LOCATION HYDRAULICS REPORT

Florida Department of Transportation

District One

SR 45 (US 41) at Bonita Beach Road Project Development and Environment (PD&E) Study

Limits of Project: US 41 and Bonita Beach Road

Lee County, Florida

Financial Management Number: 444321-1-22-01

Federal Aid Project Number: D123-081-B

ETDM Number: 6291

Date: February 2024

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022 and executed by the Federal Highway Administration and FDOT.

PROFESSIONAL ENGINEER CERTIFICATION

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This Location Hydraulics Report contains engineering information that fulfills the purpose and need for the SR 45 (US 41) at Bonita Beach Road Project Development and Environment (PD&E) Study in Lee County, Florida. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgment and experience.

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Inwood Consulting Engineers, and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice for this project.

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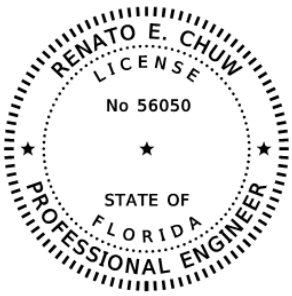

This item has been digitally signed and sealed by Renato Chuw, PE on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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Executive Summary

The SR 45 (US 41) at Bonita Beach Road Project Development and Environment (PD&E) Study evaluated capacity, safety, and multi-modal improvements at the US 41 and Bonita Beach Road intersection, in the City of Bonita Springs, Florida. The proposed improvements will modify the signalized configuration of the US 41 and Bonita Beach Road intersection to be a partial displaced left turn (PDLT), with the northbound and southbound left turn movements to crossover and be located outside of the opposing traffic flow. This configuration will allow the northbound and southbound left turning movements to operate in the same signal phase or simultaneously as the northbound and southbound through movements. To accommodate the partial displaced left turn configuration and facilitate the relocation of northbound and southbound turning vehicles, two new signalized "crossover" intersections will be added along US 41 approximately 675' south and 460' north of Bonita Beach Road. The southbound and eastbound left turn movements are proposed to have three lanes each, and the eastbound and westbound right turn movements are proposed to have two lanes each. Intersection improvements will also be supported by an enhanced Northwest Quadrant Roadway and a new Northeast Quadrant Roadway.

The purpose of the Location Hydraulics Report is to address base floodplain encroachments resulting from the roadway improvements evaluated in the US 41 at Bonita Beach Road PD&E Study for FDOT District 1. In accordance with Executive Order 11988 "Floodplain Management," U.S. DOT Order 5650.2 "Floodplain Management Protection," and Federal-Aid Policy Guide 23 CFR 650A, Floodplains must be protected. The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains and to avoid supporting land use development incompatible with floodplain values.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), northern portions of the proposed quadrant roadways lie within Zone AE of the 100-year floodplain. The Base Flood Elevation (BFE) of the site has been determined to be at the elevation of 9.0 feet NAVD upstream of the bridge over the Imperial River and 10.0 feet NAVD downstream of the bridge.

It was concluded that the project will have approximately 8.20 ac-ft of transverse floodplain impacts based on the proposed improvements to the US 41 and Bonita Beach Road intersection and for the proposed quadrant roadways. According to the Lee County Flood Insurance Study (FIS) the floodplain within the limits of this study are under tidal influence; therefore, it was determined that the floodplain encroachment is classified as "minimal." Minimal encroachments on a floodplain occur when there is a floodplain involvement but impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Please refer to Section 4 for additional information.

In conclusion, the following floodplain statement is a slightly modified version of statement Number 4 in the FDOT PD&E Manual (Part 2, Chapter 13 "Floodplains") tailored for this project:

"The proposed structures and stormwater management systems will perform hydraulically in a manner equal to or greater than the existing condition, and backwater surface elevations are not expected to significantly increase. As a result, there will be no significant change in flood risk, and there will not be a significant change

in the potential for interruption or termination of emergency service or in emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant."

1.0 Project Overview

Initiated in November 2019, this Project Development and Environment (PD&E) Study has been conducted to assess various intersection alternatives for US 41 at CR 865/Bonita Beach Road. This Preliminary Engineering Report (PER) documents the project's purpose and need, the alternatives developed, the process of selecting the preferred alternative, and presents the preliminary design analysis for the preferred alternative. CR 865 will be referred to as Bonita Beach Road throughout the remainder of this report.

1.1 Project Description

The US 41 at Bonita Beach Road Project Development and Environment (PD&E) Study evaluated capacity, safety, and multi-modal improvements at the US 41 and Bonita Beach Road intersection, in the City of Bonita Springs, Florida. The study area limits extend along US 41 from Foley Road to just south of the Imperial River bridge, a distance of approximately 0.9 miles. Additionally, the study area extends along Bonita Beach Road from Windsor Road to Spanish Wells Boulevard, a distance of approximately 0.8 miles.

US 41 is a north-south principal arterial roadway running parallel to Interstate 75 (I-75) and facilitates movement of regional and local traffic (including truck traffic) along Florida's west coast. Bonita Beach Road is an east-west minor arterial roadway providing a connection to I-75 and is one of two east-west connections between the Lee County mainland and coastal communities and barrier island tourist destinations and beaches to the west. US 41 is a state roadway maintained by the Florida Department of Transportation (FDOT) District 1, while Bonita Beach Road is maintained by the Lee County. Both US 41 and Bonita Beach Road are designated as emergency evacuation routes.

US 41 within the project limits is a six-lane divided roadway with 5' on-street bicycle lanes and 5' sidewalks on both sides of the roadway. Bonita Beach Road is a four lane divided roadway with 5' sidewalks on both sides but no on-street bicycle facilities.

The US 41 at Bonita Beach Road intersection of is currently a signalized intersection with two exclusive left turn lanes and an exclusive right turn lane in each approach. Aside from the main intersection, there is currently one other signalized intersection along US 41 at the Center of Bonita Springs (Tuffy Auto/Advanced Auto Parts). There are three additional signalized intersections along Bonita Beach Road at the Center of Bonita Springs, Arroyal Road, and Spanish Wells Boulevard.

The existing US 41 and Bonita Beach Road intersection has two high volume left turn movements, those being eastbound to northbound and southbound to eastbound. To partially address these heavy movements, the City of Bonita Springs conducted the "Network Enhancement Alignment Study – Quadrant Plan" in May 2017. From this, the City will be designing and building a two-lane quadrant roadway connecting Bonita Beach Road at Windsor Road to US 41 at the Center of Bonita Springs. This Northwest Quadrant Roadway is currently in design by the City and anticipated to be built ahead of the US 41 and Bonita Beach Road intersection improvements.

The proposed improvements will modify the signalized configuration of the US 41 and Bonita Beach Road intersection to be a partial displaced left turn (PDLT), with the northbound and southbound left turn movements to crossover and be located outside of the opposing traffic flow. This configuration will allow the northbound and southbound left turning movements to operate in the same signal phase or simultaneously as the northbound and southbound through movements. To accommodate the partial displaced left turn configuration and facilitate the relocation of northbound and southbound turning vehicles, two new signalized "crossover" intersections will be added along US 41 approximately 675' south and 460' north of Bonita Beach Road. The southbound and eastbound left turn movements are proposed to have three lanes each, and the eastbound and westbound right turn movements are proposed to have two lanes each.

As noted above, a Northwest Quadrant Roadway is being constructed by the City of Bonita Springs. As part of the PD&E study's proposed improvements, the US 41 and the Center of Bonita Springs intersection is proposed to be changed from a standard signalized intersection to a "thru-cut" intersection. A thru-cut intersection restricts through movements from the minor street typically due to operational and/or geometric conditions. In this case, the west leg is being widened from two lanes to five lanes (four eastbound approach lanes and one westbound receiving lane) and the east leg is being widened from two lanes to four lanes (two westbound approach lanes and two eastbound receiving lanes). This creates skew issues for any east/west through movements and creates operational constraints that are alleviated by the thru-cut intersection configuration. Tying into the new east leg is a Northeast Quadrant Roadway proposed between US 41 and Arroyal Road, northeast of the US 41 and Bonita Beach Road intersection. This will be a new three-lane roadway with two lanes eastbound and one lane westbound.

Along US 41 in the northbound direction, a 6' sidewalk is proposed from Foley Road to Springs Plaza (Sta. 232+50) and a 12' shared-use path is proposed from Springs Plaza to just north of the Imperial River Boat Ramp (Sta. 271+00). In the southbound direction, a 12' shared-use path is proposed from just north of the Imperial River Boat Ramp (Sta. 271+00) to Bonita Funeral Home (Sta. 231+00) and a 6' sidewalk is proposed from Bonita Funeral Home to Foley Road. Along both sides of Bonita Beach Road, the sidewalks will be widened to 12' shared-use paths from the Center of Bonita Springs to Arroyal Road. Signalized marked crosswalks will be maintained on every leg of the PDLT, including the channelized right turn lanes. Signalized marked crosswalks will also be provided on every leg of each signalized intersection along US 41 and Bonita Beach Road within the study area. The project location is shown in **Figure 1** and the study area is shown in **Figure 2**.

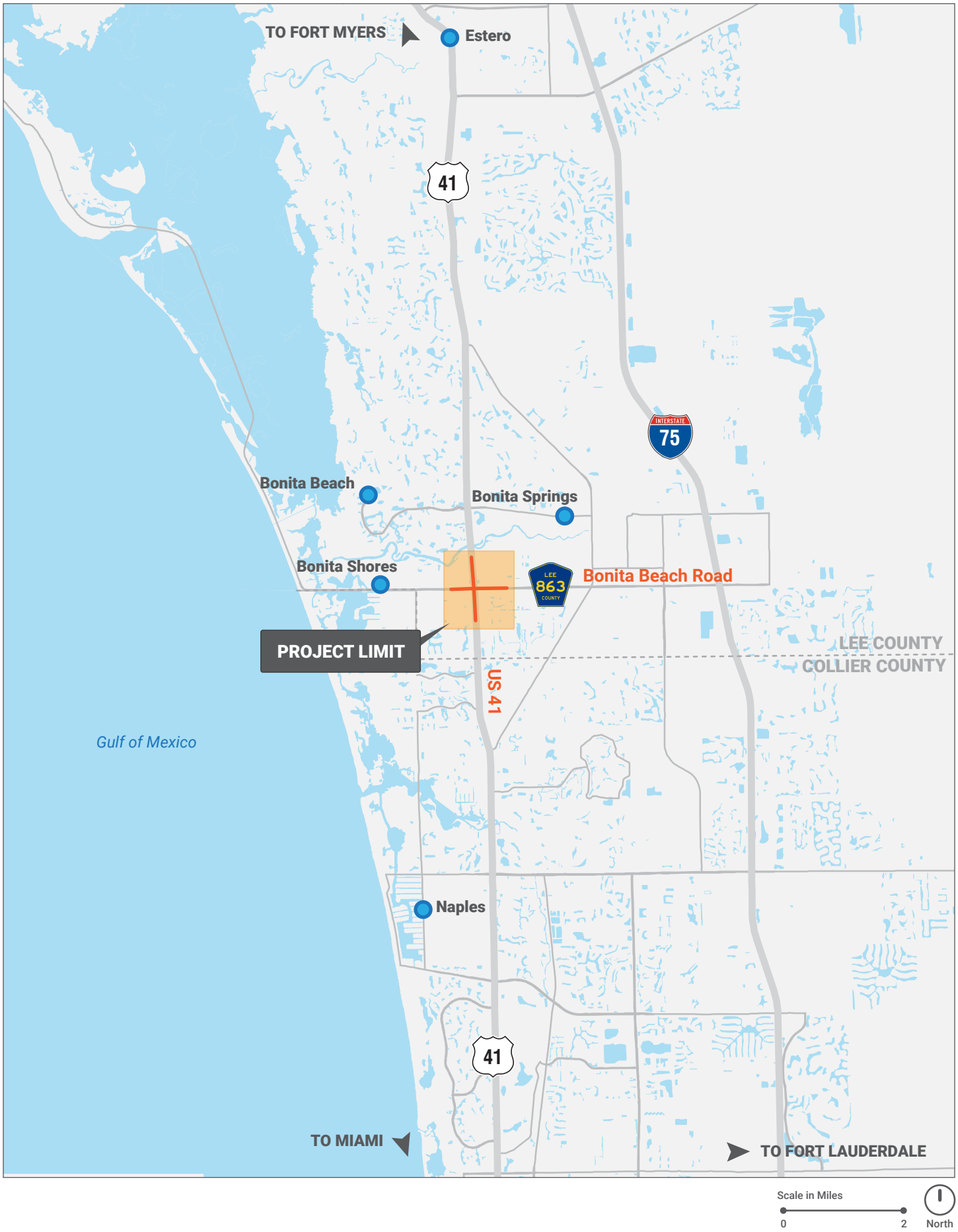


Figure 1 | Project Location

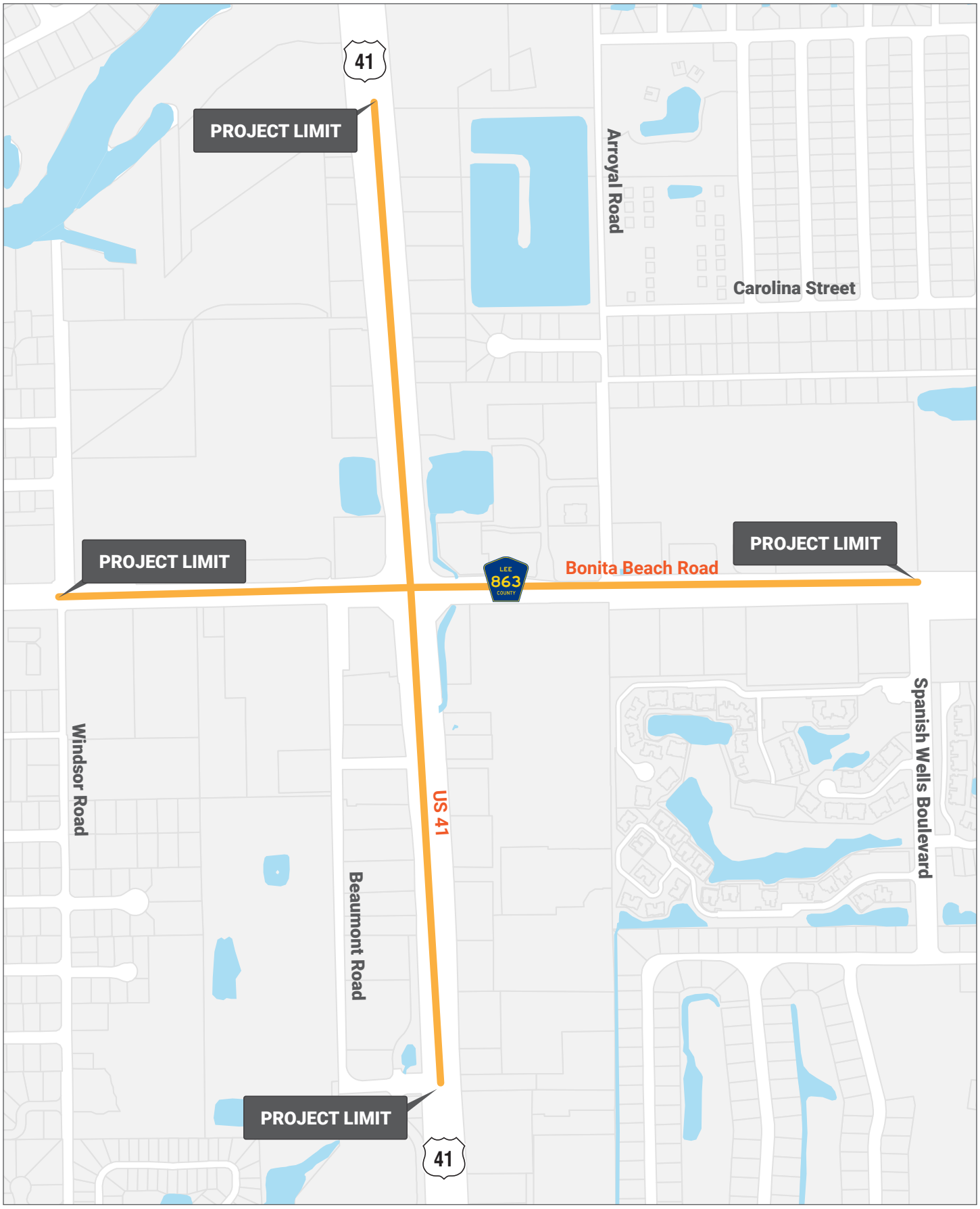


Figure 2 | Study Area

1.2 Project Purpose and Need

The purpose of this project is to address the deficient operational capacity of the US 41 and Bonita Beach Road intersection to relieve existing congestion and accommodate projected future traffic demand. The project's secondary goals are to 1) Enhance regional and local mobility; 2) Enhance safety conditions; and 3) Improve multi-modal access. The need for these improvements is described in this section.

1.2.1 Transportation Demand/Capacity

The US 41 at Bonita Beach Road intersection experiences chronic congestion. As population and employment growth are expected to continue within this area of Lee County, the intersection's congestion is anticipated to increase. Based on 2019 traffic counts taken, the existing Annual Average Daily Traffic (AADT) ranges from 39,000 to 53,000 along US 41 and was 30,000 along Bonita Beach Road. Based on future growth projections to a 2050 design year, the AADTs are forecast to range from 60,000 to 78,000 along US 41. The future 2050 AADT forecast along Bonita Beach Road is 39,000.

The existing (2019) mid-day traffic analysis for the US 41 at Bonita Beach Road intersection shows that six of the 12 movements operate at Level of Service (LOS) of F, with one of those being overcapacity (volume-to-capacity >1.0). The existing (2019) PM traffic analysis for the intersection shows that seven of the 12 movements operate at Level of Service (LOS) of F, with two of those being overcapacity. In the future 2050 condition, the no-build intersection operates at LOS F with an overall average vehicle delay between 85 and 92 seconds. While there are a similar number of LOS F movements between the existing and future no-build, latent demand is expected to increase by nearly 30 percent. The future no-build intersection is serving approximately the same amount of traffic volume as the existing condition but with the increased volumes, there are more vehicles in the overall network not being served.

1.2.2 Safety

Crash records were obtained for both US 41 and Bonita Beach Road within the study area, as described below:

US 41 from Foley Road (MP 0.540) to the Imperial River bridge (MP 1.482); and

Bonita Beach Road from 400' west of Windsor Road to 450' east of Spanish Wells Boulevard.

Crash data was obtained for the most recent five-year period on record (2018 through 2022). The crash data was obtained from the University of Florida's Signal Four (S4) Analytics crash database for US 41 and Bonita Beach Road. The safety analysis was performed for the most recent five years of crash data (January 1, 2018 – December 31, 2022). Supplemental crash data from previous years (2014 to 2017) and January 1, 2023 to June 30, 2023 were also analyzed to verify crash trends and patterns.

Figure 3 displays a summary of crash frequency by year along with the respective severities from 2014 to 2022. There was an increase in crashes between 2014 and 2017, but there has been a decrease in crashes between 2017 and 2019 before an approximate 30 percent drop in crashes due to the COVID-19 pandemic in 2020. The number

of crashes have stayed relatively constant in 2021 and 2022. There were 163 crashes per year on average between 2014 to 2017. However, there were 146 crashes per year on average in the study area between 2018 to 2022, not including 2020 (a 10 percent decrease). The fatal crash in 2019 involved a vehicle striking a pedestrian on US 41 just south of Bonita Beach Road, and the fatal crash in 2021 involved an angle crash at the intersection of US 41 at Foley Road/Shanna Lane.

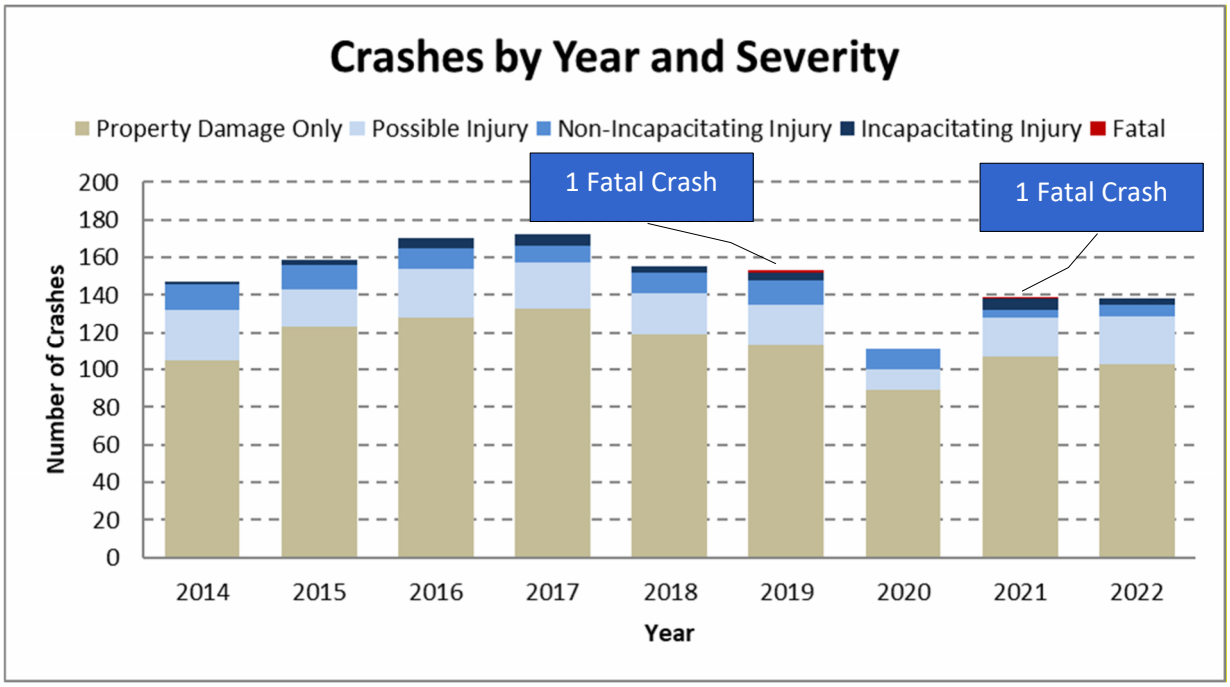


Figure 3: Crashes per Year (Entire Study Area)

Forty three percent of the total study area crashes were located within the intersection influence area of US 41 and Bonita Beach Road. Figure 4 displays a summary of crash frequency by year along with the respective severities from 2018 to 2022. There was a total of 298 reported crashes during this period, 65 injury crashes (22 percent), and one fatal crash (in 2019). As displayed in Figure 4, there were an average of 60 crashes per year at the intersection.

Figure 5 displays the crashes at the intersection by type and severity for the five-year study period. The highest crash type observed was rear end, comprising 59 percent of the total crashes. Sideswipe crashes (13 percent) and left turn (8 percent) were the second and third highest crash types. These trends are consistent with the overall study area. The fatal crash in 2019 occurred when a vehicle struck a pedestrian crossing US 41.

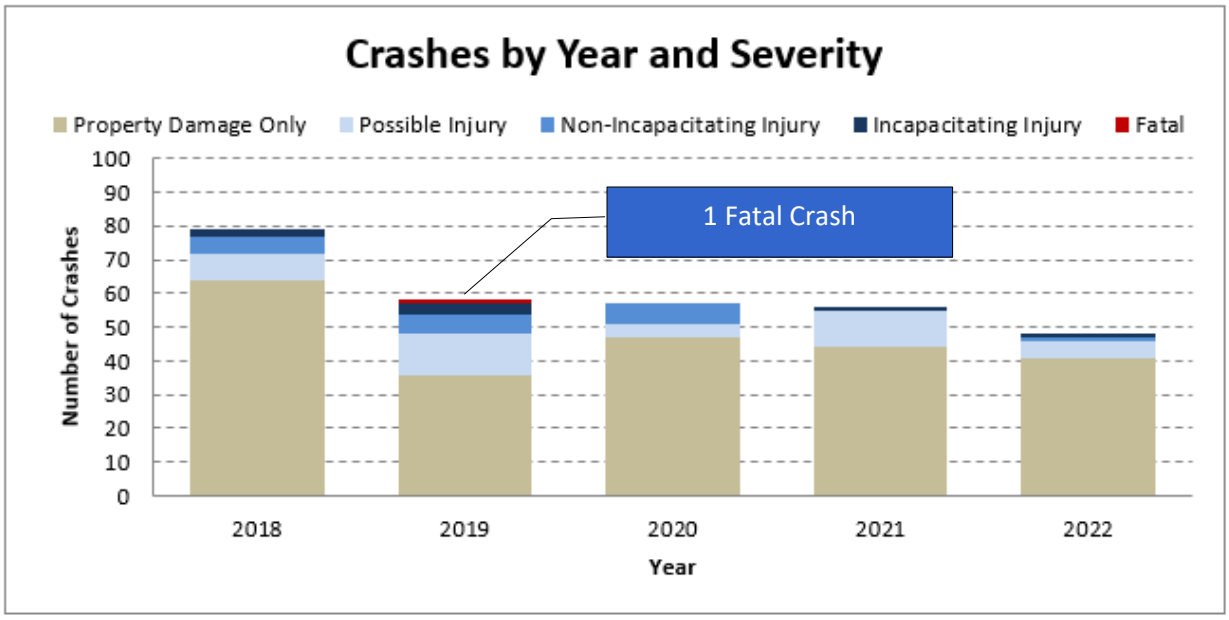


Figure 4: Crashes per Year (US 41 and Bonita Beach Road Intersection)

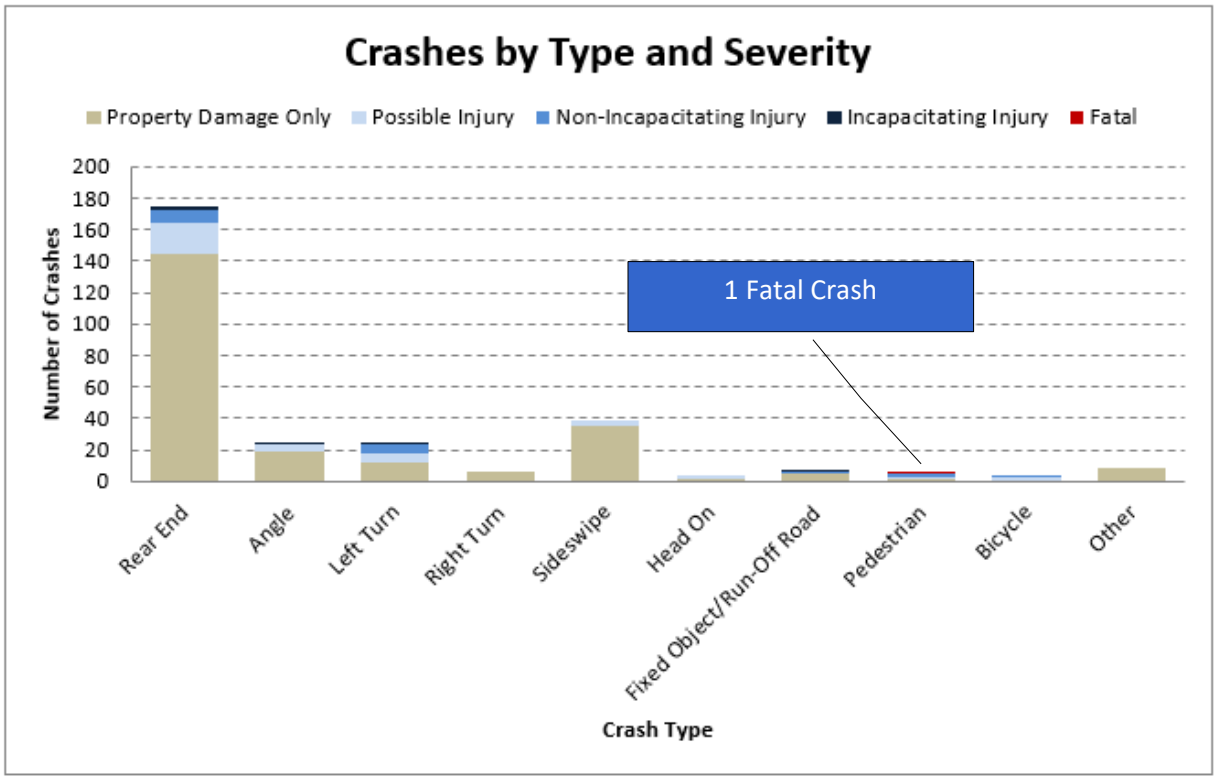


Figure 5: Crashes by Type and Severity (US 41 and Bonita Beach Road Intersection: 2018 to 2022)

A crash rate analysis was performed for the US 41 at Bonita Beach Road intersection. Note that as 2020-2022 average crash rates are not yet available, crash rate analyses were limited to 2018 and 2019 data. Based on the analysis, the study intersection experienced higher than average crash rates in both 2018 and 2019 when compared to both Statewide and Districtwide average crash rates.

US 41 and Bonita Beach Road are designated emergency evacuation routes for both the Florida Division of Emergency Management and Lee County. Providing parallel service to I-75, US 41 plays an important role in facilitating north-south traffic during incidences and emergency evacuation periods (particularly within southwest Florida). Bonita Beach Road also serves a critical role during emergency evacuation periods as it connects US 41 and I-75 (facilities of the state evacuation route network) and provides one of two connections for residents and tourists between the barrier islands/tourist destinations to the west and mainland of Lee County.

1.2.3 Modal Interrelationships

While sidewalks are present on both sides of US 41 and Bonita Beach Road, the only bicycle facilities present in the study area are 5' marked bicycle lanes along both sides of US 41. Two LeeTran bus routes (Routes 150 and 600) operate along US 41 and Bonita Beach Road. In addition to the two bus routes, LeeTran has partnered with Uber to provide ULTRA On-Demand Transit service in the Bonita Springs area. With LeeTran's ULTRA On-Demand Transit service is a deluxe mini-bus available seven days a week from 7:00 AM to 6:00 PM. ULTRA On-Demand Transit allows riders to request a ride as needed, with curb to curb service.

Due to the presence of these facilities/services and the surrounding urban environment, heavy pedestrian and bicycle traffic exists in the area (as observed during field reviews conducted for the project).

The Office of Greenways and Trails (OGT) and the Lee County Metropolitan Planning Organization (MPO) have identified trail opportunities in the vicinity of the US 41 and Bonita Beach Road study intersection. The Coastal Loop Trail is a spur loop from the Southwest Coastal Regional Trail, which is part of the larger FDOT Shared-Use Nonmotorized (SUN) Trail Program. This is a planned loop trail that begins at the Southwest Coastal Regional Trail in Bonita Springs, travels along Bonita Beach Road to the barrier islands, then travels through Fort Myers Beach and southern Fort Myers before connecting back to the Southwest Coastal Regional Trail east of US 41 in Fort Myers. Through discussions with Lee County MPO, no future funding has been dedicated for Coastal Loop Trail improvements in the vicinity of the US 41 and Bonita Beach Road intersection as per the date of this report.

1.2.4 System Linkage

US 41 serves as a critical arterial in facilitating the north-south movement of regional and local traffic (including truck traffic) as it runs parallel to I-75 along Florida's west coast. Similarly, Bonita Beach Road serves as a major east-west local roadway within Lee County, linking US 41 and I-75 and providing access (as one of two connections) between the mainland of Lee County and coastal communities/tourist destinations to the west (i.e., barrier islands and beaches).

The City of Bonita Springs performed the Network Enhancement Alignment Study, also known as the "Quadrant Plan", in May 2017. The purpose of the Quadrant Plan is to develop an expanded roadway network between

Bonita Beach Road with US 41 that improves the area's mobility, maintains a high-quality environment for the community, and minimizes impacts to the natural environment. The City is moving forward with design and construction for a northwest quadrant roadway.

1.3 Alternatives Analysis Summary

1.3.1 Prior Grade Separated Alternative

During the preliminary alternatives analysis efforts in 2020, a single point diamond interchange (SPDI) was one of two alternatives being considered (along with the PDLT). The SPDI alternative assumes the northbound and southbound through lanes on US 41 are elevated over Bonita Beach Road. Turning movements for US 41 and Bonita Beach Road occur at a single intersection underneath the US 41 overpass. To allow access to local businesses, through movements on the US 41 ramps were allowed. The US 41 overpass begins between the two access points for Springs Plaza on the south side of Bonita Beach Road and ends north of the Crown Lake Boulevard intersection to the north. Access to any minor streets along the US 41 ramps are maintained as intersections with the US 41 ramps only.

The SPDI alternative was reviewed as part of the Stage 1 Intersection Control Evaluation. During this evaluation, a new development was approved with their primary access to US 41 occurring at the Center of Bonita Springs signalized intersection via the northwest quadrant roadway. The overpass' ramps would tie-in to US 41 north of this location and convert the Center of Bonita Springs intersection into a right-in/right-out configuration. With this new development needing full access to US 41 at the Center of Bonita Springs, the SPDI alternative was removed from consideration and an enhanced at-grade traffic signal was reviewed (as discussed in the next section).

1.3.2 Intersection Alternatives

Two intersection alternatives were developed to support the US 41 at Bonita Beach Road purpose and need:

- Alternative A – Enhanced Traffic Signal (**Figure 6**)
    - Widens US 41 to eight lanes from Foley Road to the southern end of the Imperial River bridge.
    - Provides additional turn lane improvements to the existing signalized intersection.
- Alternative B – Partial Displaced Left Turn (**Figure 7**)
    - Northbound and southbound left turn movements are relocated to the outside of the opposing flow of traffic, allowing the northbound and southbound left turning movements to operate in the same signal phase as the northbound and southbound through movements.
    - Two new signalized "crossover" intersections are proposed along US 41 approximately 675' south and 460' north of Bonita Beach Road to allow left turning vehicles to cross to the other side of the opposing flow.
    - The southbound and eastbound left turn movements are proposed to have three lanes each.
    - The eastbound and westbound right turn movements are proposed to have two lanes each.

The intersection alternatives were developed using design provisions from the FDOT Design Manual (FDM). Each of the proposed intersection alternatives were applied along US 41 from Sta. 221+19 to Sta. 271+81 and along Bonita Beach Road from Sta. 254+57 to Sta. 300+33.

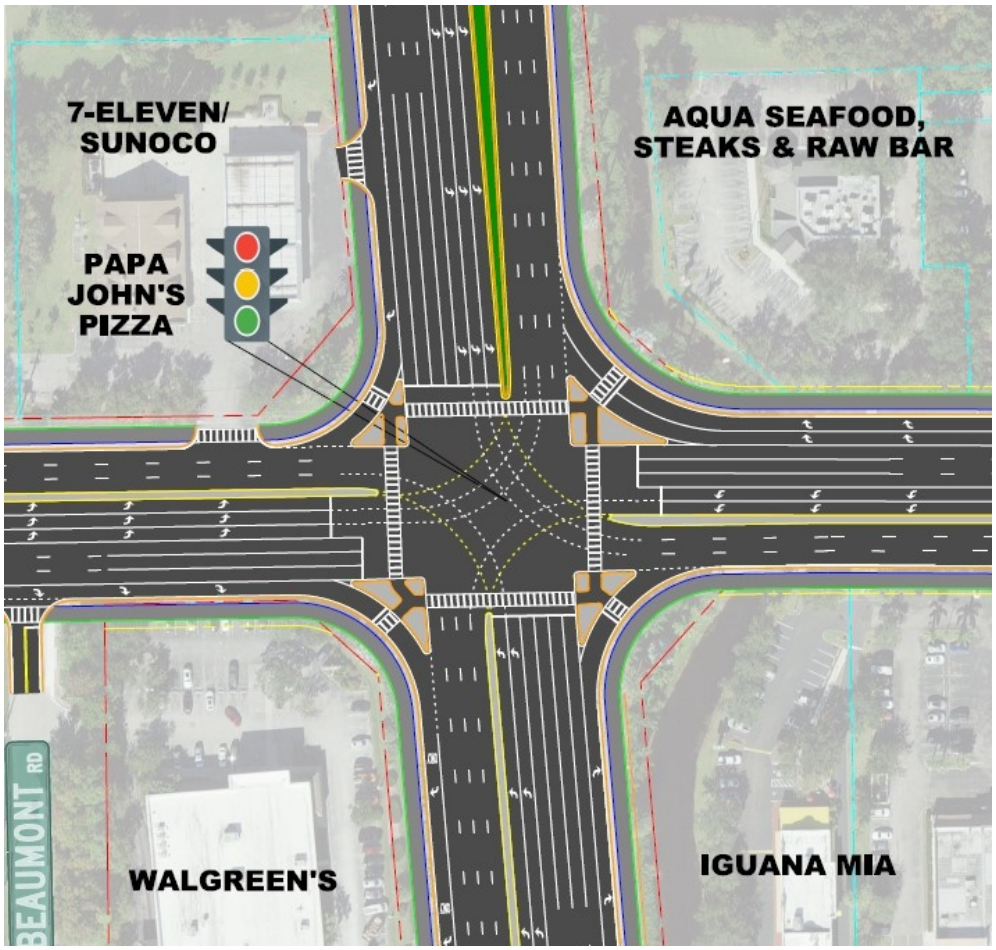


Figure 6: Alternative A – Enhanced Traffic Signal

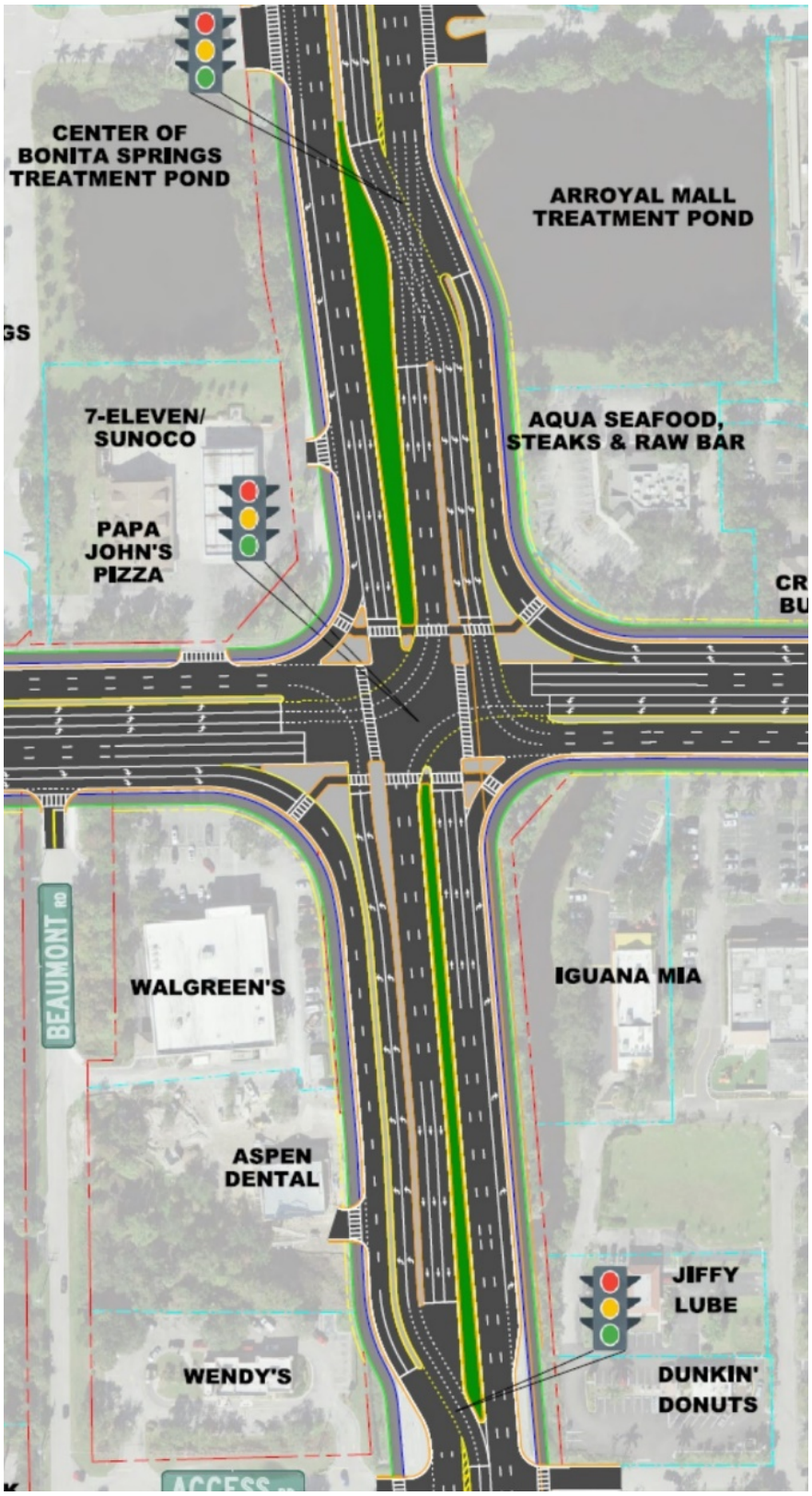


Figure 7: Alternative B – Partial Displaced Left Turn

1.3.3 Other US 41 Improvements (Outside of Main Intersection)

1.3.3.1 Alternative A – Enhanced Traffic Signal

For Alternative A, US 41 is proposed to be modified based on the following:

- Adding a fourth travel lane in each direction and reducing the lane widths to 11':
  - Additional northbound travel lane will start just north of Foley Road (Sta. 223+50) and end at the driveway for the Imperial River Boat Ramp (Sta. 270+00).
  - The additional southbound travel lane will start at Sta. 265+00 (halfway between the Imperial River Boat Ramp driveway (Sta. 270+00) and the US 41/Center of Bonita Springs intersection (Sta. 260+00)) and end at the Foley Road intersection (Sta. 222+75).
- A 12' shared-use path is proposed on both sides of US 41 in lieu of the on-street bicycle facilities:
  - In the northbound direction from Springs Plaza (Sta. 232+50) to just north of the Imperial River Boat Ramp (Sta. 271+00).
  - In the southbound direction from just north of the Imperial River Boat Ramp (Sta. 271+00) to Bonita Funeral Home (Sta. 231+00).
- A 7' on-street buffered bicycle lane is proposed on the south end of the corridor:
  - In the northbound direction from Foley Road (Sta. 222+75) to just north of Springs Plaza (Sta. 234+50).
  - In the southbound direction from Bonita Funeral Home (Sta. 231+00) to Foley Road (Sta. 222+75).
- A 6' sidewalk is proposed on the south end of the corridor:
  - In the northbound direction from Foley Road (Sta. 222+75) to Springs Plaza (Sta. 232+50).
  - In the southbound direction from Bonita Funeral Home (Sta. 231+00) to Foley Road (Sta. 222+75).

A graphic depiction of the roadway features for Alternative A is shown in **Figure 8** below.

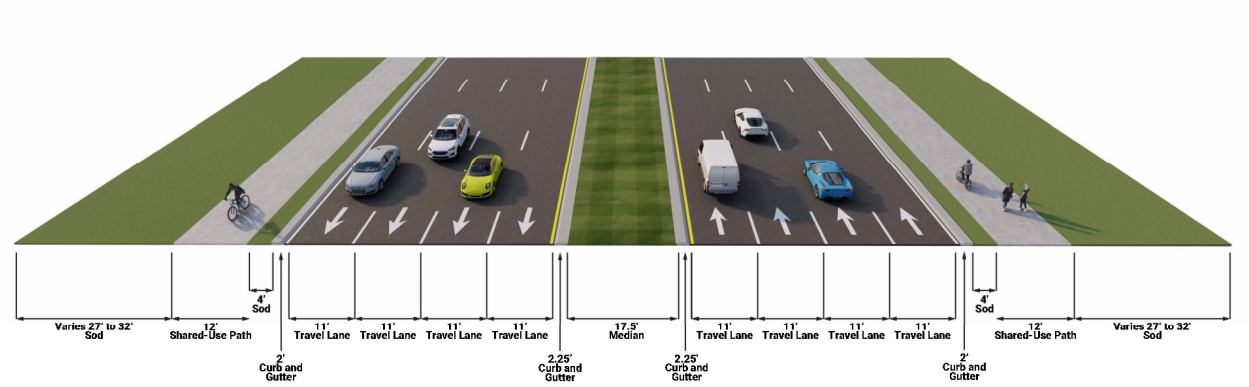


Figure 8: Alternative A US 41 Roadway Features

1.3.3.2 Alternative B – Partial Displaced Left Turn

For Alternative B, the northbound and southbound left turn movements will be relocated outside of the opposing flow of traffic. This configuration will allow the northbound and southbound left turning movements to operate in the same signal phase as the northbound and southbound through movements. To accommodate the Alternative B configuration and facilitate the relocation of northbound and southbound turning vehicles, two new signalized "crossover" intersections will be added along US 41 approximately 675' south and 460' north of Bonita Beach Road (as shown in **Figure 7**). The following features detail the improvements proposed as part of the new "crossover" intersections:

- Between Foley Road (Sta. 222+75) and southern "crossover" intersection (Sta. 239+00):
  - Three 11' northbound and southbound through lanes.
- Between southern "crossover" intersection (Sta. 239+00) and US 41 and Bonita Beach Road intersection (Sta. 246+00) (described from right side to left side across US 41 and shown in **Figure 9**):
  - Exclusive 11' northbound right turn lane.
  - Three 11' northbound and southbound through lanes.
  - Dual 11' northbound exclusive left turn lanes positioned outside of the southbound through lanes.
  - Dual 11' eastbound to southbound exclusive right turn lanes positioned outside of the northbound left turn lanes.
- Between US 41/Bonita Beach Road intersection (Sta. 246+00) and northern "crossover" intersection (Sta. 251+00) and (described from right side to left side across US 41):
  - Dual 11' westbound to northbound exclusive right turn lanes positioned outside of the southbound left turn lanes.
  - Triple 11' southbound exclusive left turn lanes positioned outside of the northbound through lanes.
  - Three 11' northbound and southbound through lanes.
  - Exclusive 11' southbound right turn lane.
- Between northern "crossover" intersection (Sta. 251+00) and US 41/Center of Bonita Springs intersection (Sta. 260+00):
  - Four 11' northbound through lanes.
  - Three 11' southbound through lanes.
- Between US 41 and Center of Bonita Springs intersection (Sta. 260+00) and the Imperial River Boat Ramp (Sta. 266+50):
  - Four 11' northbound through lanes (outside lane drops at the Imperial River Boat Ramp).
  - Three 11' southbound through lanes (a fourth "auxiliary" lane begins at Sta. 265+00 that drops into the triple southbound left turn lanes).
- A 12' shared-use path is proposed on both sides of US 41 in lieu of the on-street bicycle facilities:
  - In the northbound direction from Springs Plaza (Sta. 232+50) to just north of the Imperial River Boat Ramp (Sta. 271+00).
  - In the southbound direction from just north of the Imperial River Boat Ramp (Sta. 271+00) to just south of Access Road (Sta. 237+00).

- A 7’ on-street buffered bicycle lane is proposed on the south end of the corridor:
    - In the northbound direction from Foley Road (Sta. 222+75) to just north of Springs Plaza (Sta. 234+50).
    - In the southbound direction from just south of Access Road (Sta. 237+00) to Foley Road (Sta. 222+75).
- A 6’ sidewalk is proposed on the south end of the corridor:
    - In the northbound direction from Foley Road (Sta. 222+75) to Springs Plaza (Sta. 232+50).
    - In the southbound direction from just south of Access Road (Sta. 237+00) to Foley Road (Sta. 222+75).

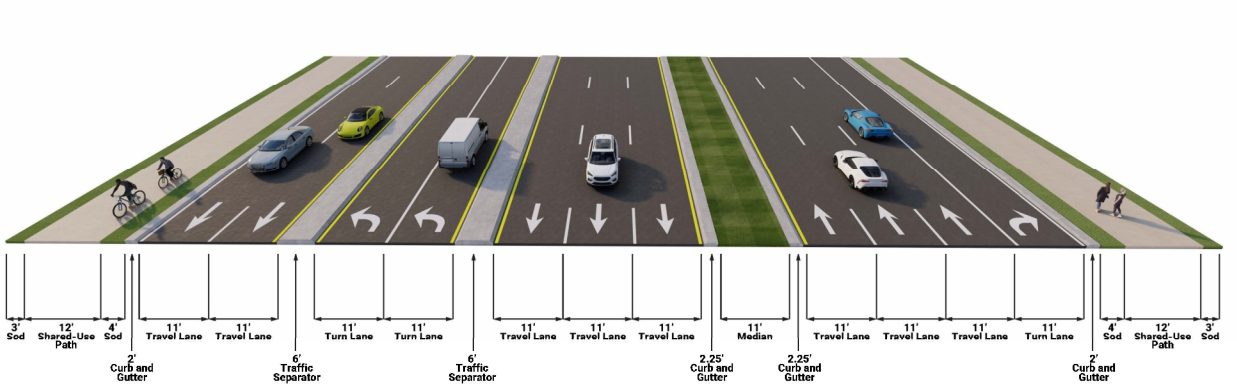


Figure 9: Alternative B US 41 Roadway Features

1.4 Description of Preferred Alternative

1.4.1 Preferred Intersection Control Alternative

The purpose of this project is to address the deficient operational capacity of the US 41 and Bonita Beach Road intersection to relieve existing congestion and accommodate projected future traffic demand. The project's secondary goals are to 1) Enhance regional and local mobility; 2) Enhance safety conditions; and 3) Improve multi-modal access.

Alternatives A (Enhanced Traffic Signal) and B (PDLT) were presented at the Alternatives Public Workshop conducted virtually on Monday April 3 and in-person on Tuesday April 4, 2023. Following the workshop, feedback was gathered from members of the public for both alternatives. The majority of public comments received expressing support for Alternative B, PDLT. Alternative B was favored as it does not add through lanes along US 41, was viewed as being more operationally efficient, and provided better pedestrian and bicyclist safety. These alternatives were also presented to the Lee County MPO on June 16, 2023 and the public support for the PDLT alternative was documented with the MPO Board.

Discussions were held with FDOT District 1 after the Alternatives Public Workshop and it was determined Alternative B – PDLT best aligns with the purpose and need of the project and was selected as the preferred alternative. The following bullets summarize how the PDLT recommendation meets the primary and secondary purpose and need goals noted above:

- Transportation Demand/Capacity
    - In the 2050 future build condition, the average network delay for vehicles traveling through the PDLT is approximately 50 percent less than the No-Build Alternative.
    - The number of vehicles served by the PDLT in 2050 is approximately 20 percent higher than the No-Build Alternative.
    - The PDLT is anticipated to improve average vehicle delay by over 45 seconds in both the 2050 mid-day and PM peak hours when compared to the No-Build Alternative.
- Safety
    - Using the predictive safety analysis methods provided in the FDOT Safety Performance for Intersection Control Evaluation (SPICE) Tool, the PDLT intersection is predicted to decrease total and fatal/injury crashes by over 10 percent vs the No-Build Alternative over the 20 year life cycle from 2030 to 2050.
    - Increase the volume of residents and tourists from coastal communities that can be evacuated during an emergency event by improving intersection operations of two major evacuation routes.
    - Enhance access to facilities of the state evacuation route network.
    - Improve response times (due to enhanced access) to emergency events and incidences.
- Modal Interrelationships
    - Sidewalks in the study area are proposed to be widened to 12' shared-use paths along both sides of US 41 and Bonita Beach Road.

  - These shared-use paths will improve pedestrian/bicycle access and circulation by modifying/limiting opportunities for conflicts between automobiles and pedestrians/bicyclists.
  - The 12' shared-use path improvements proposed as part of the PDLT would help further enhance the future vision of the Coastal Loop Trail in the study area.
  - Additional median and concrete traffic separators are included in the PDLT concept to provide pedestrian refuge areas and better facilitate non-motorist crossings.
  - The PDLT will also enhance the performance and reliability of transit service operating along US 41 and Bonita Beach Road by reducing delays at the intersection.
- System Linkage
  - Improve the viability of US 41 as a regional alternative facility to I-75 by reducing travel delay.
  - Enhance east-west access between two primary north-south transportation corridors (US 41 and I-75) as well as between the mainland of Lee County and coastal communities/tourist destinations to the west.
  - Enhance freight mobility and access within the area as US 41 is designated as regional freight mobility corridor (Tier 1 Regional Freight Corridor) in the Lee County 2045 Long Range Transportation Plan.
  - The proposed PDLT improvements will support local system linkage planning efforts by providing a Northeast Quadrant Roadway connecting US 41 to Arroyal Road.

1.4.2 Preferred Alternative Features

The following highlights the key improvement elements within the US 41 at Bonita Beach Road intersection area for Alternative B:

1.4.2.1 US 41

The proposed roadway/intersection improvements discussed in **Section 1.3.1** and **1.3.3.2** were brought forward as part of the preferred alternative design. Outside of the main US 41 and Bonita Beach Road intersection and "crossover" locations, additional intersection improvements are included as part of the preferred alternative:

- Signalization and turn lane improvements at the intersection of US 41 and Foley Road (Sta. 222+75).
- Modified "thru-cut" signalized intersection at US 41 and Center of Bonita Springs (Sta. 260+00) as shown in **Figure 10**:
  - A thru-cut intersection restricts through movements from the minor street typically due to operational and/or geometric conditions. In this case, the west leg is being widened from two lanes to five lanes (four eastbound approach lanes and one westbound receiving lane) and the east leg is being widened from two lanes to four lanes (two westbound approach lanes and two eastbound receiving lanes).
  - Dual southbound left turn lanes are also proposed in the new thru-cut configuration.

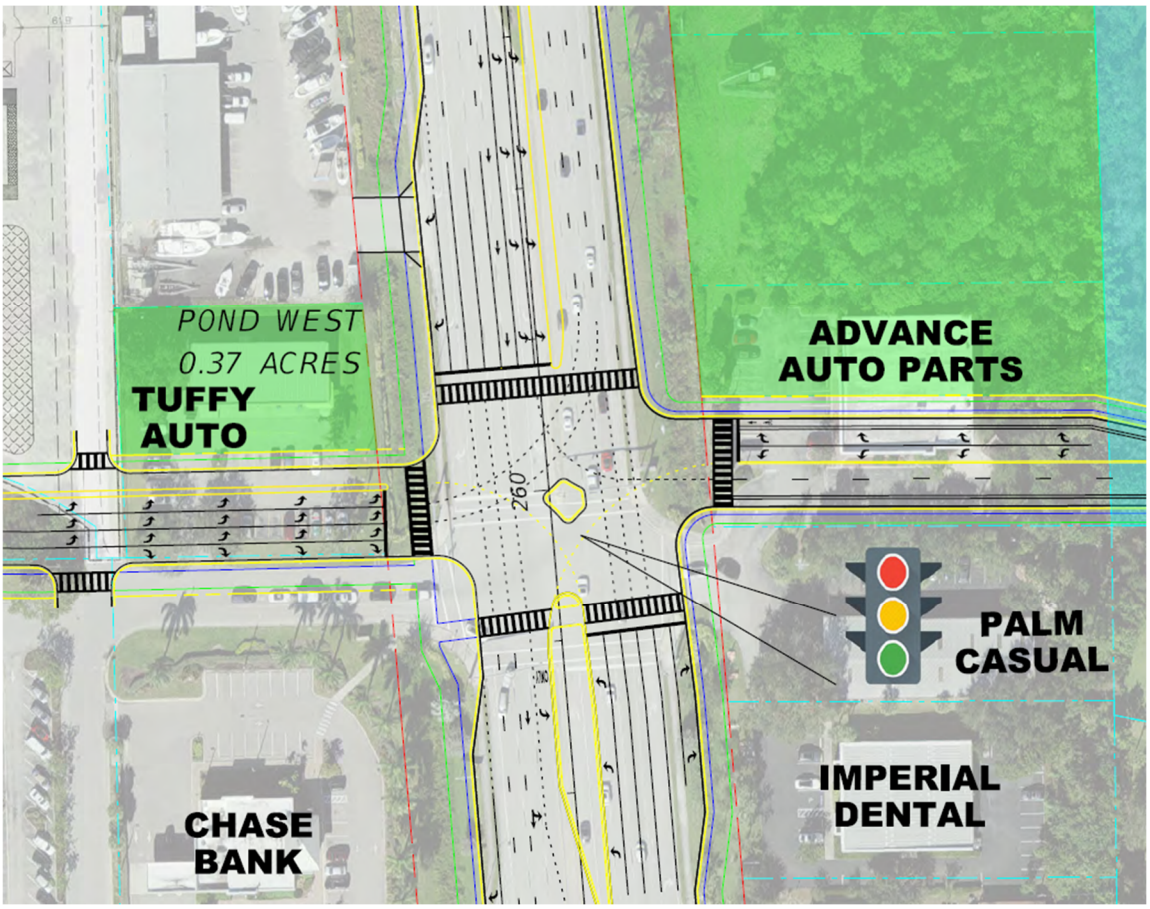


Figure 10: US 41/Center of Bonita Springs "Thru-Cut" Intersection

1.4.2.2 Bonita Beach Road

The following roadway improvements are proposed along Bonita Beach Road as part of the preferred alternative:

- Three 11' travel lanes in each direction from the Center of Bonita Springs (Sta. 266+50) to Arroyal Road (Sta. 286+25). The third eastbound through lane drops at the Spanish Wells Boulevard signal.
- Widening the sidewalk to be a 12' shared-use path on both sides from the Center of Bonita Springs (Sta. 266+50) to Arroyal Road (Sta. 286+25).

At intersections along Bonita Beach Road, the following features are included are part of the preferred alternative:

- Bonita Beach Road at Center of Bonita Springs (Sta. 266+50):
  - Develop a third 11' eastbound travel lane departing intersection.
- Bonita Beach Road at Arroyal Road (Sta. 286+25):
  - One additional 11' eastbound through lane (will be a shared through/right configuration).
  - Develop a third 11' westbound travel lane departing intersection.

- The southbound approach will be modified to include two southbound left turn lanes and one southbound shared through/right turn lane.

1.4.2.3 Quadrant Roadway System

A new Northwest Quadrant Roadway from Bonita Beach Road at Windsor Road (Bonita Beach Road Sta. 260+00) to US 41 at the Center of Bonita Springs (US 41 Sta. 260+00) will be constructed by the City of Bonita Springs before the preferred alternative is planned to be constructed at the US 41 and Bonita Beach Road intersection. The following features describe the Northwest Quadrant Roadway improvements as shown in **Figure 11**:

- Intersection of Bonita Beach Road and Windsor Road (Bonita Beach Road Sta. 260+00):
  - An eastbound displaced left turn to the Northwest Quadrant Roadway with a new crossover intersection just west of Windsor Road.
  - The southbound approach from Windsor Road will be widened to two lanes.
  - An exclusive westbound right turn lane will be added.
- Along Windsor Road:
  - Two southbound lanes and one northbound lane.
  - 6’ sidewalk on the west side and 12’ shared-use path on the east side of the roadway.
- Along New Roadway between Windsor Road and the Northwest Corner of the Center of Bonita Springs Shopping Plaza:
  - One 11’ travel lane in each direction.
  - 4’ paved shoulders in each direction.
  - 6’ sidewalk on the west side and 12’ shared-use path on the east side of the roadway.

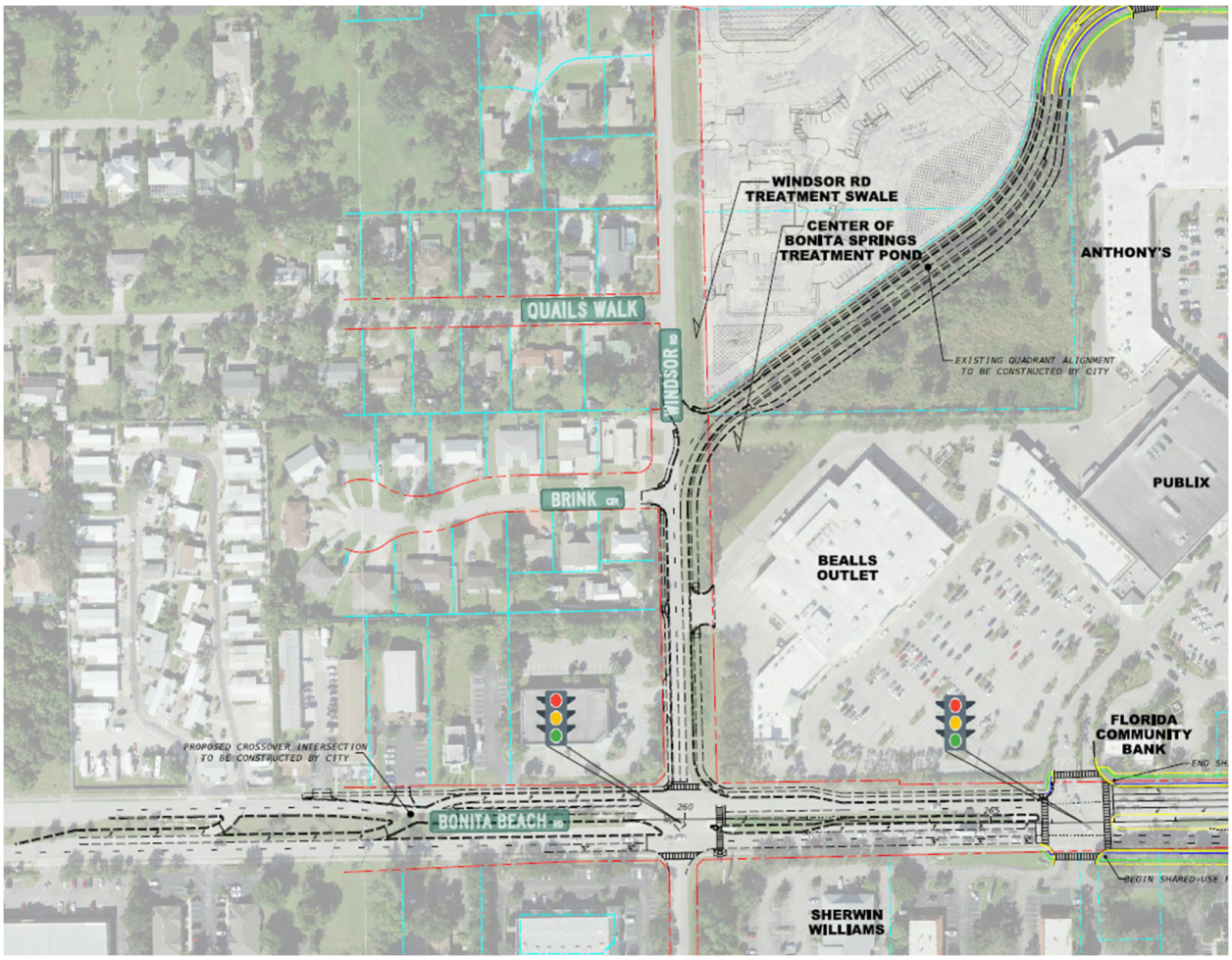


Figure 11: Northwest Quadrant Roadway – Proposed City Alignment

The design concept for the City's Northwest Quadrant Roadway ties in at the existing US 41/Center of Bonita Springs intersection and is not making any improvements to this intersection. In the future condition, this intersection will not have enough capacity to accommodate the forecasted traffic demand, necessitating additional turn lane improvements on the intersection's west leg. As part of the preferred alternative, the Northwest Quadrant Roadway is being modified from the northwest corner of the Center of Bonita Springs Shopping Plaza to US 41. These changes are described below and shown in **Figure 12**:

- Northwest Corner of the Center of Bonita Springs Shopping Plaza to US 41:
  - Roadway is widened to develop a center median with varying width.
  - One 11' travel lane in each direction.
  - 6' sidewalks on each side of the roadway.
  - 7' buffered bicycle lanes in each direction.
  - New 11' westbound left turn lane into Center of Bonita Springs behind the Old Time Pottery building.
- West Leg at US 41 Intersection:

- One 11’ eastbound right turn lane.
- Three 11’ eastbound left turn lanes.
- One 11’ westbound receiving lane.

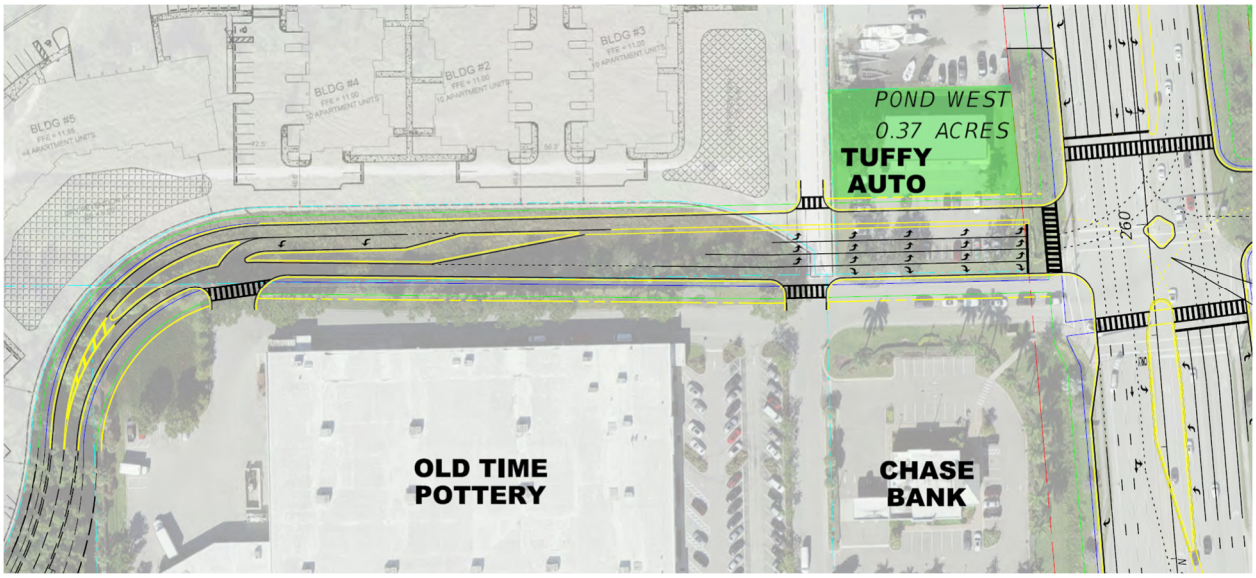


Figure 12: Northwest Quadrant Roadway – West Leg at US 41

Tying into the east leg of this intersection is a Northeast Quadrant Roadway proposed between US 41 and Arroyal Road, intersecting at Arroyal Road and Carolina Street. This will be a new three-lane roadway with two lanes eastbound and one lane westbound, as shown in **Figure 13**. The lane configuration at the US 41 intersection is discussed below:

- One 11’ westbound left turn lane.
- One 11’ westbound right turn lane.
- Two 11’ eastbound receiving lanes.

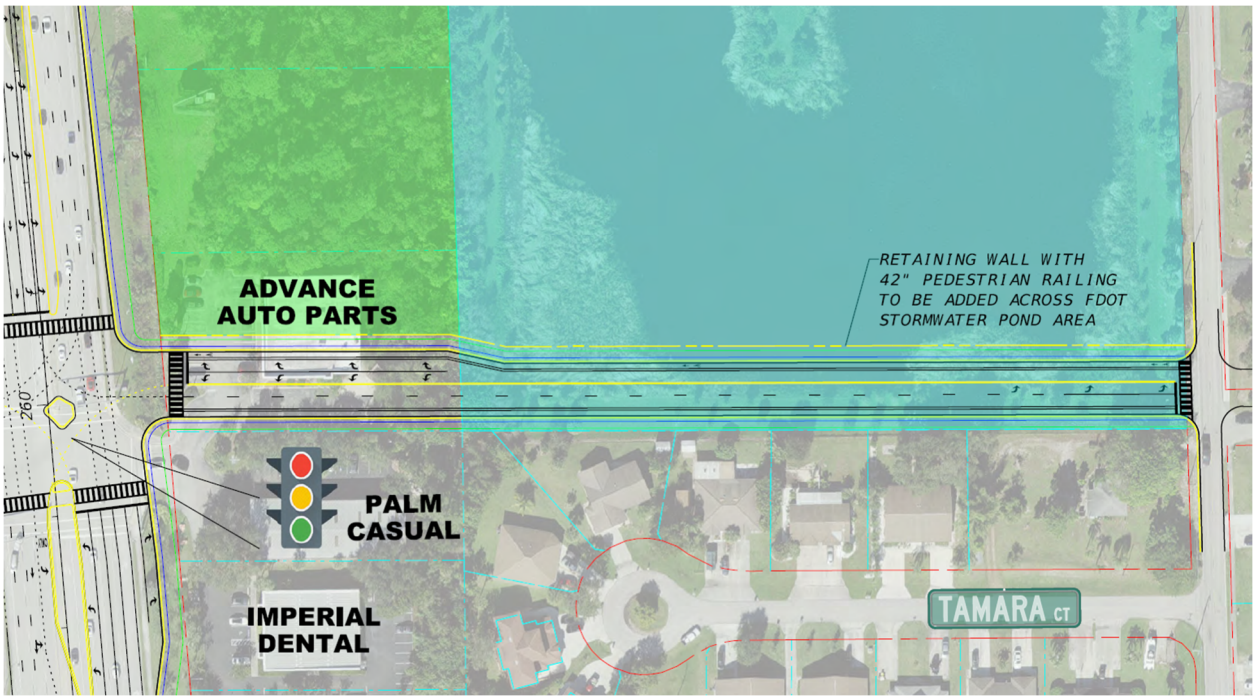


Figure 13: Northeast Quadrant Roadway – East Leg at US 41

2.0 Data Collection

The design team collected and reviewed data from the following sources:

- FDOT Drainage Manual, January 2024
- FDOT Drainage Design Guide, January 2024
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel Nos. 12071C0658G, Effective Date 11/17/2022, in Lee County, Florida.
- United States Geological Survey (USGS) Quadrangle Maps
- United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soils Survey of Lee County, Florida, 1984
- Field Reconnaissance (April 2019)
- Existing Permit Databases (SFWMD)
- 1-ft LIDAR Data Source: Lee County, 2007

3.0 Existing Drainage Conditions

3.1 Topography & Hydrologic Features

Topography throughout the project is relatively flat with a very gradual downhill slope from the study limit's southern end to the north. Roadway elevations begin at 13.0 feet and decrease to 12.0 feet. All elevations mentioned in this report are in reference to the North American Vertical Datum of 1988 (NAVD) unless otherwise stated. Where information was available only in the National Geodetic Vertical Datum of 1929 (NGVD), it was converted to NAVD using the conversion NAVD = NGVD – 1.38 feet. Please refer to the **USGS Quadrangle Map**, **Figure 2** in **Appendix A**. The study is just south of the Imperial River, Waterbody ID (WBID) 3258EB – Imperial River (Marine Segment), which is an Outstanding Florida Water (OFW) and the project's ultimate outfall. There is a Total Maximum Daily Load (TMDL) for Dissolved Oxygen (DO) and Total Nitrogen (TN) for the Imperial River.

There are three existing drainage crossings within the study limits. There is a double 8' x 4' concrete box culvert (CBC) underneath US 41 south of the US 41 and Bonita Beach Road intersection which conveys a large drainage ditch from US 41's west side to the ditch along US 41's east side. There is a single 10' x 7' CBC underneath Bonita Beach Road east of the US 41 and Bonita Beach Road intersection conveying the ditch north to the Arroyal Mall Pond. There is a 24" outfall pipe crossing underneath US 41 from the Center of Bonita Springs treatment pond into the Arroyal Mall Pond. An additional crossing will be necessary underneath the proposed Northeast Quadrant Roadway to maintain conveyance of the outfall ditch from the Arroyal Mall Pond to the Imperial River.

Initial coordination with the City of Bonita Springs indicated a flooding concern at the homes and road systems west of Beaumont Road and upstream of the double 8' x 4' CBC under US 41. Preliminary calculations, discussed in section **Section 4.1,** indicate that the concrete box culvert extension will not adversely impact the stages within the ditch upstream. It is anticipated that the flooding issues are due to issues outside of the study limits, which will need to be verified during final design.

3.2 Soils Data and Geotechnical Investigations

The soil survey of Lee County, Florida (dated 1984) published by the USDA NRCS has been reviewed within the project vicinity. USDA Soil Survey Geographic database (SSURGO) data was also obtained from NRCS to create a project limits' soils map using GIS ArcMap. The project vicinity soil survey map is illustrated in **Figure 3** of **Appendix A**.

Table 3-1: USDA NRCS Soil Survey Information for Lee County

Soil No.	USDA Soil Name	Seasonal High Ground Water		HSG	Soil Classification		
		Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
36	Immokalee Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.5-1.5	Jun-Nov	B/D	0-9 9-36 36-55 55-80	SP-SM SP, SP-SM SP-SM, SM SM, SP-SM	A-2-4, A-3 A-2-4, A-3 A-3, A-2-4 A-3, A-2-4
106	Daytona Sand-Urban Land Complex, 0 to 5 Percent Slopes	3.5-5.0	Jun-Oct	A	0-5 5-36 36-47 47-80	SP-SM, SP SP, SP-SM SP-SM, SM SP, SP-SM	A-3, A-2-4 A-3 A-2-4, A-3 A-3, A-2-4

Soil No.	USDA Soil Name	Seasonal High Ground Water		HSG	Soil Classification		
		Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
123	Myakka Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.5-1.5	Jun-Nov	A/D	0-6 6-20 20-36 36-80	SP-SM, SM SP-SM, SM SP-SM, SM SP-SM, SM	A-3, A-2-4 A-3, A-2-4 A-2-4, A-3 A-3, A-2-4
124	Myakka Fine Sand-Urban Land Complex, 0 to 1 Percent Slopes	0.0	Jul-Oct	A/D	0-5 5-25 25-39 39-80	SM, SP-SM SP-SM, SM SM SM, SP-SM	A-2-4. A-3 A-3, A-2-4 A-2-4 A-3, A-2-4
131	Pompano Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.3-1.5	Jul-Oct	A/D	0-4 4-80	SP-SM, SM SM, SP-SM	A-2-4, A-3 A-3, A-2-4
134	Satellite Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	1.5-3.5	Jun-Nov	A	0-3 3-65 65-80	SP-SM, SM SP-SM, SM SM, SP-SM	A-2-4, A-3 A-3, A-2-4 A-2-4, A-3
136	Valkaria Fine Sand-Urban Land Complex, 0 to 2 Percent Slopes	0.3-1.5	Jul-Oct	A/D	0-5 5-16 16-51 51-80	SM, SP-SM SM, SP-SM SM, SP-SM SM, SP-SM	A-3, A-2-4 A-3, A-2-4 A-3, A-2-4 A-3, A-2-4
145	Gator Muck, Ponded-Urban Land Complex, 0 to 1 Percent Slopes	0.0	Jun-Dec	C/D	0-18 18-36 36-55 55-80	PT CL, SC, SM SC, SC-SM, SM SP-SM, SM	A-8 A-4, A-7-6, A-6 A-4, A-2-4, A-6 A-2-4, A-3

*Seasonal High Ground Water Table: Depth is referenced below existing grade, except where indicated as "+".

The soils encountered along the project limits are mostly Hydrologic Soil Group (HSG) A/D, B/D, and C/D. Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission. Group B soils have moderate infiltration rate when thoroughly wet and consist chiefly of moderately deep or deep, moderately well drained, or well drained soils that have moderately fine texture to moderately coarse texture. Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission. If a soil is assigned to a dual HSG, the first letter is for drained areas and the second is for un-drained areas. Soils are only assigned a dual class if they are group D in their natural condition. According to the Soil Survey, there are 7 different soil types located along the project limits within Lee County. **Table 3-1: USDA NRCS Soil Survey Information for Lee County** summarizes and lists the soil types and relevant information. The ground water depth varies from 0' to 5' along the project per the NRCS Soil Survey information.

3.3 Floodplains/Floodways

The Federal Emergency Management Agency (FEMA) flood insurance rate map (FIRM) for Lee County (Map No. 12071C0658G) dated November 17th, 2022 indicates that portions of the study area are within Zone AE floodplains (Flood El. 10.0 feet NAVD). The floodplain area within the study limits is tidally influenced and will not require compensation for impacts anticipated from the proposed study per coordination with SFWMD. The Imperial River is considered a regulatory FEMA floodway; however, the proposed improvements considered for this study will not impact the roadway or bridge at the river.

4.0 Proposed Drainage Conditions

The project limits' stormwater runoff will be collected and conveyed via curb and gutter to the recommended pond alternative for each basin. The various pond alternatives consist of dry retention ponds, wet detention ponds, and dry linear swales. Additional information regarding the proposed stormwater management is included in the Pond Siting Report, under a separate cover.

4.1 Cross Drain Analysis

There are three existing cross drains within the study limits that will need to be extended to accommodate the proposed improvements to the US 41 and Bonita Beach Road intersection. There is a double 8' x 4' concrete box culvert underneath US 41, located south of the intersection, and a 10' x 7' concrete box culvert underneath Bonita Beach Road, located east of the intersection. Additionally, there is a 24" crossing underneath US 41 acting as the pond outfall from the Center of Bonita Springs Treatment Pond into the Arroyal Mall Pond, which will need to be extended to accommodate the turn lane. The two cross drains accommodate the ditch system, which conveys runoff from offsite areas to the Arroyal Mall Pond. Preliminary cross drain analysis have been performed in HY-8 using available permit information. The proposed extensions, including the enclosure of the large ditch north of Bonita Beach Road found minimal impacts to the ditch's upstream stages. Please see **Appendix C – Cross Drain Analysis and Floodplain Impact Calculations** for the cross-drain analysis. During design, existing cross drains will be required to be video inspected to determine their condition and if they are eligible for extension or will need to be replaced.

The proposed Northeast Quadrant Roadway bisects the existing Arroyal Mall Pond outfall ditch. A cross drain underneath the proposed roadway will be required to maintain the outfall conveyance system. Review of the existing permit information and field review determined the outfall ditch to be approximately 10' wide and 4' deep with 1:1 side slopes. To maintain the capacity of the swale the proposed cross drain has conservatively been sized to be a 10' x 4' concrete box culvert.

4.2 Floodplain Compensation

According to the Lee County FIS, the Imperial River within the study limits is under tidal influence. Per coordination with SFWMD, floodplain compensation is not required for floodplain impacts within tidal limits. However, compensation volume will be available and can be provided within the expanded FDOT stormwater pond as it will be hydraulically connected to the 100-year floodplain. Compensation is provided between the normal water elevation and the 100-year floodplain elevation. The expanded Pond North provides 8.96 ac-ft of compensation volume. Please see **Appendix B – Basin Maps** for a graphic of the pond's proposed expansion.

4.3 Longitudinal And Transverse Floodplain Impacts

The 100-year floodplain impacts can be categorized as transverse impacts – impacts resulting from filling the floodplain areas within the project limits to construct the quadrant roadways, including floodplains associated with wetland systems and depressional areas.

The transverse impacts cannot be avoided since the proposed roadway locations lie within the floodplain extent. The floodplain impact area was quantified based on the FEMA FIRMs and established 100-year base flood elevation, and the existing ground elevations were established from 1-foot LiDAR contours. The SHW elevations

were estimated using permit data and NRCS soils data. To be conservative, it was assumed that any fill from the proposed improvements would extend higher than the base flood elevation.

According to the FEMA FIRMs, portions of the Northwest Quadrant Roadway and Northeast Quadrant Roadway proposed as part of the intersection improvements lie within Zone AE of the 100-year floodplain. The floodplain's BFE within the study limits ranges from elevation 9.00 NAVD to elevation 10.00 NAVD upstream and downstream of the Imperial River bridge. Study area volumetric floodplain impacts were computed by estimating the volume to be filled between the higher of either the SHW table or existing ground elevation and the 100-year flood elevation. This was done by measuring the existing ground area that lies at a contour elevation (using data obtained from LiDAR) and multiplying by the height differential to the 100-year flood elevation. The site's Seasonal High Water (SHW) table elevation was estimated at elevation ranges from elevation 3.60 feet NAVD to 4.00 feet using SHW information taken from available permit information. The study was determined to have 8.20 ac-ft of floodplain impacts.

4.4 Project Classification

The encroachment areas for this site is classified as "minimal." Minimal encroachments on a floodplain occur when there is a floodplain involvement but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Normally, these minimal efforts to address the impacts will consist of applying the Department's drainage design standards and following the Water Management District's procedures to achieve results that will not increase or significantly change the flood elevations and/or limits.

4.5 Risk Evaluation

There is no change in flood "risk" associated with this project. The encroachments will not have a significant potential for interruption or termination of transportation facilities needed for emergency vehicles or used as an evacuation route. In addition, no significant adverse impacts on natural and beneficial floodplain values are anticipated and no significant impacts to highway users are expected.

4.6 PD&E Manual Requirements With Minimal Encroachment

Chapter 13 Floodplains of the FDOT's PD&E Manual, Part 2, defines four categories of encroachments as they pertain to base floodplain involvement: significant, minimal, none, and no involvement; and also lists the report criteria corresponding to these encroachment categories. The FDOT has different requirements based on the category of encroachment. The proposed project was determined to have minimal encroachments and, as a result, the requirements for this category are listed as follows:

General description of the project, including location, length, existing and proposed typical sections, drainage basins, and cross drains.

Refer to Section 1 of this report for general project information and Sections 3 and 4 of this report for existing and proposed drainage basin descriptions. There is an existing cross drain under US 41 and Bonita Beach Road, a double 8' x 4' concrete box culvert, and an existing cross drain underneath Bonita Beach Road, a 10' x 7' concrete box culvert. These cross drains will require extensions due to the proposed improvements to the intersection of

the US 41 and Bonita Beach Road. There is an existing 24" crossing underneath US 41, acting as the pond outfall from the Center of Bonita Springs treatment pond into the Arroyal Mall Pond. The outfall pipe will need to be extended to accommodate the turn lane improvements and widening at the US 41 and Bonita Beach Road intersection. An additional proposed crossing will be required underneath the Northeast Quadrant Roadway to maintain the outfall conveyance from the Arroyal Mall Pond. To match the existing ditch's capacity the proposed culvert has been sized to be 10' x 4'.

Determination of whether the proposed action is in the base floodplain.

The US 41 and Bonita Beach Road intersection study's quadrant roadways will encroach on the Zone AE 100-year floodplain as established by the most recent FEMA maps dated 11/17/2022.

The history of flooding of the existing facilities and/or measures to minimize any impacts due to the proposed project improvements.

The floodplains within the study limits are associated with the Imperial River, which is under tidal influence at the project location. Floodplains within tidal influence do not require cup for cup compensation. However, the proposed expansion to the existing FDOT Pond North is located within the floodplain limits and will provide floodplain compensation, mitigating the study area's storage loss.

Initial coordination with the City of Bonita Springs indicated a flooding concern at the homes and road systems west of Beaumont Road and upstream of the double 8' x 4' CBC under US 41. Preliminary calculations show that the Concrete Box Culvert extension underneath US 41 will not adversely impact the stages within the ditch upstream and it is anticipated that the flooding issues are due to issues outside of the study limits, but will need to be verified during the final design.

Determination of whether the encroachment is longitudinal or transverse, and if it is a longitudinal encroachment an evaluation and discussion of practicable avoidance alternatives.

The project's transverse floodplain impacts occur due to filling floodplain areas to construct the Northwest Quadrant Roadway and Northeast Quadrant Roadway for the US 41 and Bonita Beach Road intersection improvements. Impacts will be minimized by utilizing the maximum allowable embankment slopes during construction. The proposed site location is constrained to occupy land within the floodplain. There are no economically feasible avoidance alternatives.

The practicability of avoidance alternatives and/or measures to minimize impacts.

The project will take every effort to minimize floodplain impacts resulting from constructing the proposed project's fill. The maximum allowable embankment slope will be used within the floodplain area to minimize the floodplain impacts.

Impact of the project on emergency services and evacuation.

The cross drains within the project limits will perform hydraulically in a manner equal to or greater than the existing condition, and backwater elevations are not expected to increase. As a result, there will be no significant

change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or in emergency evacuation routes.

Impacts of the project on the base flood, likelihood of flood risk, overtopping, location of overtopping, backwater.

The cross drains within the project limits will perform hydraulically in a manner equal to or greater than the existing condition. As a result, there will be no significant change in flood risk or overtopping. Due to the proximity to the Gulf of Mexico, the floodplain is tidally influenced.

Determination of the impact of the proposed improvements on regulatory floodways, if any, and documentation of coordination with FEMA and local agencies to determine the project's consistency with the regulatory floodway.

The Imperial River is a regulatory floodway; however, the proposed improvements will be outside of the floodway limits.

The impacts on natural and beneficial floodplain values, and measures to restore and preserve these values (this information may also be addressed as part of the wetland impact evaluation and recommendations).

The proposed project will not have adverse impacts to floodplain areas as the study area's floodplain is tidal.

Consistency of the project with the local floodplain development plan or the land use elements in the Comprehensive Plan, and the potential impacts of encouraging development within the 100-year base floodplain.

The project will remain consistent with local floodplain development plans. The project will not support base floodplain development that is incompatible with existing floodplain management programs.

Measures to minimize floodplain impacts associated with the project, and measures to restore and preserve the natural and beneficial floodplain values impacted by the project.

The project will take every effort to minimize floodplain impacts resulting from constructing the proposed project's fill. The maximum allowable embankment slope will be used within the floodplain area to minimize the floodplain impacts.

A map showing project, location and impacted floodplains. Copies of applicable maps should be included in the appendix.

Please see Appendix A for project figures and maps.

Results of any and all project risk assessments performed.

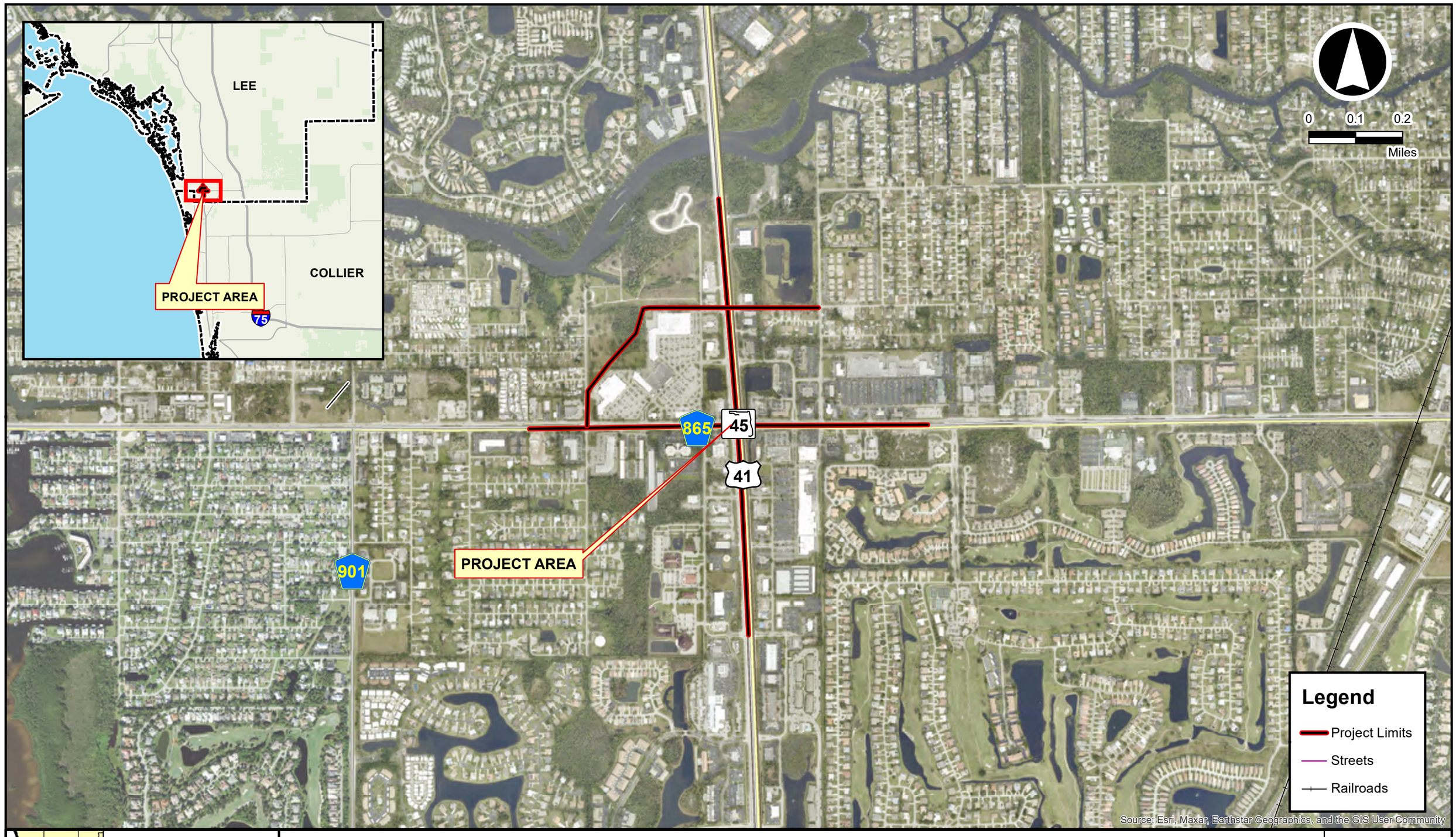
The cross drains within the study limits will perform hydraulically in a manner equal to or greater than the existing condition. As a result, there will be no significant change in flood risk.

5.0 Conclusions and Recommendations

The project will result in an insignificant change in the capacity to carry floodwater. This change will cause minimal increases in flood heights and flood limits. The proposed structures should be hydraulically equivalent to or greater than the existing structures, and backwater surface elevations are not expected to increase. As a result, the project will not affect existing flood heights or floodplain limits. This project will not result in any new or increased adverse environmental impacts. There will be no significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that these encroachments are not significant.

APPENDIX A

Exhibits



FDOT

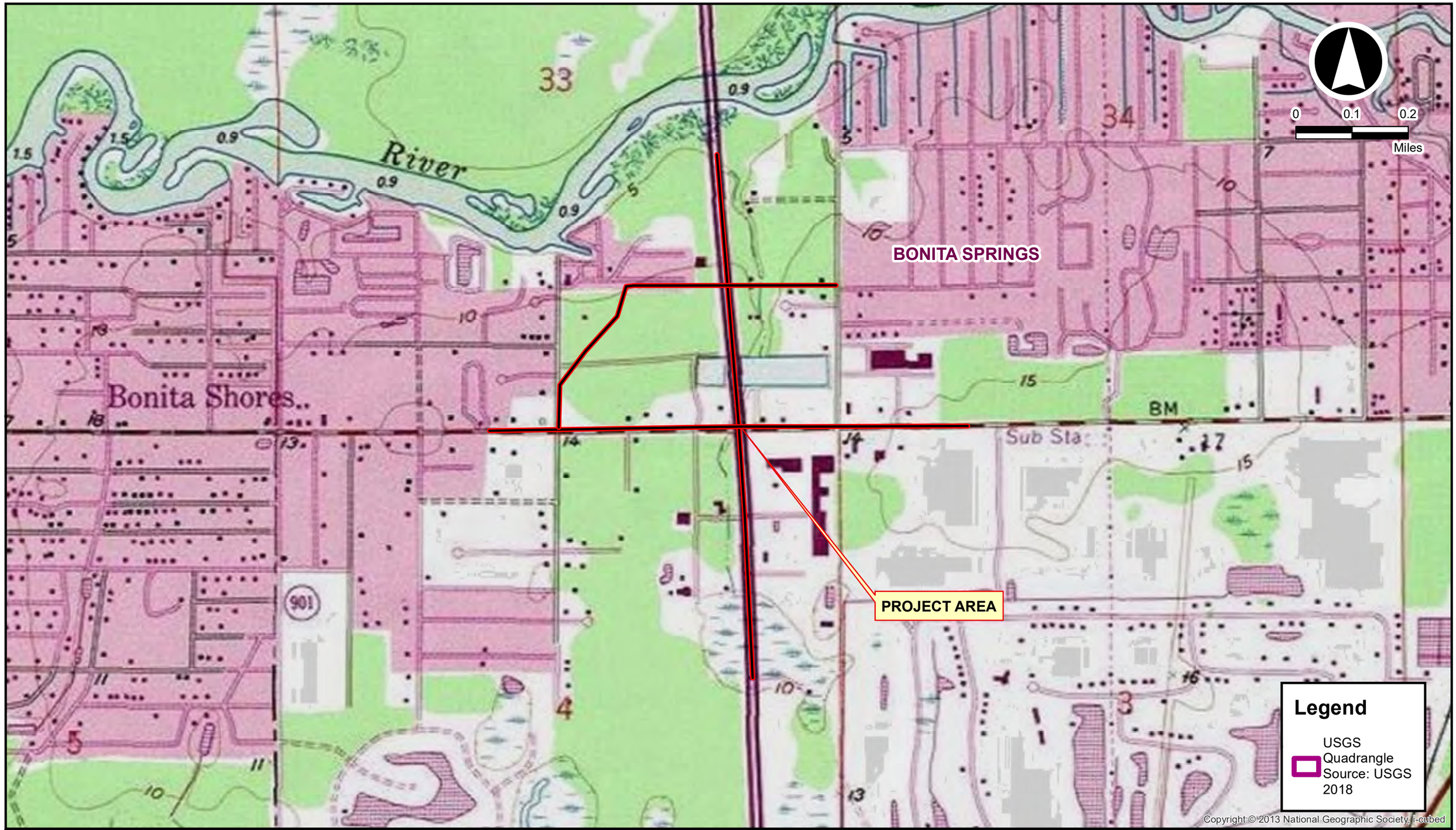
US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

PROJECT LOCATION MAP

Figure 1



FDOT

US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

USGS QUADRANGLE MAP

Figure

2

Lee County Soil Descriptions

10: POMPANO FINE SAND, 0 TO 2 PERCENT SLOPES

24: KESSON FINE SAND, TIDAL, 0 TO 1 PERCENT SLOPES

36: IMMOKALEE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

53: MYAKKA FINE SAND, FREQUENTLY PONDED, 0 TO 1 PERCENT SLOPES

59: URBAN LAND, 0 TO 2 PERCENT SLOPES

99: WATER

100: WATERS OF THE GULF OF MEXICO

106: DAYTONA SAND-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES

123: MYAKKA FINE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

124: MYAKKA FINE SAND, PONDED-URBAN LAND COMPLEX, 0 TO 1 PERCENT SLOPES

131: POMPANO FINE SAND-URBAN LAND COMPEX, 0 TO 2 PERCENT SLOPES

134: SATELLITE FINE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

136: VALKARIA FINE SAND-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

138: WABASSO SAND, LIMESTONE SUBSTRATUM-URBAN LAND COMPLEX, 0 TO 2 PERCENT SLOPES

145: GATOR MUCK, PONDED-URBAN LAND COMPLEX, 0 TO 1 PERCENT SLOPES

0 0.1 0.2 Miles

Soil Group

- A
- A/D
- B/D
- C/D
- Water
- Urban Land

Legend

- Project Limits
- Streets

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

US 41 to CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

NRCS SOILS MAP

Figure 3

Lee County Land Use

Urban and Built Up

- 1210: Fixed Single Family Units
- 1320: Mobile Home Units
- 1330: Multiple Dwelling Units, Low Rise
- 1400: Commercial and Services
- 1410: Retail Sales and Services (not used in map)
- 1490: Commercial and Services Under Construction
- 1700: Institutional
- 1820: Golf Course
- 1850: Parks and Zoos
- 1900: Open Land
- 3100: Open Land

Upland Forests

- 4130: Sand Pine
- 4340: Hardwood-Conifer Mixed

Water

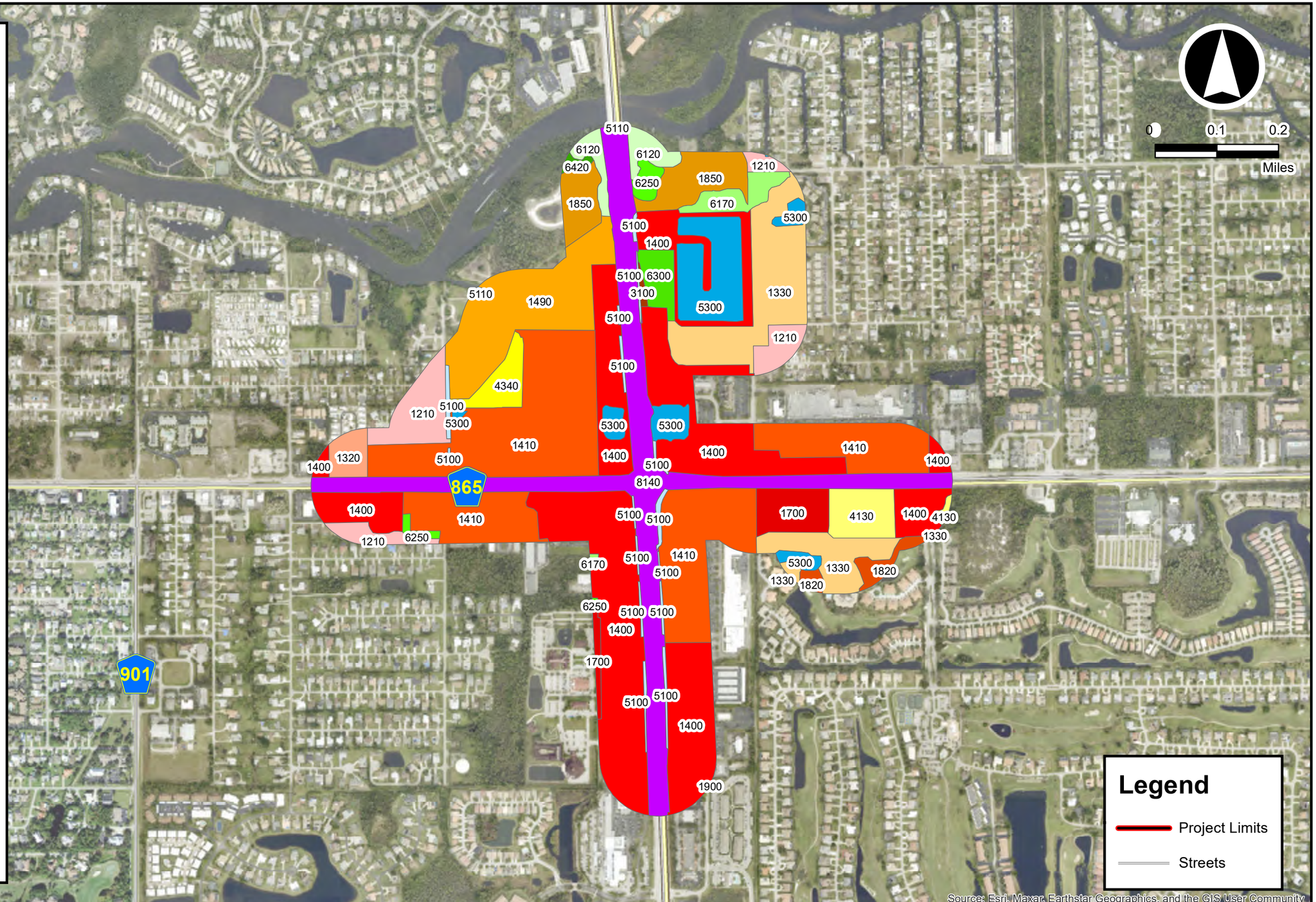
- 5100: Streams and Waterways
- 5110: Natural River, Stream, Waterway
- 5120: Channelized Waterways, Canals
- 5300: Reservoirs

Wetlands

- 6120: Mangrove Swamp
- 6170: Mixed Wetland Hardwoods
- 6250: Wet Pinelands Hydric Pine
- 6300: Wetland Forested Mixed
- 6420: Saltwater Marshes / Halophytic Herbaceous Prairie

Transportation, Communication, and Utilities

- 8140: Roads and Highways



FDOT

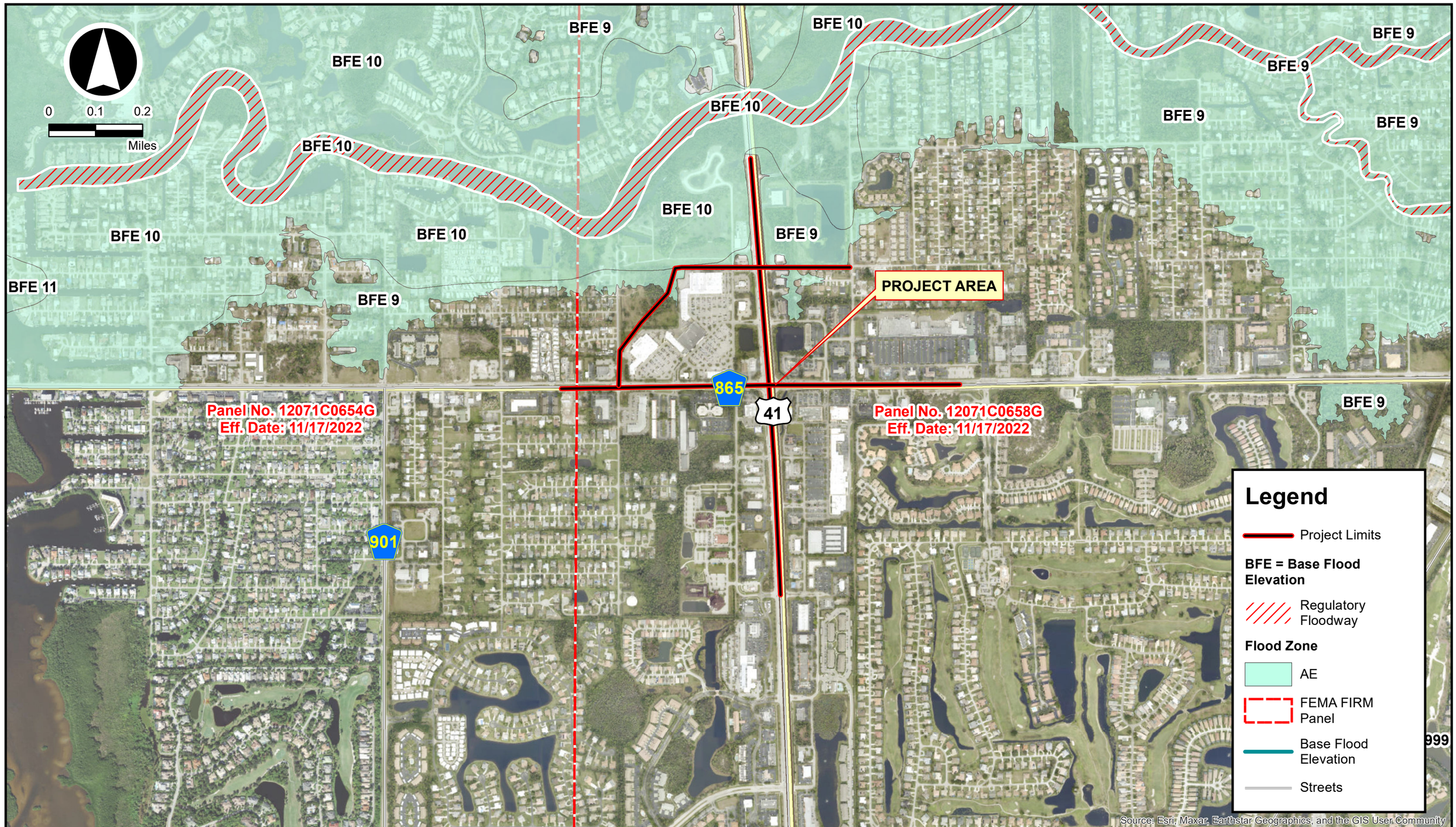
US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-0

LAND USE MAP

Figure 4



FDOT

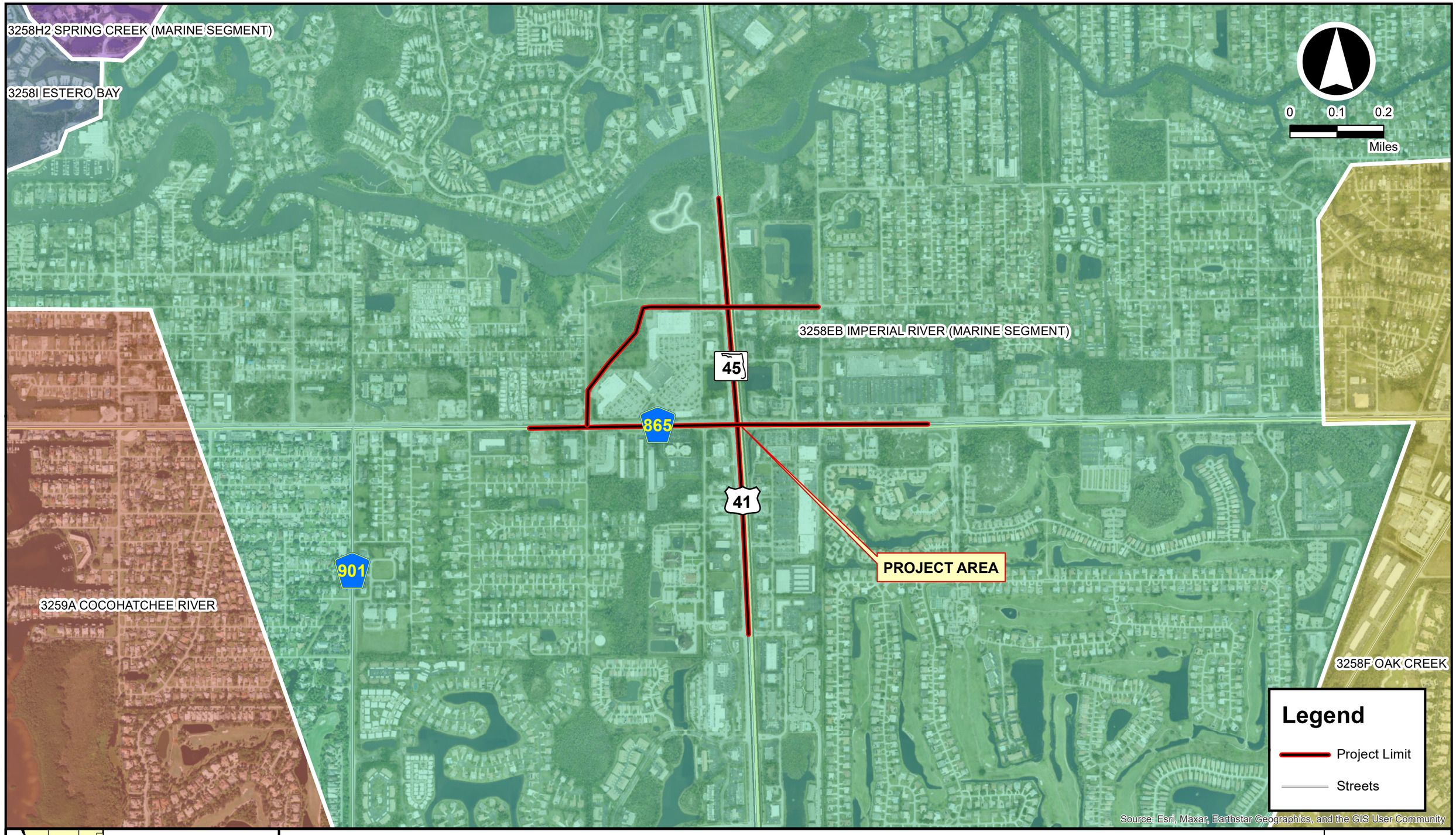
US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

FEMA FLOODPLAINS MAP

Figure
6



US 41 at CR 865 (Bonita Beach Road)

Project Development and Environment (PD&E) Study
Lee County, FL

Financial Project ID: 444321-1-22-01

WBID MAP

Figure
7

APPENDIX B

Basin Maps

IMPERIAL RIVER

IMPERIAL RIVER

EXISTING FDOT POND NORTH (14.79 AC)

TAMARA CT

SOMERSET LN

CAROLINA ST

US 41

QUAILS WALK RD

WINDSOR RD

BRINK CIR

PUBLIX

CENTER OF BONITA SPRINGS TREATMENT POND

24" RCP

NW QUADRANT POND DESIGNED BY CITY OF BONITA SPRINGS

ARROYAL MALL POND

CROWN LAKE BLVD

CROWN LAKE CT

ARROYAL RD

BONITA BEACH RD

BONITA BEACH RD

BONITA BEACH RD

10' X 7' CONCRETE BOX CULVERT

DOUBLE 8' X 4' CONCRETE BOX CULVERT

BEAUMONT RD

ACCESS RD

US 41

SPANISH WELLS BLVD

N

0 100 500

Feet

LEGEND

- WINDSOR ROAD SWALE/NORTHWEST QUADRANT ROADWAY BASIN (8.19 ac)
- BASIN WEST (2.90 AC)
- PERMITTED BASIN NORTH (54.61 AC)
- BASIN EAST (8.88 AC)
- CROSS DRAIN
- FEMA FLOODPLAIN (ZONE AE)
- OFFSITE DRAINAGE AREA
- PROPOSED RIGHT-OF-WAY

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

EXISTING BASIN MAP

SHEET NO.

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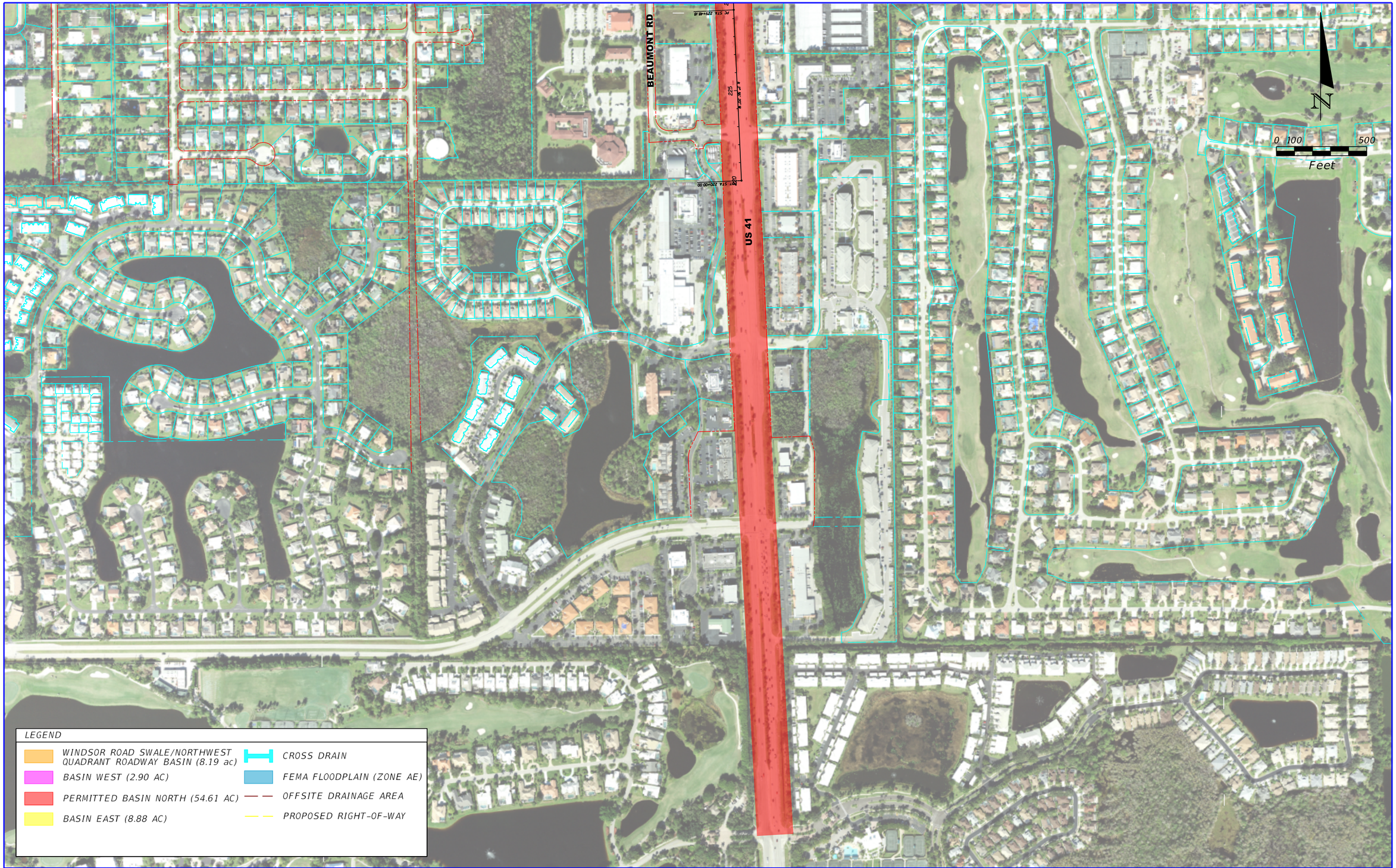

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

EXISTING BASIN MAP

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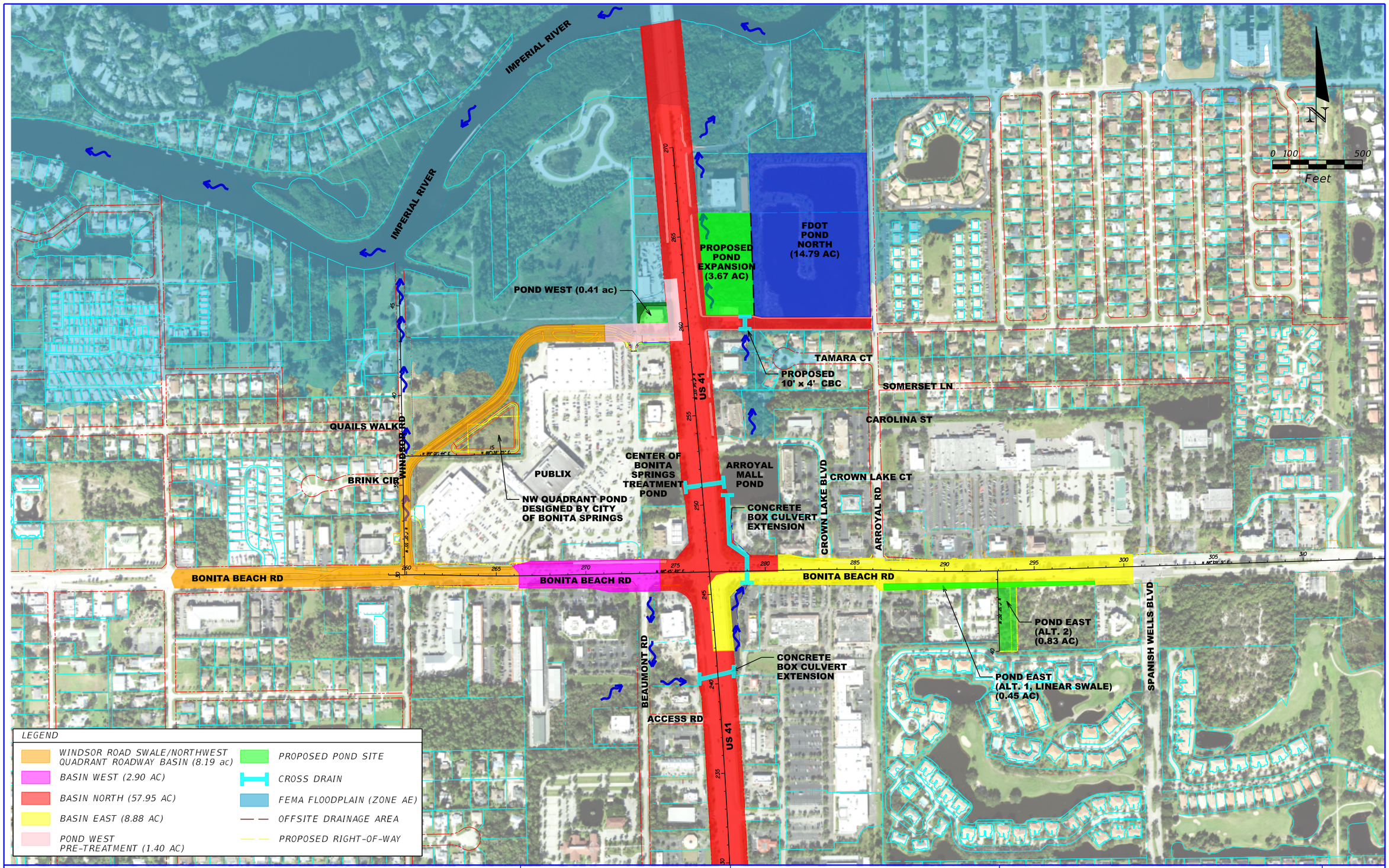

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

PROPOSED BASIN MAP

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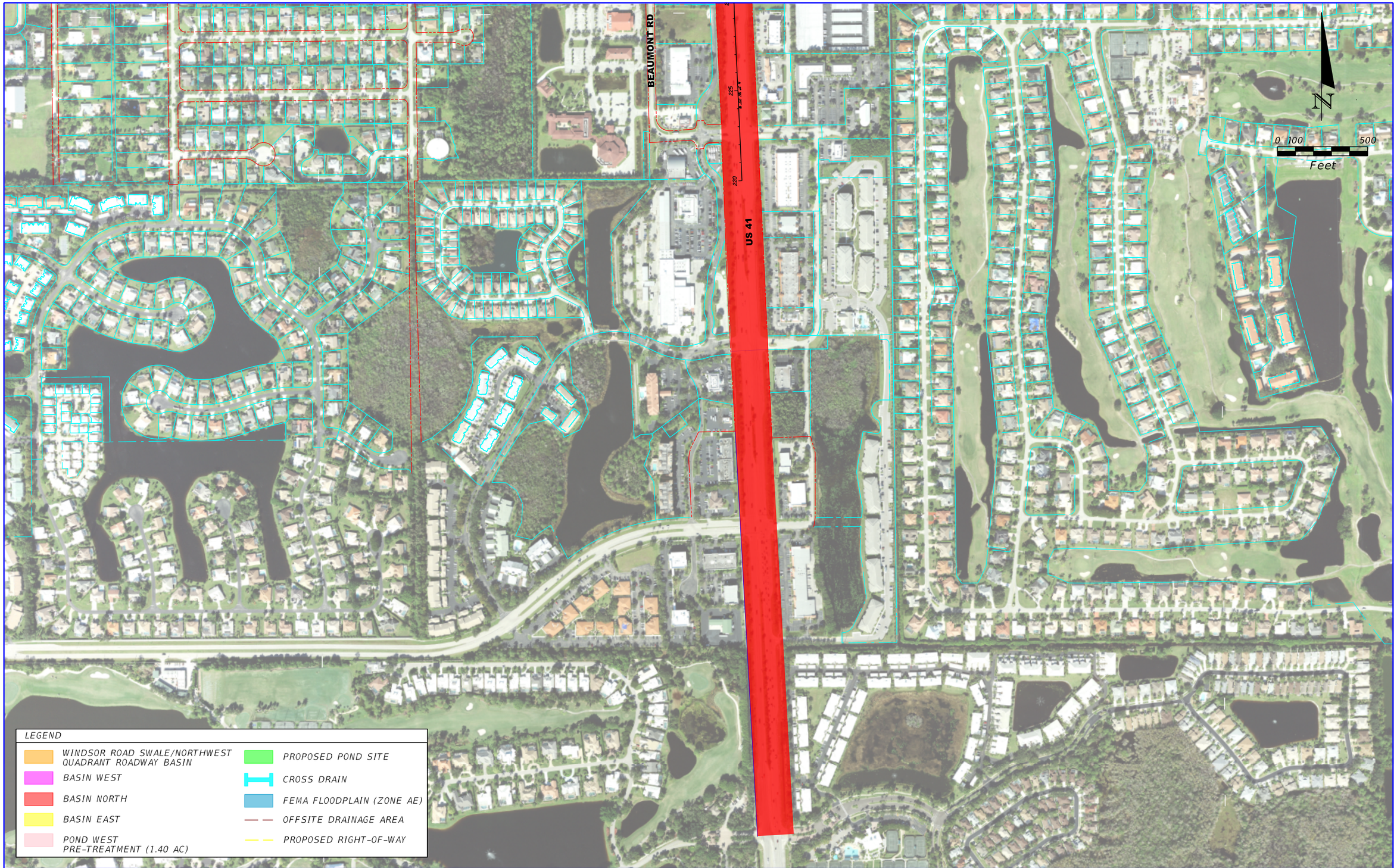

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
US 41	LEE	444321-1-22-01

PROPOSED BASIN MAP

SHEET NO.

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APPENDIX C

Cross Drain Analysis and Floodplain Impact Calculations

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 32765
(407) 971-8850 - (407) 971-8955 (fax)

Made by: ZKE
Ch'd by: REC

DATE: 02/08/24
PROJECT #: KIT-008-01

US 41 at CR 865 (Bonita Beach Road) PD&E Study

TABLE – CROSS DRAIN FLOOD DATA SHEET - EXISTING VS. PROPOSED

Structure Number	Approximate Location	Design Flood (50-yr Storm Event)					Base Flood (100-yr Storm Event)					Overtopping Flood				Greatest Flood (500-yr Storm Event)				
		Existing (A)		Proposed (B)		B-A	Existing (A)		Proposed (B)		B-A	Existing (A)		Proposed (B)		Existing (A)		Proposed (B)		B-A
		Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)
CD-1	STA 240+50 (Under US 41)	64.55	9.83	64.55	9.83	0.00	88.10	9.85	88.10	9.85	0.00	814.66	14.00	778.98	14.00	142.79	9.93	142.79	9.94	0.01
CD-2	STA 279+00 (Under Bonita Beach Rd)	64.55	9.83	64.55	9.84	0.01	88.10	9.85	88.10	9.87	0.02	787.48	14.00	750.28	14.00	142.79	9.93	142.79	9.97	0.04

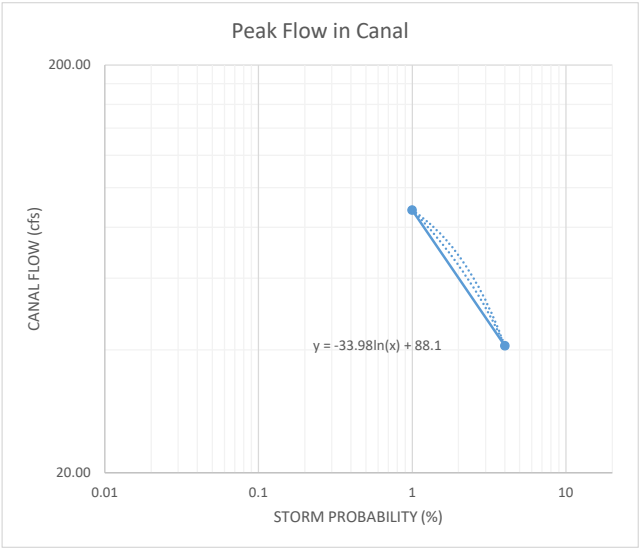
Cross Drain Upsizing Summary			
Structure Number	Existing Pipe Size	Proposed Pipe Size	Proposed Change
CD-1	Double 8' x 4' CBC	Double 8' x 4' CBC	Extend
CD-2	Single 10' x 7' CBC	Single 10' x 7' CBC	Extend

Peak Flow Calculations in Canal

Storm Event	Probability	Probability%	Peak Flow (cfs)	
25	0.04	4	41.00	
50	0.02	2	64.55	*
100	0.01	1	88.10	
500	0.002	0.2	142.79	*

* 50-YR and 500-YR Peak Flow Found by plotting the 25-YR and 100-YR storm events (See Adjacent) and Trend line equation (y = = -33.98ln(x) + 88.1) was used to find the value for the 50-YR and 500-YR storm.

25-YR and 100-YR Peak Flow determined from existing permit information found in **Appendix F.**



HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 64.55 cfs

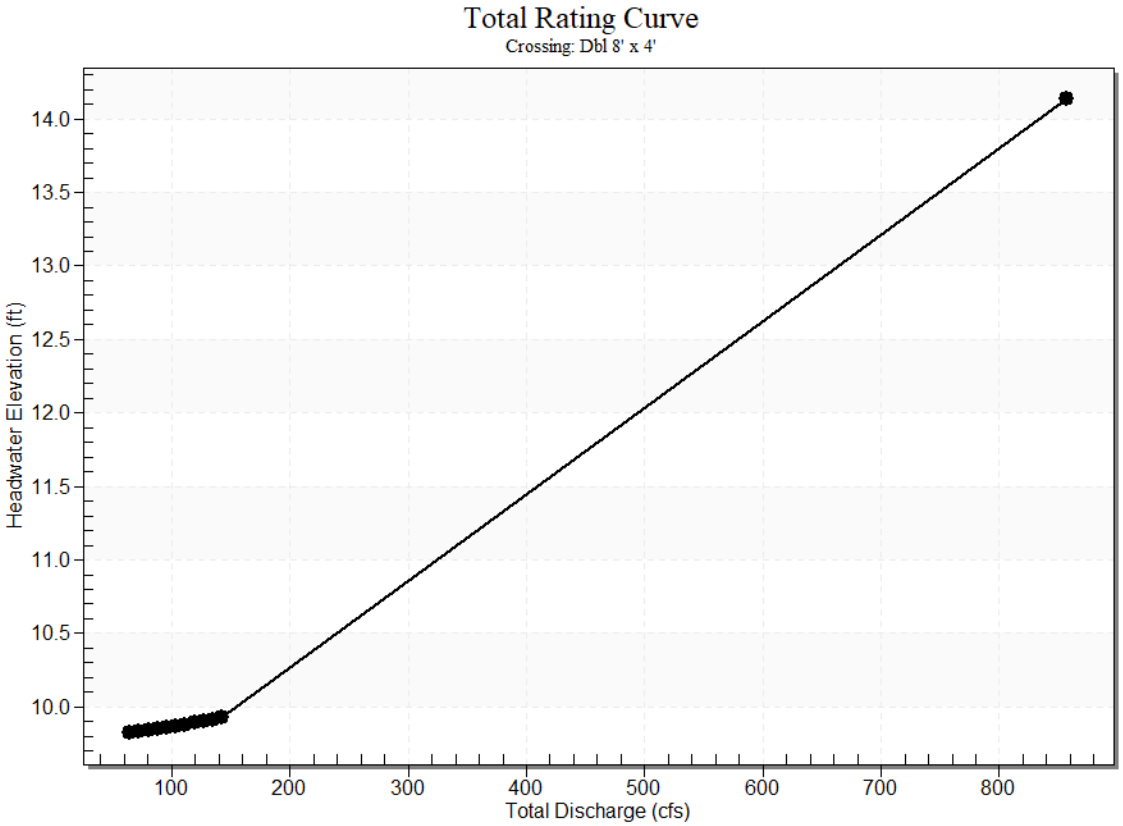
Design Flow: 88.10 cfs

Maximum Flow: 142.79 cfs

Table 1 - Summary of Culvert Flows at Crossing: Dbl 8' x 4'

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
9.83	64.55	64.55	0.00	1
9.83	72.37	72.37	0.00	1
9.84	80.20	80.20	0.00	1
9.85	88.10	88.10	0.00	1
9.86	95.85	95.85	0.00	1
9.87	103.67	103.67	0.00	1
9.88	111.49	111.49	0.00	1
9.89	119.32	119.32	0.00	1
9.90	127.14	127.14	0.00	1
9.92	134.97	134.97	0.00	1
9.93	142.79	142.79	0.00	1
14.00	814.66	814.66	0.00	Overtopping

Rating Curve Plot for Crossing: Dbl 8' x 4'



Culvert Data: Culvert 1

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
64.55 cfs	64.55 cfs	9.83	1.30	5.226	4-FFf	0.92	0.80	4.00	5.50	1.01	0.00
72.37 cfs	72.37 cfs	9.83	1.40	5.233	4-FFf	0.99	0.86	4.00	5.50	1.13	0.00
80.20 cfs	80.20 cfs	9.84	1.50	5.241	4-FFf	1.06	0.92	4.00	5.50	1.25	0.00
88.10 cfs	88.10 cfs	9.85	1.60	5.249	4-FFf	1.13	0.98	4.00	5.50	1.38	0.00
95.85 cfs	95.85 cfs	9.86	1.69	5.258	4-FFf	1.20	1.04	4.00	5.50	1.50	0.00
103.67 cfs	103.67 cfs	9.87	1.78	5.268	4-FFf	1.26	1.09	4.00	5.50	1.62	0.00

111.49 cfs	111.49 cfs	9.88	1.87	5.279	4-FFf	1.32	1.15	4.00	5.50	1.74	0.00
119.32 cfs	119.32 cfs	9.89	1.96	5.290	4-FFf	1.38	1.20	4.00	5.50	1.86	0.00
127.14 cfs	127.14 cfs	9.90	2.04	5.302	4-FFf	1.44	1.25	4.00	5.50	1.99	0.00
134.97 cfs	134.97 cfs	9.92	2.11	5.315	4-FFf	1.50	1.30	4.00	5.50	2.11	0.00
142.79 cfs	142.79 cfs	9.93	2.18	5.329	4-FFf	1.56	1.35	4.00	5.50	2.23	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

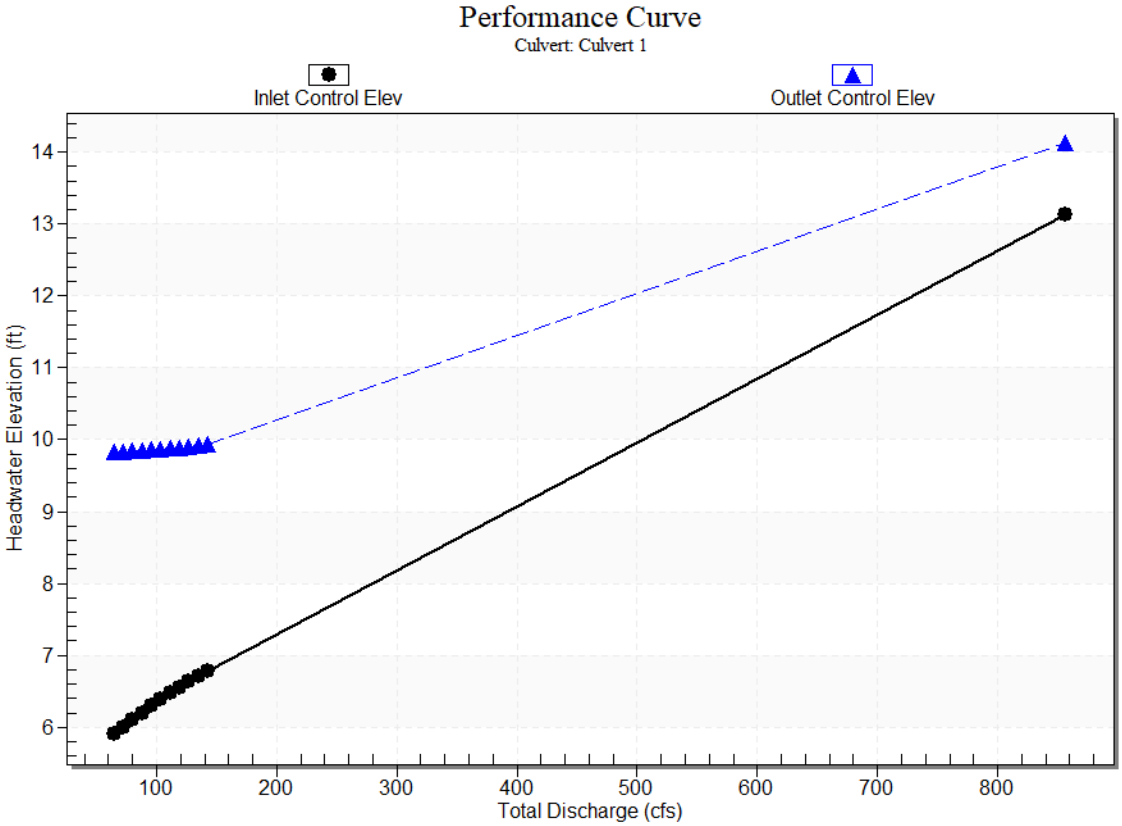
Inlet Elevation (invert): 4.60 ft,

Outlet Elevation (invert): 4.30 ft

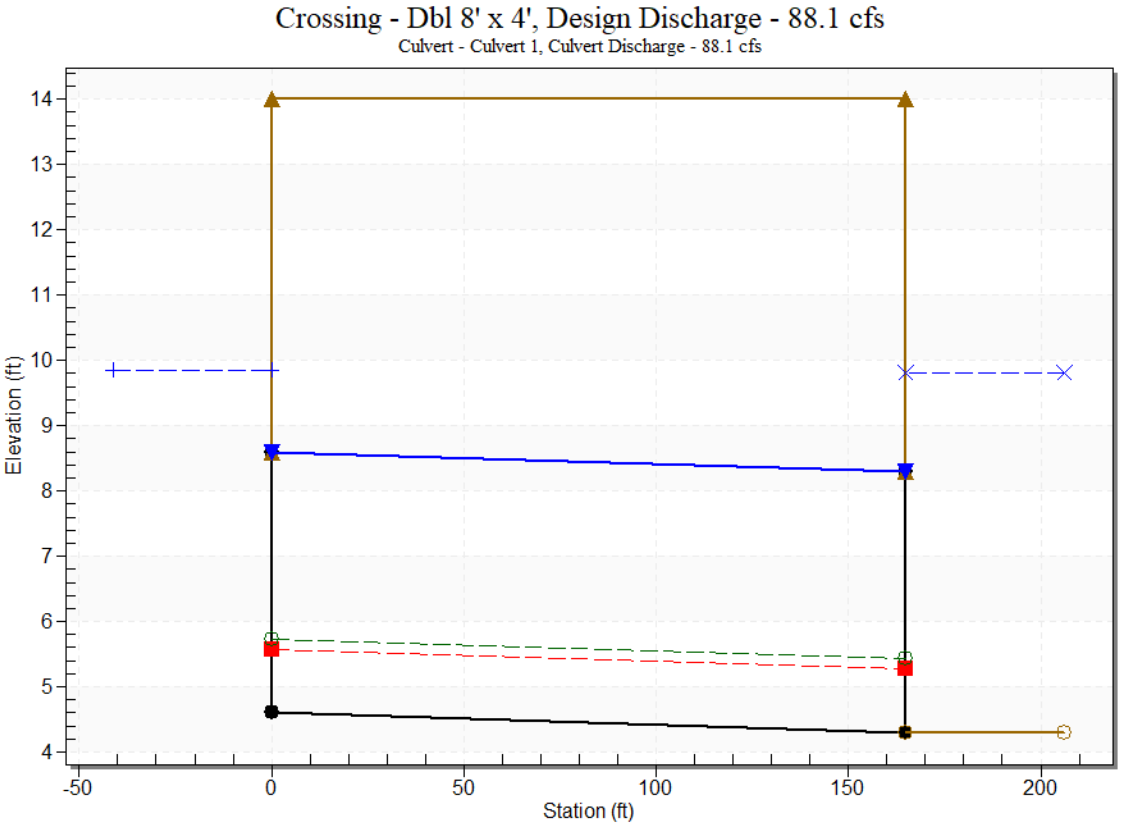
Culvert Length: 165.00 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.60 ft

Outlet Station: 165.00 ft

Outlet Elevation: 4.30 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Dbl 8' x 4'

Table 3 - Downstream Channel Rating Curve (Crossing: Dbl 8' x 4')

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
64.55	9.80	5.50
72.37	9.80	5.50
80.20	9.80	5.50
88.10	9.80	5.50
95.85	9.80	5.50
103.67	9.80	5.50
111.49	9.80	5.50
119.32	9.80	5.50
127.14	9.80	5.50
134.97	9.80	5.50
142.79	9.80	5.50

Tailwater Channel Data - Dbl 8' x 4'

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 9.80 ft

Roadway Data for Crossing: Dbl 8' x 4'

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 14.00 ft

Roadway Surface: Paved

Roadway Top Width: 165.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 64.55 cfs

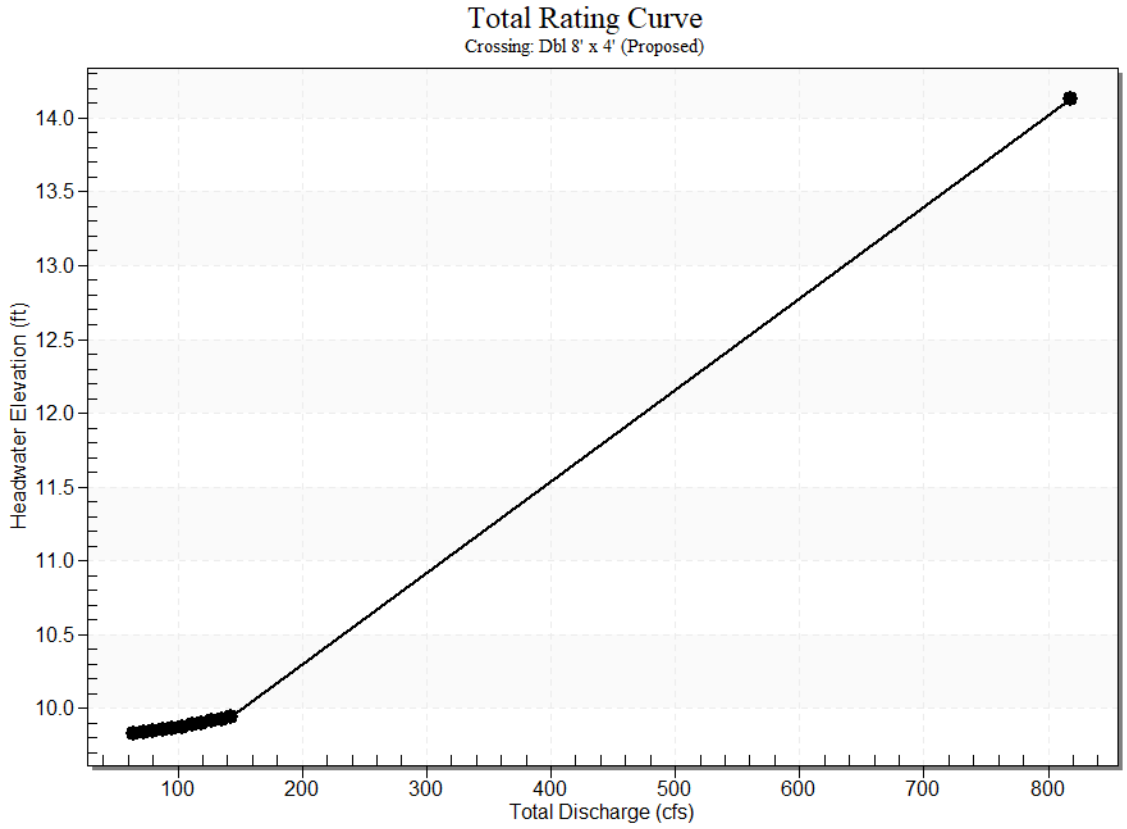
Design Flow: 88.10 cfs

Maximum Flow: 142.79 cfs

Table 4 - Summary of Culvert Flows at Crossing: Dbl 8' x 4' (Proposed)

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
9.83	64.55	64.55	0.00	1
9.84	72.37	72.37	0.00	1
9.84	80.20	80.20	0.00	1
9.85	88.10	88.10	0.00	1
9.86	95.85	95.85	0.00	1
9.87	103.67	103.67	0.00	1
9.89	111.49	111.49	0.00	1
9.90	119.32	119.32	0.00	1
9.91	127.14	127.14	0.00	1
9.93	134.97	134.97	0.00	1
9.94	142.79	142.79	0.00	1
14.00	778.98	778.98	0.00	Overtopping

Rating Curve Plot for Crossing: Dbl 8' x 4' (Proposed)



Culvert Data: Culvert 1

Table 5 - Culvert Summary Table: Culvert 1

Total Disch	Culvert	Headwater	Inlet	Outlet	Flow	Normal	Critical	Outlet	Tailwater	Outlet	Tailwater

arge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
64.55 cfs	64.55 cfs	9.83	1.30	5.229	4-FFf	1.01	0.80	4.00	5.50	1.01	0.00
72.37 cfs	72.37 cfs	9.84	1.40	5.236	4-FFf	1.09	0.86	4.00	5.50	1.13	0.00
80.20 cfs	80.20 cfs	9.84	1.50	5.245	4-FFf	1.17	0.92	4.00	5.50	1.25	0.00
88.10 cfs	88.10 cfs	9.85	1.60	5.254	4-FFf	1.24	0.98	4.00	5.50	1.38	0.00
95.85 cfs	95.85 cfs	9.86	1.69	5.264	4-FFf	1.32	1.04	4.00	5.50	1.50	0.00
103.67 cfs	103.67 cfs	9.87	1.78	5.274	4-FFf	1.39	1.09	4.00	5.50	1.62	0.00
111.49 cfs	111.49 cfs	9.89	1.87	5.286	4-FFf	1.46	1.15	4.00	5.50	1.74	0.00
119.32 cfs	119.32 cfs	9.90	1.96	5.299	4-FFf	1.52	1.20	4.00	5.50	1.86	0.00
127.14 cfs	127.14 cfs	9.91	2.04	5.312	4-FFf	1.59	1.25	4.00	5.50	1.99	0.00
134.97 cfs	134.97 cfs	9.93	2.11	5.326	4-FFf	1.66	1.30	4.00	5.50	2.11	0.00
142.79 cfs	142.79 cfs	9.94	2.18	5.341	4-FFf	1.72	1.35	4.00	5.50	2.23	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

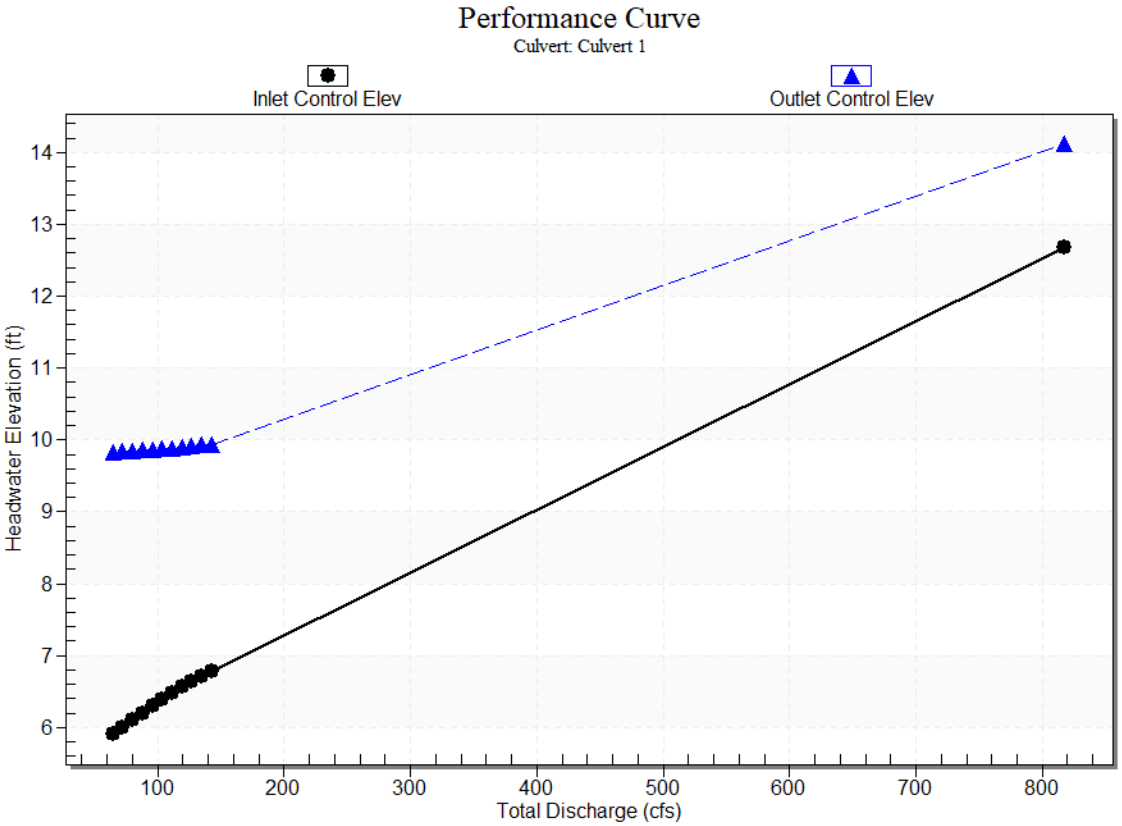
Inlet Elevation (invert): 4.60 ft,

Outlet Elevation (invert): 4.30 ft

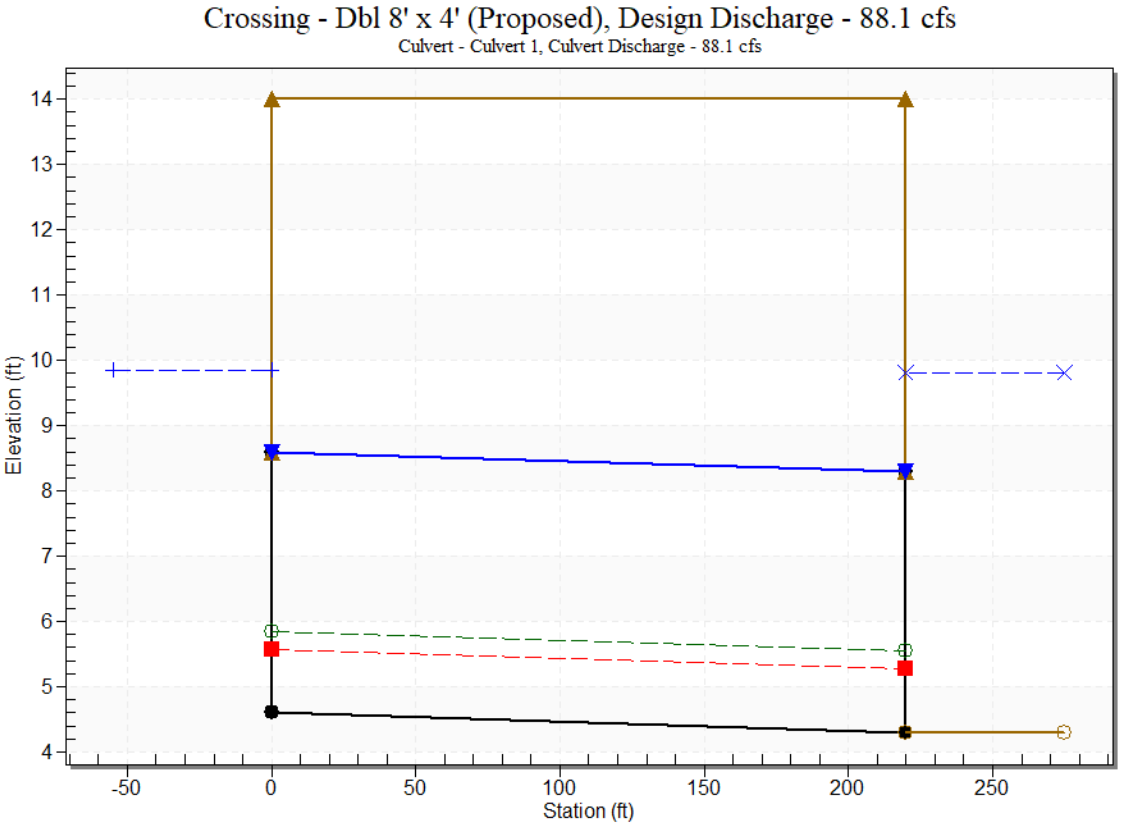
Culvert Length: 220.00 ft,

Culvert Slope: 0.0014

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.60 ft

Outlet Station: 220.00 ft

Outlet Elevation: 4.30 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Dbl 8' x 4' (Proposed)

Table 6 - Downstream Channel Rating Curve (Crossing: Dbl 8' x 4' (Proposed))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
64.55	9.80	5.50
72.37	9.80	5.50
80.20	9.80	5.50
88.10	9.80	5.50
95.85	9.80	5.50
103.67	9.80	5.50
111.49	9.80	5.50
119.32	9.80	5.50
127.14	9.80	5.50
134.97	9.80	5.50
142.79	9.80	5.50

Tailwater Channel Data - Dbl 8' x 4' (Proposed)

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 9.80 ft

Roadway Data for Crossing: Dbl 8' x 4' (Proposed)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 14.00 ft

Roadway Surface: Paved

Roadway Top Width: 220.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 64.55 cfs

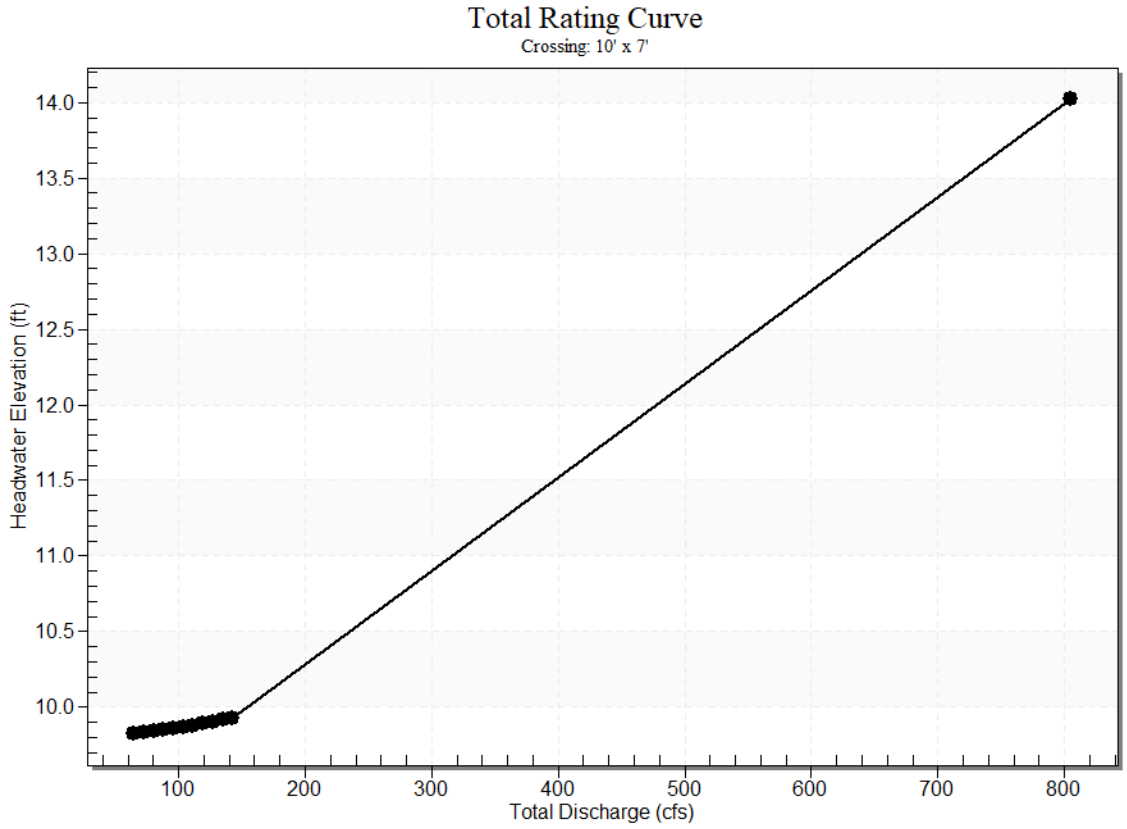
Design Flow: 88.10 cfs

Maximum Flow: 142.79 cfs

Table 7 - Summary of Culvert Flows at Crossing: 10' x 7'

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
9.83	64.55	64.55	0.00	1
9.83	72.37	72.37	0.00	1
9.84	80.20	80.20	0.00	1
9.85	88.10	88.10	0.00	1
9.86	95.85	95.85	0.00	1
9.87	103.67	103.67	0.00	1
9.88	111.49	111.49	0.00	1
9.89	119.32	119.32	0.00	1
9.90	127.14	127.14	0.00	1
9.92	134.97	134.97	0.00	1
9.93	142.79	142.79	0.00	1
14.00	787.48	787.48	0.00	Overtopping

Rating Curve Plot for Crossing: 10' x 7'



Culvert Data: Culvert 1

Table 8 - Culvert Summary Table: Culvert 1

Total Disch	Culvert	Headwater	Inlet	Outlet	Flow	Normal	Critical	Outlet	Tailwater	Outlet	Tailwater

arge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
64.55 cfs	64.55 cfs	9.83	1.66	5.527	3-M1t	1.14	1.09	5.80	5.80	1.11	0.00
72.37 cfs	72.37 cfs	9.83	1.79	5.533	3-M1t	1.23	1.18	5.80	5.80	1.25	0.00
80.20 cfs	80.20 cfs	9.84	1.91	5.541	3-M1t	1.31	1.26	5.80	5.80	1.38	0.00
88.10 cfs	88.10 cfs	9.85	2.04	5.549	3-M1t	1.39	1.34	5.80	5.80	1.52	0.00
95.85 cfs	95.85 cfs	9.86	2.16	5.559	3-M1t	1.47	1.42	5.80	5.80	1.65	0.00
103.67 cfs	103.67 cfs	9.87	2.27	5.568	3-M1t	1.55	1.49	5.80	5.80	1.79	0.00
111.49 cfs	111.49 cfs	9.88	2.39	5.579	3-M1t	1.63	1.57	5.80	5.80	1.92	0.00
119.32 cfs	119.32 cfs	9.89	2.50	5.591	3-M1t	1.70	1.64	5.80	5.80	2.06	0.00
127.14 cfs	127.14 cfs	9.90	2.60	5.603	3-M1t	1.78	1.71	5.80	5.80	2.19	0.00
134.97 cfs	134.97 cfs	9.92	2.71	5.616	3-M1t	1.85	1.78	5.80	5.80	2.33	0.00
142.79 cfs	142.79 cfs	9.93	2.81	5.630	3-M1t	1.92	1.85	5.80	5.80	2.46	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

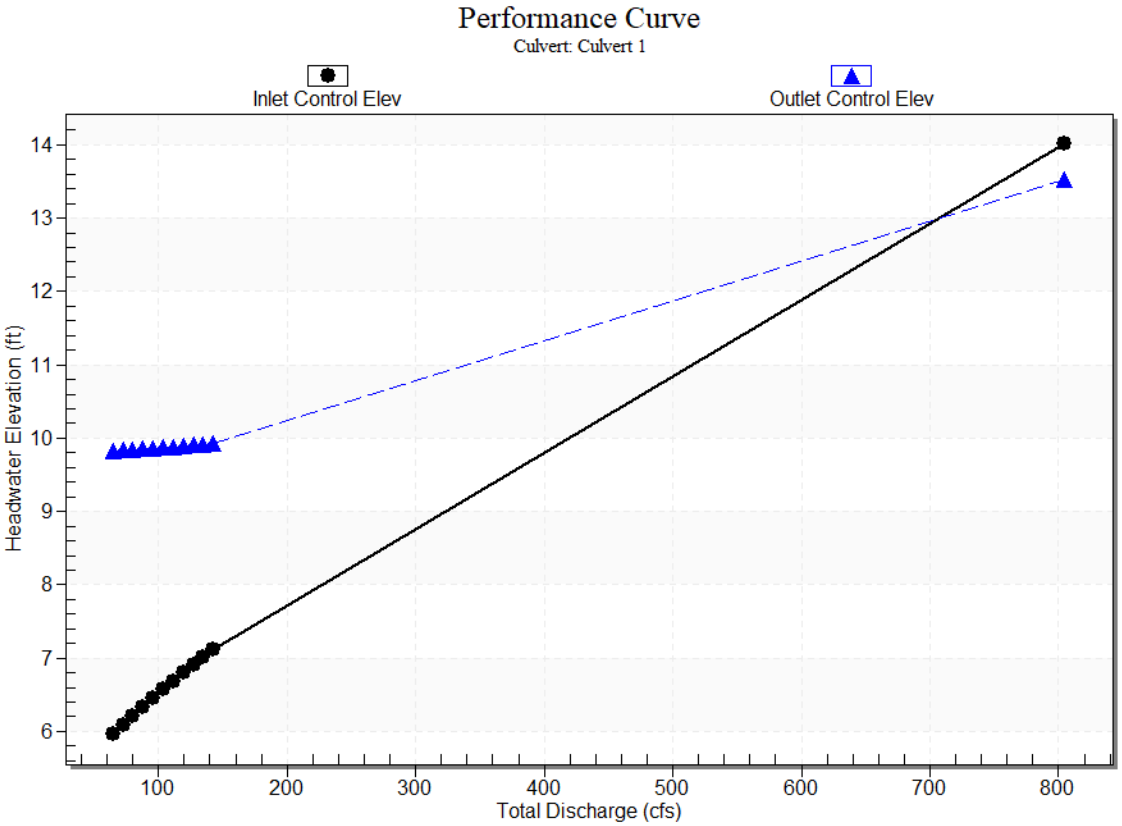
Inlet Elevation (invert): 4.30 ft,

Outlet Elevation (invert): 4.00 ft

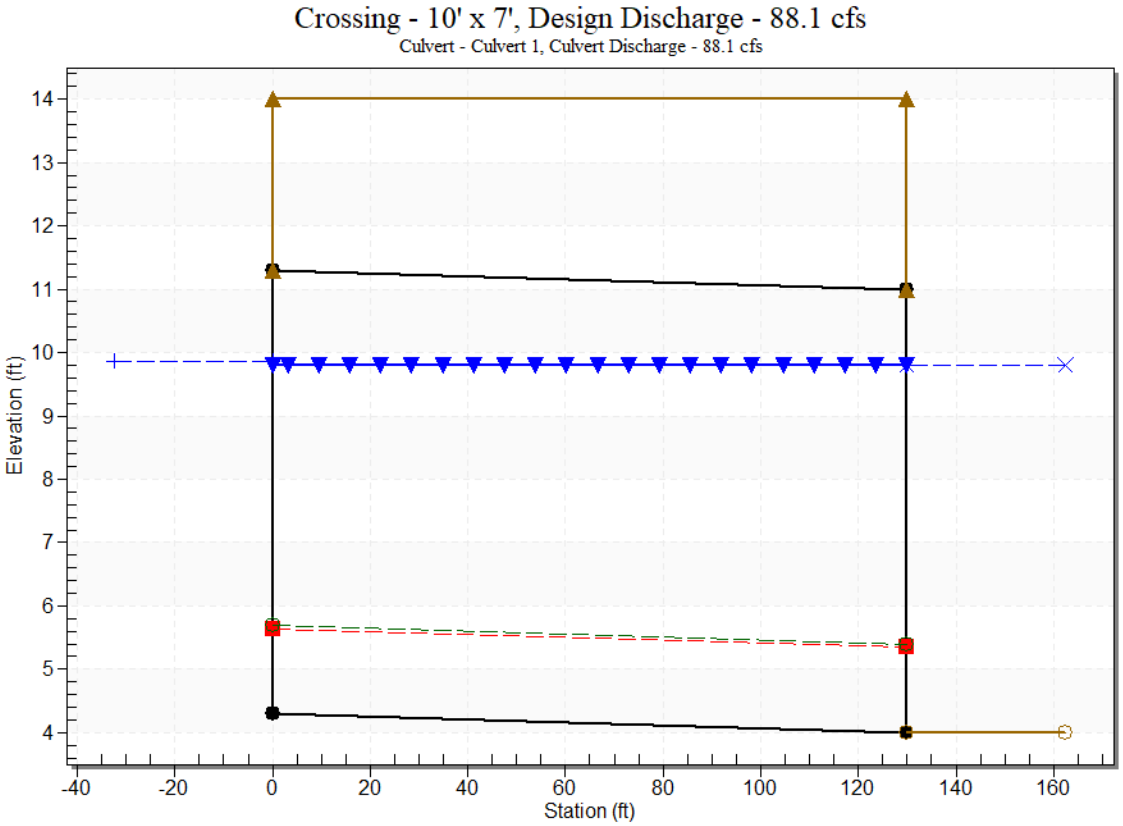
Culvert Length: 130.00 ft,

Culvert Slope: 0.0023

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.30 ft

Outlet Station: 130.00 ft

Outlet Elevation: 4.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 7.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45º flare) Wingwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: 10' x 7'

Table 9 - Downstream Channel Rating Curve (Crossing: 10' x 7')

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
64.55	9.80	5.80
72.37	9.80	5.80
80.20	9.80	5.80
88.10	9.80	5.80
95.85	9.80	5.80
103.67	9.80	5.80
111.49	9.80	5.80
119.32	9.80	5.80
127.14	9.80	5.80
134.97	9.80	5.80
142.79	9.80	5.80

Tailwater Channel Data - 10' x 7'

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 9.80 ft

Roadway Data for Crossing: 10' x 7'

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1500.00 ft

Crest Elevation: 14.00 ft

Roadway Surface: Paved

Roadway Top Width: 130.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 64.55 cfs

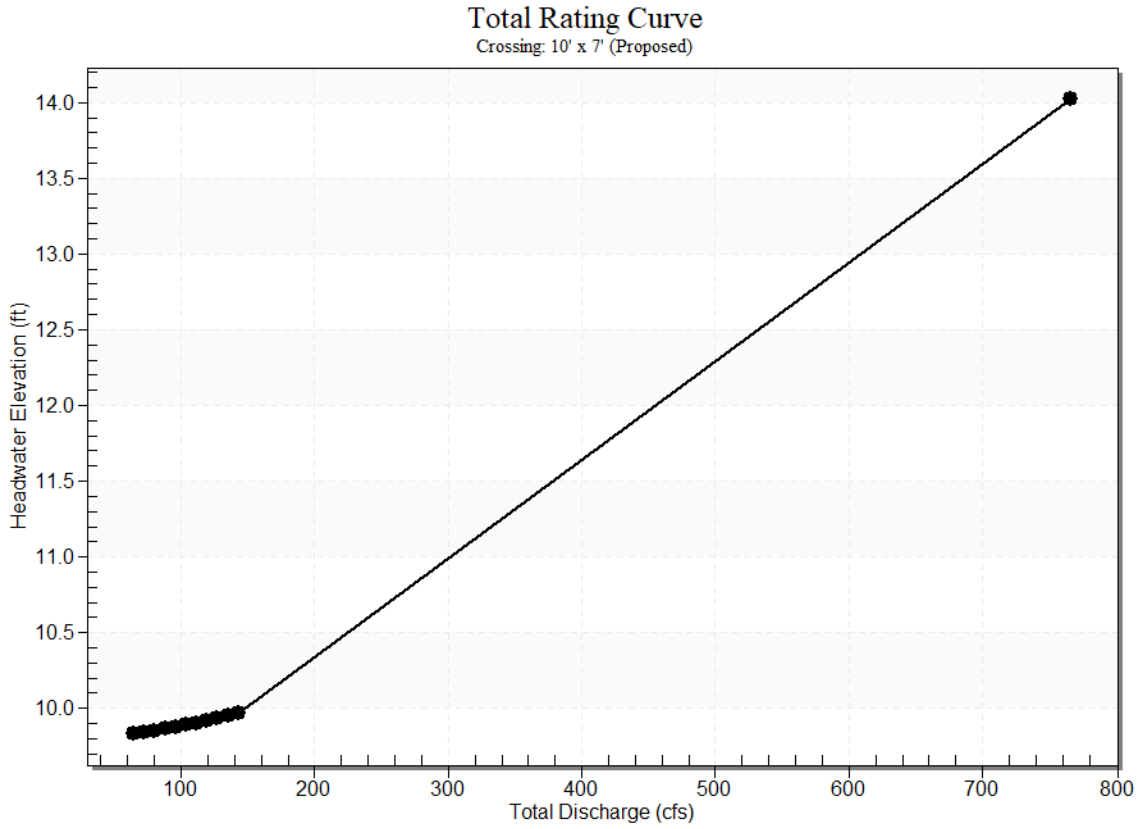
Design Flow: 88.10 cfs

Maximum Flow: 142.79 cfs

Table 10 - Summary of Culvert Flows at Crossing: 10' x 7' (Proposed)

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
9.84	64.55	64.55	0.00	1
9.84	72.37	72.37	0.00	1
9.85	80.20	80.20	0.00	1
9.87	88.10	88.10	0.00	1
9.88	95.85	95.85	0.00	1
9.89	103.67	103.67	0.00	1
9.90	111.49	111.49	0.00	1
9.92	119.32	119.32	0.00	1
9.94	127.14	127.14	0.00	1
9.95	134.97	134.97	0.00	1
9.97	142.79	142.79	0.00	1
14.00	750.28	750.28	0.00	Overtopping

Rating Curve Plot for Crossing: 10' x 7' (Proposed)



Culvert Data: Culvert 1

Table 11 - Culvert Summary Table: Culvert 1

Total Disch	Culvert	Headwater	Inlet	Outlet	Flow	Normal	Critical	Outlet	Tailwater	Outlet	Tailwater

arge (cfs)	Discharge (cfs)	Elevation (ft)	Control Depth (ft)	Control Depth (ft)	Type	Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Velocity (ft/s)	Velocity (ft/s)
64.55 cfs	64.55 cfs	9.84	1.78	5.535	3-M1t	1.77	1.09	5.80	5.80	1.11	0.00
72.37 cfs	72.37 cfs	9.84	1.92	5.544	3-M1t	1.92	1.18	5.80	5.80	1.25	0.00
80.20 cfs	80.20 cfs	9.85	2.06	5.554	3-M1t	2.05	1.26	5.80	5.80	1.38	0.00
88.10 cfs	88.10 cfs	9.87	2.19	5.565	3-M1t	2.19	1.34	5.80	5.80	1.52	0.00
95.85 cfs	95.85 cfs	9.88	2.32	5.577	3-M1t	2.32	1.42	5.80	5.80	1.65	0.00
103.67 cfs	103.67 cfs	9.89	2.44	5.590	3-M1t	2.45	1.49	5.80	5.80	1.79	0.00
111.49 cfs	111.49 cfs	9.90	2.56	5.604	3-M1t	2.57	1.57	5.80	5.80	1.92	0.00
119.32 cfs	119.32 cfs	9.92	2.68	5.620	3-M1t	2.70	1.64	5.80	5.80	2.06	0.00
127.14 cfs	127.14 cfs	9.94	2.80	5.636	3-M1t	2.82	1.71	5.80	5.80	2.19	0.00
134.97 cfs	134.97 cfs	9.95	2.91	5.653	3-M1t	2.94	1.78	5.80	5.80	2.33	0.00
142.79 cfs	142.79 cfs	9.97	3.02	5.671	3-M1t	3.06	1.85	5.80	5.80	2.46	0.00

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

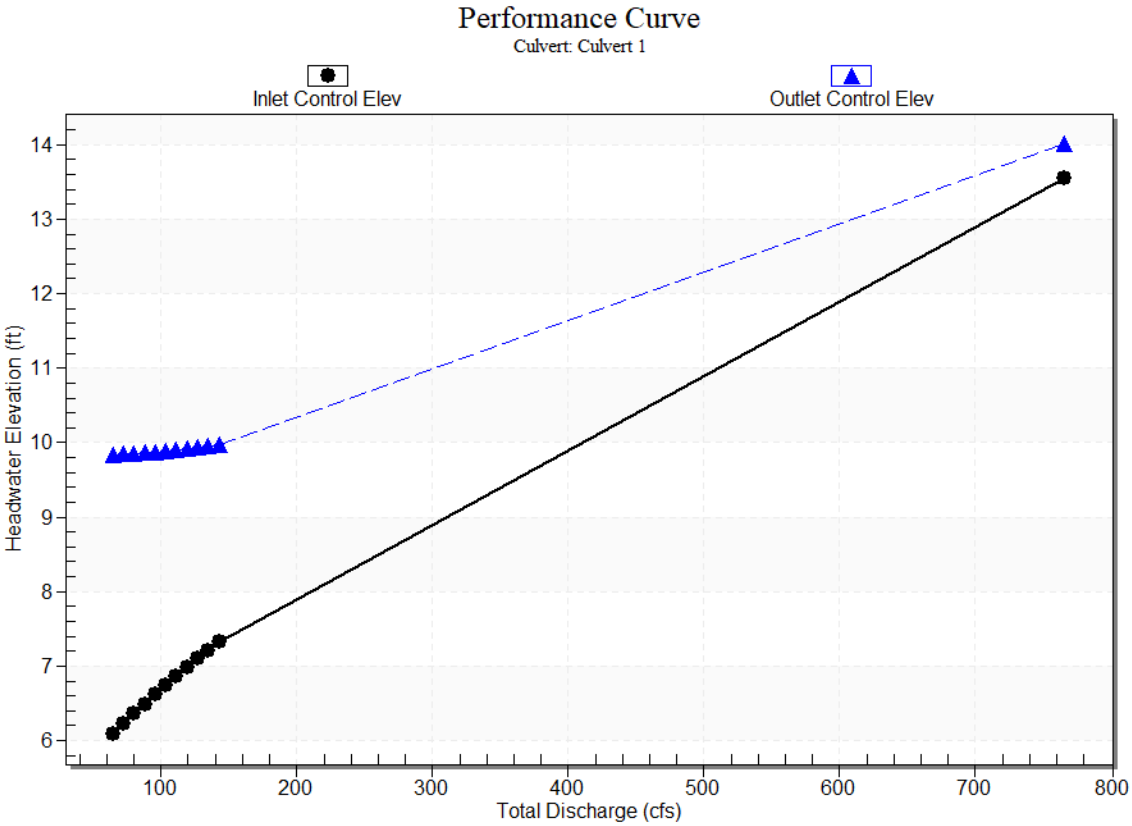
Inlet Elevation (invert): 4.30 ft,

Outlet Elevation (invert): 4.00 ft

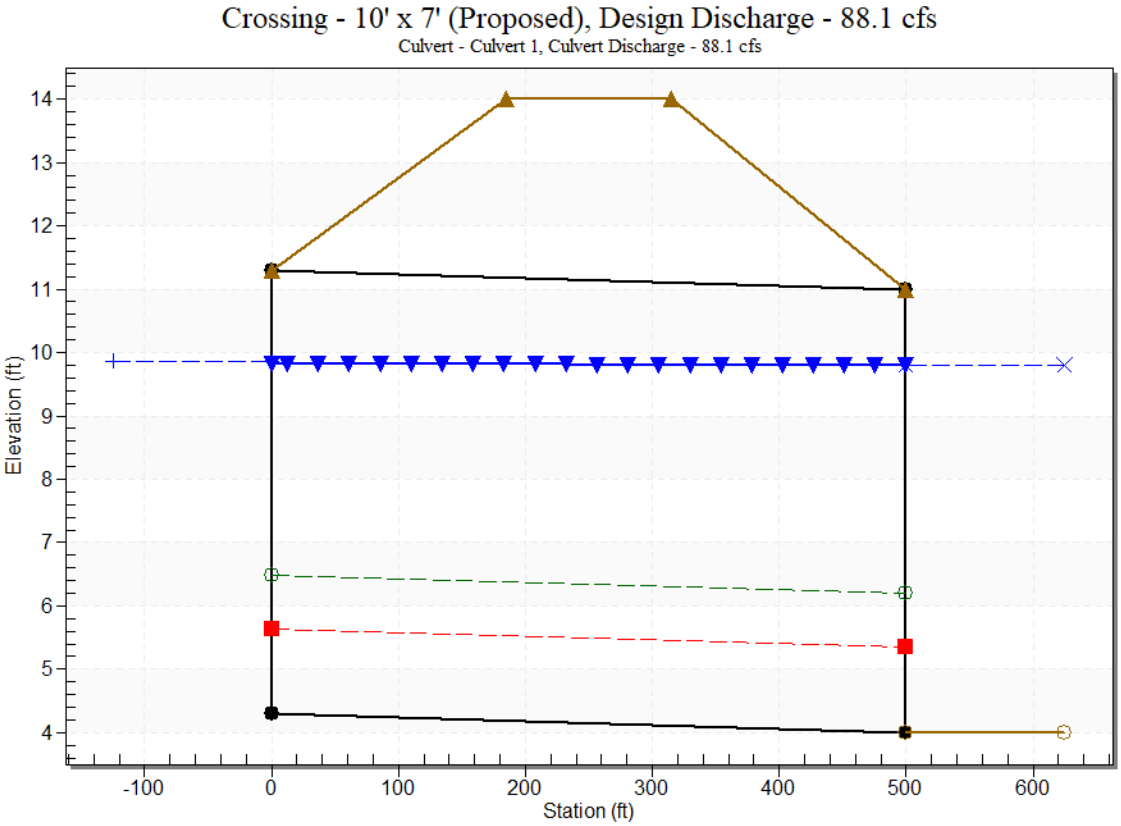
Culvert Length: 500.00 ft,

Culvert Slope: 0.0006

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 4.30 ft

Outlet Station: 500.00 ft

Outlet Elevation: 4.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 7.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: 10' x 7' (Proposed)

Table 12 - Downstream Channel Rating Curve (Crossing: 10' x 7' (Proposed))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
64.55	9.80	5.80
72.37	9.80	5.80
80.20	9.80	5.80
88.10	9.80	5.80
95.85	9.80	5.80
103.67	9.80	5.80
111.49	9.80	5.80
119.32	9.80	5.80
127.14	9.80	5.80
134.97	9.80	5.80
142.79	9.80	5.80

Tailwater Channel Data - 10' x 7' (Proposed)

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 9.80 ft

Roadway Data for Crossing: 10' x 7' (Proposed)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1500.00 ft

Crest Elevation: 14.00 ft

Roadway Surface: Paved

Roadway Top Width: 130.00 ft

Inwood Consulting Engineers, Inc.
3000 Dovera Drive
Oviedo, FL 32765

Made by: ZKE
Ck. by: REC

Date: 11/29/2023

Project Number: KIT-008-01

US 41 at CR 865 (Bonita Beach Road) PD&E Study

Floodplain Impact Area 1 Calculations - Northwest Quadrant Roadway						
ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
10.00	100-yr (Zone AE)	1.80				**4.20**
			1.40	3.00	4.20	
7.00	Ground El.	1.00				**0.00**

Inwood Consulting Engineers, Inc.
3000 Dovera Drive
Oviedo, FL 32765

Made by: ZKE
Ck. by: REC

Date: 11/29/2023

Project Number: KIT-008-01

US 41 at CR 865 (Bonita Beach Road) PD&E Study

Floodplain Impact Area 1 Calculations - Northeast Quadrant Roadway						
ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
9.00	100-yr (Zone AE)	1.48				**4.00**
			0.74	5.40	4.00	
3.60	SHWT	0.00				**0.00**

Inwood Consulting Engineers, Inc.
3000 Dovera Drive
Oviedo, FL 32765

Made by: ZKE
Ck. by: REC

Date: 11/29/2023

Project Number: KIT-008-01

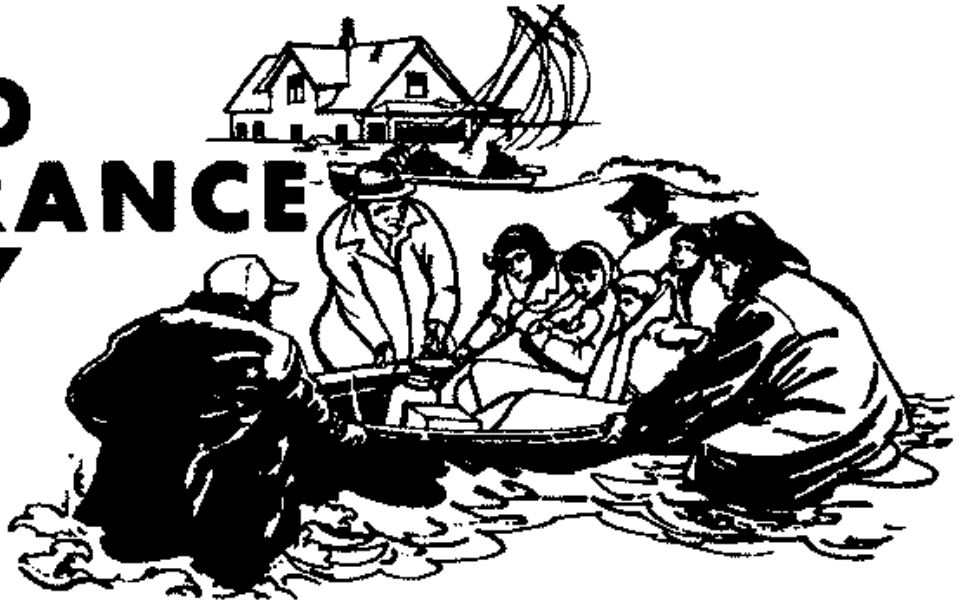
US 41 at CR 865 (Bonita Beach Road) PD&E Study

Floodplain Compensation Area 1 Calculations - Pond North Expansion						
ELEV. (ft)		AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
6.50	Ground El.	3.54				**8.96**
			3.09	2.90	8.96	
3.60	SHWT	2.64				**0.00**

APPENDIX D

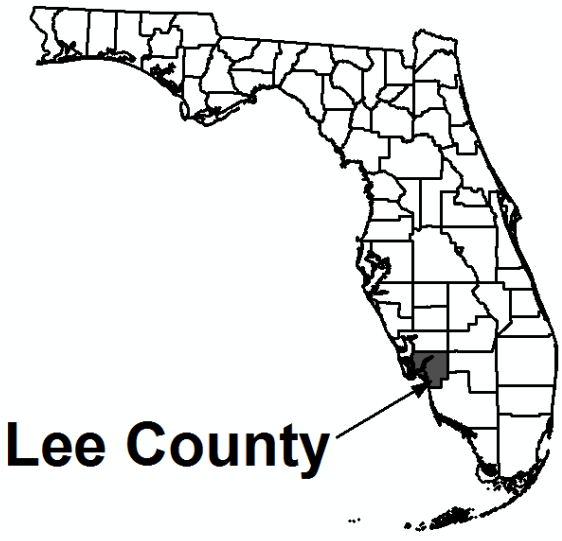
FEMA FIS Information

FLOOD INSURANCE STUDY



LEE COUNTY, FLORIDA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
BONITA SPRINGS, CITY OF	120680
CAPE CORAL, CITY OF	125095
ESTERO, VILLAGE OF	120260
FORT MYERS, CITY OF	125106
FORT MYERS BEACH, TOWN OF	120673
LEE COUNTY, UNINCORPORATED AREAS	125124
SANIBEL, CITY OF	120402



REVISED:
DECEMBER 7, 2018

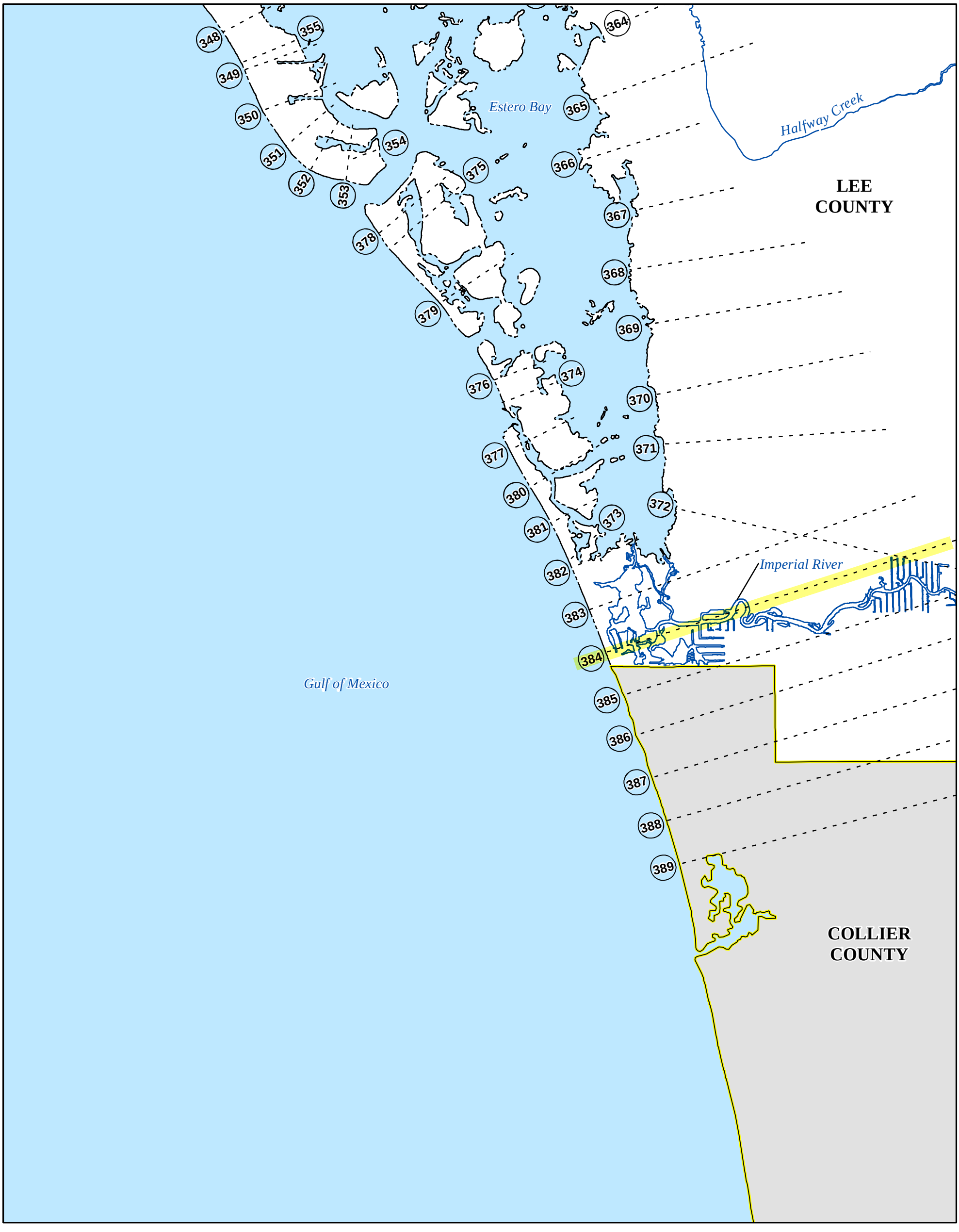
Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
12071CV001B

Table 16: Coastal Transect Parameters (continued)

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Gulf of Mexico	379	7.7	9.0	4.7 4.4-4.7	7.0 6.4-7.0	8.9 7.9-8.9	10.7 9.6-10.7	14.8 14.0-14.8
Gulf of Mexico	380	8.9	8.3	4.6 4.3-4.6	6.8 6.1-6.8	8.6 7.6-8.7	10.4 9.2-10.6	14.4 13.5-14.6
Gulf of Mexico	381	8.8	8.4	4.6 4.3-4.6	6.8 6.1-6.8	8.6 7.6-8.6	10.4 9.2-10.4	14.4 13.4-14.4
Gulf of Mexico	382	9.1	8.5	4.4 4.3-4.4	6.5 6.1-6.5	8.5 7.6-8.5	10.4 9.2-10.4	14.3 13.3-14.4
Gulf of Mexico	383	8.9	8.9	4.4 4.2-4.4	6.4 5.9-6.4	8.4 7.3-8.4	10.3 9.1-10.3	14.3 12.5-14.3
Gulf of Mexico	384	9.0	9.2	4.5 4.2-4.5	6.6 6.0-6.6	8.5 7.4-8.5	10.3 9.0-10.3	14.3 12.7-14.3
Gulf of Mexico	385	9.2	9.1	4.5 4.2-4.4	6.7 6.0-6.3	8.5 7.5-7.8	10.3 9.1-9.4	14.3 12.7-13.8

Figure 9: Transect Location Map (continued)



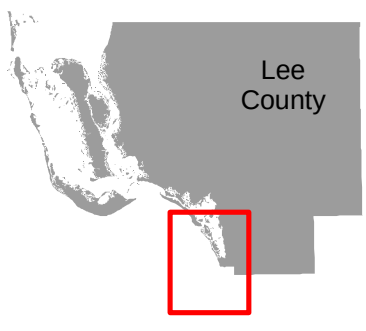
N

1 in = 1 miles 1:60,000

0 0.45 0.9 1.8 Miles

Map Projection:
State Plane Florida West (FIPS Zone 0902) Coordinate System, North American Datum 1983.

COUNTY LOCATOR



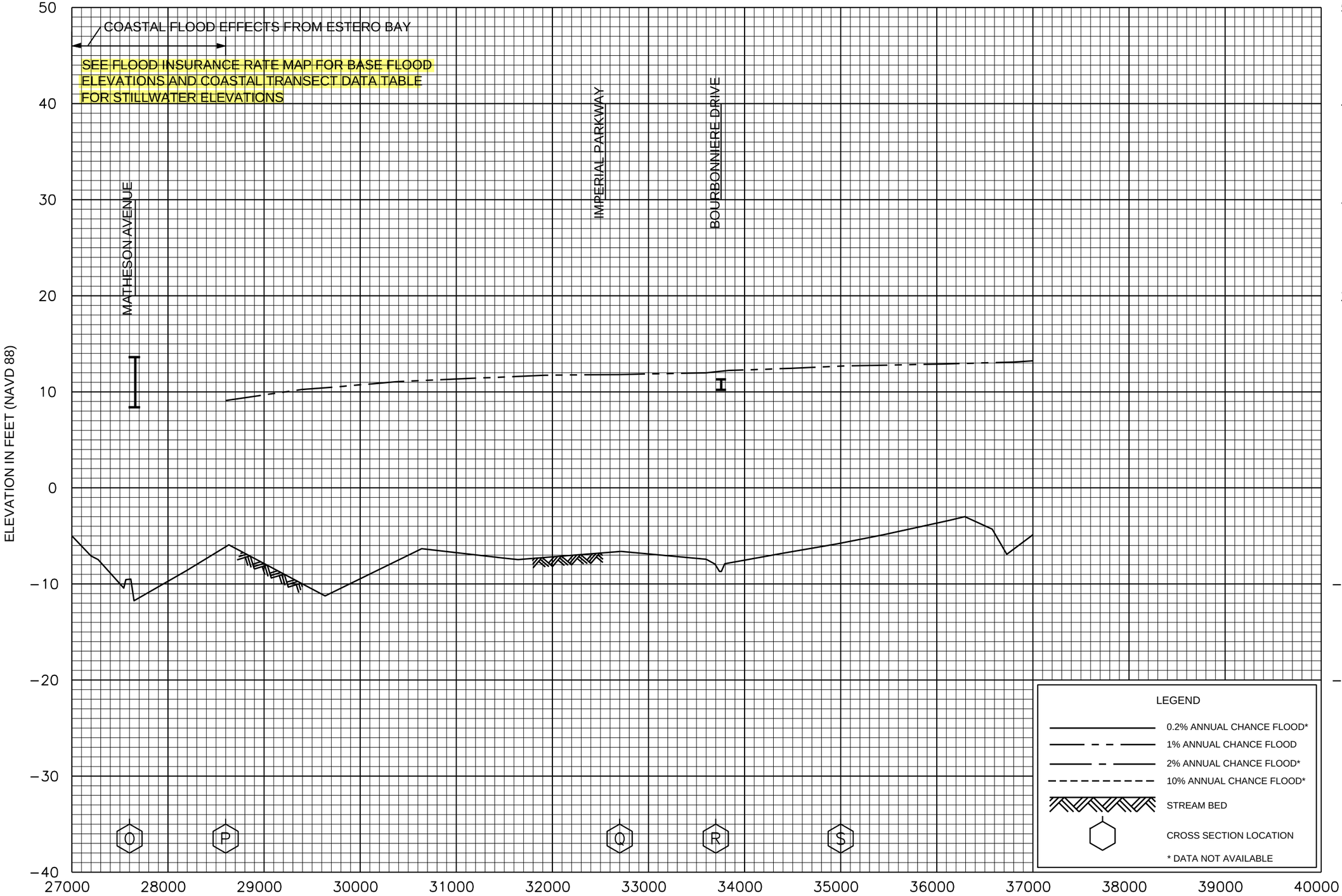
NATIONAL FLOOD INSURANCE PROGRAM

Figure 9. Transect Locator Map

PANELS WITH TRANSECTS

0566, 0567, 0569, 0586, 0587, 0588, 0589, 0593, 0651, 0652, 0653, 0654, 0656, 0658

FEMA



FLOOD PROFILES

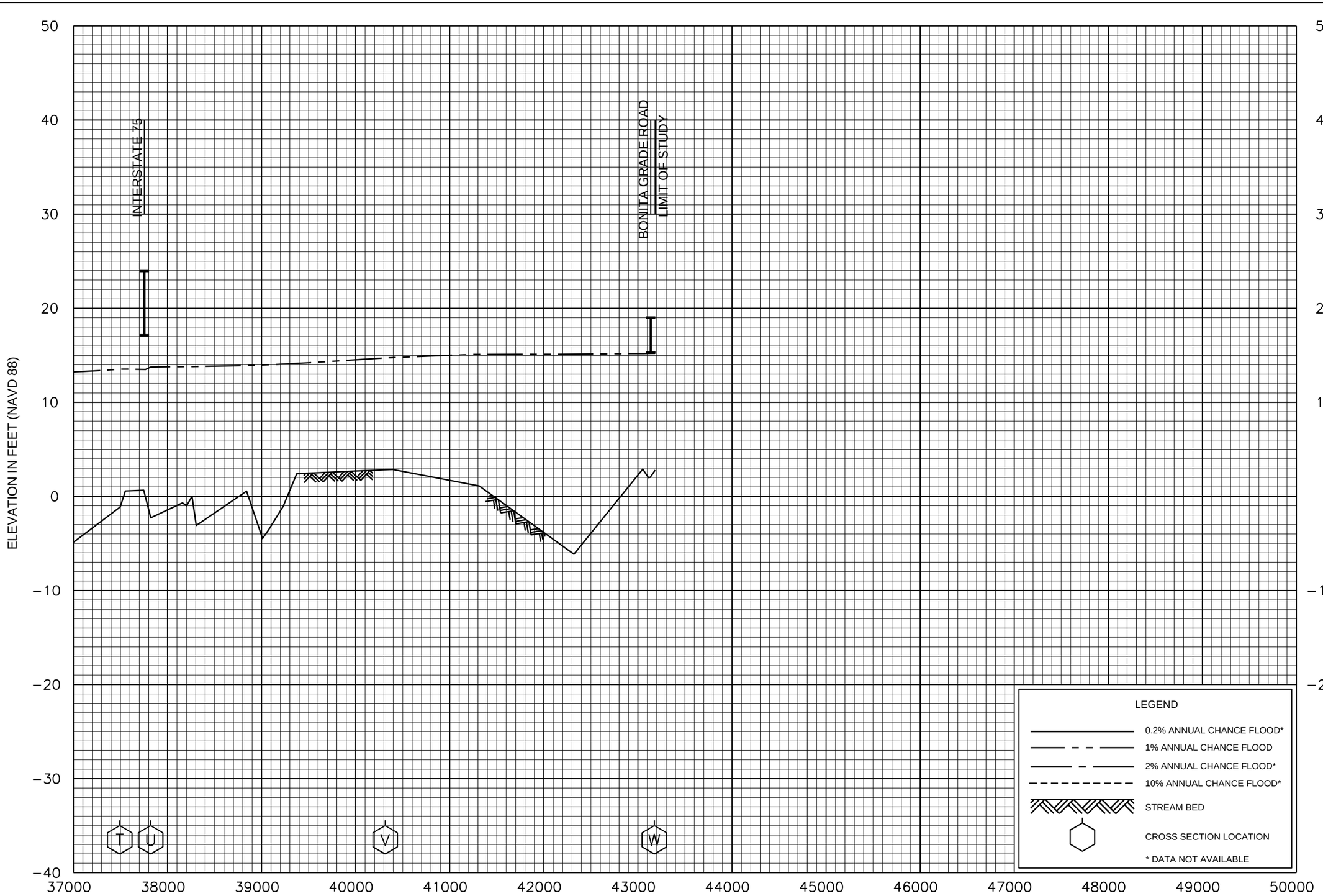
IMPERIAL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEE COUNTY, FL

AND INCORPORATED AREAS

37P



FLOOD PROFILES

IMPERIAL RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

LEE COUNTY, FL

AND INCORPORATED AREAS

38P

APPENDIX E

Correspondence

Meeting Minutes

3000 Dovera Drive, Suite 200, Oviedo, FL 32765 I P: 407-971-8850 I F: 407-971-8955 I www.inwoodinc.com

DATE: July 13, 2023

TO: **Patrick Bateman, P.E. – FDOT Project Manager**

FROM: Renato Chuw, P.E.

RE: 444321-1; US 41 at Bonita Beach Road Intersection PD&E Study – FDOT Drainage Methodology Meeting

CC: Brent Setchell (FDOT), Nicole Monies (FDOT), Jack Freeman (Kittelson), Travis Hills (Kittelson), Zach Evans (Inwood), Jason Houck (Inwood)

The meeting was held via TEAMS on July 13, 2023, at 3:00 pm and adjourned at 4:00 pm. The purpose of the meeting was to discuss the drainage approach for this PD&E Study with FDOT District Drainage and Permitting staff. A summary of the meeting discussion is below:

- Introduction of attendees started, followed by a brief overview of the project. The project is a PD&E study by FDOT District One to evaluate intersection improvement alternatives for US 41 at Bonita Beach Road (BBR) in Lee County.

- The improvements are to relieve existing congestion at the intersection and meet project travel demands in the future. Two intersection alternatives were evaluated (a signalized intersection and a partial Displaced Left Turn – DLT lane). The partial DLT alternative is the recommended preferred option and is currently under review for approval by FDOT Management. The partial DLT concept was shared in the meeting via a KMZ in Google Earth.

- In the existing condition, US 41 consists of 6 travel lanes with curb and gutter and closed drainage systems. Bonita Beach Road consists of 4 travel lanes with curb and gutter and closed drainage systems.

- The Imperial River is an Outstanding Florida Water (OFW); therefore, a 50% additional water quality treatment will be required. The WBID is also impaired for nutrients (a TMDL exists for Dissolved Oxygen and Total Nitrogen). A nutrient loading analysis will be performed.

- Stormwater runoff from US 41 is treated in an FDOT pond north and east of US 41. The six-laning for BBR was permitted in the past; however, the County withdrew plans to move forward with six-laning the road. Other permits exist for the developments surrounding the intersection.

- The NW quadrant of the intersection consists of a new roadway connection between US 41 and Bonita Beach Road via Windsor Road. The City of Bonita Springs (with RK&K as their design consultant) is designing portions of this new roadway connection with the intent that the PD&E study will widen the roadway in the future at its US 41 connection. Preliminary parcels shown as potential locations for pond sites were shared via a KMZ in Google Earth. A triangular (remnant) parcel was shown as a possible pond site for the basin for the NW quadrant roadway and BBR west of the intersection. This parcel is portrayed as this time not having plans for future development. The area to the west of the new roadway is planned for development. Coordination with RK&K is occurring to discuss if the City plans to use the triangular remnant parcel for their stormwater needs.

- Inwood indicated that a preliminary sizing on the remnant triangular parcel was able to accommodate the treatment/attenuation for the NW quadrant roadway and the net new improvements on BBR west of the intersection. FDOT asked if the City submitted a permit to SFWMD for this new roadway. Kittelson indicated that it is believed that the roadway plans are between 30% to 60% phase and that a permit hasn't been applied for yet. This will be verified with RK&K.

- There are three existing cross drains on the project. A single 10'x7' CBC under US 41 south of the intersection, a double 8'x4' CBC under BBR east of the intersection, and a single 24" RCP under US 41 north of the intersection that provides the outfall of the existing Center of Bonita Springs pond to the existing Arroyal Mall pond.

- A large canal exists east of the intersection that drains regional areas south of US 41 and surrounding developments by the intersection. The two existing box culverts convey the canal under US 41 and BBR. This canal discharges to the existing Arroyal Mall pond.

- The NE quadrant of the intersection will be improved with the DLT alternative. The improvements will have some encroachments into the Arroyal Mall pond and the existing canal. During the study, the minimization of impacts on the pond will be evaluated with the potential use of walls. The current canal will be enclosed with a box culvert along the NE quadrant segment. FDOT asked if the existing control structure of the Arroyal Mall pond would be impacted or modified. Inwood mentioned that the encroachments will slightly reduce the pond capacity, but as the study progresses and stormwater alternatives are investigated, the goal will be to maintain existing peak stages in the pond. Modifications to the existing control structure may be required.

- The outfall for the Arroyal Mall pond is north through an existing ditch between two businesses, then runs alongside the west side of the existing FDOT pond, turns west just south of The Lock Up Storage Facility and then turns north along the existing swale adjacent to US 41 and crosses under the bridge for the Imperial River Boat entrance side street, ultimately to the Imperial River (see picture below). The new roadway connection between Arroyal Road / Carolina St to US 41 will block this outfall pattern, necessitating a new cross drain underneath.

- FDOT asked if there were any existing easements for the ditch between the two businesses for the outfall of the Arroyal Mall pond. If there are no easements, we may need to consider to allow maintenance of the outfall ditch.

- The existing FDOT pond that treats US 41 contains a diversion berm. A few options were discussed to obtain more capacity in the pond to treat the improvements on US 41. One option is to eliminate the diversion berm and relocate the inflow and outflow of the ponds to keep the maximum flow path in the pond. FDOT asked if there were any uses for the diversion berm other than to maximize the flow path. Inwood indicated that the pond is fenced and does not provide any access to the public. The other option is expanding the pond to the parcel/lots adjacent west. The parcel immediately north of the Advanced Auto Parts store is owned by the City of Bonita Springs.

- FDOT indicated that the PSR evaluation matrix and cost comparison would show which option would be preferable for increasing capacity in the existing FDOT pond.

- Initial discussions with the City indicated flooding concerns at the homes west of Beaumont Rd and south of BBR. In addition, flooding concerns were brought up upstream of the double 8'x4' CBC. Improvements to the box culvert system and canal will need to consider these concerns.

- Pond Siting Report approach and methodology

    - One pond site per basin is to be evaluated. FDOT indicated that because this is a PD&E project, this approach is acceptable

    - Three basins were determined. Efforts to identify preliminary parcels for pond sites have started. Using/expanding the existing FDOT Pond and evaluating the triangular remnant parcel for the NW quadrant roadway were discussed. East of the intersection, a pond site was shown; however, Inwood indicated that it was the only parcel with no development, and further investigation is ongoing for this basin. Taking this runoff to the existing FDOT pond may be difficult since a pipe system would need to cross the canal/box culvert or be routed through local streets.

    - Will evaluate regional stormwater options (ELA/WATERSS). The Arroyal Mall pond already acts as a regional stormwater system and will remain for this study.

    - Water quality treatment will be provided for the net new impervious. Initial discussions with SFWMD during the proposal phase of the study indicated this was acceptable. This will be verified during the pre-application meeting set with SFWMD on July 26, 2023.

    - Compensating treatment will be evaluated where it is advantageous.

- Location Hydraulics Report and floodplain approach and methodology

    - A preliminary analysis of the cross drains will be performed.

    - FEMA floodplains associated with the Imperial River are located on the project. The river is tidal, and SFWMD indicated during the project proposal phase that floodplain compensation would not be required; however, this will be discussed and verified with SFWMD during the pre-application meeting on July 26, 2023.

3000 Dovera Drive, Suite 200, Oviedo, FL 32765 I P: 407-971-8850 I F: 407-971-8955 I www.inwoodinc.com

ACTION ITEMS:

1. FDOT TO INCLUDE PROJECT IN AGENDA FOR SFWMD JULY MEETING (**COMPLETED**)
2. SET COORDINATION MEETING WITH RK&K TO DISCUSS REMNANT PARCEL FOR STORMWATER NEEDS ON NW QUADRANT (**SET UP FOR AUGUST 3RD AT 9:00 AM**)

*****END OF MEETING*****

NOTE: THE ABOVE REFLECTS THE WRITER'S UNDERSTANDING OF THE CONTENTS OF THE MEETING. IF ANY MISINTERPRETATION OR INACCURACIES ARE INCLUDED, PLEASE CONTACT RENATO CHUW AT (407) 971-8850 OR RCHUW@INWOODINC.COM AS SOON AS POSSIBLE FOR RESOLUTION AND REVISIONS IF NECESSARY.

Meeting Minutes

3000 Dovera Drive, Suite 200, Oviedo, FL 32765 I P: 407-971-8850 I F: 407-971-8955 I www.inwoodinc.com

DATE: July 27, 2023

TO: **Patrick Bateman, P.E. – FDOT Project Manager**

FROM: Zach Evans, P.E.

RE: 444321-1; US 41 at Bonita Beach Road Intersection PD&E Study – SFWMD Meeting

CC: Brent Setchell (FDOT), Nicole Monies (FDOT), Patrick Bateman (FDOT), Melissa Roberts (SFWMD), Angelica Hoffert (SFWMD), Richard Batewell (SFWMD), Jack Freeman (Kittelson), Renato Chuw (Inwood), Jason Houck (Inwood), Ben Shepherd (Inwood)

FDOT's monthly pre-application meeting with SFWMD was held via TEAMS on July 26, 2023, at 10:00 am. The purpose of the meeting was to discuss the drainage criteria and approach for this PD&E Study with SFWMD staff. A summary of the meeting discussion is below:

- The meeting started with an introduction of the project team followed by a brief overview of the project. The project is a FDOT District One PD&E study to evaluate intersection improvement alternatives for US 41 at Bonita Beach Road (BBR) in Lee County.
- Two intersection alternatives were evaluated (a signalized intersection and a partial Displaced Left Turn – DLT). The partial DLT alternative is the recommended preferred option. The partial DLT concept was shared in the meeting via a KMZ in Google Earth.
- US 41 consists of 6 travel lanes with curb and gutter and closed drainage systems. Bonita Beach Road consists of 4 travel lanes with curb and gutter and 6 travel lanes from the Center of Bonita Springs entrance to Arroyal Road, and closed drainage systems.
- US 41 north and south of the intersection is treated within an FDOT pond north of the intersection located near the Imperial River east of US 41. Treatment and attenuation is provided within the pond before discharging to roadway swales, flowing to the Imperial River.
- Bonita Beach Road east of the intersection discharges directly to the concrete box culvert underneath the roadway, which flows to the Arroyal Mall Pond. The Arroyal Mall Pond is controlled by a weir structure north of Crown Lake Blvd, which outfalls to a ditch system flowing to the Imperial River.
- West of the intersection Bonita Beach Road is collected and conveyed to the Windsor Road swale, which outfalls north to the Imperial River.
- The Imperial River is the ultimate outfall for the project and is an Outstanding Florida Water (OFW); therefore, a 50% additional water quality treatment will be required. The WBID is also impaired for nutrients (a TMDL exists for Dissolved Oxygen and Total Nitrogen). A nutrient loading analysis will be performed.
- The proposed roadway improvements will include new quadrant roadways NW and NE of the intersection. The NW quadrant roadway will initially be built by the City of Bonita Springs. This project is only widening the NW quadrant's US 41 approach leg to accommodate future traffic.

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- The NW quadrant roadway will provide a connection between US 41 and Bonita Beach Road via Windsor Road. The City of Bonita Springs is designing portions of this new roadway connection and a triangular pond in a remnant parcel created by the new road. Our intent is to evaluate if this pond can serve the stormwater requirements for the PD&E study.

- A large canal exists east of the intersection draining regional areas south of US 41 and surrounding developments by the intersection. The two existing box culverts convey the canal under US 41 and BBR. This canal discharges to the existing Arroyal Mall pond.

- The intersection's NE quadrant will be improved with the DLT alternative. The improvements will encroach into the Arroyal Mall pond and the existing canal. During the study, the minimization of impacts on the pond will be evaluated with the potential use of walls. The current canal will be enclosed with a box culvert along the NE quadrant segment. Inwood mentioned that the encroachments will slightly reduce the pond capacity. SFWMD indicated pre vs post conditions for the Arroyal Mall pond must be met.

- Stormwater alternatives will be investigated including: (1) evaluating if the Arroyal Mall pond can be expanded to increase capacity, (2) route stormwater from Bonita Beach Road away from the Arroyal Mall pond to other proposed stormwater treatment alternatives. Ultimately, the goal will be to maintain existing peak stages in the Arroyal Mall pond.

- SFWMD stated clear documentation of the volumetric impacts to the pond and exhibits of the drainage areas routed away from the culvert will need to be provided to ensure no negative impacts to the stormwater facility will occur.

- The existing FDOT pond that treats US 41 contains a diversion berm. Alternatives were discussed to obtain more capacity in the pond to treat the improvements on US 41. One option is to eliminate the diversion berm and relocate the inflow and outflow of the ponds to keep the maximum flow path in the pond. The other option is expanding the pond to the parcel/lots adjacent west.

- Inwood stated the approach for water quality treatment will be to provide for the net new impervious. An additional 50% treatment volume will be provided to meet OFW Criteria. Nutrient Loading analysis will be provided due to the adopted TMDL for the basin.

- The improvements associated with the PD&E study will modify both the Arroyal Mall pond and the existing FDOT US 41 permits.

- FEMA floodplains associated with the Imperial River are located on the project. The Imperial River is tidal within the project limits and Inwood asked if floodplain compensation would be required. SFWMD stated that documentation would need to be provided that this area was tidal, but compensation would not be required for floodplain impacts.

- Inwood asked if pre vs post attenuation would be required for the project due to the tidal condition of the Imperial River. SFWMD stated that the existing permit for the US 41 pond meets the pre vs post attenuation criteria and should be followed for this study. Approved discharges to the Imperial River should also be met.

*****END OF MEETING*****

NOTE: THE ABOVE REFLECTS THE WRITER'S UNDERSTANDING OF THE CONTENTS OF THE MEETING. IF ANY MISINTERPRETATION OR INACCURACIES ARE INCLUDED, PLEASE CONTACT ZACH EVANS AT (407) 971-8850 OR ZEVANS@INWOODINC.COM AS SOON AS POSSIBLE FOR RESOLUTION AND REVISIONS IF NECESSARY.

Meeting Minutes

3000 Dovera Drive, Suite 200, Oviedo, FL 32765 I P: 407-971-8850 I F: 407-971-8955 I www.inwoodinc.com

DATE: August 3, 2023

TO: **Patrick Bateman, P.E. – FDOT Project Manager**

FROM: Renato Chuw, P.E.

RE: 444321-1; US 41 at Bonita Beach Road Intersection PD&E Study – Coordination with City's design consultant (RK&K) regarding NW quadrant roadway and stormwater pond

CC: Brent Setchell (FDOT), Nicole Monies (FDOT), Matt Feeney (City of Bonita Springs), Joel Langaney (City of Bonita Springs), Dave Hill (Bowman), Jack Freeman (Kittelson), Joseph Baan (RK&K), Zach Evans (Inwood)

A coordination meeting with RK&K (the City of Bonita Springs' design consultant for the NW quadrant roadway connection Windsor Road at Bonita Beach Road to US 41) was held to discuss the design status of the roadway and the proposed stormwater management. In attendance were: Patrick Bateman (FDOT), Jack Freeman (Kittelson), Travis Hills (Kittelson), Joseph Baan (RK&K), and Renato Chuw (Inwood). A summary of the meeting discussion is below:

- The meeting started with introducing the project team and a brief overview of the project. Inwood indicated FDOT District One is conducting a PD&E study for the intersection of US 41 and Bonita Beach Road to evaluate intersection improvement alternatives. Kittelson is the prime consultant for the PD&E study, and Inwood is assisting in the drainage evaluation.

- This meeting aimed to inquire about the status of the City's quadrant roadway design project connecting Bonita Beach Road to US 41 via Windsor Road and behind the Center of Bonita Springs Plaza.

- RK&K mentioned that the design is moving towards 60% completion, with plans submitted to the City in October 2023. A pre application meeting with SFWMD will be held during the week of August 7 – 11 to discuss the City's project and permit requirements.

- Kittelson indicated that 30% design CADD files by RK&K were provided on March 10, 2023. Kittelson requested if updated design files for the roadway alignment can be provided to the PD&E study team. A request will be sent to RK&K.

- RK&K indicated that a CSI (Continuous Flow intersection) is proposed at Bonita Beach Road and Windsor Road intersection. This was shown in 30% plans of May 2023. RK&K mentioned that the design CADD files provided to Kittelson early in the year were likely 15% design-level files.

- Kittelson asked if the horizontal alignment of the roadway behind the Publix stayed the same as what was provided to the team earlier of has it moved. RK&K indicated that the alignment has not significantly changed at that location.

- The roadway design by the Windsor Road and Bonita Beach Road intersection was updated to minimize impacts to the existing Windsor Road swale. The goal is to maintain the swale's drainage pattern. Compensatory treatment is proposed, with minor improvements at the intersection being untreated to the existing swale. Instead, the remnant parcel will collect and treat the existing Windsor Road pavement in the proposed pond. Inwood indicated some information was obtained for the existing swale during the permit research and will share that with RK&K.

- The City is designing the pond in the remnant parcel to treat and attenuate the runoff for the NW quadrant roadway from the Bonita Beach Road intersection to just west of Tuffy Auto Center at the US 41 and NW quadrant roadway's NW corner.

- RK&K indicated that they will maximize the pond usage in the remnant parcel due to having to meet several drainage criteria and constraints, such as OFW (Imperial River), pre vs. post attenuation, and nutrient loading. The design intent is for the pond to be a dry pond to meet the nutrient loading requirements. Underdrains underneath the pond bottom are proposed to draw down the water table and maximize the storage capacity in the pond. RK&K indicated the design of the pond is still ongoing and that more design information will be available in October when plans are submitted. It was suggested to reconvene in the future to get an update on the design of the roadway and the pond.

- The PD&E study proposes to add more impervious to the quadrant roadway as it ties to US 41 and beginning at the curve alignment. RK&K indicated that it does not think the pond will have extra capacity for the additional improvements to the roadway per the study. However, RK&K indicated that if the FDOT was able to convince SFWMD that attenuation was not required when direct discharging to the tidal Imperial River, some additional capacity might be available. A possible alternative discussed for the study is to evaluate if the Tuffy Auto Center parcel at US 41's NW corner and the NW quadrant roadway would be a viable pond site location for the FDOT project since the roadway improvements will impact the parcel. Inwood indicated that would be a possibility and could be investigated further.

- RK&K indicated that a segment of the proposed roadway is a rural-type typical section to provide cost savings to the City by implementing a roadside swale for drainage conveyance instead of a close drainage system. Kittelson mentioned the PD&E study initial concept shows the roadway with curb and gutter, noting that more room will be available to expand the pond.

- RK&K mentioned their current design shows two accesses to the Center of Bonita Springs Plaza (Old Time Pottery), and that access from the new roadway to the plaza should be preserved with the PD&E concept. The proposed accesses have not yet been discussed with the shopping center.

Action Items

1. RK&K to provide latest design CADD files for the quadrant roadway
2. Inwood to share permit information for the existing Windsor Swale and Bonita Beach Road

*****END OF MEETING*****

NOTE: THE ABOVE REFLECTS THE WRITER'S UNDERSTANDING OF THE CONTENTS OF THE MEETING. IF ANY MISINTERPRETATION OR INACCURACIES ARE INCLUDED, PLEASE CONTACT RENATO CHUW AT (407) 971-8850 OR RCHUW@INWOODINC.COM AS SOON AS POSSIBLE FOR RESOLUTION AND REVISIONS IF NECESSARY.

APPENDIX F

Existing Permit Information

GENERAL PERMIT DUE BY:
JULY 1, 1988

SURFACE WATER MANAGEMENT STAFF REVIEW SUMMARY

APPLICATION NO.: 11047-B

PROJECT NAME: Arroyal Mall

LOCATION: Lee County S33/T47S/R25E

APPLICANTS NAME AND ADDRESS: Captain Investments, Inc.
1645 Warden Avenue, Suite 305
Scarborough, Ontario Canada M1R 5B3

OWNER: Captain Investments, Inc.

DEVELOPER: Captain Investments, Inc.

ENGINEER: Hole, Montes & Associates, Inc.

REVIEWER RATING OF PROJECT DESIGN

1. Suitability of land for proposed use	GOOD	(FAIR)	POOR	NOT APPLICABLE
2. Water quantity impacts	GOOD	(FAIR)	POOR	NOT APPLICABLE
3. Water quality impacts	(GOOD)	FAIR	POOR	NOT APPLICABLE
4. Environmental impacts	GOOD	FAIR	POOR	(NOT SIGNIFICANT)
5. Water conservation	(GOOD)	FAIR	POOR	NOT APPLICABLE
6. Flood protection	(GOOD)	FAIR	POOR	NOT APPLICABLE
7. Relief from rainstorm inconvenience	(GOOD)	FAIR	POOR	NOT APPLICABLE
8. System maintainability	(GOOD)	FAIR	POOR	NOT APPLICABLE
9. Overall use of land with respect to water resource	(GOOD)	FAIR	POOR	NOT APPLICABLE
10. Water management system with respect to feasible alternatives	GOOD	(FAIR)	POOR	NOT APPLICABLE

SURFACE WATER MANAGEMENT EVALUATION

APPLICATION NUMBER 11047-B DATE: May 2, 1988

PROJECT NAME: Arroyal Mall

LOCATION: Lee COUNTY

SECTION 33, TOWNSHIP 47 SOUTH, RANGE 25 EAST

PROJECT AREA 18.1 ACRES DRAINAGE AREA 393.5 ACRES *

* Several permitted projects and other off-site areas currently drain through this site and will continue to do so after development (see Exhibit 2).

FACILITIES:

1. EXISTING: This 18.1 acre site lies within a 415.0 acre sub-basin of the Imperial River watershed. The site contains a 5.0 acre inactive borrow pit. The following off-site areas currently drain through this site (see Exhibit 2):

Name	Permit No.	Area	
Sunshine Superex	36-00203-S	21.5	acres
Springs Plaza	36-00317-S	24.8	acres
Center of Bonita Springs	36-00718-S	32.0	acres
Bonita Beach Boulevard	GP 87-20	18.6	acres
Woods Edge DRI	36-00854-S	119.5	acres
Undeveloped Off-site	----	180.5	acres

Runoff from these areas enters this site from the east, the west and the south and exits (along with the site's own runoff) through an existing ditch which conveys the flow north to the Imperial River.

2. PROPOSED: A General Permit is requested for an 18.1 acre commercial park consisting of six lots and a 1.9 acre lake. The proposed drainage design will accept runoff from all of the off-site areas that currently drain through the site (415.0 acres) with the exception of Sunshine Superex (21.5 acres) which will be routed around the project via an interceptor swale (see Exhibits 3 & 4).

Runoff from this project and 375.4 acres of off-site lands (for a total of 393.5 acres) will be directed via inlets, culverts and swales into the 1.9 acre lake. Runoff from each commercial lot will be routed through dry pretreatment areas prior to entering the lake (see Special Condition No. 9). Discharge from the lake will be directed through a control structure consisting of 1-15.5' wide weir with a crest at elevation 8.0' NGVD and 1-20 degree V-notch bleeder with an invert at elevation 7.0' NGVD discharging to the Imperial River via an existing ditch. The applicant's engineer has reasonably demonstrated that the existing ditch has the capacity to handle more than the anticipated peak runoff and that downstream impacts will not occur as a result of development.

DRAINAGE BASIN Imperial River RECEIVING BODY Imperial River

RUN OFF FORMULA PRE vs. POST ALLOWABLE DISCHANGE 85 CFS $

$ This figure reflects the 373.5 acre drainage basin. The actual allowable discharge for this 18.1 acre site is 2 cfs.

REQUIRED DETENTION 2.0 AC-FT
DETENTION METHOD Lake
DETENTION PROVIDED 2.0 AC-FT

FLOOD PROTECTION		
LOCAL ROAD CRITERIA	5	YEAR, 24 HOUR STORM
FLOOD CONTOUR	9.2	FEET NGVD
MINIMUM ROAD GRADE	10.0	FEET NGVD
BASIN DESIGN FREQUENCY	25	YEAR, 72 HOUR STORM
FLOOD CONTOUR	9.8	FEET NGVD
DESIGN DISCHARGE	85	CFS
100 YEAR FLOOD		
FLOOD CONTOUR	11.0	FEET NGVD
MINIMUM FLOOR ELEVATION	12.0	FEET NGVD
FIA FLOOD ELEVATION	12.0	FEET NGVD

WATER QUALITY

A. ADVERSE IMPACTS EXPECTED: NO

B. BEST MANAGEMENT PRACTICES UTILIZED: Detention provided in excess of the first inch over the project site.

ENVIRONMENTAL

A. SIGNIFICANT ADVERSE IMPACTS EXPECTED: NO

B. COMMENTS: The project site contains pine flatwoods, cleared and improved lands, a borrow lake, oak hammocks and a wetland area (0.6 acres). This system contains a marsh and hydric hammocks. This area is located immediately to the north with eventual outfall to the Imperial River. The submitted information indicated that a wildlife survey was performed on this site. This survey located approximately six active gopher tortoise burrows within uplands areas on-site.

The project as proposed includes the construction of water management facilities to serve a commercial development. The existing wetlands and some adjacent upland areas will be incorporated into the water management system. A portion of the existing borrow lake will be filled. The gopher tortoises are to be relocated in accordance with the FGFWFC requirements.

Adverse environmental impacts are not anticipated as a result of the construction and operation of the water management facilities.

LAND USE

PRESENT ZONING Commercial Planned Development, ALLOWED DENSITY N/A DU/A

PROPOSED USE Commercial Park, PROPOSED DENSITY N/A DU/A

COMPATIBLE: YES

POTABLE WATER: Bonita Springs Water System, Inc.

PERMITTED ALLOCATION	3.0986	MGD
PRESENT WITHDRAWAL	1.5973	MGD
PROJECTED DEMAND	0.0330	MGD

WASTEWATER TREATMENT: Environmental Systems, Inc. (see Additional Comments)

ADDITIONAL COMMENTS: Wastewater treatment will be temporarily provided by on-site drainfields (if necessary) until the construction of Environmental Systems' wastewater treatment plant is completed.

APPLICABLE LAND AREA

	Project	Phase Construction
Total	18.1 acres;	18.1 acres
Water Management	1.9 acres;	1.9 acres
Impervious	11.6 acres;	11.6 acres
Commercial	100,000 sq ft;	100,000 sq ft

Location: This site is located in the northeast corner of the intersection of Bonita Beach Boulevard (CR 865) and U.S. 41.

County: Lee

Special District: None

SFWMD Basin: Imperial River

Operation Entity: Property Owners Association

The Staff recommends that the following be issued:

__X__General Permit

_____Construction and Operation Permit

_____Construction Permit

_____Operation Permit

_____Letter of Conceptual Approval

_____Right-of-Way Occupancy Permit

	APPLICATION REVIEWER:	SUPERVISOR/CHECKER:
TECHNICAL:	J. Hiscock	E. Yaun
WATER QUALITY:	J. Hiscock	S. Anderson
ENVIRONMENTAL:	R. Boylan	C. Padera

APPROVED:

DIVISION DIRECTOR: _____ DATE: 3/17/88

for James T. Show, P.E.
Water Management Division
Resource Control Department

Subject to the following 12 Standard Limiting and 9 Special Conditions (for conceptual approvals only, these conditions as a minimum will apply to subsequent construction permitting).

LIMITING CONDITIONS

1. THE PERMITTEE SHALL PROSECUTE THE WORK AUTHORIZED IN A MANNER SO AS TO MINIMIZE ANY ADVERSE IMPACT OF THE WORKS ON FISH, WILDLIFE, NATURAL ENVIRONMENTAL VALUES, AND WATER QUALITY. THE PERMITTEE SHALL INSTITUTE NECESSARY MEASURES DURING THE CONSTRUCTION PERIOD, INCLUDING FULL COMPACTION OF ANY FILL MATERIAL PLACED AROUND NEWLY INSTALLED STRUCTURES, TO REDUCE EROSION, TURBIDITY, NUTRIENT LOADING AND SEDIMENTATION IN THE RECEIVING WATERS.

2. WATER QUALITY DATA FOR THE WATER DISCHARGED FROM THE PERMITTEE'S PROPERTY OR INTO SURFACE WATERS OF THE STATE SHALL BE SUBMITTED TO THE DISTRICT AS REQUIRED. PARAMETERS TO BE MONITORED MAY INCLUDE THOSE LISTED IN CHAPTER 17-3. IF WATER QUALITY DATA IS REQUIRED, THE PERMITTEE SHALL PROVIDE DATA AS REQUIRED, ON VOLUMES OF WATER DISCHARGED, INCLUDING TOTAL VOLUME DISCHARGED DURING THE DAYS OF SAMPLING AND TOTAL MONTHLY DISCHARGES FROM THE PROPERTY OR INTO SURFACE WATERS OF THE STATE.

3. THE PERMITTEE SHALL COMPLY WITH ALL APPLICABLE LOCAL SUBDIVISION REGULATIONS AND OTHER LOCAL REQUIREMENTS. IN ADDITION THE PERMITTEE SHALL OBTAIN ALL NECESSARY FEDERAL, STATE, LOCAL AND SPECIAL DISTRICT AUTHORIZATIONS PRIOR TO THE START OF ANY CONSTRUCTION OR ALTERATION OF WORKS AUTHORIZED BY THIS PERMIT.

4. THE OPERATION PHASE OF THIS PERMIT SHALL NOT BECOME EFFECTIVE UNTIL A FLORIDA REGISTERED PROFESSIONAL ENGINEER CERTIFIES THAT ALL FACILITIES HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE DESIGN APPROVED BY THE DISTRICT. WITHIN 30 DAYS AFTER COMPLETION OF CONSTRUCTION OF THE SURFACE WATER MANAGEMENT SYSTEM, THE PERMITTEE SHALL SUBMIT THE CERTIFICATION AND NOTIFY THE DISTRICT THAT THE FACILITIES ARE READY FOR INSPECTION AND APPROVAL. UPON APPROVAL OF THE COMPLETED SURFACE WATER MANAGEMENT SYSTEM, THE PERMITTEE SHALL REQUEST TRANSFER OF THE PERMIT TO THE RESPONSIBLE ENTITY APPROVED BY THE DISTRICT.

5. ALL ROADS SHALL BE SET AT OR ABOVE ELEVATIONS REQUIRED BY THE APPLICABLE LOCAL GOVERNMENT FLOOD CRITERIA.

6. ALL BUILDING FLOORS SHALL BE SET AT OR ABOVE ELEVATIONS ACCEPTABLE TO THE APPLICABLE LOCAL GOVERNMENT.

7. OFF-SITE DISCHARGES DURING CONSTRUCTION AND DEVELOPMENT SHALL BE MADE ONLY THROUGH THE FACILITIES AUTHORIZED BY THIS PERMIT. NO ROADWAY OR BUILDING CONSTRUCTION SHALL COMMENCE ON-SITE UNTIL COMPLETION OF THE PERMITTED DISCHARGE STRUCTURE AND DETENTION AREAS. WATER DISCHARGED FROM THE PROJECT SHALL BE THROUGH STRUCTURES HAVING A MECHANISM SUITABLE FOR REGULATING UPSTREAM WATER STAGES. STAGES MAY BE SUBJECT TO OPERATING SCHEDULES SATISFACTORY TO THE DISTRICT.

8. NO CONSTRUCTION AUTHORIZED HEREIN SHALL COMMENCE UNTIL A RESPONSIBLE ENTITY ACCEPTABLE TO THE DISTRICT HAS BEEN ESTABLISHED AND HAS AGREED TO OPERATE AND MAINTAIN THE SYSTEM. THE ENTITY MUST BE PROVIDED WITH SUFFICIENT OWNERSHIP SO THAT IT HAS CONTROL OVER ALL WATER MANAGEMENT FACILITIES AUTHORIZED HEREIN. UPON RECEIPT OF WRITTEN EVIDENCE OF THE SATISFACTION OF THIS CONDITION, THE DISTRICT WILL ISSUE AN AUTHORIZATION TO COMMENCE CONSTRUCTION.

9. THE PERMIT DOES NOT CONVEY TO THE PERMITTEE ANY PROPERTY RIGHT NOR ANY RIGHTS OR PRIVILEGES OTHER THAN THOSE SPECIFIED IN THE PERMIT AND CHAPTER 40E-4, FAC.

10. THE PERMITTEE SHALL HOLD AND SAVE THE DISTRICT HARMLESS FROM ANY AND ALL DAMAGES, CLAIMS, OR LIABILITIES WHICH MAY ARISE BY REASON OF THE CONSTRUCTION, OPERATION, MAINTENANCE OR USE OF ANY FACILITY AUTHORIZED BY THE PERMIT.

11. THIS PERMIT IS ISSUED BASED ON THE APPLICANT'S SUBMITTED INFORMATION WHICH REASONABLY DEMONSTRATES THAT ADVERSE OFF-SITE WATER RESOURCE RELATED IMPACTS WILL NOT BE CAUSED BY THE COMPLETED PERMIT ACTIVITY. IT IS ALSO THE RESPONSIBILITY OF THE PERMITTEE TO INSURE THAT ADVERSE OFF-SITE WATER RESOURCE RELATED IMPACTS DO NOT OCCUR DURING CONSTRUCTION.

12. PRIOR TO DEWATERING, PLANS SHALL BE SUBMITTED TO THE DISTRICT FOR APPROVAL. INFORMATION SHALL INCLUDE AS A MINIMUM: PUMP SIZES, LOCATIONS AND HOURS OF OPERATION FOR EACH PUMP. IF OFF-SITE DISCHARGE IS PROPOSED, OR OFF-SITE ADVERSE IMPACTS ARE EVIDENT, AN INDIVIDUAL WATER USE PERMIT MAY BE REQUIRED. THE PERMITTEE IS CAUTIONED THAT SEVERAL MONTHS MAY BE REQUIRED FOR CONSIDERATION OF THE WATER USE PERMIT APPLICATION.

SPECIAL CONDITIONS

1. MINIMUM BUILDING FLOOR ELEVATION 12.0 FEET NGVD.

2. MINIMUM ROAD CROWN ELEVATION 10.0 FEET NGVD.

3. DISCHARGE FACILITIES:

   DESCRIPTION: 1-15.5' WIDE WEIR WITH A CREST AT ELEVATION 8.0' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT ELEVATION 7.0' NGVD.

   RECEIVING WATER: IMPERIAL RIVER VIA AN EXISTING DITCH.

   CONTROL ELEVATION: 7.0 FEET NGVD.

4. THE PERMITTEE SHALL BE RESPONSIBLE FOR THE CORRECTION OF ANY WATER QUALITY, EROSION, OR SHOALING PROBLEMS THAT RESULT FROM THE CONSTRUCTION OR OPERATION OF THE SURFACE WATER MANAGEMENT SYSTEM.

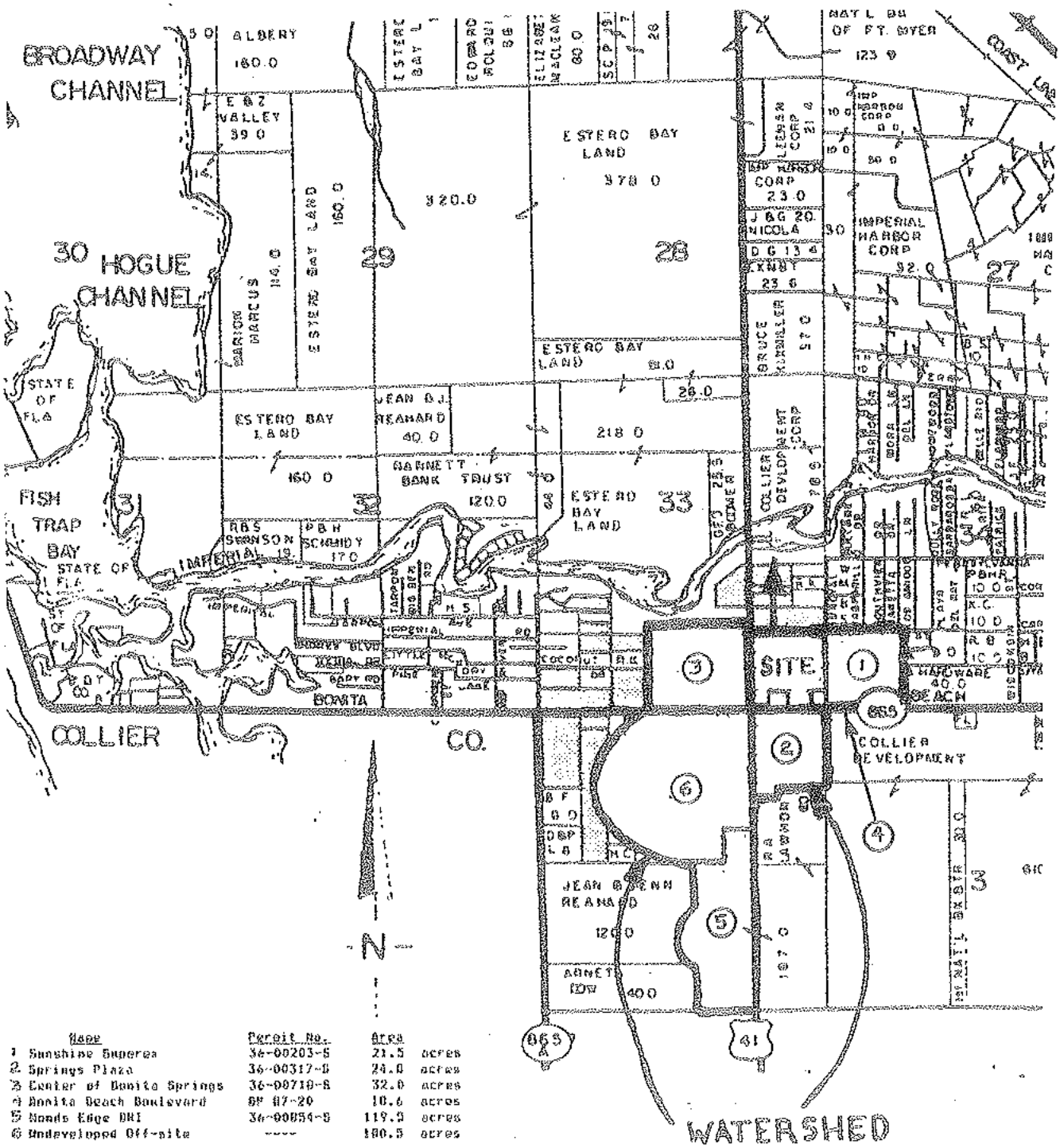
5. MEASURES SHALL BE TAKEN DURING CONSTRUCTION TO INSURE THAT SEDIMENTATION AND/OR TURBIDITY PROBLEMS ARE NOT CREATED IN THE RECEIVING WATER.

6. THE DISTRICT RESERVES THE RIGHT TO REQUIRE THAT WATER QUALITY TREATMENT METHODS BE INCORPORATED INTO THE DRAINAGE SYSTEM IF SUCH MEASURES ARE SHOWN TO BE NECESSARY.

7. OPERATION OF THE SURFACE WATER MANAGEMENT SYSTEM SHALL BE THE RESPONSIBILITY OF A PROPERTY OWNERS ASSOCIATION.

8. PRIOR TO THE INITIATION OF ANY WITHDRAWAL OF WATER (IRRIGATION, DEWATERING, PUBLIC WATER SUPPLY, ETC.), IT WILL BE NECESSARY TO APPLY FOR A WATER USE PERMIT. THE PERMITTEE IS CAUTIONED THAT A MINIMUM OF 90 DAYS IS REQUIRED FOR CONSIDERATION OF THE WATER USE PERMIT APPLICATION. THE PERMITTEE IS CAUTIONED THAT THE ISSUANCE OF A SURFACE WATER MANAGEMENT PERMIT SHALL NOT BE CONSTRUED TO BE A GUARANTEE THAT WATER WILL BE AVAILABLE.

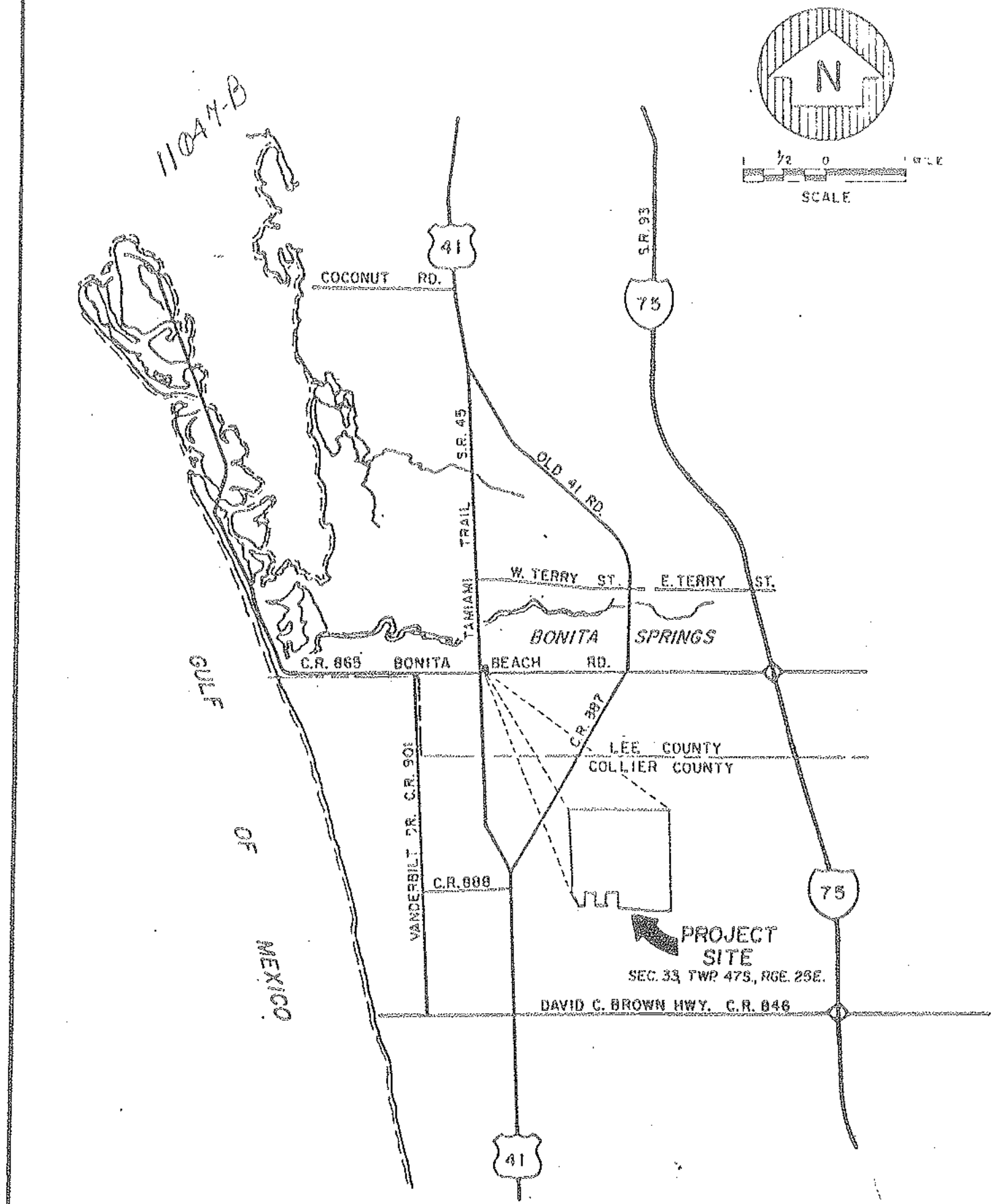
9. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION OF FUTURE PHASES, PAVING, GRADING, AND DRAINAGE PLANS SHALL BE SUBMITTED TO THE DISTRICT FOR REVIEW AND APPROVAL. EACH COMMERCIAL TRACT SHALL PROVIDE ONE HALF INCH OF DRY PRETREATMENT AND SHALL NOT EXCEED 85 PERCENT OF IMPERVIOUS AREA WITHOUT PROVIDING ADDITIONAL WATER MANAGEMENT TO COMPENSATE.



Name	Permit No.	Area
1 Sunshine Squares	36-00203-S	21.5 acres
2 Springs Plaza	36-00317-S	24.0 acres
3 Center of Bonita Springs	36-00710-S	32.0 acres
4 Bonita Beach Boulevard	BP #7-20	10.6 acres
5 Woods Edge DRI	36-00054-S	119.9 acres
6 Undeveloped Off-site	-----	180.5 acres

LOCATION MAP

EXHIBIT 2



LOCATION MAP

EXHIBIT

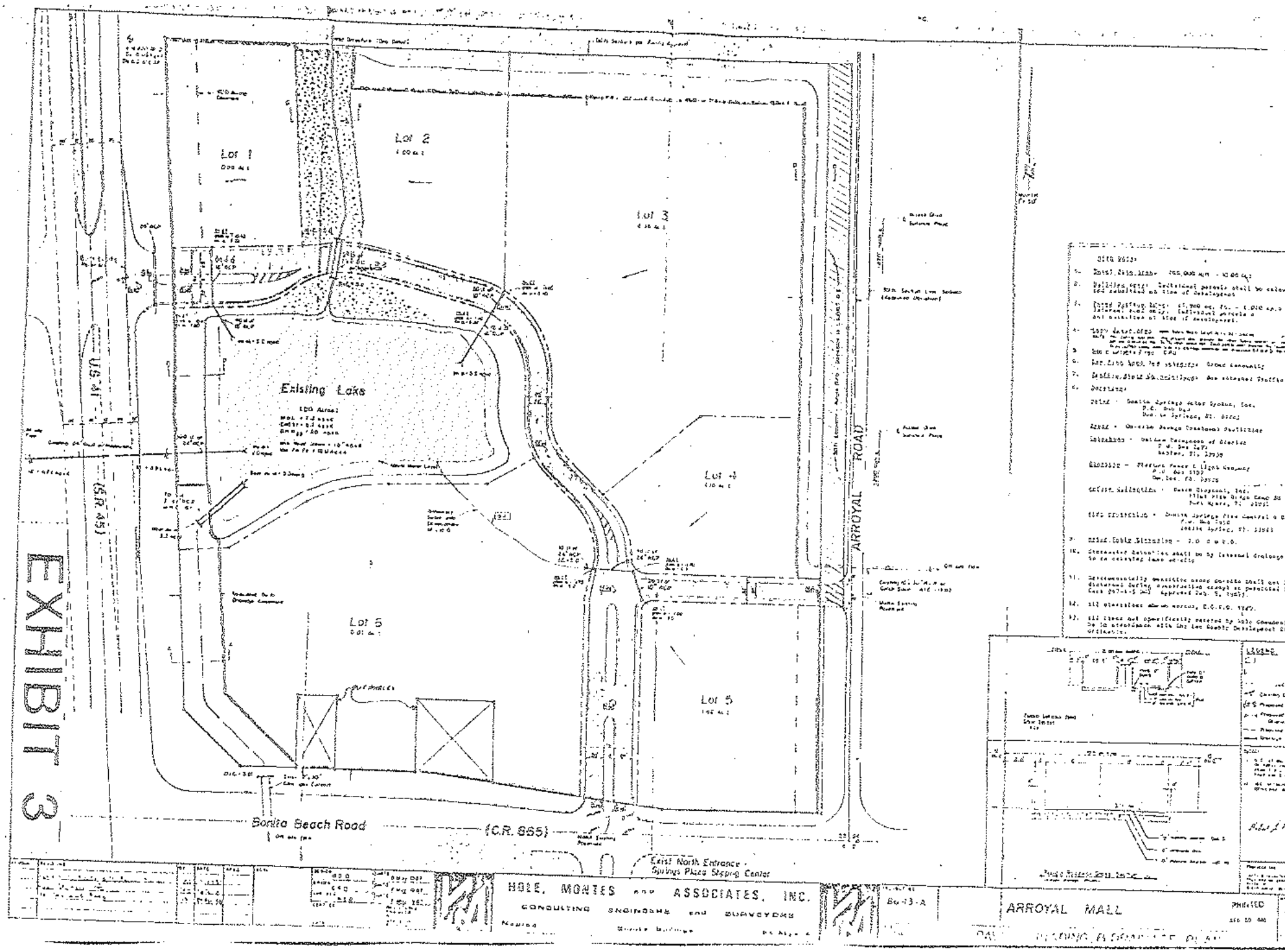
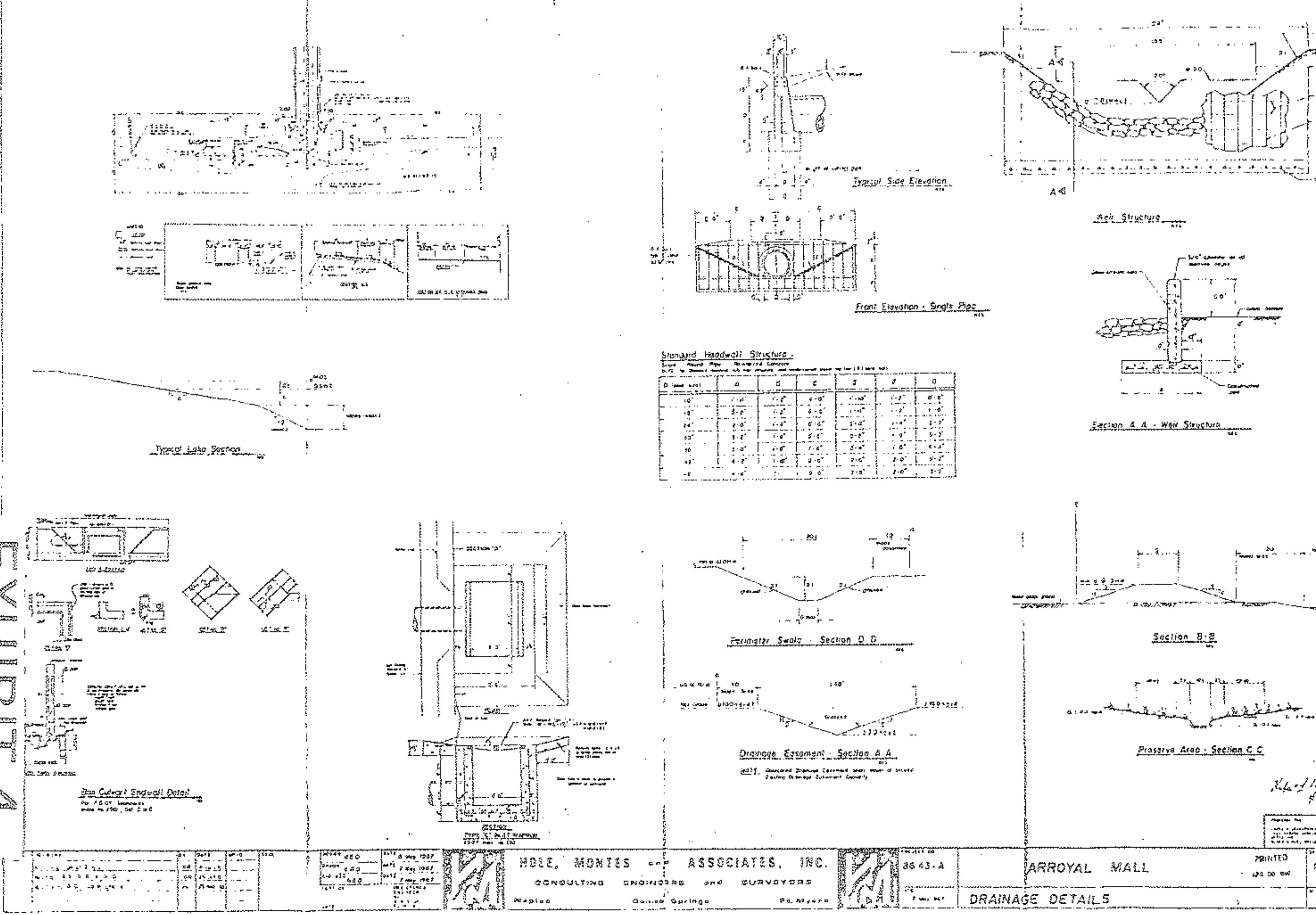


EXHIBIT 3
Lot 1
Lot 2
Lot 3
Lot 4
Lot 5
Lot 5
Existing Lakes
ARROYAL ROAD
Bonita Beach Road (C.R. 865)
US 41 (SR 45)
Exist North Entrance - Bonita Plaza Shopping Center
HOLE, MONTES and ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
ARROYAL MALL

EXHIBIT 4



Typical Side Elevation
Front Elevation - Single Pipe
Standard Headwall Structure
Weir Structure
Section A-A - Weir Structure
Typical Lake Section
Perimeter Swale - Section D-D
Drainage Easement - Section A-A
Section B-B
Preserve Area - Section C-C
Box Culvert Endwall Detail
HOLE, MONTES and ASSOCIATES, INC.
CONSULTING ENGINEERS and SURVEYORS
Naples
Bonita Springs
Ft. Myers
8643-A
ARROYAL MALL
DRAINAGE DETAILS
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X Engineer, County of:
Lee
Engineer, City of:

Local Drainage District:

DEPT. OF ENVIRONMENTAL REGULATION

X Ft. Myers
Orlando
Port St. Lucie
Tallahassee
West Palm Beach

BUILDING AND ZONING

Boca Raton
Boynton Beach
Royal Palm Beach
Tequesta
West Palm Beach

COUNTY

Broward -Director, Water Mgmt. Div.
-BCEQCB
Collier -Agricultural Agent
Dade -DERM
X Lee -Long Range Planning
X -Mosquito Control
X -E.P.S.
Martin -Attorney
-Board of County Commissioners
-Community Development Director
Palm Beach -Building Dept.
-School Brd., Plant Planning
Polk -Water Resources Dept.

OTHER

Fred Vidzes, Big Cypress Basin
Kissimmee River Coordinating Council

EXHIBIT 5

OFFSITE #4 (5 YR)

Program Name........................ Santa Barbara -- [illegible]

Project Name........................ [illegible]
Engineer's Name..................... ND
Project Area........................ [illegible] acres
Ground Storage...................... .01 inches
Termination Discharge............... 1 cfs
Time of Concentration............... .17 hours
Distribution Type................... SFWMD
Return Frequency.................... 5 years
Rainfall Duration................... 1-day
24-hr Rainfall...................... 5.4 inches
Reporting Sequence.................. Standardized
Discharge Hydrograph................ OFF4

Point No.	Stage (ft)	Storage (af)	Discharge (cfs)
1	7.00	0.00	0.00
2	8.00	[illegible]	[illegible]
3	9.00	0.00	7.32
4	10.00	0.00	[illegible]
5	11.00	0.16	7.32
6	12.00	0.82	12.67
7	13.00	[illegible]	16.32
8	14.00	7.01	19.25

					- - - - - R E S E R V O I R - - - - -				
Time (hr)	Rain fall (in)	Accum. Runoff (in)	Basin Dischg (cfs)	Accum. Inflow (af)	Volume (af)	Accum. Outflow (af)	Instant Dischge (cfs)	Average Dischge (cfs)	Stage (ft)
0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	7.00
4.00	0.24	[illegible]	1.0	0.2	0.0	0.2	1.0	0.7	[illegible]
8.00	0.74	[illegible]	1.1	0.7	0.0	0.7	2.1	1.5	[illegible]
10.00	1.15	1.14	[illegible]	1.2	0.0	1.1	3.0	2.5	7.42
11.00	1.45	[illegible]	4.4	1.5	0.0	1.4	4.4	3.5	7.60
11.50	1.72	1.71	6.7	1.7	0.1	1.7	6.7	5.5	[illegible]
11.75	[illegible]	2.02	23.9	2.2	0.4	1.8	7.4	7.1	11.02
12.00	[illegible]	3.53	[illegible]	3.1	1.1	2.0	12.7	10.1	[illegible]
12.50	3.94	3.92	[illegible]	4.0	1.5	2.6	14.1	13.6	[illegible]
13.00	4.14	4.13	[illegible]	[illegible]	1.2	3.2	13.7	14.0	[illegible]
14.00	4.42	4.41	[illegible]	4.7	0.5	4.2	10.4	12.7	[illegible]
16.00	4.75	4.74	2.1	5.0	0.0	5.0	[illegible]	5.0	7.29
20.00	5.14	5.13	[illegible]	5.5	0.0	5.4	[illegible]	1.3	7.17
24.00	5.40	5.39	0.8	5.7	0.0	5.7	0.8	0.9	7.11

Maximum Stage = [illegible] feet
Maximum Discharge = 14.12 cfs

OFFSITE #5 (5 YR)

Program Name........................ Santa Barbara -- (05/08/84)

Project Name........................ #4
Engineer's Name..................... ND
Project Area........................ 5.8 acres
Ground Storage...................... .01 inches
Termination Discharge............... 1 cfs
Time of Concentration............... .17 hours
Distribution Type................... SFWMD
Return Frequency.................... 5 years
Rainfall Duration................... 1-day
24-hr Rainfall...................... 5.4 inches
Reporting Sequence.................. Standardized
Discharge Hydrograph................ OFF5

Point No.	Stage (ft)	Storage (af)	Discharge (cfs)
1	8.75	0.00	0.00
2	9.00	0.08	0.10
3	9.50	0.13	0.20
4	10.00	0.25	13.30
5	11.00	0.50	13.30
6	12.00	1.02	23.00
7	13.00	1.77	29.70

					- - - - - R E S E R V O I R - - - - -				
Time (hr)	Rain fall (in)	Accum. Runoff (in)	Basin Dischge (cfs)	Accum. Inflow (af)	Volume (af)	Accum. Outflow (af)	Instant Dischge (cfs)	Average Dischge (cfs)	Stage (ft)
0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	8.75
4.00	0.24	0.23	0.4	0.1	0.1	0.0	0.1	0.1	9.20
8.00	0.74	0.73	0.9	0.3	0.1	0.2	0.9	0.5	9.53
10.00	1.15	1.14	1.4	0.5	0.2	0.4	1.4	1.1	9.54
11.00	1.45	1.44	2.0	0.7	0.2	0.5	1.9	1.5	9.56
11.50	1.72	1.71	3.1	0.8	0.2	0.6	2.8	2.3	9.60
11.75	2.05	2.02	10.8	1.0	0.3	0.7	7.2	5.0	9.77
12.00	3.54	3.53	19.7	1.4	0.5	0.9	13.3	10.2	10.14
12.50	3.94	3.92	6.0	1.8	0.4	1.5	13.3	13.3	10.16
13.00	4.14	4.13	2.6	2.0	0.2	1.8	3.0	7.7	9.61
14.00	4.42	4.41	1.5	2.1	0.2	2.0	1.6	2.1	9.56
16.00	4.75	4.74	0.9	2.3	0.1	2.1	0.9	1.1	9.53
20.00	5.14	5.13	0.6	2.5	0.1	2.3	0.6	0.6	9.51
24.00	5.40	5.39	0.4	2.6	0.1	2.5	0.4	0.4	9.51

Maximum Stage = 10.37 feet
Maximum Discharge = 13.30 cfs

HOLE, MONTES & ASSOCIATES, INC.
Consulting Engineers-Land Surveyors
6202-F Presidential Court
FT. MYERS, FLORIDA 33919
(813) 481-7874

SUBJECT
DESIGN ND DATE 3/11/88
CHECKED BY DATE
SCALE SHEET NO 19

DRAINAGE PIPES

- OFFSITE RUNOFF VIA DRAINAGE EASEMENT TO LAKE

ASSUME h = 0.5'

Q_{max} = OFFSITE AREAS 1, 2, 4 + 5

Q_{max} = 10 cfs + 40.6 cfs + 16.36 cfs + 15.59 cfs = 82.75 cfs

L = 76'

n = 0.013

TRY 42" RCP : R = 0.875

A = 9.62

$$V = \left[2(32.2)(0.5) \Big/ \left(1.2 + \frac{29(0.013)^2(76)}{0.875^{1.33}}\right)\right]^{1/2}$$

V = 4.42 ft/s

Q = VA = (4.42 ft/s)(9.62 ft²) = 42.52 cfs × 2 pipes

= 85 cfs OK

USE 2- 42" RCP

- LAKE TO PRESERVE AREA

ASSUME h = 0.2'

Q_{max} = 84.5 cfs

L = 45'

n = 0.013

TRY 7'x4' BC: R = 1.33

A = 27.11 ft²

$$V = \left[2(32.2)(0.2) \Big/ \left(1.2 + \frac{29(0.013)^2(45)}{1.33^{1.33}}\right)\right]^{1/2}$$

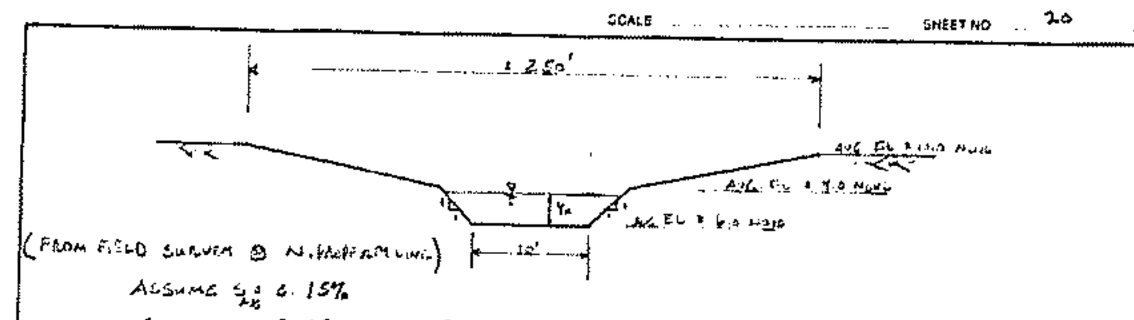
V = 3.09 ft/s

Q = VA = (3.09 ft/s)(27.11 ft²) = 83.8 cfs OK

USE 1- 7'x4' Box culvert

HOLE, MONTES & ASSOCIATES, INC.
Consulting Engineers-Land Surveyors
6202-F Presidential Court
FT. MYERS, FLORIDA 33907
(813) 481-7874

SUBJECT OUTFALL DITCH CAPACITY
DESIGN ND DATE 3/11/88
CHECKED BY DATE
SCALE SHEET NO 20



(FROM FIELD SURVEY @ N. [illegible] LINE)

ASSUME S = 0.15%

CHANNEL n = 0.05

FLOODPLAIN n = 0.12

SECTION A-A
NTS

STAGE / DISCHARGE : $Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

$A = Y_n^2 + 10Y_n$

$R = \frac{Y_n^2 + 10Y_n}{10 + 2Y_n\sqrt{2}}$

@ 7.0	Y_n = 1.0	(ASSUME FOR ROUTING PURPOSES Q = 0)			
@ 7.5	Y_n = 1.5	A = 17.25	R = 1.21	Q = 22.62 cfs	
@ 8.0	Y_n = 2.0	A = 24.0	R = 1.53	Q = 36.83 cfs	
@ 8.5	Y_n = 2.5	A = 31.25	R = 1.83	Q = 54.07 cfs	
@ 9.0	Y_n = 3.0	A = 39.0	R = 2.11	Q = 74.23 cfs	
@ 9.5	Y_n = 3.5	A = 47.25	R = 2.37	Q = 97.23	> 102.79
	(FLOODPLAIN)	A = 29.25	R = 0.25	Q = 5.56	
@ 10.0	Y_n = 4.0	A = 56.0	R = 2.63	Q = 123.54	> 158.90
	(FLOODPLAIN)	A = 117.0	R = 0.5	Q = 35.36	

DRAFT

BYLAWS

OF

ARROYAL MALL PROPERTY OWNERS' ASSOCIATION, INC.

ARTICLE I

Name

SECTION 1. The name of this corporation is the ARROYAL MALL PROPERTY OWNERS' ASSOCIATION, INC.

Offices

SECTION 2. Its principal office shall be located at Willis & Meyer Real Estate, Inc., 4040 Bonita Beach Road, SW, Bonita Springs, Florida 33923. Other offices for the transaction of business shall be located at such places as the board of directors may from time to time determine.

ARTICLE II

Membership in this corporation shall be limited to the subscribers and those parties owning commercial property in a development known as "The Arroyal Mall" which development is located on real property described on attached Exhibit "A", and which properties are included in a deed or deeds of restrictions, or other covenants running with the land, covering the properties or portions thereof and specifically referencing in their texts "The Arroyal Mall Property Owners' Association".

ARTICLE III

Purpose

The purpose of the ARROYAL MALL PROPERTY OWNERS' ASSOCIATION, INC., shall be to enforce the maintenance and preservation of the drainage and surface water management system including water monitoring and maintenance as required by the development order covering the project, and as required by the South Florida Water Management District permit covering the project, and to levy assessments and to collect same for the purpose of providing funds with which to continue operation, enforcement and maintenance of the drainage and surface water management system. The Association shall also be empowered to establish a Community Disaster Plan and a program of information and education covering disaster vulnerability and community protection. The Association is empowered to enforce and make assessments to enforce all the provisions of the Deed Restrictions for the development.

ARTICLE IV

Members' Meetings

SECTION 1. An Annual Meeting of the members shall be held on the first Monday of December in each year at the principal office of the corporation. At such meeting, the members shall elect directors and officers to serve as provided by the charter, or these bylaws or until their successors shall be elected and qualified.

SECTION 2. A special meeting of the members may be called at any time and place by the president, vice-president or by a

majority of the board of directors. It shall be the duty of the president, vice-president or the board of directors to call such a meeting whenever so requested by members representing a majority of the votes in the Association.

SECTION 3. Notice of the time and place of all annual and special meetings shall be mailed by the secretary-treasurer to each member ten days before the date thereof, but each member respectively may dispense with the notice requirement by signing written waiver.

SECTION 4. The president, or in his absence, the vice-president, shall preside at all such meetings.

SECTION 5. At every such meeting, each member will be entitled to cast one vote for each residential parcel owned. If a parcel is owned jointly, its owners shall have one vote amongst them which may not be casted fractionally. If joint owners are not in agreement as to their vote, it shall not be considered in any given ballot except for purposes of determining a quorum.

SECTION 6. A quorum for the transaction of business at any such meeting shall consist of a representation of a majority of the residential parcels, either in person or by proxy. The members present at any meeting, though less than a quorum, may adjourn the meeting to a future time.

SECTION 7. Notwithstanding anything herein to the contrary, for a period of time sufficient for the Developer, Captain Investments, Inc., or its successor in interest, to complete the development of the referenced property (see Exhibit "A") or a period of five years whichever comes first, Captain Investments,

Inc., or its successor, shall maintain control and responsibility for the obligation of this Association and no meeting of the members shall be required unless an assessment against other members is proposed during this period.

ARTICLE IV

Directors

SECTION 1. The business and property of the corporation shall be managed by a board of directors of not less than three (3) or more than five (5) in number, who shall be elected by the members and shall receive such compensation for their services as the members authorize.

SECTION 2. The regular meetings of the directors shall be held at the principal office of the corporation immediately after the adjournment of each annual membership meeting upon the same or a succeeding day or at such other place as a majority of the board may agree upon.

SECTION 3. Special meetings of the board of directors, to be held in the principal office of the corporation, may be called by the president, vice-president or a majority of the board. By unanimous consent of the directors, special meetings of the board may be held without notice at any time and place.

SECTION 4. Notice of all regular and special meetings shall be mailed to each director by the secretary-treasurer, or in his absence, by the president or vice-president, at least five days previous to the time fixed for the meeting, unless written waiver

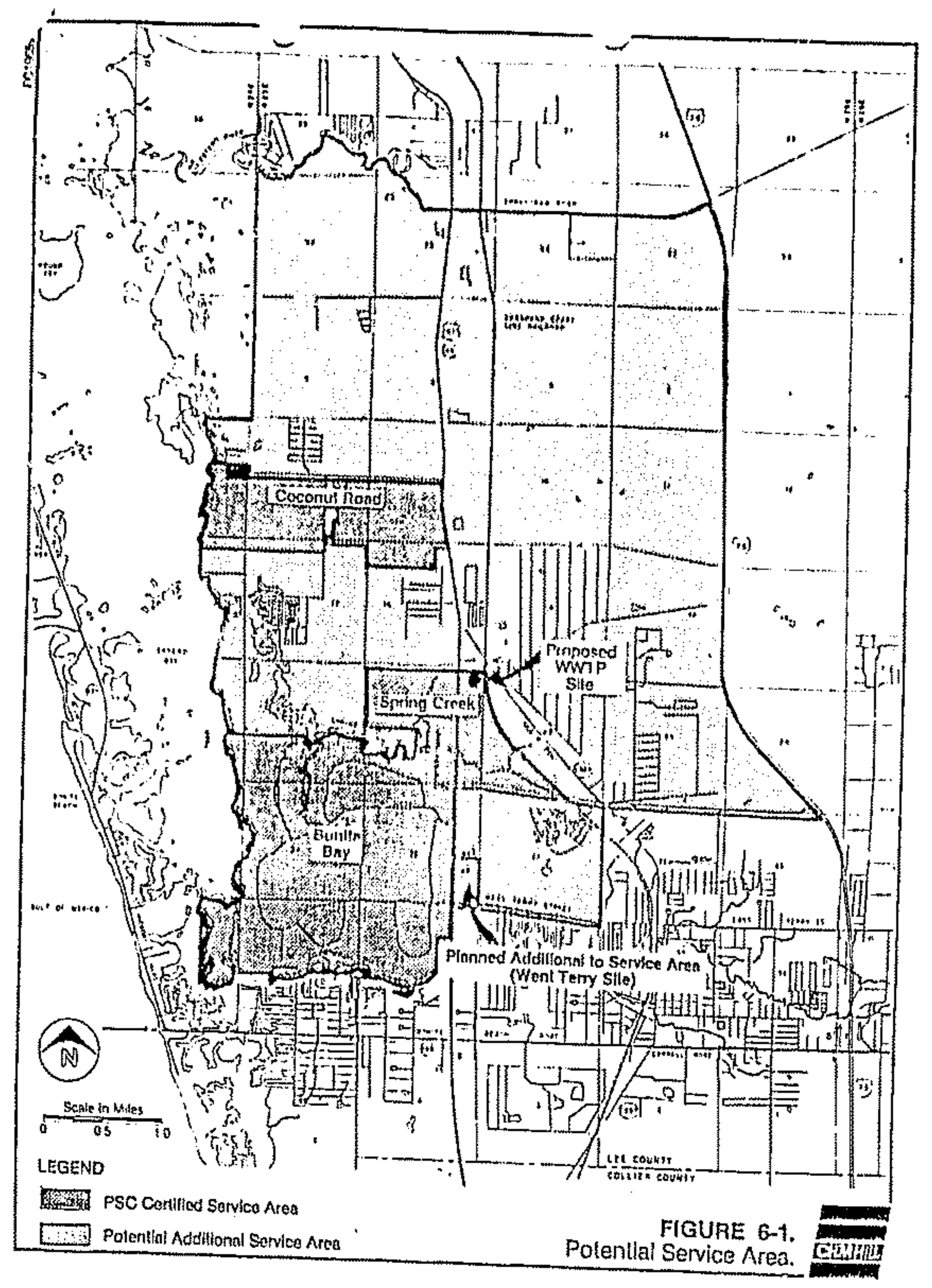


FIGURE 6-1.
Potential Service Area.

Table 3-1
UPDATED PHASE 1 AND PHASE 2 EXPANSION TIMING

Phase	Construction Completion	Sufficient Through	Net Treatment Capacity (mgd) ADF	Net Treatment Capacity (mgd) PMF	New Capacity Added (mgd) ADF	New Capacity Added (mgd) PMF
1	4th Qtr 1987	1st Qtr 1991	0.40	0.50	0.40	0.50
2	4th Qtr 1990	4th Qtr 1993	1.45	1.80	1.05	1.30

FMT20/003

4

EXHIBIT 7

SLAMIS - STATE LANDS ADMINISTRATIVE MANAGEMENT INFORMATION SYSTEM
DERMP1 DERTRKN SCREEN 1
DER TRACKING SYSTEM [redacted] (BROWSE ONLY) UPDATED: 19861010 BY: CLD (LAST,FIRST,INIT,TITLE)
APPLICATION TYPE : 1 [redacted] COMMERCIAL (OPEN TO THE PUBLIC)
APPLICATION STATUS : E1 EXEMPTION
DATE RECEIVED : 19860829
DATE TO BE COMPLETED : 19860928 DATE COMPLETED : 19861010
DATE TO TITLE : 19860829 ASSIGNED IN TITLE : KHM
AQUATIC PRESERVE :
DATE TO BELM : DATE FROM BELM :
DATE TO SUBMERGED : ASSIGNED IN SUBMERGED :
DATE TO UPLANDS : ASSIGNED IN UPLANDS :
DATE FINAL ACTION DUE: DATE FINAL ACTION : 19861010
DATE ON AGENDA : DATE DEACTIVATED :
REMARKS [redacted]
Dept of Natural Resources
PF2 NAME BRW PF4 UPDATE PF5 ADD PF6 DELETE PF8 SCREEN2 PF9 CANCEL PF10 NUM BRW

SLAMIS - STATE LANDS ADMINISTRATIVE MANAGEMENT INFORMATION SYSTEM
DERMP1 DERTRKN SCREEN 1
DER TRACKING SYSTEM (BROWSE ONLY) UPDATED: 19861010 BY: CLD (LAST,FIRST,INIT,TITLE)
DER NUMBER : 361242005
APPLICANT : CAPTAIN INVESTMENTS, INC.
APPLICATION TYPE : 1 COMMERCIAL (OPEN TO THE PUBLIC)
APPLICATION STATUS : E1 EXEMPTION
DATE RECEIVED : 19860829
DATE TO BE COMPLETED : 19860928 DATE COMPLETED : 19861010
DATE TO TITLE : 19860829 ASSIGNED IN TITLE : KHM
AQUATIC PRESERVE :
DATE TO BELM : DATE FROM BELM :
DATE TO SUBMERGED : ASSIGNED IN SUBMERGED :
DATE TO UPLANDS : ASSIGNED IN UPLANDS :
DATE FINAL ACTION DUE: DATE FINAL ACTION : 19861010
DATE ON AGENDA : DATE DEACTIVATED :
REMARKS [redacted]
PF2 NAME BRW PF4 UPDATE PF5 ADD PF6 DELETE PF8 SCREEN2 PF9 CANCEL PF10 NUM BRW

Rd 9/18/86

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTH FLORIDA BRANCH OFFICE
7451 GOLF COURSE BOULEVARD
PUNTA GORDA, FLORIDA 33950-9399

BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

September 16, 1986

Captain Investments, Inc.
c/o Hole, Montes & Assoc. Inc.
6202-D Presidential Ct.
Ft. Meyers, Fl. 33907

Gentlemen:

This is to acknowledge receipt of your application, file number 361242005, for a permit to: Plug an existing upland ditch, having a cross-sectional area of less than 35 sq. ft. at its point of connection to the Imperial River (Class III Waters), a natural, navigable waterbody within Section 33, Township 47S, Range 25 East, Lee County.

[ ] This letter constitutes notice that a permit will be required for your project pursuant to Chapter(s) 403, Florida Statutes.

[ ] Your application for permit is complete as of ______ and processing has begun. You are advised that the department under Chapter 120, Florida Statutes, must take final action on your application within ninety (90) days unless the time is tolled by an administrative hearing.

[ ] Your application for permit is incomplete. Please provide the information listed on the attached sheet promptly. Evaluation of your proposed project will be delayed until all requested information has been received.

[ ] The additional information was received on ______ was reviewed, however, the items listed on the attached sheet remain incomplete. Evaluation of your proposed project will continue to be delayed until we receive all requested information.

[XX] At this time no permit is required for your project by this department. Any modifications in your plans should be submitted for review, as changes may result in permits being required. This letter does not relieve you from the need to obtain any other permits (local, state or federal) which may be required.

If you have any questions, please contact Stuart Bradow of this office. When referring to this project, please use the file number indicated.

Sincerely,

Philip R. Edwards
District Manager

Encl
cc: Jim Beever
USACOE
Grant Gelhardt, DNR
PRE/aa

DER Form 17-1.201(4) Effective November 30, 1982

Protecting Florida and Your Quality of Life

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO ATTENTION OF

SEP 29 1986

Regulatory Division
Permits Branch
86IND-20177

Captain Investments, Inc.
Suite 305
1645 Warden Avenue
Scarborough, Ontario M1R 5B3

Gentlemen:

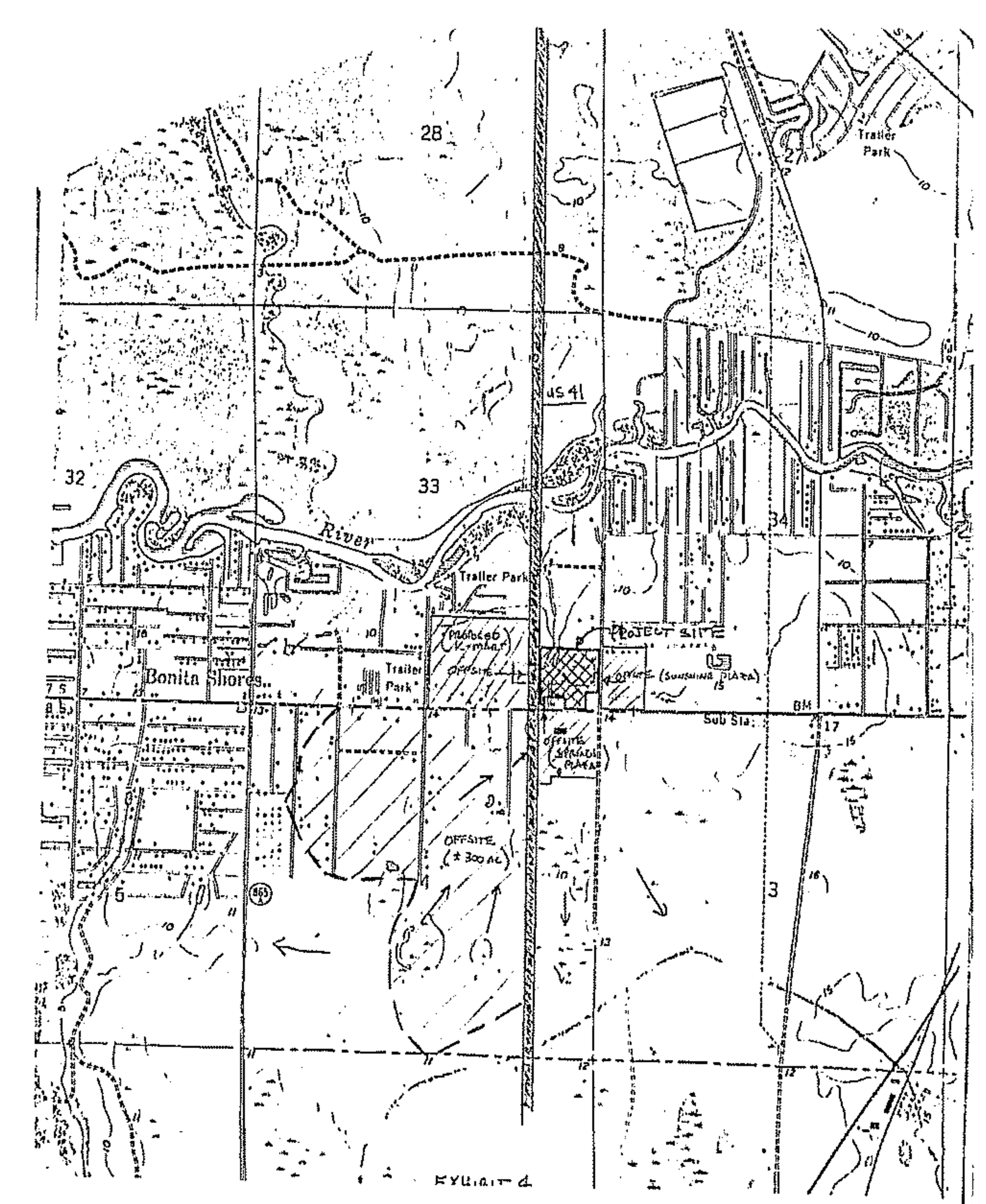
Reference your permit application dated August 6, 1986, concerning discharge of fill material associated with a commercial development in Section 33, Township 47 South, Range 25 East, Bonita Springs, Lee County, Florida.

Your proposal is authorized by a nationwide permit in accordance with the enclosed copy of our regulations as stated in 33 CFR Part 330.5(a)(26)(i).

A separate Department of the Army permit is not required providing the work is done in accordance with the enclosed drawings, the conditions listed in 33 CFR 330.5(b)(1-9), and the following conditions: Activities authorized by a nationwide permit may be initiated only after the State permit/certification pursuant to Chapters 253 and 403 of Florida Statutes and concurrence with coastal zone consistency pursuant to 15 CFR 930, if applicable, has been granted by the State of Florida. The State shall not be deemed to waive its right to certify any activity proposed under Corps nationwide permits for failure to issue a State permit or certification within 60 days of application to the State. Waivers shall only be effective when specifically exercised by the State.

This letter does not obviate the requirement to obtain any State or local permits which may be necessary for your proposed work. You should check State permitting requirements with the Florida Department of Environmental Regulation. A list of addresses of the appropriate State office is enclosed for your information and use.

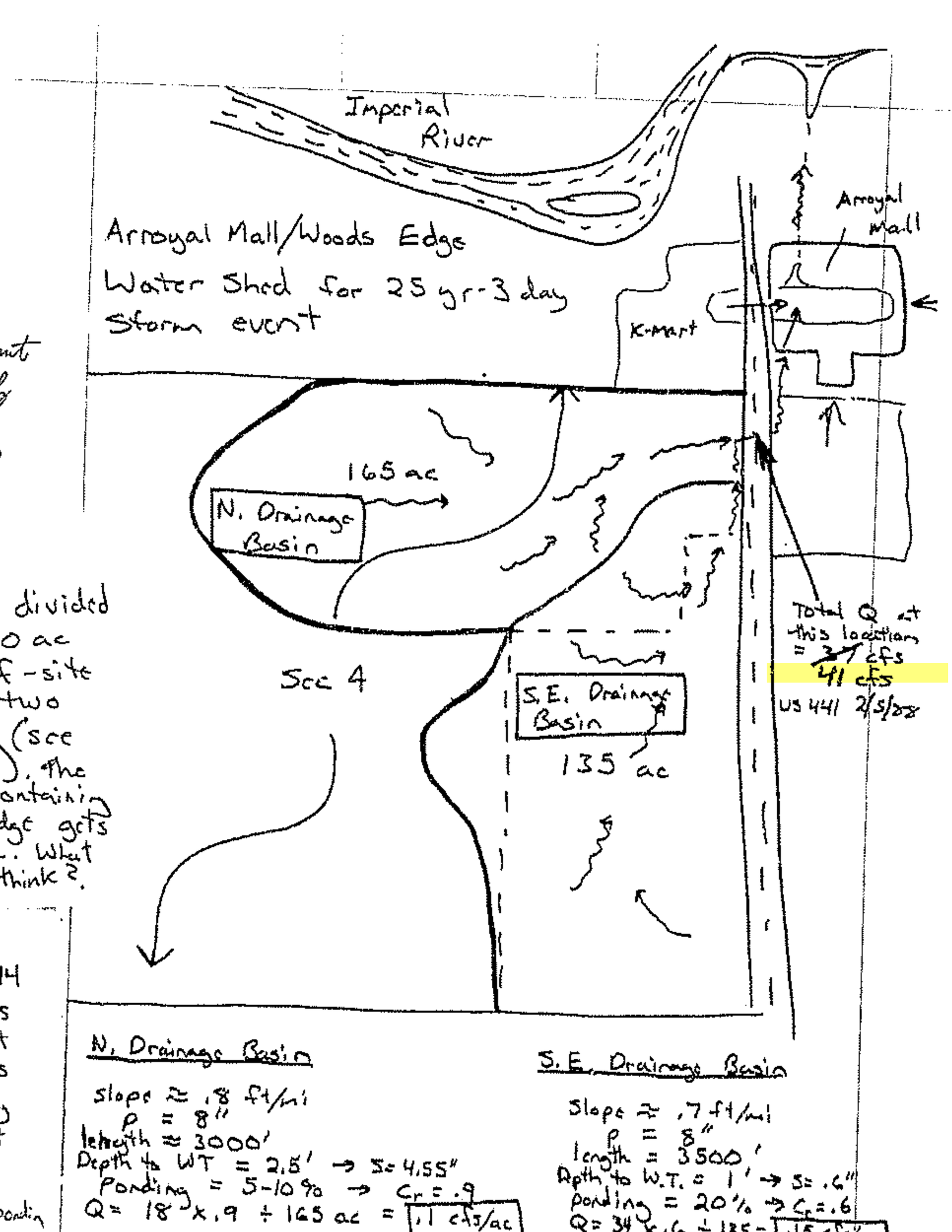
RECEIVED 10-7



Looks OK but can you justify 20% ponding to what he now?
Ed

Ed, I divided the 300 ac of off-site into two basins (see aerial). The basin containing Woods Edge gets .15 cfs/ac. What do you think?

talked to Carl on 1-14
He still wants to show that project gets more Q by using different programs w/ our parameters
.7 ft/mi. 20% ponding



STAGE (FT)	STORAGE (AF)
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	2.4
[illegible]	6.2[illegible]
17.00	17.20
[illegible]	17.1[illegible]

################### BASIN 5 ###################

AREA [illegible] ACRES   GROUND STORAGE - [illegible] INCHES

TIME STEP - 4.00 HOURS   TIME OF CONCENTRATION - .20 HOURS

RETURN FREQUENCY - 100.00 YEARS   RAINFALL DISTRIBUTION : 3- DAY   24-HOUR RAINFALL - [illegible] INCHES

STAGE (FT)	STORAGE (AF)
8.75	.00
[illegible]	.04
10.00	.25
11.00	.50
12.00	1.00
13.00	1.80

################### BASIN 6 ###################

AREA 12.80 ACRES   GROUND STORAGE - [illegible] INCHES

TIME STEP - 4.00 HOURS   TIME OF CONCENTRATION - .20 HOURS

RETURN FREQUENCY - 100.00 YEARS   RAINFALL DISTRIBUTION : 3- DAY   24-HOUR RAINFALL - 10.00 INCHES

STAGE (FT)	STORAGE (AF)
7.00	.00
11.00	.16
12.00	.62
13.00	2.40
14.00	7.80

################### BASIN 7 ###################

AREA 16.50 ACRES   GROUND STORAGE - .90 INCHES

TIME STEP - 4.00 HOURS   TIME OF CONCENTRATION - .20 HOURS

RETURN FREQUENCY - 100.00 YEARS   RAINFALL DISTRIBUTION : 3- DAY   24-HOUR RAINFALL - [illegible] INCHES

STAGE (FT)	STORAGE (AF)
7.00	.00
7.50	.94
8.00	1.95
8.50	3.04
9.00	4.80
9.50	7.47
10.00	10.80
10.50	14.40
11.00	30.00

DISCHARGE STRUCTURE INFORMATION

STRUCT NO.	PIPE [illegible]	DIAMETER (FT)	ROUGHNESS	LENGTH (FT)	WEIR CREST ELEV	WEIR LENGTH	HEAD INVERT ELEVATION	TAIL INVERT ELEVATION	
1	NO PIPE				SHARP 9.5	1.87			BASIN 1 TO BASIN 2
2	NO PIPE				SHARP 9.5	[illegible]			BASIN 2 TO BASIN 7
3	NO PIPE				SHARP 10.6	[illegible]			BASIN 3 TO BASIN 7
4	NO PIPE				SHARP 11.1	[illegible]			BASIN 4 TO BASIN 7
5	[illegible]	2.0	.024	24.[illegible]	SHARP 9.50	34.00	8.75	8.75	BASIN 5 TO BASIN 7
6	[illegible]	2.0	.024	300.[illegible]	BROAD 7.00	10.00	7.00	7.00	BASIN 6 TO BASIN 7
7	NO PIPE				SHARP 15.0	[illegible]			BASIN 7 TO BASIN 8
8	NO PIPE				SHARP 11.1	[illegible]			BASIN 4 TO BASIN 7

BLEEDER INFORMATION

STRUCT NO.	BLEEDER TYPE	ORIFICE DIAMETER OR WIDTH (FT)	ORIFICE INVERT ELEVATION (FT-NGVD)	AREA (FT2)	V-NOTCH ANGLE (DEG)	V-NOTCH INVERT ELEVATION (FT-NGVD)	TOP ELEVATION (FT-NGVD)
1	NO BLEEDER INCLUDED IN STRUCTURE						
2	NO BLEEDER INCLUDED IN STRUCTURE						
3	V-NOTCH	NA	NA	NA	20.0	7.5	8.2
4	CIRCLE	.3	9.2	.1			
5	V-NOTCH	NA	NA	NA	20.0	8.8	9.5
6	NO BLEEDER INCLUDED IN STRUCTURE						
7	NO BLEEDER INCLUDED IN STRUCTURE						
8	CIRCLE	.3	9.2	.1			

OFFSITE RECEIVING WATER

TIME(HR)	STAGE(FT-NGVD)
.00	7.00
40.00	7.50
60.00	8.50
80.00	8.00
140.00	7.00
160.00	6.50

1

SUMMARY REPORT

TIME (HR)	STRUCT NO	BASIN NO	CUMULATIVE RAINFALL (INCHES)	CUMULATIVE RUNOFF (INCHES)	INSTANT. RUNOFF (CFS)	RUNOFF HYDROGRAPH (CFS)	DISCHARGE (CFS)	INSTANT. STAGE (FT)	FROM	TO	STRUCTURE CONTROL
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	6	6	1.2	1.1	.8	.8	.77	8.48	6	7	PIPES
	7	7	1.2	.6	.8	.8	.00	8.37	7	8	NO FLOW
	8	4	1.2	.6	1.2	1.2	.28	9.84	4	7	BLEEDER
OFFSITE STAGE IS 7.25 FT.NGVD											
24.0	1	1	1.5	1.0	6.8	6.8	1.09	9.84	1	2	WEIR
	2	2	1.5	.2	4.4	3.9	.52	9.58	2	7	WEIR
	3	3	1.5	.7	1.6	1.6	.18	8.90	3	7	BLEEDER
	4	4	1.5	.8	1.3	1.3	.32	10.04	4	7	BLEEDER
	5	5	1.5	1.3	.4	.4	.35	9.51	5	7	WEIR
	6	6	1.5	1.3	.8	.8	.77	8.72	6	7	PIPES
	7	7	1.5	.0	.8	.8	.00	8.71	7	8	NO FLOW
	8	4	1.5	.8	1.3	1.3	.32	10.04	4	7	BLEEDER
OFFSITE STAGE IS 7.30 FT.NGVD											
28.0	1	1	1.8	1.3	10.2	9.9	1.56	9.94	1	2	WEIR
	2	2	1.8	.4	7.9	7.6	1.21	9.63	2	7	WEIR
	3	3	1.8	1.0	2.4	2.4	.21	9.35	3	7	BLEEDER
	4	4	1.8	1.1	2.0	2.0	.36	10.33	4	7	BLEEDER
	5	5	1.8	1.7	.5	.5	.52	9.32	5	7	WEIR
	6	6	1.8	1.7	1.1	1.1	1.10	9.12	6	7	PIPES
	7	7	1.8	1.1	1.3	1.3	.00	9.09	7	8	NO FLOW
	8	4	1.8	1.1	2.0	2.0	.36	10.33	4	7	BLEEDER
OFFSITE STAGE IS 7.35 FT.NGVD											
32.0	1	1	2.2	1.7	10.3	10.3	2.12	10.05	1	2	WEIR
	2	2	2.2	.5	9.2	8.5	2.32	9.70	2	7	WEIR
	3	3	2.2	1.3	2.5	2.5	.27	9.85	3	7	BLEEDER
	4	4	2.2	1.4	2.1	2.0	.37	10.63	4	7	BLEEDER
	5	5	2.2	2.1	.5	.5	.51	9.52	5	7	WEIR
	6	6	2.2	2.1	1.1	1.1	1.10	9.47	6	7	PIPES
	7	7	2.2	1.4	1.3	1.3	.00	9.43	7	8	NO FLOW
	8	4	2.2	1.4	2.1	2.0	.37	10.63	4	7	BLEEDER
OFFSITE STAGE IS 7.40 FT.NGVD											

1

TIME (HR)	STRUCT NO	BASIN NO	CUMULATIVE RAINFALL (INCHES)	CUMULATIVE RUNOFF (INCHES)	INSTANT. RUNOFF (CFS)	RUNOFF HYDROGRAPH (CFS)	DISCHARGE (CFS)	INSTANT. STAGE (FT)	FROM	TO	STRUCTURE CONTROL
36.0	1	1	2.5	2.0	10.4	10.4	2.67	10.16	1	2	WEIR
	2	2	2.5	.8	10.1	9.6	1.80	9.79	2	7	WEIR
	3	3	2.5	1.6	2.6	2.6	.32	10.36	3	7	BLEEDER
	4	4	2.5	1.8	2.1	2.1	.37	10.94	4	7	BLEEDER
	5	5	2.5	2.4	.5	.5	.34	9.76	5	7	PIPES
	6	6	2.5	2.4	1.1	1.1	1.11	9.79	6	7	PIPES
	7	7	2.5	1.7	1.4	1.4	.00	9.76	7	8	NO FLOW
	8	4	2.5	1.8	2.1	2.1	.37	10.94	4	7	BLEEDER
OFFSITE STAGE IS 7.45 FT.NGVD											
40.0	1	1	2.9	2.4	10.5	10.5	3.09	10.26	1	2	WEIR
	2	2	2.9	[illegible]	[illegible]	10.5	-1.77	9.91	[illegible]	[illegible]	WEIR
	3	3	2.9	[illegible]	2.7	2.6	.34	[illegible]	[illegible]	7	BLEEDER
	4	4	2.9	[illegible]	2.1	2.1	.37	[illegible]	4	7	BLEEDER
	5	5	2.9	2.8	.5	.5	.44	9.92	5	7	PIPES
	6	6	2.9	2.8	1.1	1.1	1.13	9.95	6	7	PIPES
	7	7	2.9	2.0	1.4	1.4	[illegible]	9.92	7	8	NO FLOW
	8	4	2.9	2.1	2.1	2.1	.37	11.10	4	7	BLEEDER
OFFSITE STAGE IS 7.50 FT.NGVD											
44.0	1	1	3.2	2.7	[illegible]	10.5	3.39	10.35	1	2	WEIR
	2	2	3.2	1.2	11.5	11.2	-1.09	10.4[illegible]	2	7	WEIR
	3	3	3.2	2.3	2.7	2.7	.75	10.60	3	7	WEIR
	4	4	3.2	2.4	2.1	2.1	.49	11.21	4	7	WEIR
	5	5	3.2	3.1	.5	.5	.38	10.05	5	7	PIPES
	6	6	3.2	3.1	1.1	1.1	1.17	10.09	6	7	PIPES
	7	7	3.2	2.4	1.4	1.4	.00	10.06	7	8	NO FLOW
	8	4	3.2	2.4	2.1	2.1	.49	11.21	4	7	WEIR
OFFSITE STAGE IS 7.70 FT.NGVD											
48.0	1	1	3.6	3.1	10.6	10.6	3.55	10.45	1	2	WEIR
	2	2	3.6	1.5	12.1	11.8	-1.43	10.23	2	7	WEIR
	3	3	3.6	2.5	2.7	2.7	.62	10.70	3	7	WEIR
	4	4	3.6	2.8	2.2	2.2	.64	11.30	4	7	WEIR
	5	5	3.6	3.5	.5	.5	.36	10.21	5	7	PIPES
	6	6	3.6	3.5	1.1	1.1	1.13	10.24	6	7	PIPES
	7	7	3.6	2.7	1.4	1.4	.00	10.21	7	8	NO FLOW
	8	4	3.6	2.8	2.2	2.2	.64	11.30	4	7	WEIR
OFFSITE STAGE IS 7.90 FT.NGVD											

1

TIME (HR)	STRUCT NO	BASIN NO	CUMULATIVE RAINFALL (INCHES)	CUMULATIVE RUNOFF (INCHES)	INSTANT. RUNOFF (CFS)	RUNOFF HYDROGRAPH (CFS)	DISCHARGE (CFS)	INSTANT. STAGE (FT)	FROM	TO	STRUCTURE CONTROL
52.0	1	1	4.0	3.5	16.7	14.3	3.46	10.54	1	2	WEIR
	2	2	4.0	1.8	19.9	16.1	-2.76	10.38	2	7	WEIR
	3	3	4.0	3.0	4.3	4.1	1.05	10.89	3	7	WEIR
	4	4	4.0	3.2	3.4	3.2	.86	11.40	4	7	WEIR
	5	5	4.0	3.9	.8	.8	.61	10.38	5	7	PIPES
	6	6	4.0	3.9	1.8	1.8	1.75	10.46	6	7	PIPES
	7	7	4.0	3.1	2.2	2.2	.00	10.38	7	8	NO FLOW
	8	4	4.0	3.2	3.4	3.2	.86	11.40	4	7	WEIR
OFFSITE STAGE IS 8.10 FT.NGVD											
56.0	1	1	5.0	4.4	36.0	30.1	4.19	10.73	1	2	WEIR
	2	2	5.0	2.6	45.4	34.8	-3.34	10.56	2	7	WEIR
	3	3	5.0	3.9	9.4	9.0	2.32	11.12	3	7	WEIR
	4	4	5.0	4.1	7.4	7.1	1.62	11.65	4	7	WEIR
	5	5	5.0	4.8	1.8	1.8	1.62	10.57	5	7	PIPES
	6	6	5.0	4.8	3.9	3.8	3.81	10.93	6	7	PIPES
	7	7	5.0	4.0	4.9	4.8	.00	10.56	7	8	NO FLOW
	8	4	5.0	4.1	7.4	7.1	1.62	11.65	4	7	WEIR
OFFSITE STAGE IS 8.30 FT.NGVD											
60.0	1	1	10.1	9.6	813.7	280.2	9.28	11.28	1	2	WEIR
	2	2	10.1	7.3	1152.7	314.0	-12.43	10.80	2	7	WEIR
	3	3	10.1	9.0	215.6	144.4	6.60	11.67	3	7	WEIR
	4	4	10.1	9.2	169.0	113.3	4.47	12.29	4	7	WEIR
	5	5	10.1	10.0	39.4	39.2	20.47	12.31	5	7	PIPES
	6	6	10.1	10.0	87.0	80.6	9.25	13.05	6	7	PIPES
	7	7	10.1	9.1	111.4	92.4	.00	10.85	7	8	NO FLOW
	8	4	10.1	9.[illegible]	169.9	113.3	4.47	12.29	4	7	WEIR
OFFSITE STAGE IS 8.50 FT.NGVD											

STAGE STORAGE LIMITS WERE EXCEEDED FOR BASIN 7

STRUCTURE NO.	PEAK DISCHARGE (CFS)	TIME OF QPEAK	PEAK STAGE (FT-NGVD)	TIME OF HPEAK
1	12.5	60.6	11.6	60.6
2	2.7	33.6	11.0	60.6
3	8.6	60.6	11.9	60.6
4	6.3	60.6	12.6	60.6
5	20.9	60.1	12.4	60.1
6	2[illegible].8	12.6	13.3	60.6
7	.0	.0	11.0	60.6
8	6.3	60.6	12.6	60.6

BASIN NO.	TOTAL INFLOW (AC-FT)	TOTAL RUNOFF (AC-FT)	TOTAL OUTFLOW (AC-FT)	FINAL TIME (HOURS)	FINAL STAGE (FT-NGVD)	FINAL STORAGE (AC-FT)
1	.00	104.28	10.52	60.67	11.61	63.99
2	16.52	121.16	-3.40	60.67	10.97	86.67
3	.00	26.38	3.28	60.67	11.90	20.21
4	.00	21.04	5.68	60.67	12.63	13.10
5	.00	5.26	4.27	60.67	11.80	.93
6	.00	11.61	7.15	60.67	13.33	4.16
7	16.99	13.74	.00	60.67	11.00	30.01

100-yr 3-day
Zero Q from Basin 7

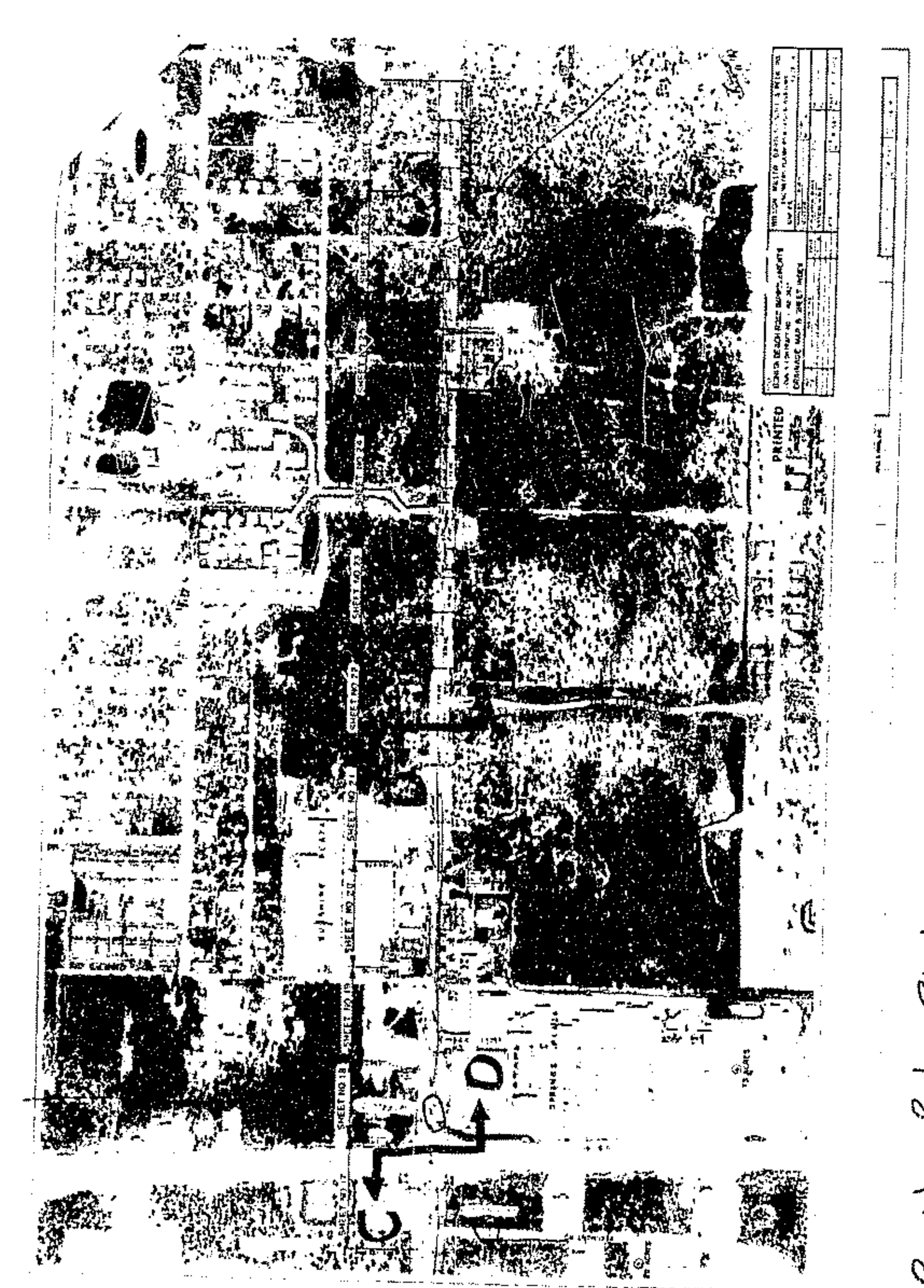


Exhibit 3

Bonita Bch Blvd. GP 87-20

ition as used here
should be printed.
pression shall be on on
er it known.

GP 87-20

SPECIAL CONDITIONS

1. DISCHARGE FACILITIES:

OUTFALL A: 1-31.0' WIDE WEIR WITH A CREST AT ELEVATION 2.0' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT 1.4' NGVD.

RECEIVING WATER: IMPERIAL RIVER VIA AN EXISTING CANAL.

CONTROL ELEVATION: 1.4' NGVD.

OUTFALL B: 1-13.0' WIDE WEIR WITH A CREST AT ELEVATION 8.0' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT 7.4' NGVD AND 16 LF 36" DIAMETER RCP CULVERT.

RECEIVING WATER: IMPERIAL RIVER VIA EXISTING DITCH.

CONTROL ELEVATION: 7.4' NGVD.

OUTFALL C: 1-34.0' WIDE WEIR WITH A CREST AT ELEVATION 9.5' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT 8.75' NGVD.

RECEIVING WATER: IMPERIAL RIVER VIA EXISTING LAKE AND CANAL.

CONTROL ELEVATION: 8.75' NGVD.

OUTFALL E1: 1-25.0' WIDE WEIR WITH A CREST AT ELEVATION 9.85' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT 8.75' NGVD.

RECEIVING WATER: IMPERIAL RIVER VIA EXISTING DITCH.

CONTROL ELEVATION: 8.75' NGVD.

OUTFALL E2: 1-24.0' WIDE WEIR WITH A CREST AT ELEVATION 9.25' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT 8.75'NGVD.

RECEIVING WATER: IMPERIAL RIVER VIA EXISTING DITCH.

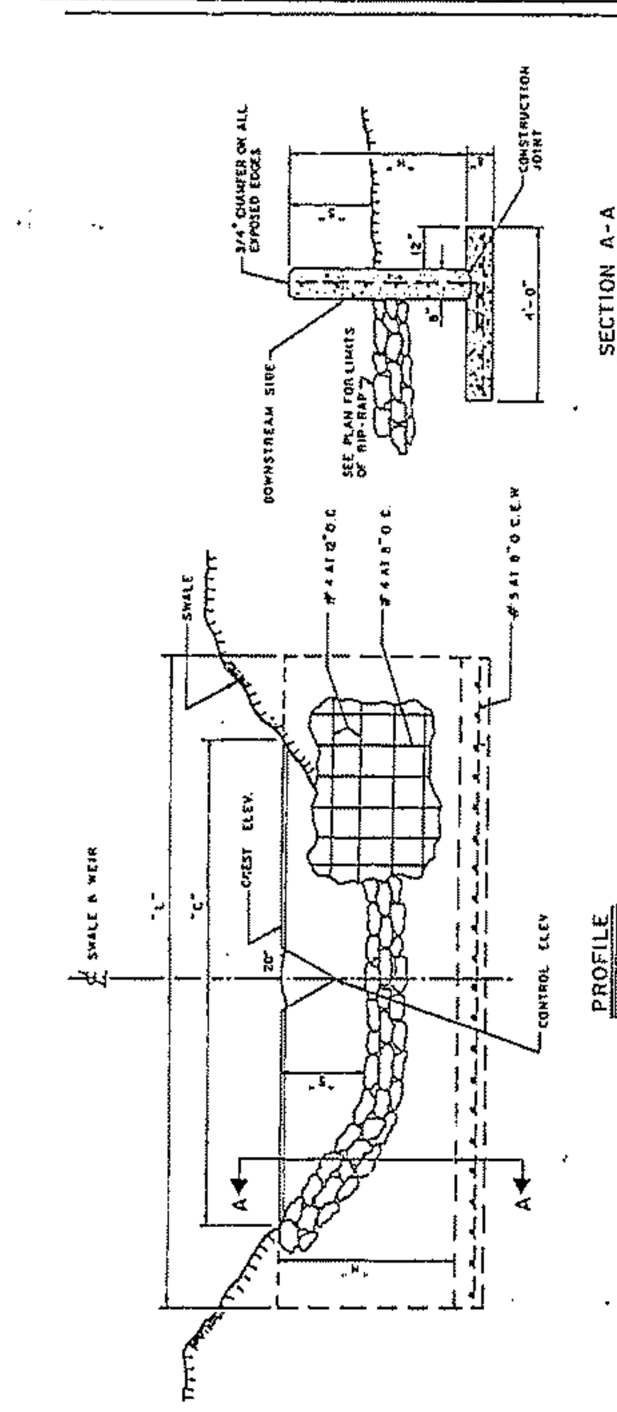
CONTROL ELEVATION: 8.75' NGVD.

OUTFALL H: 1-9.0' WIDE WEIR WITH A CREST AT ELEVATION 8.4' NGVD AND 1-20 DEGREE V-NOTCH BLEEDER WITH AN INVERT AT 7.1' NGVD AND 20 LF 30" DIAMETER RCP CULVERT.

RECEIVING WATER: IMPERIAL RIVER VIA OAK CREEK.

CONTROL ELEVATION: 7.1' NGVD.

GP 87-20



STRAIGHT WEIR W/ V-NOTCH
N.T.S.

7

DRAINAGE REPORT

State Road 45 (US41)
From North of CR 887 to North of Bonita Beach Road

Collier County
Financial Project ID: 195406-1-52-01
WPI: 1114178

Lee County
Financial Project ID: 195736-1-52-01
WPI: 1114706

Prepared For:

Florida Department of Transportation
District One

Prepared By:

PBS&J
ORLANDO, FLORIDA
(407) 647-7275
(407) 647-4143 fax

February 2002

2/11/02

(1) 38+60, BOTH
EW, 2-3.08 X 1.2 BC, EW
NW 1.065
SW 1.059
SE 1.150
NE 1.155

(2) 39+93, LT
DBI, 457 RCP, EW
W 2.209
E 2.291

(3) 41+75, LT
MES, 2-610 RCP, MES
SW 2.129
NW 2.150
SE 2.142
NE 2.161

(4) 42+68, LT
DBI, 457 RCP, EW
W 2.335
E 2.492

(5) 44+02, LT
DBI, 610 RCP, MES
S 2.464
N 2.515

(6) 44+70, LT
DBI, 610 RCP
S 2.526
N 2.618

(7) 44+94, LT
DBI, 457 RCP
S 2.618
N 2.584

(8) 45+08, LT
MES, 610 RCP
S 2.584
N 2.597

(9) 45+30, LT
2-610 CMP
SW 2.720
NW 2.408
SE 2.631
NE 2.362

(10) 45+40, BOTH
EW, 762 RCP, EW
W 2.356
E 2.439

(11) 45+72, LT
DBI, 457 RCP, EW
W 2.786
E 3.010

(12) 47+60, LT
MES, 2-610 RCP, MES
S 3.228
N 3.199

(13) 50+60, BOTH
EW, 2-610 RCP, EW
SE 3.008
SW 2.895
NE 2.884
NW 2.941

(14) 50+60, MED
DBI
GRATE 3.86

(15) 51+00, LT
MES, 2-__, MES
NO SURVEY

(16) 51+25, RT
MES, 914 RCP, MES

(17) 52+__
W __ CMP, MES
S 3.109
N 3.1__

(18) 52+75, LT
MES, 2-__, MES
NO SURVEY

(19) 53+20, RT
DBI, 381 RCP, EW
W 3.310
E 3.140

(20) 53+70, RT
MES, 1067X610 CMP, MES
S 3.205
N 3.208

(21) 54+45, RT
MES, 914 RCP, MES
S 3.2 4
N 3.227

(22) 55+80, RT
MES, 610 RCP, MES
S 3.274
N 3.204

(23) 55+80, LT
MES, 2-610 RCP, MES
SW 3.133
SE 3.159
NW 3.189
NE 3.175

(24) 58+80, BOTH
EW, 2-762 RCP, EW
SW 2.755
NW 2.806
SE 2.795
NE 2.794

(25) 58+80, MED
DBI
W 2.748
E 2.720

(26) 59+10, RT
MES, 610 RCP, MES
S 3.124
N 3.132

(27) 61+00, RT
MES, 610 RCP, MES
S 3.092
N 3.115

(28) 61+03, LT
MES, 970X160 RCP
S 2.769
N 2.74__

(29) 63+70, LT
DBI, 457 RCP, EW
W 2.941
E 3.000

(30) 64+00, RT
MES, 610 RCP, MES
S 2.912
N 2.875

(31) 64+00, LT
MES, 915X610 RCP, MES
S 2.686
N 2.774

(32) 67+05, LT
DBI, 460 RCP
W 2.707
E 2.953

(33) 67+05, LT
DBI, 570X610 RCP, MES
S 2.726
N 2.715

(34) 67+65, RT
610 RCP
S 2.635
N 2.580

(35) 67+75, RT
CURB INLET.
S 2.580
N 2.545

(36) 68+00, RT
CURB INLET, 610 RCP
S 2.545
N 2.601

(37) 68+90, RT
EW, 711 RCP
W 2.237
E 2.061

(38) 68+90, LT
DBI, 787 RCP, EW
W 1.795
E 2.238

(39) 70+00, LT
MES, 762 RCP
W 2.807
E 2.876

(40) 70+40, LT
MES, 2-965X610 RCP, MES
SW 2.730
SE 2.758
NW 2.754
NE 2.728

(41) 70+75, RT
610 RCP
S 2.659
N 2.693

(42) 70+80, RT
CURB INLET, 610 RCP
S 2.691
N 2.641

(43) 71+00, RT
CURB INLET, 610 RCP
S 2.659
N 2.585

(44) 72+45, RT
762 RCP
S 2.545
N 2.452

(45) 72+50, RT
INLET, 457X254 RCP
S 2.770
N 2.724

(46) 72+60, RT
CURB INLET, 762X509 RCP
S 2.722
N 2.676

(47) 72+65, RT
CURB INLET, 610 RCP
SE 2.763
NW 2.529

(48) 72+70, RT
DBI
S 2.452
N 2.460

(49) 72+80, RT
762X509 RCP
SE
NW 2.759

(50) 72+45, LT
MES, 2-960X610 RCP, MES
SW 2.721
SE 2.722
NW 2.725
NE 2.774

(51) 73+20, BOTH
EW, 2.439X1.219, EW
SE 1.413
NE 1.430
SW 1.461
NW 1.480

(52) 74+75, RT

(53) 75+55, LT
457 RCP
S 3.062
N 2.947

(54) 75+80 LT
457 RCP
S 2.921
N 2.790

(55) 76+50, RT
304 RCP
W 2.535
E 2.138

(56) 77+00, RT
MES, 610 RCP, M__
S 2.274
N 2.229

(57) 77+05, LT
MES, 610 RCP, MES
S 2.369
N 2.400

(58) 78+20, BOTH
EW, 610 RCP, EW
W 2.356
E 2.183

(59) 78+25, RT
610 CP
S 2.039
N 2.021

(60) 78+45, RT
610 CP
S 2.002
N 2.020

(61) 78+65, RT
DBI, 457 RCP, EW
W 2.295
E 1.972

(62) 78+75, RT
MES, 559 RCP, M__
S 1.635
N 1.782

(63) 79+00, LT
MES, 610 RCP, M__
S 1.851
N 1.879

(64) 79+25, RT
610 RCP
S 1.783
N 1.661

(65) 79+70, LT
457 RCP
S 1.693
N 1.653

(66) 79+75, RT
MES, 610 RCP, MES
S 1.568
N 1.507

REVISIONS											
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE		DESCRIPTION	DATE	BY	DESCRIPTION

FLORIDA DEPARTMENT OF TRANSPORTATION

EXISTING DRAINAGE STRUCTURES

FINANCIAL PROJECT ID | ST

PGL

EXISTING GROUND AT ℄

SCAL
1:50
1:50

TARPON
COVE
39.4 ha
(97.28 ac)
Permit No. 11-01457-P

CYPRESS LAKES/
RETREAT/
BENTLEY VILLAGE
84.6 ha
(209 ac)
Permit No. 11-00182-S

RETREAT DR.

AUDOBON
COUNTRY CLUB
293.2 ha
(724.5 ac)
Permit No. 11-004

BEGIN PROJECT
195406-1-52-01
STA 39+94.980

SUB-BASIN C
1.615 ha

TARPON COVE

SUB-BASIN A
2.779 ha

STERLING
OAKS
100.3 ha
(247.9 ac)
Permit No. 11-01042-S

SUB-BASIN B
1.561 ha

BASIN NORTH
22.1 ha

WETLAND

CR 887 (OLD US 41)

S-540 S-541 S-515 S-516 S-517 S-518 S-519 S-520 S-521 S-522 S-523 S-524 S-525 S-526 S-528 S-529 S-530 S-531 S-532 S-533 S-542 S-501 S-502 S-509

20-DEC-2000 15:23

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

DRAINAGE MA

F.3

FINANCIAL PROJECT ID

SCALE
1:50
1:50

PGL

EXISTING GROUND AT ℄

LAKE SHORE DR

WOODS EDGE PKWY

AUDUBON BLVD

AUDUBON
COUNTRY CLUB
293.2 ha
(724.5 ac)
Permit No. 11-00427-S

Woods Edge DRI
48.4 ha
(119.5 ac)
Permit No. 36-00854-S

LAWHON COMM.
CENTER
1.4 ha
(3.4 ac)
Permit No. 36-02746-S

BASIN NORTH
22.1 ha

WETLAND

SPRINGS PLAZA
24.2 ha
(59.7 ac)
Permit No. 36-00317-S

SPRINGS PLAZ
OUT PARCEL
10.0 ha
(24.8 ac)
Permit No. 36-00

OAKS BLVD

STERLING
OAKS
100.3 ha
(247.9 ac)
Permit No. 11-01042-S

END PROJECT
195406-1-52-01
STA 59+15.749

BEGIN PROJECT
195736-1-52-01
STA 59+15.749

06-JUN-2001 16:43
F:\dist1\sis41\drnmap02.dgn

REVISIONS											
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

DRAINAGE MA

FINANCIAL PROJECT ID

PGL

EXISTING GROUND AT ℄

SCALE
1:50
1:100

CENTER OF
BONITA SPRINGS
13.0 ha
(32.0 AC)
Permit No. 36-00718-S

END PROJECT
195736-1-52-01
STA 80+25.00

BASIN NORTH
22.1 ha

IMPERIAL RIVER

1:5000

BONITA BEACH RD

S-221 S-220 S-222 S-223 S-224 S-226 S-227 S-226 S-229 S-123 S-124 S-125 S-126 S-127 S-126 S-129 S-120 S-121 S-122 S-118 S-119

WETLAND

WETLAND

ARROYAL MALL
7.3 ha
(18.1 ac)
Permit No.
36-00863-S

CROWN LAKE BLVD

POND
NORTH

28-AUG-2001 10:30
E:\dist\civil\drainmap03.dgn

REVISIONS											
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

DRAINAGE MA