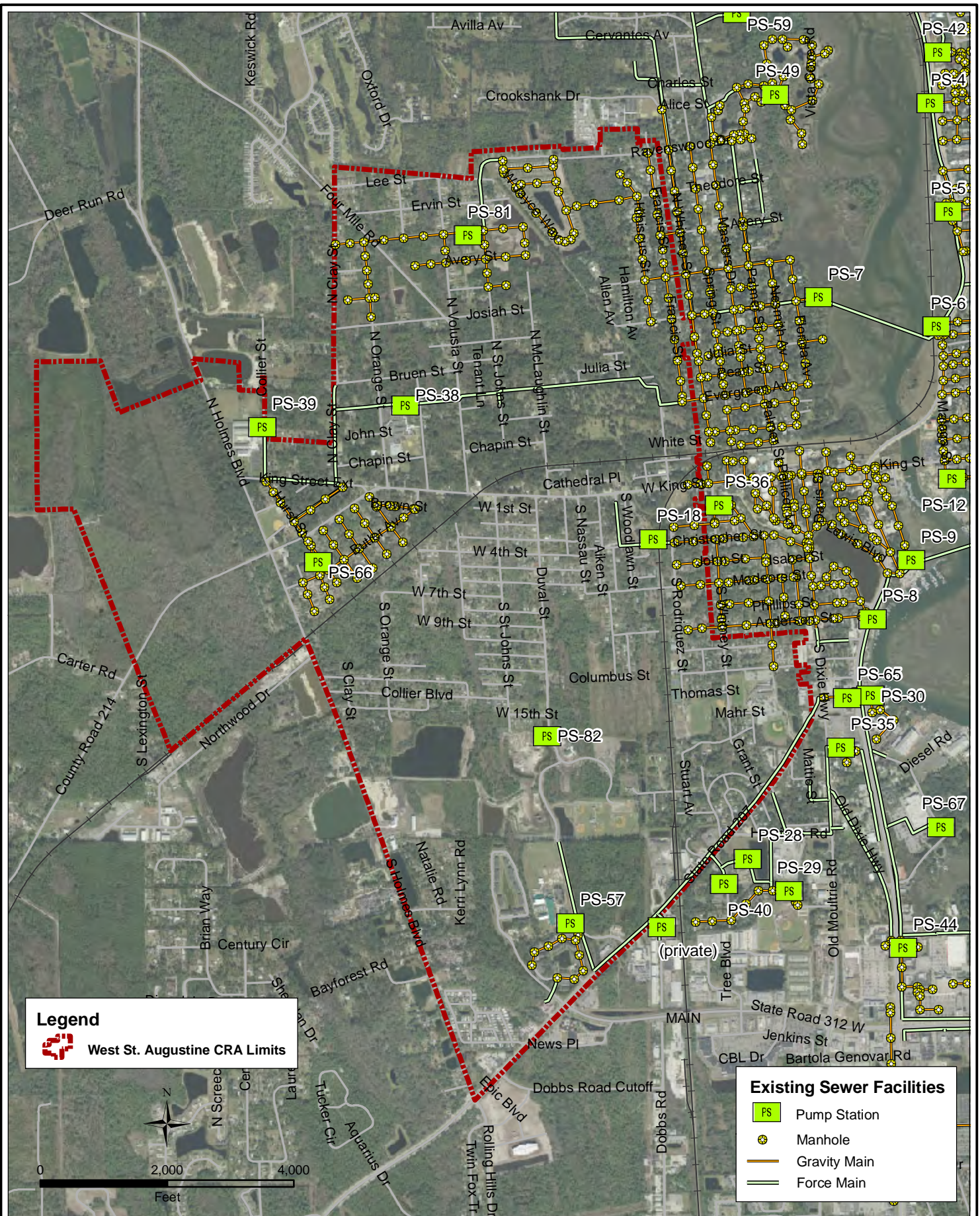


Figure 2-1  
Existing Collection System  
West Augustine CRA

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Table 2-3      Impacts to existing Pump Stations			
Pump Station	Capacity (gpm)	Estimated Current PF <sup>1</sup> (gpm)	CRA Build-out PF (gpm)
PS-7	500	650	645 <sup>2</sup>
PS-9	1000	450	610
PS-66	230	93	133
PS-81	92	20	364 <sup>2</sup>
PS-82	200	20	383 <sup>2</sup>
<b>Total</b>		1,233	2,135
<i>1 – PF = Peak Flow</i>			
<i>2 – Note build-out exceeds current capacity; therefore the OPCC includes costs to expand capacity.</i>			

The information presented in the table shows that future upgrades to three existing City pump stations will be necessary as new sewer infrastructure is constructed in the CRA and in-fill growth in the area occurs.

## 2.2 WATER SYSTEM

A large percentage of West Augustine currently receives water service from the City of St. Augustine. The City's water system includes two co-located water treatment plants (WTPs), which are located at the northwest corner of Palmer Street and King Street. The oldest WTP is a lime softening plant, and the City's newer facility utilizes reverse osmosis. The existing water distribution system in West Augustine is shown in Figure 2-2.

Although most of the West Augustine area receives water service from the City, many of the pipes are small in diameter. These smaller pipes could impede water flow and pressure. Additionally, because fire hydrants require 6-inch diameter or larger water mains for adequate fire protection, the existing hydrants do not meet International Fire Code (IFC) spacing requirements in some areas.



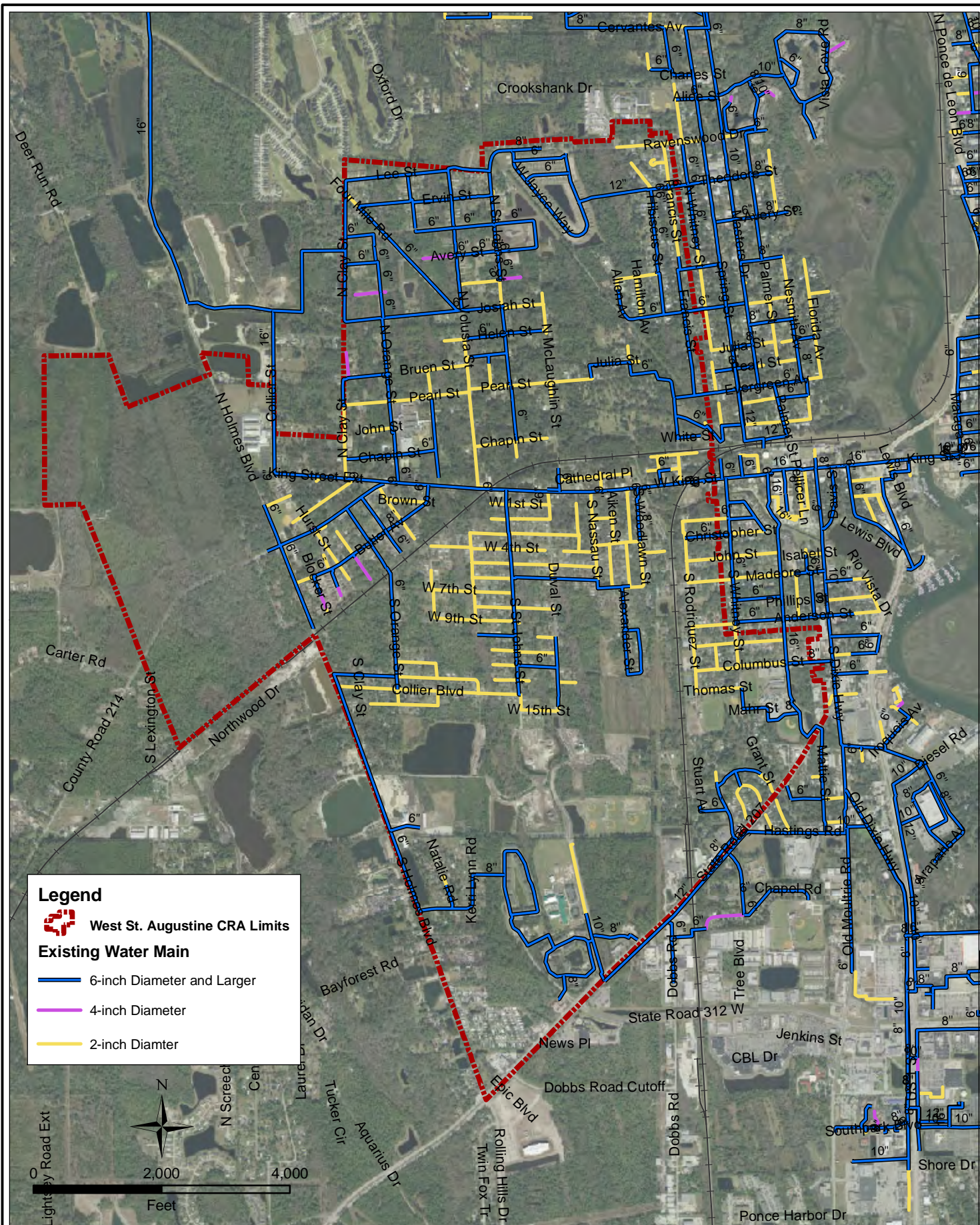


Figure 2-2  
Existing Water Distribution System  
West Augustine CRA

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### 3.0 WASTEWATER SYSTEM EXPANSION AREAS

Areas of the West Augustine CRA that currently do not have centralized sewer collection service are identified for this Plan using GIS parcel information obtained from the County Property Appraiser's Office and sewer infrastructure data provided by the City. To organize the overall unsewered regions into manageable portions, ATM divided the area into multiple zones (i.e., Zone A, Zone B, etc...), as shown in Figure 3-1. In general, the new zones are separated by proposed pump station service areas and typically have one pump station per zone. Each of the zones is sized to cover the largest service area feasible given the City's maximum sewer main construction depth standard of 14 ft and planning area topography. In some areas, existing sewers are deep enough that portions of the expansion areas can be served without requiring a new pump station.

Figure 3-2 provides a schematic flow diagram of the expansion areas and existing collection system impacted by the proposed expansion. For cost estimating purposes, ATM prepared preliminary sewer layouts for each zone.

#### 3.1 FLOW PROJECTIONS

The sewer expansion zones identified for this planning study are made up primarily of platted subdivision lots with the developed properties averaging approximately five (5) dwelling units (DU) per acre. Many of the vacant residential lots in the project area are individually owned and will likely support a single dwelling unit each; however the larger vacant lots could potentially be sub-divided to support multiple DUs. To accommodate this potential, vacant residential lots larger than 1 acre are assumed to contribute 5 DUs per acre at build-out.

Wastewater Average Daily Flows (ADF) for each zone are calculated by multiplying the total number of DUs by the City's standard per capita sewer load of 210 gallons per day (gpd) per dwelling unit. Table 3-1 summarizes the area of each zone and its estimated flow contribution. Ten State Standards recommends using a peaking factor of four times the average flow to determine peak hour flows for the small basin populations in the project area. Because Expansion Zone M could develop much greater loads at build-out than each of the other zones, a lower peaking factor of 3.4 was calculated and used for this zone.





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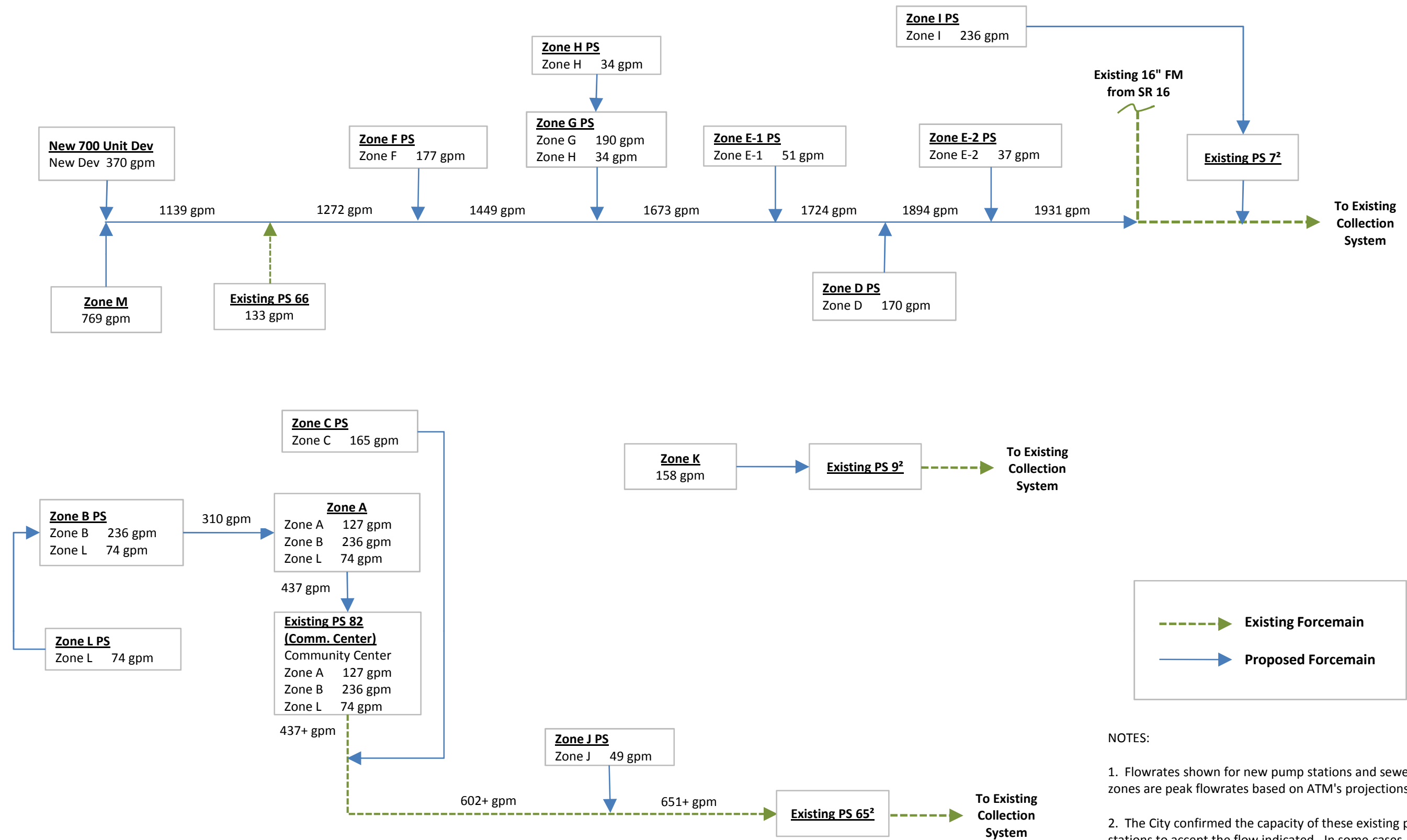


Figure 3-2  
Collection System Flow Diagram

For the purpose of this study, all sewer loads are calculated as single family residential, using the 210 gpd/DU stated previously. Review of the 2009 aerial imagery shows that multi-family properties in the project area typical support two dwelling units; therefore, the DUs and loads for these properties are doubled in the basin load calculations for this Plan. Fewer than five percent of the properties within the expansion zones are non residential, with many of these being small businesses, small churches, and parking lots. Because this is such a small percentage of the total sewer load contribution, and detailed water consumption data was not provided for these existing customers, this Plan uses the residential wastewater loading of 210 gpd per unit for these properties.

Table 3-1 Expansion Basin Flow Estimates							
Basin	Acreage	Existing Units	Build-out Units	Existing ADF <sup>1</sup> (gpd)	Build-out ADF <sup>1</sup> (gpd)	Existing Peak Flow <sup>2</sup> (gpm)	Build-out Peak Flow <sup>2</sup> (gpm)
Zone A	56	80	218	16,800	45,780	47	127
Zone B	98	143	405	30,030	85,050	83	236
Zone C	58	166	282	4,860	59,220	97	165
Zone D	67	179	291	37,590	61,110	104	170
Zone E-1	15	46	88	9,660	18,480	27	51
Zone E-2	10	28	64	5,880	13,440	16	37
Zone F	100	93	303 <sup>3</sup>	19,530	63,630	54	177
Zone G	96	108	326 <sup>4</sup>	22,680	68,460	63	190
Zone H	12	19	58	3,990	12,180	11	34
Zone I	97	154	404 <sup>5</sup>	32,340	84,840	90	236
Zone J	78	70	84	14,700	17,640	41	49
Zone K	157	112	270	3,520	56,700	65	158
Zone L	63	58	127	12,180	26,670	34	74
Zone M	310	0	1550	-	325,500	-	769
700 Unit Dev.	-	0	700	-	147,000	-	368
PS-66 Basin	-	160	228	33,600	47,880	93	133
PS-81 Basin	-	34	220	7,140	46,200	20	128
<b>Total</b>	<b>1,217</b>	<b>1,450</b>	<b>5,618</b>	<b>304,500</b>	<b>1,179,780</b>	<b>NA</b>	<b>NA</b>
1 -- Average Daily Flows (ADF) are based on wastewater loading of 210 gpd per home or dwelling unit (DU)							
2 -- Peak flows are based on the Ten State Standards recommended peaking factors							
3 -- Build-out Total includes 77 County owned vacant lots							
4 -- Build-out Total includes 45 County owned vacant lots							
5 -- Build-out Total includes 110 County owned vacant lots							

As the table above shows, the number of dwelling units could increase by almost 300 percent and flows could increase by more than 875,000 gpd at build-out. This information is intended for long range planning and should be re-evaluated as growth and development trends change.

Note that in Section 2 of this Plan, the current excess capacity of the WWTP is stated as approximately 500,000 gallons per day (gpd). As indicated above, at build-out the West Augustine CRA area could create an additional 875,000 gpd of sewage or approximately 375,000 gpd more than is currently available from the WWTP. At this conceptual level of planning, costs for the additional 375,000 gpd of treatment capacity at the plant are not included. Since the timeline of this project is not currently defined, it is difficult to assign a cost for future wastewater treatment due to changing regulations. Currently in 2010, there is significant debate on whether numeric nutrient criteria (NNC) will be enacted and the resulting impacts. NNC could have a dramatic affect on future wastewater treatment costs. There are many other potential regulations that will dramatically affect the capital cost of wastewater treatment plant construction in the future. For these reasons, we have not assigned a cost to the additional 375,000 gpd of capacity necessary.

The capacity projections in the Table above are based on the City's planning per DU wastewater loading of 210 gpd. In reality, DU contributions may be much lower in the West Augustine area than other areas of St. Augustine's service area because of the smaller lot sizes, traditionally lower incomes, and smaller home size. Additionally, the build out of the West Augustine CRA sewer service area will likely be spread over time. During that time, water conservation measures will increase and larger portions of the City's existing sewer service area will be rehabilitated. Conservation and the reduction in infiltration from rehabilitation will also reduce the likely impact on future treatment capacity. Over time as build out occurs, the City may want to evaluate billing data to better forecast potential wastewater flows.

### 3.2 EXPANSION ZONES

In accordance with the City's goal, this Plan's focus is on developing planning level costs to provide sewer service to the unsewered areas. As such, the sewer layouts presented herein were developed to determine general length, depth, and size of sewer pipe, general number and depth of manholes, and approximate size and number of pump stations. The pump stations are generally located towards the center of the collection basin. For this planning level

evaluation, detailed locations of pump stations are not identified. During preliminary engineering, the exact location will be determined and coordinated with available property and right of way availability.

A conservative planning level Opinion of Probable Construction Cost based on this conceptual design information is presented in a subsequent section. Several factors such as surface contours and existing road alignments are considered in the conceptual system design; however, during the preliminary engineering phase of these improvements, when more detailed information is available, more efficient layouts may be possible.

All the expansion zones are designed using gravity flow collection systems and submersible pump stations as necessary, similar to those already in operation throughout the City. Expansion Zones E-2 and J include small amounts of low-pressure forcemain to provide sewer service to homes which cannot be served by the gravity collection system due to topography constraints.

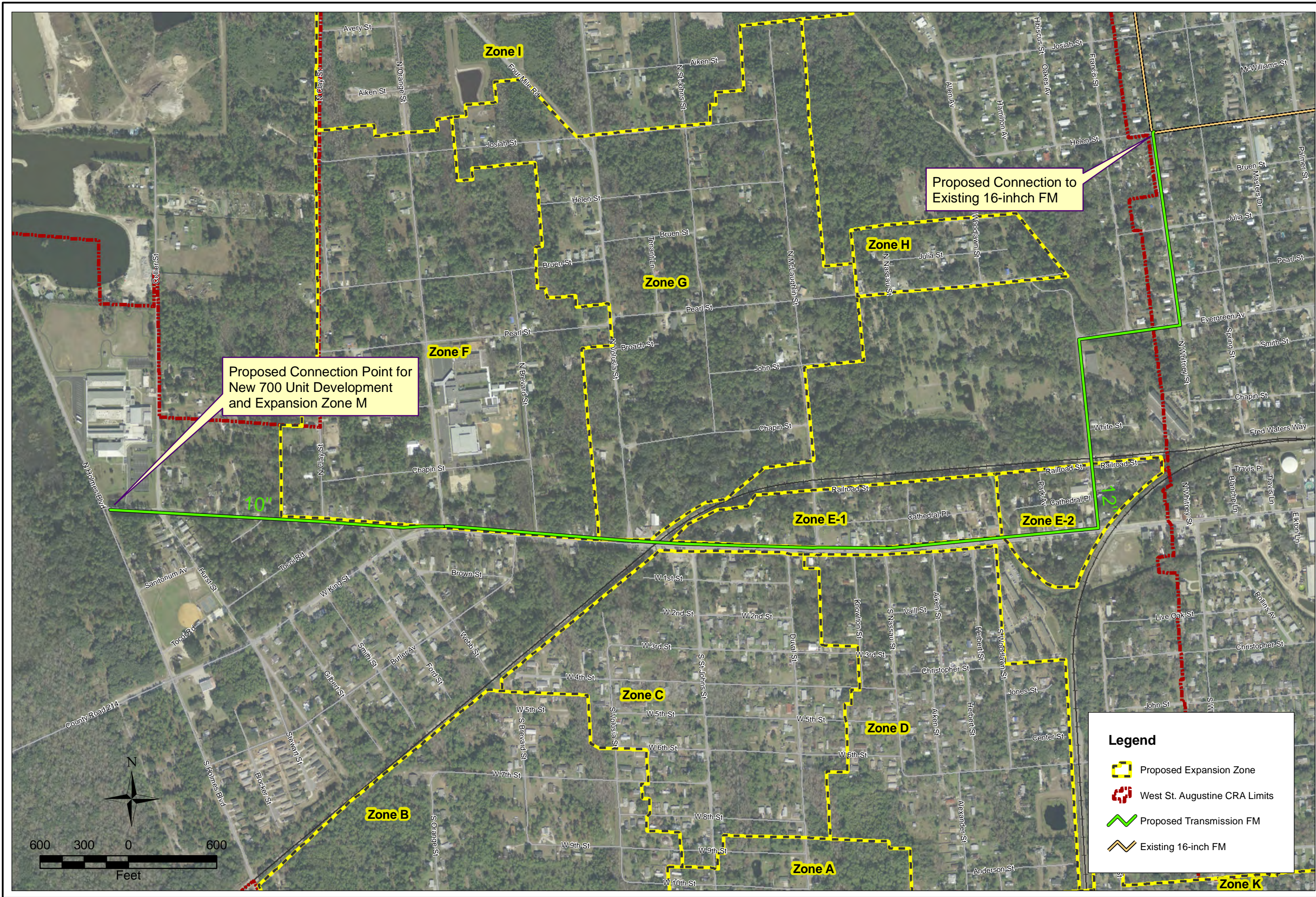
The following sections describe each of the zones in more detail. The gravity layouts use 8-inch polyvinylchloride (PVC) pipe sloped at 0.4 percent. Manholes are included at direction changes and 400-foot maximum spacing on straight pipe alignments and a 0.10-foot drop is provided at each manhole junction. In conformance with the City's maximum depth requirements, design pipe inverts are between 3-feet and 12-feet deep.

### **3.2.1 Transmission Capacity**

The first and biggest hurdle for West Augustine sewer service is sewer transmission capacity. Therefore, the first step in the process of expanding sewer service to West Augustine is the development of a transmission forcemain along the major W King Street corridor. Capacity along this corridor will spur economic development of business.

The proposed transmission main route is presented in Figure 3-3 and includes approximately 2,300 LF of 10-inch forcemain and 7,800 LF of 12-inch main. The 10-inch diameter main runs along the King Street Extension from N Holmes Blvd. to W King Street and provides transmission capacity for the new 700 unit development northeast of the CRA and for potential future development of the Florida Memorial College property (Expansion Zone M of this Plan).







The proposed forcemain increase in diameter from 10-inch to 12-inch at N Orange Street to accommodate the future wastewater loads from Expansion Zones D, E-1, E-2, F, and G, which manifold to the transmission main at connection points along W King Street. As shown in the figure, the 12-inch forcemain turns north on N Rodriguez Street, then east on Evergreen Avenue and north again on N Whitney Street to connect to the City's existing 16-inch forcemain at Helen Street.

The County's Engineering Division has plans for major roadway improvements to W King Street from Holmes Blvd. east to Travis Lane. Improvements to the portion King Street from Travis Lane to US Highway 1 have recently been completed and the County is currently working to acquire funding for the portion from Holmes Blvd. to Travis Lane, but does not anticipate construction to begin for at least two years.

Typical roadway sections from the Roadway and Infrastructure Improvements design prepared for the County by Prosser Hallock Planners & Engineers and provided in Appendix C indicate that the proposed transmission forcemain may be constructed within the north right-of-way of W King Street, but may require that portions of the main be installed beneath travel lanes or sidewalk. Coordination with the County is necessary to ensure utility corridor allocation is identified for the forcemain route.

### **3.2.2 Zone A**

Zone A is centrally located in the CRA, just north of the Solomon Calhoun Community Center shown in the photograph below. The St. Johns County Public Works Department is currently in the design phases of a transportation and drainage improvement project in Zone A which includes new gravity sewer along Duval Street and St. Johns Street. The County's proposed design presently includes sewer stub out's at street intersections and discharges to the existing Community Center gravity system and pump station.

- Photograph provided on following page -



Soloman Calhoun Community Center

The layout shown in Figure 3-4 expands on the County's gravity sewer design for Duval and St. Johns streets to collect wastewater throughout the Zone. The gravity system proposed for Zone A maximizes the use of the County's proposed collector mains along Duval and St. Johns streets. Preliminary analysis by the City confirms that the Solomon Calhoun pump station can accommodate the build-out capacity for this zone. Further coordination with the County is necessary to ensure sewer main stub-outs are installed at appropriate invert elevations.

### 3.2.3 Zone B

Zone B is adjacent to and west of Zone A. This area has similar characteristics as Zone A, and includes several large undeveloped parcels. Only a portion of Zone B is served by County roadways and the County does not currently have plans to develop new roads in the area. For the purpose of this Plan, no sewer infrastructure is proposed in areas not currently served by County roads.

The gravity sewer layout shown in Figure 3-5 collects wastewater throughout the Zone, which ultimately accumulates in a pump station. The pump station is located centrally within the Zone to minimize the required depth of the gravity pipe system. A 6-inch forcemain from the pump station carries the wastewater south and east, discharging to the proposed Zone A gravity system at the intersection of S Volusia Street and Collier Blvd. Staging of these improvements must be considered, as Zone A must be constructed at the same time as or before Zone B if this layout is used.



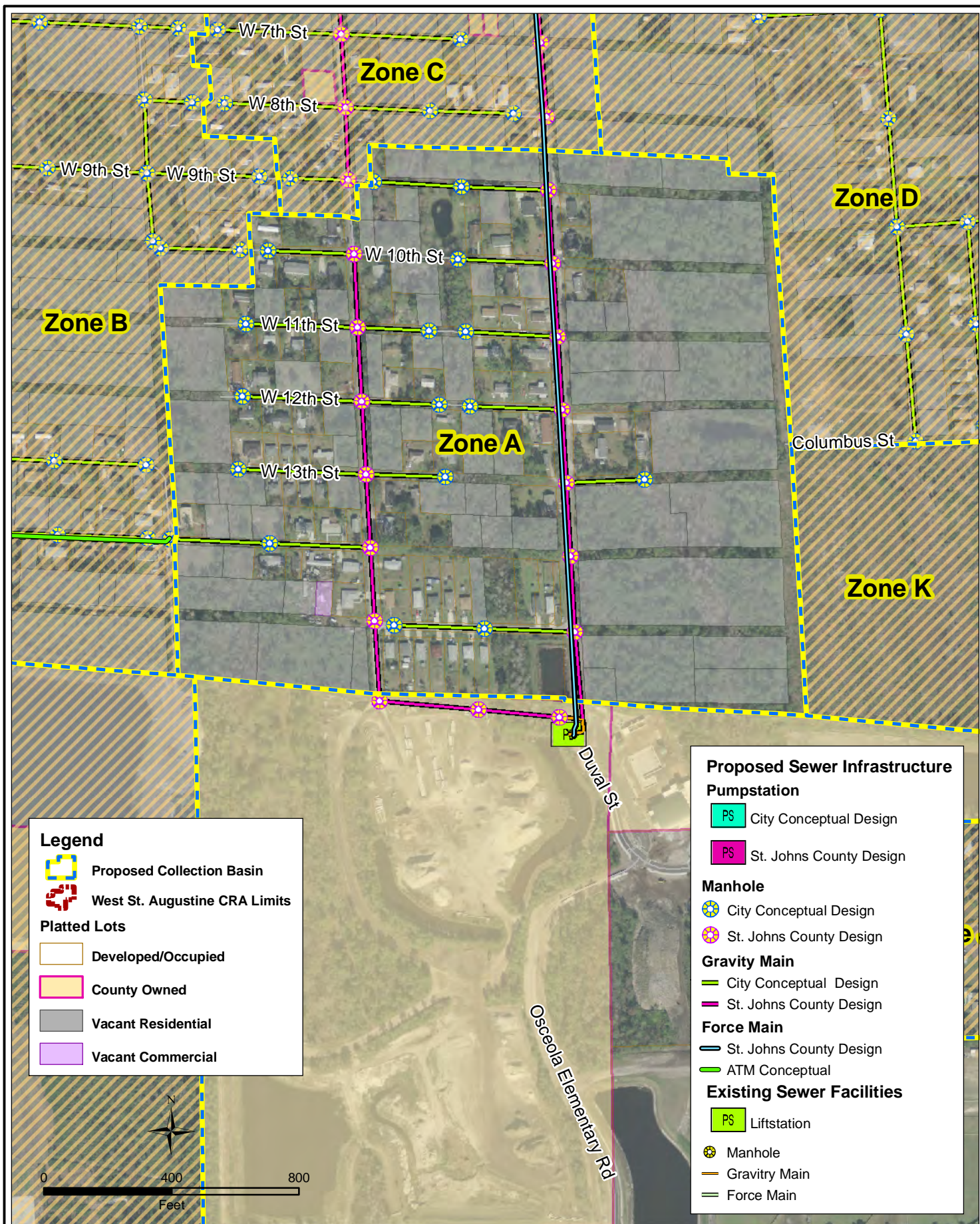


Figure 3-4  
Conceptual Sewer Layout - Zone A  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.





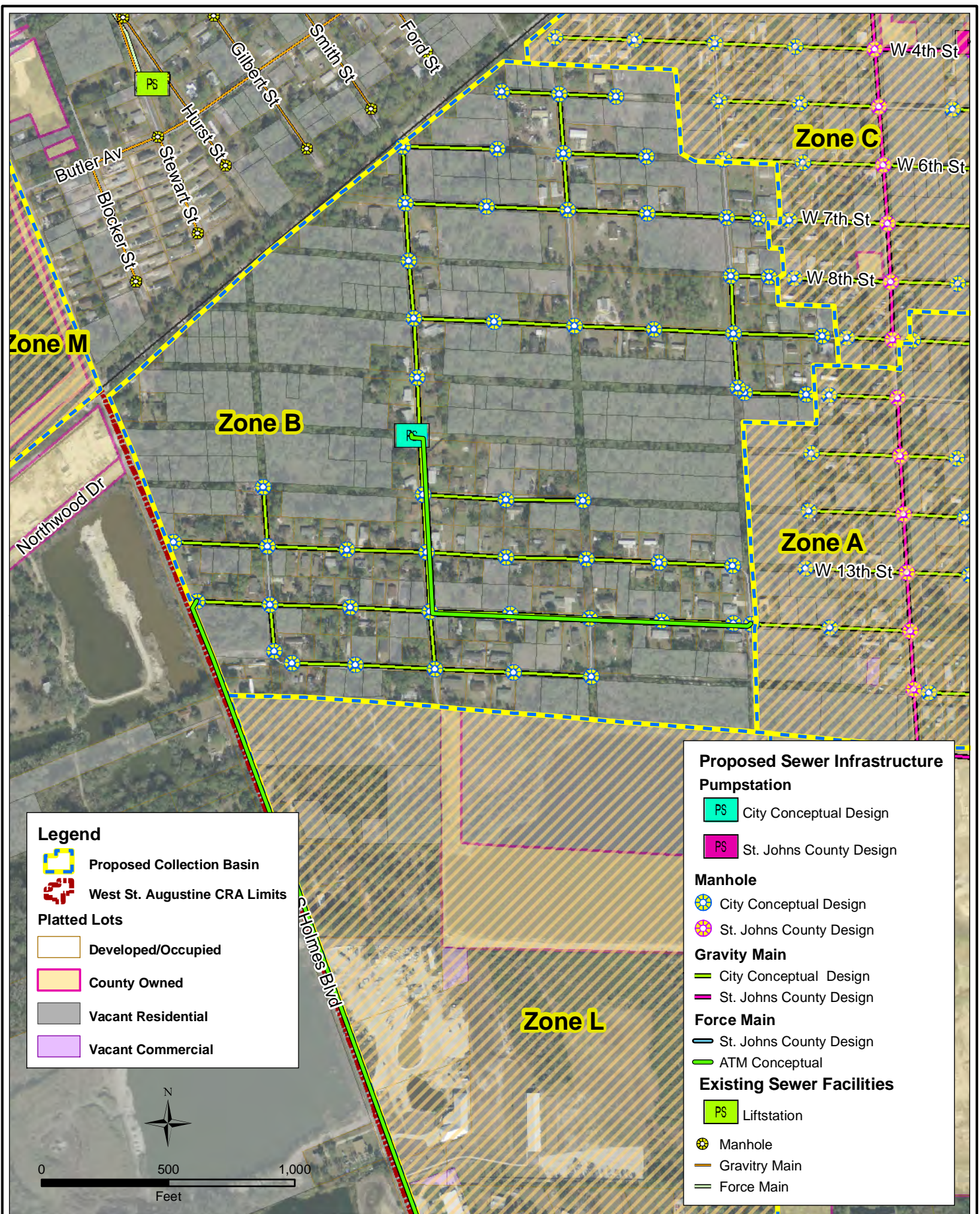


Figure 3-5  
Conceptual Sewer Layout - Zone B  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.

### 3.2.4 Zone C

Expansion Zone C is located adjacent and to the north of Zone A. Zone C is bordered on the north by King Street and includes commercial properties along this street. The County transportation and drainage improvement project described previously in this Report includes sanitary sewer infrastructure along Duval and St. Johns streets and a sewer pump station on 4<sup>th</sup> Street with a 6-inch forcemain running south on Duval Street to manifold at the Solomon Calhoun Community Center pump station.

The proposed sewer design for Zone C shown in Figure 3-6 maximizes the use of the County's gravity main on Duval and St. Johns streets. As with Zone A, coordination with the County is necessary to ensure appropriate stub-out invert elevation. Adequate sizing of the pump station to provide build-out capacity and peak flow capabilities will also need to be confirmed.

### 3.2.5 Zone D

Zone D is located adjacent to Zone C and is bordered on the east by the Florida East Coast Railway line and by W King Street. to the north. The basin drops sharply in elevation toward the north and east and requires deeper gravity infrastructure than would a more uniform topography.

The proposed sewer system is presented in Figure 3-7 and includes a pump station on Herbert St. and 1,350 linear feet (LF) of 6-inch forcemain crossing W King Street and manifold to the proposed 12-inch transmission forcemain. To minimize construction impacts, a trenchless technology is recommended for the forcemain installation under W King Street.



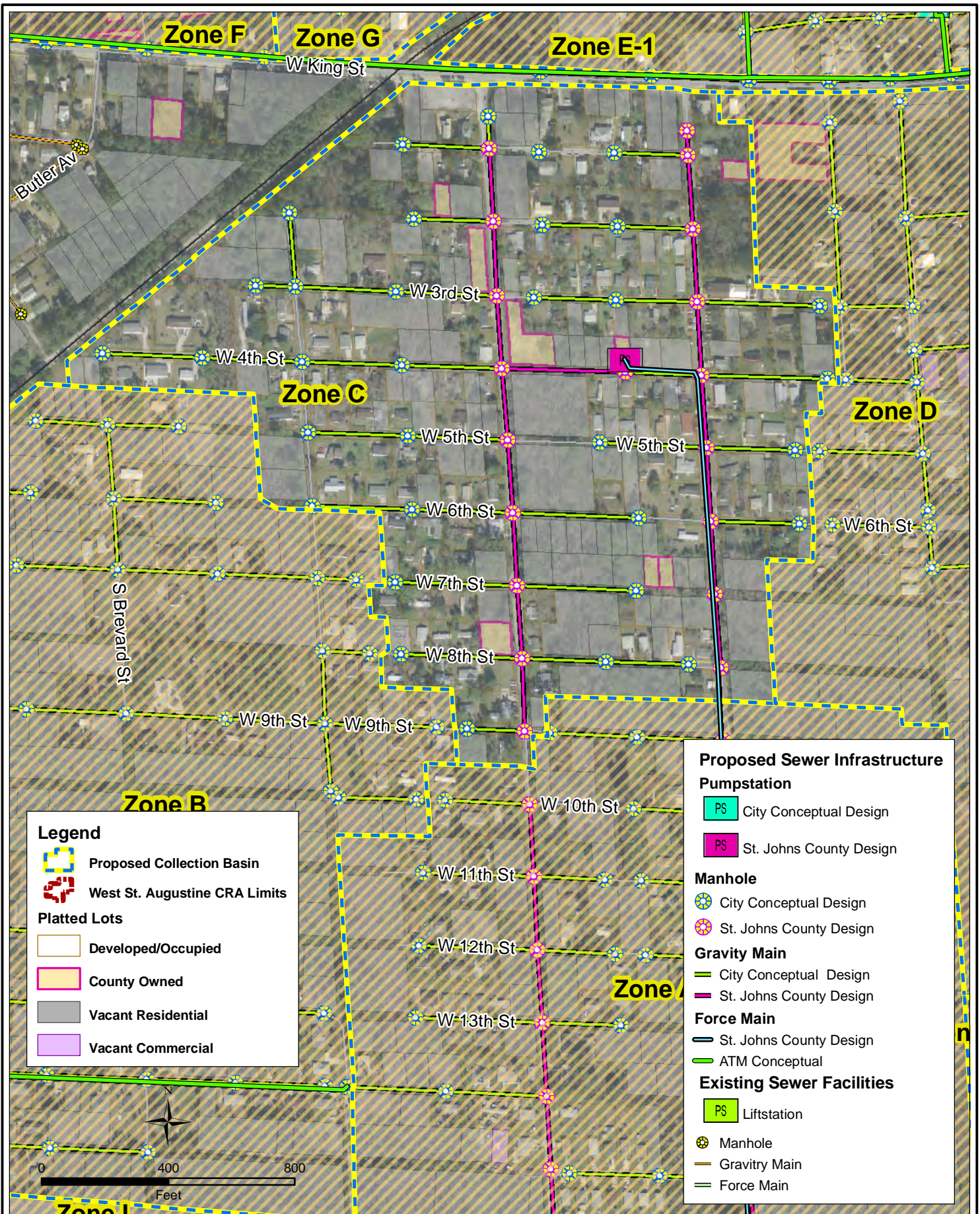


Figure 3-6  
Conceptual Sewer Layout - Zone C  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.



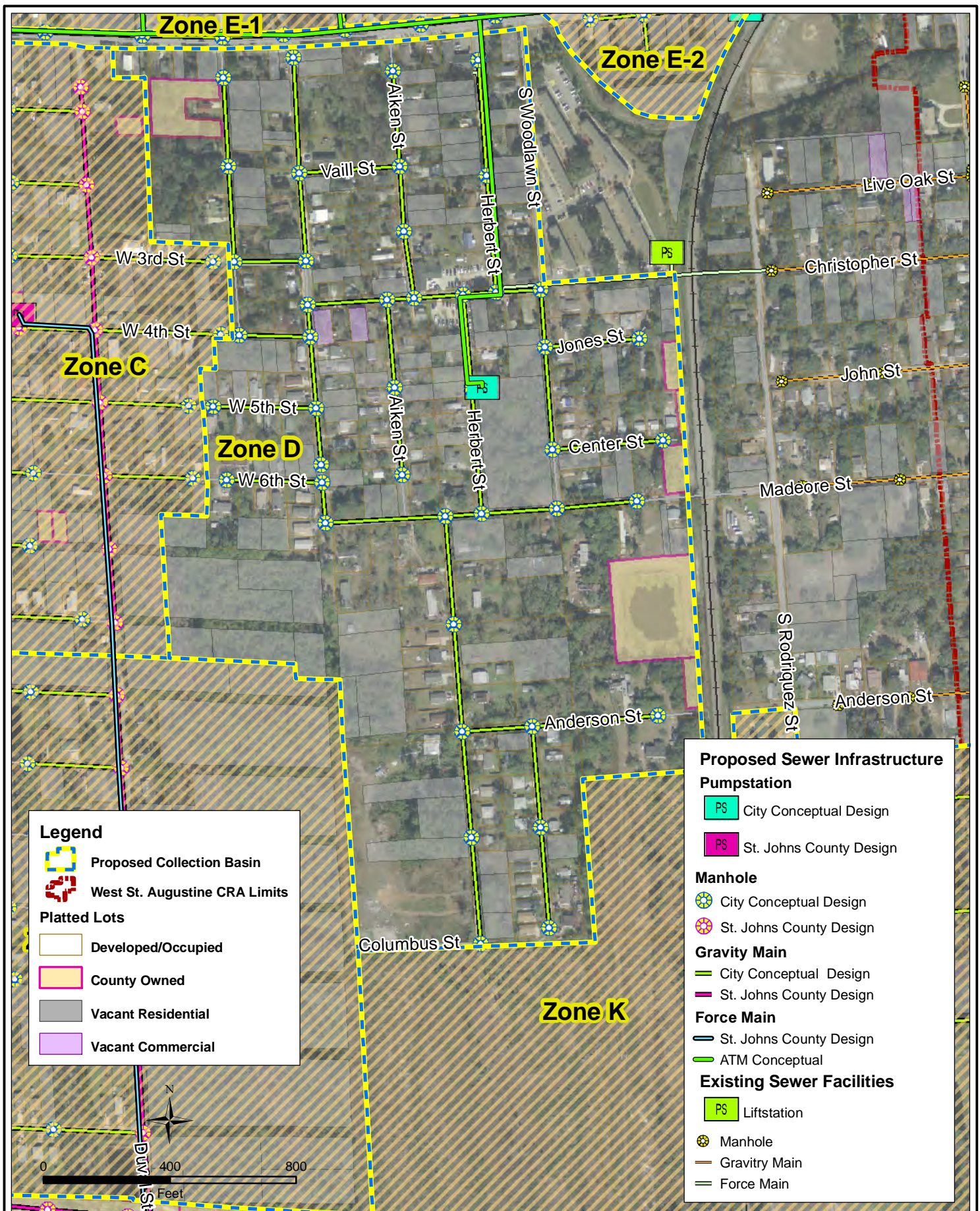


Figure 3-7  
Conceptual Sewer Layout - Zone D  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.

### 3.2.6 Zone E-1 and Zone E-2

Zones E-1 and E-2, presented in Figure 3-8, are relatively small, only 15 and 10 acres respectively, and include both residential and commercial properties along King St. The area is effectively separated by a small stream feature and requires that individual collection systems be constructed.

The Zone E-1 system design includes gravity main and manholes in the north right-of-way of W King Street. to provide sewer service to properties fronting King. A visual field investigation of the area suggests that sufficient ROW is available if the infrastructure is installed along the existing sidewalk alignment. A detailed survey of the right-of-way and existing infrastructure is needed to determine the optimum alignment and is not a part of this Plan. A pump station, centrally located in Zone E-1, manifolds to the proposed 12-inch transmission forcemain on W King Street.

Zone E-2 is a particularly challenging area to provide sewer service due to its topography. A centrally located high point north of W King Street slopes sharply down to the stream. Homes in the low area sloping toward the stream cannot be served by gravity sewer; therefore the proposed design includes several hundred feet of low pressure forcemain for individual grinder pump connections.

W King Street runs directly through the zone from East to West and the proposed design includes a short section of gravity main under the street to discharge the north gravity system to a small pump station south of King. A short section of 4-inch forcemain manifolds the pump station to the proposed 12-inch transmission forcemain.



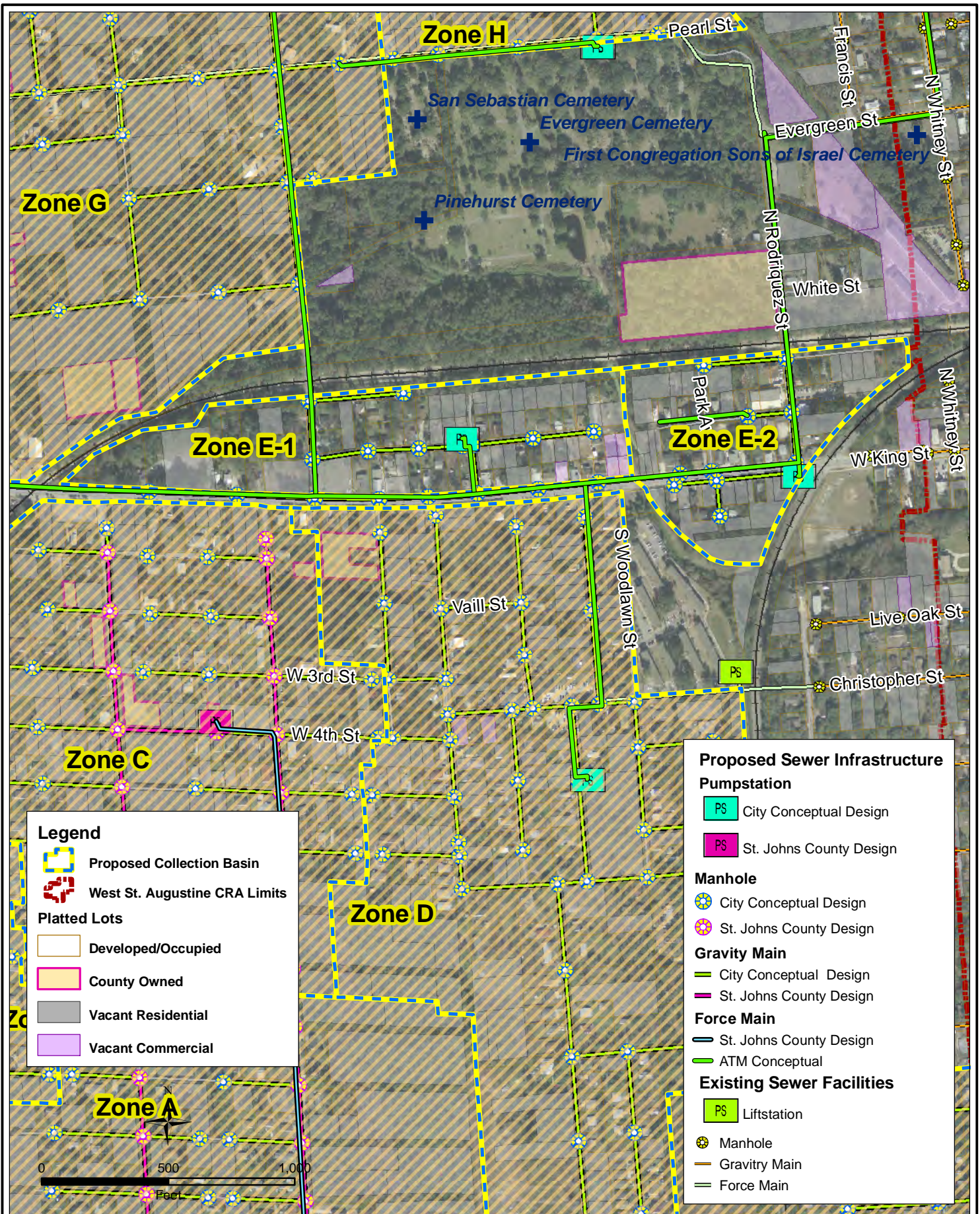


Figure 3-8  
Conceptual Sewer Layout - Zones E-1 & E-2  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.



### 3.2.7 Zone F

Only about one third of Expansion Zone F is populated, however, the existing homes are scattered throughout the Zone. The gravity layout for this area is presented in Figure 3-9 and shows that a substantial amount of infrastructure is needed to serve the existing basin population, which translates to a higher per capita system costs than other zones in this Plan.

### 3.2.8 Zone G

Similar to Zone F, Expansion Zone G is relatively undeveloped. The collection system design for Zone G, shown in Figure 3-10, includes more than 14,000 LF of gravity main and covers an area of about 100 acres. The proposed pump station is located in a low topographic portion of the zone to maximize the extent of the gravity collection system.

### 3.2.9 Zone H

Expansion Zone H is a small area along Pearl St. between Woodlawn Cemetery and Evergreen Cemetery. Although the zone is in close proximity to the proposed Zone G pump station location, as shown in Figure 3-11, the streets which make up the zone are at a lower elevation than Zone G and the gravity system cannot be connected.

A small pump station proposed on Pearl St. will discharge to a manhole in the Zone G gravity system. If the gravity system for Zone H is funded and constructed prior to Zone G, the pump station could manifold into the existing 6-inch forcemain on Pearl Street if sufficient capacity were available at that time.

### 3.2.10 Zone I

Expansion Zone I located in the northern portion of the CRA in an area designated by the County as the “West Augustine In-fill Housing” area. The County recently constructed a pump station and approximately 8,000 LF of gravity main in the area to provide sewer service to new affordable housing units under development.

The layout presented in Figure 3-12 extends the system north to provide service to the remainder of the in-fill basin. Future upgrades to the pump station for this Zone will be necessary to provide sufficient pumping capacity for the projected basin build-out flows.



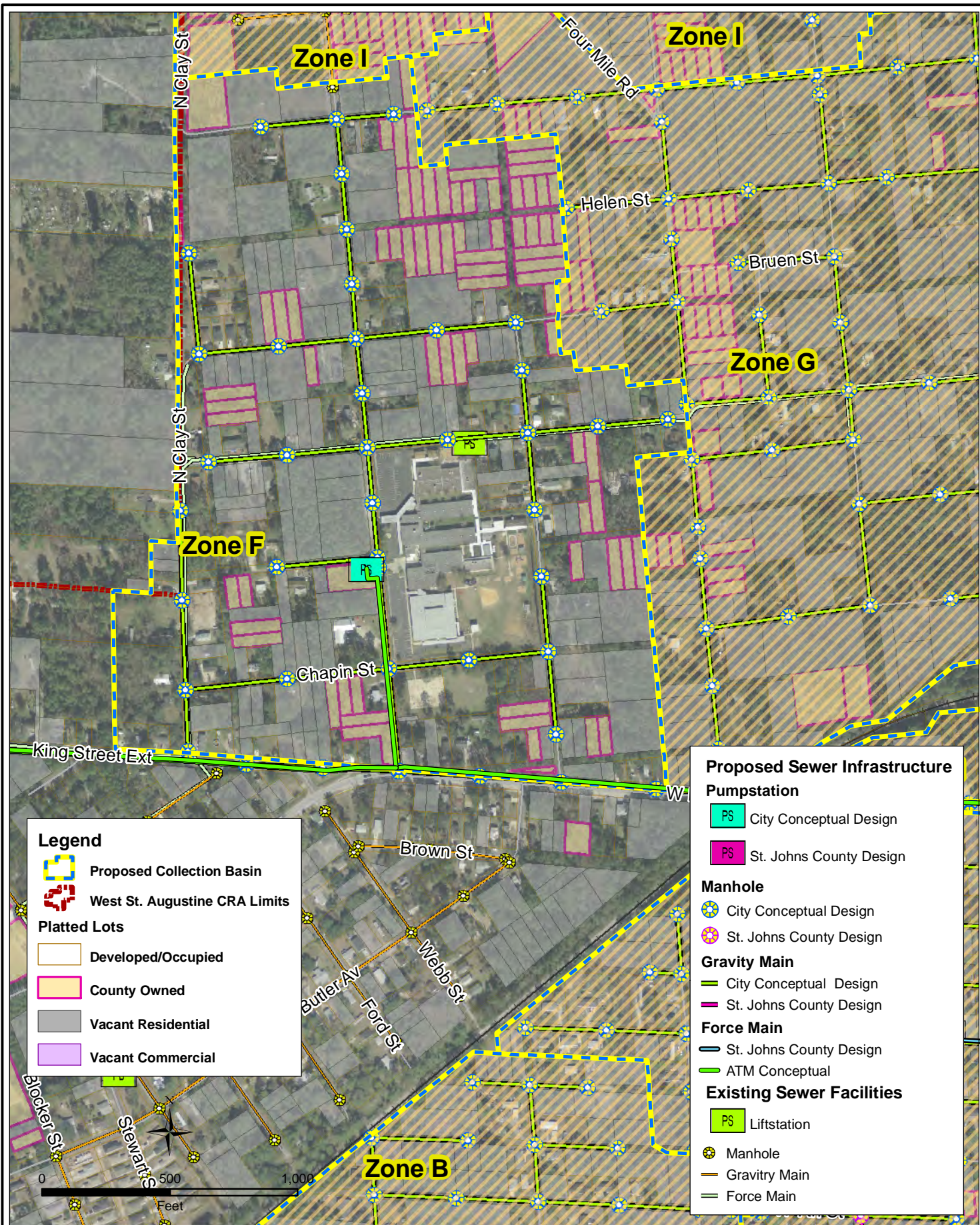


Figure 3-9  
Conceptual Sewer Layout - Zone F  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.





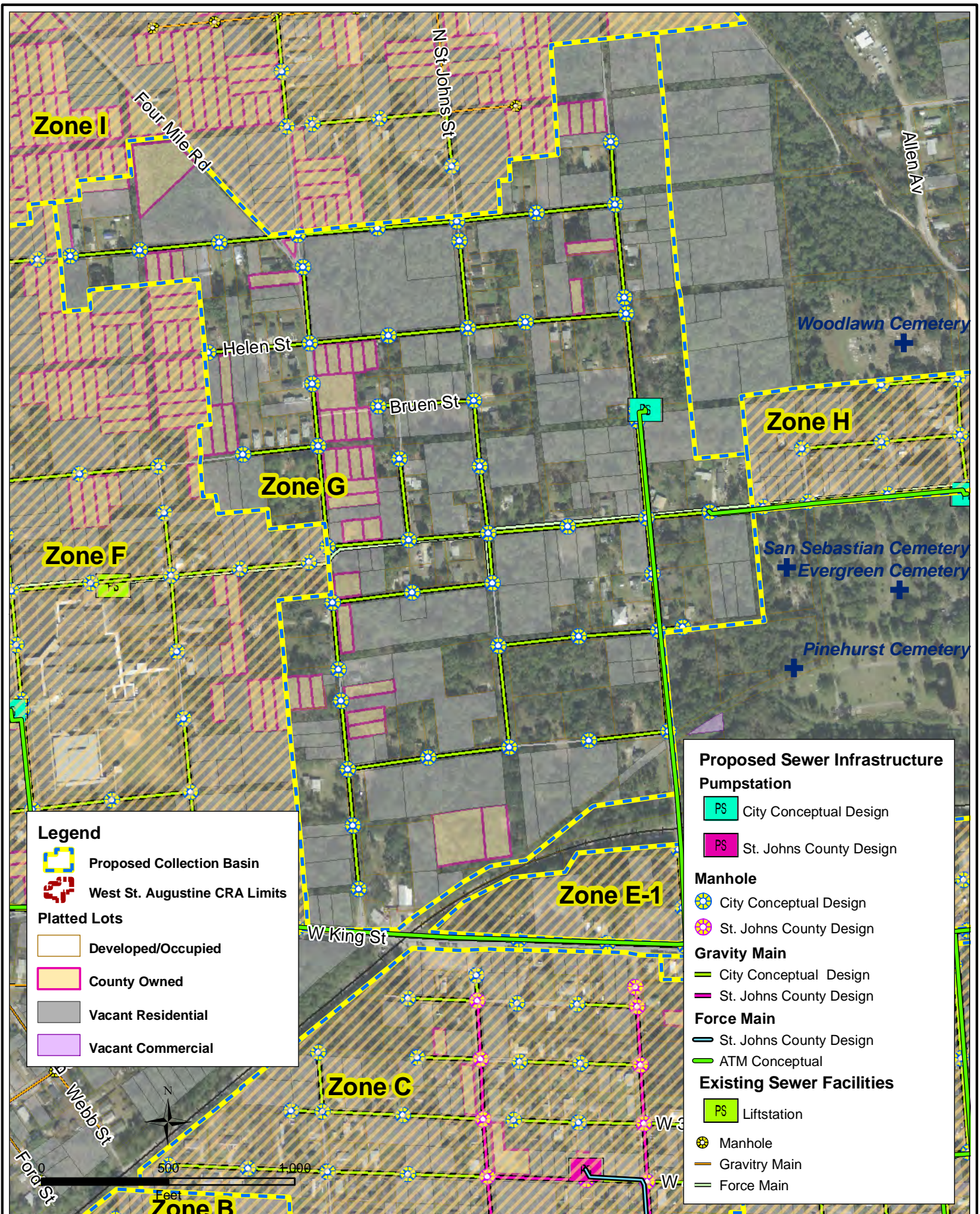


Figure 3-10  
Conceptual Sewer Layout - Zone G  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.



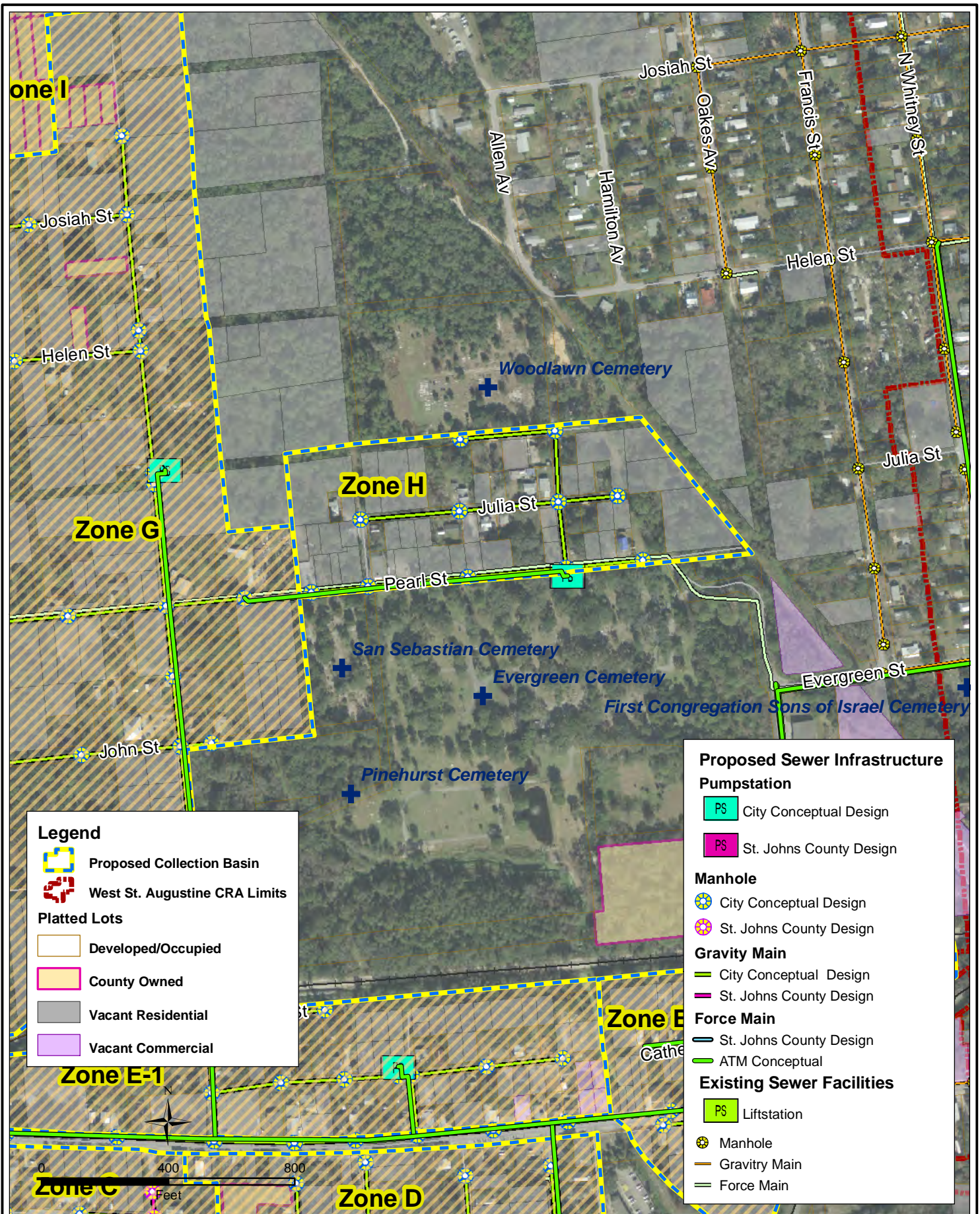
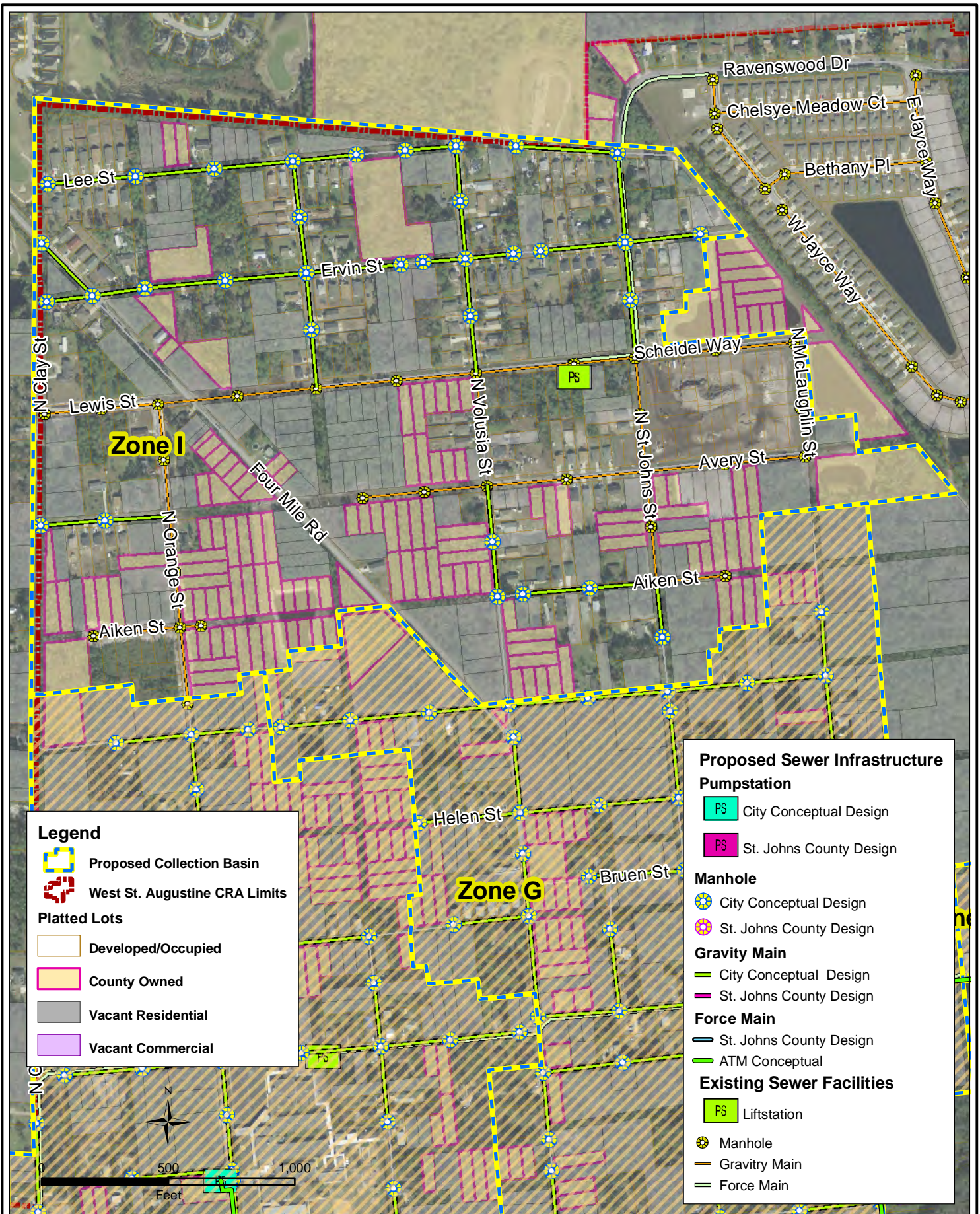


Figure 3-11  
Conceptual Sewer Layout - Zone H  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.







### 3.2.11 Zone J

Zone J is adjacent to and south of Zone K and includes mostly developed residential properties. The collection system for this Zone, shown in Figure 3-13, requires several additional junction manholes due to the non-linear streets present in the basin. The results in a slightly higher per capita cost for the improvements proposed for this Zone. The design includes a pump station located near Grant St. and Los Robles Ave. that discharges to the existing forcemain on State Road 207.

The proposed design includes several hundred feet of low pressure forcemain on Kinlaw Rd. for individual grinder pump connections to provide service to isolated properties west of the railroad corridor.

### 3.2.12 Zone K

The gravity layout for Zone K is presented in Figure 3-14 and collects wastewater from homes along Lena St, Columbus St. and S Whitney St. The proposed system connects to the City's existing sanitary manholes on Sidney St. Due to invert constraints at the existing manholes, the proposed gravity mains discharging to these manholes will have a top cover of slightly more than two feet, and may require a small amount of cover reinforcement.

### 3.2.13 Zone L

Expansion Zone L includes residential properties on Kerri Lynn Rd. and Natalie Rd. and commercial properties along S Holmes Blvd. The layout shown in Figure 3-15 proposes a small pump station at Kerri Lynn Rd and Holmes Blvd and a 4-inch forcemain running north on Holmes and discharging to a manhole in the Zone B gravity system. The forcemain will operate at a sufficiently low pressure to allow grinder pump service connection for businesses along Holmes Blvd.

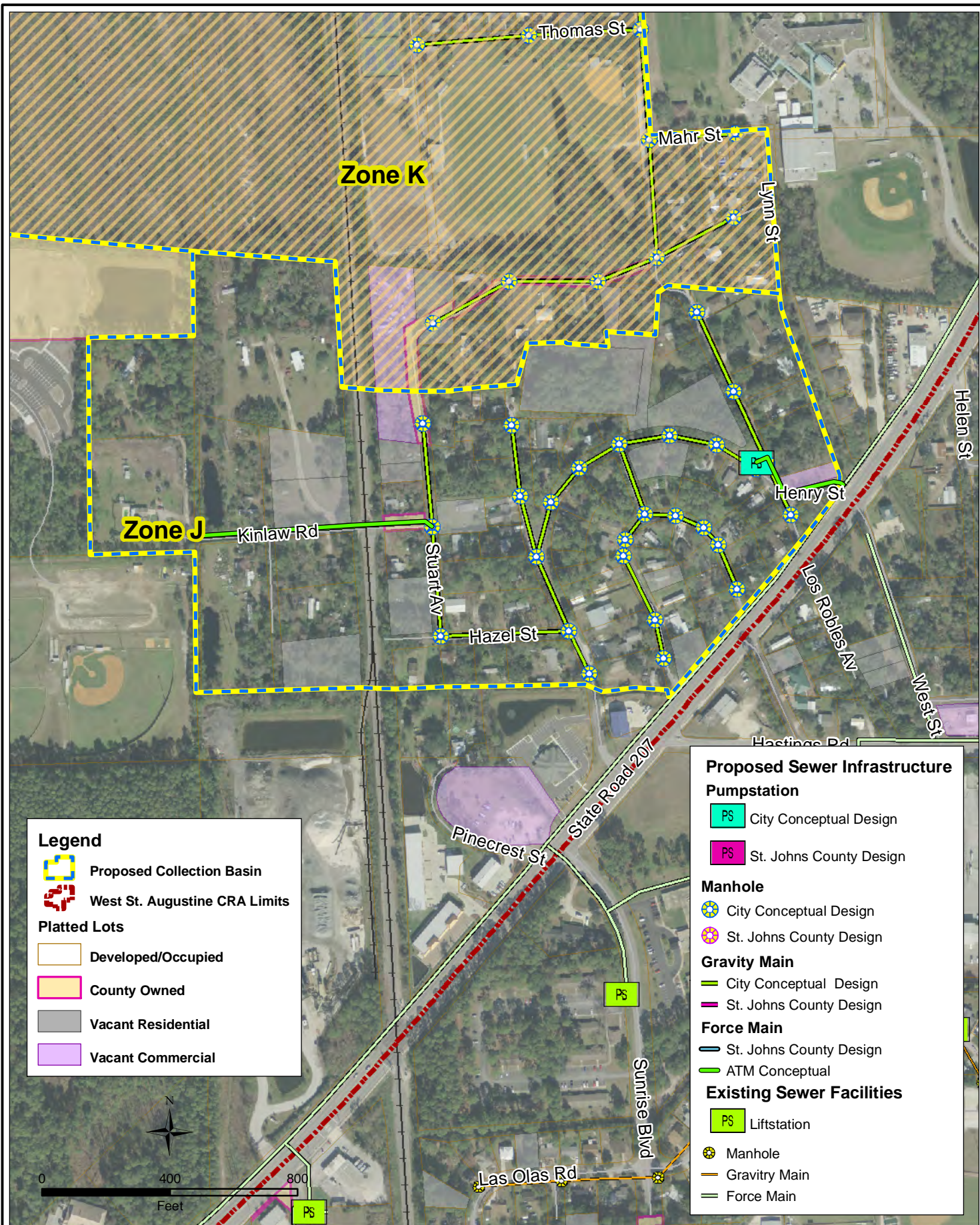


Figure 3-13  
Conceptual Sewer Layout - Zone J  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.



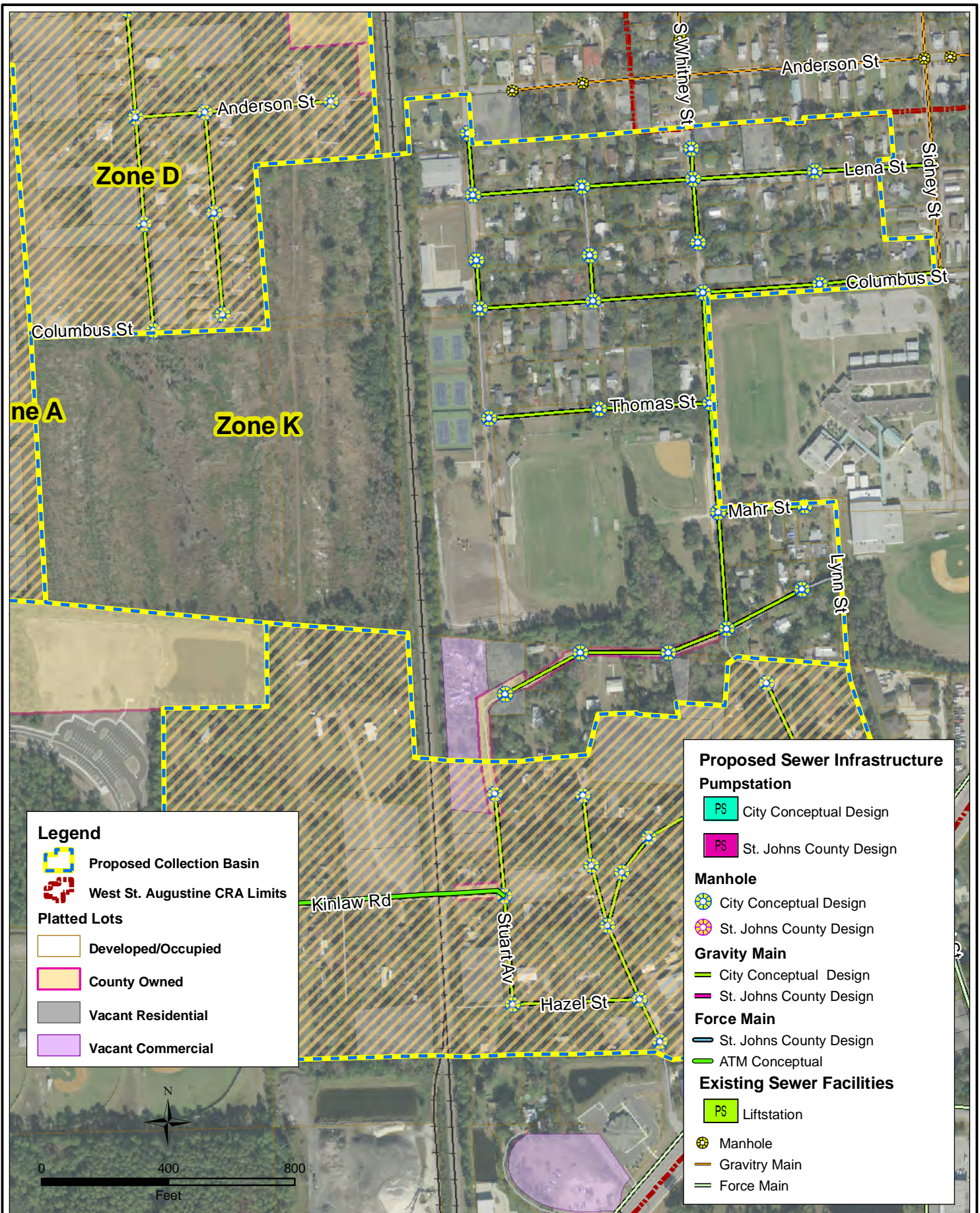


Figure 3-14  
Conceptual Sewer Layout - Zone K  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.



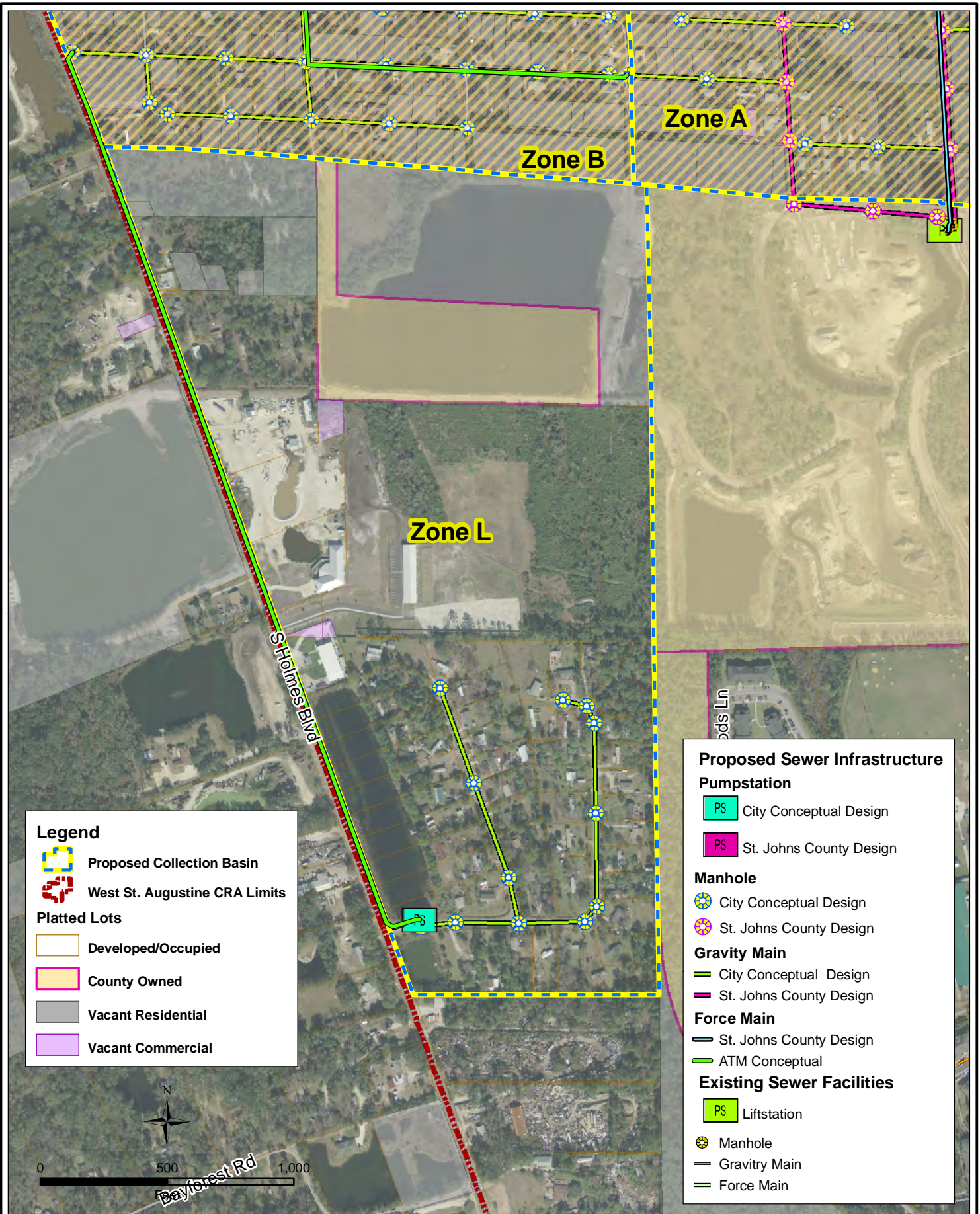


Figure 3-15  
Conceptual Sewer Layout - Zone L  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.





### 3.2.14 Zone M

Zone M is shown in Figure 3-16, and is comprised of property which was once the Florida Memorial College to the West of Holmes Blvd. The property is currently undeveloped and is included in this Master Plan for future capacity planning only. Water/wastewater infrastructure design and an opinion of costs for this basin are not provided in this Master Plan Report.

The sewer load projections for Zone M assume that at build-out, the 310 acre area will support 5 dwelling units per acre

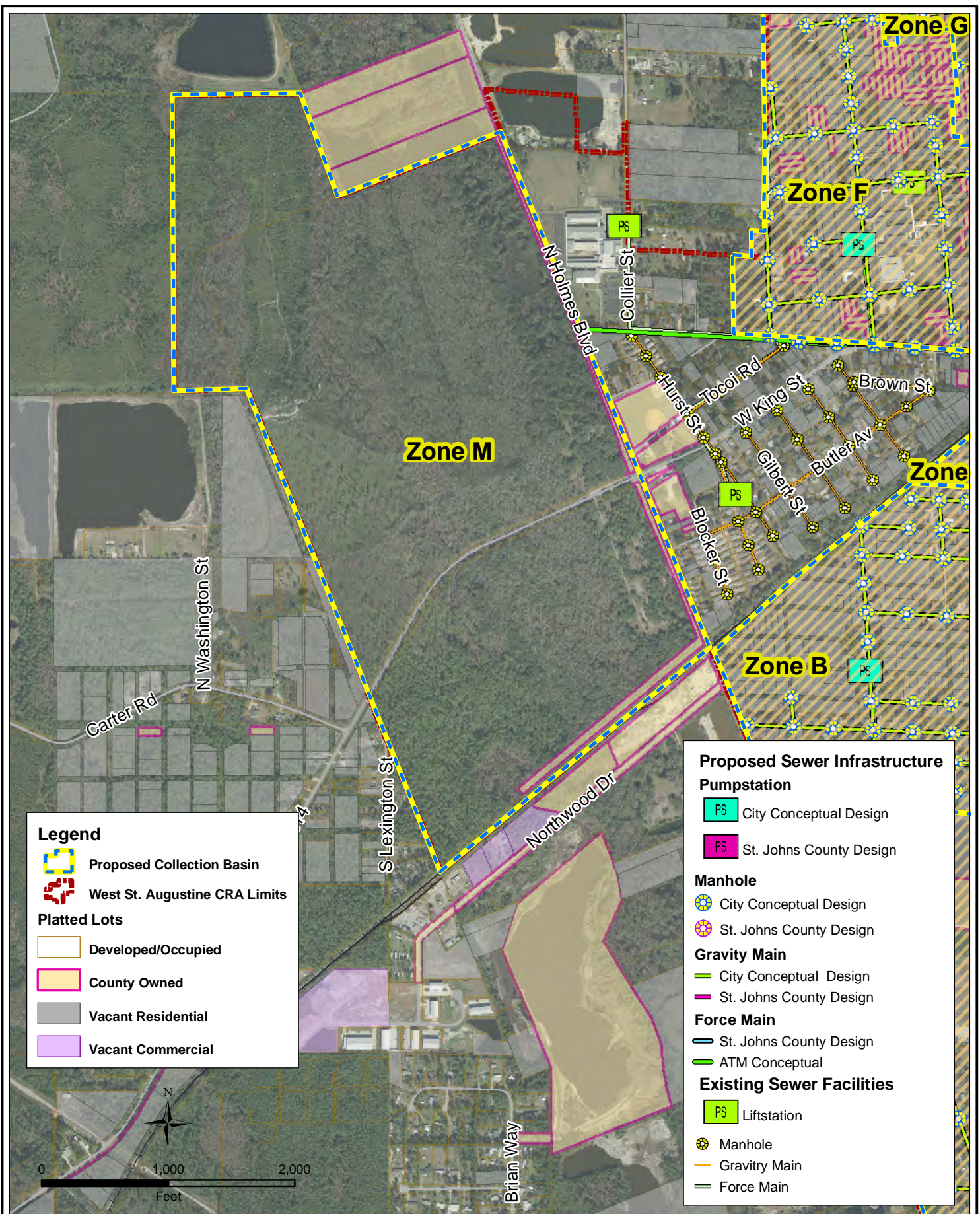


Figure 3-16  
Conceptual Sewer Layout - Zone M  
West Augustine CRA

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.



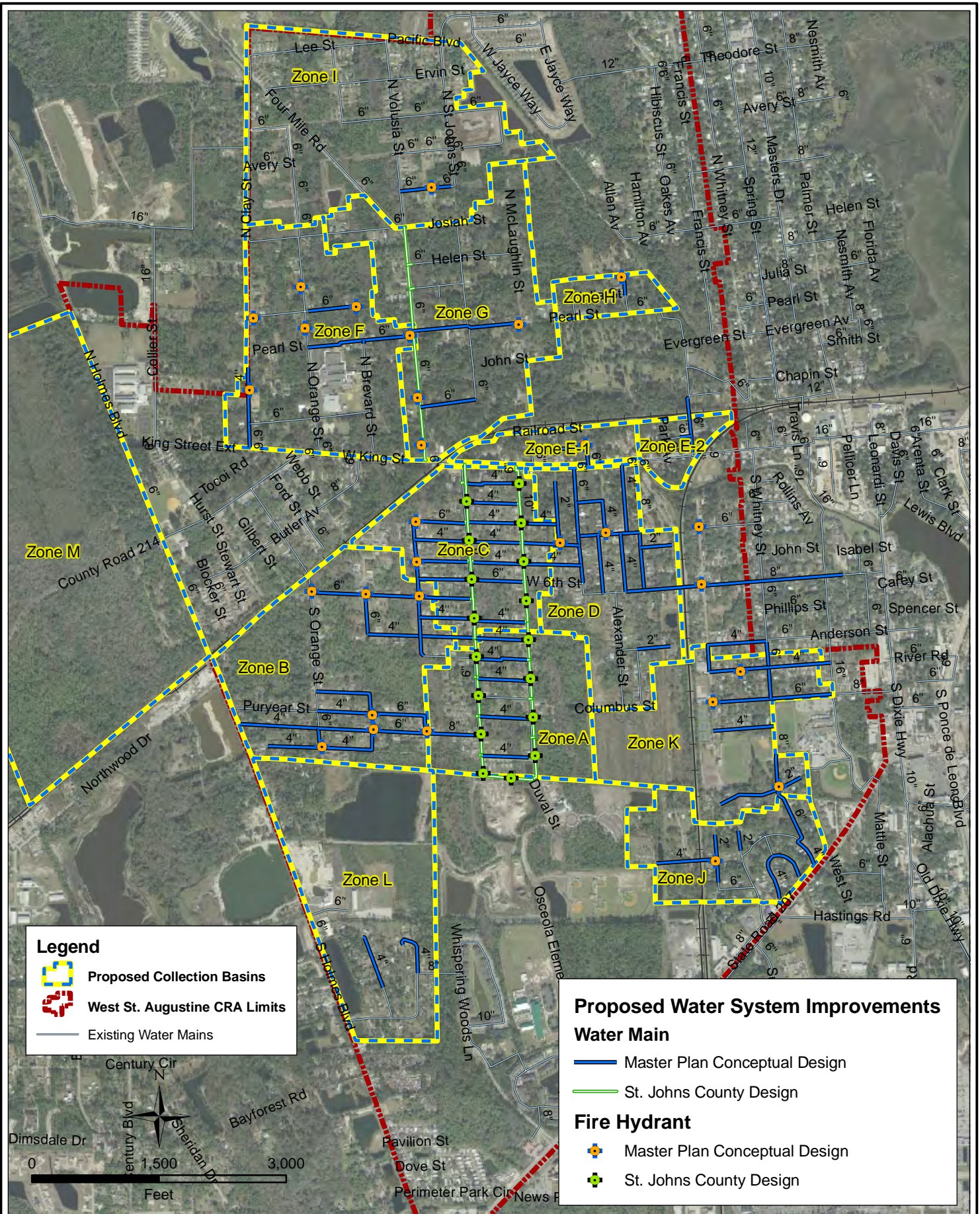
## 4.0 WATER DISTRIBUTION SYSTEM IMPROVEMENTS

Although the primary focus of the West Augustine CRA Master Plan and this Report was on the expansion of sewer services for the CRA, ATM performed a general review and evaluation of the City's water distribution system serving the master planning area.

The existing water distribution system, shown previously in Figure 2-2, includes a substantial amount of older 2-inch galvanized piping. Over time, these lines corrode and degrade the reliability and level of service. A capital improvement project such as the sewer system expansion can significantly offset the cost of upgrades to aging water infrastructure when constructed concurrently. This Master Plan includes recommended water main replacements and upgrades within the sewer expansion zones to provide improved system performance and fire protection. The water system recommendations made in this plan are general and are not validated by hydraulic models of the existing system or the proposed improvements.

Recommended improvements to the City's water distribution system within the West Augustine CRA planning area are shown in Figure 4-1. In general, the recommendations include replacing older 2-inch distribution mains with 4-inch and 6-inch PVC piping, installing new fire hydrants and looping portions of the distribution system for improved hydraulics, fire protection and redundancy. It is expected that these improvements would be constructed during the sewer system installations and are separated by sewer expansion zone for the purpose of this Report. Costs for the water system improvements in each zone are included in the opinion of costs presented in the following section.







## 5.0 OPINION OF PROBABLE CONSTRUCTION COSTS

The main purpose of this Plan is to identify the capital costs necessary to provide sewer service to the residents of the West Augustine Community Redevelopment Area currently on septic systems. For each of the zones described in the previous sections, a planning level Opinion of Probable Construction Cost is provided. Typically, capital improvement cost estimates are inflated to the year when execution of the project is expected. In this case, the schedule for implementation of these projects has not been determined. Therefore, all costs presented are based on representative construction bid costs for August 2009 and should be compared to the Engineering News and Record Construction Cost Index of 8563.8.

Table 5-1 provides a summary of the Opinion of Probable Construction Cost for each zone. Costs for recommended water main replacement area included in the totals for each zone, and where applicable, the costs for any portion of proposed transmission forcemain running through the zone. The costs below also include contingency values and costs for engineering. Land acquisition costs for pump station sites are not included in these costs. A detailed Opinion of Probable Construction Cost for each zone is provided in Appendix C.

Table 5-1      Opinion of Probable Construction Cost	
Project Area	Capital Cost <sup>1</sup>
Transmission Upgrades	\$ 1,408,000
Zone A	\$ 1,042,000
Zone B	\$ 3,211,000
Zone C	\$ 2,092,000
Zone D	\$ 3,076,000
Zone E-1	\$ 906,000
Zone E-2	\$ 563,000
Zone F	\$ 2,440,000
Zone G	\$ 2,796,000
Zone H	\$ 597,000
Zone I	\$ 1,801,000
Zone J	\$ 1,303,000
Zone K	\$ 1,406,000
Zone L	\$ 863,000
Zone M	N/A
<b>Total</b>	<b>\$ 23,500,000</b>
<i>1 – Costs are based on August 2009 representative bid costs. August 2009 Engineering News and Record Construction Cost Index at 8563.8.</i>	

## 6.0 IMPLEMENTATION SCHEDULE

The schedule for implementation of these projects will be driven by the availability of future funding. The information in this report is intended to identify both the areas that do not have sewer service and a planning level capital cost to provide service. Using this information, the City can begin planning for future improvements by matching available funding with the identified expansion projects. The first step in the process is to increase transmission capacity along King Street.

The proposed gravity system designs for Zones A and C are directly dependent on the County's infrastructure improvements project for Duval and St. Johns streets. The County project includes pavement and drainage improvements and water main replacement along the two streets. The County also proposes to construct gravity sewer trunk lines on Duval Street and St. Johns Street, a pump station on West 4<sup>th</sup> Street and a forcemain along Duval Street to the Solomon Calhoun Community Center pump station discharge forcemain. Therefore, the sewer facilities for Zones A and C should be constructed concurrently with the County improvements or after the County project is completed.

Expansion Zone B discharges to Zone A, and should be scheduled for construction with the Zone A system or following its completion. Zone L, to the South of Zone B discharges to the gravity system of Zone B and should be phased accordingly.

The gravity layout and pump station proposed for Zone D is independent of the County project but manifolds to a proposed 12-inch forcemain at W King Street and Herbert Street. The pump stations for Zones E-1 and E-2 also manifold to the proposed 12-inch main on W King Street and cannot be placed into service until the transmission main is installed.

Zone F design includes a pump station and forcemain which connects to the proposed transmission forcemain at W King Street and N Orange Street. The Zone G pump station manifolds into the proposed 12-inch forcemain at N McLaughlin Street and W King Street and the pump station for Zone H discharges to a manhole in the gravity system for Zone G.

Expansion Zones I, J and K connect to existing system infrastructure and are not dependent on other portions of the Master Plan design. These systems may be designed and constructed when funding is available, however the existing pump station in Zone I will require upgrades to



accommodate basin build-out flows. Table 6-1 provides a general summary of the above implementation recommendations.

Table 6-1 Expansion Zone Implementation		
Zone	Implementation Recommendation	Comment
N/A	Construct proposed transmission forcemain initially to provide capacity for expansion zone sewer loads	The City does not currently have transmission capacity to support sewer system expansion along the West King Street corridor
A	Construct with or after County project	Requires County proposed gravity main.
B	Construct with or after Zone A	Zone B pump station discharges to Zone A manhole.
C	Construct with or after County project	Requires County proposed gravity main and pump station.
D	Construct with or after proposed new transmission forcemain	Requires proposed transmission forcemain.
E-1	Construct with or after proposed new transmission forcemain	Requires proposed transmission forcemain.
E-2	Construct with or after proposed new transmission forcemain	Requires proposed transmission forcemain.
F	Construct with or after proposed new transmission forcemain	Requires proposed transmission forcemain.
G	Construct with or after proposed new transmission forcemain	Requires proposed transmission forcemain.
H	Construct with or after Zone G	Zone H pump station discharges to Zone G manhole.
I	Construct when funding is available	Connects to existing gravity but will require upgrade to existing pump station prior to basin build-out.
J	Construct when funding is available	Zone J pump station manifold to existing 6" forcemain.
K	Construct when funding is available	Zone K connect to existing gravity system.
L	Construct with or after Zone B	Zone L pump station discharges to Zone B manhole.
M	N/A - Currently undeveloped property.	Development of this property requires the proposed transmission forcemain on W King Street.

As the table shows, several of the zones are dependent on the proposed new transmission forcemain on W King Street. Other systems, such as Zone K, may be installed independently of other construction.



# APPENDIX A

## Joint Resolution to Support Improved Infrastructure

ST. JOHNS COUNTY RESOLUTION NO. 2009- 226

CITY OF ST. AUGUSTINE RESOLUTION NO. 2009-22

A JOINT RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA AND THE CITY OF ST. AUGUSTINE CITY COMMISSION, ST. AUGUSTINE, FLORIDA TO WORK COOPERATIVELY TO SUPPORT FUNDING INITIATIVES FOR IMPROVED PUBLIC SANITARY SEWER AND WATER INFRASTRUCTURE IN THE WEST AUGUSTINE REDEVELOPMENT AREA.

RECITALS:

**WHEREAS**, the Board of County Commissioners of St. Johns County, Florida (COUNTY) and the City of St. Augustine City Commission, St. Augustine, Florida (CITY) recognize the need for improved public sanitary sewer and water infrastructure in the West Augustine Community Redevelopment Area (CRA); and

**WHEREAS**, the West Augustine CRA lies within the CITY Utility Service area as created by the Interlocal Agreement of the parties; and

**WHEREAS**, the COUNTY and the CITY have each invested significant resources in the West Augustine CRA over the last ten years; and

**WHEREAS**, the COUNTY and the CITY have each requested federal appropriations for Federal Fiscal Year 2010, including federal economic stimulus funding, for West Augustine CRA public sanitary sewer and water infrastructure improvements; and

**WHEREAS**, the COUNTY and the CITY desire to support further congressional funding initiatives, State Revolving Fund and Community Development Block Grant funding and other federal, state, regional and local funding sources or financing mechanisms for the West Augustine CRA; and

**WHEREAS**, the COUNTY and the CITY recognize the need to work cooperatively to carry out these purposes and met in a Joint Workshop on June 3, 2009 to develop an Action Plan;

**NOW, THEREFORE, BE IT RESOLVED** by the Board of County Commissioners of St. Johns County, Florida and the City of St. Augustine City Commission, St. Augustine, Florida, as follows:

I HEREBY CERTIFY THAT THIS DOCUMENT  
IS A TRUE AND CORRECT COPY AS APPEARS  
ON RECORD IN ST. JOHNS COUNTY, FLORIDA  
WITNESS MY HAND AND OFFICIAL SEAL  
THIS 24 DAY OF August 2009  
CHERYL STRICKLAND, CLERK  
Ex-Officio Clerk of the Board of County Commissioners

BY Adam Halterman D.C.





**Section 1.** The above Recitals are incorporated by reference into the body of this Resolution, and such Recitals are adopted as Findings of Fact.

**Section 2.** The COUNTY and the CITY will work cooperatively to support funding initiatives for improved public sanitary sewer and water infrastructure in the West Augustine CRA by implementing the following strategy:

1. Develop a Master Plan.
2. Determine the best use of existing funds and partnerships.
3. Pursue grants through the State Revolving Fund and the Community Development Block Grant programs.
4. Support Congressional funding initiatives.
5. Evaluate other financing mechanisms.
6. Implement a connection policy.

**Section 3.** This resolution shall take effect upon its approval and adoption by the COUNTY and the CITY.

**PASSED AND ADOPTED** by the Board of County Commissioners of St. Johns County, State of Florida, this 18<sup>th</sup> day of August, 2009.

ATTEST:

*Ram Halterman*  
Clerk of Court, Deputy Clerk  
St. Johns County, Florida

(SEAL)

APPROVED AS TO FORM AND  
LEGAL SUFFICIENCY:

*[Signature]*  
COUNTY ATTORNEY

BOARD OF COUNTY COMMISSIONERS  
OF ST. JOHNS COUNTY, FLORIDA

By:

*Ron Sanchez*  
Ron Sanchez, Vice Chair

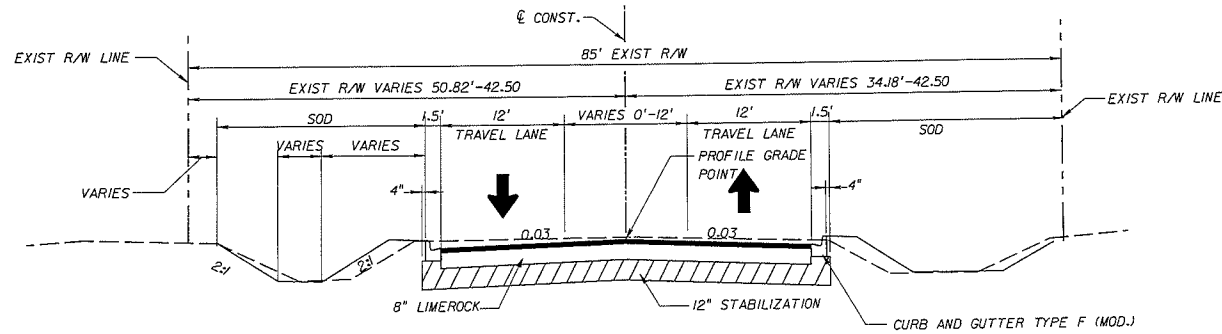
RENDITION DATE 8/20/09

\* \* \* SIGNATURES CONTINUE ON THE FOLLOWING PAGE \* \* \*

## APPENDIX B

### County Proposed West King Street Typical Roadway Sections



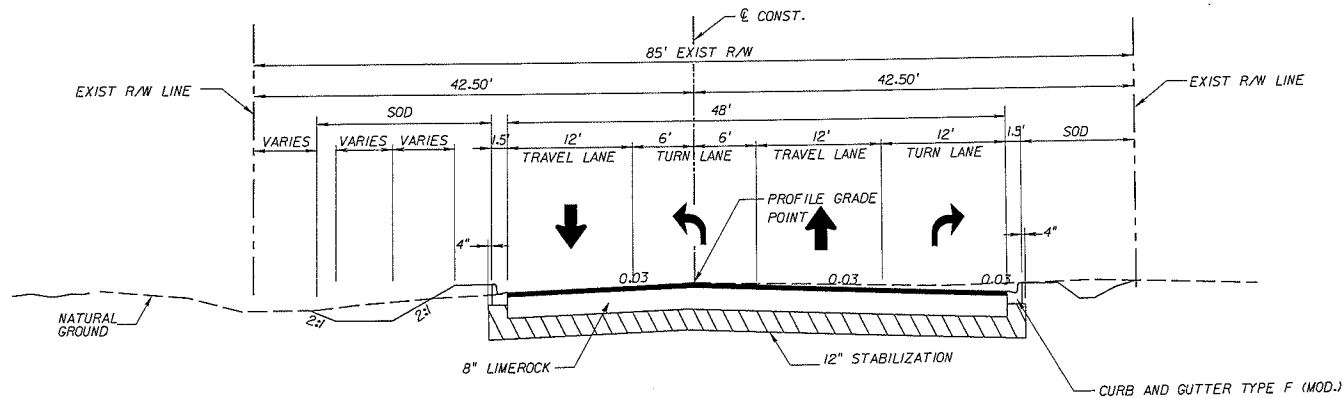


DESIGN SPEED = 50 MPH

WEST KING STREET FROM  
HOLMES BOULEVARD TO FORD STREET

### TYPICAL SECTION - NO. 1 WEST KING STREET

STA. 11+68.00 TO STA. 15+70.00



NEW CONSTRUCTION

3/4" TYPE S-III ASPHALTIC CONC. SURFACE COURSE  
1/4" TYPE S-I ASPHALTIC CONC. STRUCTURAL COURSE  
8" LIMEROCK BASE, LBR 100, 98% MAX. DENSITY  
12" STABILIZED SUBGRADE, LBR 40, 95% MAX. DENSITY

### TYPICAL SECTION - NO. 2 WEST KING STREET

STA. 15+70.00 TO STA. 18+60.00

*B. J. Cooper*  
6/30/2008

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

13901 Sunset Park Drive SE, Ste. 200  
Jacksonville, Florida 32224-0229  
p - 904.739.3655  
f - 904.739.3613  
e - info@prosserhallock.com  
Bernard L. O'Connor P.E. #93496  
Fla. Certificate of Authorization No. 0000429

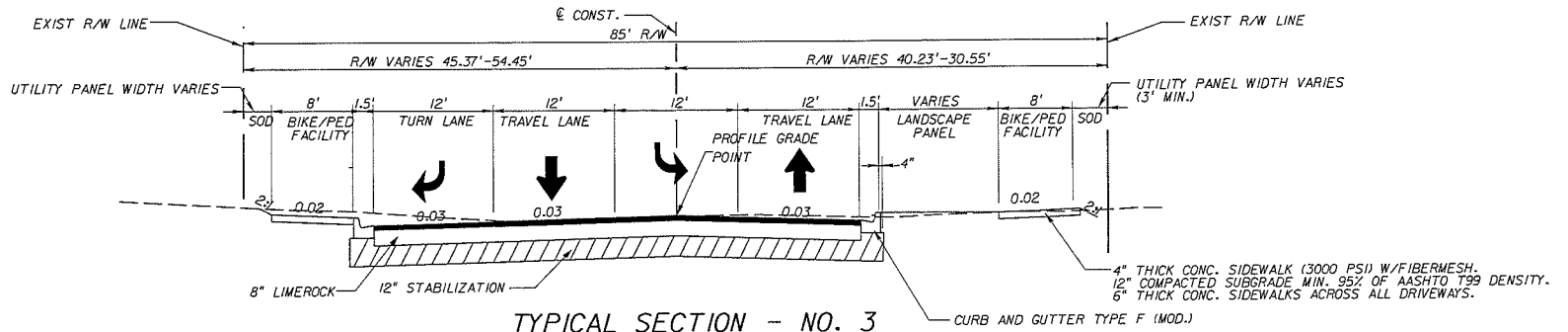
**Prosser Hallock**  
PLANNERS & ENGINEERS

WEST KING STREET IMPROVEMENTS  
FROM  
HOLMES BOULEVARD TO McLAUGHLIN ST.  
ST. JOHN'S COUNTY

**WEST KING STREET  
TYPICAL SECTIONS**

SHEET NO. 8

6/24/2008 12:32:21 PM P:\NO.3\NO.300-04\CADD\CURRENT\Typical01.dgn

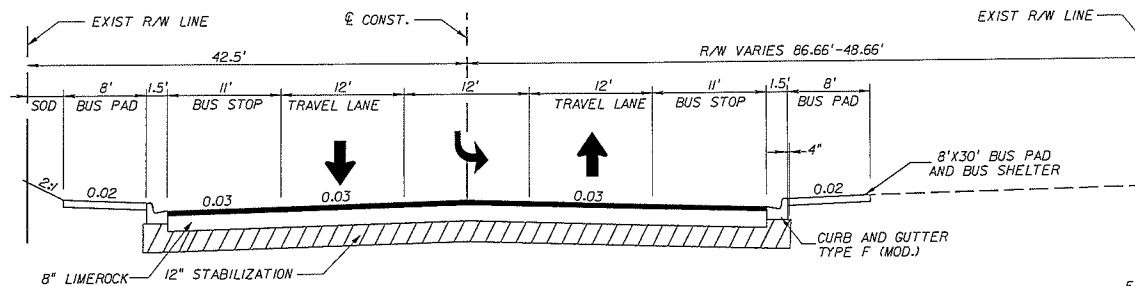


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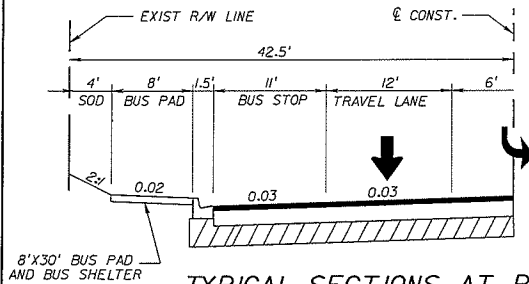
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WEST KING STREET FROM  
HOLMES BOULEVARD TO FORD STREET

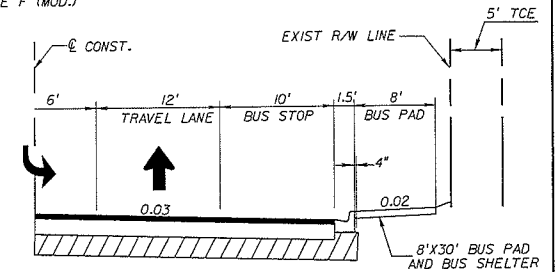
NEW CONSTRUCTION  
3/4" TYPE S-III ASPHALTIC CONC. SURFACE COURSE  
1 1/4" TYPE S-I ASPHALTIC CONC. STRUCTURAL COURSE  
8" LIMEROCK BASE, LBR 100, 98% MAX. DENSITY  
12" STABILIZED SUBGRADE, LBR 40, 95% MAX. DENSITY



TYPICAL SECTIONS AT BUS STOPS - NO. 4  
WEST KING STREET  
STA. 22+60.00 TO STA. 24+60.00



TYPICAL SECTIONS AT BUS STOPS  
WEST KING STREET  
STA. 50+80.00 TO STA. 52+40.00 (LEFT)



TYPICAL SECTIONS AT BUS STOPS  
WEST KING STREET  
STA. 58+20.00 TO STA. 59+60.00 (RIGHT)

*B. J. [Signature]*  
6/30/2008

REVISIONS							
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY

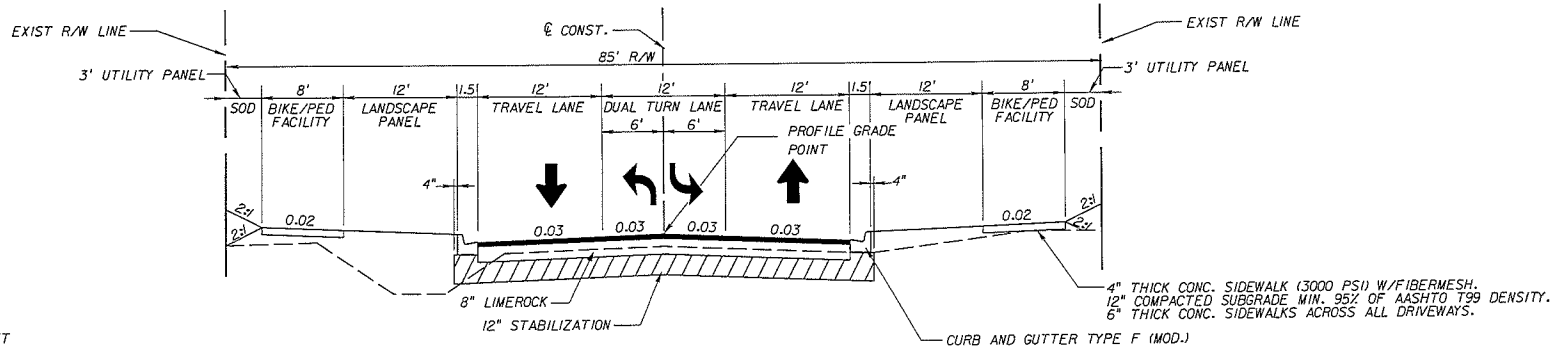
12901 Sutton Park Drive Ste. 200  
Jacksonville, Florida 32214-4228  
P: 904.739.3555  
F: 904.739.3513  
E: info@prosserhallock.com  
Barnard J. O'Connor P.E. #24896  
P.E. Certificate of Authorization No. 00004050

WEST KING STREET IMPROVEMENTS  
FROM  
HOLMES BOULEVARD TO McLAUGHLIN ST.  
ST. JOHN'S COUNTY

WEST KING STREET  
TYPICAL SECTIONS

SHEET NO.  
9





DESIGN SPEED = 50 MPH

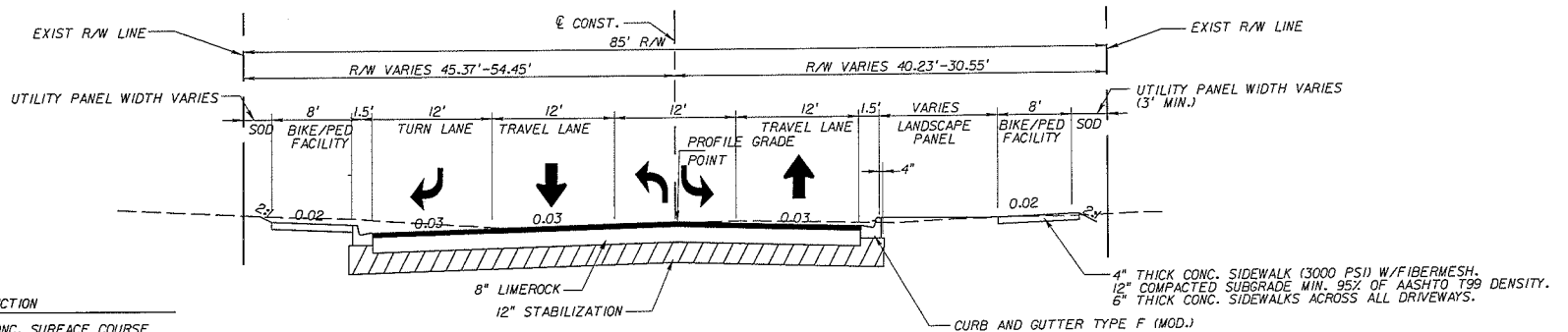
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HOLMES BOULEVARD TO FORD STREET

DESIGN SPEED = 40 MPH

WEST KING STREET FROM  
FORD STREET TO N. McLAUGHLIN STREET

### TYPICAL SECTION - NO. 5 WEST KING STREET

STA. 24+60.00 TO STA. 40+60.00  
STA. 43+75.00 TO STA. 54+05.00



#### NEW CONSTRUCTION

3/4" TYPE S-III ASPHALTIC CONC. SURFACE COURSE  
1/4" TYPE S-I ASPHALTIC CONC. STRUCTURAL COURSE  
8" LIMEROCK BASE, LBR 100, 98% MAX. DENSITY  
12" STABILIZED SUBGRADE, LBR 40, 95% MAX. DENSITY


### TYPICAL SECTION - NO. 6 WEST KING STREET

STA. 40+60 TO STA. 43+75

*B. J. Long*  
6/30/2008

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

  
**Prosser Hallock**  
 PLANNERS & ENGINEERS  
 13901 S. Palm Beach Blvd., Ste. 200  
 Jacksonville, Florida 32224-0229  
 P: 904.739.3655  
 F: 904.739.3653  
 E: info@prosserhallock.com  
 Bureau: J. D. Carter P.E. #2488

  
 WEST KING STREET IMPROVEMENTS  
 FROM  
 HOLMES BOULEVARD TO McLAUGHLIN ST.  
 ST. JOHN'S COUNTY

**WEST KING STREET**  
**TYPICAL SECTIONS**

SHEET NO.
10

6/24/2008 1:31:56 PM P:\03\23300-01\CADD\CURRENT\Typical01.dgn





## APPENDIX C

### Detailed Engineer's Opinion of Probable Construction Costs

# Engineers Opinion of Probable Construction Cost<sup>1,2,3</sup>

Conceptual Sanitary Sewer System Design

March 23, 2010

West Augustine CRA

	Zone A	Zone B	Zone C	Zone D	Zone E-1	Zone E-2	Zone F	Zone G	Zone H	Zone I	Zone J	Zone K	Zone L	Transmission Upgrades	Estimated Project Cost
<b>General Construction</b>	\$ 88,000	\$ 282,000	\$ 173,000	\$ 260,000	\$ 79,000	\$ 50,000	\$ 219,000	\$ 253,000	\$ 55,000	\$ 148,000	\$ 111,000	\$ 117,000	\$ 70,000	\$ 124,000	
<b>Manholes</b>	\$ 47,000	\$ 182,000	\$ 97,200	\$ 155,100	\$ 65,300	\$ 37,200	\$ 146,900	\$ 181,500	\$ 33,900	\$ 107,600	\$ 100,000	\$ 71,400	\$ 42,900	\$ -	
<b>Gravity Main</b>	\$ 216,750	\$ 658,750	\$ 409,000	\$ 533,000	\$ 169,250	\$ 88,500	\$ 574,000	\$ 676,750	\$ 111,000	\$ 388,250	\$ 219,000	\$ 296,250	\$ 120,250	\$ -	
<b>Force Main</b>	\$ -	\$ 60,000	\$ -	\$ 40,500	\$ 6,250	\$ 1,875	\$ 25,500	\$ 64,500	\$ 26,250	\$ -	\$ 8,750	\$ -	\$ 95,000	\$ 633,500	
<b>Pump Station</b>	\$ -	\$ 150,000	\$ 150,000	\$ 150,000	\$ 80,000	\$ 60,000	\$ 150,000	\$ 150,000	\$ 80,000	\$ 50,000	\$ 150,000	\$ -	\$ 80,000	\$ 150,000	
<b>Service Connections<sup>4</sup></b>	\$ 156,000	\$ 278,850	\$ 323,700	\$ 349,050	\$ 89,700	\$ 54,600	\$ 181,350	\$ 210,600	\$ 37,050	\$ 300,300	\$ 136,500	\$ 218,400	\$ 113,100	\$ -	
<b>Water Improvements</b>	\$ 125,000	\$ 374,250	\$ 126,750	\$ 392,750	\$ 46,250	\$ 35,000	\$ 150,500	\$ 110,250	\$ 18,500	\$ 64,500	\$ 105,250	\$ 146,250	\$ 45,750	\$ -	\$ 1,741,000
<b>Replacement/Restoration</b>	\$ 155,150	\$ 442,050	\$ 302,350	\$ 444,000	\$ 147,900	\$ 97,300	\$ 396,200	\$ 466,900	\$ 89,100	\$ 303,100	\$ 153,900	\$ 213,000	\$ 84,150	\$ 155,700	
<b>Subtotal</b>	\$ 787,900	\$ 2,427,900	\$ 1,582,000	\$ 2,324,400	\$ 683,650	\$ 424,475	\$ 1,843,450	\$ 2,113,500	\$ 450,800	\$ 1,361,750	\$ 984,400	\$ 1,062,300	\$ 651,150	\$ 1,063,200	\$ 17,761,000
<b>Contingency (15%)</b>	\$ 118,000	\$ 364,000	\$ 237,000	\$ 349,000	\$ 103,000	\$ 64,000	\$ 277,000	\$ 317,000	\$ 68,000	\$ 204,000	\$ 148,000	\$ 159,000	\$ 98,000	\$ 160,000	\$ 2,666,000
<b>Engineering (15%)</b>	\$ 136,000	\$ 419,000	\$ 273,000	\$ 402,000	\$ 119,000	\$ 74,000	\$ 319,000	\$ 365,000	\$ 78,000	\$ 235,000	\$ 170,000	\$ 184,000	\$ 113,000	\$ 184,000	\$ 3,071,000
<b>Total</b>	\$ 1,042,000	\$ 3,211,000	\$ 2,092,000	\$ 3,076,000	\$ 906,000	\$ 563,000	\$ 2,440,000	\$ 2,796,000	\$ 597,000	\$ 1,801,000	\$ 1,303,000	\$ 1,406,000	\$ 863,000	\$ 1,408,000	\$ 23,500,000
<b>Current AADF (gpd)</b>	16,800	30,030	34,860	37,590	9,660	5,880	19,530	22,680	3,990	32,340	14,700	23,520	12,180		
<b>Build-out AADF (gpd)</b>	45,780	85,050	59,220	61,110	18,480	13,440	63,630	68,460	12,180	84,840	17,640	56,700	26,670		
<b>Current Connections<sup>5</sup></b>	80	143	166	179	46	28	93	108	19	154	70	112	58		1,256
<b>Cost per Connection</b>	\$ 13,030	\$ 22,450	\$ 12,600	\$ 17,180	\$ 19,700	\$ 20,110	\$ 26,240	\$ 25,890	\$ 31,420	\$ 11,690	\$ 18,610	\$ 12,550	\$ 14,880		\$ 18,710

1 - Based on August 2009 construction bid costs

2 - August 2009 Engineering News and Record Construction Cost Index at 8563.8

3 - Note that values in table above are rounded off.

4 - Service connection costs include laterals and septic tank abandonment.

5 - Represents the number connections if all existing residents connect to sewer system



West Augustine CRA Sewer Master Plan - DRAFT  
March 26, 2010

## Conceptual Sewer System and Water System Improvements Design Engineer's Opinion of Probable Construction Costs<sup>1,2,3</sup>

				ZONE A		ZONE B		ZONE C		ZONE D		ZONE E-1		ZONE E-2		ZONE F		ZONE G		ZONE H		ZONE I		ZONE J		ZONE K		ZONE L		TRANSMISSION UPGRADES					
ITEM DESCRIPTION			UNIT	UNIT COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST					
GENERAL																																			
Mobilization			LS	6%	1	\$ 36,000	1	\$ 117,000	1	\$ 71,000	1	\$ 109,000	1	\$ 33,000	1	\$ 21,000	1	\$ 90,000	1	\$ 103,000	1	\$ 23,000	1	\$ 60,000	1	\$ 47,000	1	\$ 47,000	1	\$ 30,000	1	\$ 57,000			
Traffic Control			LS	4%	1	\$ 24,000	1	\$ 78,000	1	\$ 47,000	1	\$ 73,000	1	\$ 22,000	1	\$ 14,000	1	\$ 60,000	1	\$ 69,000	1	\$ 15,000	1	\$ 40,000	1	\$ 31,000	1	\$ 32,000	1	\$ 20,000	1	\$ 38,000			
Erosion Control			LS	3%	1	\$ 18,000	1	\$ 59,000	1	\$ 36,000	1	\$ 55,000	1	\$ 17,000	1	\$ 11,000	1	\$ 45,000	1	\$ 52,000	1	\$ 12,000	1	\$ 30,000	1	\$ 24,000	1	\$ 24,000	1	\$ 15,000	1	\$ 29,000			
As-built Survey			LF	\$ 2.00	5000	\$ 10,000	14150	\$ 28,000	9500	\$ 19,000	11500	\$ 23,000	3700	\$ 7,000	2100	\$ 4,000	12100	\$ 24,000	14500	\$ 29,000	2650	\$ 5,000	8800	\$ 18,000	4700	\$ 9,000	6750	\$ 14,000	2600	\$ 5,000		\$ -			
Sub Total						\$ 88,000		\$ 282,000		\$ 173,000		\$ 260,000		\$ 79,000		\$ 50,000		\$ 219,000		\$ 253,000		\$ 55,000		\$ 148,000		\$ 111,000		\$ 117,000		\$ 70,000		\$ 124,000			
PRE-CAST MANHOLES																																			
Less than 6' deep			EA	\$ 2,900	14	\$ 40,600	30	\$ 87,000	28	\$ 81,200	26	\$ 75,400	8	\$ 23,200	6	\$ 17,400	20	\$ 58,000	19	\$ 55,100	7	\$ 20,300	22	\$ 63,800	14	\$ 40,600	14	\$ 40,600	5	\$ 14,500		\$ -			
6' to 8' deep			EA	\$ 3,200	2	\$ 6,400	12	\$ 38,400	5	\$ 16,000	7	\$ 22,400	2	\$ 6,400	2	\$ 6,400	12	\$ 38,400	11	\$ 35,200	3	\$ 9,600	7	\$ 22,400	3	\$ 9,600	5	\$ 16,000	3	\$ 9,600		\$ -			
8' to 10' deep			EA	\$ 4,000	0	\$ -	3	\$ 12,000	0	\$ -	4	\$ 16,000	2	\$ 8,000	2	\$ 8,000	4	\$ 16,000	13	\$ 52,000	1	\$ 4,000	4	\$ 16,000	4	\$ 16,000	1	\$ 4,000	2	\$ 8,000		\$ -			
10' to 12' deep			EA	\$ 5,400	0	\$ -	6	\$ 32,400	0	\$ -	2	\$ 10,800	4	\$ 21,600	1	\$ 5,400	3	\$ 16,200	5	\$ 27,000	0	\$ -	1	\$ 5,400	4	\$ 21,600	2	\$ 10,800	2	\$ 10,800		\$ -			
12' to 14' deep			EA	\$ 6,100	0	\$ -	2	\$ 12,200	0	\$ -	5	\$ 30,500	1	\$ 6,100	0	\$ -	3	\$ 18,300	2	\$ 12,200	0	\$ -	0	\$ -	2	\$ 12,200	0	\$ -	0	\$ -		\$ -			
14' to 16' deep			EA	\$ 8,000	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		\$ -			
Sub Total					16	\$ 47,000	53	\$ 182,000	33	\$ 97,200	44	\$ 155,100	17	\$ 65,300	11	\$ 37,200	42	\$ 146,900	50	\$ 181,500	11	\$ 33,900	34	\$ 107,600	27	\$ 100,000	22	\$ 71,400	12	\$ 42,900	0	\$ -			
GRAVITY SEWER PIPE																																			
8", less than 6' deep			LF	\$ 40	2250	\$ 90,000	5900	\$ 236,000	5400	\$ 216,000	5350	\$ 214,000	1650	\$ 66,000	1200	\$ 48,000	4950	\$ 198,000	4900	\$ 196,000	1800	\$ 72,000	4600	\$ 184,000	2200	\$ 88,000	4350	\$ 174,000	900	\$ 36,000		\$ -			
8", 6' to 8' deep			LF	\$ 45	2150	\$ 96,750	4800	\$ 216,000	2900	\$ 130,500	2850	\$ 128,250	850	\$ 38,250	900	\$ 40,500	3300	\$ 148,500	3450	\$ 155,250	800	\$ 36,000	2050	\$ 92,250	1050	\$ 47,250	950	\$ 42,750	950	\$ 42,750		\$ -			
8", 8' to 10' deep			LF	\$ 50	600	\$ 30,000	1150	\$ 57,500	950	\$ 47,500	1850	\$ 92,500	700	\$ 35,000	0	\$ -	1700	\$ 85,000	4500	\$ 225,000	0	\$ -	1700	\$ 85,000	550	\$ 27,500	750	\$ 37,500	350	\$ 17,500		\$ -			
8", 10' to12' deep			LF	\$ 60	0	\$ -	1550	\$ 93,000	250	\$ 15,000	700	\$ 42,000	500	\$ 30,000	0	\$ -	1250	\$ 75,000	1550	\$ 93,000	50	\$ 3,000	450	\$ 27,000	750	\$ 45,000	700	\$ 42,000	400	\$ 24,000		\$ -			
8", 12' to 14' deep			LF	\$ 75	0	\$ -	750	\$ 56,250	0	\$ -	750	\$ 56,250	0	\$ -	0	\$ -	900	\$ 67,500	100	\$ 7,500	0	\$ -	0	\$ -	150	\$ 11,250	0	\$ -	0	\$ -		\$ -			
8", 14' to 16' deep			LF	\$ 95	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		\$ -			
Sub Total					5000	\$ 216,750	14150	\$ 658,750	9500	\$ 409,000	11500	\$ 533,000	3700	\$ 169,250	2100	\$ 88,500	12100	\$ 574,000	14500	\$ 676,750	2650	\$ 111,000	8800	\$ 388,250	4700	\$ 219,000	6750	\$ 296,250	2600	\$ 120,250	0	\$ -			
FORCE MAIN																																			
3", trenching			LF	\$ 20		\$ -		\$ -		\$ -		\$ -		\$ -	700	\$ 14,000		\$ -		\$ -		\$ -		\$ -	750	\$ 15,000		\$ -		\$ -		\$ -			
4", trenching			LF	\$ 25		\$ -		\$ -		\$ -		\$ -	250	\$ 6,250	75	\$ 1,875		\$ -		\$ -	1050	\$ 26,250		\$ -	350	\$ 8,750		\$ -	3800	\$ 95,000		\$ -			
6", trenching			LF	\$ 30		\$ -	2000	\$ 60,000		\$ -	1350	\$ 40,500		\$ -		\$ -	850	\$ 25,500	2150	\$ 64,500		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -			
8", trenching			LF	\$ 40		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -			
10", trenching			LF	\$ 55		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	2300	\$ 126,500			
12", trenching			LF	\$ 65		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	7800	\$ 507,000			
4", directional drill			LF	\$ 50		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -			
6", directional drill			LF	\$ 60		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -			
Sub Total					0	\$ -	2000	\$ 60,000	0	\$ -	1350	\$ 40,500	250	\$ 6,250	75	\$ 1,875	850	\$ 25,500	2150	\$ 64,500	1050	\$ 26,250	0	\$ -	350	\$ 8,750	0	\$ -	3800	\$ 95,000	10100	\$ 633,500			
WATER SYSTEM IMPROVEMENTS																																			
2" Water Main			LF	\$ 15	0	\$ -	0	\$ -	0	\$ -	1300	\$ 19,500	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	550	\$ 8,250	1050	\$ -	0	\$ -		\$ -			
4" Water Main			LF	\$ 25	2900	\$ 72,500	6050	\$ 151,250	7150	\$ -	3750	\$ 93,750	0	\$ -	0	\$ -	250	\$ 6,250	0	\$ -	0	\$ -	0	\$ -	2050	\$ 51,250	2850	\$ -	1250	\$ 31,250		\$ -			
6" Water Main			LF	\$ 35	0	\$ -	4350	\$ 152,250	2150	\$ 75,250	2050	\$ 71,750	850	\$ 29,750	800	\$ 28,000	2600	\$ 91,000	1950	\$ 68,250	250	\$ 8,750	600	\$ 21,000	900	\$ 31,500	2950	\$ 103,250	0	\$ -		\$ -			
8" Water Main			LF	\$ 50	650	\$ 32,500	0	\$ -	0	\$ -	3250	\$ 162,500	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -	0	\$ -		\$ -			
Fire Hydrant Assembly			EA	\$ 5,000	0	\$ -	7	\$ 35,000	2	\$ 10,000	4	\$ 20,000	1	\$ 5,000	0	\$ -	6	\$ 30,000	3	\$ 15,000	1	\$ 5,000	1	\$ 5,000	1	\$ 5,000	3	\$ 15,000	0	\$ -		\$ -			
Reconnect Water Service			EA	\$ 250	80	\$ 20,000	143	\$ 35,750	166	\$ 41,500	179	\$ 44,750	46	\$ 11,500	28	\$ 7,000	93	\$ 23,250	108	\$ 27,000	19	\$ 4,750	154	\$ 38,500	70	\$ 17,500	112	\$ 28,000	58	\$ 14,500		\$ -			
Sub Total					3630	\$ 125,000	10550	\$ 374,250	9468	\$ 126,750	9233	\$ 392,750	897	\$ 46,250	828	\$ 35,000	2949	\$ 150,500	2061	\$ 110,250	270	\$ 18,500	755	\$ 64,500	3021	\$ 105,250	5915	\$ 146,250	1308	\$ 45,750	0	\$ -			
RESTORATION																																			
Asphalt Removal and Replacement			SY	\$ 28	4100	\$ 114,800	11500	\$ 322,000	7700	\$ 215,600	9400	\$ 263,200	3000	\$ 84,000	1700	\$ 47,600	9900	\$ 277,200	11800	\$ 330,400	2200	\$ 61,600	7200	\$ 201,600	3800	\$ 106,400	5500	\$ 154,000	2100	\$ 58,800	1000	\$ 28,000			
Culvert Removal and Replacement			EA	\$ 1,000	3	\$ 3,000	19	\$ 19,000	14	\$ 14,000	30	\$ 30,000	2	\$ 2,000	5	\$ 5,000	8	\$ 8,000	14	\$ 14,000	2	\$ 2,000	9	\$ 9,000	3	\$ 3,000	3	\$ 3,000	2	\$ 2,000		\$ -			
Water Main Relocation			EA	\$ 2,500	0	\$ -	1	\$ 2,500	-	\$ -	4	\$ 10,000	3	\$ 7,500	5	\$ 12,500	12	\$ 30,000	10	\$ 25,000	3	\$ 7,500	10	\$ 25,000	4	\$ 10,000	2	\$ 5,000	1	\$ 2,500	6	\$ 15,000			
Curb & Gutter Replacement			LF	\$ 16		\$ -		\$ -		\$ -	2500	\$ 40,000		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	2000	\$ 32,000.00			
Sidewalk Replacement			SY	\$ 35		\$ -		\$ -		\$ -		\$ -	800	\$ 28,000	500	\$ 17,500		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	1500	\$ 52,500			
Driveway Replacement			SY	\$ 42	175	\$ 7,350	325	\$ 13,650	375	\$ 15,750	400	\$ 16,800	100	\$ 4,200	50	\$ 2,100	200	\$ 8,400	250	\$ 10,500	50	\$ 2,100	350	\$ 14,700	150	\$ 6,300	250	\$ 10,500	125	\$ 5,250	100	\$ 4,200			
Sodding/Seeding			LF	\$ 6	5000	\$ 30,000	14150	\$ 84,900	9500	\$ 57,000	14000	\$ 84,000	3700	\$ 22,200	2100	\$ 12,600	12100	\$ 72,600	14500	\$ 87,000	2650	\$ 15,900	8800	\$ 52,800	4700	\$ 28,200	6750	\$ 40,500	2600	\$ 15,600	4000	\$ 24,000			
Sub Total						\$ 155,150		\$ 442,050		\$ 302,350		\$ 444,000		\$ 147,900		\$ 97,300		\$ 396,200		\$ 466,900		\$ 89,100		\$ 303,100		\$ 153,900		\$ 213,000		\$ 84,150		\$ 155,700			
ADDITIONAL COSTS																																			
Pump Station			LS	by zone		\$ -	1	\$ 150,000		\$ 150,000		\$ 150,000		\$ 80,000		\$ 60,000		\$ 150,000		\$ 150,000		\$ 80,000		\$ 50,000		\$ 150,000		\$ -		\$ 80,000		\$ 150,000			
6" Service Laterals			EA	\$ 500	80	\$ 40,000	143	\$ 71,500	166	\$ 83,000	179	\$ 89,500	46	\$ 23,000	28	\$ 14,000	93	\$ 46,500	108	\$ 54,000	19	\$ 9,500	154	\$ 77,000	70	\$ 35,000	112	\$ 56,000	58						

1 - Unit costs a based on August 2009 construction bid costs

2 - August 2009 Engineering News and Record Construction Cost Index at 8563.8

3 - Note that values in table above are rounded off.

4 - Represents the number of connections if all existing residents connect to sewer system

<b>Total Cost:</b>	<b>\$ 23,500,000</b>
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## APPENDIX D

24" x 36" Opinion of Cost  
Breakdown Map





West Augustine Community Redevelopment Area  
Sewer Master Plan Opinion of Costs Breakdown

DISCLAIMER: This map is for reference and discussion purposes only. Data provided are derived from multiple sources with varying levels of accuracy. The information shown hereon is not intended for site specific use or design.

