LOCATION HYDRAULIC REPORT

Osceola Parkway Extension (599-223)

(From SR 417 to Cyrils Drive)

Project Development and Environment (PD&E) Study

Orange and Osceola Counties, FL

Project 599-223 (formerly 599-221)

Prepared for:

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

Central Florida Expressway Authority

4974 ORL Tower Road

Orlando, Florida, 32807

Prepared By:

The Balmoral Group

165 Lincoln Avenue

Winter Park, FL 32789

January 2020

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I am a registered professional engineer in the State of Florida practicing engineering with The Balmoral Group and that I have supervised the preparation of and approve the analysis, findings, opinions, conclusions and technical advice hereby reported for:

PROJECT: Osceola Parkway Extension PD&E Study
(From SR 417 to Cyrils Drive)
Location Hydraulic Report
Project ID: 599-223
Orange and Osceola Counties, Florida

The engineering work represented by this document was performed through the following duly authorized engineering business:

The Balmoral Group
165 Lincoln Ave
Winter Park, Florida 32789
Telephone: (407) 629-2185
Certificate of Authorization No. 26123

This report provides the results of a summary of data collection efforts, and limited calculation for the existing and the proposed cross drain and floodplain evaluations prepared for the conceptual analyses for the Location Hydraulic Report for the Project Development and Environment Study for Osceola Parkway Extension (from SR417 to Cyrils Drive). I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of hydrologic analysis and hydraulic engineering as applied through professional judgment and experience. This document is for planning purposes only and is not to replace any effort required for final design.

Any engineering analysis, documents, conclusions or recommendations relied upon from other professional sources or provided with responsibility by the client are referenced accordingly in the following report.

FLORIDA REGISTERED ENGINEER:
Gregory S. Seidel, State of Florida, Professional Engineer, License No. 47571
This item has been electronically signed and sealed by:

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

EXECUTIVE SUMMARY

The Balmoral Group has subcontracted with RS&H, Inc. to provide Project Development and Environment (PD&E) re-evaluation drainage design services for the Central Florida Expressway Authority (CFX) for the Osceola Parkway Extension improvements from SR 417 to Cyrils Drive (Project ID No. 599-223). The new roadway alignment will provide approximately 10 to 10.5 miles of limited access highway. The project is located within the Kissimmee River Watershed in the South Florida Water Management District (SFWMD), and more specifically within the Lake Tohopekaliga basin. The project horizontal datum is Florida State Plane East Zone (NAD 1983), and the vertical datum is NAVD'88, which is 1.014 feet below NGVD'29 (0.00 ft NGVD'29 = -1.014 ft NAVD'88). The project site is within Township 24 South, Range 30 East (Sections 27, 28, 29, 33, 34, 35); Township 24 South, Range 31 East (Sections 31, 32, 33); Township 24 South, Range 30 East (Sections 3, 4); and Township 25 South, Range 31 East (Sections 1, 2, 3, 4, 7, 8, 9, 10).

The proposed project limits spans from SR 417 to Cyrils Drive. Four alignment alternatives were evaluated. Alignments for the Boggy Creek Alternative (aka Alternative 405) and the Lake Nona Alternative (aka Alternative 404B) provide connection from SR 417 to Narcoossee Road. Alignments for the Split Oak Minimization Alternative (aka Alternative 500_107C-1) and the Split Oak Avoidance Alternative (aka Alternative 502_207D-1) continue east from Narcoossee Road to Cyrils Drive.

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) depicts Zone X, Zone AE, and Zone A along the corridor. Zone X is an area of minimal flood hazard and was not evaluated for floodplain impacts. Zone AE has an established Base Flood Elevation (BFE) that has been approved by FEMA and ranges from 61 to 80 feet NAVD within the study area. Zone A has an identified area of inundation resulting from the 100-year storm event, but no BFE has been established. There are no FEMA-designated regulatory floodways within the study area.

Proposed cross drains for the four alternatives were evaluated. **Table ES1** below summarizes the cross drains and indicates whether the location is within a FEMA floodplain.

Floodplain impacts are not expected to occur within the contributing areas for cross drains CD-404-06, CD-404-07, CD-405-02, CD-405-06, CD-405-07, CD-500-03, and CD-502-05. There is some encroachment of the alternative footprint on the existing 100-year FEMA floodplain at cross drains CD-404-02, CD-404-03, CD-404-04, CD-405-01, CD-405-04, CD-500-01, CD-500-03, CD-500-05, CD-500-06, CD-500-07, CD-502-01, CD-502-03, CD-502-04, CD-502-06, CD-502-07, and CD-502-08, which will be mitigated by routing the floodplain impacted volume to the project's stormwater management facility or floodplain compensation pond, as stated in the Pond Siting Report. Additionally, it is anticipated that floodplain impacts associated with the alternative footprints at cross drains CD-404-01, CD-404-05, CD-405-03, CD-405-05, CD-500-02, and CD-502-02 will be mitigated with either a proposed cross drain or a bridge.

The proposed cross drains within the project limits were analyzed hydraulically using Federal Highway Administration's (FHWA) HY-8 (Version 7.50). Flow rates were calculated using the Rational Method for cross drains CD-404-01, CD-404-02, CD-404-03, CD-404-07, CD-405-02, CD-405-07, CD-500-01, CD-500-03, CD-500-04, CD-500-05, CD-500-07, CD-502-01, CD-502-03, CD-502-04, CD-502-05, and CD-502-06.

Cross drains CD-404-04 and CD-405-03, use existing flow rates from available model associated with Poitras East Planned Development (PD) FEMA Letter of Map Revision (LOMR) Application (December 2018) as input flows for HY-8. Generally, the proposed cross drain inverts are estimated from LiDAR. It is assumed that the final design team will perform a detailed survey of the existing cross drains to update the HY-8 calculations as necessary.

This is a project on a new alignment with encroachments into the floodplain. Proposed cross drains, and bridges will perform hydraulically in a manner equal to or greater than the existing condition, and backwater surface elevations are not expected to increase. Floodplain encroachments will be mitigated on a cup-for-cup basis in floodplain compensation sites and treatment/attenuation pond sites, which should result in no increase to the floodplain elevations. These changes will not result in any adverse impacts on the natural and beneficial floodplain values or any changes in flood risk or damage. There will not be a change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that the encroachment type for this study is classified as "minimal".

Table ES1 – Proposed Cross Drains

Cross Drain		Pipe Size	Flow Direction	Within a FEMA Floodplain
Lake Nona Alternative	**CD-404-01**	2 - 36"	East	Yes, mitigated with cross drain
	CD-404-02	24"	East	Yes, mitigated within pond/FPC
	CD-404-03	24"	East	Yes, mitigated within pond/FPC
	CD-404-04	3 - 42"	North	Yes, mitigated within pond/FPC
	CD-404-05	3 - 5' x 8'	Southeast	Yes, mitigated with cross drain
	CD-404-06	2 - 30"	Southeast	No
	CD-404-07	3 - 48"	South	No
Boggy Creek Alternative	**CD-405-01**	2 - 72"	Northwest	Yes, mitigated within pond/FPC
	CD-405-02	2 - 48"	West	No
	CD-405-03	3 - 38" x 60"	Southwest	Yes, mitigated with cross drain
	CD-405-04	3 - 42"	North	Yes, mitigated within pond/FPC
	CD-405-05	3 - 5' x 8' CBC	Southeast	Yes, mitigated with cross drain
	CD-405-06	2 - 30"	Southeast	No
	CD-405-07	3 - 48"	South	No

Cross Drain		Pipe Size	Flow Direction	Within a FEMA Floodplain
Split Oak Minimization Alternative	CD-500-01	2 - 42”	Northeast	Yes, mitigated within pond/FPC
	CD-500-02	Bridge	South	Yes, mitigated with bridge
	CD-500-03	3 - 42”	South	Yes, mitigated within pond/FPC
	CD-500-04	2 - 48”	Southwest	No
	CD-500-05	36”	Southwest	Yes, mitigated within pond/FPC
	CD-500-06	2 - 36”	South	Yes, mitigated within pond/FPC
	CD-500-07	36”	North	Yes, mitigated within pond/FPC
	CD-500-08	6 - 3' x 6' CBC	Northeast	Yes, mitigated within pond/FPC
Split Oak Avoidance Alternative	CD-502-01	2 - 42”	Northeast	Yes, mitigated within pond/FPC
	CD-502-02	Bridge	South	Yes, mitigated with bridge
	CD-502-03	4 - 42”	Southwest	Yes, mitigated within pond/FPC
	CD-502-04	6 - 48”	West	Yes, mitigated within pond/FPC
	CD-502-05	2 - 42”	Northeast	No
	CD-502-06	2 - 36”	South	Yes, mitigated within pond/FPC
	CD-502-07	2 - 36”, 24”	South	Yes, mitigated within pond/FPC
	CD-502-08	6 - 3' x 6' CBC	North	Yes, mitigated within pond/FPC

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1. Introduction

The Central Florida Expressway Authority is conducting a Project Development and Environment (PD&E) Study to evaluate the proposed Osceola Parkway Extension (OPE), from the SR 417 and Boggy Creek Interchange extending south and then east crossing the Orange-Osceola County line and connects to Cyrils Drive in Osceola County, Florida. The primary purpose of the OPE is to respond to and prepare for future growth planned and approved in Orange County's Innovation Way Overlay and Osceola County's Narcoossee Planning Initiative area and the Northeast District (NED) planning areas. Additionally, the OPE will promote regional system linkage and network connectivity to existing SR 417 and SR 528 in east Orange County and the proposed Northeast Connector Expressway that is planned to provide further connectivity to Florida's Turnpike and US 192. The total length of this project is approximately 10 miles. The project horizontal datum is Florida State Plane East Zone (NAD 1983), and the vertical datum is NAVD'88, which is 1.014 feet below NGVD'29 (0.00 ft NGVD'29 = -1.014 ft NAVD'88). The project site is within Township 24 South, Range 30 East (Sections 27, 28, 29, 33, 34, 35); Township 24 South, Range 31 East (Sections 31, 32, 33); Township 24 South, Range 30 East (Sections 3, 4); and Township 25 South, Range 31 East (Sections 1, 2, 3, 4, 7, 8, 9, 10). See **Figure 1** in **Appendix A** for the Project Location Map.

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) depicts Zone AE floodplain limits throughout Lake Hart, Lake Mary Jane, Fells Cove, and Lake Myrtle and its associated channels and sloughs. The majority of the project is located in floodplain Zone A and AE. However, there have not been any FEMA approved stormwater studies to evaluate potential inundation along the project corridor that is independent of the Kissimmee River watershed. The FEMA Floodplain Map is included in **Appendix A**, **Figure 5**.

This project is located within the Kissimmee River Watershed and within five Waterbody ID's (WBIDs) (3172A, 3168B, 3174F, 3172C, and 3171EA). The project is wholly contained within the South Florida Water Management District (SFWMD). The Kissimmee River Watershed is not an Outstanding Florida Water (OFW) and a portion of this project area of interest is considered impaired for macrophyte nutrients by the Florida Department of Environmental Protection (FDEP).

2. Purpose

The purpose of this Location Hydraulics Report is to assess locations of off-site runoff towards the potential Osceola Parkway Extension alternatives analyzed within the PD&E Study. The intent of the Osceola Parkway Extension PD&E Study is to develop a proposed improvement strategy that is technically sound, environmentally sensitive, and publicly acceptable. The need for the project is to provide system linkage, multi-modal opportunities, and meet social demands. Analysis within this report determines potential impacts to floodplains and proposes mitigation strategies to be utilized in final design to offset those impacts. Additionally, the report provides estimated quantity and capacity of drainage features required to accommodate off-site runoff needs.

3. Cross Drain Analysis Methodology

Within the East Lake Tohopekaliga (East Lake Toho) basin, several smaller sub-basins exist, such as Boggy Creek, Jim Branch, Ajay Lake, C-29A Canal, and Lake Center Outlet basins. Within the project limits from SR 417 to Narcoossee Road, the area has a mix of pervious and impervious land. Ultimately, the runoff discharges into East Lake Toho. Within the project limits east of Narcoossee Road to Cyrils Drive, the area

is highly pervious and runoff ultimately discharges to either Ajay Lake or Lake Mary Jane. Refer to **Appendix A**, **Figure 6B**, **Figure 7B**, **Figure 8B**, and **Figure 9B** for basin maps.

Off-site contributing areas to the alternatives were delineated utilizing CatchmentSIM (CSIM) software to review where topographic ridges occur, reviewing existing permits and plans, a field review of the project area, and reviewing surveyed drainage information. Relevant permit information is contained within **Appendix B**. Two site visits to confirm the basin boundaries and cross drain locations were conducted on October 11th and December 14th of 2018. Field measurements, aerial imagery, Google Earth, LiDAR, and existing Environmental Resource Permit (ERP) information was used to determine the pipe size, length, inverts, and condition of existing upstream and/or downstream culverts. As the project consists of new alignments connecting to existing roadways, there are no existing pipes to analyze, however, existing downstream major cross drains were used to size pipes along the Osceola Parkway Extension Alternatives. Proposed pipe locations were determined from field review, LiDAR, and other available information including FEMA floodplains, United States Geological Survey (USGS) topographic information, and permits for upstream or downstream culverts. Generally, proposed pipes were located where there are existing open channels or depressional areas.

Table 1 provides the required storm events to be analyzed for each cross drain, per the Florida Department of Transportation (FDOT) Drainage Manual and Culvert Handbook requirements.

Table 1 – Storm Frequency Criteria

Storm Event Frequency	Reason
10-year	• General Roadside Ditch Culverts • Pedestrian and Trail Bridges
25-year	Design Flood Event (20-year project of AADT < 1,500)
50-year*	Design Flood Event (20-year projection of AADT > 1,500)
100-year	Base Flood Event
500-year	Greatest Flood Event

* This is the design storm for this project.

The proposed cross drains along the new alignment will be designed to allow the offsite flow to follow the pre-development conditions. For cross drains that have permitted culverts downstream of the alternative's proposed cross drain, the proposed crossing was sized to match the existing downstream cross drain. This assumption was not used in all cases where the downstream cross drain was considered small for the upstream basin contributing area, such as existing cross drains along Cyrils Drive and Boggy Creek Road (e.g. EX-19, EX-33) where the level of service would be considered smaller than what would be required for a limited access interstate. Additionally, the Sunbridge Northeast District drainage model and proposed plans was taken into consideration for pertinent outfall locations and sizes. No further analysis was performed on these cross drains.

For cross drains that did not have permitted downstream culvert sizes, the existing peak flows through the cross drains were calculated using the FDOT Rational Method, with an exception within the Poitras

Development where the Poitras FEMA LOMR Application model was used to determine the existing flowrates between wetlands at the cross drain locations.

The Rational Method was employed for cross drains CD-404-01, CD-404-02, CD-404-03, CD-404-07, CD-405-02, CD-405-07, CD-500-01, CD-500-03, CD-500-04, CD-500-05, CD-500-07, CD-502-01, CD-502-03, CD-502-04, CD-502-05, and CD-502-06 to calculate discharge rates for the Design (50-year), Base (100-year), and Greatest Flood (500-year). The intensity for each storm event was calculated from the FDOT Intensity-Duration-Frequency (IDF) Equations for Zone 7 provided in the FDOT Hydrology Handbook if time of concentration was less than or equal to 180 minutes. If the time of concentration was more than 180 minutes, intensities were attained directly from the IDF curve for Zone 7. Discharge rates for the 500-year event were estimated by plotting the calculated discharge rates for the 25-year, 50-year, and 100-year event on a log-log graph of frequency versus flow and forecasting for the 0.002 event frequency (500-year event).

Cross drains CD-404-04 and CD-405-04, use existing flow rates from available model from FEMA LOMR 002-17137 as input flows for HY-8.

Federal Highway Administration (FHWA) HY-8 (Version 7.50) software was used to determine peak stages associated with these flows and proposed pipe sizes. Pipe sizes were determined by providing approximately three feet per second (fps) velocity during the design storm to minimize risk of increasing stages for the surrounding properties. For the purpose of this study, it was assumed that a maximum pipe size of 48-inches would be used before creating multiple pipes at the cross drain, if needed. In all cases, overtopping for the basin was assumed to be the roadway for the mainline Osceola Parkway Extension. A roadway profile was developed for each of the alternatives, and generally, the profile is three feet above existing ground. Cross drains are typically located at low points in the roadway profile. At cross drain locations, the roadway was assumed to be five feet above the crown of pipe in an effort to provide dry bottoms in the roadside ditches. The roadway profile will be re-evaluated during final design. The crown of pipe was assumed to match either FEMA's Base Flood Elevation (BFE) or the existing ground elevation provided by LiDAR data. The crown of pipe at the downstream end is used as the constant tailwater elevation for each cross drain in HY-8, as it was assumed this would be the condition where peak flow occurs.

If the 500-year discharge did not result in overtopping of the Osceola Parkway Extension Alternative, then the 500-year discharge and stage was entered in the Flood Data Box as the Greatest Flood. If a storm event of lower frequency than the 500-year discharge resulted in overtopping, then the frequency of the storm event was calculated using the log-log discharge estimate. This result was recorded as the Overtopping Flood within the Flood Data Box. The Flood Data Box is included in Section 6 - Conclusion of this report.

It is assumed that during the design phase pipe sizes will be re-evaluated for any existing infrastructure (e.g. underground utilities) or topographic limitations that can influence pipe inverts, as well as the proposed profile that can limit the pipe height. It is also assumed that the basin overtopping analysis and floodplain stage increases will be evaluated in the design phase.

4. Existing Conditions

4.1 Previously Permitted Information

Existing drainage basin locations and previously permitted cross drains located upstream and downstream of the project were used to determine the sizing and flow for the proposed cross drains. The Balmoral Group's (TBG) site visits on October 11 and December 14 of 2018, the SFWMD ERPs along the Southeast SR 417 and east of Narcoossee Road verified the location and sizing of previously permitted cross drains. The cross drains found within the project boundaries were verified. **Table 2** provides a list of SFWMD ERPs as well as FDOT Record Drawings reviewed for cross drain information and locations along the Osceola Parkway Extension project limits.

Table 2 - Existing Plans within Osceola Parkway Extension Project Limits, West to East

Permit No.	Application No.	Project Name	Plans show pertinent Cross Drain?
48-00063-S	051109-15	Poitras Property Borrow Pit No 5	No
48-00195-S	080515-14	Lake Nona South West Mass Grading Phase 2	No
48-00195-S[1]	180309-3	Poitras East PD FEMA LOMR	No, but provides flow at CD-405-03 & CD-404-04
48-00788-S	130419-13	Lake Preserve	No
48-00922-P	010413-2	World Gateway - Offsite Mitigation Area	No
48-00954-P-02	070322-11	County Road 15 (Narcoossee Road)	Yes, EX-2 & EX-2A
48-01152-P	010919-11	Lake Hart Phase 1B Parcel 4 Lot Fill	No
48-01288-P	020116-5	Ginn Property DRI	No
48-01290-P	170515-25	Village K and J	No
48-02210-P	121029-15	Eagles Roost Pier	No
48-02392-P	150603-2	Southern Oaks	No
48-02396-P	141208-2	Clapp Simms Duda Road	Yes; EX-4 & EX-5
48-02409-P	150106-3	Clapp Simms Duda Road - Bridge Improvements	No
49-00993-P	030730-12	Swale East of Springhead Lake Excavation	No
49-01136-P	090508-7	Villa Sol	No
49-01331-P	030520-26	Turnberry Reserve	No
49-02042-P	091118-6	Boggy Creek Road Widening (Orange Co)	Yes; EX-12
49-02211-P	031231-10	Boggy Creek Road Widening	Yes; EX-35, EX-1, EX-20
49-02681-P[1]	170814-2	Sunbridge-Cyrils Drive Master Drainage Report	Yes; F-22, F-23, F-25, F-26

Note[1]: Construction for this project has not yet initiated.

Permit information showing pertinent cross drains within the project vicinity are included in **Appendix B**.

4.2 Existing Cross Drains

TBG's field review resulted in the discovery of pertinent cross drains along Boggy Creek Road, Happy Lane, Simpson Road, Narcoossee Road, and Cyrils Drive. Field review notes are located in **Appendix C**. **Plates 1** and **2** provide an overview of these existing cross drain locations in relation to the alternatives for the Osceola Parkway Extension. The direction of flow is determined from LiDAR, previously permitted data, and field visit observations. See **Figures 10** through **17**, **Appendix A**, for existing cross drain location exhibits.

Table 3 provides pertinent information for existing crossdrains along the Osceola Parkway Extension.

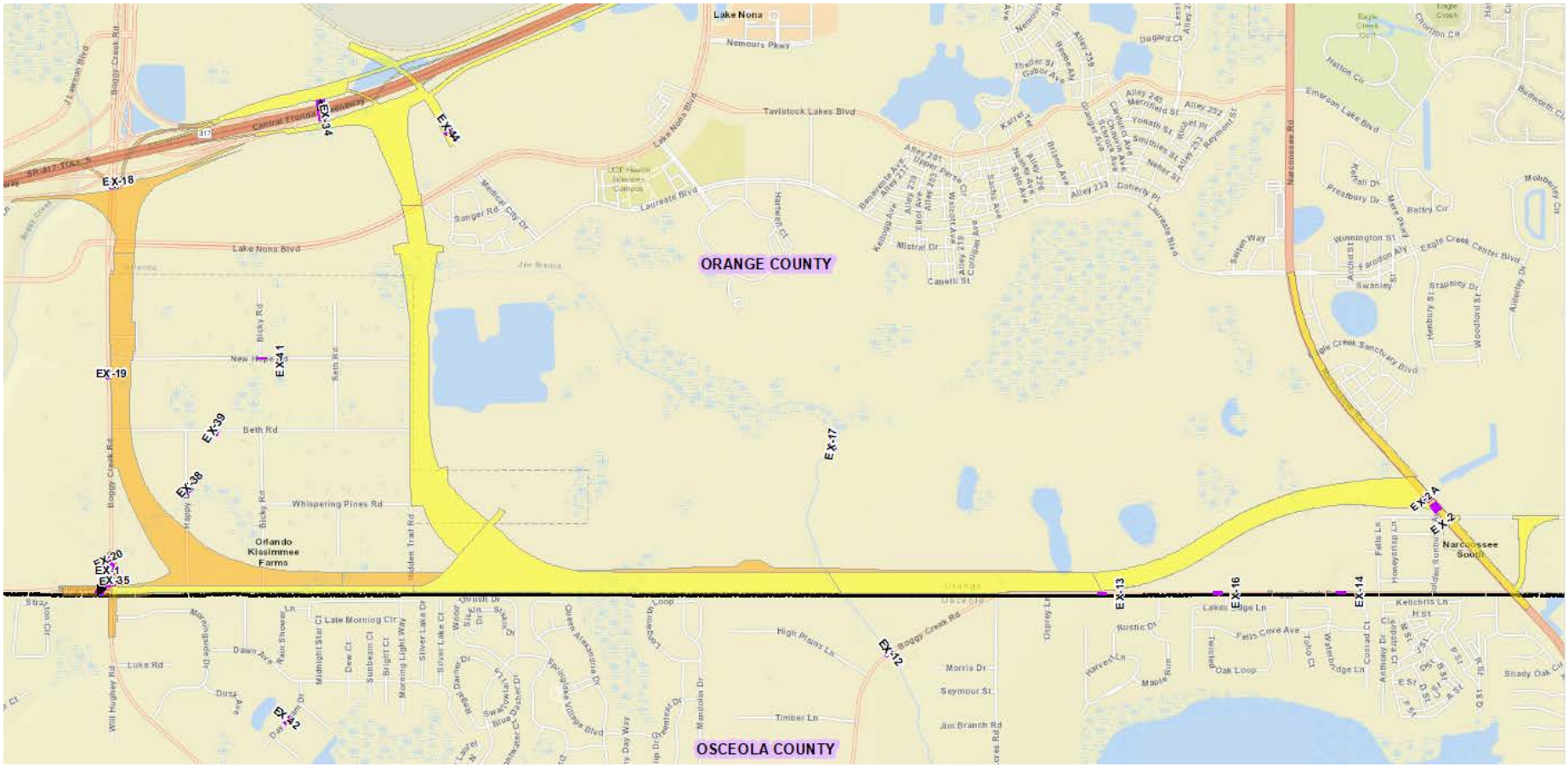

Plate 1 – Existing Cross Drains Relative to Proposed Boggy Creek (Orange) and Lake Nona (Yellow) Alternatives

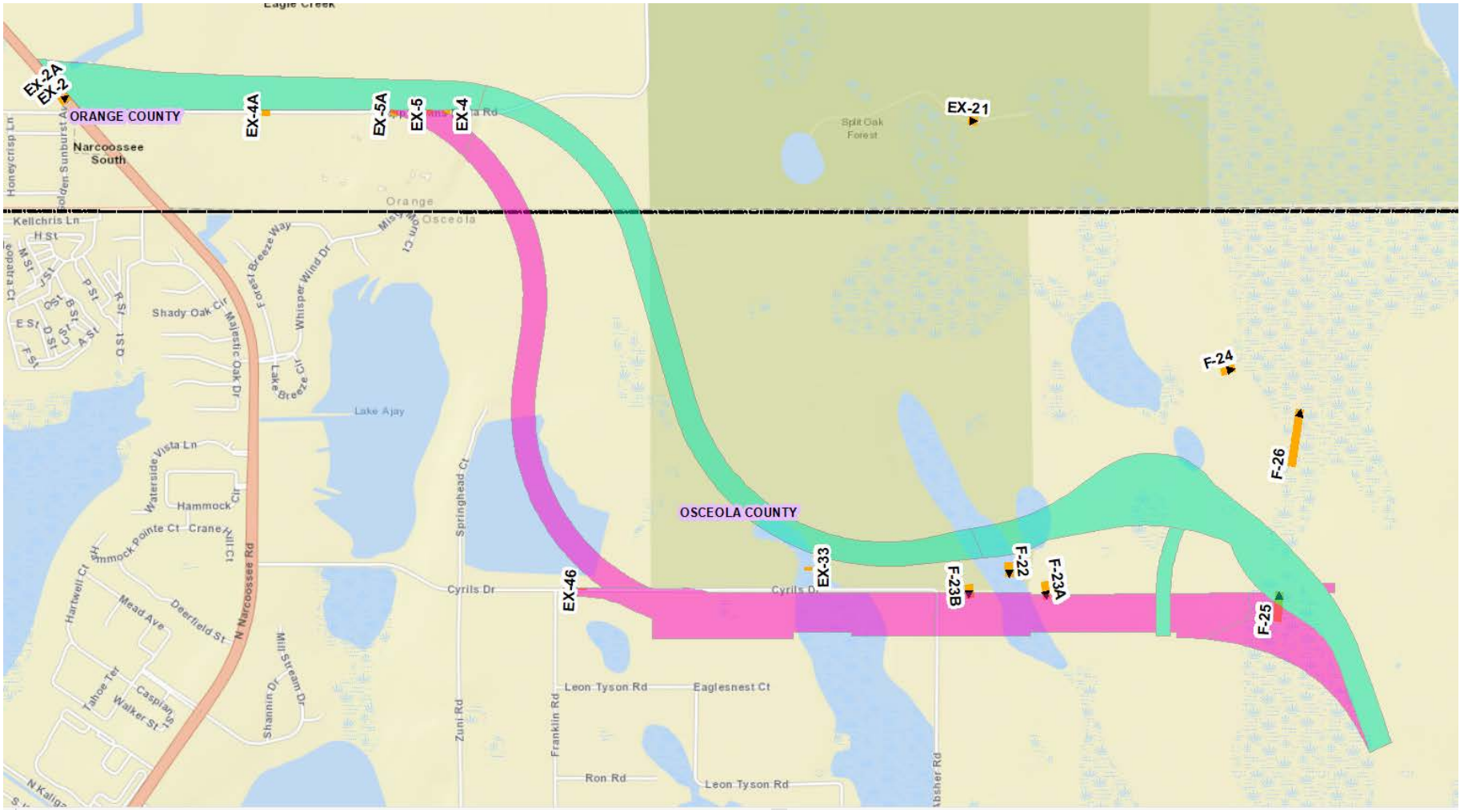

Plate 2 – Existing Cross Drains Relative to Proposed Split Oak Minimization (Green) and Split Oak Avoidance (Pink) Alternatives

Table 3 – Pertinent Existing Cross Drains Along OPE Alternatives Summary

Existing & Future Cross Drain ID	Proposed Cross Drain ID	Size	Flow Direction	Source
EX-2	N/A	24" Reinforced Concrete Pipe (RCP) (Narcoossee Road Existing Pond Outfall)	Northeast	ERP Application No. 070322-11
EX-2A	N/A	8' x 6' Wildlife Crossing	Northeast	ERP Application No. 070322-11
EX-12	CD-405-05, CD-404-05	3 - 8' x 5' Concrete Box Culvert (CBC)	Southeast	ERP Application No. 091118-6
EX-13	CD-405-06, CD-404-06	2 - 30" Pipes	Southeast	TBG Field Visit
EX-18	CD-405-01	2 - 72" Pipes	West	Osceola Parkway Extension Location Hydraulics Report for Osceola County Expressway Authority (OCX) (Inwood, 2016)
EX-19	N/A	24" Pipe	West	Osceola Parkway Extension Location Hydraulics Report for OCX (Inwood, 2016)
EX-33	N/A	18" Control Structure	Southwest	Cyrils Drive Survey, Provided by Tavistock
EX-35	CD-405-03	3 - 38"x60" Pipes	South	ERP Application No. 031231-10
F-22	CD-500-06 CD-502-07	2 - 36" Pipes	South	ERP Application No. 170814-2 & ERP Application No. 180209-328
F-23A & F-23B	N/A	2 - 24" Wildlife Crossings	South	ERP Application No. 170814-2
F-25	CD-502-08	6 - 3' x 6' CBC	North	ERP Application No. 180209-328
F-26	CD-500-08	6 - 3' x 6' CBC	North	ERP Application No. 180209-328

Note: For the Cross Drain ID column, "EX" indicates a currently existing culvert & "F" indicates plans show this culvert to be constructed in the future.

4.2.1 EX-2 & EX-2A

Cross drains EX-2 and EX-2A are located along Narcoossee Road at the proposed interchange with the Osceola Parkway Extension. The sizes for these crossings were pulled from the Narcoossee Road Widening project under SFWMD ERP Application No. 070322-11.

From the permitted plans, EX-2 is shown as a 24-inch outfall pipe for the Narcoossee Road stormwater management facility, which is proposed to be impacted by both the Boggy Creek and Lake Nona Alternatives. The existing pond is proposed to be relocated and merged with the stormwater management facility associated with the Osceola Parkway Extension's improvements along Narcoossee Road. Therefore, this crossing is not proposed to be extended or replaced.

From the permitted plans, EX-2A is shown as an 8' x 6' CBC Wildlife Crossing to connect Poitras and Eagle Creek Primary Conservation Network (Conservation Network map provided in **Appendix B**). This was confirmed during TBG's Field Visit in October 2018 (see **Plate 3** below). Due to the wildlife crossing location in relation to the proposed OPE Interchange with Narcoossee Road and the surrounding proposed developments, this wildlife crossing is not currently proposed to be extended or relocated. The disposition of the wildlife crossing is unknown at this time. It is assumed that coordination of wildlife crossings will be performed during the design phase.

Plate 3 – EX-2A Wildlife Crossing (Facing South)

4.2.2 EX-12

Cross drain EX-12 is located on Boggy Creek Road approximately 540 feet northeast of the Boggy Creek Road and High Plains Lane intersection, along Jim Branch in Osceola County. This cross drain is included in ERP Application No. 091118-6. Refer to **Appendix C**. The cross drain consists of three 8' x 5' concrete culverts.

Figure 14 in **Appendix A** shows the EX-12 location and surrounding topography. **Plate 4** shows the condition of EX-12.

Plate 4 - Downstream End of Cross Drain EX-12 in Series Downstream of CD-405-04 (CD-404-02)

4.2.3 EX-13

Cross drain EX-13 is located on Boggy Creek Road approximately 1,000 feet east of the Boggy Creek Road and Opsy Lane intersection. This cross drain is included within the field notes for the field review on October 11th of 2018, which can be found in **Appendix C**. The cross drain consists of two 30 inch RCP's.

Figure 14 in **Appendix A** shows the EX-13 location and surrounding topography. **Plate 5** shows the condition of EX-13.

Plate 5 - Upstream End of Cross Drain EX-13 in Series Downstream of CD-405-05 (CD-404-06)

4.2.4 EX-18

Cross Drain EX-18 is located on Boggy Creek Road just south of the existing SR 417 Interchange. It is documented within the Osceola Parkway Extension Location Hydraulics Report for OCX, by Inwood in 2016, as a double 72-inch pipe. This pipe receives flow from the Lake Nona Medical Center as documented within SFWMD ERP Application 130628-7 for the Lake Nona Boulevard connection to Boggy Creek Road. Refer to **Appendix B**.

4.2.5 EX-33

EX-33 is located on Cyrils Drive approximately 1,000 feet west of the Absher Road and Cyrils Drive intersection. This cross drain is included within the Cyrils Drive topographic survey CADD file from Tavistock. It is surveyed to be a control structure with a V-notch weir with an 18-inch pipe crossing Cyrils Drive.

Figure 16 in **Appendix A** shows the EX-33 location and surrounding topography.

4.2.6 EX-35

Existing cross drain EX-35 is located at the intersection of Boggy Creek Road and East Boggy Creek Road (See **Plate 6** below). Multiple iterations of the plan set for this cross drain exist within ERP Application No. 031231-10. TBG field review confirmed this cross drain is a triple 38" x 60" RCP that connects the residential area east of Boggy Creek Road to a Boggy Creek tributary. The culvert connects from the northeast quadrant to the southeast quadrant.

Plate 6 – EX-35 South of Boggy Creek Road (Facing Northeast)

4.2.7 EX-39

Cross drain EX-39 is located on Beth Road approximately 400 feet east of the Happy Lane and Beth Road intersection. This cross drain is included within the field notes for the field review on December 14th of 2018, which can be found in **Appendix C**. The cross drain consists of two 30 inch RCP's.

Figure 11 in **Appendix A** shows the EX-39 location and surrounding topography. **Plate 7** shows the condition of EX-39.

Plate 7 - Upstream End of Cross Drain EX-39 in Series Upstream of CD-405-02

4.2.8 EX-46

Cross drain EX-46 was discovered in the field during a TBG Field Visit. It is a double 15-inch pipe under Cyrils Drive at the southeast corner of an existing borrow pit.

Figure 16 in **Appendix A** shows the EX-46 location and surrounding topography. **Plate 8** shows the condition of EX-46.

Plate 8 – EX-46 along Cyrils Drive

4.2.9 Cross Drain F-22

Cross drain, F-22 is located approximately 1,000 feet east of the Absher Road and Cyrils Drive intersection. This cross drain is shown in SFWMD Permit Application 170814-2 (future Sunbridge NED Cyrils Drive Phase I Project Plans). As such, it is assumed that this cross drain will be constructed in the future. It is intended to replace EX-30, which is a double 12-inch cross drain. Refer to **Appendix B** for plans showing future cross drain F-22, which will be double 36-inch pipes.

Figure 17 in **Appendix A** shows the F-22 location and surrounding topography. Cross drain F-22 is in series downstream of proposed cross drain CD-500-05 for the Split Oak Minimization Alternative and in series upstream of proposed cross drain CD-502-07 for the Split Oak Avoidance Alternative.

4.2.10 Cross Drain F-23A and F-23B

F-23A and F-23B are located east of the Absher Road and Cyrils Drive intersection, on the east and west side of F-22. These pipes are 24-inch wildlife crossings situated at a higher elevation than the F-22 hydraulic cross drain. These wildlife crossings are shown in SFWMD Permit Application 170814-2 (future Sunbridge NED Cyrils Drive Phase I Project Plans). As such, it is

assumed that these cross drains will be constructed in the future. Refer to **Appendix B** for plans showing these future cross drains.

Wildlife crossings were not included in cross drain estimates for the OPE alternatives. It is assumed that coordination of wildlife crossings will be performed during the design phase.

Figure 17 in **Appendix A** shows the F-23A and F-23B locations and surrounding topography.

4.2.11 Cross Drain F-26

Cross drain F-26 is located approximately 5,200 feet northeast of the Absher Road and Cyrils Drive intersection. This cross drain is shown in SFWMD Permit Application 171106-4 (future Sunbridge NED Phase I West of C-30 Canal Project Plans). As such, it is assumed that this cross drain will be constructed in the future. Refer to **Appendix B** for plans showing future cross drain F-26, which will be six 3' x 6' box culverts.

Figure 17 in **Appendix A** shows the F-26 location and surrounding topography. Cross drain F-26 is in series downstream of proposed cross drain CD-500-08 for the Split Oak Minimization Alternative.

4.2.12 Cross Drain F-25

Cross drain F-25 is located approximately 4,670 feet northeast of the Absher Road and Cyrils Drive intersection. This cross drain is shown in SFWMD Permit Application 171106-4 (future Sunbridge NED Phase I West of C-30 Canal Project Plans). As such, it is assumed that this cross drain will be constructed in the future. Refer to **Appendix B** for plans showing future cross drain F-25, which will be six 3' x 6' box culverts.

Figure 17 in **Appendix A** shows the F-25 location and surrounding topography. Cross drain F-25 is in series downstream of proposed cross drain CD-502-08 of the split oak avoidance alternative.

5. Proposed Conditions

Potential floodplain impacts as a result of the Osceola Parkway Extension from SR 417 to Cyrils Drive were reviewed along the contributing basin for each cross drain. Any floodplain impacts associated with the proposed bridges over Boggy Creek and Canal C-29A tributary to Fells Cove will be handled during the design phase through a bridge hydraulics analysis.

Floodplain impacts are not expected to occur within the contributing areas for cross drains CD-404-06, CD-404-07, CD-405-02, CD-405-06, CD-405-07, CD-500-04, and CD-502-05. There is some encroachment of the alternative footprint on the existing 100-year FEMA floodplain at cross drains CD-404-02, CD-404-03, CD-404-04, CD-405-01, CD-405-04, CD-500-01, CD-500-03, CD-500-05, CD-500-06, CD-500-07, CD-502-01, CD-502-03, CD-502-04, CD-502-06, CD-502-07, and CD-502-08, which will be mitigated by routing the floodplain impacted volume to the project's stormwater management facility or floodplain compensation pond, as stated in the Pond Siting Report prepared by The Balmoral Group under a separate cover. Additionally, it is anticipated that floodplain impacts associated with the alternative footprints at cross drains CD-404-01, CD-404-05, CD-405-03, CD-405-05, CD-500-02, and CD-502-02 will be mitigated with a proposed cross drain or bridge.

This document serves to identify the proposed offsite conveyance required to maintain existing drainage patterns through the proposed alternatives.

Please see **Appendix D** for proposed calculations, assumptions, and HY-8 results.

5.1 Lake Nona Alternative (Alternative 404B) Cross Drains

The OPE Lake Nona Alternative extends from SR 417 to Narcoossee Road. The Lake Nona Alternative includes an interchange with SR 417 approximately 5,000-feet east of the existing SR 417 and Boggy Creek Road interchange, then heads south to a proposed interchange with Laureate Boulevard and the proposed interchange with the Simpson Road extension before heading due east along the Osceola and Orange County Line until reaching the Narcoossee Road interchange. This alternative intersects FEMA Flood Zones A and AE within the SR 417 interchange, the Lake Nona Medical Center, Jim Branch Creek, and the Jim Branch Creek tributaries. **Table 4** provides alternatives for proposed cross drains at Lake Nona.

Table 4 – Lake Nona Alternative Proposed Cross Drains

Cross Drain	Culvert Size	Flow Direction
CD-404-01	2 - 36”	East
CD-404-02	24”	East
CD-404-03	24”	East
CD-404-04	3 - 42”	North
CD-404-05	3 - 5’ x 8’	Southeast
CD-404-06	2 - 30”	Southeast
CD-404-07	3 - 48”	South

5.1.1 Cross Drain CD-404-01

CD-404-01 is located within Jim Branch tributary wetlands, which flow east towards Jim Branch Creek. The crossing is located within FEMA Flood Zone AE with a base flood elevation of 80 feet-NAVD. There are no pertinent existing cross drains for this crossing, so the rational method was utilized to size this cross drain. From analysis of the Digital Elevation Model (DEM), the contributing basin area is approximately 35.7 acres. The rational method estimates a peak design storm flow of 47.3 cubic feet per second (cfs). To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 36-inch pipes.

See **Figure 6B** in **Appendix A** for a GIS exhibit showing CD-404-01's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-404-01.

5.1.2 Cross Drain CD-404-02

CD-404-02 is located within Jim Branch tributary wetlands, which flows east towards Jim Branch Creek. The crossing is located within FEMA Flood Zone A. There are no known pertinent existing cross drains for this crossing, so the rational method was utilized to size this cross drain. From analysis of the DEM, the contributing basin area is approximately 5.8 acres. The rational method estimates a peak design storm flow of 10.6 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be a single 24-inch pipe.

See **Figure 6B** in **Appendix A** for a GIS exhibit showing CD-404-02's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-404-02.

5.1.3 Cross Drain CD-404-03

CD-404-03 is located within Jim Branch tributary wetlands, which flows east towards Jim Branch Creek. The crossing is located within FEMA Flood Zone A. There are no known pertinent existing cross drains for this crossing, so the rational method was utilized to size this cross drain. From analysis of the DEM, the contributing basin area is approximately 8.5 acres. The rational method estimates a peak design storm flow of 11.4 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be a single 24-inch pipe.

See **Figure 6B** in **Appendix A** for a GIS exhibit showing CD-404-03's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-404-03.

5.1.4 Cross Drain CD-404-04

CD-404-04 conveys water north connecting wetlands within Jim Branch tributary. This area is included within a large watershed model for the Poitras East PD, which submitted a FEMA LOMR Application in December 2018. The existing flowrate results between the wetlands were included in this model and used to size a cross drain along the Lake Nona Alternative. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be triple 42-inch pipes.

See **Figure 6B** in **Appendix A** for a GIS exhibit showing CD-404-04's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-404-04.

5.1.5 Cross Drain CD-404-05

CD-404-05 is located on Jim Branch Creek, which flows south outfalling into Fells Cove and ultimately discharges into East Lake Toho. The cross drain is located within FEMA Flood Zone A for Jim Branch Creek. The proposed cross drain size is assumed to match the existing

downstream cross drain, EX-12, at Boggy Creek Road, which is a triple 5-foot x 8-foot concrete box culvert.

Quantity estimates for this cross drain were prorated using the pay items and unit estimates for EX-12 as documented in SFWMD ERP Application No. 091118-6. Refer to **Appendix B**.

See **Figure 6B** in **Appendix A** for a GIS exhibit showing CD-404-05's location and surrounding topography.

5.1.6 Cross Drain CD-404-06

CD-404-06 is located north of and adjacent to Boggy Creek Road, outfalling to Fells Cove and ultimately discharging into East Lake Toho. The cross drain is not located within a FEMA floodplain. An existing cross drain at Boggy Creek Road, EX-13, was discovered during the TBG Field Visit in October 2018. The cross drain measured as double 30-inch pipes. From review of the contributing basin size, the existing cross drain size appears to be appropriate and was used as the estimated pipe size for this crossing.

See **Figure 6B** in **Appendix A** for a GIS exhibit showing CD-404-06's location and surrounding topography.

5.1.7 Cross Drain CD-404-07

CD-404-07 outfalls to a system of cross drains, which outfall directly to Fells Cove and ultimately discharge into East Lake Toho. It is located outside of a FEMA floodplain. There is an existing cross drain, EX-14, which includes double 24-inch pipes along Boggy Creek Road. However, from analysis of the DEM and TBG field review, the contributing basin area is approximately 66 acres. It was presumed that the existing cross drain along Boggy Creek Road, a county road, does not provide the level of service a limited access facility would require. The rational method was performed at this location which estimates a peak design storm flow of 61 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 48-inch pipes.

See **Figure 6B** in **Appendix A** for a GIS exhibit showing CD-404-07's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-404-07.

5.2 Boggy Creek Alternative (Alternative 405) Cross Drains

The OPE Boggy Creek Alternative extends from the SR 417 and Boggy Creek Road interchange to Narcoossee Road. The Boggy Creek Alternative includes new ramps within the existing interchange with SR 417 and Boggy Creek Road, then heads due south to a proposed interchange with an extension of Simpson Road before turning due east along the Osceola and Orange County Line to the proposed Narcoossee Road interchange. This alternative intersects FEMA Flood Zones A and AE within the Boggy Creek, Boggy Creek tributary wetlands, Jim Branch Creek, and the Jim Branch Creek tributary wetlands.

The Boggy Creek Alternative proposes bridges over the Boggy Creek Floodway. All floodplain impact analyses associated with Boggy Creek should be further evaluated and coordinated with the SR 417 widening project.

During permit and existing studies research, it was noted that the Boggy Creek tributary wetlands located east of Boggy Creek Road has two major outfall locations at EX-18 and EX-35. These existing cross drains along Boggy Creek Road were sized to accommodate the entire respective FEMA floodplain at each crossing, therefore, these existing cross drain sizes were used at the FEMA crossings along Alternative 405. TBG Field Review on December 14, 2018, intended to verify basin boundaries between the Lake Nona Medical Center property and the southern residential area, however, there is a gated access roadway for the City of Orlando property that appears to be a basin divide. From aerial imagery there is a possible cross drain along this gated access roadway northeast of Bicky Road. If this alternative is chosen, it is suggested to further evaluate the contributing areas and direction of flow in the design phase to decrease the required cross drain sizing as appropriate. For purposes of this study, the two major cross drain sizes were used for CD-405-01 and CD-405-03. **Table 5** provides alternatives for proposed cross drains at Boggy Creek.

Table 5 – Boggy Creek Alternative Proposed Cross Drains

Cross Drain	Culvert Size	Flow Direction
CD-405-01	2 - 72”	West
CD-405-02	2 - 48”	West
CD-405-03	3 - 38” x 60”	Southwest
CD-405-04	(3) 42”	North
CD-405-05	3 - 5’ x 8’	Southeast
CD-405-06	2 - 30”	Southeast
CD-405-07	3 - 48”	South

5.2.1 Cross Drain CD-405-01

CD-405-01 is located within a Boggy Creek Tributary and FEMA Flood Zone AE. Offsite runoff discharges west from the Lake Nona Medical Center to Boggy Creek Road as documented within SFWMD ERP Application 130628-7 for the Lake Nona Boulevard connection to Boggy Creek Road. CD-405-01 is a cross drain for the northbound OPE to eastbound SR 417 interchange ramp, since current design does not include a bridge at this location. The pipe size matches the existing downstream cross drain at Boggy Creek Road, EX-18, which includes double 72-inch pipes.

All other ramps at this interchange include a bridge over the Boggy Creek tributary, therefore, no additional cross drains were identified at this location.

5.2.2 Cross Drain CD-405-02

CD-405-02 outfalls west to Boggy Creek and ultimately discharges into East Lake Toho. It is located outside of a FEMA floodplain. There is an existing cross drain, EX-19, which is a 24-inch pipe, along Boggy Creek Road. However, from analysis of the DEM and TBG field review, the contributing basin area is approximately 115 acres. It was presumed that the existing cross drain along Boggy Creek Road, a county road, does not provide the level of service a limited access facility would require. The rational method was performed at this location, which estimates a peak design storm flow of 67.4 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 48-inch pipes.

See **Figure 7B** in **Appendix A** for a GIS exhibit showing CD-405-02's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-405-02.

5.2.3 Cross Drain CD-405-03

CD-405-03 outfalls to Boggy Creek and ultimately discharges into East Lake Toho. The cross drain is located within FEMA Flood Zone A, which is comprised of the wetland tributary to Boggy Creek east of Boggy Creek Road. From the Boggy Creek Road Widening, under ERP Application 031231-10, these wetlands flow towards the Boggy Creek Road and East Boggy Creek Road intersection, therefore, CD-405-03 pipe size matches the existing downstream cross drain EX-35.

See **Figure 7B** in **Appendix A** for a GIS exhibit showing CD-405-03's location and surrounding topography.

5.2.4 Cross Drain CD-405-04

CD-405-04 conveys water north connecting wetlands within the Jim Branch tributary. This area is included within a large watershed model for the Poitras East PD, which has submitted a FEMA LOMR Application in December 2018. The existing flowrate results between the wetlands were included in this model and used to size a cross drain along the Boggy Creek Alternative. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be triple 42-inch pipes.

See **Figure 7B** in **Appendix A** for a GIS exhibit showing CD-405-04's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-405-04.

5.2.5 Cross Drain CD-405-05

CD-405-05 is located on Jim Branch Creek, which flows south outfalling into Fells Cove and ultimately discharges into East Lake Toho. The cross drain is located within FEMA Flood Zone A for Jim Branch Creek. The proposed cross drain size is assumed to match the existing downstream cross dain, EX-12, at Boggy Creek Road, which is a triple 5-foot x 8-foot concrete box culvert.

Quantity estimates for this cross drain assumes the same pay items and unit estimates for EX-12 as documented in SFWMD ERP Application No. 091118-6. Refer to **Appendix B**.

See **Figure 7B** in **Appendix A** for a GIS exhibit showing CD-405-05's location and surrounding topography.

5.2.6 Cross Drain CD-405-06

CD-405-06 is located north of and adjacent to Boggy Creek Road, outfalling to Fells Cove and ultimately discharging into East Lake Toho. The cross drain is not located within a FEMA floodplain. An existing cross drain at Boggy Creek Road, EX-13, was discovered during the TBG field visit in October 2018. The cross drain measured as double 30-inch pipes. From review of the contributing basin size, the existing cross drain size appears to be appropriate and was used as the estimated pipe size for this crossing.

See **Figure 7B** in **Appendix A** for a GIS exhibit showing CD-405-06's location and surrounding topography.

5.2.7 Cross Drain CD-405-07

CD-405-07 outfalls to a system of cross drains downstream, which directs runoff to Fells Cove and ultimately discharges into East Lake Toho. It is located outside of a FEMA floodplain. There is an existing cross drain, EX-14, which includes double 24-inch pipes along Boggy Creek Road. However, from analysis of the DEM and TBG field review, the contributing basin area is approximately 66 acres. It was presumed that the existing cross drain along Boggy Creek Road, a county road, does not provide the level of service a limited access facility would require. The rational method was performed at this location, which estimates a peak design storm flow of 61 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 48-inch pipes.

See **Figure 7B** in **Appendix A** for a GIS exhibit showing CD-405-07's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-405-07.

5.3 Split Oak Minimization Alternative (Alternative 500 107C-1) Cross Drains

The OPE Split Oak Minimization Alternative extends east from the Narcoossee Road Interchange, which is approximately 2,300-feet northwest of the existing Narcoossee Road and Boggy Creek Road intersection, to SFWMD C-29A Canal where it then shifts southeast into the southern portion of Split Oak Forest and connects to Cyrils Drive, west of the C-30 Canal.

A large stormwater management study for the future development west of the C-30 Canal and the Sunbridge Parkway connection to Cyrils Drive was used as applicable. The future cross drain sizes and locations are provided in SFWMD ERP Applications 170814-2 and 180209-328, refer to **Appendix B** for documentation. For purposes of this study, only the applicable future hydraulic connections were used, and wildlife crossings were not included. It is assumed that the final design phase will coordinate locations and sizes for any desired wildlife crossings within the corridor. **Table 6** provides minimization alternatives for proposed cross drains at Split Oak.

Table 6 – Split Oak Minimization Alternative Proposed Cross Drains

Cross Drain	Culvert Size	Flow Direction
CD-500-01	2 - 42”	North
CD-500-02	BRIDGE	South
CD-500-03	3 - 42”	South
CD-500-04	2 - 48”	Southwest
CD-500-05	36”	Southwest
CD-500-06	2 - 36"	South
CD-500-07	36”	North
CD-500-08	6 - 3’ x 6’	Northeast

5.3.1 Cross Drain CD-500-01

CD-500-01 is located north of and adjacent to Clapp Simms Duda Road. The cross drain is located within FEMA Flood Zone AE, with a base flood elevation of 63 feet-NAVD. From the Clapp Simms Duda Road Utility and Road Improvements Project under SFWMD ERP Application No. 141208-2, there are several 15-inch and 18-inch cross drains along Clapp Simms Duda Road between Narcoossee Road and the C-29A Canal, conveying runoff from south of Clapp Simms Duda Road to the roadside ditch on the north, which flows east outfalling into the C-29A Canal. From analysis of the DEM, the contributing basin area is approximately 48.9 acres. It was presumed that the existing cross drain along Clapp Simms Duda Road does not provide the level of service a limited access facility would require. The rational method was performed at this location, which estimates a peak design storm flow of 63.2 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 42-inch pipes for a single crossing between Narcoossee Road and the C-29A Canal.

See **Figure 8B** in **Appendix A** for a GIS exhibit showing CD-500-01’s location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-500-01.

5.3.2 Cross Drain CD-500-02

CD-500-02 is located at SFWMD C-29A Canal. It is assumed that the alternative will bridge over the entire SFWMD right-of-way. Floodplain impacts directly associated with this crossing will be analyzed within the design phase for this project.

5.3.3 Cross Drain CD-500-03

CD-500-03 is located within an existing conveyance ditch that flows west to Ajay Lake. The cross drain is within FEMA Flood Zone A, associated with Ajay Lake. There are no known pertinent

existing or future cross drains within this area at this time. From analysis of the DEM, the contributing basin area is approximately 79.0 acres. The rational method was performed at this location, which estimates a peak design storm flow of 85.9 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be triple 42-inch pipes.

See **Figure 8B** in **Appendix A** for a GIS exhibit showing CD-500-03's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-500-03.

5.3.4 Cross Drain CD-500-04

CD-500-04 is located upstream of an existing conveyance ditch that flows west to Ajay Lake. The cross drain is not located within a FEMA floodplain. There are no known pertinent existing or future cross drains within this area at this time. From analysis of the DEM, the contributing basin area is approximately 96.0 acres. The rational method was performed at this location which estimates a peak design storm flow of 72.0 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 48-inch pipe.

See **Figure 8B** in **Appendix A** for a GIS exhibit showing CD-500-04's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-500-04.

5.3.5 Cross Drain CD-500-05

CD-500-05 is located within existing FEMA floodplain Zone A associated with wetlands within Split Oak Forest just north of Cyrils Drive. This cross drain conveys runoff southwest to the wetlands north of Cyrils Drive. There is an existing cross drain along Cyrils Drive that is a control structure with an 18" pipe, EX-33. Since the intention of CD-500-05 is to mimic existing conditions, which is free flow to the wetland at the EX-33 control structure, the rational method was used to size the cross drain. From analysis of the DEM, the contributing basin area is approximately 21.9 acres. The rational method estimates a peak design storm flow of 19.9 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be a single 36-inch pipe.

See **Figure 8B** in **Appendix A** for a GIS exhibit showing CD-500-05's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-500-05.

5.3.6 Cross Drain CD-500-06

CD-500-06 is located within existing FEMA Flood Zone A associated with wetlands within Split Oak Forest just north of the proposed Cyril Drive extension to Sunbridge Parkway. This section of the Split Oak Minimization Alternative is situated within the Sunbridge Northeast District (NED) Master Drainage Plan, ERP Application No. 180209-328. From the proposed model and development plans, the future cross drain along Cyril Drive, F-22, includes double 36-inch pipes that conveys the wetlands north of Cyril Drive to the wetlands to the south. This pipe size was used for the Split Oak Minimization Alternative's crossing. The future pipes F-23A and F-23B are

wildlife crossings and are not included within this proposed crossing. The wetland to the east, north of the alignment, will need to be connected to this cross drain.

See **Figure 8** in **Appendix A** for a GIS exhibit showing CD-500-06's location and surrounding topography. Refer to **Appendix B** for the permit data used for this cross drain.

5.3.7 Cross Drain CD-500-07

CD-500-07 is located within the interchange with Cyrils Drive. The cross drain is located within FEMA Flood Zone AE associated with various isolated wetlands. From a review of the Sunbridge Northeast District Master Drainage Plan, ERP Application 180209-328, within the Pre and Post Development models the isolated wetland south the Split Oak Minimization Alternative is a part of the basin for the large wetland due north of this location. The cross drain extends along the width of the interchange. It is assumed that any conflicts with the infield pond or other related items will be resolved during the design phase.

From analysis of the DEM, the contributing basin area is approximately 17.7 acres. The rational method was performed at this location, which estimates a peak design storm flow of 21.5 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be a single 36-inch pipe.

See **Figure 8** in **Appendix A** for a GIS exhibit showing CD-500-07's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-500-07.

5.3.8 Cross Drain CD-500-08

CD-500-08 is located within wetland sloughs that flow north into Lake Mary Jane. The cross drain is within FEMA Flood Zone AE with a base flood elevation of 65.5 ft-NAVD. This section of the Split Oak Minimization Alternative is situated within the Sunbridge NED Master Drainage Plan, ERP Application No. 180209-328. This particular crossing is located in between two proposed culverts, F-25 and F-26, both of which are six 3' x 6' box culverts.

Refer to **Figure 8** and **Figure 17** in **Appendix A** for a GIS exhibit showing CD-500-08's location, surrounding topography, and permitted upstream and downstream hydraulic crossings for this wetland slough. Refer to **Appendix B** for the permit data used for this cross drain.

5.4 Split Oak Avoidance Alternative (Alternative 502 207D-1) Cross Drains

The OPE Split Oak Avoidance Alternative extends east from the Narcoossee Road Interchange, which is approximately 2,300-feet northwest of the existing Narcoossee Road and Boggy Creek Road intersection, towards the SFWMD C-29A Canal where it shifts south bridging over the existing borrow pit located just west of Split Oak Forest. From there the Split Oak Avoidance Alternative turns east going parallel to Cyril Drive, avoiding Split Oak Forest, and interchanges with Cyrils Drive, near Absher Road, west of the C-30 Canal.

A large stormwater management study for the future development west of the C-30 Canal and the Sunbridge Parkway connection to Cyrils Drive was used as applicable. The future cross drain sizes and locations are provided in SFWMD ERP Applications 170814-2 and 180209-328, refer to **Appendix B** for documentation. For the purpose of this study, only the applicable future hydraulic

connections were used, and wildlife crossings were not included. It is assumed that the final design phase will coordinate locations and sizes for any desired wildlife crossings within the corridor. **Table 7** provides avoidance alternatives for proposed cross drains at Split Oak.

Table 7 – Split Oak Avoidance Alternative Proposed Cross Drains

Cross Drain	Culvert Size	Flow Direction
CD-502-01	2 - 42”	North
CD-502-02	BRIDGE	South
CD-502-03	4 - 42”	Southwest
CD-502-04	6 - 48”	West
CD-502-05	2 - 42”	Northeast
CD-502-06	2 - 36”	South
CD-502-07	2 - 36”	South
CD-502-08	6 - 3’ x 6’	North

5.4.1 Cross Drain CD-502-01

CD-502-01 is located north of and adjacent to Clapp Simms Duda Road. The cross drain is located within FEMA Flood Zone AE, with a base flood elevation of 63 feet-NAVD. From the Clapp Simms Duda Road Utility and Road Improvements Project under SFWMD ERP Application No. 141208-2, there are several 15-inch and 18-inch cross drains along Clapp Simms Duda Road between Narcoossee Road and the C-29A Canal, conveying runoff from south of Clapp Simms Duda Road to the roadside ditch on the north, which flows east outfalling into the C-29A Canal. From analysis of the DEM, the contributing basin area is approximately 48.9 acres. It was presumed that the existing cross drain along Clapp Simms Duda Road does not provide the level of service a limited access facility would require. The rational method was performed at this location, which estimates a peak design storm flow of 63.2 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 42-inch pipes for a single crossing between Narcoossee Road and the C-29A Canal.

See **Figure 9B** in **Appendix A** for a GIS exhibit showing CD-502-01’s location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-502-01.

5.4.2 Cross Drain CD-502-02

CD-502-02 is located at the SFWMD C-29A Canal. It is assumed that the Split Oak Avoidance Alternative will bridge over the entire SFWMD right-of-way. Floodplain impacts directly associated with this crossing will be analyzed during the design phase for this project.

5.4.3 Cross Drain CD-502-03

CD-502-03 is located within an existing conveyance ditch that flows west to Ajay Lake. The cross drain is within FEMA Flood Zone A associated with Ajay Lake. There are no known pertinent existing or future cross drains within this area at this time. From analysis of the DEM, the

contributing basin area is approximately 156.4 acres. The rational method was performed at this location, which estimates a peak design storm flow of 119.7 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be quadruple 42-inch pipes.

See **Figure 9** in **Appendix A** for a GIS exhibit showing CD-502-03's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-502-03.

5.4.4 Cross Drain CD-502-04

CD-502-04 is located within an existing conveyance ditch that flows west to Ajay Lake. The cross drain is within FEMA Flood Zone A associated with Ajay Lake. There are no known pertinent existing or future cross drains within this area at this time. TBG's field review determined that the existing borrow pit that the Split Oak Avoidance Alternative bridges over would overtop along its northeast berm, if overtopping occurs. Since it is unknown what storm events the borrow pit would overtop, it was included within this cross drain's basin. Additionally, there is an existing cross drain along Cyrils Drive, EX-46, which also contributes runoff south of Cyrils Drive, therefore, the peak flow calculated from CD-502-05 is also included for this cross drain's sizing.

From analysis of the DEM and field review, the contributing basin area is approximately 432.0 acres. The rational method was performed at this location, which estimates a peak design storm flow of 218.0 cfs, including the additional upstream peak design flow from CD-502-05. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be six 48-inch pipes.

See **Figure 9** in **Appendix A** for a GIS exhibit showing CD-502-04's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-502-04.

5.4.5 Cross Drain CD-502-05

CD-502-05 is located approximately 200-feet east of the Cyrils Drive and Franklin Road intersection, crossing both the Split Oak Avoidance Alternative and Cyrils Drive. The crossing is not located within a FEMA floodplain. This cross drain connects the wetland sloughs south of Cyrils Drive to the north and ultimately discharges to Lake Ajay. There is an existing cross drain along Cyrils Drive that includes double 15" pipes, EX-46. However, from analysis of the DEM and TBG field review, the contributing basin area is approximately 72.0 acres. It was presumed that the existing cross drain along Cyrils Drive, a county road, does not provide the level of service a limited access facility would require. The rational method estimates a peak design storm flow of 62.5 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 42-inch pipes.

See **Figure 9** in **Appendix A** for a GIS exhibit showing CD-502-05's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-502-05.

5.4.6 Cross Drain CD-502-06

CD-502-06 is located within existing FEMA Flood Zone A associated with wetland sloughs from Split Oak Forest just north of Cyrils Drive to Absher Road. This cross drain conveys runoff south extending along the Split Oak Avoidance Alternative and Cyrils Drive. There is an existing cross drain along Cyrils Drive that is a control structure with an 18" pipe, EX-33. It is unclear if this control structure is intended to remain, or the design storms associated with the control structure, therefore, CD-502-06 is sized for free flow conditions between the wetlands north and south of Cyrils Drive instead of extending the pipe of the EX-33 control structure. From analysis of the DEM, the contributing basin area is approximately 70.4 acres. The rational method estimates a peak design storm flow of 51.2 cfs. To provide approximately 3 fps velocity through the cross drain during the design storm, the proposed cross drain was sized to be double 36-inch pipes.

See **Figure 9** in **Appendix A** for a GIS exhibit showing CD-502-06's location and surrounding topography. Refer to **Appendix D** for the full calculations and HY-8 input and output for CD-502-06.

5.4.7 Cross Drain CD-502-07

CD-502-07 is located within existing FEMA Flood Zone A associated with wetlands sloughs that flow south from Split Oak Forest to wetlands south of the proposed Cyril Drive extension to Sunbridge Parkway. This section of the Split Oak Avoidance Alternative is situated within the Sunbridge NED Master Drainage Plan, ERP Application No. 180209-328. From the proposed model and development plans, the future cross drain along Cyril Drive, F-22, is comprised of double 36-inch pipes that convey the wetlands north of Cyril Drive to the wetlands to the south. This pipe size was used for the Split Oak Avoidance Alternative's crossing. The future pipes F-23A and F-23B are wildlife crossing and are not included within this proposed crossing.

See **Figure 9** in **Appendix A** for a GIS exhibit showing CD-502-07's location and surrounding topography. Refer to **Appendix B** for the permit data used for this cross drain.

5.4.8 Cross Drain CD-502-08

CD-502-08 is located within wetland sloughs that flow north into Lake Mary Jane. The cross drain is within FEMA Flood Zone AE with a base flood elevation of 65.5 ft-NAVD. This section of the Split Oak Avoidance Alternative is situated within the Sunbridge NED Master Drainage Plan, ERP Application No. 180209-328. This particular crossing is located at proposed culvert, F-25, six 3' x 6' box culvert.

See **Figure 9** and **Figure 17** in **Appendix A** for a GIS exhibit showing CD-502-08's location, surrounding topography, and future cross drain. Refer to **Appendix B** for the permit data used for this cross drain.

6. Conclusion

In summary, the hydraulic structures proposed along the new alignments will be designed to cause no adverse increase in flood stages and flood limits. These changes will not result in any adverse impacts in the natural and beneficial floodplain values or any changes in flood risk or damage. The purpose of this report is to determine the existing condition and location of the cross drains along the project area of the Osceola Parkway Extension improvements and the associated impacts of these improvements.

Additional right-of-way is anticipated for offsite floodplain compensation sites to mitigate for impacts to the floodplain on a cup-for-cup basis and a determination to the best location for compensation should be performed during the design phase. Refer to the Pond Siting Report under a separate cover for additional information.

The proposed roadway improvement is expected to have no adverse impact on the existing cross drains that will be in series with the proposed cross drains. The proposed cross drains along the alternatives were reviewed and analyzed to not cause an increase in flood staging and flood limits. In addition, the proposed roadway is expected to route some of the roadway runoff to proposed ponds, thereby reducing the amount of flow through each cross drain. There are no significant impacts of the proposed roadway on the headwater stages for the modeled cross drains.

In final design, the HY-8 models from the PD&E Study should be updated to include surveyed cross drain information to show the hydraulic improvement and prove there will be no adverse impacts. It is expected that cross drain flows will decrease if a different methodology is utilized that can account for upstream storage within the surrounding wetlands. The proposed cross drains are to be designed by the final design team. There shall be no adverse impacts due to the incorporation of cross drains along the Osceola Parkway Extension improvements.

This is a project on a new alignment with encroachments into the floodplain. Proposed cross drains, and bridges will perform hydraulically in a manner equal to or greater than the existing condition, and backwater surface elevations are not expected to increase. Floodplain encroachments will be mitigated on a cup-for-cup basis in floodplain compensation sites and treatment/attenuation pond sites, which should result in no increase to the floodplain elevations. These changes will not result in any adverse impacts on the natural and beneficial floodplain values or any changes in flood risk or damage. There will not be a change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that the encroachment type for this study is classified as "minimal".

Table 8 – Lake Nona Alternative Flood Data Box

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-404-01	2 - 36 inch	47.30	80.83	57.64	81.24	--	--	--	--	88.91	82.95	0.2%	500
CD-404-02	24 inch	10.61	79.81	12.08	80.04	--	--	--	--	17.28	81.14	0.2%	500
CD-404-03	24 inch	11.38	78.96	13.19	79.29	--	--	--	--	19.30	80.75	0.2%	500
CD-404-04	3 - 42 inch	84.14	78.39	99.20	78.54	--	--	--	--	145.79	79.17	0.2%	500
CD-404-05	3 - 8' x 5' CBC	--	--	1396.47	73.26	--	--	--	--	--	--	--	--
CD-404-06	2 - 30 inch	--	--	78.88	75.92	--	--	--	--	--	--	--	--
CD-404-07	2 - 48 inch	61.30	77.28	69.81	77.37	--	--	--	--	101.13	77.77	0.2%	500
Note:	For CD-404-05 & CD-404-06, the 100-year/24 hr.discharge & stage information was obtained from the Poitras East PD FEMA LOMR Report (002-17137).												

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

Table 9 – Boggy Creek Alternative Flood Data Box

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-405-01	2 - 72 inch	--	--	273.81	72.00	--	--	--	--	--	--	--	--
CD-405-02	2 - 48 inch	67.35	76.56	77.98	76.75	--	--	--	--	115.49	77.65	0.2%	500
CD-405-03	3 - 38" x 60"	--	--	--	--	--	--	--	--	--	--	--	--
CD-405-04	3 - 42 inch	84.14	78.39	99.20	78.54	--	--	--	--	145.79	79.17	0.2%	500
CD-405-05	3 - 5' x 8' CBC	--	--	1354.09	73.65	--	--	--	--	--	--	--	--
CD-405-06	2 - 30 inch	--	--	78.88	75.92	--	--	--	--	--	--	--	--
CD-405-07	2 - 48 inch	61.30	77.28	69.81	77.37	--	--	--	--	101.13	77.77	0.2%	500
Note:	For CD-405-01, the 100 yr/72 hr discharge & stage information from Lake Nona South ERP 130822-7 (Node Boggy Creek Pre). For CD-405-05 (Node JB-4) & CD-405-06 (Node W-36), the 100-year/24 hr.discharge & stage information was obtained from the Poitras East PD FEMA LOMR Report (002-17137). No available permit information for CD-405-03.												

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

Table 10 – Split Oak Minimization Alternative Flood Data Box

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-500-01	2 - 42 inch	63.20	63.52	73.34	63.70	--	--	--	--	108.77	64.54	0.2%	500
CD-500-02	Bridge	--	--	--	--	--	--	--	--	--	--	--	--
CD-500-03	3 - 42 inch	85.87	61.98	96.31	62.10	--	--	--	--	137.46	62.73	0.2%	500
CD-500-04	2 - 48 inch	72.03	61.89	79.22	61.97	--	--	--	--	111.36	62.43	0.2%	500
CD-500-05	36 inch	19.87	73.70	22.47	73.81	--	--	--	--	32.44	74.37	0.2%	500
CD-500-06	2 - 36 inch	46.50	71.20	--	--	--	--	--	--	--	--	--	--
CD-500-07	36 inch	21.49	71.11	24.78	71.44	--	--	--	--	36.24	72.96	0.2%	500
CD-500-08	6 - 3' x 6' CBC	292.00	65.50	--	--	--	--	--	--	--	--	--	--
Note:	For CD-500-06, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED10 C Pre). For CD-500-08, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED15-2C Pre).												

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

Table 11 – Split Oak Avoidance Alternative Flood Data Box

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-502-01	2 - 42 inch	63.20	63.52	73.34	63.70	--	--	--	--	108.77	64.54	0.2%	500
CD-502-02	Bridge	--	--	--	--	--	--	--	--	--	--	--	--
CD-502-03	4 - 42 inch	119.67	61.95	134.08	62.07	--	--	--	--	191.37	62.66	0.2%	500
CD-502-04	6 - 48 inch	218.02	61.85	244.30	61.94	--	--	--	--	364.43	62.48	0.2%	500
CD-502-05	2 - 42 inch	62.50	71.40	70.41	71.54	--	--	--	--	101.51	72.23	0.2%	500
CD-502-06	2 - 36 inch	51.22	61.01	59.86	61.19	161.07	65.50	0.21%	479	--	--	--	--
CD-502-07	2 - 36 inch	46.50	71.20	--	--	--	--	--	--	--	--	--	--
CD-502-08	6 - 3' x 6' CBC	292.00	65.50	--	--	--	--	--	--	--	--	--	--
Note:	For CD-502-07, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED10 C Pre). For CD-502-08, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED15-2C Pre).												

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

7. References

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Appendix A

Maps and Figures

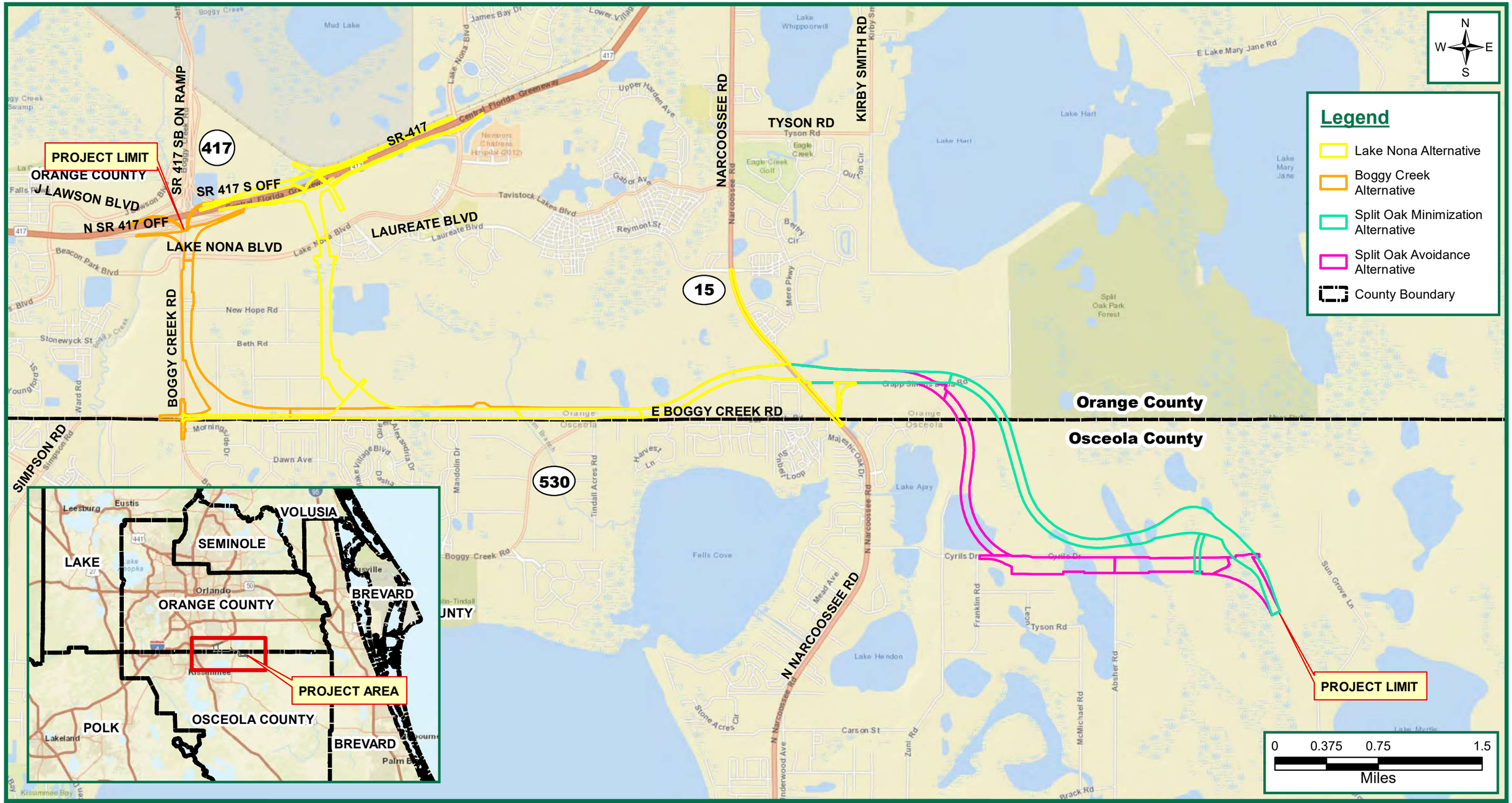

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FIGURE 1

PROJECT LOCATION MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

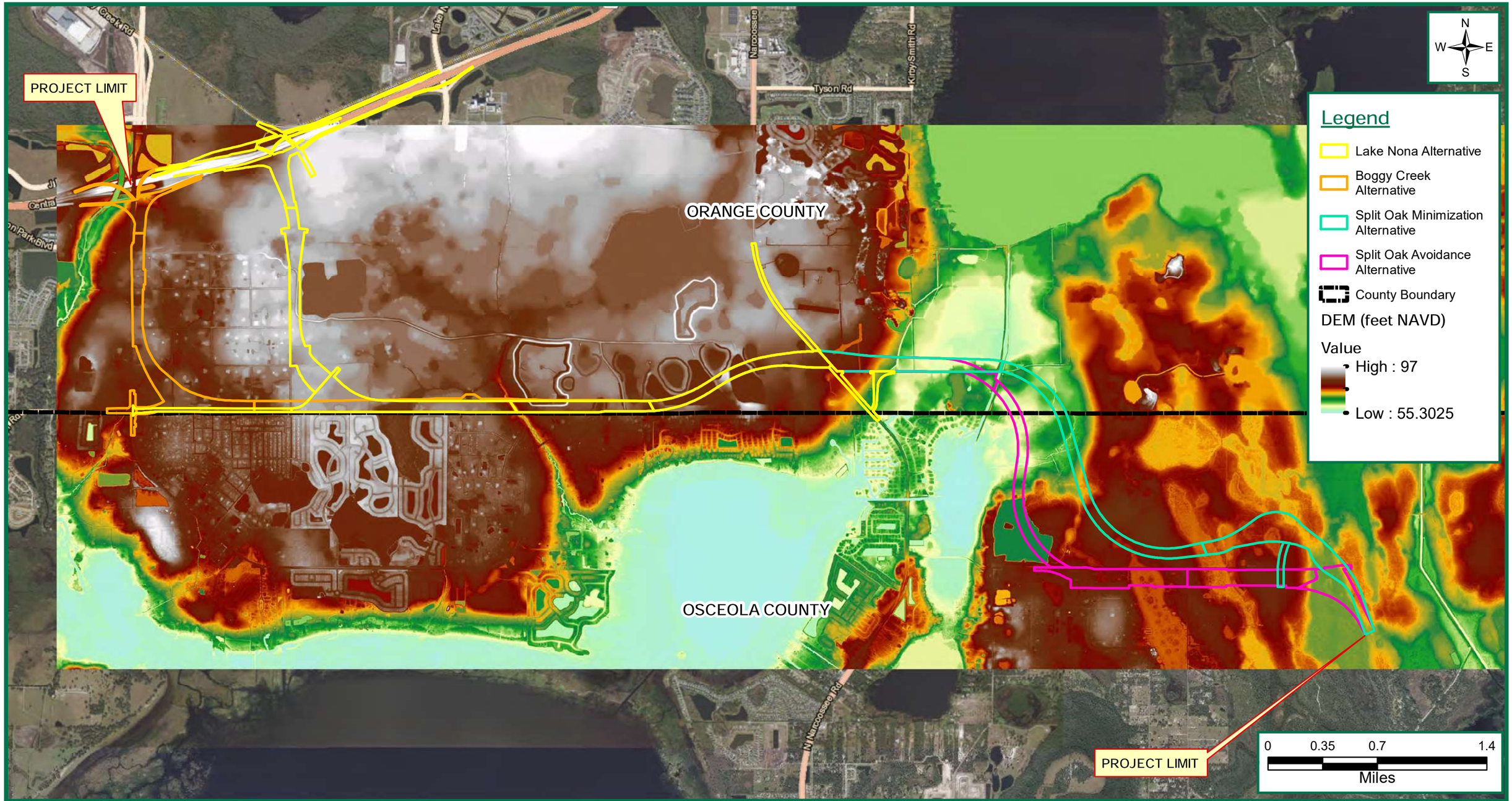

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FIGURE 2

DIGITIAL ELEVATION MODEL MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
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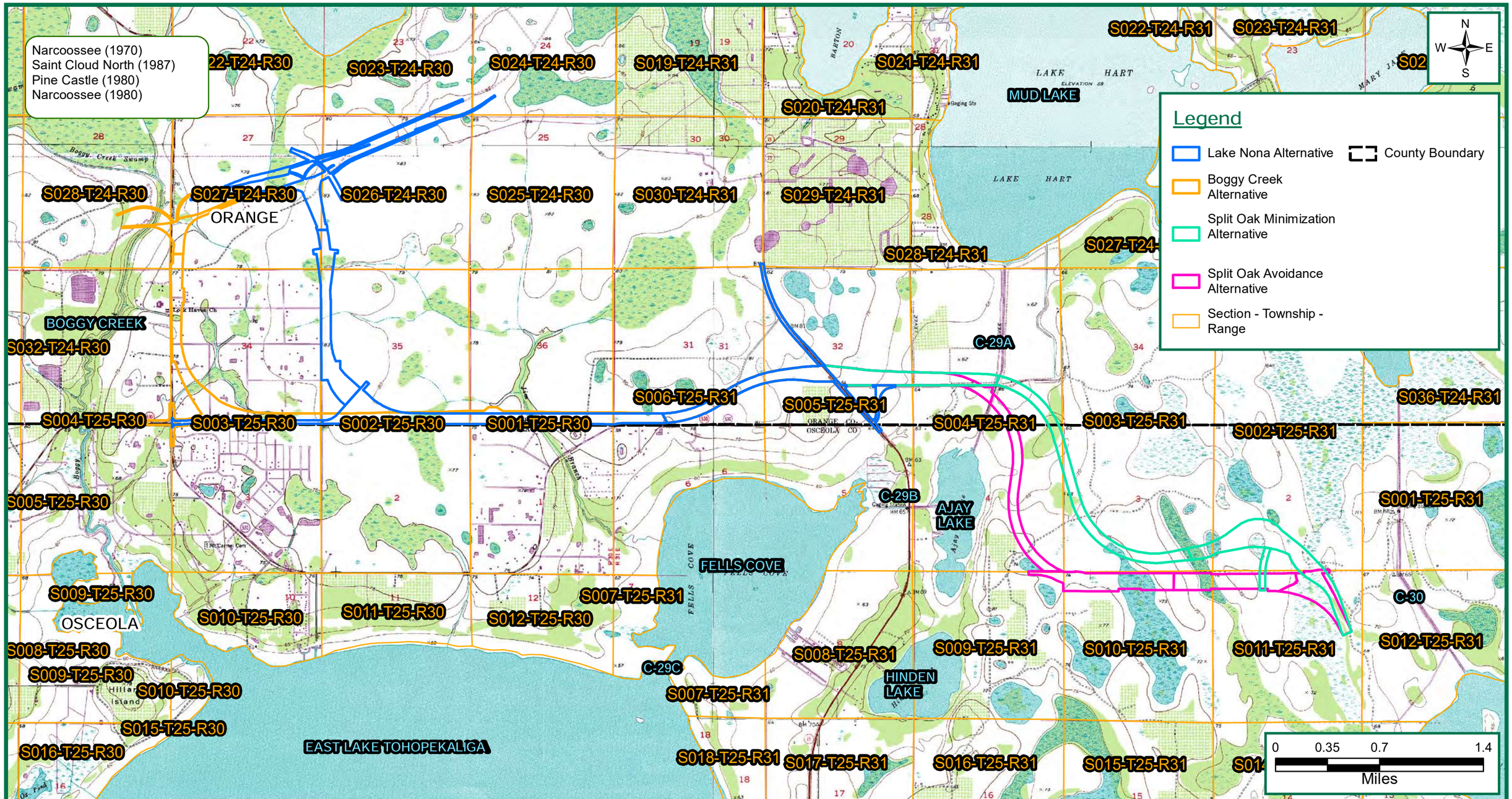

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FIGURE 3

USGS QUADRANGLE MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
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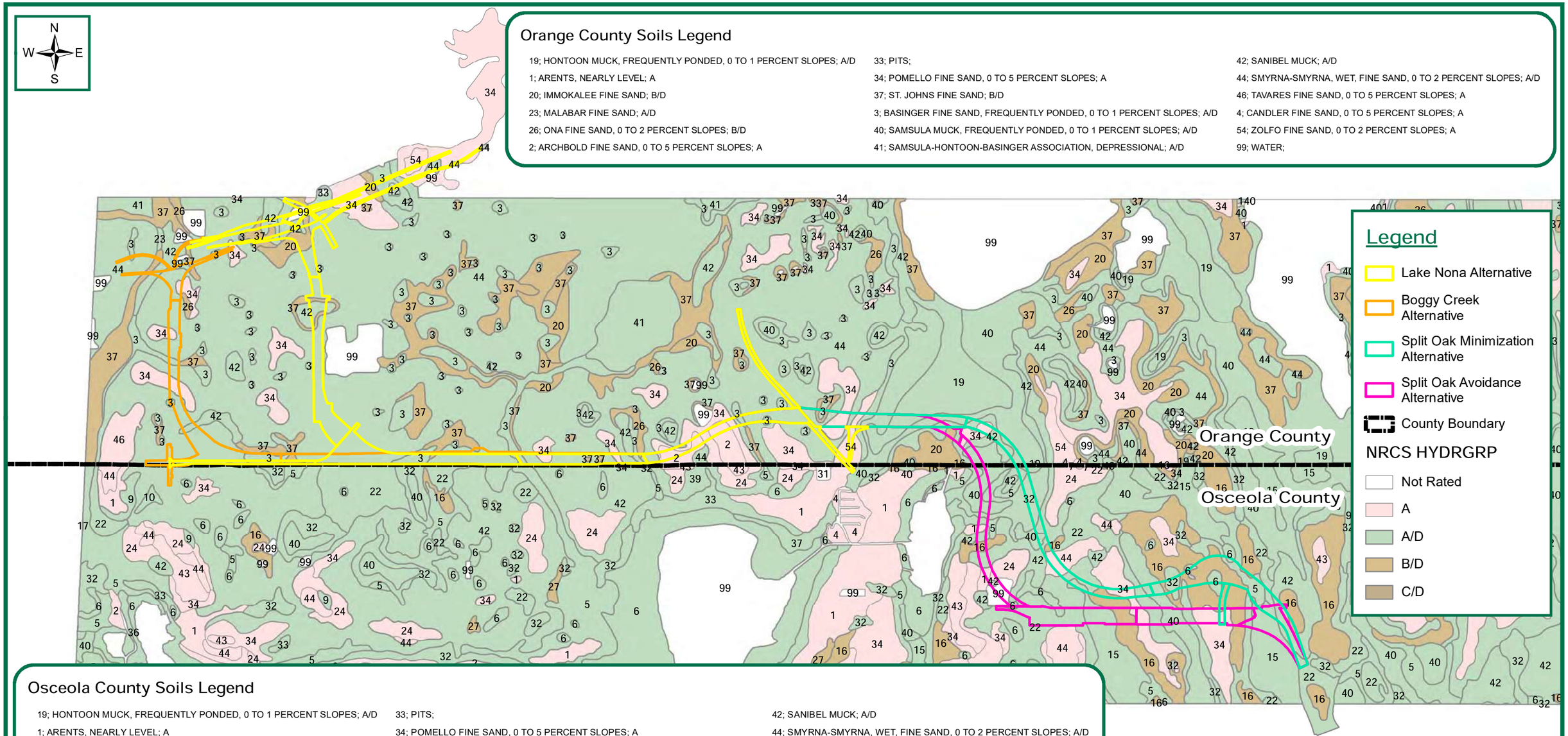

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FIGURE 4

NRCS SOILS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
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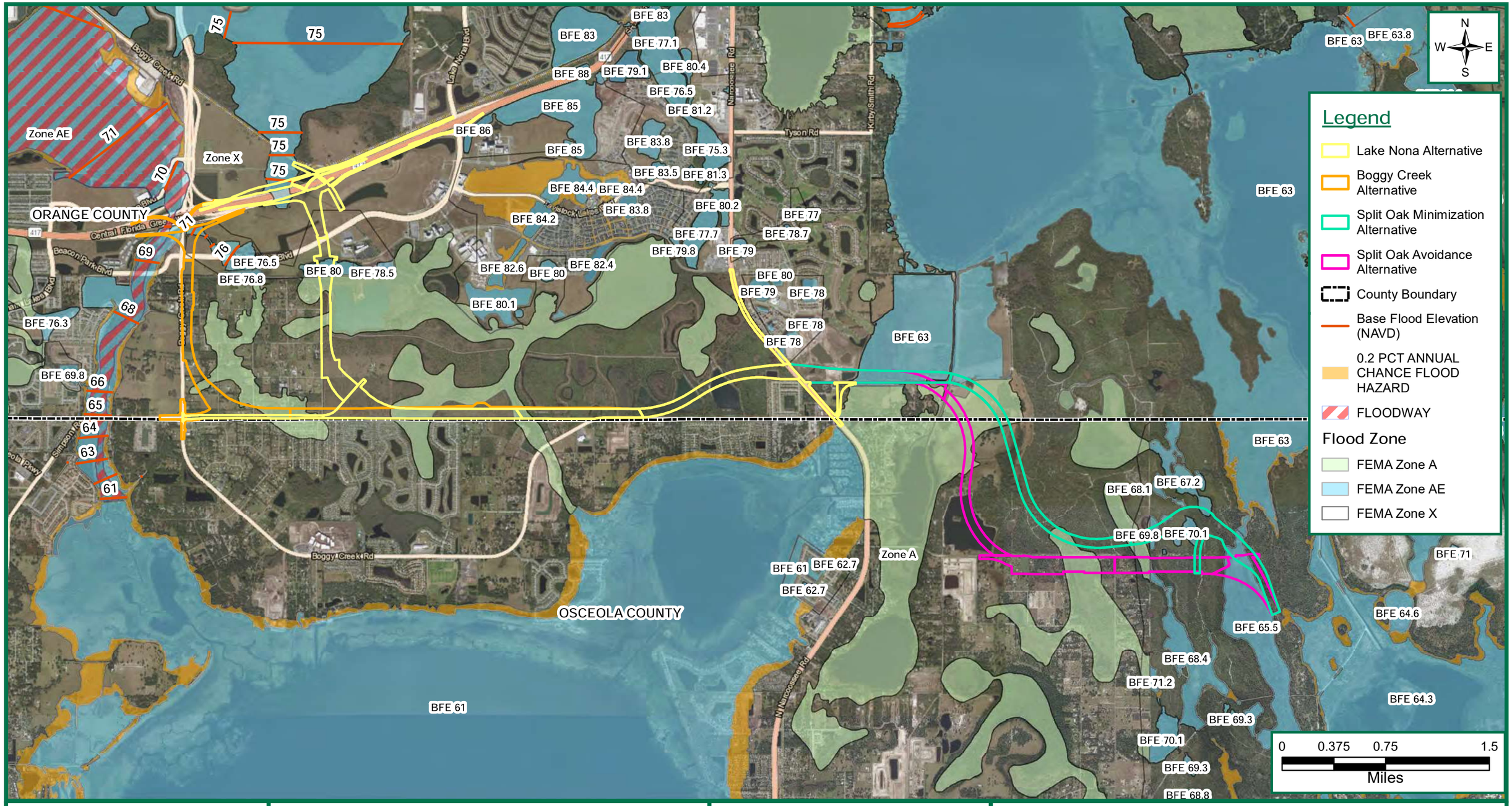

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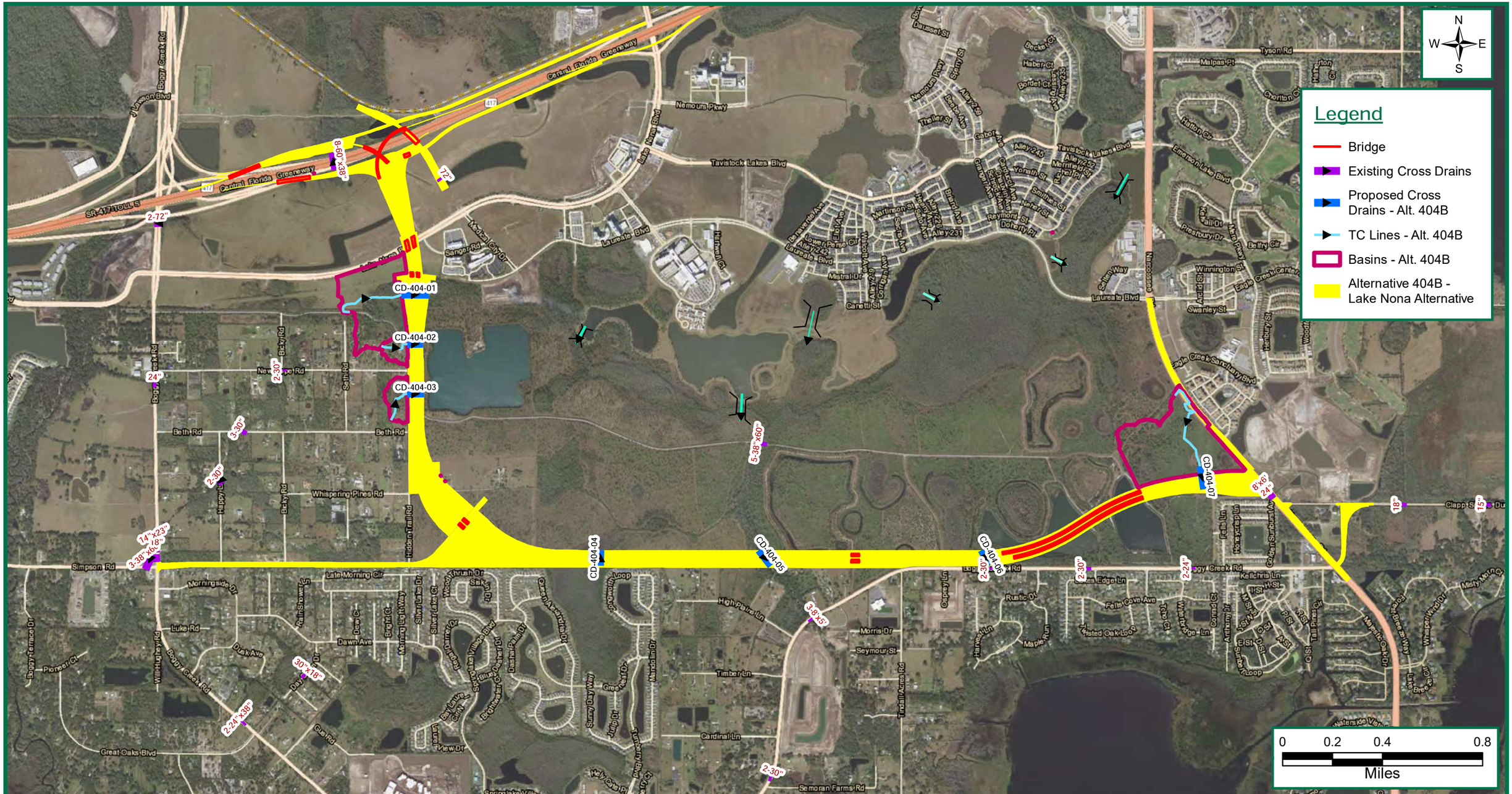
FIGURE 5

FEMA FLOODPLAIN MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



The Balmoral Group 165 Lincoln Avenue Winter Park, Florida 32789	FIGURE 6A LAKE NONA ALTERNATIVE (404B) MAP Cross Drain Methodology	CENTRAL FLORIDA EXPRESSWAY AUTHORITY	OSCEOLA PARKWAY EXTENSION FROM SR 417 TO CYRILS DRIVE CFX PD&E Study ORANGE & OSCEOLA COUNTY, FLORIDA

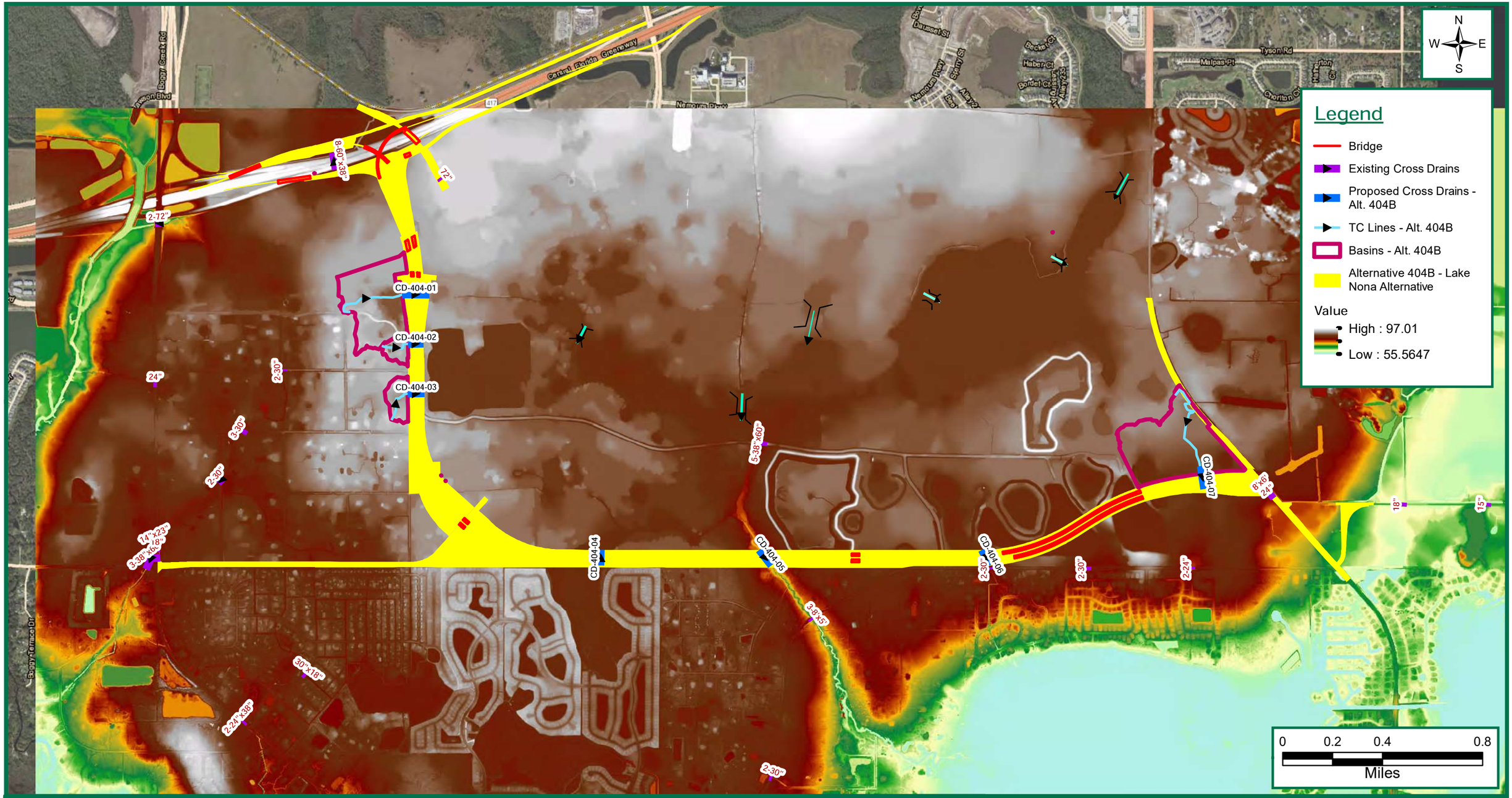


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FIGURE 6B

LAKE NONA ALTERNATIVE (404B) MAP
Cross Drain Methodology

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

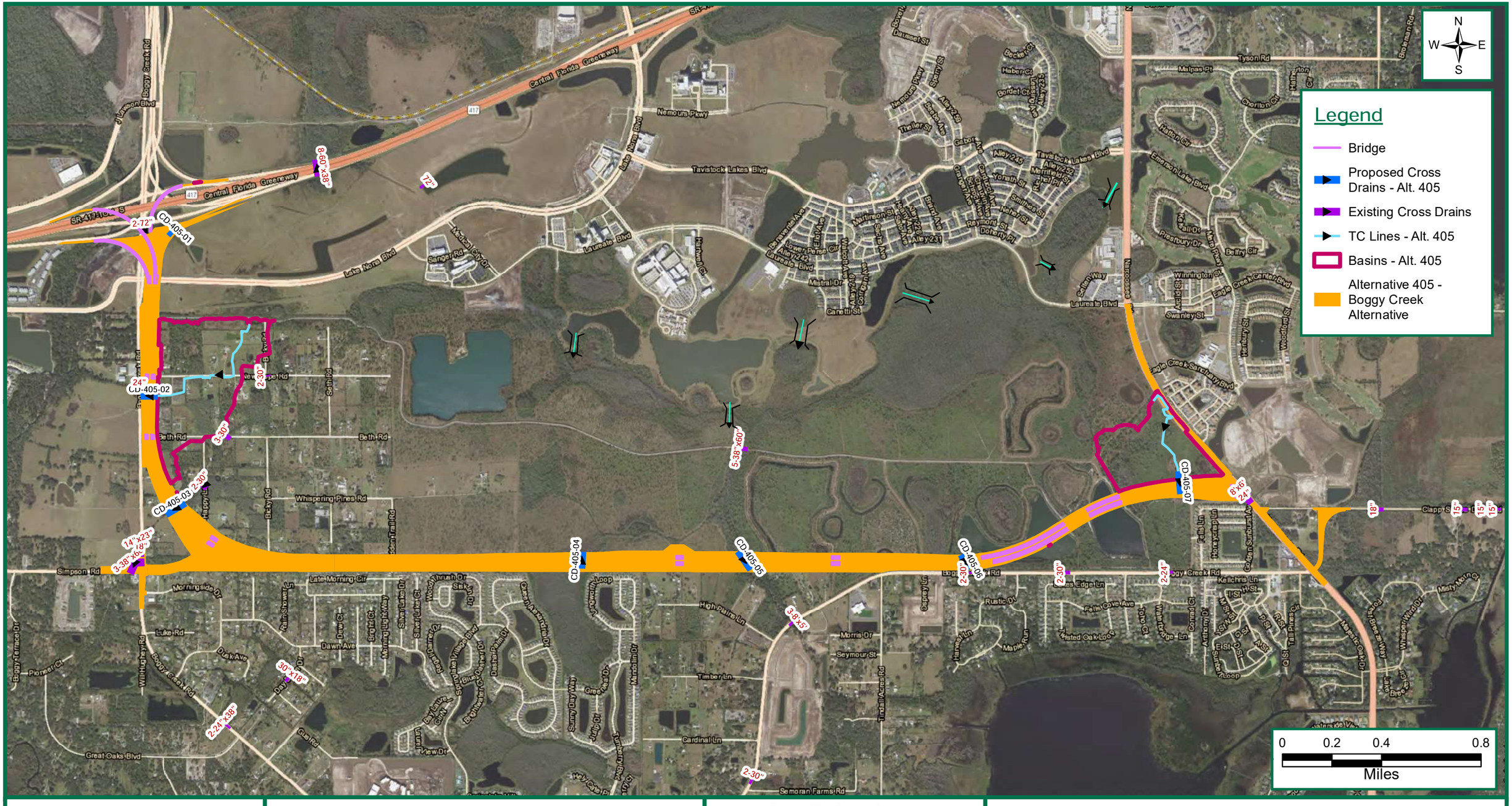

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FIGURE 7A

BOGGY CREEK ALTERNATIVE (405) MAP
Cross Drain Methodology

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

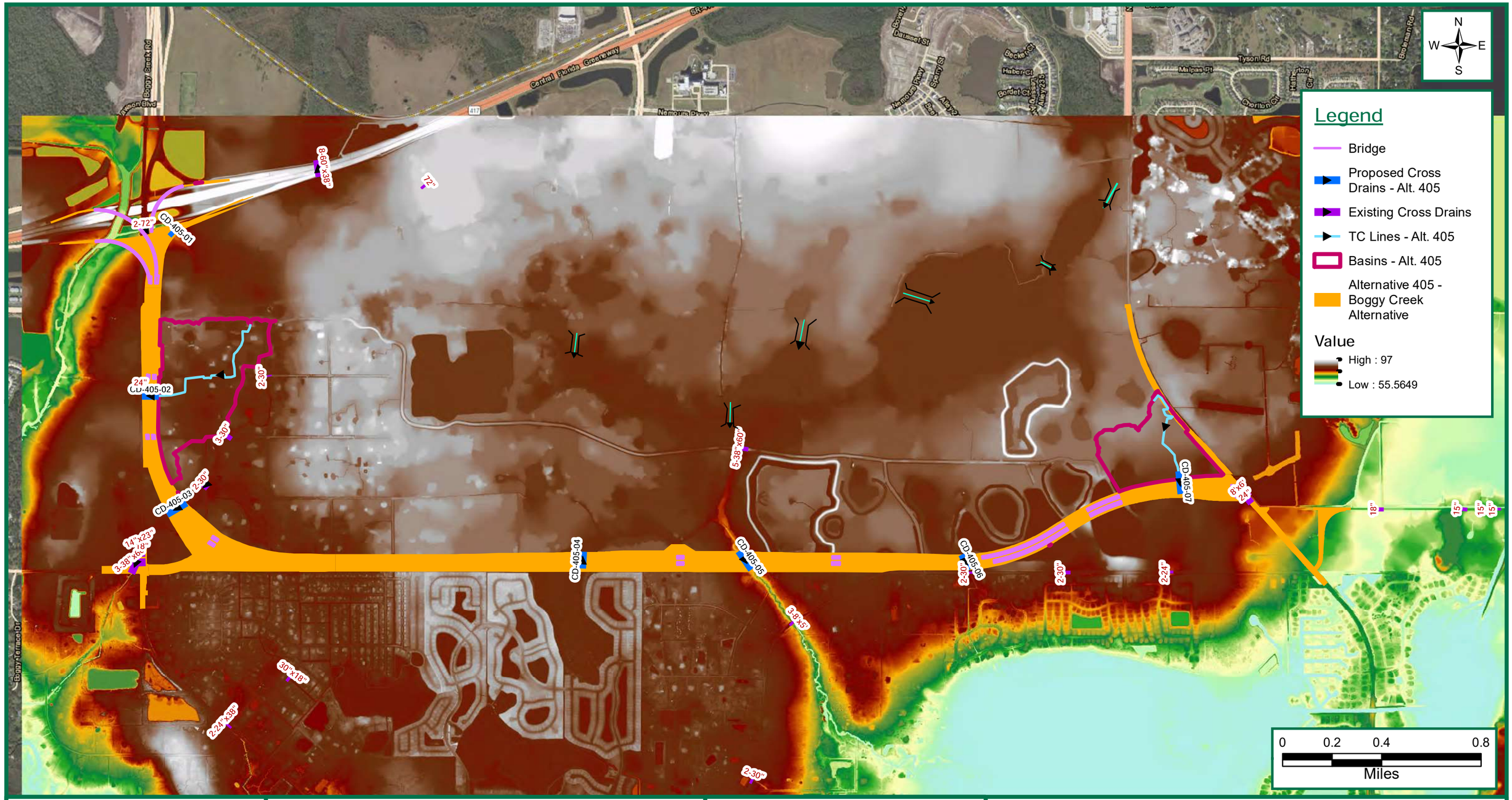

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FIGURE 7B

BOGGY CREEK ALTERNATIVE (405) MAP
Cross Drain Methodology

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

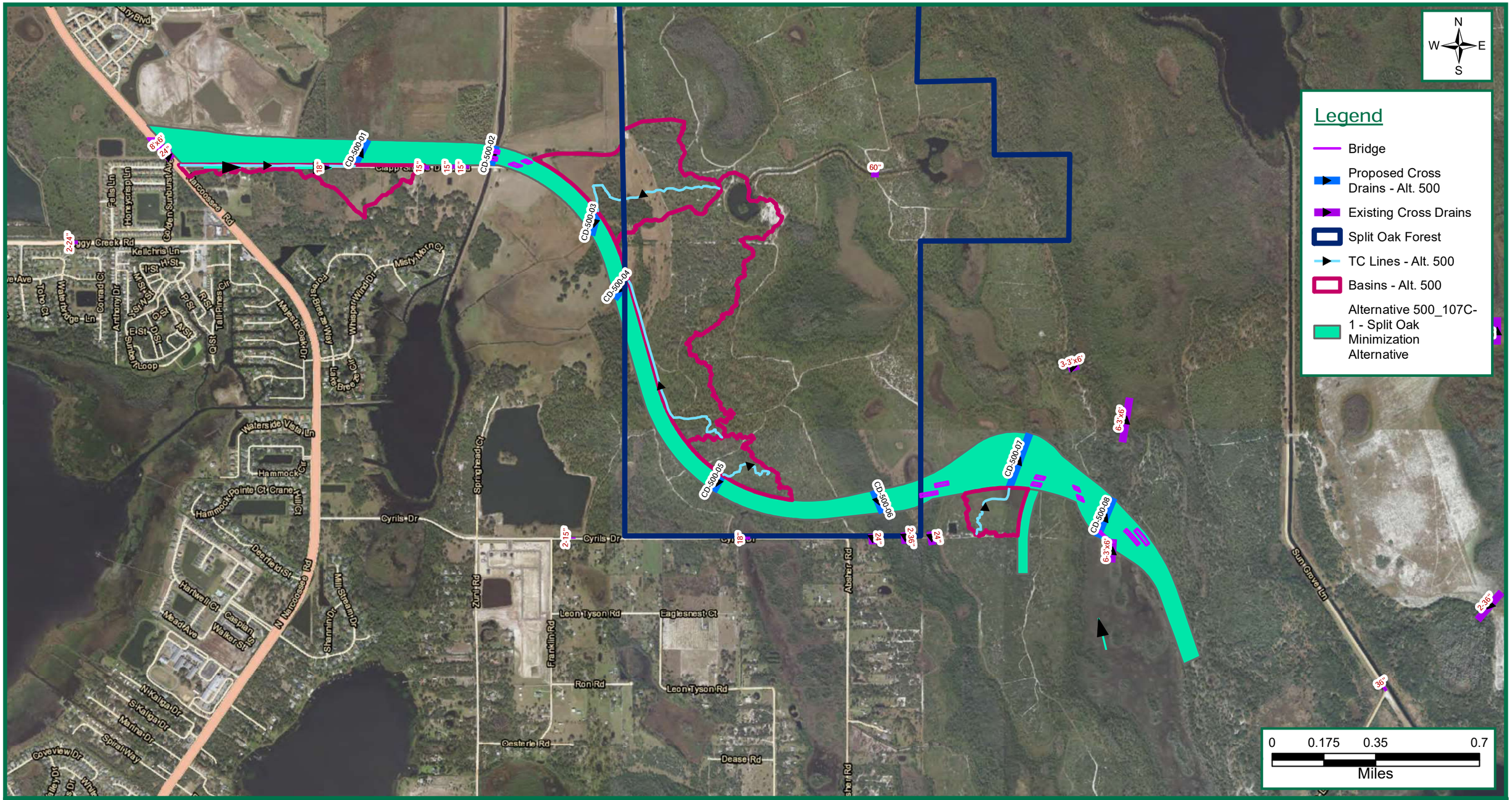

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FIGURE 8A

SPLIT OAK MINIMIZATION ALTERNATIVE (500_107C) MAP
Cross Drain Methodology

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

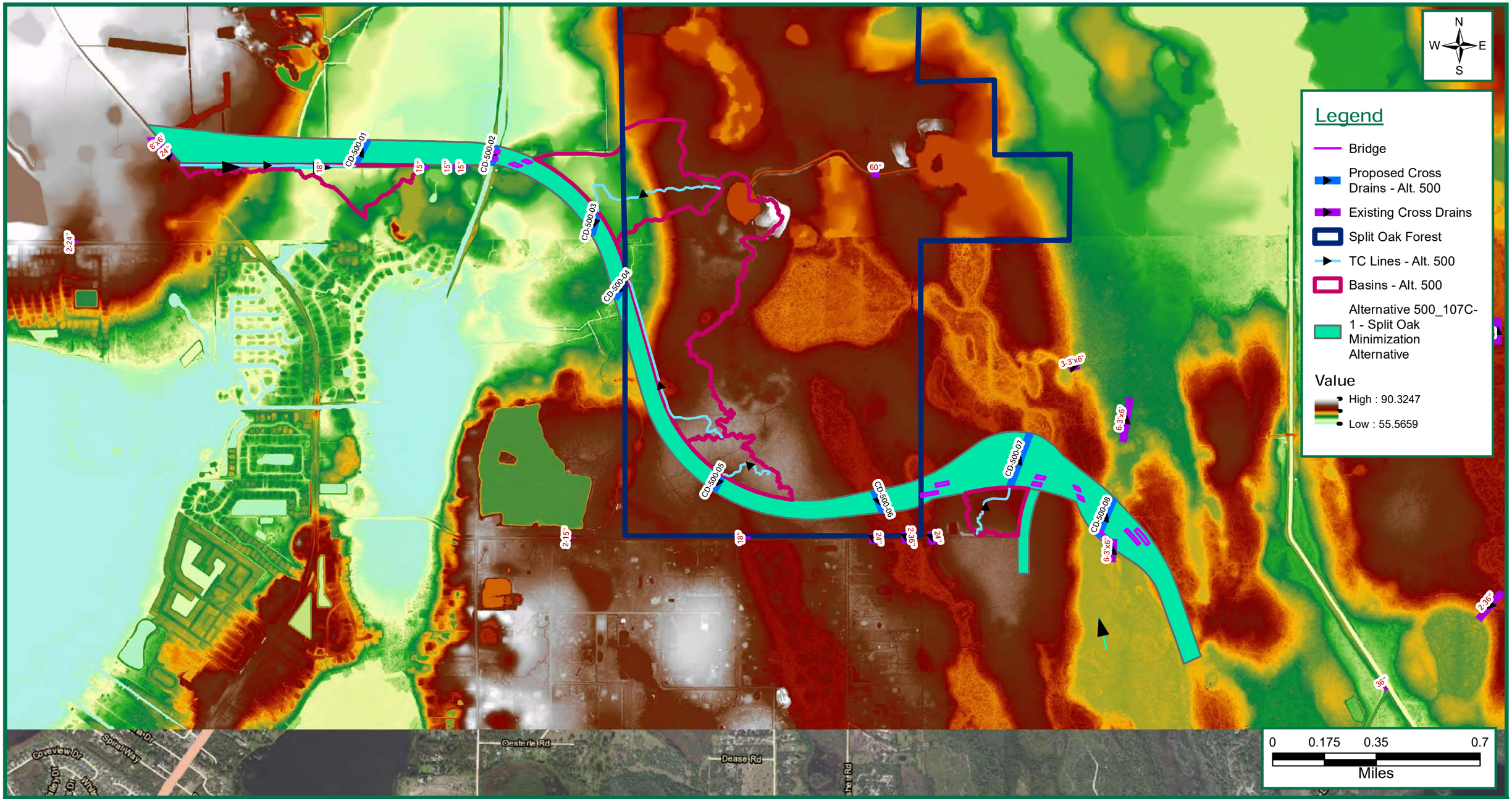

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FIGURE 8B

SPLIT OAK MINIMIZATION ALTERNATIVE (500_107C) MAP
Cross Drain Methodology

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

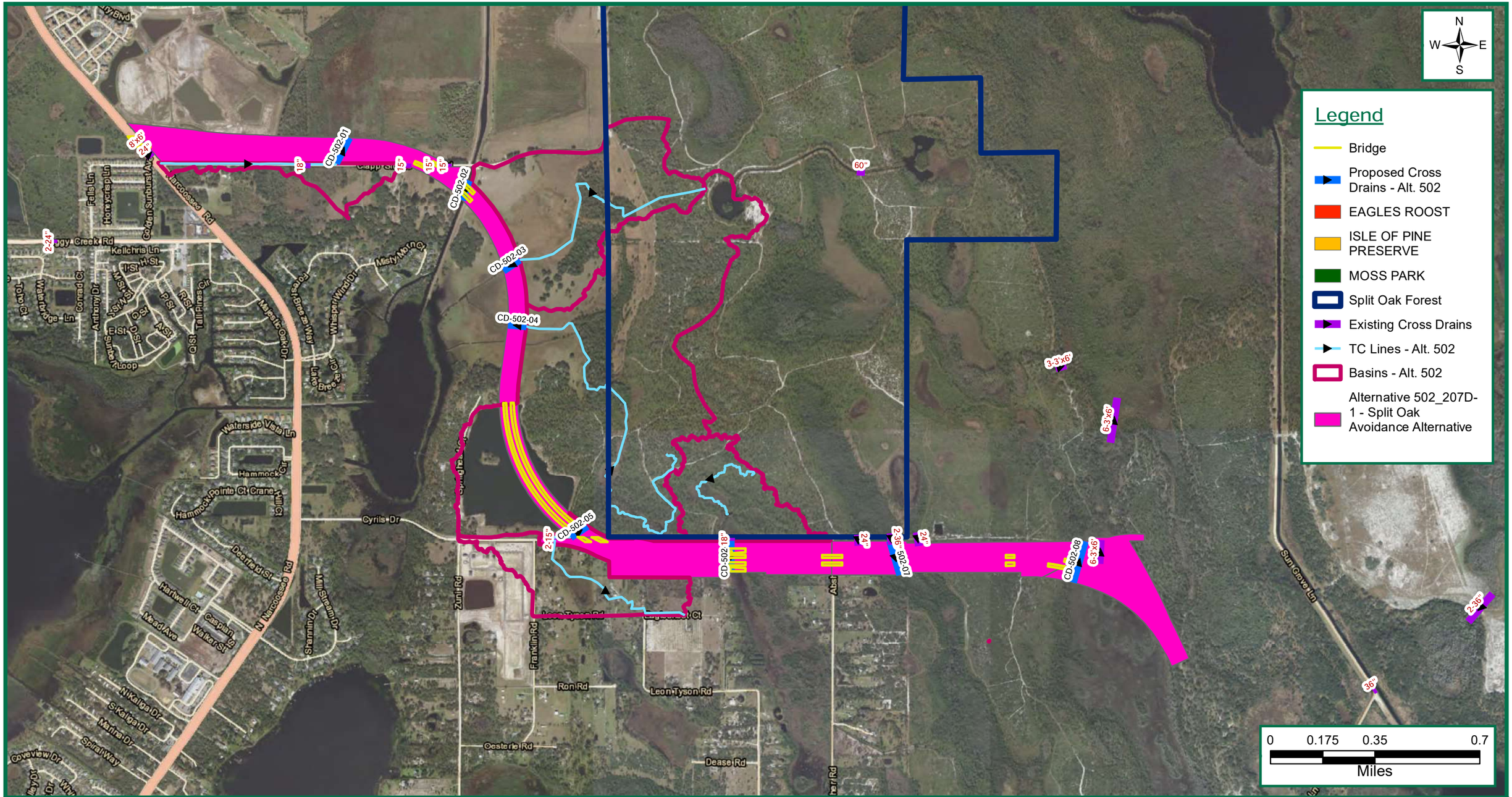

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FIGURE 9A

SPLIT OAK AVOIDANCE ALTERNATIVE (502_207D) MAP
Cross Drain Methodology

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

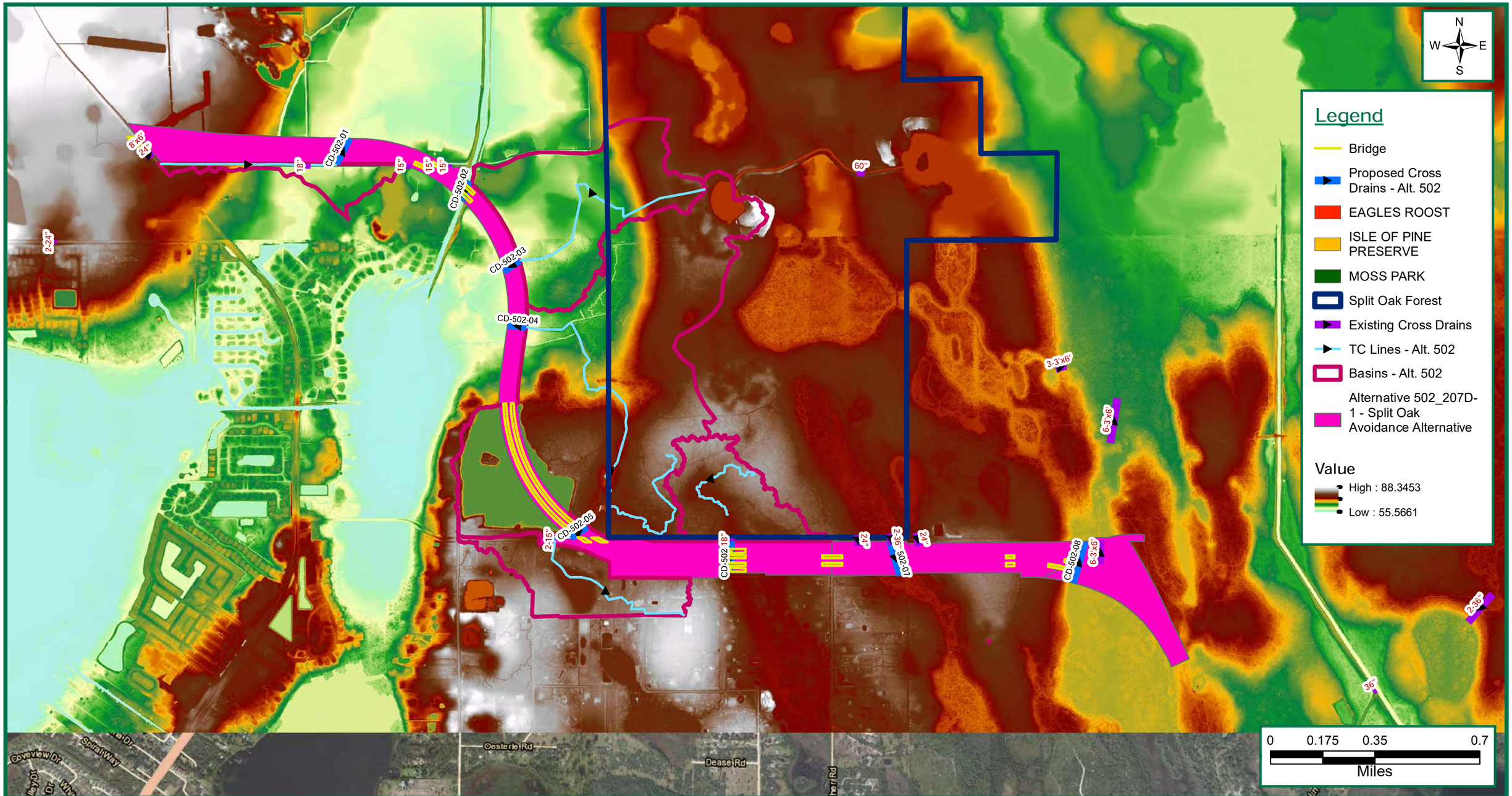

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FIGURE 9B

SPLIT OAK AVOIDANCE ALTERNATIVE (502_207D) MAP
Cross Drain Methodology

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

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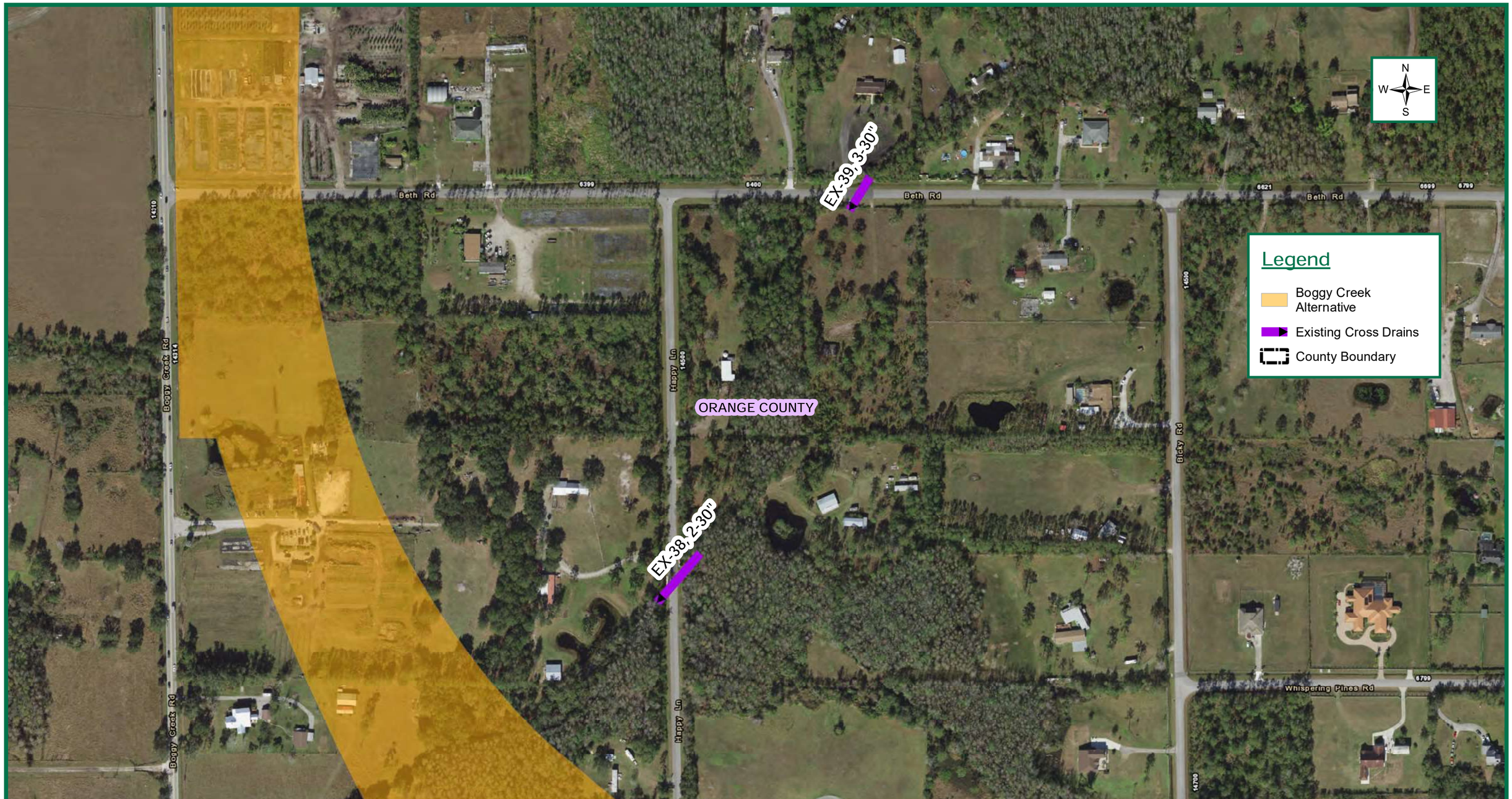
FIGURE 10
EXISTING CROSS DRAINS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



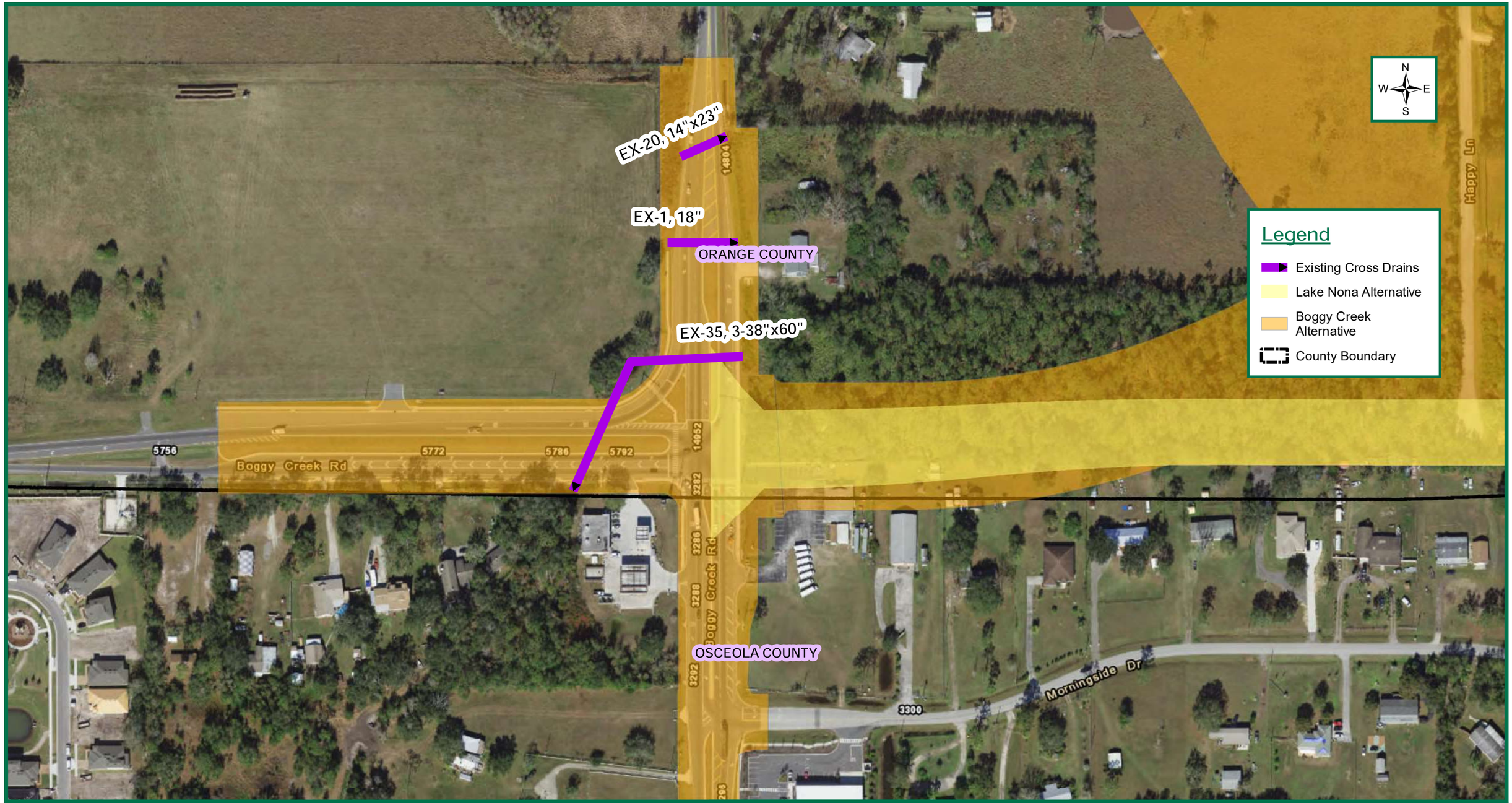
The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

FIGURE 11
EXISTING CROSS DRAINS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



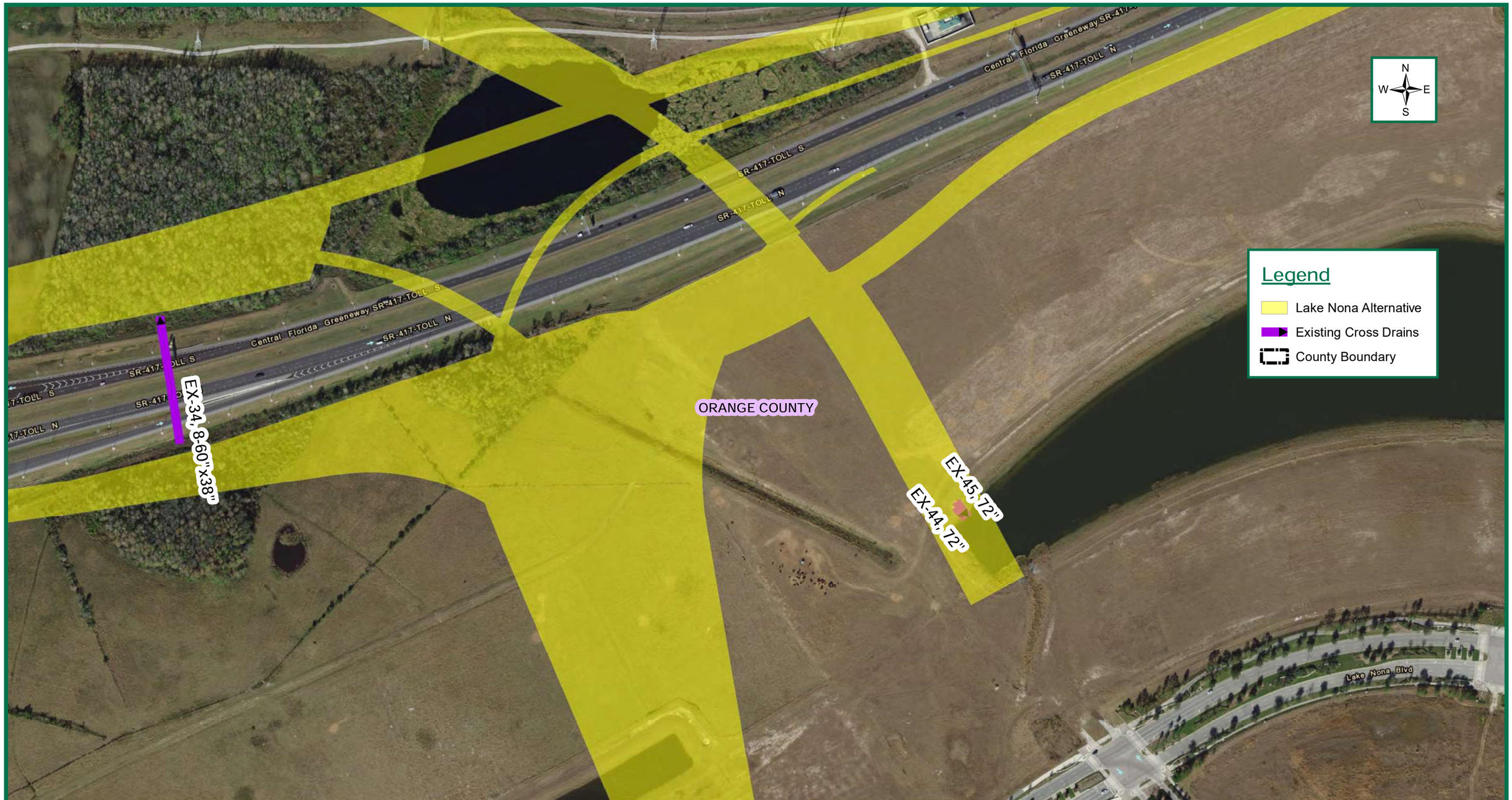
The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

FIGURE 12
EXISTING CROSS DRAINS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



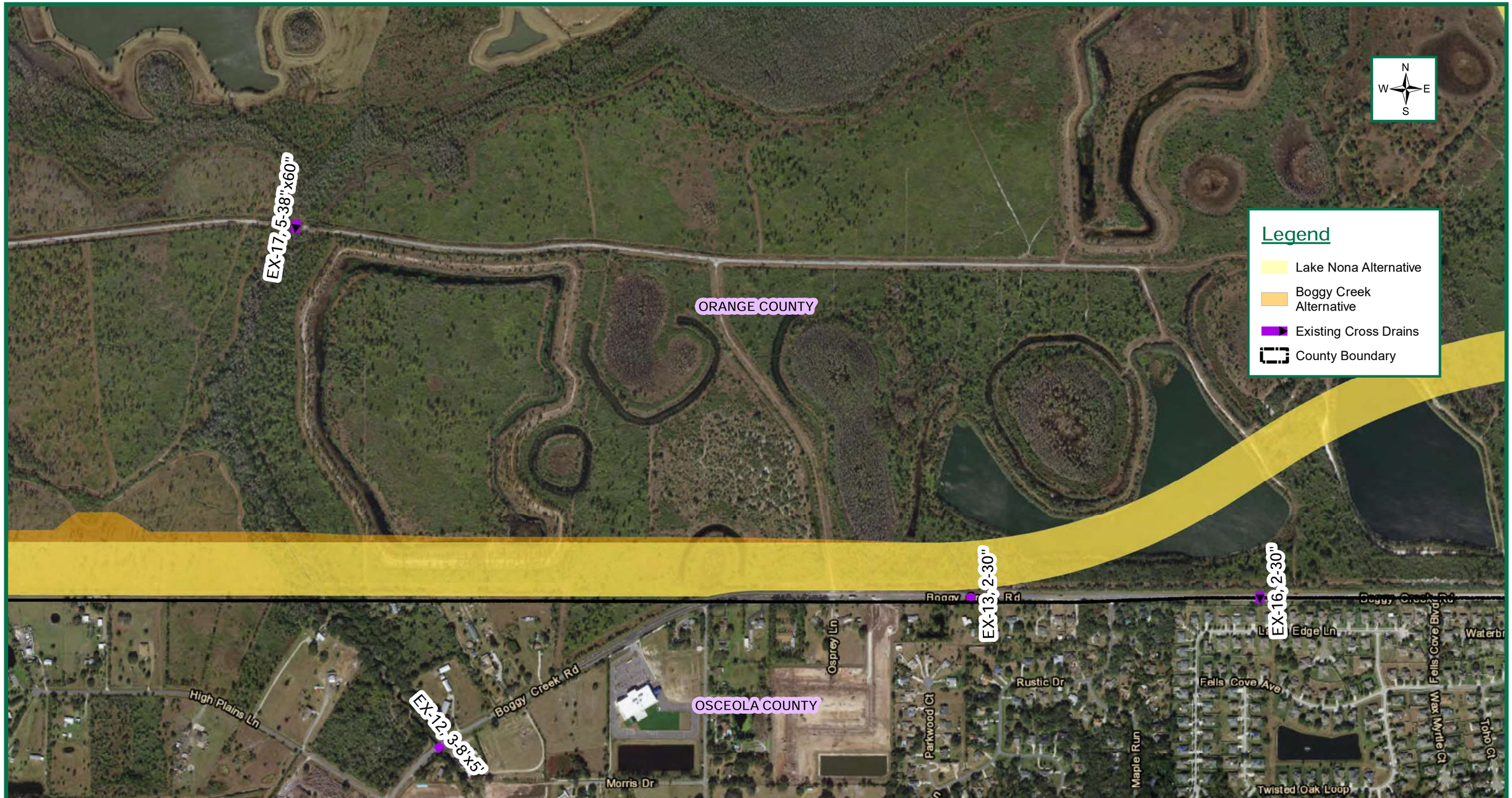
The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

FIGURE 13
EXISTING CROSS DRAINS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



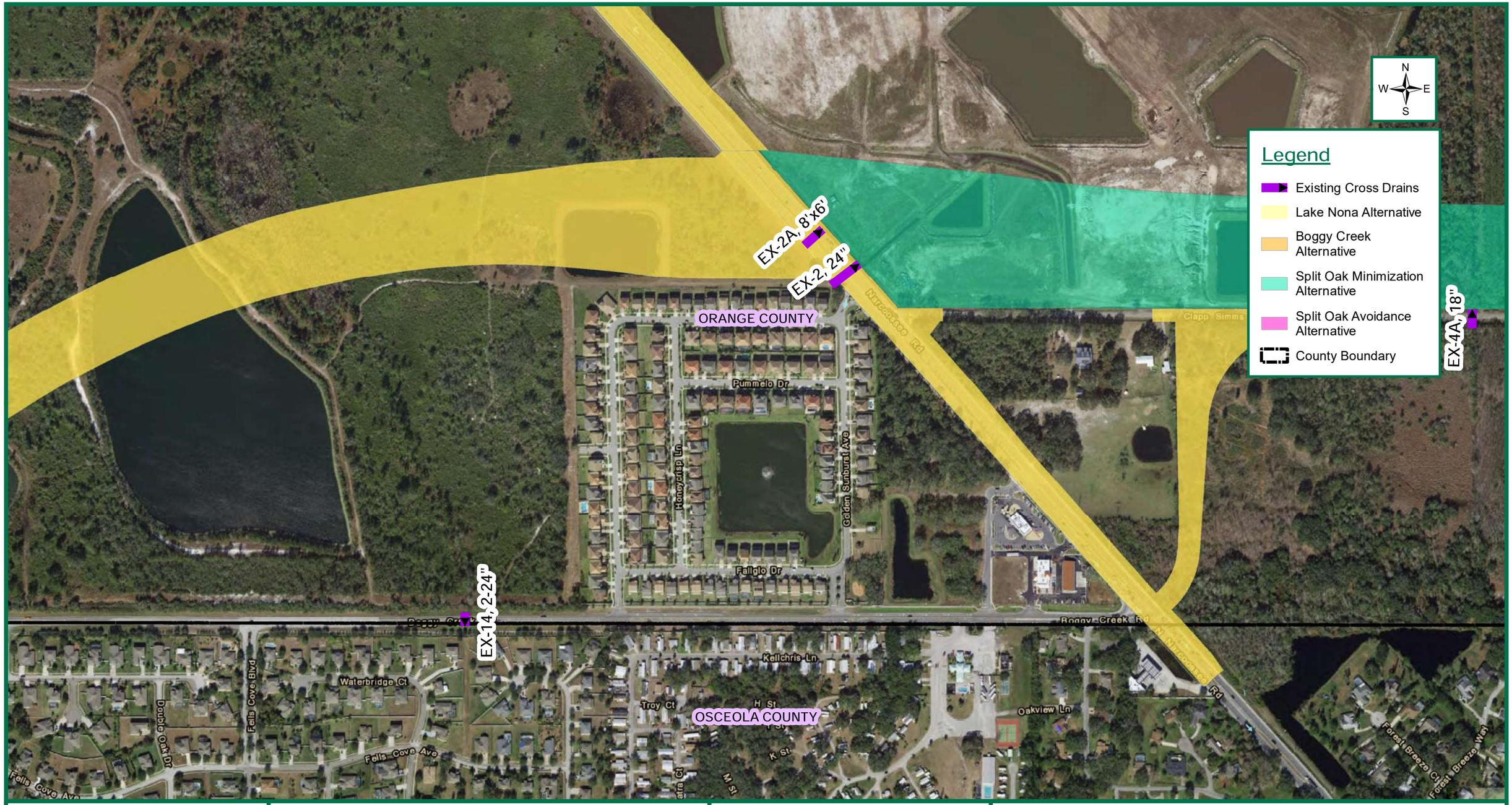
The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

FIGURE 14
EXISTING CROSS DRAINS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



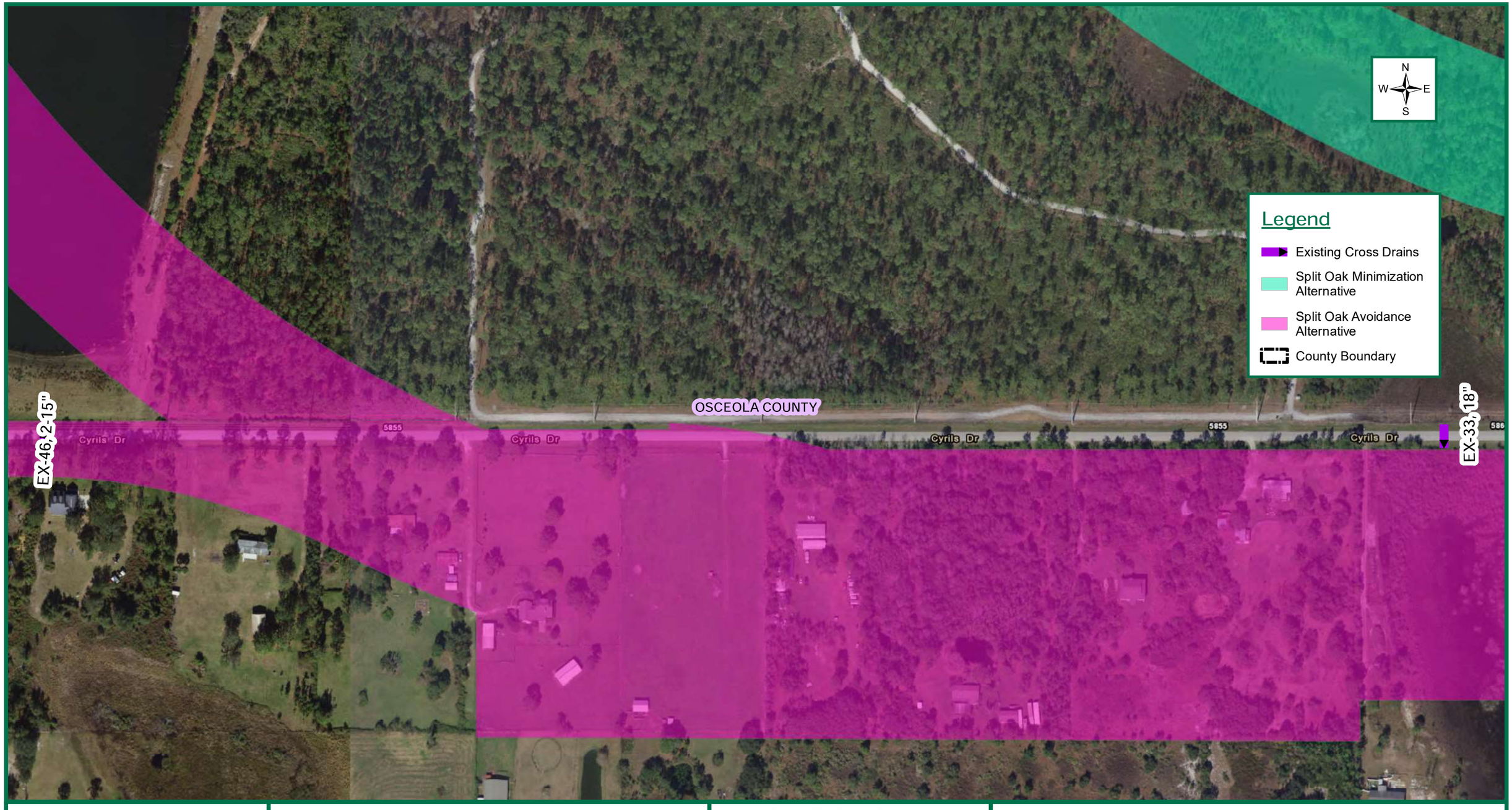
The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

FIGURE 15
EXISTING CROSS DRAINS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



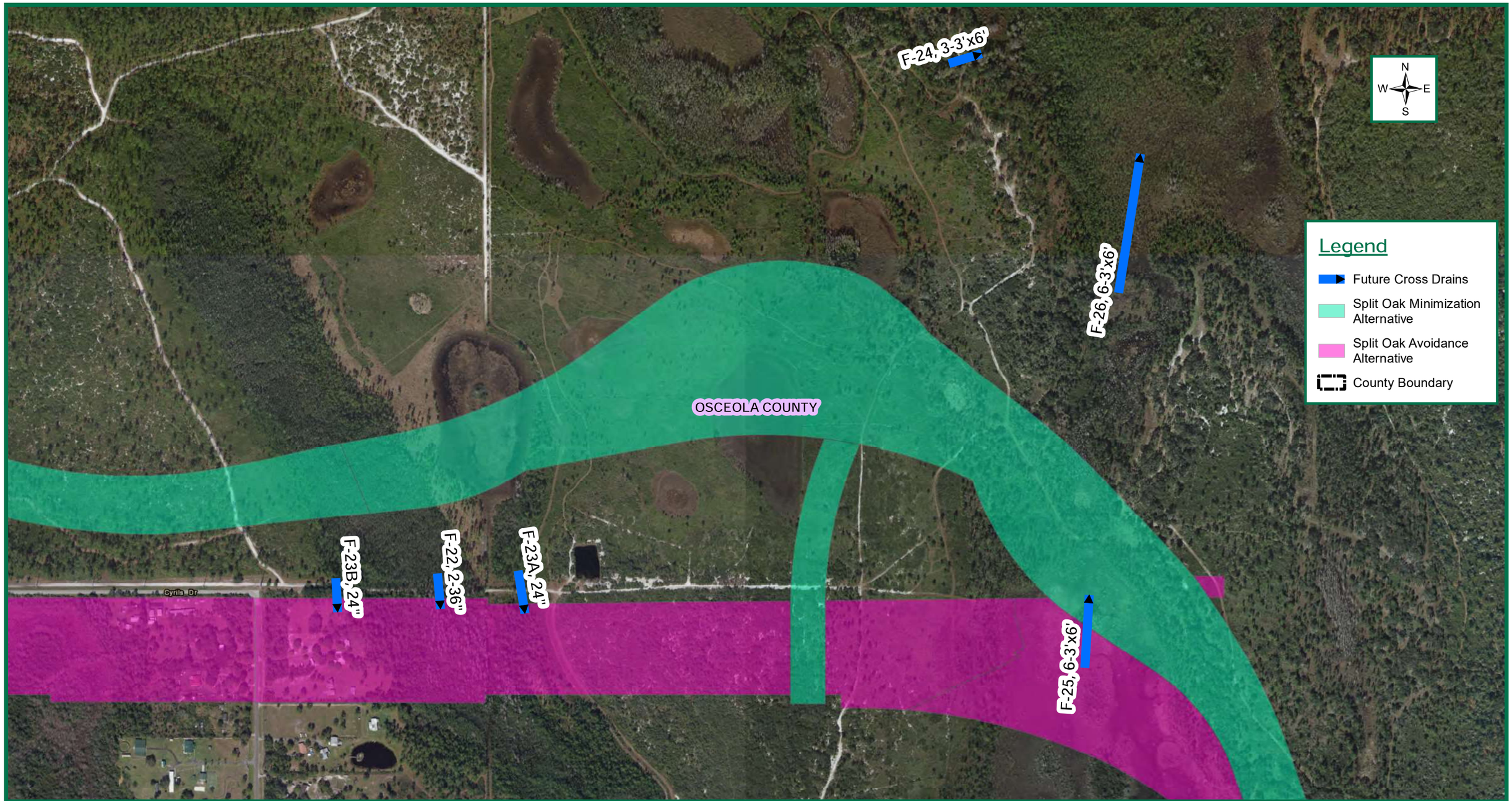
The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

FIGURE 16
EXISTING CROSS DRAINS MAP

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA



The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

FIGURE 17

FUTURE CROSS DRAINS MAP
in Sunbridge Northeast District (NED)

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

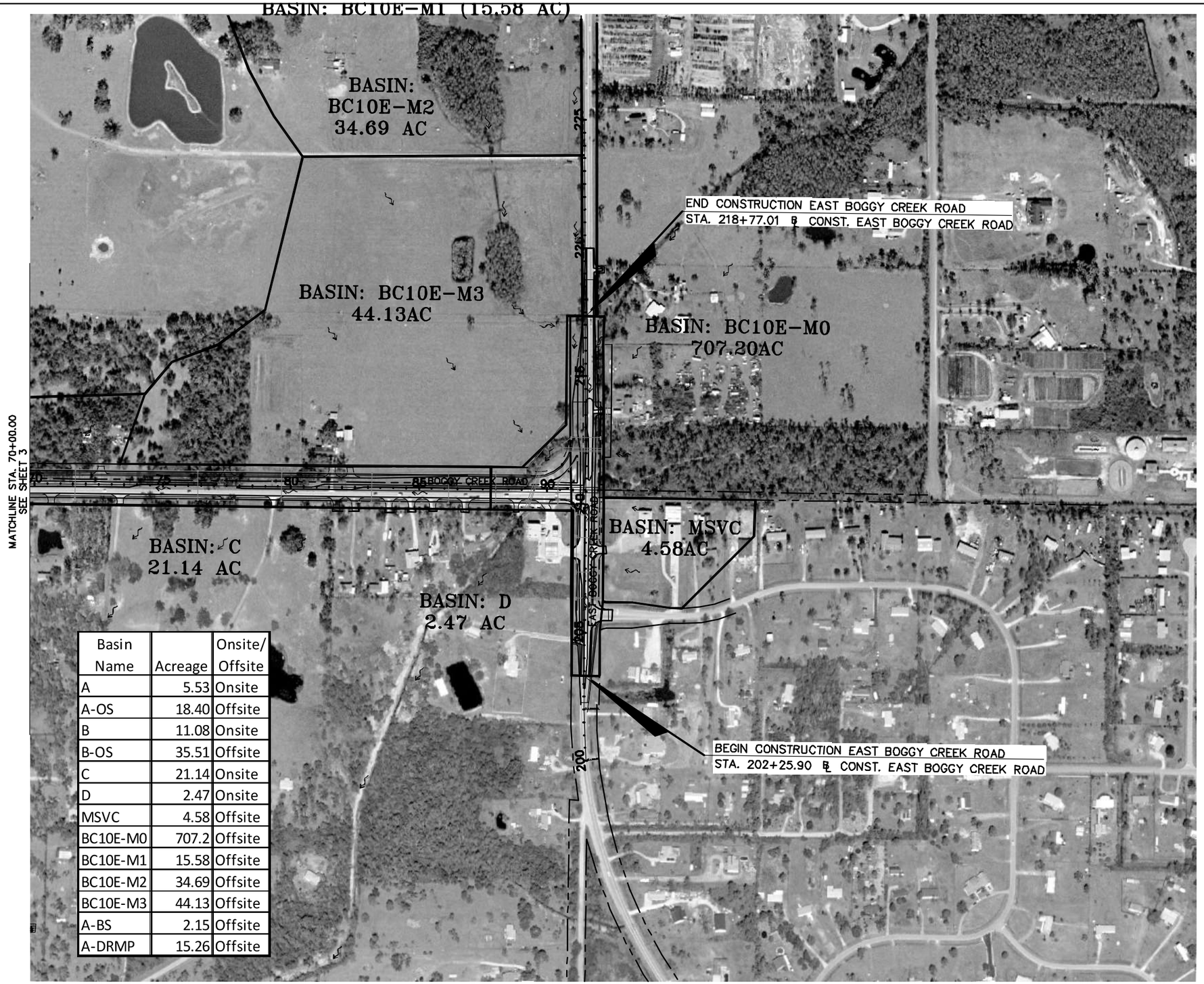
OSCEOLA PARKWAY EXTENSION

FROM SR 417 TO CYRILS DRIVE
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

Appendix B

Existing Plans & Permitted Documents

ERP Application No. 031231-10: Boggy Creek Road Widening



Basin Name	Acreage	Onsite/ Offsite
A	5.53	Onsite
A-OS	18.40	Offsite
B	11.08	Onsite
B-OS	35.51	Offsite
C	21.14	Onsite
D	2.47	Onsite
MSVC	4.58	Offsite
BC10E-M0	707.2	Offsite
BC10E-M1	15.58	Offsite
BC10E-M2	34.69	Offsite
BC10E-M3	44.13	Offsite
A-BS	2.15	Offsite
A-DRMP	15.26	Offsite

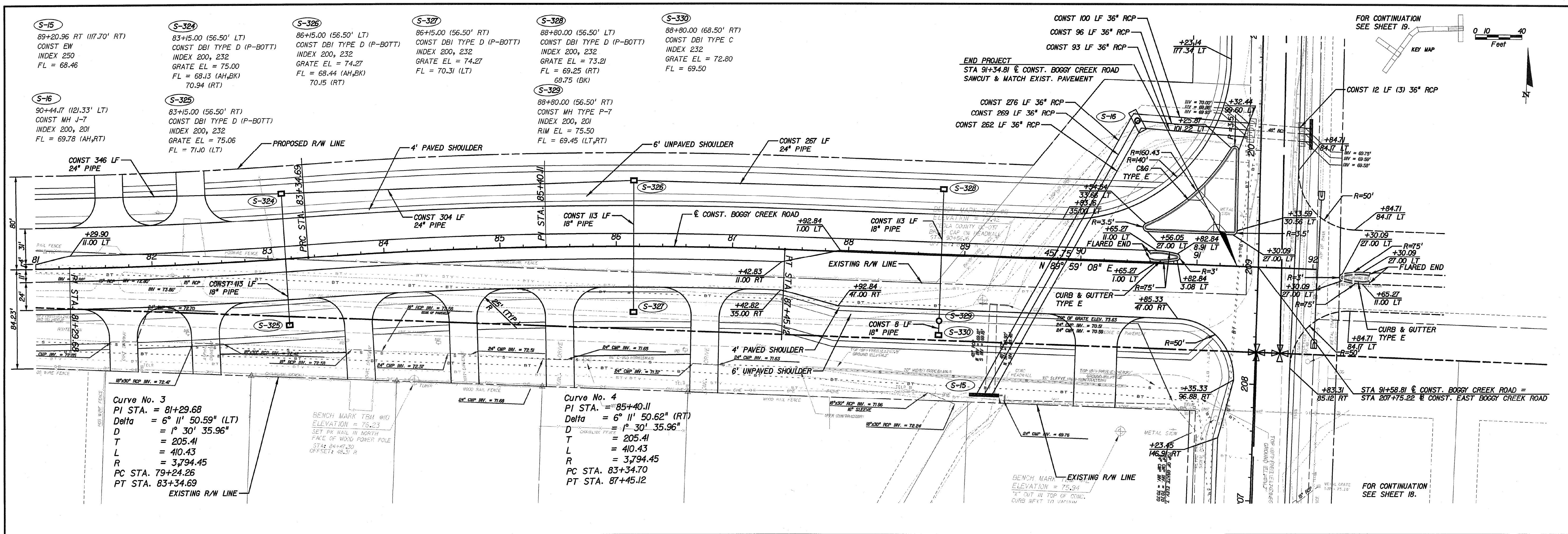
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

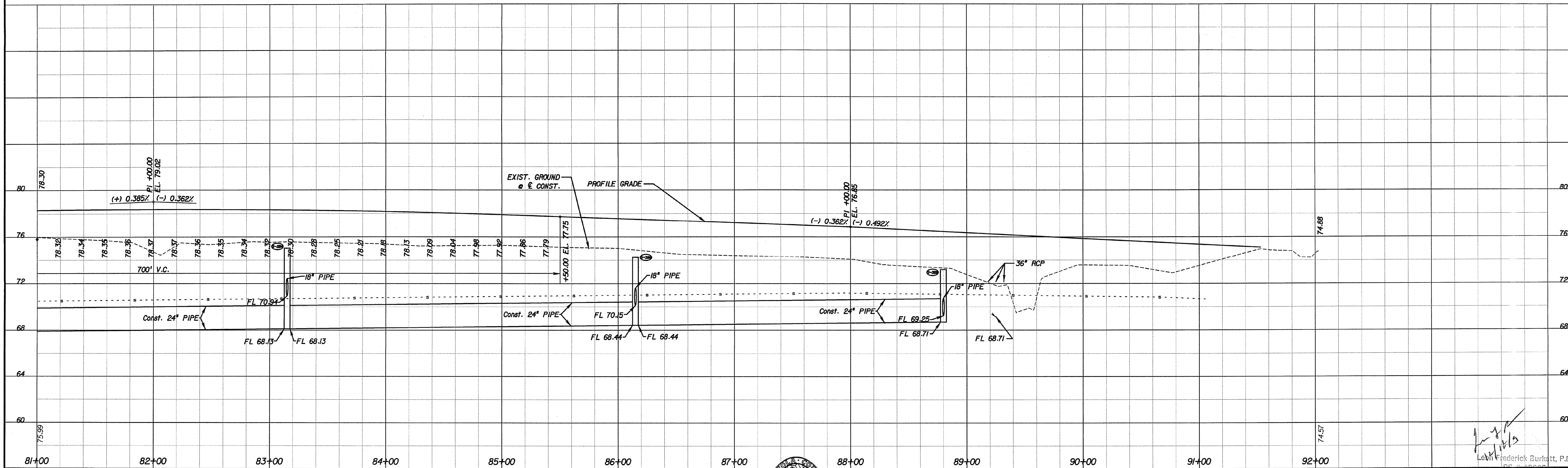
Vanasse Hangen Brustlin, Inc.
Transportation, Land Development, Environmental Services
225 E. Robinson Street, Suite 300
Orlando, FL 32801 (407)839-4006
Certificate of Authorization # 3932
Paul W. Yeargain, P.E.
PE # 50682

OSCEOLA COUNTY
ENGINEERING DEPARTMENT
BOGGY CREEK ROADWAY WIDENING

DRAINAGE MAP
BOGGY CREEK ROAD

SHEET NO. 4


S-15
89+20.96 RT (117.70' RT)
CONST EW
INDEX 250
FL = 68.46
S-16
90+44.17 (121.33' LT)
CONST MH J-7
INDEX 200, 201
FL = 69.78 (AH,RT)
S-324
83+15.00 (56.50' LT)
CONST DBI TYPE D (P-BOTT)
INDEX 200, 232
GRATE EL = 75.00
FL = 68.13 (AH,BK)
70.94 (RT)
S-325
83+15.00 (56.50' RT)
CONST DBI TYPE D (P-BOTT)
INDEX 200, 232
GRATE EL = 75.06
FL = 71.10 (LT)
S-326
86+15.00 (56.50' LT)
CONST DBI TYPE D (P-BOTT)
INDEX 200, 232
GRATE EL = 74.27
FL = 68.44 (AH,BK)
70.15 (RT)
S-327
86+15.00 (56.50' RT)
CONST DBI TYPE D (P-BOTT)
INDEX 200, 232
GRATE EL = 74.27
FL = 70.31 (LT)
S-328
88+80.00 (56.50' LT)
CONST DBI TYPE D (P-BOTT)
INDEX 200, 232
GRATE EL = 73.21
FL = 69.25 (RT)
68.75 (BK)
S-329
88+80.00 (56.50' RT)
CONST MH TYPE P-7
INDEX 200, 201
RIM EL = 75.50
FL = 69.45 (LT,RT)
S-330
88+80.00 (68.50' RT)
CONST DBI TYPE C
INDEX 232
GRATE EL = 72.80
FL = 69.50
CONST 100 LF 36" RCP
CONST 96 LF 36" RCP
CONST 93 LF 36" RCP
END PROJECT
STA 91+34.81 ℄ CONST. BOGGY CREEK ROAD
SAWCUT & MATCH EXIST. PAVEMENT
CONST 276 LF 36" RCP
CONST 269 LF 36" RCP
CONST 262 LF 36" RCP
FOR CONTINUATION
SEE SHEET 19.
KEY MAP
Feet
CONST 12 LF (3) 36" RCP
CONST 346 LF
24" PIPE
PROPOSED R/W LINE
4' PAVED SHOULDER
6' UNPAVED SHOULDER
CONST 267 LF
24" PIPE
CONST 304 LF
24" PIPE
CONST 113 LF
18" PIPE
℄ CONST. BOGGY CREEK ROAD
CONST 113 LF
18" PIPE
EXISTING R/W LINE
CONST 8 LF
18" PIPE
4' PAVED SHOULDER
6' UNPAVED SHOULDER
CURB & GUTTER
TYPE E
FLARED END
N 89° 59' 08" E
STA 91+58.81 ℄ CONST. BOGGY CREEK ROAD =
STA 207+75.22 ℄ CONST. EAST BOGGY CREEK ROAD
Curve No. 3
PI STA. = 81+29.68
Delta = 6° 11' 50.59" (LT)
D = 1° 30' 35.96"
T = 205.41
L = 410.43
R = 3,794.45
PC STA. 79+24.26
PT STA. 83+34.69
EXISTING R/W LINE
Curve No. 4
PI STA. = 85+40.11
Delta = 6° 11' 50.62" (RT)
D = 1° 30' 35.96"
T = 205.41
L = 410.43
R = 3,794.45
PC STA. 83+34.70
PT STA. 87+45.12
EXISTING R/W LINE
FOR CONTINUATION
SEE SHEET 18.



Leon Frederick Burkett, P.E.

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

REVISIONS

VHB

Vanasse Hangen Brustlin, Inc.
Transportation, Land Development, Environmental Services
135 West Central Blvd., Suite 800
Orlando, FL 32801 (407)839-4006
Vendor Number VF-042-931-679-001
Certificate of Authorization # 3932

Leon Frederick Burkett, P.E.
PE # 45825

OSCEOLA COUNTY
ENGINEERING DEPARTMENT
BOGGY CREEK ROADWAY WIDENING

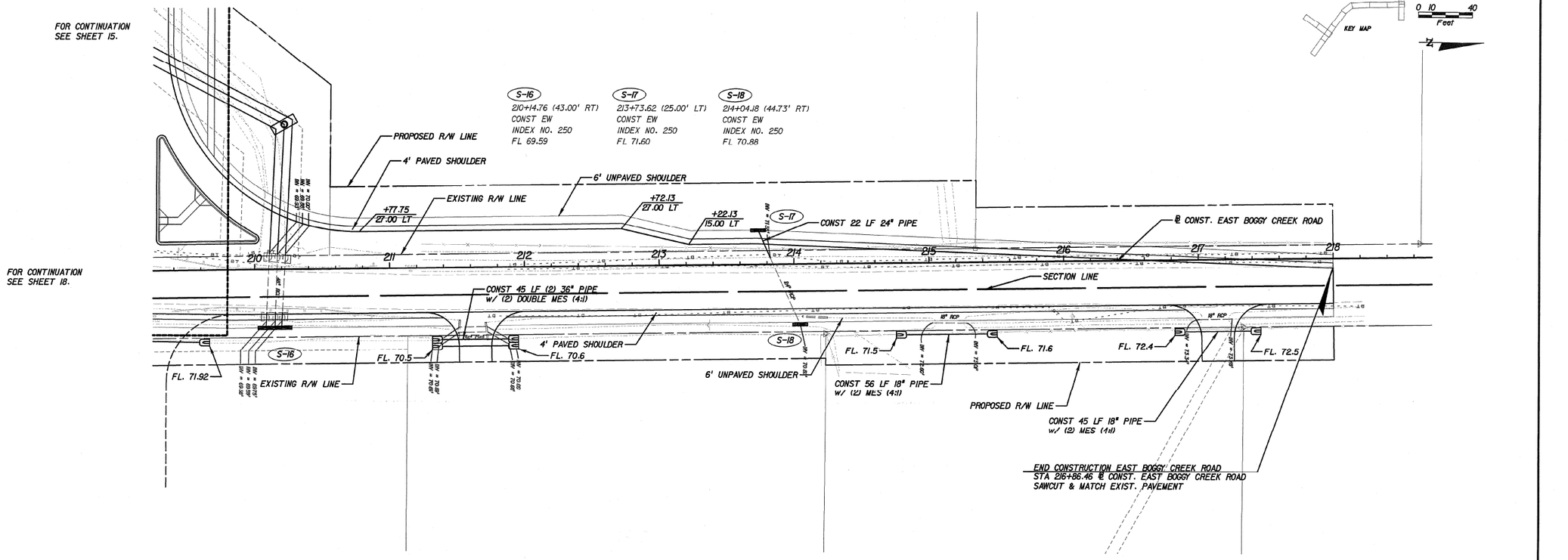
PLAN - PROFILE SHEET
BOGGY CREEK ROAD
STA. 81+00.00 TO STA. 91+34.81

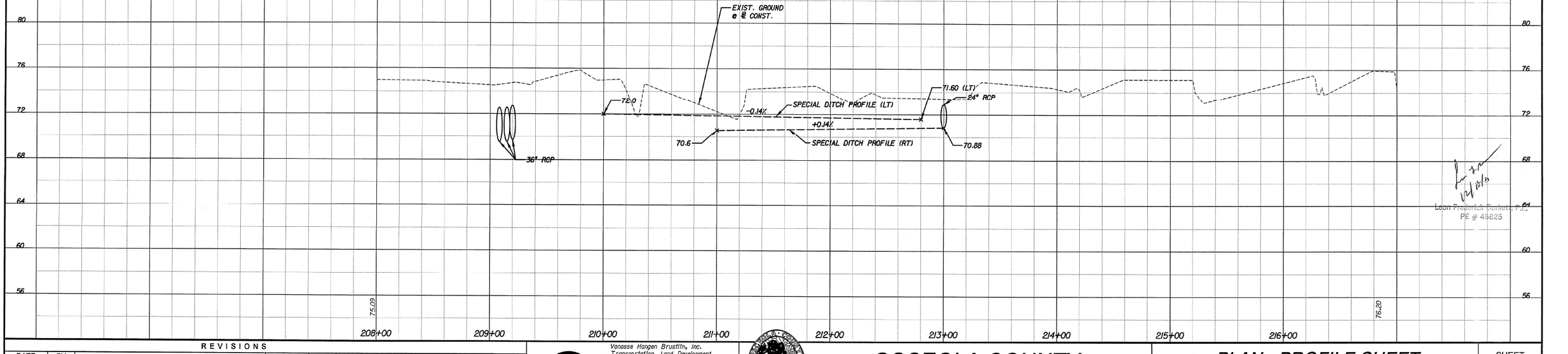
SHEET NO. 15

12/18/2003 02:44:46 PM pt\60854\cad\te\planset\plprrd07.dgn

FOR CONTINUATION
SEE SHEET 15.

FOR CONTINUATION
SEE SHEET 18.





Leon Frederick Burkett, P.E.
PE # 45825

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Vanasse Hangen Brustlin, Inc.
Transportation, Land Development,
Environmental Services
135 West Central Blvd., Suite 800
Orlando, FL 32801 (407)839-4006
Vendor Number VF-042-931-679-001
Certificate of Authorization # 3932

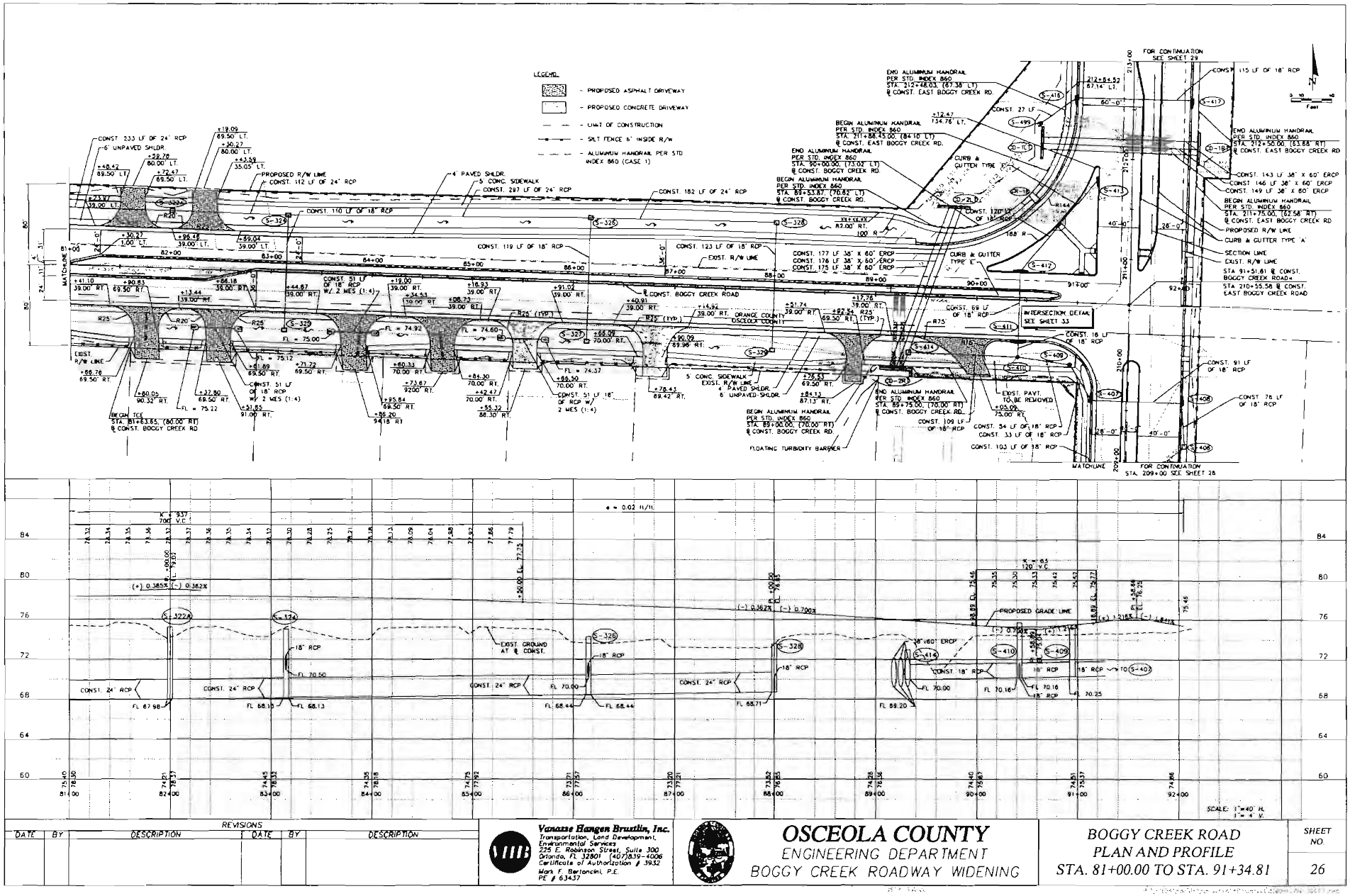
Leon Frederick Burkett, P.E.
PE # 45825

OSCEOLA COUNTY
ENGINEERING DEPARTMENT
BOGGY CREEK ROADWAY WIDENING

PLAN - PROFILE SHEET
EAST BOGGY CREEK ROAD
STA. 208+00.00 TO STA. 216+86.46

SHEET NO. 19

12/18/2003 02:44:55 PM p:\60854\cad\te\planset\plprfdll.dgn



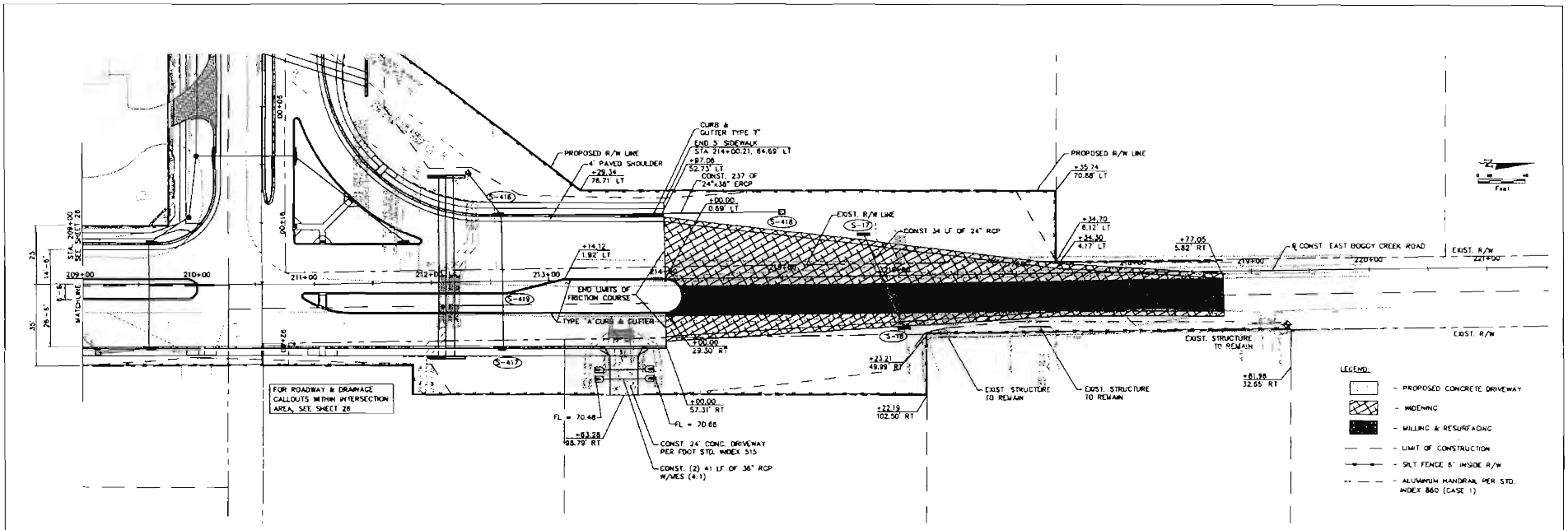
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

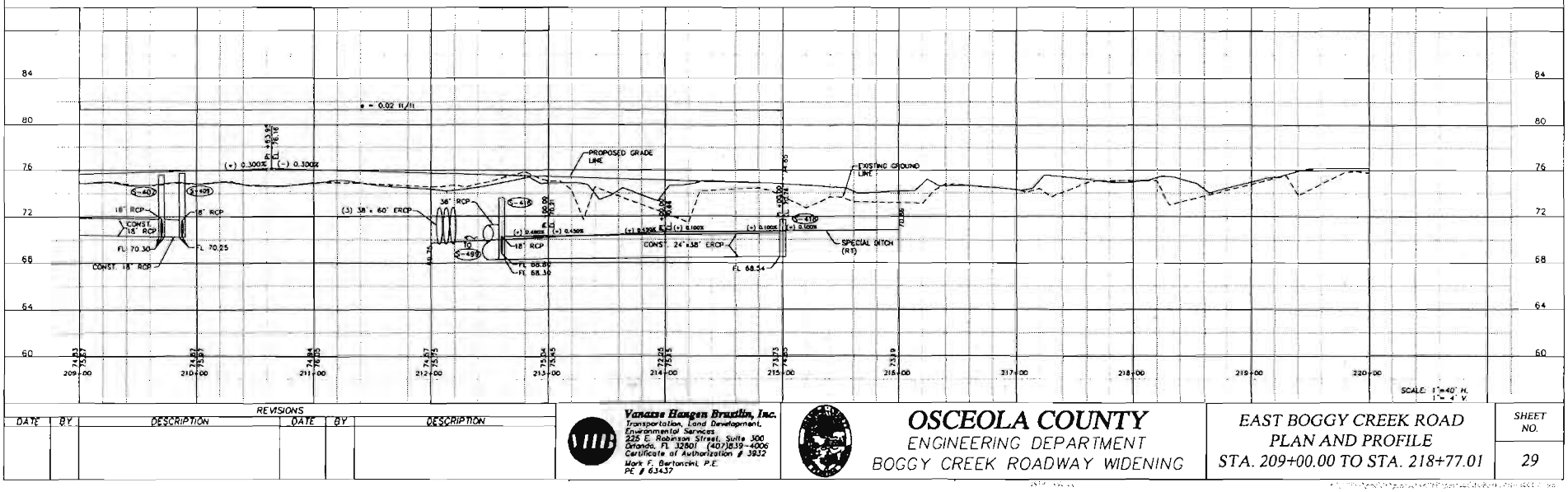
Vanasse Hangen Brustlin, Inc.
Transportation, Land Development, Environmental Services
225 E. Robinson Street, Suite 300
Orlando, FL 32801 (407)839-4006
Certificate of Authorization # 3932
Mark F. Bertoncini, P.E.
PE # 63457

OSCEOLA COUNTY
ENGINEERING DEPARTMENT
BOGGY CREEK ROADWAY WIDENING

BOGGY CREEK ROAD
PLAN AND PROFILE
STA. 81+00.00 TO STA. 91+34.81

SHEET NO. 26





REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Vanasse Hangen Brustlin, Inc.
Transportation, Land Development, Environmental Services
225 E. Robinson Street, Suite 300
Orlando, FL 32801 (407)839-4006
Certificate of Authorization # 3932
Mark F. Bertoncini, P.E.
PE # 63437

OSCEOLA COUNTY
ENGINEERING DEPARTMENT
BOGGY CREEK ROADWAY WIDENING

EAST BOGGY CREEK ROAD
PLAN AND PROFILE
STA. 209+00.00 TO STA. 218+77.01

SHEET NO. 29

ERP Application No. 091118-6: Boggy Creek Road Widening (Orange Co.)

CONSTRUCTION PLANS

FOR

BOGGY CREEK ROAD IMPROVEMENT PROJECT

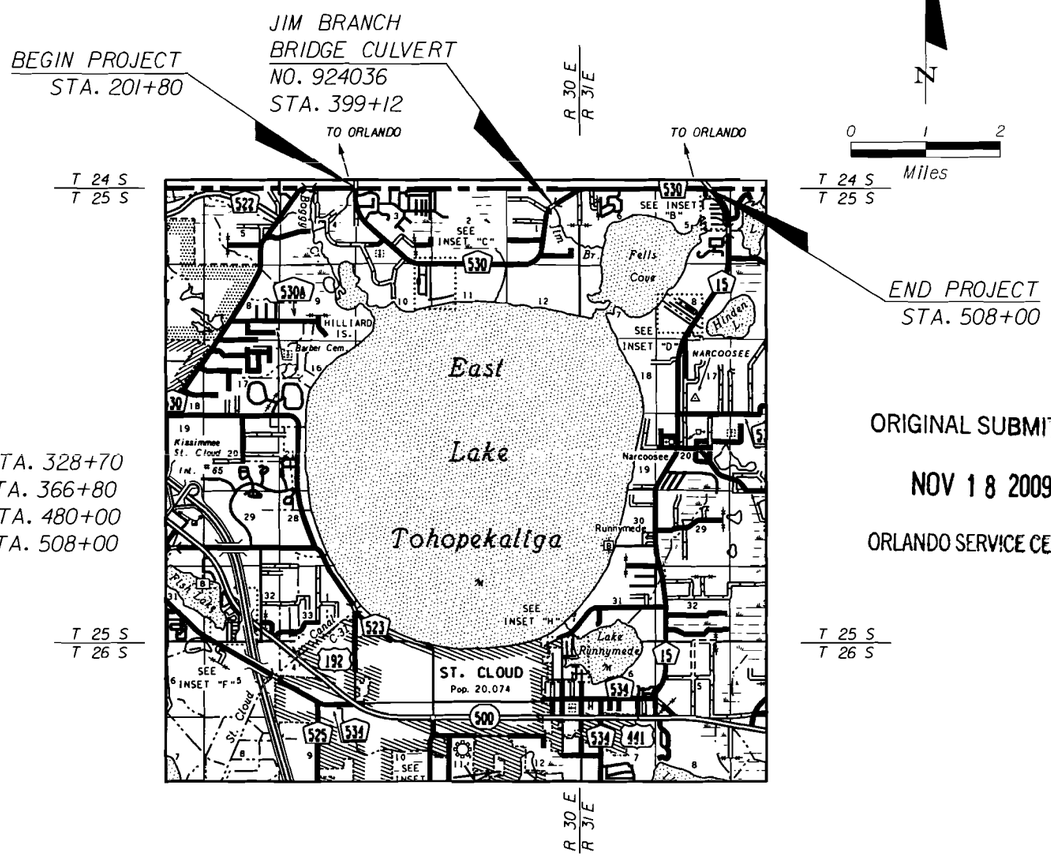
OSCEOLA COUNTY

FDOT FINANCIAL PROJECT ID. .....

FEDERAL AID NO. ARRA-.....

RECEIVED
NOV 18 2009
ORLANDO SERVICE CENTER

APP# 091118-6



PROJECT LENGTH IS BASED ON ℄ OF CONSTRUCTION

LENGTH OF PROJECT		
	LINEAR FEET	MILES
ROADWAY	30,620.00	5.799
BRIDGES	0.00	0.000
NET LENGTH OF PROJECT	30,620.00	5.799
EXCEPTIONS	8,250.00	1.563
GROSS LENGTH OF PROJECT	22,370.00	4.236

OSCEOLA COUNTY PROJECT MANAGER: STEVE NICHOLS, P.E.

INDEX OF ROADWAY PLANS

EXCEPTIONS

STA. 295+00 TO STA. 328+70
STA. 351+50 TO STA. 366+80
STA. 456+00 TO STA. 480+00
STA 507+00 TO STA. 508+00

GOVERNING STANDARDS AND SPECIFICATIONS:
FLORIDA DEPARTMENT OF TRANSPORTATION,
DESIGN STANDARDS DATED 2008,
AND STANDARD SPECIFICATIONS FOR ROAD
AND BRIDGE CONSTRUCTION DATED 2007,
AS AMENDED BY CONTRACT DOCUMENTS.

APPLICABLE DESIGN STANDARDS MODIFICATIONS: 07/01/09
For Design Standards Modifications click on
"Design Standards" at the following web site:
http://www.dot.state.fl.us/rddesign/

PLANS PREPARED FOR:

OSCEOLA COUNTY BOARD OF COUNTY COMMISSIONERS
PUBLIC WORKS DIVISION
1 COURTHOUSE SQUARE, SUITE 3100
KISSIMMEE, FLORIDA 34741
PH: 407-742-0662
FAX: 407-742-0660

ROADWAY
SHOP DRAWINGS
TO BE SUBMITTED TO:
STEVEN M. KREIDT, P.E.
KELLY, COLLINS & GENTRY, INC.
1700 N. ORANGE AVE.
SUITE 400
ORLANDO, FLORIDA 32804

STRUCTURAL
SHOP DRAWINGS
TO BE SUBMITTED TO:
MARK NIEDERMANN, P.E.
FLORIDA BRIDGE & TRANSPORTATION, INC.
P.O. BOX 947777
MAITLAND, FLORIDA 32794-7777

PLANS PREPARED BY:

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO. 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

ORIGINAL SUBMITTAL

NOV 18 2009

ORLANDO SERVICE CENTER

NOTE: THE SCALE OF THESE PLANS MAY HAVE CHANGED DUE TO REPRODUCTION.

SCANNED 11 OSCEOLA COUNTY
SCANNED 11 PUBLIC WORKS

JOHN QUIÑONES	CHAIRMAN OF THE BOARD OF COUNTY COMMISSIONERS
KEN SMITH	VICE CHAIRMAN OF THE BOARD OF COUNTY COMMISSIONERS
FRED HAWKINS, JR.	COUNTY COMMISSIONER
BRANDON ARRINGTON	COUNTY COMMISSIONER
MICHAEL E. HARFORD	COUNTY COMMISSIONER
MICHAEL FREILINGER	COUNTY MANAGER
KENNETH ATKINS	PUBLIC WORKS ADMINISTRATOR

ROADWAY PLANS
ENGINEER OF RECORD: STEVEN M. KREIDT, P.E.

P.E. NO: 39540

11-18-09

SHEET NO. 1

ARGIraud 11/12/2009 9:10:22 AM R:\Highway\work_v-8\Boggy_Creek_Rd_JB\roadway\KEYSRD01.DGN

NOTE: THESE QUANTITIES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY. THE CONTRACTOR SHALL BE RESPOSIBLE FOR DEVELOPING THE INFORMATION NECESSARY TO PREPARE HIS BID.

APP# 091118-6

ORIGINAL SUBMITTAL

NOV 18 2009

ORLANDO SERVICE CENTER

SUMMARY OF PAY ITEMS

ITEM NUMBER	DESCRIPTION	UNIT	PLAN QUANTITY	FINAL QUANTITY
101-1	MOBILIZATION	LS	1	
102-1	MAINTENANCE OF TRAFFIC	LS	1	
102-14	TRAFFIC CONTROL OFFICER	MH	560	
102-60	WORK ZONE SIGNS	ED	840	
102-71-11	BARRIER WALL, TEMPORARY, F&I, CONCRETE	LF	850	
102-71-21	BARRIER WALL, TEMPORARY, RELOCATE, CONCRETE	LF	850	
102-74-1	BARRICADES	ED	280	
102-77	HIGH INTENSITY FLASHING LIGHTS, TEMP, TYPE B	ED	280	
102-99	CHANGEABLE-VARIABLE MESSAGE SIGN, TEMP	ED	280	
104-99	EROSION CONTROL	LS	1	
110-1-1	CLEARING AND GRUBBING	LS	1	
120-1	REGULAR EXCAVATION	CY	137	
120-4	SUBSOIL EXCAVATION	CY	88	
120-6	EMBANKMENT	CY	616	
285-709	OPTIONAL BASE GROUP 9 TYPE B-12.5	SY	67	
327-70-5	MILLING EXIST ASPHALT PAV'T (2" AVG DEPTH)	SY	54,737	
337-7-32	ASPHALTIC CONCRETE FRICTION COURSE (FC-12.5) (TRAFFIC C) (2") (RUBBER)	TN	6,081	
339-1	MISCELLANEOUS ASPHALT PAVEMENT	TN	44	
400-4-1	CLASS IV CONCRETE (CULVERTS)	CY	90.9	
415-1-1	REINFORCING STEEL (ROADWAY)	LB	15,683	
524-1-1	CONCRETE DITCH PAVEMENT	SY	62	
530-3-4	RIP RAP, RUBBLE, F & I, DITCH LINING	TN	70	
536-1-1	GUARDRAIL	LF	400	
536-76	SPECIAL GUARDRAIL POST	EA	12	
536-85-22	GUARDRAIL END ANCHORAGE ASSEMBLY (FLARED)	EA	4	
570-1-2	PERFORMANCE TURF, SOD	SY	400	
710-90	SIGNING AND PAVEMENT MARKINGS	LS	1	

SCANNED 11/19/2009 JC

SCANNED 11/19/2009 JC

PAY ITEM NOTES

104-99 THE LUMP SUM COST FOR EROSION CONTROL SHALL INCLUDE ALL ACTIVITIES AND ITEMS REQUIRED, INCLUDING BUT NOT LIMITED TO STAKED SILT FENCE, TURBIDITY BARRIERS, SYNTHETIC BALES, ROCK BAGS, SAND BAGS, RIP-RAP, SLOPE DRAINS, FILTER FABRIC, TEMPORARY SODDING, ROCK OUTLET STRUCTURES, EARTHEN CONTAINMENT BERMS, PUMPING SYSTEM FOR STREAM DIVERSION, FLOCCULANTS, MONITORING, ETC.

110-1-1 INCLUDES THE REMOVAL OF CURB, GUTTER, SIDEWALK, AND GUARDRAIL.

327-70-5 MILLINGS SHALL BE RETAINED AND TRANSPORTED BY THE CONTRACTOR TO OSCEOLA COUNTY ROAD AND BRIDGE STORAGE YARD #1 AT 3850 OLD CANOE CREEK ROAD, ST. CLOUD, FLORIDA 34769. PAYMENT SHALL BE INCLUDED IN COST OF MILLING. CONTRACTOR SHALL NOTIFY OSCEOLA ROAD AND BRIDGE DEPARTMENT AT 407-343-7164 AT LEAST 48 HOURS PRIOR TO DELIVERY OF MATERIAL.

337 INCLUDES THE COST OF TACK.

710-90 THE CONTRACTOR SHALL APPLY THERMOPLASTIC AS THE SECOND APPLICATION A MINIMUM OF THIRTY (30) DAYS AFTER THE FIRST APPLICATION OF PAINT BUT PRIOR TO THE FINAL ACCEPTANCE OF THE PROJECT. THE THERMOPLASTIC SHALL BE IN ACCORDANCE WITH SECTION 711 OF THE SPECIFICATION. ALL PAVEMENT MARKINGS SHALL BE INCLUDED IN THE COST OF ITEM NUMBER 710-90. ALL SIGNING AND PAVEMENT MARKINGS SHALL MATCH EXISTING, UNLESS NOTED OTHERWISE, AND MEET FDOT DESIGN STANDARDS. INCLUDES COST OF SIGNING.

SUMMARY OF SODDING

LOCATION STA. TO STA.	SIDE	P L	P W	P SY	F L	F W	F SY	FIELD BOOK REFERENCE
397+65 - 400+60	LT	VARIES	VARIES	100				
397+65 - 400+60	RT	VARIES	VARIES	100				
* MISCELLANEOUS	L/R	VARIES	VARIES	200				
			TOTAL	400				

* TO BE PLACED AS DIRECTED BY ENGINEER.

SUMMARY OF DITCH PAVEMENT AND SODDING

LOCATION STA. TO STA.	SIDE	CONCRETE SY P	CONCRETE SY F	FIELD BOOK REFERENCE
398+84 - 398+98	L/R	31		
399+24 - 399+38	L/R	31		
TOTAL		62		

11-18-09

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE, SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

SUMMARY OF PAY ITEMS

SHEET NO. 2

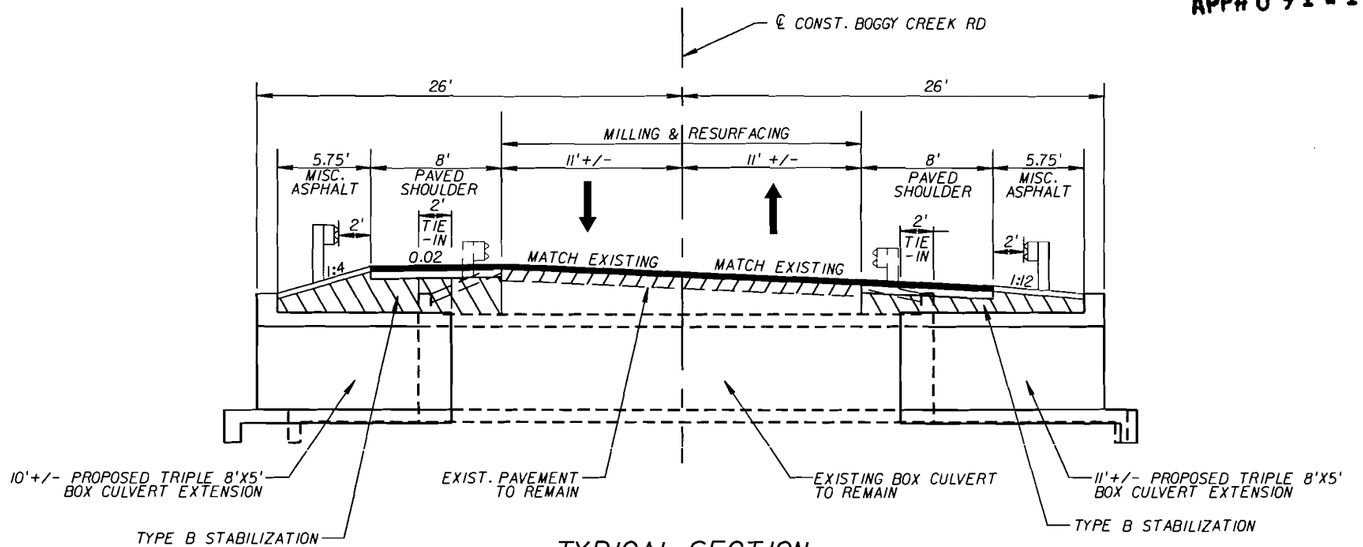
ARGiraud 11/12/2009 9:10:16 AM R:\Highway\work_y-8\Boggy_Creek_Rd_JB\roadway\CESSRD01.DGN

ORIGINAL SUBMITTAL

APP# 091118-6

NOV 18 2009

ORLANDO SERVICE CENTER



TYPICAL SECTION
BOX CULVERT EXTENSION
AT JIM BRANCH CREEK
STA. 397+65 TO STA. 400+60

MILLING (MAINLINE)

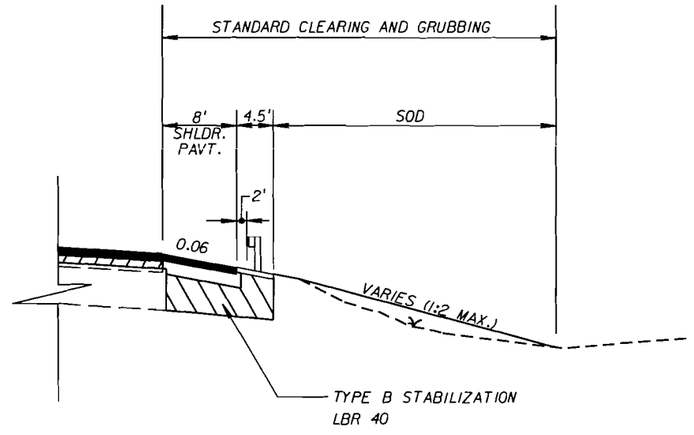
MILL EXISTING ASPHALT PAVEMENT (2" AVG. DEPTH)

RESURFACING (MAINLINE)

FRICTION COURSE FC-12.5 (TRAFFIC C) (2") (RUBBER)

SHOULDER PAVEMENT

OPTIONAL BASE GROUP I WITH
FRICTION COURSE FC-12.5 (TRAFFIC C) (2") (RUBBER)



NEW PAVED SHOULDER DETAIL
STA. 397+65 TO STA. 400+60 (LT. & RT.)

SHOULDER PAVEMENT

OPTIONAL BASE GROUP I WITH
FRICTION COURSE FC-12.5 (TRAFFIC C) (2") (RUBBER)

NOT TO SCALE

SCANNED 11/19/2009 JC
SCANNED 11/19/2009 JC

11-18-09

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC. ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO. 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

TYPICAL SECTION
BOX CULVERT EXTENSION

SHEET NO. 4

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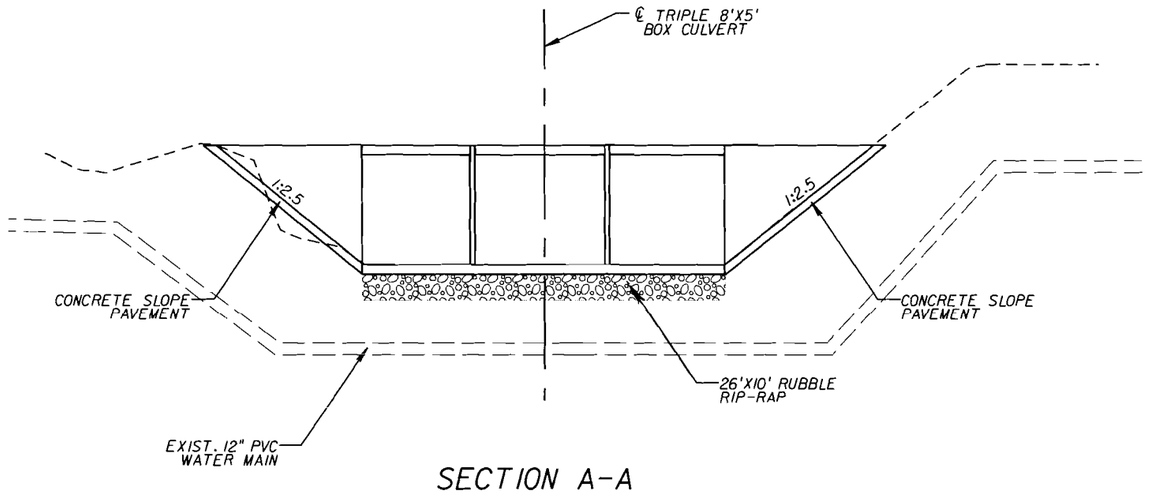
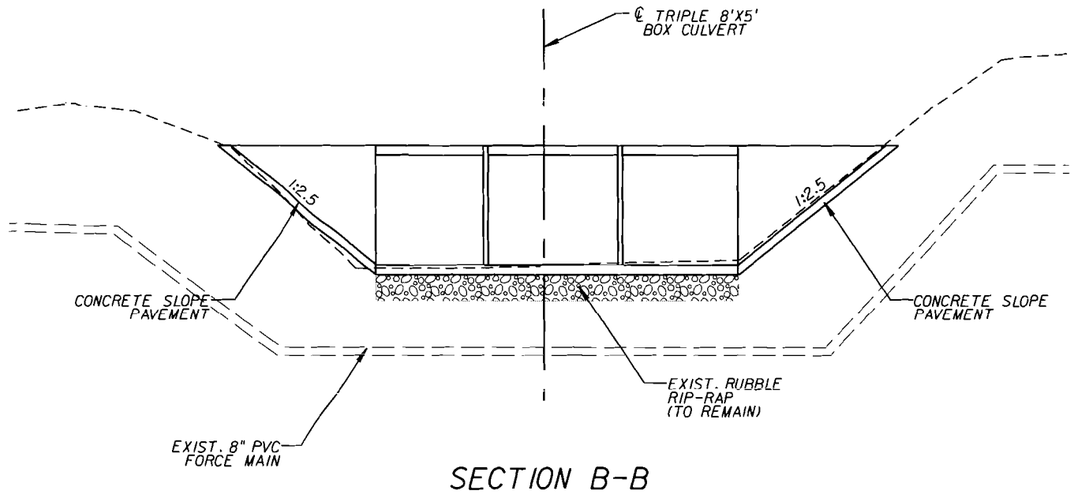


SECTION A-A



SECTION B-B

11-18-09

NOT TO SCALE

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

TYPICAL SECTION
JIM BRANCH CREEK

SHEET NO. 5

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APP# 091118-6

ORIGINAL SUBMITTAL

NOV 18 2009

ORLANDO SERVICE CENTER

GENERAL NOTES

1. THE STATIONS SHOWN ON THE PLANS ARE APPROXIMATE AND SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION WITHIN THE PROJECT LIMITS.

2. ANY PUBLIC LAND CORNER WITHIN THE LIMITS OF CONSTRUCTION IS TO BE PROTECTED. IF A CORNER MONUMENT IS IN DANGER OF BEING DESTROYED AND HAS NOT BEEN PROPERLY REFERENCED, THE ENGINEER SHOULD NOTIFY THE DISTRICT LOCATION SURVEYOR, WITHOUT DELAY, BY TELEPHONE.

3. DURING MILLING OPERATIONS BASE MAY BE EXPOSED. IF BASE IS EXPOSED, THE CONTRACTOR SHALL PRIME PRIOR TO RESURFACING.

4. CONTRACTOR SHALL NOT ALLOW ANY ASPHALT OR BASE SPOILS TO BE SWEPT ONTO EXISTING GRASSED SHOULDER.

5. THE CONTRACTOR IS REQUIRED TO FIELD VERIFY THESE CONSTRUCTION PLANS AGAINST THE EXISTING CONDITIONS TO ENSURE THAT ANY CHANGES THAT HAVE OCCURRED ARE INCLUDED WITHIN THE BID PRICE. ANY DISCREPANCIES DISCOVERED SHALL NOT BE CONSIDERED ADDITIONAL WORK. SUCH CHANGES ARE TO BE INCLUDED WITHIN THE CONSTRUCTION BID PRICE AND NO ADDITIONAL COMPENSATION FOR SUCH CHANGES WILL BE GIVEN DURING CONSTRUCTION.

6. EROSION PROTECTION AT INLET OPENINGS AND BRIDGE BOX CULVERT SHALL BE PROVIDED USING ROCK BAGS, SOCKDRAINS, OR OTHER EROSION CONTROL DEVICE AS APPROVED BY THE ENGINEER TO PREVENT THE INTRUSION OF MILLED MATERIALS, SOIL AND DEBRIS FROM ENTERING THE EXISTING DRAINAGE INLETS AND WATER BODY.

7. THE FOLLOWING LIST OF UTILITY COMPANIES HAVE FACILITIES WITHIN THE PROJECT LIMITS. IT HAS BEEN DETERMINED THAT NO RELOCATION IS ANTICIPATED BY THE FOLLOWING COMPANIES FOR THE PROJECT:

COMPANY	TELEPHONE NO.
AT&T LONG DISTANCE	352-331-9294
AT&T	561-439-9118
BRIGHT HOUSE NETWORKS	407-532-8509
CITY OF ST. CLOUD	407-957-7301
COMCAST COMMUNICATIONS	407-849-3610
CONNEXION TECHNOLOGIES	919-535-7280
EMBARQ	407-814-5383
KISSIMMEE UTILITY AUTHORITY	407-933-7777 X1210
ORLANDO UTILITIES COMMISSION (OUC)	407-236-9651
OSCEOLA COUNTY TRAFFIC	407-742-0501
SPRING NEXTEL	407-838-5602
TOHO WATER AUTHORITY	407-518-2253

8. THE COST OF DE-WATERING SHALL BE INCLUDED IN THE COST OF THE BOX CULVERT EXTENSION.

SCANNED 11/19/2009 JC

SCANNED 11/19/2009 JC

11-18-09

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT OF AUTHORIZATION NO. 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

GENERAL NOTES

SHEET NO. 6

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BRIDGE CULVERT
NO. 924036
STA. 399+11

R/W LINE

PROPOSED 8' PAVED SHOULDER

PROPOSED TRIPLE 8'X5' BOX CULVERT EXTENSION

MILLING AND RESURFACING LIMITS

+00

+25

396 397 398 399 400 401 402

0 10 50
Feet

395+00.00

402+50.00

EXIST. GUARDRAIL (TO BE REMOVED)

℄ CONST. BOGGY CREEK RD.

JIM BRANCH CREEK

PROPOSED GUARDRAIL END ENCORAGE (FLARED) (TYP.)

R/W LINE

PROPOSED TRIPPLE 8'X5' BOX CULVERT EXTENSION

403 404 405 406 407 408 409

402+50.00

410+00.00

MILLING AND RESURFACING LIMITS

℄ CONST. BOGGY CREEK RD.

R/W LINE

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
			11-18-09

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO. 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

ORIGINAL SUBMITTAL
NOV 18 2009
ORLANDO SERVICE CENTER

APP# 091118-6
PLAN SHEET

SHEET NO. 22

APP#091118-6

REMOVE GUARDRAIL

℄ CONST. BOGGY CREEK RD.

TEMP. SLOPE DRAIN

CONCRETE SLOPE PAVEMENT

STAKED SILT FENCE

0 2 10
Feet

CONCRETE SLOPE PAVEMENT

A

B

STAKED SILT FENCE

STAKED TURBIDITY BARRIER

JIM BRANCH CREEK

PROPOSED 9.92 LF EXTENSION OF TRIPLE 8'X5' CONC. BOX CULVERT (SEE BOX CULVERT DATA SHEETS)

PROPOSED 10.58 LF EXTENSION OF TRIPLE 8'X5' CONC. BOX CULVERT (SEE BOX CULVERT DATA SHEETS)

31.5' EXIST. (3) 8'X5' CBC

26'X10' RUBBLE RIP-RAP

STAKED TURBIDITY BARRIER

WETLAND IMPACT 0.03 AC. (ASSUME TOP OF BANK)

26'X10' RUBBLE RIP-RAP

WETLAND IMPACT 0.04 AC. (ASSUME TOP OF BANK)

R/W LINE

CONCRETE SLOPE PAVEMENT

A

BRIDGE CULVERT NO. 924036 STA. 399+11

STAKED SILT FENCE

SCANNED 11/19/2009 JC
SCANNED 11/19/2009 JC

11-18-09

STAKED SILT FENCE

R/W LINE

CONCRETE SLOPE PAVEMENT

B

TEMP. SLOPE DRAIN

NOTE:

1. SEE BOX CULVERT DATA SHEETS FOR DETAILS.
2. REMOVE SUBSOIL 5 FT. OUTSIDE OF BOX CULVERT EXTENSION FOOT PRINT AND 15 FT. DEEP.

ORIGINAL SUBMITTAL

NOV 18 2009

ORLANDO SERVICE CENTER

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO. 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
JIM BRANCH CULVERT PROJECT

BOX CULVERT EXTENSION PLAN

SHEET NO. 30

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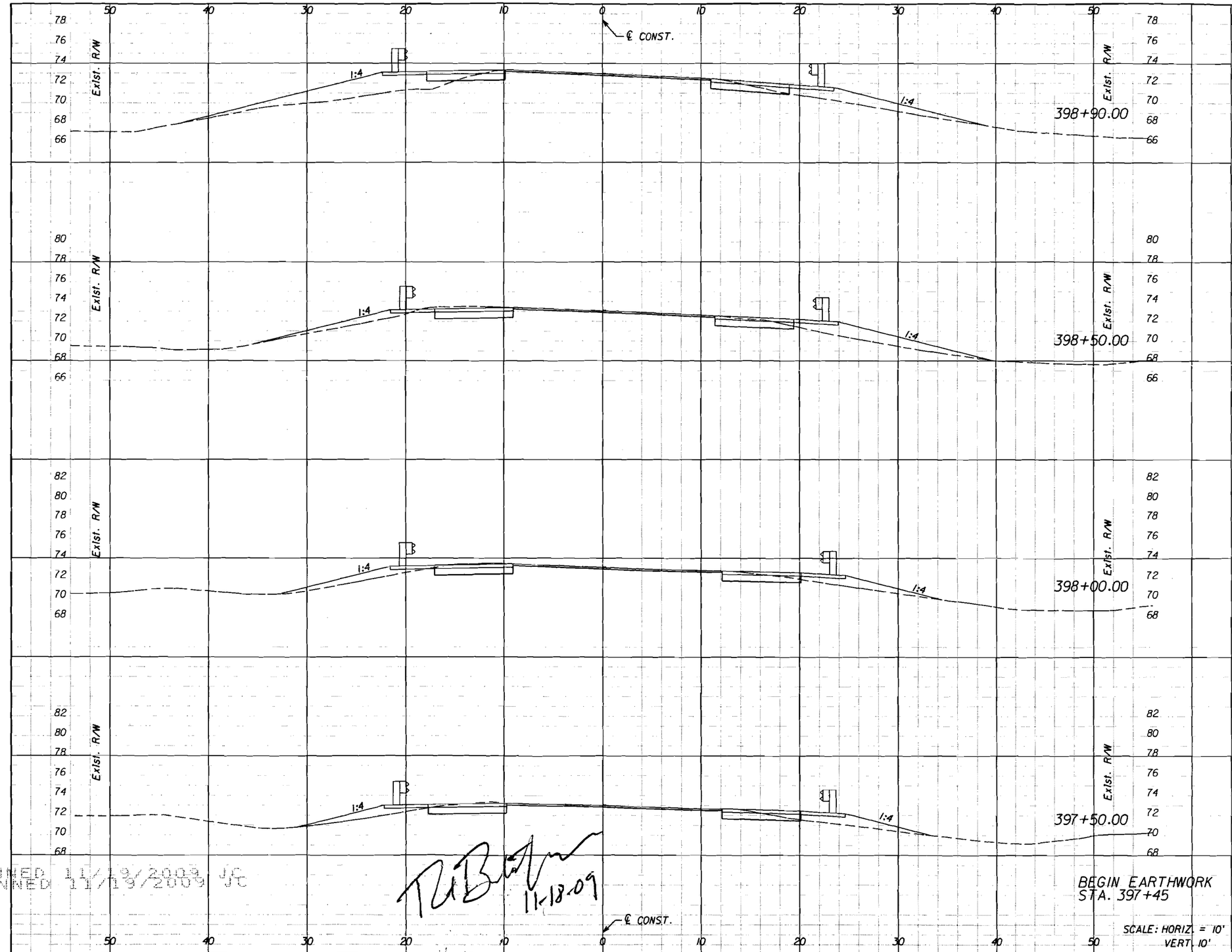

Subsoil Exc.		Regular Exc.		Embankment	
A	V	A	V	A	V
		8		42	
			17		47
		16		22	
			28		34
		14		15	
			25		27
		13		14	
			1		1
		0		0	
			0		0

SCANNED 11/19/2009 JC

11-18-09

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO. 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

ORIGINAL SUBMITTAL
NOV 18 2009
APP# 091118-6

CROSS SECTION

SHEET NO. 31

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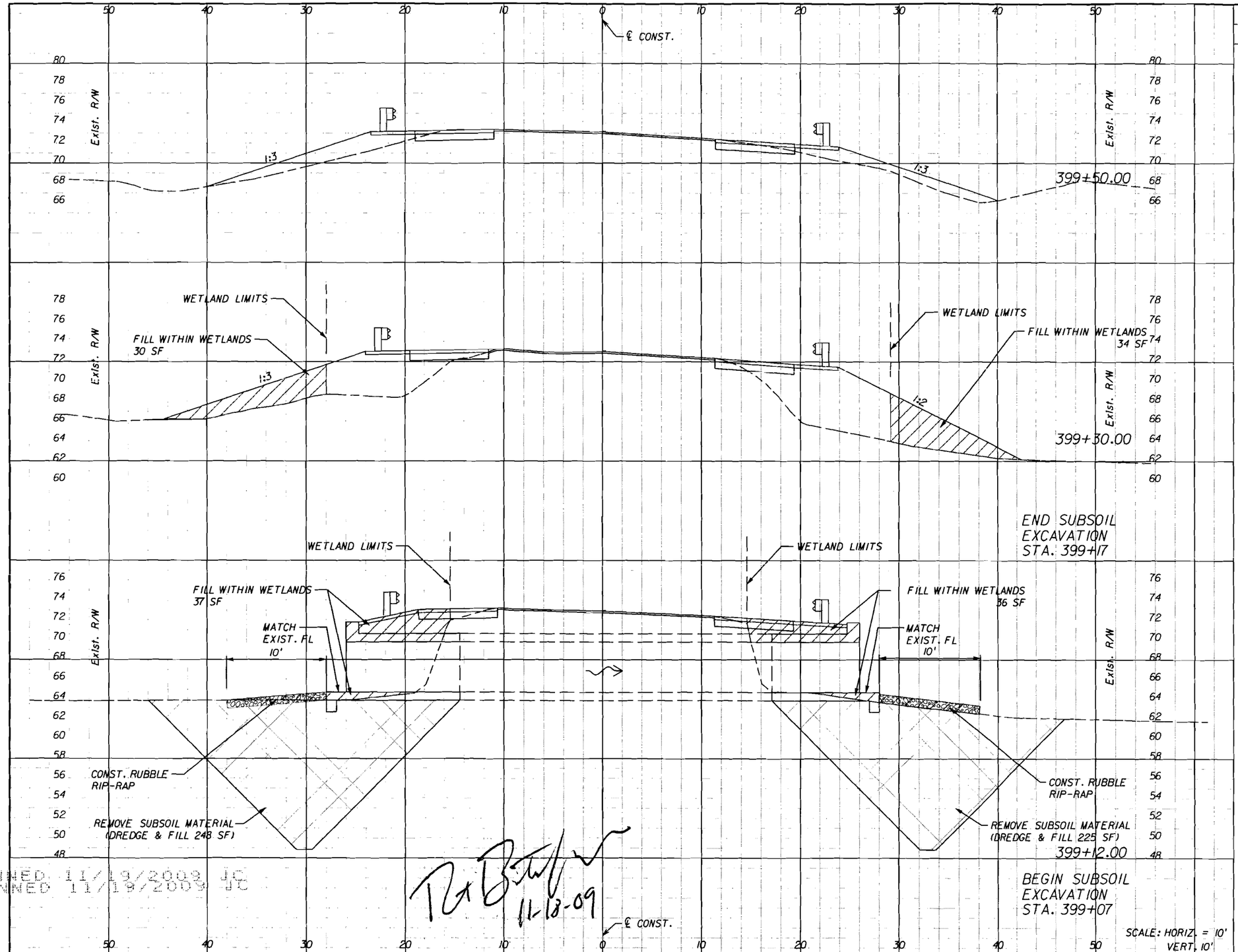
ORLANDO SERVICE CENTER



Subsoil Exc.		Regular Exc.		Embankment	
A	V	A	V	A	V
		13		40	
			6		78
		3		170	
			3		105
0					
	44				
473		5		146	
	44		5		76
0					
	0				

SCALE: HORIZ. = 10'
VERT. 10'

SCANNED 11/19/2009 JC

SCANNED 11/19/2009 JC

11-18-09

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
407-898-7858 CERT. OF AUTHORIZATION NO. 7350
STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

ORIGINAL SUBMITTAL
NOV 18 2009
APP# 091118-6
CROSS SECTION

SHEET NO. 32

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ORLANDO SERVICE CENTER

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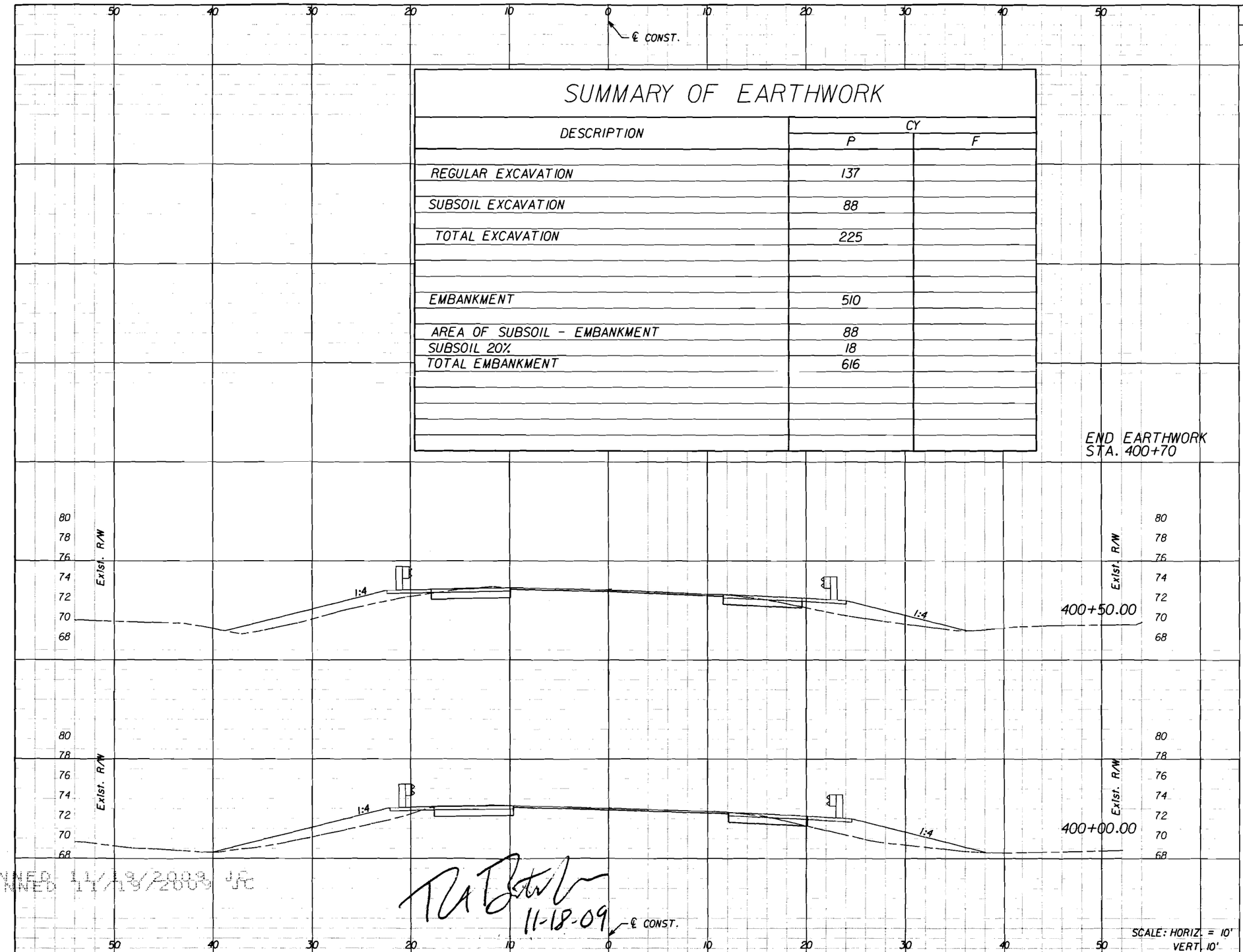

SUMMARY OF EARTHWORK

DESCRIPTION	CY P	CY F
REGULAR EXCAVATION	137	
SUBSOIL EXCAVATION	88	
TOTAL EXCAVATION	225	
EMBANKMENT	510	
AREA OF SUBSOIL - EMBANKMENT	88	
SUBSOIL 20%	18	
TOTAL EMBANKMENT	616	

END EARTHWORK
STA. 400+70

Subsoil Exc. A	Subsoil Exc. V	Regular Exc. A	Regular Exc. V	Embankment A	Embankment V
		0		0	
			5		12
		13		31	
			24		61
		14		35	
			24		70

SCALE: HORIZ. = 10'
VERT. 10'

SCANNED 11/19/2009 JC
SCANNED 11/19/2009 JC

11-18-09

REVISIONS DATE	DESCRIPTION	DATE	DESCRIPTION

KCG KELLY, COLLINS & GENTRY, INC.
ENGINEERING / PLANNING
1700 N. ORANGE AVE., SUITE 400 ORLANDO, FL 32804
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STEVEN M. KREIDT, P.E. LICENSE NO. 39540

OSCEOLA COUNTY
PUBLIC WORKS
BOGGY CREEK ROAD

ORIGINAL SUBMITTAL APP# 091118-6
NOV 18 2009 CROSS SECTION
ORLANDO SERVICE CENTER

SHEET NO. 33

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ERP Application No. 180309-3 Poitras East PD FEMA LOMR ERP

POITRAS EAST PD

FEMA LOMR

Application for a Letter of Map Revision (LOMR)

SUBMITTED TO:
City of Orlando
Federal Emergency Management Agency

DECEMBER 2018

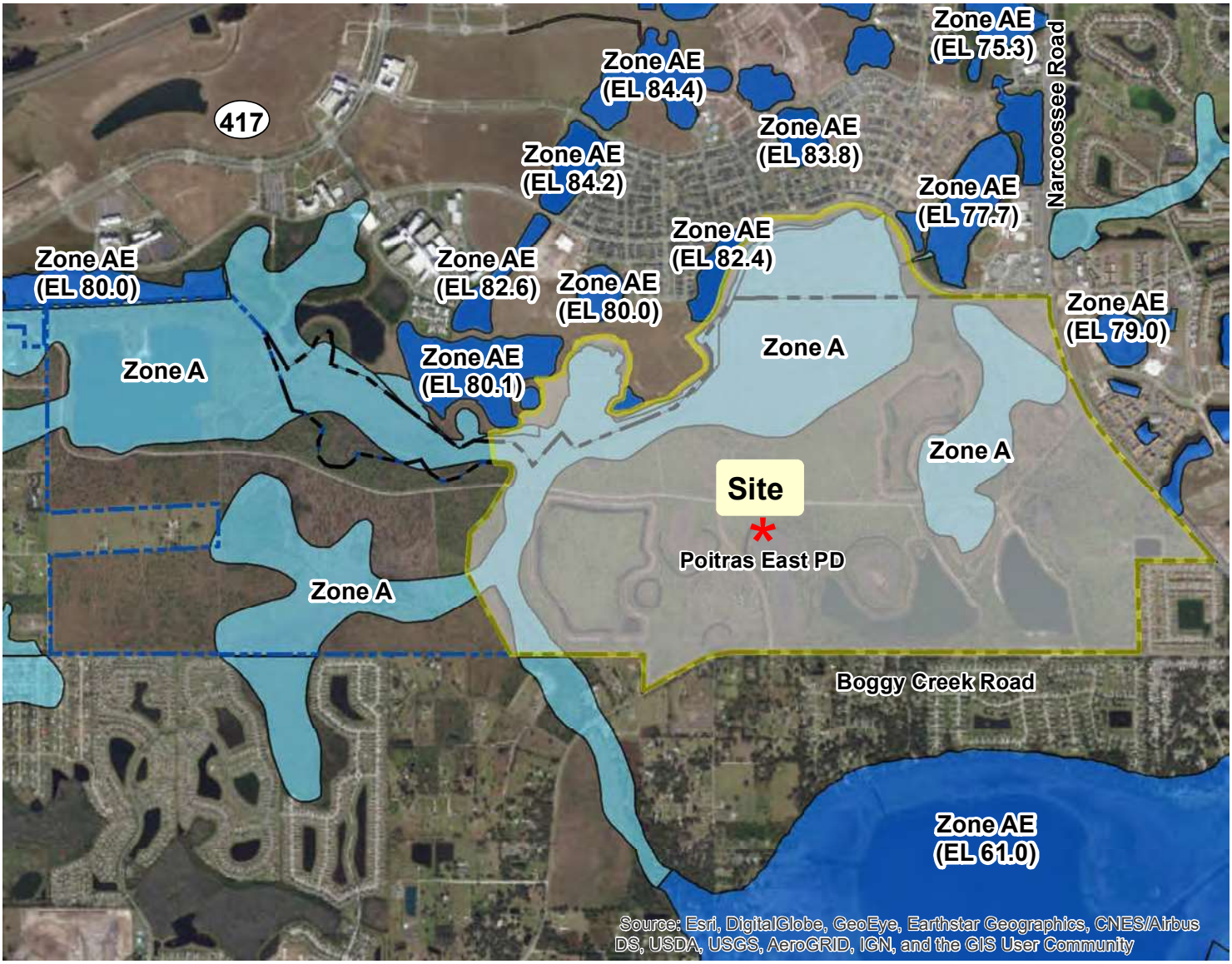
DONALD W. MCINTOSH ASSOCIATES, INC. Certification of Authorization No. 68 Dated March 7, 2001

POITRAS EAST PD

Sections 31&32, Township 24 South, Range 31 East
Sections 35&36, Township 24 South, Range 30 East
City of Orlando, Florida

N

1:30,000
@ 8.5x11



Legend

FEMA Flood Zone

- Zone A
- Zone AE

Poitras East PD Boundary

Mapping Limits

Site

NOTES

1) This is not a survey.
2) This map is for planning and permitting activity for the above named project and should be used for those purposes only.
3) The Flood Zone data shown digitized from FEMA FIRM Panels 12095C0650G, 12095C0675G effective 6/18/2018, and 2097C0085G, 12097C105G effective 6/18/2013 LOMR 11-04-5608P effective 4/25/2014, 14-04-A992P effective 8/21/2015, 15-04-7419P effective 3/7/2016 and 16-04-5226P effective 3/10/2017. NAVD 88 Datum.

Map A.5
Flood Map

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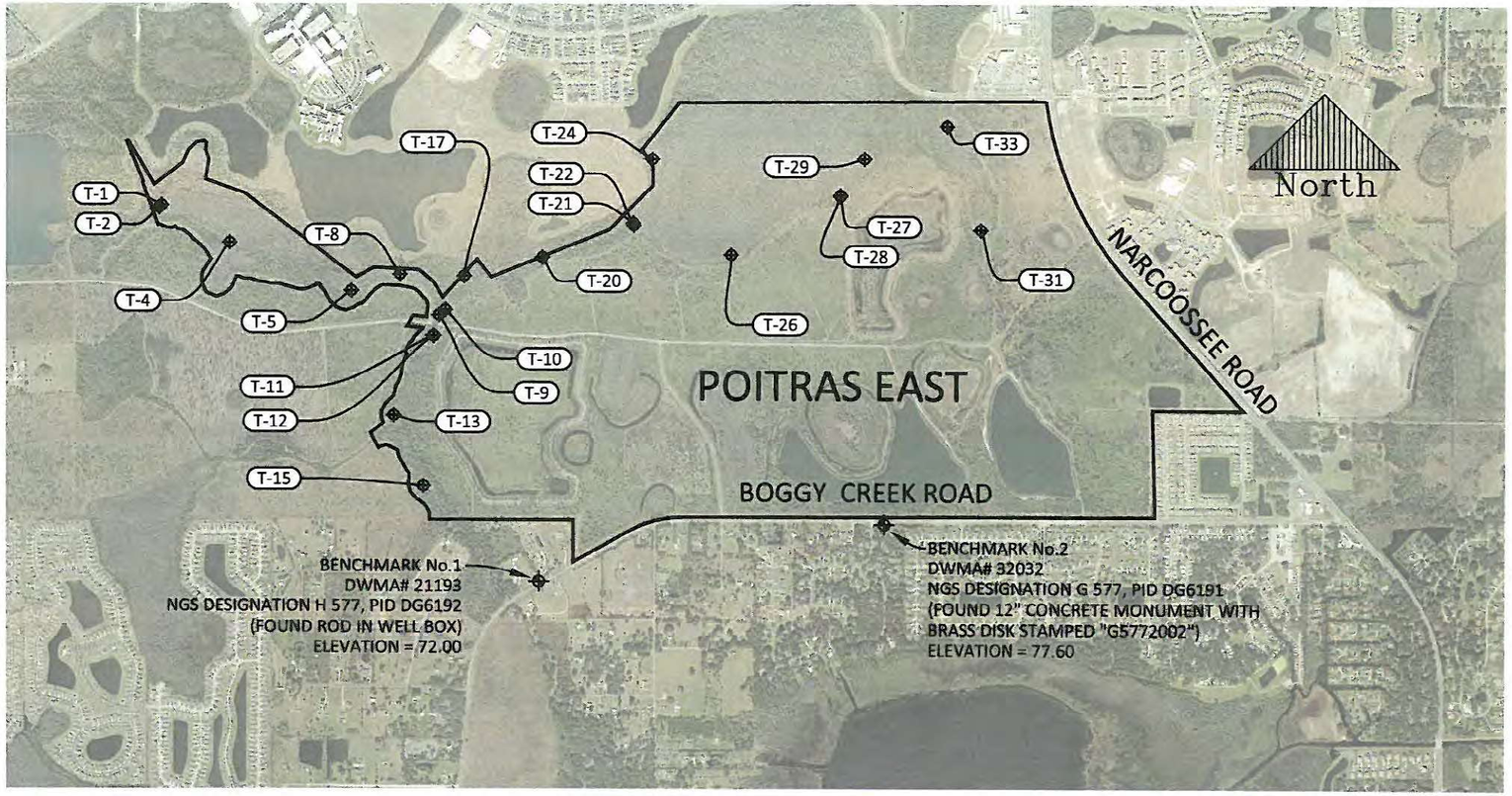
DONALD W. McINTOSH ASSOCIATES, INC.
CIVIL ENGINEERS · LAND PLANNERS · SURVEYORS
2200 PARK AVENUE NORTH, WINTER PARK, FL 32789
PHONE 407.644.4068 FAX 407.644.8318

SPECIFIC PURPOSE SURVEY



Poitras Hydro Nails

Hydro Nail	Surveyed Normal Pool Elevation	Surveyed SHWL Elevation	Existing Ground	Water Elevation	Field Date / (DWMA Book)
T-1	76.06	-	75.2	76.1	7/27/18 (1598/12)
T-2	-	76.87	75.4	76.1	7/27/18 (1598/12)
T-4	76.03	76.78	75.3	76.1	7/27/18 (1598/11)
T-5	75.89	76.86	75.0	76.1	7/26/18 (1598/8)
T-8	75.73	76.77	74.9	76.1	7/26/18 (1598/7)
T-9	-	75.61	73.6	75.3	7/23/18 (1597/3)
T-10	74.86	-	74.0	75.4	7/23/18 (1597/3)
T-11	-	75.46	73.8	75.0	7/23/18 (1598/2)
T-12	74.83	-	73.7	75.0	7/23/18 (1598/2)
T-13	71.81	72.39	71.0	72.2	7/23/18 (1598/3)
T-15	70.30	71.41	69.6	69.8	7/26/18 (1597/18)
T-17	75.15	76.22	74.1	75.5	7/23/18 (1597/4)
T-20	75.89	76.61	75.1	75.9	7/23/18 (1597/5)
T-21	-	77.85	76.1	77.1	7/24/18 (1597/8)
T-22	76.83	-	76.3	77.1	7/24/18 (1597/8)
T-24	76.90	77.84	75.8	77.1	7/26/18 (1597/19)
T-26	76.89	77.77	75.9	77.1	7/24/18 (1597/9)
T-27	-	77.83	75.9	77.1	7/24/18 (1597/10)
T-28	76.87	-	75.9	77.1	7/24/18 (1597/10)
T-29	76.88	77.79	76.4	77.1	7/25/18 (1597/13)
T-31	77.43	78.44	76.8	77.2	7/25/18 (1597/15)
T-33	77.11	77.77	76.8	77.3	7/25/18 (1597/14)

NOTE: THE HYDRO NAILS INCLUDED IN THE ABOVE TABLE ARE BASED ON DIRECTION FROM AECOM. (SEE SURVEYOR'S NOTES)

SURVEYOR'S NOTES:

1. This is not a boundary survey.
2. The purpose of this survey is to document the measured elevations on the Hydro Nails detailed and shown hereon. The Hydro Nails shown hereon were placed in the field by AECOM and the information on the table was reviewed and edited by AECOM. The locations of the Hydro Nails depicted hereon are approximate.
3. The features and linework shown hereon are relative to National Geodetic Survey control point "Lance" (PID AJ2445), Northing 1477081.39, Easting 575759.46 Florida State Plane Coordinate System, Florida East Zone, 1983 North American Datum, 2011 adjustment average combined factor: 0.99994883912 (1.00005116349757).
4. Elevations shown hereon are relative to NAVD88 datum based on NGS (National Geodetic Survey) Benchmark Designation H 577, PID DG6192, Elevation 72.00 (NAVD88), being a found rod with disk in well box stamped "H 577 2002" and NGS (National Geodetic Survey) Benchmark Designation G 577, PID DG6191, Elevation 77.60 (NAVD88), being a 12" concrete monument with brass disk stamped "G 577 2002".

2000' 0 2000'

Scale: 1" = 2000'

LEGEND

T-9 *HYDRO NAIL*

SHWL SEASONAL HIGH WATER LINE

PREPARED FOR: TAVISTOCK DEVELOPMENT COMPANY
POITRAS EAST – HYDRO NAIL SPECIFIC PURPOSE SURVEY

DONALD W. McINTOSH ASSOCIATES, INC.
ENGINEERS PLANNERS SURVEYORS
2200 PARK AVENUE NORTH, WINTER PARK, FLORIDA 32789 (407) 644-4068
CERTIFICATE OF AUTHORIZATION NO. LB68

DRAWN BY: PH	CHECKED BY: SG	JOB NO.	SCALE	SHEET 1
DATE: 8/2018	DATE: 8/2018	17137.001.03	1"=2000'	OF 1

Printed: Mon 27-Aug-2018 - 01:24PM
F:\Proj2017\17137\Sdwg\NAVD88\specific purpose\17-133(1) Hydro Nails (17137).dwg

SURVEY DATE: July 27, 2018

I hereby certify that this survey, subject to the surveyor's notes contained hereon, meets the applicable "Standards of Practice" set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J-17.05, Florida Administrative Code, pursuant to Section 472.027, Florida Statutes.

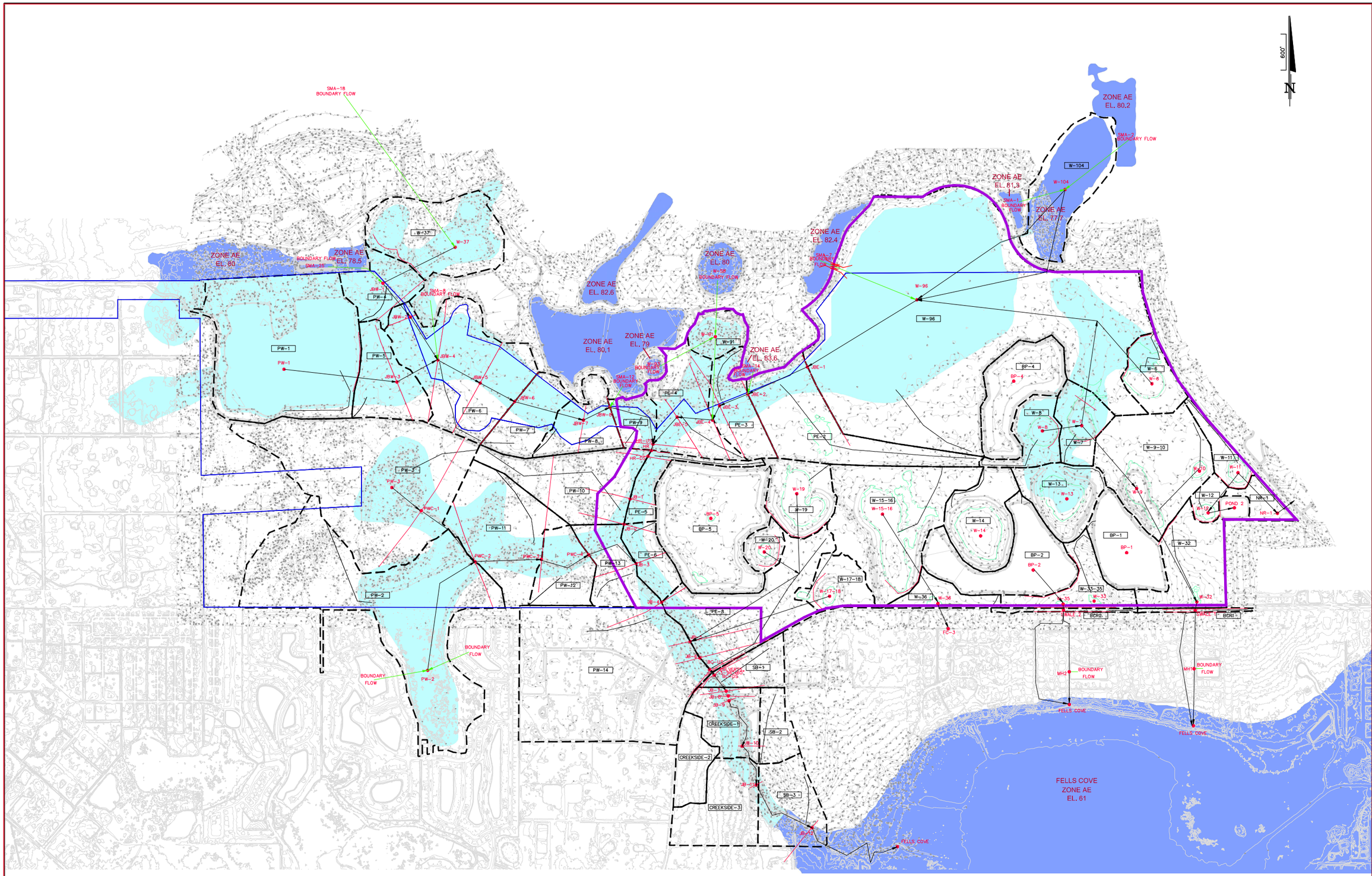
DONALD W. McINTOSH ASSOCIATES, INC.
CERTIFICATE OF AUTHORIZATION NO. 68

8/27/18
Signature Date

Scott Grossman
Florida Registered Surveyor and Mapper
Certificate No. 5048

NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.

CS# 17-133(1)



LEGEND

- POITRAS BOUNDARY
- MAPPING LIMITS
- EXISTING ZONE A
- EXISTING ZONE AE
- 70 TOPOGRAPHY
- WETLAND LINE
- PE-2 BASIN
- JB-1 NODE
- LINK
- CROSS SECTION/WEIR LOCATION
- TC PATH
- BOUNDARY FLOW

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DONALD W. McINTOSH ASSOCIATES, INC. ENGINEERING BUSINESS AUTHORIZATION NO. 68

DATE:

NO.	DATE	DESCRIPTION	CHK.
		REVISIONS	

DONALD W. McINTOSH ASSOCIATES, INC.
PLANNERS
ENGINEERS
SURVEYORS
2200 PARK AVENUE NORTH, WINTER PARK, FL 32789 407.644.4068

SCALE 1"=600'
JOB NUMBER 17137

CHECKED BY: STAFF
DATE: 12-14-2018

DESIGNED BY: STAFF
DRAWN BY: STAFF
DATE: 12-14-2018

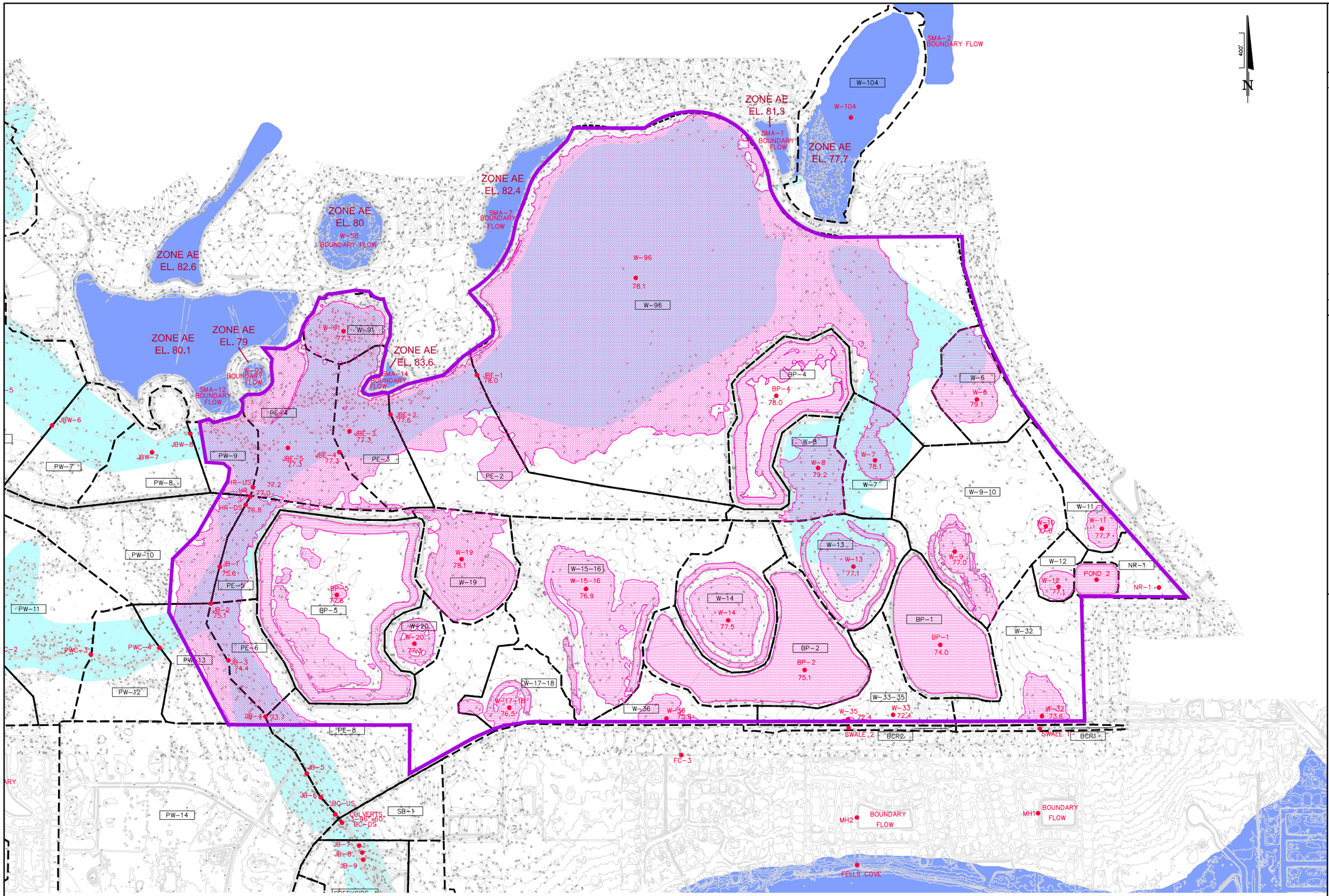
POITRAS EAST PD

CITY OF ORLANDO, FL

FEMA LOMR WORK MAP

DRAWING 17137-POITRAS FEMAWK

SHEET 1 OF 2



LEGEND

- MAPPING LIMITS
- EXISTING ZONE A
- EXISTING ZONE AE
- PROPOSED ZONE AE
- PE-2 BASIN
- JB-1 NODE
- 70 TOPOGRAPHY

F:\Proj2017\17137\EDWG\Exhibits\17137-POITRAS-FEMAWK.dwg

DONALD W. McINTOSH ASSOCIATES, INC.
ENGINEERING BUSINESS NO. 68
AUTHORIZATION NO. 68
DATE:

NO.	DATE	DESCRIPTION	CHK.
		REVISIONS	

DONALD W. McINTOSH ASSOCIATES, INC.
ENGINEERS PLANNERS SURVEYORS
2200 PARK AVENUE NORTH, WINTER PARK, FL 32789 407.644.4068

DRAWN BY: STAFF DATE: 12-14-2018
DESIGNED BY: STAFF DATE: 12-14-2018
CHECKED BY: STAFF DATE: 12-14-2018
SCALE 1"=400'
JOB NUMBER 17137

POITRAS EAST PD
CITY OF ORLANDO, FL
FEMA LOMR WORK MAP

DRAWING 17137-POITRAS FEMAWK
SHEET 2 OF 2

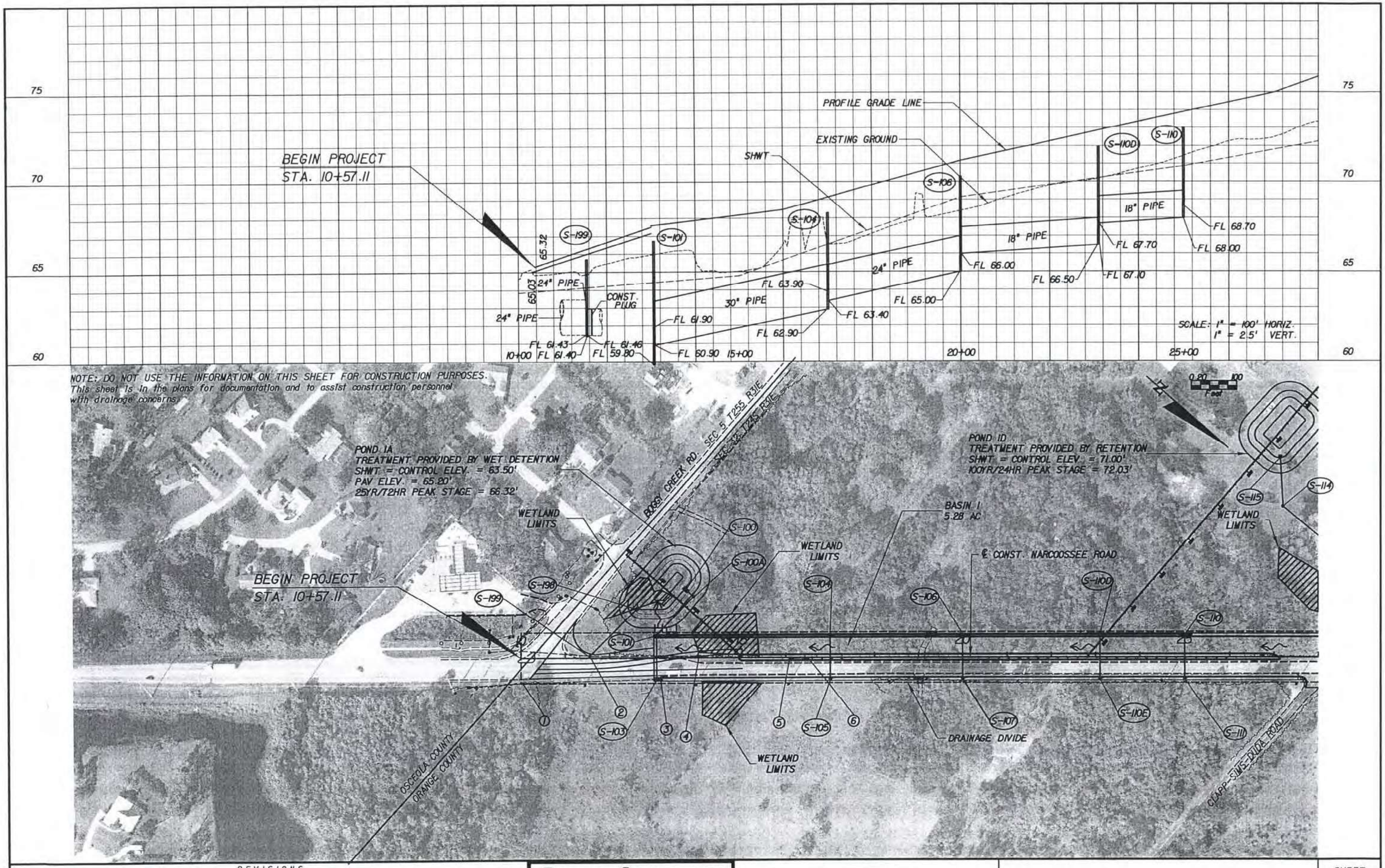
Poitras East PD - 100YR/24HR
NODE MAX

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
BCDS	POITRAS	100-24	19.85	67.03	74.00	-0.7000	0	19.86	1536.65	19.86	1536.65
BCUS	POITRAS	100-24	19.88	73.11	75.00	0.0057	116931	19.82	1504.08	19.88	1504.05
Box	FELLS COVE	100-24	14.09	68.15	73.37	0.0016	3262	14.07	33.49	14.12	33.51
BP-1	POITRAS	100-24	26.00	73.96	75.25	0.0001	1188835	12.00	123.03	0.00	0.00
BP-2	POITRAS	100-24	13.92	75.06	78.00	0.0000	1686180	12.00	153.78	13.92	28.56
BP-4	POITRAS	100-24	29.00	78.01	81.00	0.0001	826608	13.00	68.78	0.00	0.00
BP-5	POITRAS	100-24	25.00	77.59	78.50	0.0005	1602428	12.00	350.65	0.00	0.00
FC-3	POITRAS	100-24	0.00	70.75	70.76	0.0000	145	14.75	78.88	0.00	0.00
FELLS COVE	POITRAS	100-24	0.00	57.00	61.00	0.0000	663416	19.70	1834.03	0.00	0.00
HR	POITRAS	100-24	19.11	77.02	80.92	0.0002	31656	19.08	1025.55	19.09	1025.55
HRDS	POITRAS	100-24	19.14	76.77	77.00	0.0002	313533	19.09	1055.25	19.16	1055.23
HRUS	POITRAS	100-24	19.10	77.23	77.50	0.0004	773915	18.87	996.36	19.08	995.85
JB-1	POITRAS	100-24	19.29	75.59	75.84	0.0005	573363	18.94	1110.61	19.13	1109.92
JB-10	POITRAS	100-24	19.71	64.58	69.00	-0.5000	0	12.02	1983.74	12.02	1983.74
JB-11	POITRAS	100-24	19.71	64.58	69.00	-0.0018	279301	12.02	2032.80	19.78	1701.24
JB-12	POITRAS	100-24	19.88	61.82	64.00	0.0005	771189	19.75	1735.67	19.88	1735.51
JB-2	POITRAS	100-24	19.45	75.13	77.00	0.0002	436458	19.13	1139.62	19.27	1138.94
JB-3	POITRAS	100-24	19.76	74.41	77.00	0.0002	721211	19.45	1325.95	19.67	1324.90
JB-4	POITRAS	100-24	19.88	73.65	78.00	-0.0002	566141	19.67	1354.60	19.86	1354.09
JB-5	POITRAS	100-24	19.88	73.26	76.00	0.0021	462659	19.79	1396.43	20.00	1396.47
JB-6	POITRAS	100-24	19.87	73.16	76.00	-0.0030	233633	19.70	1474.65	19.82	1474.38
JB-7	POITRAS	100-24	19.85	67.02	74.00	-0.4000	0	19.86	1566.35	19.86	1566.35

Poitras East PD - 100YR/24HR
NODE MAX

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
POND D	CREEKSIDE	100-24	12.68	71.89	74.00	0.0003	126789	12.00	87.56	12.68	39.86
PW-1	POITRAS	100-24	19.09	77.55	77.75	0.0000	3545562	15.00	105.36	29.15	81.08
PW-2	POITRAS	100-24	20.24	77.67	78.10	0.0000	4054180	14.00	247.38	19.71	99.20
PW-3	POITRAS	100-24	20.11	77.68	78.10	0.0001	2056452	13.00	200.35	15.07	107.26
PWC-1	POITRAS	100-24	20.24	77.66	79.00	0.0100	354777	15.07	107.26	14.81	113.32
PWC-2	POITRAS	100-24	20.25	77.66	78.10	0.0000	1259738	19.33	130.05	20.46	128.78
PWC-3	POITRAS	100-24	20.20	77.62	78.00	0.0001	643091	19.73	148.53	20.19	148.10
PWC-4	POITRAS	100-24	20.16	75.92	76.60	0.0001	316956	20.06	152.21	20.28	152.22
Swale 1	FELLS COVE	100-24	19.65	72.03	76.00	0.0015	4848	19.57	31.90	19.55	31.89
Swale 2	FELLS COVE	100-24	12.18	71.51	75.00	-0.0039	3917	12.00	0.45	0.00	0.00
W-104	LAKE NONA	100-24	15.57	78.83	79.00	0.0000	2113730	13.00	266.09	15.50	177.45
W-11	POITRAS	100-24	22.44	77.71	78.00	0.0001	157230	14.00	11.99	22.44	2.51
W-12	POITRAS	100-24	14.31	77.05	78.00	0.0001	103000	12.00	13.31	14.31	5.34
W-13	POITRAS	100-24	30.00	77.09	78.00	0.0000	551275	13.00	41.37	0.00	0.00
W-14	POITRAS	100-24	29.00	77.49	78.50	0.0000	766562	13.00	65.43	0.00	0.00
W-15-16	POITRAS	100-24	13.76	76.91	78.00	0.0000	1247203	13.00	123.44	13.76	84.55
W-17-18	POITRAS	100-24	13.48	76.49	77.00	0.0000	171203	13.00	25.66	13.48	21.15
W-19	POITRAS	100-24	13.78	78.10	78.50	0.0000	690100	12.00	51.05	13.78	31.37
W-20	POITRAS	100-24	20.37	77.32	78.00	0.0002	150212	12.00	30.83	20.37	1.38
W-32	POITRAS	100-24	19.65	73.62	76.50	-0.0005	241023	16.35	47.99	19.64	31.46
W-33-35	POITRAS	100-24	14.07	72.37	75.00	-0.0076	15226	13.90	34.37	14.07	33.49
W-36	POITRAS	100-24	14.75	75.92	77.00	-0.0100	149404	13.68	97.49	14.75	78.88

Application No. 070322-11: Narcoossee Road (CR 15) Widening



REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

BOWYER-SINGLETON & ASSOCIATES, INCORPORATED
520 S. MAGNOLIA AVENUE · ORLANDO, FLORIDA 32801
FBPR CERTIFICATE OF AUTHORIZATION NO. 1221
ENGINEER OF RECORD, BARRY J. SWITZER P.E. NO. 43422

Orange County

NARCOOSSEE ROAD DRAINAGE MAP

SHEET NO. 4

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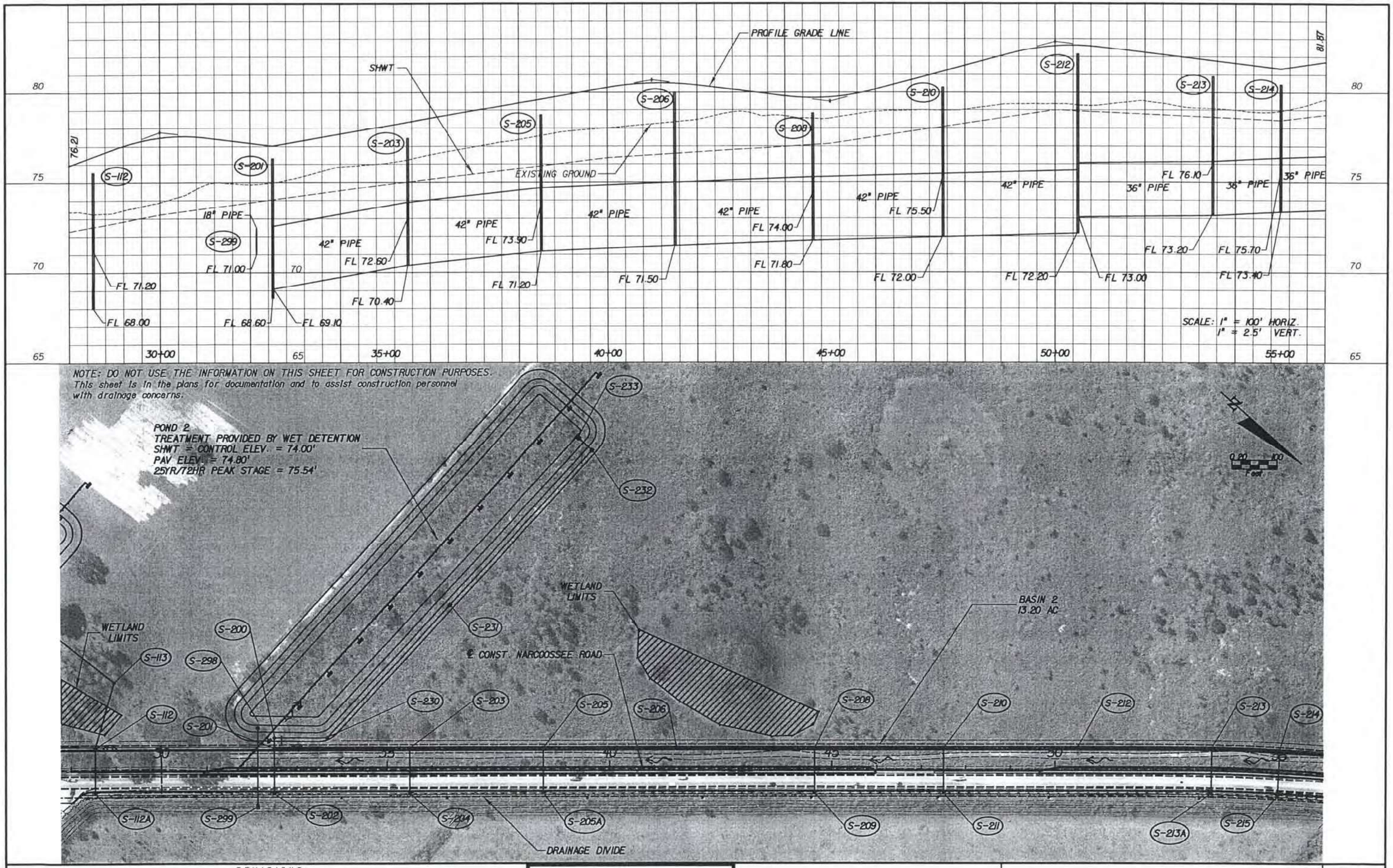

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

BOWYER-SINGLETON & ASSOCIATES, INCORPORATED
520 S. MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
FBPR CERTIFICATE OF AUTHORIZATION NO. 1221
ENGINEER OF RECORD, BARRY J. SWITZER P.E. NO. 43422

Orange County

NARCOOSSEE ROAD DRAINAGE MAP

SHEET NO. 5

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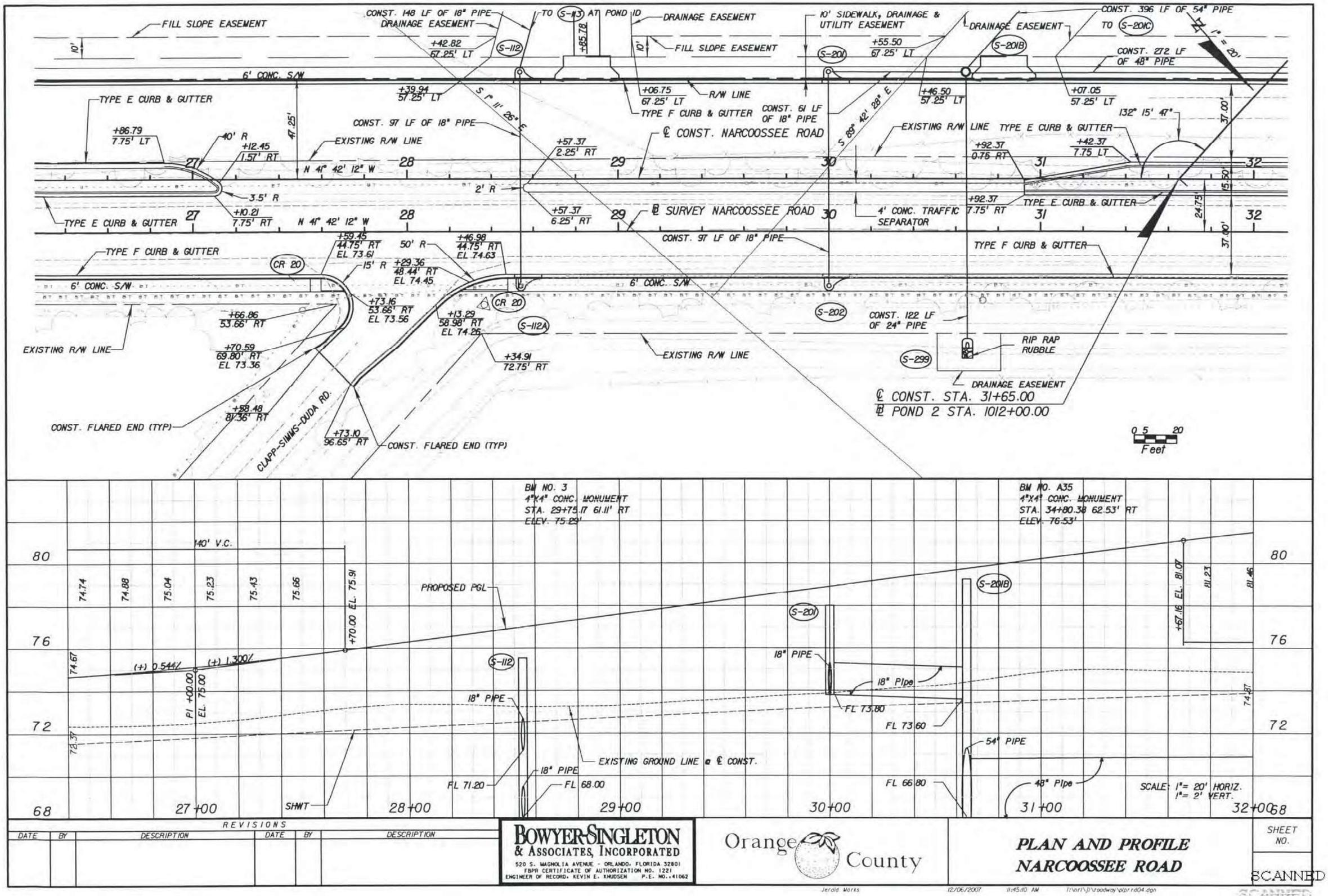

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

BOWYER-SINGLETON & ASSOCIATES, INCORPORATED
520 S. MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
FBPR CERTIFICATE OF AUTHORIZATION NO. 1221
ENGINEER OF RECORD: KEVIN E. KNUDSEN P.E. NO.: 41062

Orange County

PLAN AND PROFILE
NARCOOSSEE ROAD

SHEET NO.

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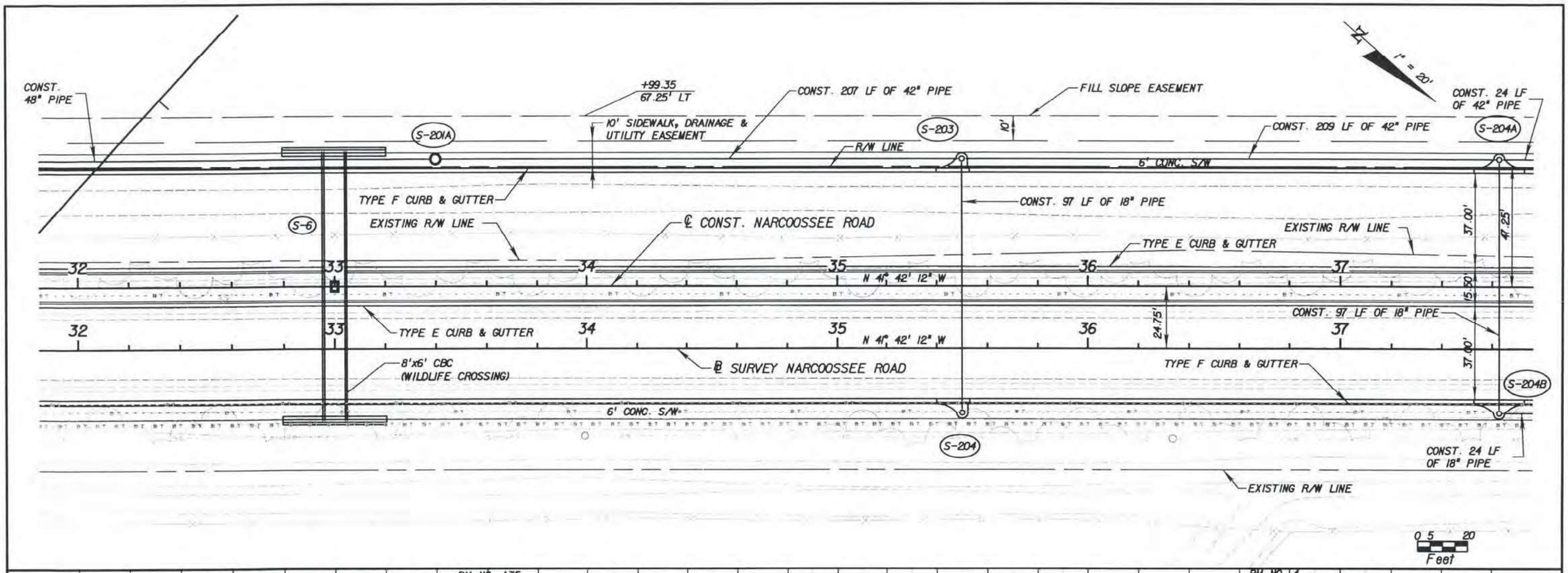
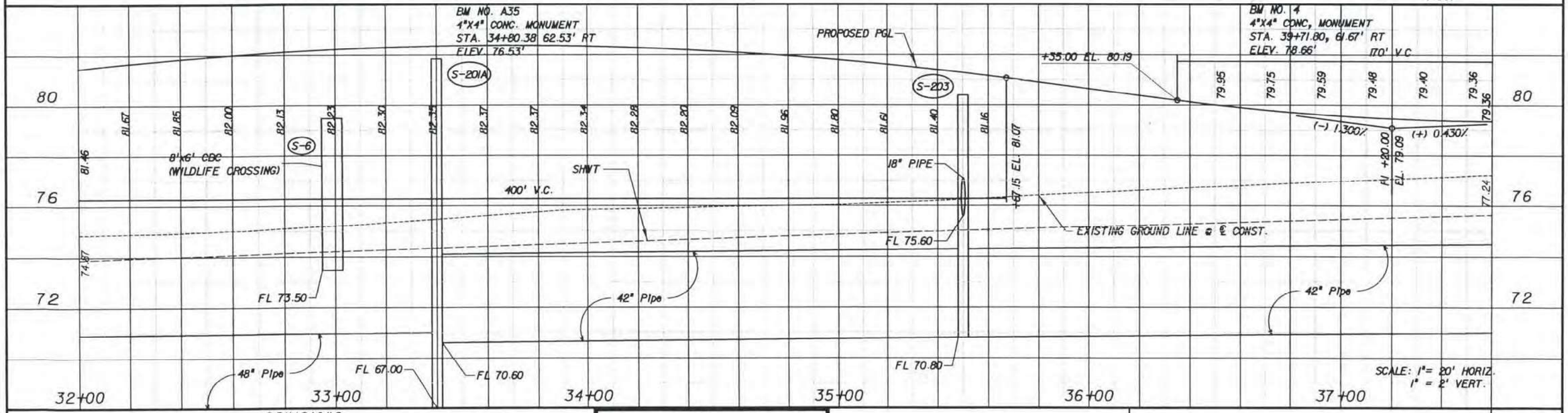
SCANNED





REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
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BOWYER-SINGLETON & ASSOCIATES, INCORPORATED
520 S. MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
FBPR CERTIFICATE OF AUTHORIZATION NO. 1221
ENGINEER OF RECORD: KEVIN E. KNUDSEN P.E. NO.:41062

Orange County

PLAN AND PROFILE
NARCOOSSEE ROAD

SHEET NO.

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BOWYER SINGLETON & ASSOCIATES, INCORPORATED
ENGINEERING - PLANNING - SURVEYING - ENVIRONMENTAL

(407) 843-5120 www.bsacorporate.com

Primary Conservation Network of SE Orange County, Florida

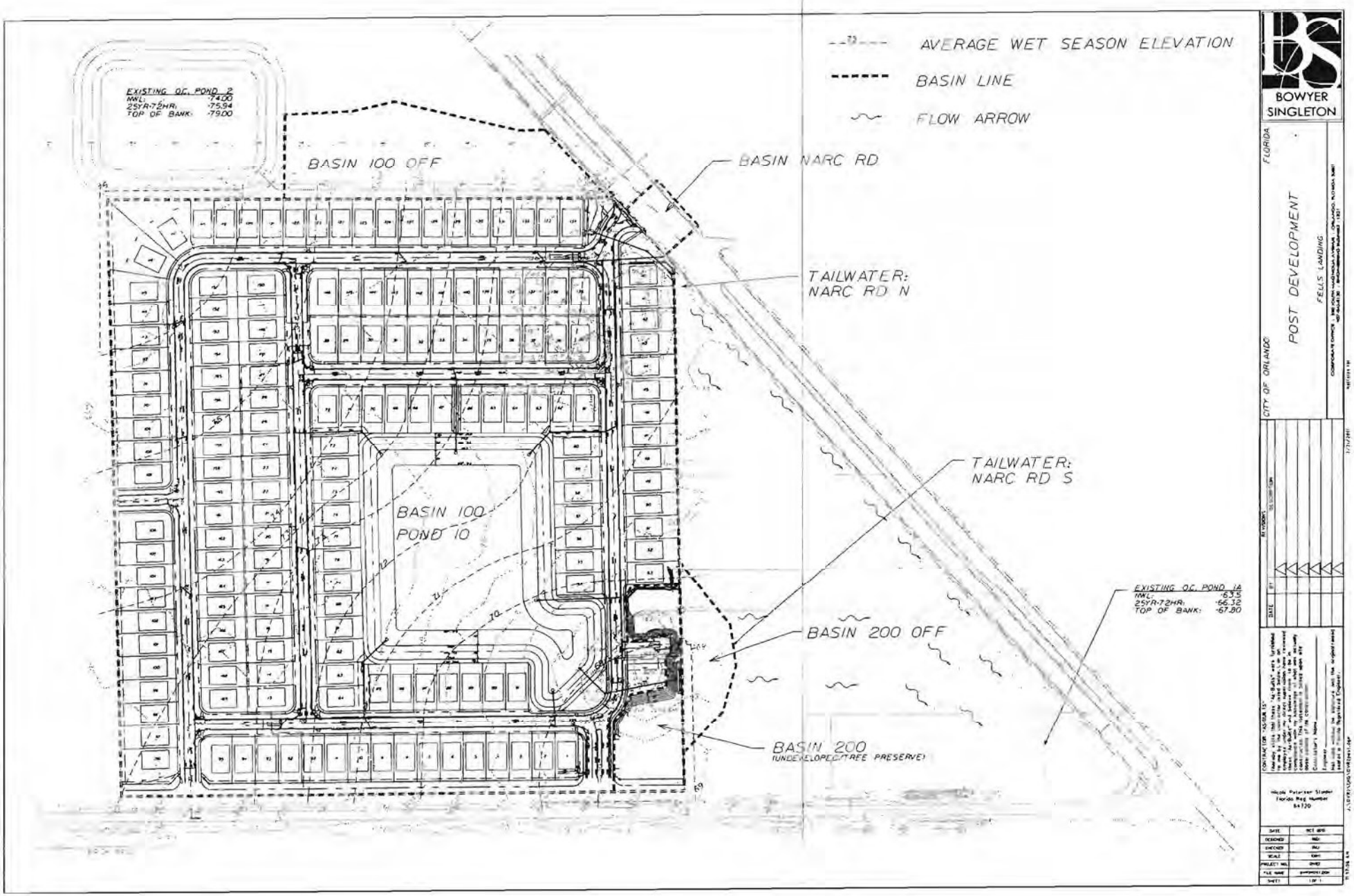
APP# 070322-11
ADDITIONAL INFORMATION
SEP 21 2007
ORLANDO SERVICE CENTER

N
0 3,000 6,000
Feet

Data Source: Aerial ... FNAI
Orange County GIS (FNAI)

SCANNED

ERP Application No. 071023-23: Fells Landing



ERP Application No. 141208-2: Clapps Simms Duda Road

CONSTRUCTION PLANS

ORANGE COUNTY, FLORIDA

CLAPP SIMMS DUDA ROAD UTILITY & ROAD IMPROVEMENTS

SEPTEMBER 2014

ENGINEER/SURVEY/ENVIRONMENTAL

DEWBERRY/BOWYER-SINGLETON
520 SOUTH MAGNOLIA AVE.
ORLANDO, FLORIDA 32801
PHONE: (407) 843-5120
CONTACT: SCOTT STEARNS, P.E.

GEOTECHNICAL ENGINEER

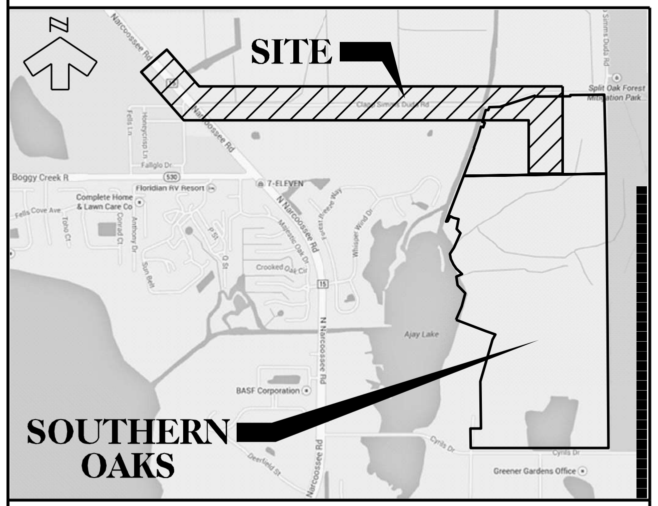
UNIVERSAL ENGINEERING SCIENCES, INC.
3532 MAGGIE BOULEVARD
ORLANDO, FLORIDA 32811
PHONE: (407) 423-0504
CONTACT: ANDREW WILDEROTTER P.E.

TRAFFIC ENGINEER

LUKE TRANSPORTATION ENGINEERING CONSULTANTS, INC.
29 EAST PINE STREET
ORLANDO, FLORIDA 32828
PHONE: (407) 423-8055
CONTACT: J. ANTHONY LUKE, P.E.

TABLE OF CONTENTS

THIS IS TO CERTIFY THAT THE ROADWAY CONSTRUCTION PLANS AND SPECIFICATIONS AS CONTAINED HEREIN WERE DESIGNED TO APPLICABLE STANDARDS AS SET FORTH IN THE "MANUAL OF UNIFORM MINIMUM STANDARDS FOR DESIGN, CONSTRUCTION AND MAINTENANCE FOR STREETS AND HIGHWAYS" AS PREPARED BY FLORIDA DEPARTMENT OF TRANSPORTATION.



SITE LOCATION

PREPARED FOR

STANDARD PACIFIC HOMES

558 WEST NEW ENGLAND AVENUE, SUITE 250
WINTER PARK, FLORIDA 32789

BOWYER SINGLETON
LAND DEVELOPMENT & TRANSPORTATION ENGINEERING
PLANNING | SURVEYING & MAPPING
BSA-CIVIL.COM

ORANGE COUNTY FLORIDA
CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS
CONSTRUCTION PLANS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

halfsize.tbl

DATE	BY	REVISIONS DESCRIPTION

10/2/2014

CONTRACTOR "AS-BUILTS"
I hereby state that these "As-Builts" were furnished to me by the contractor listed below. I, or an employee under my direct supervision have reviewed these "As-Builts" and believe them to be in compliance with my knowledge of what was actually constructed. This statement is based upon site observations of the construction.
Contractor's Name ________
Engineer ________
Not valid without the signature and the original seal of a Florida Registered Engineer.

Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	N/A
PROJECT NO.	AJAY-1/FINAL/CSD RD
FILE NAME	AJAY1 CSD Cover
SHEET	1 OF 32

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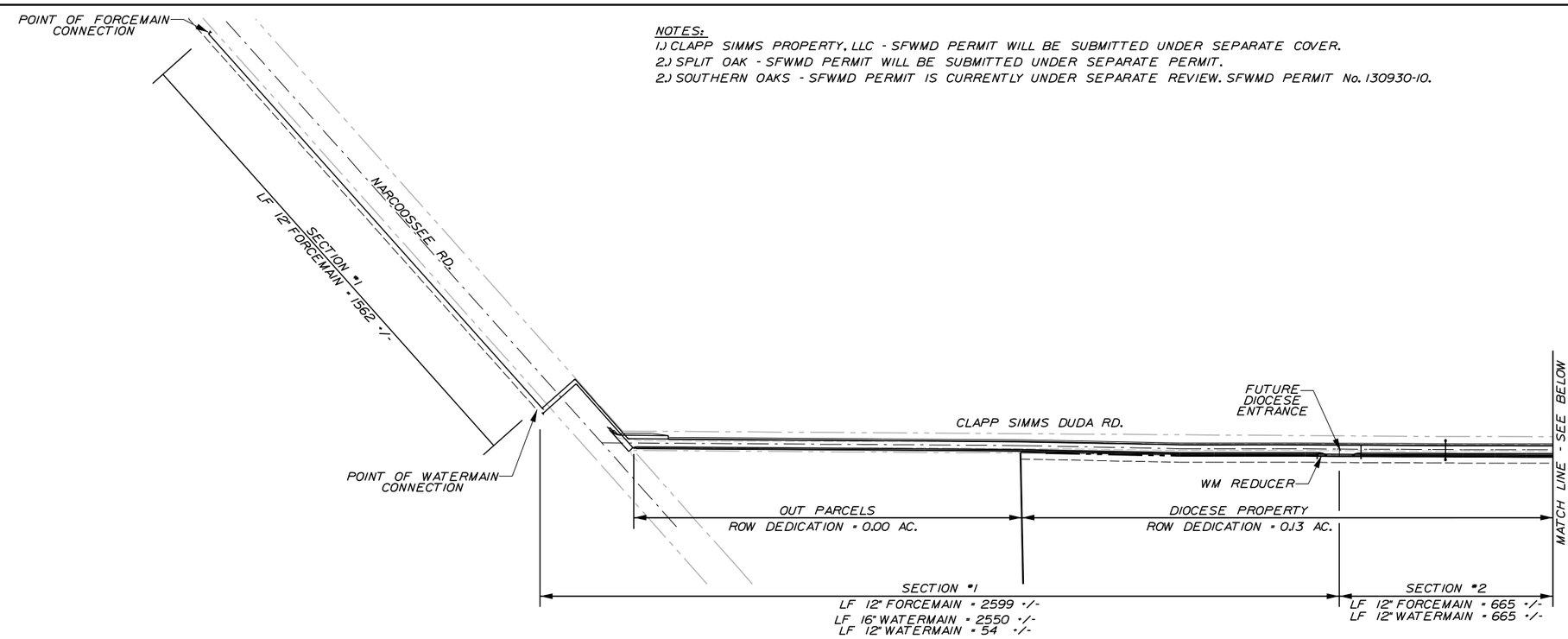
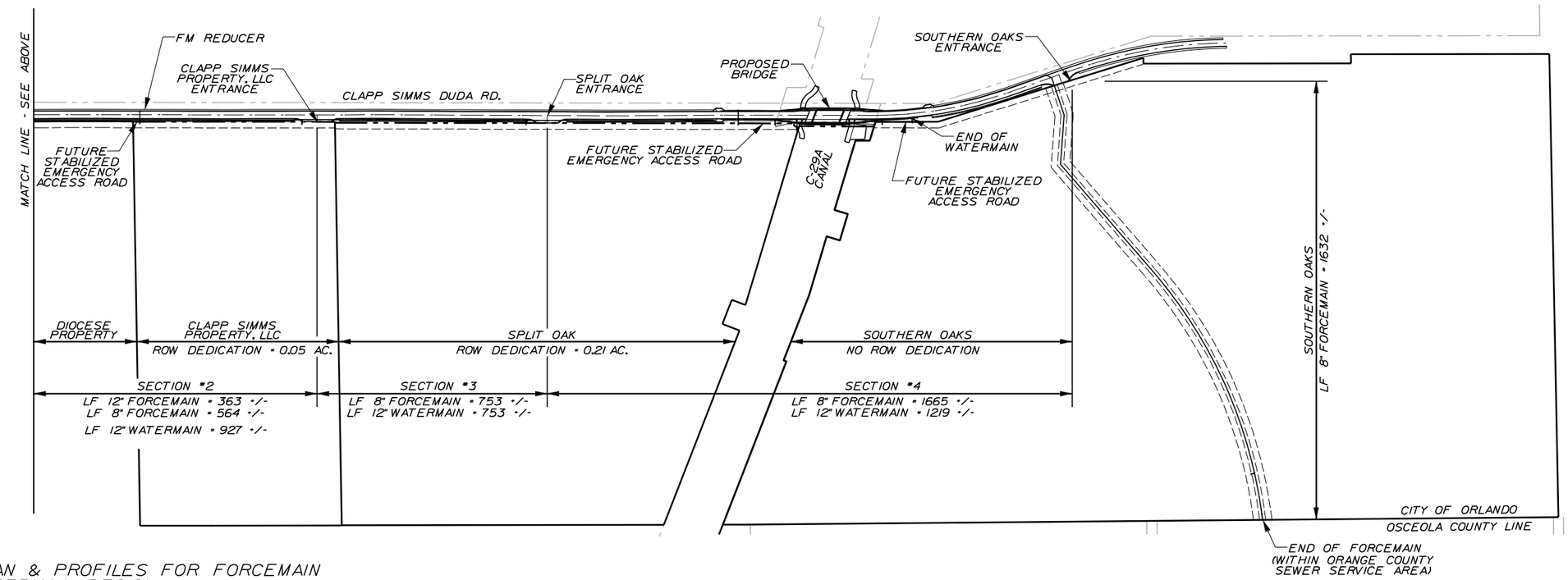


NOTES:
1.) CLAPP SIMMS PROPERTY, LLC - SFWMD PERMIT WILL BE SUBMITTED UNDER SEPARATE COVER.
2.) SPLIT OAK - SFWMD PERMIT WILL BE SUBMITTED UNDER SEPARATE PERMIT.
2.) SOUTHERN OAKS - SFWMD PERMIT IS CURRENTLY UNDER SEPARATE REVIEW. SFWMD PERMIT No. 130930-10.



NOTE:
SEE PLAN & PROFILES FOR FORCEMAIN AND WATERMAIN DESIGN.

BOWYER SINGLETON

FLORIDA
ORANGE COUNTY

OVERALL SITE / UTILITY PLAN

CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

REVISIONS

DATE	BY	DESCRIPTION

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Contractor's Name _____
Engineer _____

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Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1" = 200'
PROJECT NO.	AJAY1/FINAL/CSD RD
FILE NAME	AJAY1 CSD OverallSite
SHEET	4 OF 32

10/2/2014
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NOTES:

1.) CONTRACTOR TO MAINTAIN 3' OF COVER OVER PROPOSED WATER MAIN & FORCE MAIN.

2.) ALL POWER POLES AND DRY UTILITIES TO RELOCATED BY OTHERS.

3.) SEASONAL HIGH PER UNIVERSAL ENGINEERING SCIENCES, INC. REPORT NO. 1120402.

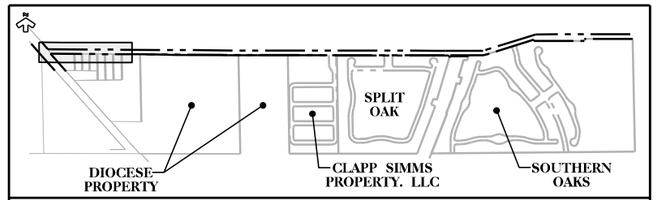
4.) MUCK TO BE REMOVED PER UNIVERSAL ENGINEERING SCIENCES, INC. REPORT NO. 1120402.

5.) SEE SHEET No's 28-29 FOR TYPICAL SECTIONS.

6.) SEE CROSS-SECTION SHEETS 19-27 FOR ESTIMATE AREAS OF MUCK REMOVAL. QUANTITY OF MUCK REMOVAL MAY VARY BASED ON CONDITIONS ENCOUNTERED. SEE REMOVAL OF ORGANIC MATERIAL DETAIL ON SHEET No. 29.

N

0 50' 100'



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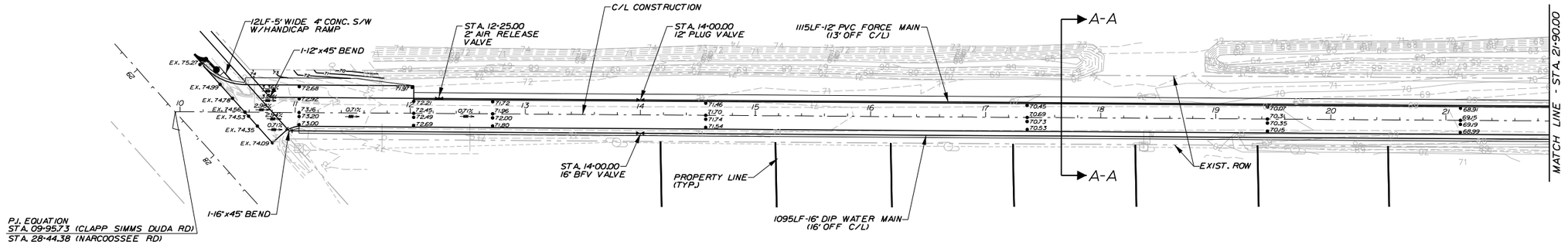
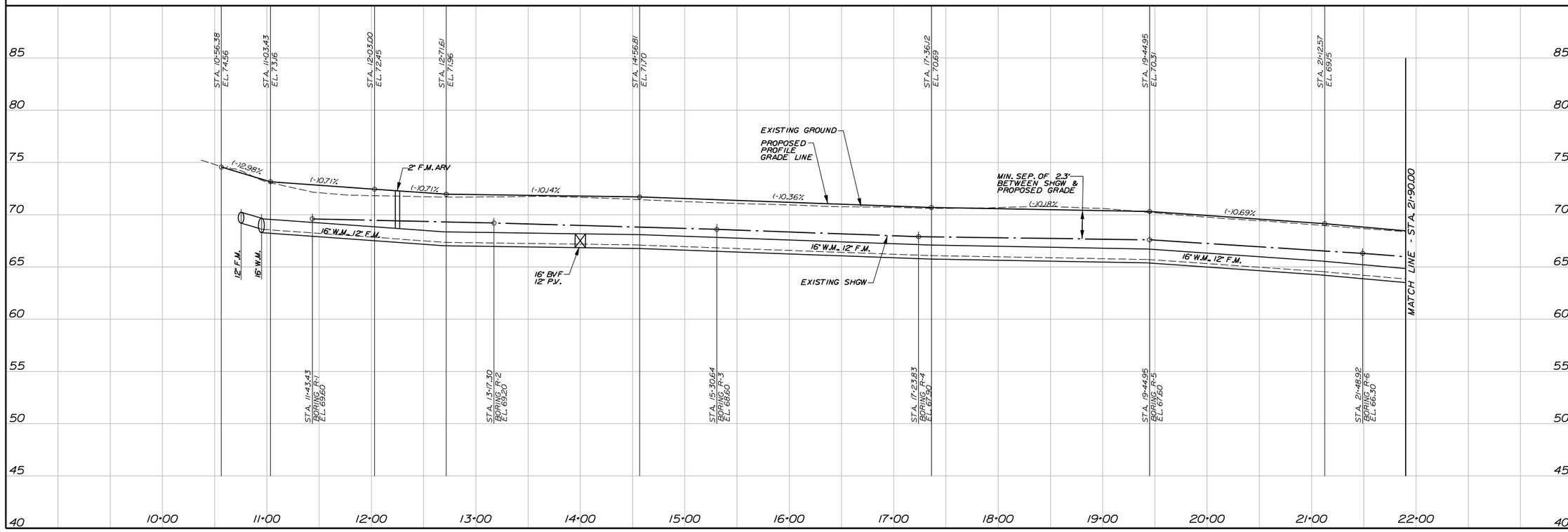


CLAPP SIMMS DUDA ROAD



BOWYER SINGLETON

FLORIDA

ORANGE COUNTY

PLAN & PROFILE
CLAPP SIMS DUDA
CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

REVISIONS		
DESCRIPTION	BY	DATE

CONTRACTOR "AS-BUILTS"

I hereby state that these "As-Builts" were furnished to me by the contractor listed below or one of his employees under my direct supervision have reviewed these "As-Builts" and believe them to be in compliance with my knowledge of what was actually constructed. This statement is based upon site observations of the construction.

Contractor's Name _____

Engineer _____

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Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1" = 50' HORIZONTAL 1" = 5' VERTICAL
PROJECT NO.	AJAY1/FINAL/CSD RD
FILE NAME	AJAY1 CSD PlanProfile-01
SHEET	7 OF 32

10/22/2014

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NOTES:

1.) CONTRACTOR TO MAINTAIN 3' OF COVER OVER PROPOSED WATER MAIN & FORCE MAIN.

2.) ALL POWER POLES AND DRY UTILITIES TO RELOCATED BY OTHERS.

3.) SEASONAL HIGH PER UNIVERSAL ENGINEERING SCIENCES, INC. REPORT NO. 1120402.

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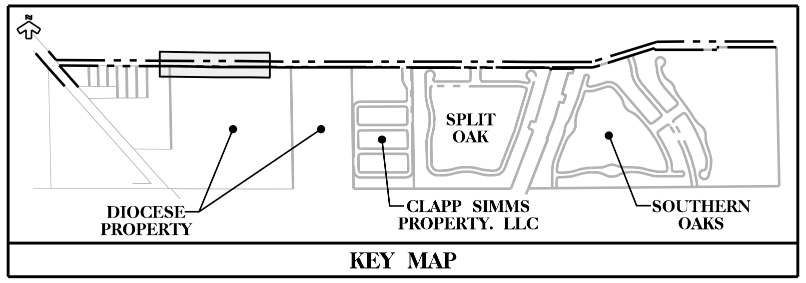
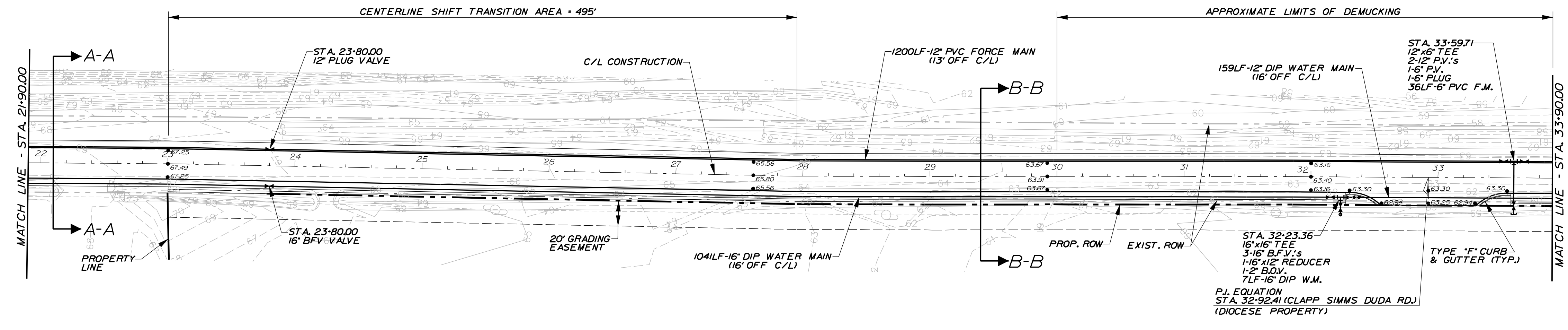
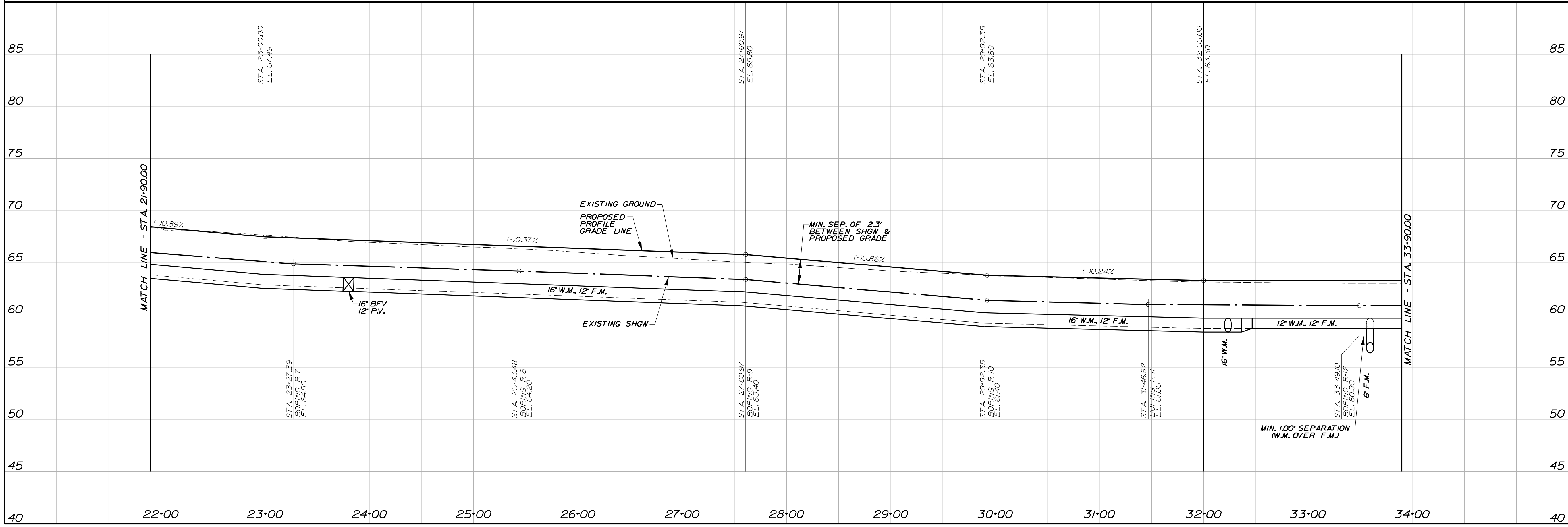




CLAPP SIMMS DUDA ROAD



BOWYER SINGLETON

ORANGE COUNTY FLORIDA

PLAN & PROFILE CLAPP SIMMS DUDA

CLAPP SIMMS DUDA ROAD UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 • ENGINEERING BUSINESS • 1221

REVISIONS		
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Engineer ____

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Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1" = 50' HORIZONTAL 1" = 5' VERTICAL
PROJECT NO.	AJAY1/FINAL/CSD RD
FILE NAME	AJAY1 CSD PlanProfile-02
SHEET	8 OF 32

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NOTES:

1.) CONTRACTOR TO MAINTAIN 3' OF COVER OVER PROPOSED WATER MAIN & FORCE MAIN.

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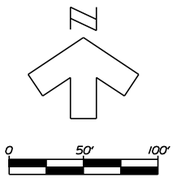

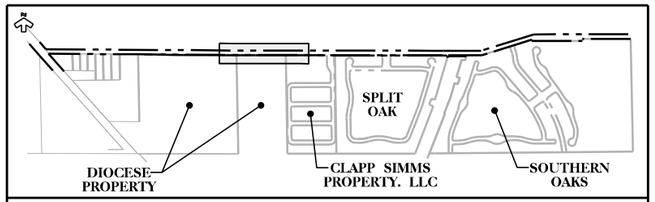

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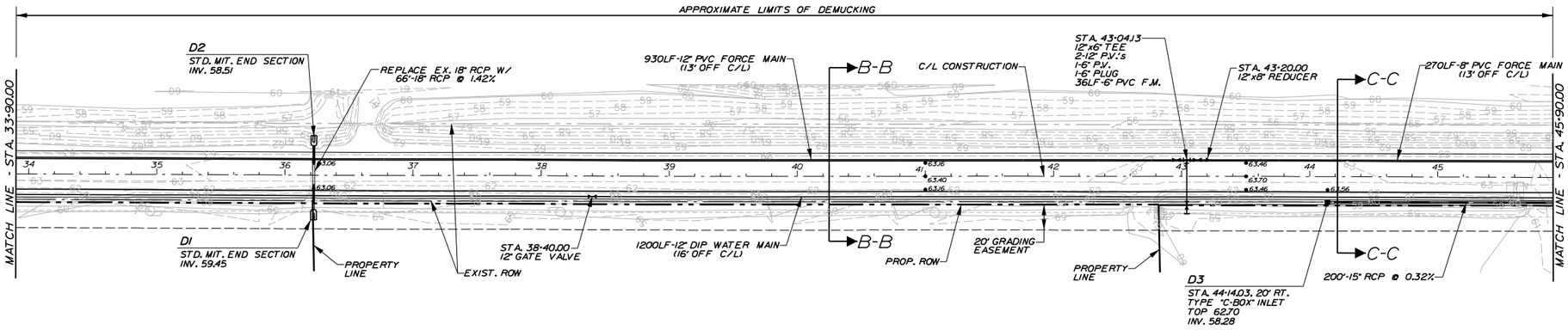
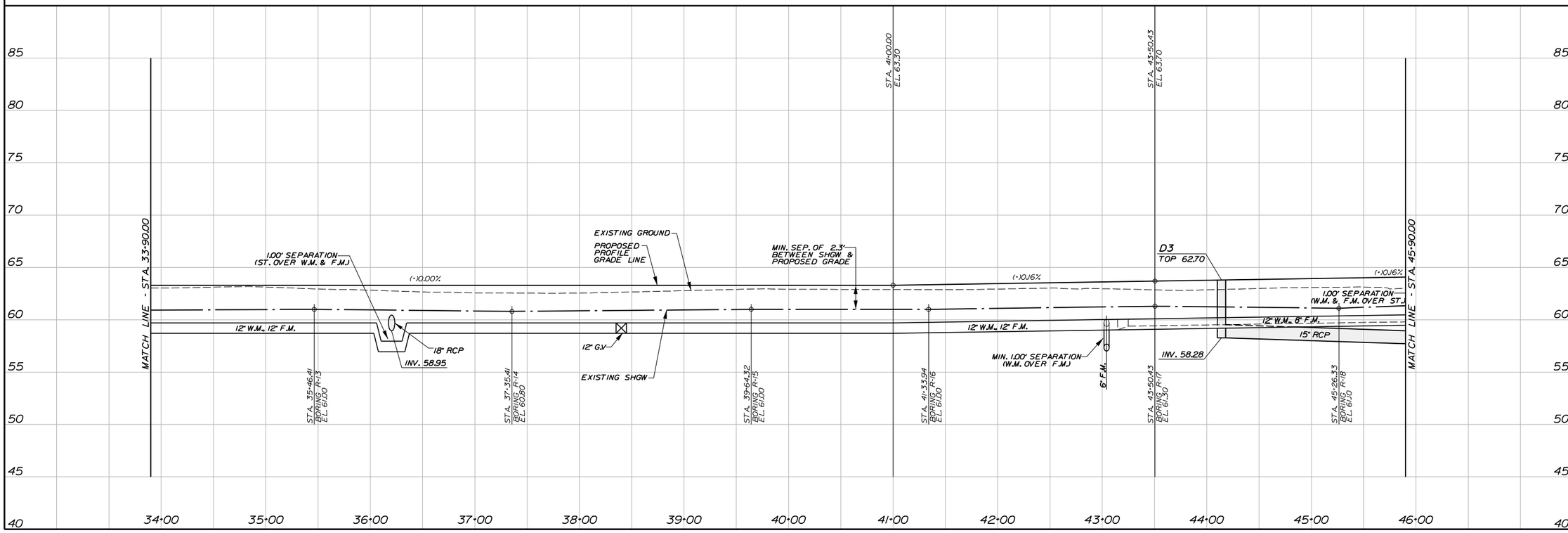


CLAPP SIMMS DUDA ROAD



BOWYER SINGLETON

FLORIDA

ORANGE COUNTY

PLAN & PROFILE
CLAPP SIMS DUDA
CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

REVISIONS		
DATE	BY	DESCRIPTION

CONTRACTOR "AS-BUILTS"
I hereby state that these "As-Builts" were furnished to me by the contractor and/or his representative employed under my direct supervision have reviewed these "As-Builts" and believe them to be in compliance with my knowledge of what was actually constructed. This is based upon site observations of the construction.

Contractor's Name _____

Engineer _____

Not valid without the signature and the original seal of a Florida Registered Engineer.

Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1" = 50' HORIZONTAL 1" = 5' VERTICAL
PROJECT NO.	AJAY1/FINAL/CSD RD
FILE NAME	AJAY1 CSD PlanProfile-03
SHEET	9 OF 32

10/22/2014

...\AJAY1 CSD PlanProfile-CSD 03.dgn

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NOTES:

1.) CONTRACTOR TO MAINTAIN 3' OF COVER OVER PROPOSED WATER MAIN & FORCE MAIN.

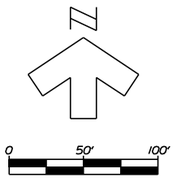
2.) ALL POWER POLES AND DRY UTILITIES TO RELOCATED BY OTHERS.

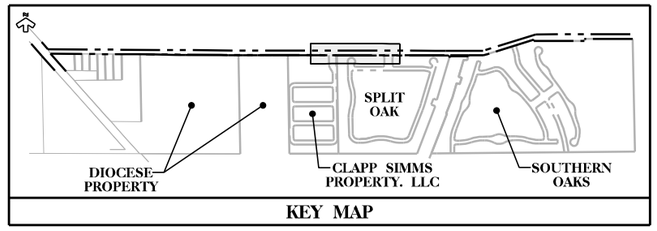
3.) SEASONAL HIGH PER UNIVERSAL ENGINEERING SCIENCES, INC. REPORT NO. 1120402.

4.) MUCK TO BE REMOVED PER UNIVERSAL ENGINEERING SCIENCES, INC. REPORT NO. 1120402.

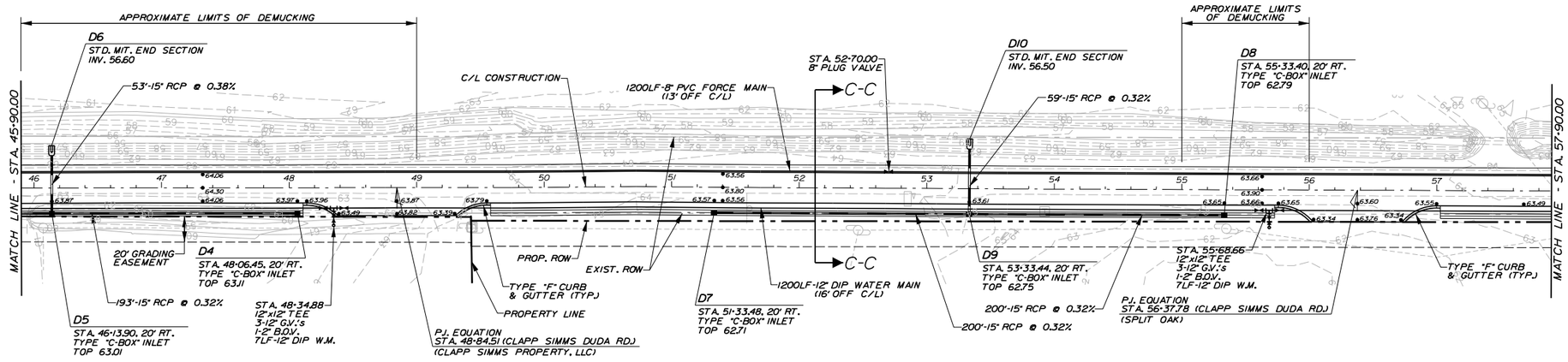
5.) SEE SHEET No's 28-29 FOR TYPICAL SECTIONS.

6.) SEE CROSS-SECTION SHEETS 19-27 FOR ESTIMATE AREAS OF MUCK REMOVAL. QUANTITY OF MUCK REMOVAL MAY VARY BASED ON CONDITIONS ENCOUNTERED. SEE REMOVAL OF ORGANIC MATERIAL DETAIL ON SHEET No. 29.

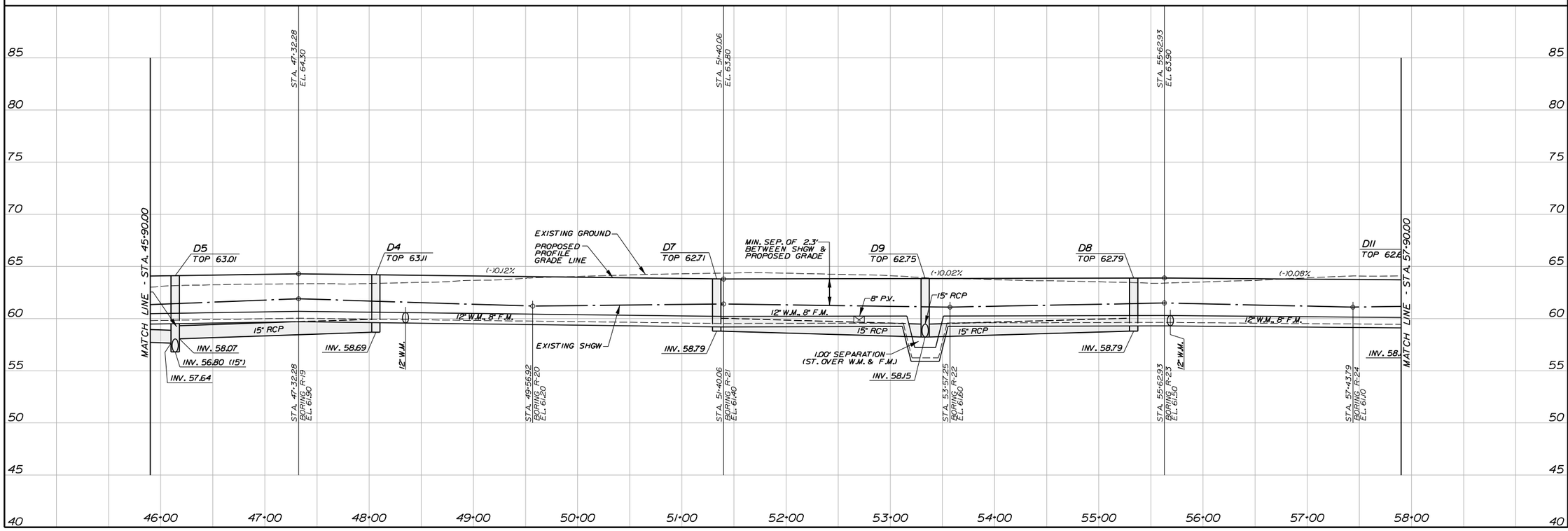




KEY MAP



CLAPP SIMMS DUDA ROAD



BOWYER SINGLETON

FLORIDA

ORANGE COUNTY

PLAN & PROFILE
CLAPP SIMS DUDA
CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

REVISIONS

DATE	BY	DESCRIPTION

CONTRACTOR "AS-BUILTS"
I hereby state that these "As-Builts" were furnished by the contractor and that field changes noted by his employee under my direct supervision have reviewed these "As-Builts" and believe them to be in compliance with my knowledge of what was actually constructed. This statement is based upon site observations of the construction.

Contractor's Name _____

Engineer _____

Not valid without the signature and the original seal of a Florida Registered Engineer.

Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1" = 50' HORIZONTAL 1" = 5' VERTICAL
PROJECT NO.	AJAY1/FINAL/CSD RD
FILE NAME	AJAY1 CSD PlanProfile-04
SHEET	10 OF 32

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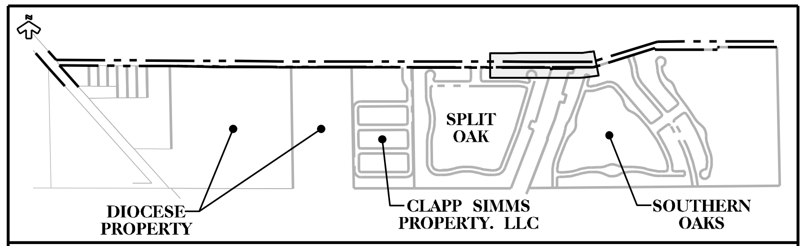
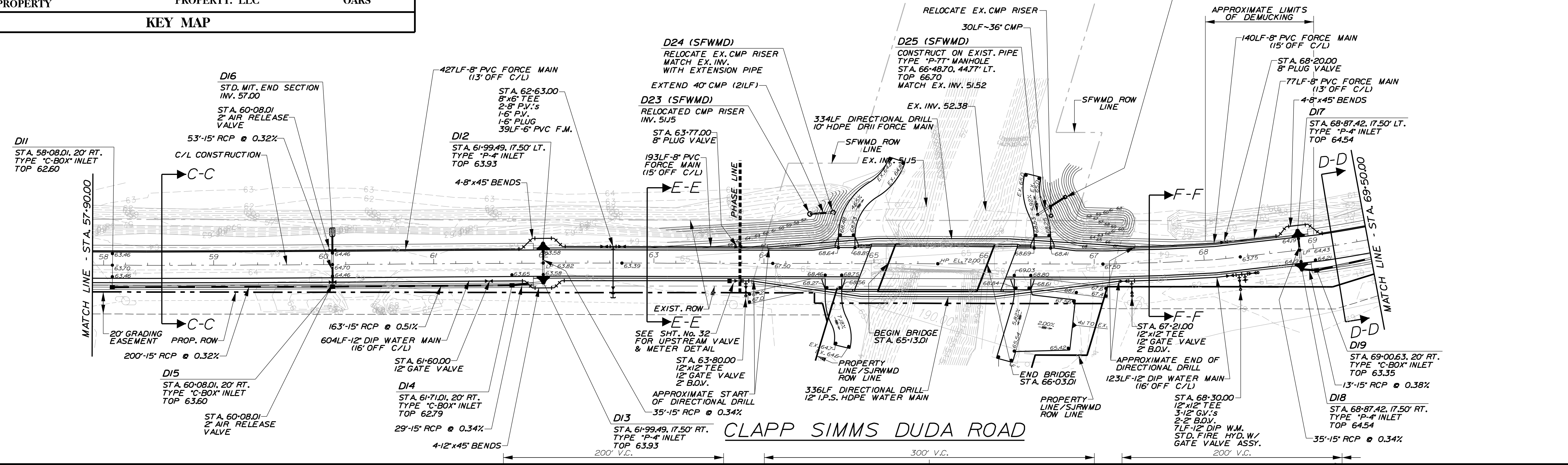
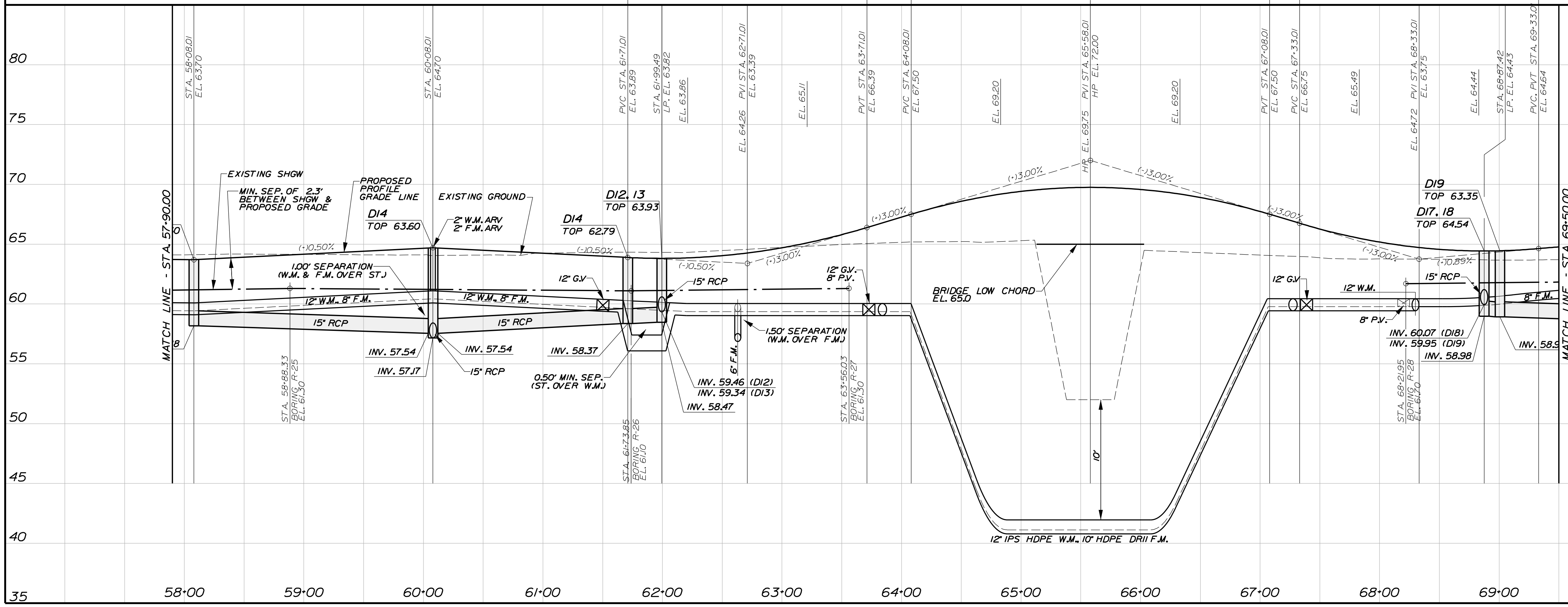


KEY MAP

NOTES:

1.) CONTRACTOR TO MAINTAIN 3' OF COVER OVER PROPOSED WATER MAIN & FORCE MAIN.
2.) ALL POWER POLES AND DRY UTILITIES TO RELOCATED BY OTHERS.
3.) SEASONAL HIGH PER UNIVERSAL ENGINEERING SCIENCES, INC. REPORT NO. 1120402.
4.) MUCK TO BE REMOVED PER UNIVERSAL ENGINEERING SCIENCES, INC. REPORT NO. 1120402.
5.) SEE SHEET No's 28-29 FOR TYPICAL SECTIONS.
6.) SEE CROSS-SECTION SHEETS 19-27 FOR ESTIMATE AREAS OF MUCK REMOVAL. QUANTITY OF MUCK REMOVAL MAY VARY BASED ON CONDITIONS ENCOUNTERED. SEE REMOVAL OF ORGANIC MATERIAL DETAIL ON SHEET No. 29.
7.) SEE SHEET No. 6 FOR DIRECTIONAL DRILL PROFILES.





BOWYER SINGLETON

ORANGE COUNTY FLORIDA

PLAN & PROFILE CLAPP SIMMS DUDA

CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

halfsize.tbl

10/2/2014

REVISIONS		
DATE	BY	DESCRIPTION

CONTRACTOR "AS-BUILTS"
I hereby state that these "As-Builts" were furnished to me by the contractor listed below, I, or an employee under my direct supervision have reviewed these "As-Builts" and believe them to be in compliance with my knowledge of what was actually constructed. This statement is based upon site observations of the construction.
Contractor's Name ______
Engineer ______
Not valid without the signature and the original seal of a Florida Registered Engineer.

Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1" = 50' HORIZONTAL 1" = 5' VERTICAL
PROJECT NO.	AJAY1/FINAL/CSD RD
FILE NAME	AJAY1 CSD PlanProfile-05
SHEET	11 OF 32

...\AJAY1 CSD PlanProfile-CSD 05.dgn

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1" = 20'

EXISTING FELL'S LANDING PROPERTY BOUNDARY

FELL'S LANDING SUBDIVISION

NARCOOSSEE ROAD R/W

16" DIP WM CONTINUES TO FELL'S LANDING PHASE I

8" FM CONTINUES TO FELL'S LANDING PHASE I

EX. 16" DIP WATER MAIN

EXIST. 25' UTIL. ESMT.

EX. 10' SIDEWALK/ DRAINAGE ESMT.

BASELINE OF EX. GRADE PROFILE

135LF-12" PVC FORCE MAIN (OFFSET 3' FROM CENTER OF EX. 8" F.M.)

EX. 8" PVC FORCE MAIN

SEE UTILITY CONNECTION DETAIL FOR THIS AREA

28 NARCOOSSEE ROAD CENTERLINE OF CONSTRUCTION 29 30 31

28 NARCOOSSEE ROAD BASELINE OF SURVEY 29 30 31

MATCH LINE STA. 32+00.00

139LF JACK & BORE W/ 30" CASING @ EL. 68.0

137LF JACK & BORE W/ 24" CASING @ EL. 68.5

STA. 30+35.00 16" BFV VALVE 12" PLUG VALVE

NARCOOSSEE ROAD R/W

249LF-12" PVC FORCE MAIN

272LF-16" DIP WATER MAIN

UTILITY CONNECTION DETAIL

16"x16" WET TAP W/ 16" TAPPING SLEEVE & VALVE

EX. 16" G.V.

EX. 16" W.M.

8.5'

5'

12"x12" TEE

16" W.M.

3'

EX. 8" F.M.

12"X8" WET TAP W/ 12" TAPPING SLEEVE & VALVE 45° BEND

12" F.M.

NOTE:
FORCE MAIN WET TAP PLUG VALVE TO BE INSTALLED VERTICALLY AND TAPPING VALVE TO BE INSTALLED HORIZONTALLY AND ABANDONED IN THE OPEN POSITION AS SHOWN IN OCU STANDARD DETAIL A121-2.

80 76 72 68

140' V.C.

+30.00 EL. 74.62

74.74 74.88 75.04 75.23 75.43 75.66

+70.00 EL. 75.91

+67.16 EL. 81.07

81.23 81.46 81.46 81.67

74.67 74.67

(+) 0.54%

(+) 1.30%

PI +00.00 EL. 75.00

72.37 72.37

EX. C/L OF NARCOOSSEE ROAD

S-112 S-201 S-201B

BASELINE OF EX. GRADE PROFILE

18" Pipe

FL 73.80 FL 73.60

NOTE: PROP. F.M. TO HAVE 3'-0" MIN. COVER

74.87 74.87

EX.8" PVC FM EX.8" PVC FM 12" PVC FM

EX. 16" DIP WM

FL 71.20

16" DIP WM 12" PVC FM 16" DIP WM

48" Pipe

FL 68.00

FL 66.80

16" DIP WM 12" PVC FM

MATCH LINE STA. 32+00.00

27+00 28+00 29+00 30+00 31+00 32+00

SCALE: 1" = 20' HORIZ.
1" = 2' VERT.

BOWYER SINGLETON

FLORIDA

ORANGE COUNTY

PLAN & PROFILE
STA. 26+40.00 TO STA. 32+00.00

CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

REVISIONS

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Michael Scott Stearns
Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1"=20' HORIZ. 1"=2' VERT.
PROJECT NO.	DVR10OffsiteUtilitiesFINAL
FILE NAME	DVR10Uplanprofile01.dgn
SHEET	15 OF 32

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BASELINE OF EX. GRADE PROFILE

EX. 16" DIP WATER MAIN

10'

6'

12.5'

6.5'

EXIST. 25' UTIL. ESMT.

EX. 10' SIDEWALK/ DRAINAGE ESMT.

560LF-12" PVC FORCE MAIN (OFFSET 3' FROM CENTER OF EX. 8" F.M.)

EX. 8" PVC FORCE MAIN

NARCOOSSEE ROAD R/W

MATCH LINE STA. 32+00.00

MATCH LINE STA. 37+60.00

NARCOOSSEE ROAD CENTERLINE OF CONSTRUCTION

NARCOOSSEE ROAD BASELINE OF SURVEY

2 33 34 35 36 37

R-204

NARCOOSSEE ROAD R/W

1" = 20'

EX. C/L OF NARCOOSSEE ROAD

S-201A

(+)1.300%

(-)1.300%

PI +67.15
EL. 83.67

S-203

+35.00 EL. 80.19

170' V.C.

79.95 79.75 79.59 79.48 79.40 79.36 79.36

(-)1.300%

(+)0.430%

PI +21.00
EL. 79.09

81.67 81.85 82.00 82.13 82.23 82.30 82.35 82.37 82.37 82.34 82.28 82.20 82.09 81.96 81.80 81.61 81.40 81.16 81.07

81.46

74.67

77.24

400' V.C.

BASELINE OF EX. GRADE PROFILE

NOTE: PROP. F.M. TO HAVE 3'-0" MIN. COVER

+67.15 ℄ 81.07

FL 75.60

12" PVC FM

EX. 8" PVC FM

EX. 16" DIP WM

42" Pipe

42" Pipe

Pipe

FL 70.60

FL 70.80

FL 70.80

FL 67.00

80 76 72 68

MATCH LINE STA. 32+00.00

MATCH LINE STA. 37+60.00

32+00 33+00 34+00 35+00 36+00 37+00

SCALE: 1" = 20' HORIZ.
1" = 2' VERT.

BOWYER SINGLETON

CITY OF ORLANDO

FLORIDA

PLAN & PROFILE
STA. 32+00.00 TO STA. 37+60.00

CLAPP SIMMS DUDA ROAD
UTILITY & ROAD IMPROVEMENTS

CORPORATE OFFICE - 520 SOUTH MAGNOLIA AVENUE - ORLANDO, FLORIDA 32801
407-843-5120 - ENGINEERING BUSINESS - 1221

REVISIONS		
DESCRIPTION	BY	DATE

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Florida Reg. Number
57602

DATE	SEPTEMBER 2014
DESIGNED	SKH
CHECKED	MSS
SCALE	1"=20' HORIZ. 1"=2' VERT.
PROJECT NO.	DVR1\OffsiteUtilitiesFINAL
FILE NAME	DVR1OUplanprofile02.dgn
SHEET	16 OF 32

10/2/2014

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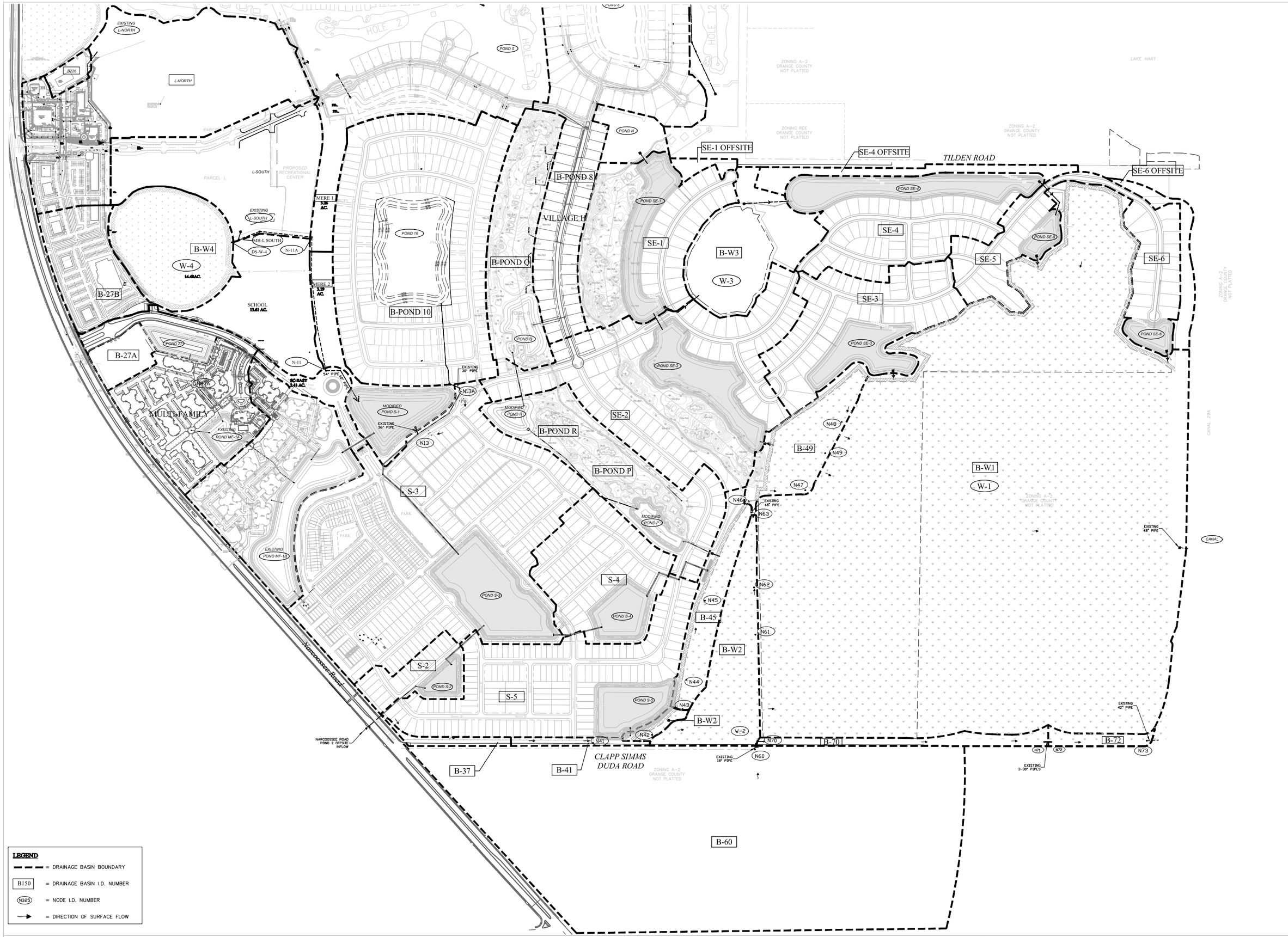
ERP Application No. 61592-42: Eagle Creek - Village K and J



vhb
225 E. Robinson Street
Suite 300
Orlando, FL 32801
407.839.4006
Certificate of Authorization
Number FL #3932

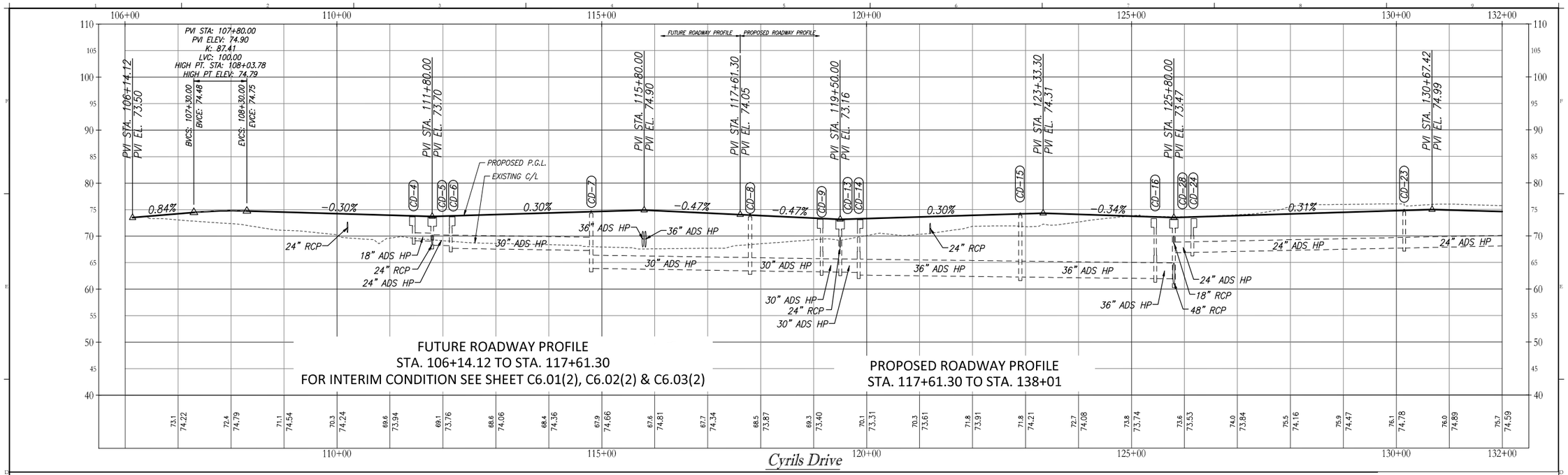
Eagle Creek - Village K & J

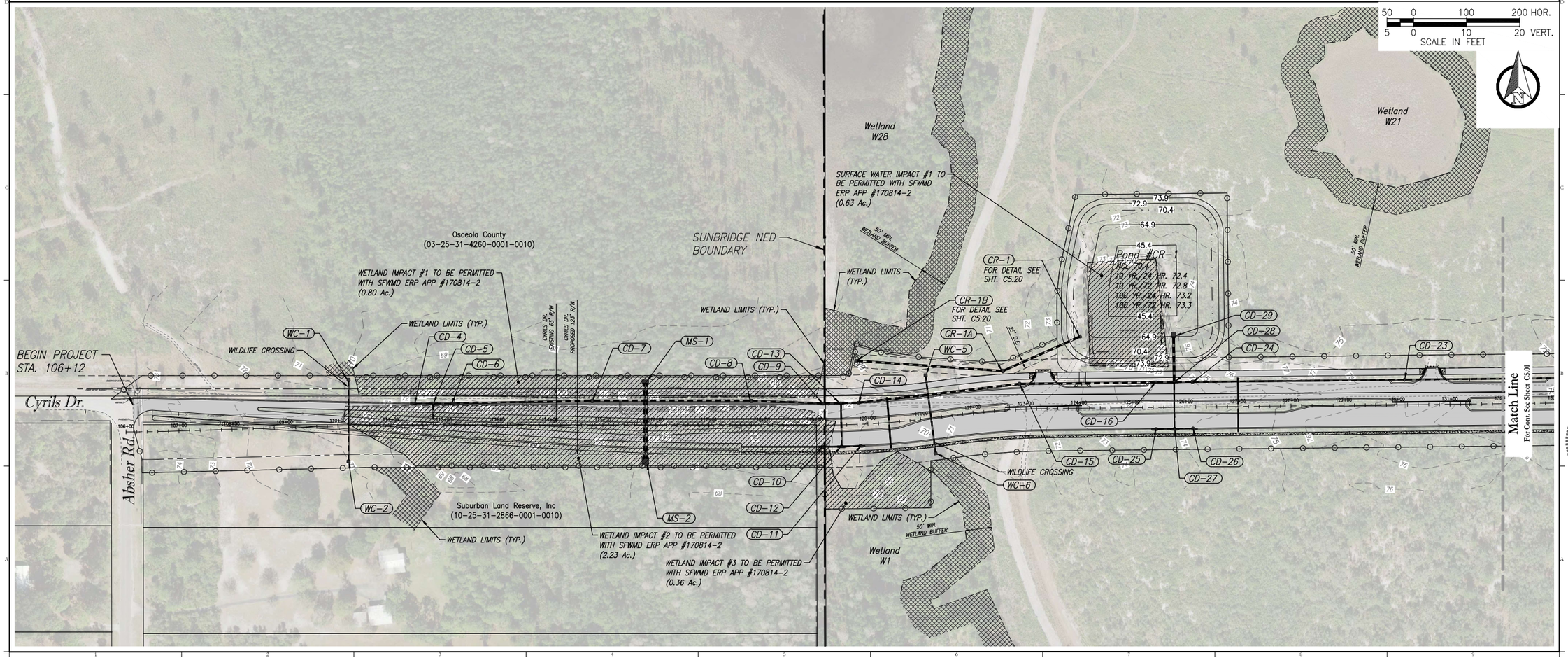
Post Development Drainage Basin Map

April 2017

Exhibit 3

ERP Application No. 170814-2: Sunbridge-Cyrils Drive Master Drainage Report





Key Map:

Consultant:

NO.	DATE:	DESCRIPTIONS:
	11/15/17	SUBMIT TO OSCEOLA CO.

SUBMISSIONS/REVISIONS

VERTICAL DATUM:	NAVD 88
JOB NO.:	17-042
DESIGNED BY:	LEN/JLD
DRAWN BY:	JLD
CHECKED BY:	LEN/CMB
APPROVED BY:	CMB
SCALE IN FEET:	1" = 100'

Project Name:

SUNBRIDGE NED CYRILS DRIVE PHASE 1 & UTILITY ACCESS ROAD

(SP17-xxxx) (PS17-00025)
(CP17-00002) (CPA09-009)

Jurisdiction:

OSCEOLA COUNTY, FL

Sheet Title:

DRAINAGE MAP

Sheet No.:

C5.00

Seal:

CHRISTINA M. BAXTER
LICENSE No. 67547
STATE OF FLORIDA
PROFESSIONAL ENGINEER

CHRISTINA M. BAXTER
P.E. NO. 0067547
DATE: November 15, 2017

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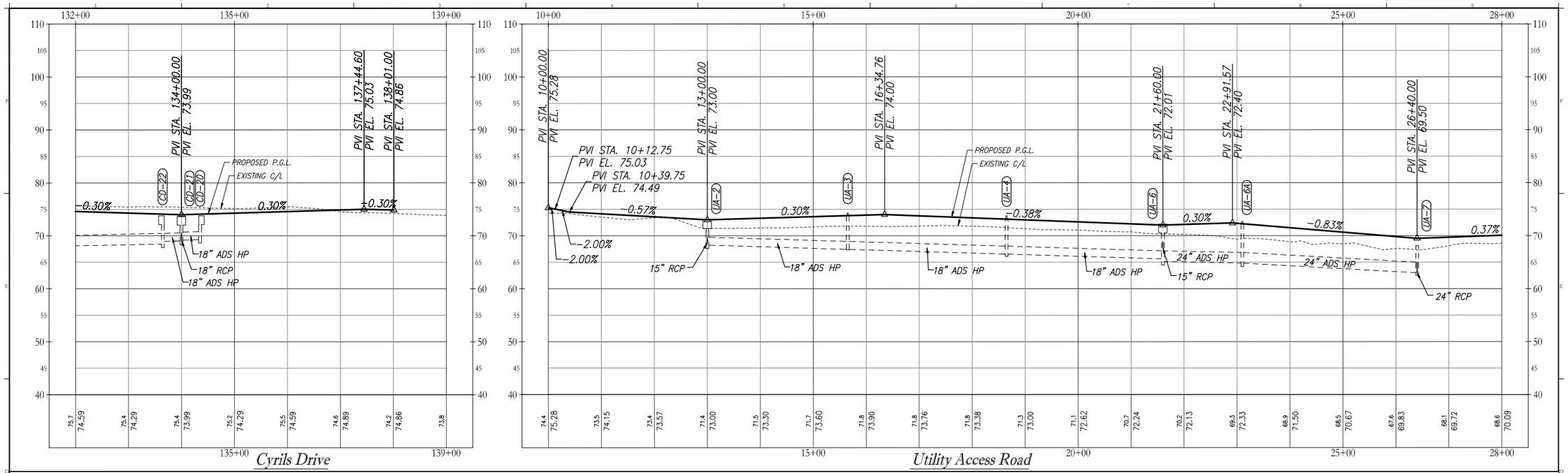
POULOS & BENNETT

Poulos & Bennett, LLC
2602 E. Livingston St., Orlando, FL 32803
Tel. 407.487.2594 www.poulosandbennett.com
Eng. Bus. No. 28567

Z:\2017\17-042 TAWSTOCK - SUNBRIDGE\CYRILS DR\CAD\FINAL\PHASE 1\17042-CD_PH1-DM



Key Map:

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NO.	DATE:	DESCRIPTIONS:
	11/15/17	SUBMIT TO OSCEOLA CO.

SUBMISSIONS/REVISIONS

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DESIGNED BY:	LEN/JLD
DRAWN BY:	JLD
CHECKED BY:	LEN/CMB
APPROVED BY:	CMB
SCALE IN FEET:	1" = 100'

Project Name:

SUNBRIDGE NED CYRILS DRIVE PHASE 1 & UTILITY ACCESS ROAD

(SP17-xxxx) (PS17-00025)
(CP17-00002) (CPA09-009)

Jurisdiction:

OSCEOLA COUNTY, FL

Sheet Title:

DRAINAGE MAP

Sheet No.:

C5.01

Seal:

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LICENSE
No. 67547
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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Eng. Bus. No. 28567

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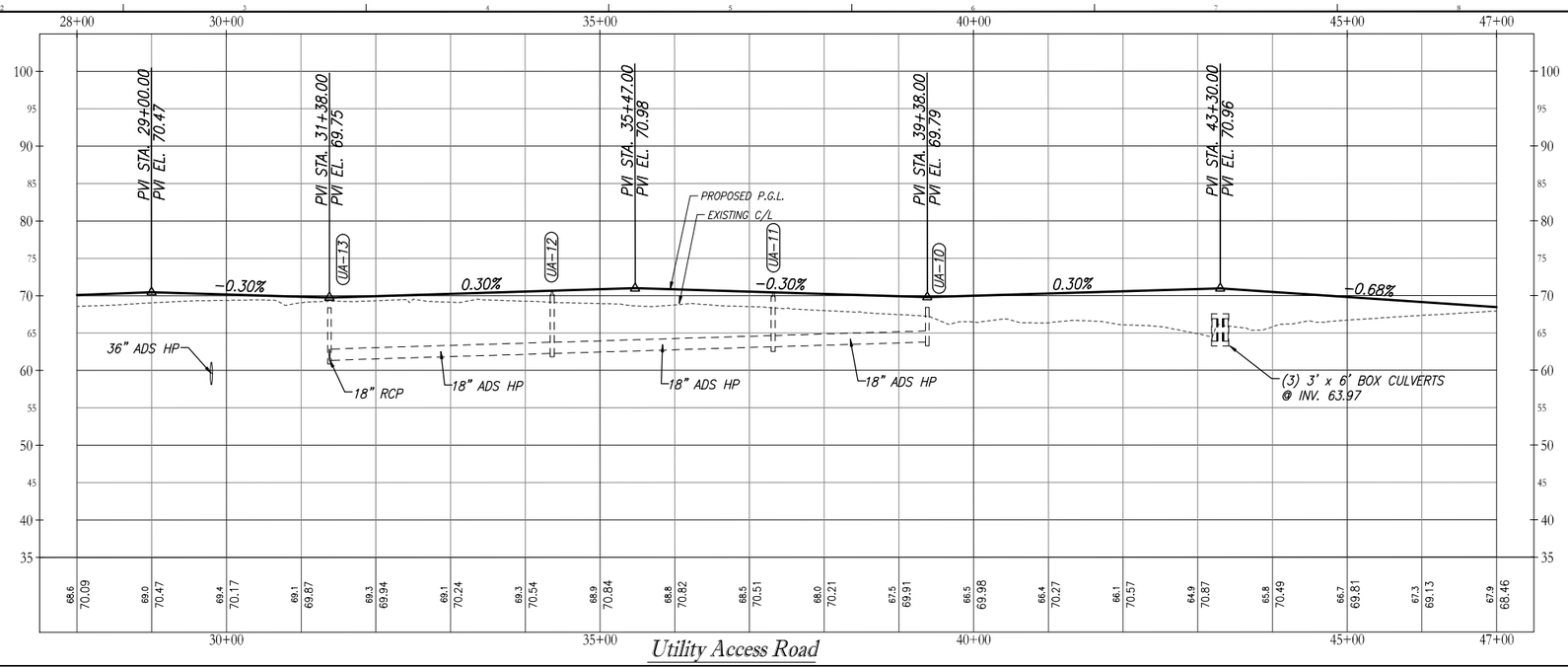
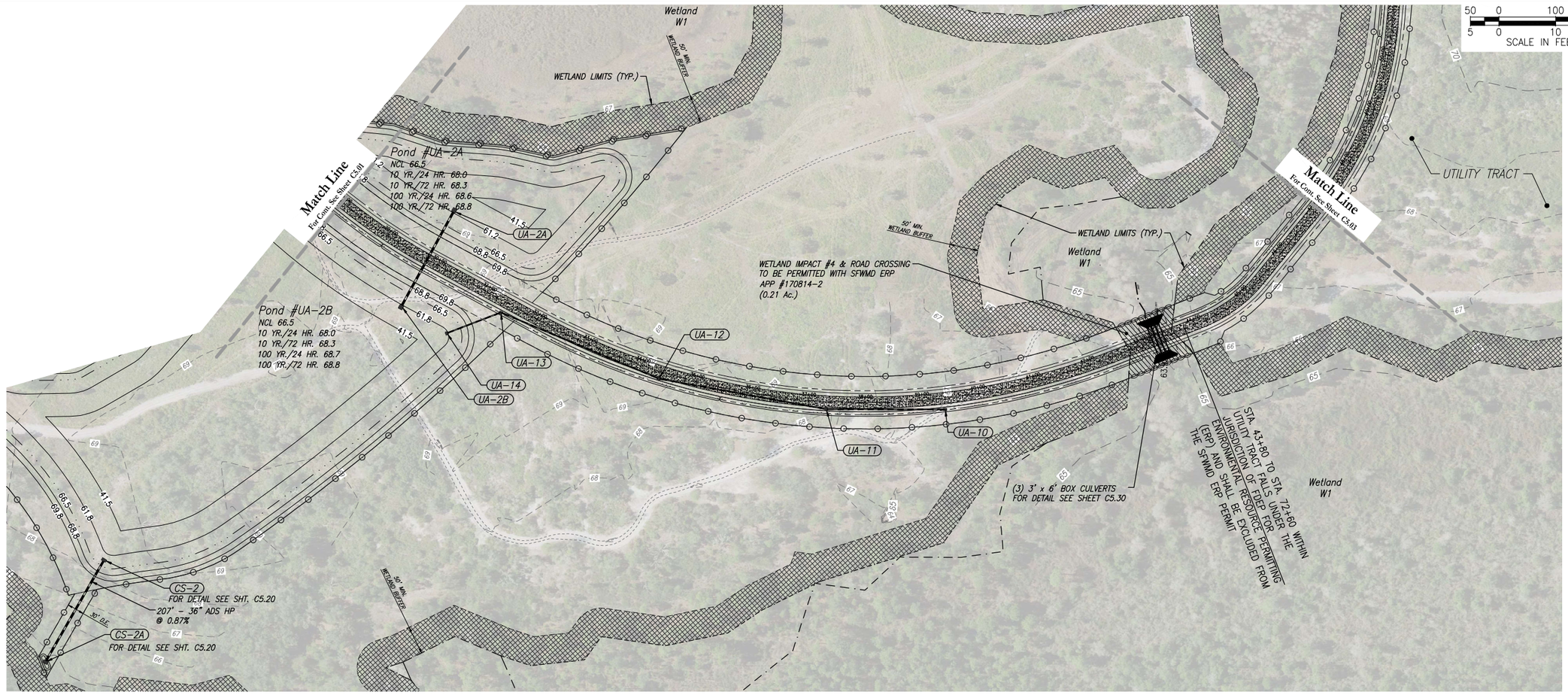


Utility Access Road



Key Map:

Consultant:

NO.	DATE:	DESCRIPTIONS:
	11/15/17	SUBMIT TO OSCEOLA CO.

SUBMISSIONS/REVISIONS

VERTICAL DATUM:	NAVD 88
JOB NO.:	17-042
DESIGNED BY:	LEN/JLD
DRAWN BY:	JLD
CHECKED BY:	LEN/CMB
APPROVED BY:	CMB
SCALE IN FEET:	1" = 100'

Project Name:

SUNBRIDGE NED CYRILS DRIVE PHASE 1 & UTILITY ACCESS ROAD

(SP17-xxxx) (PS17-00025)
(CP17-00002) (CPA09-009)

Jurisdiction:

OSCEOLA COUNTY, FL

Sheet Title:

DRAINAGE MAP

Sheet No.:

C5.02

Seal:

CHRISTINA M. BAXTER
LICENSE
No. 67547
STATE OF FLORIDA
PROFESSIONAL ENGINEER

CHRISTINA M. BAXTER
P.E. NO. 067547
DATE: November 15, 2017

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Eng. Bus. No. 28567

B.50

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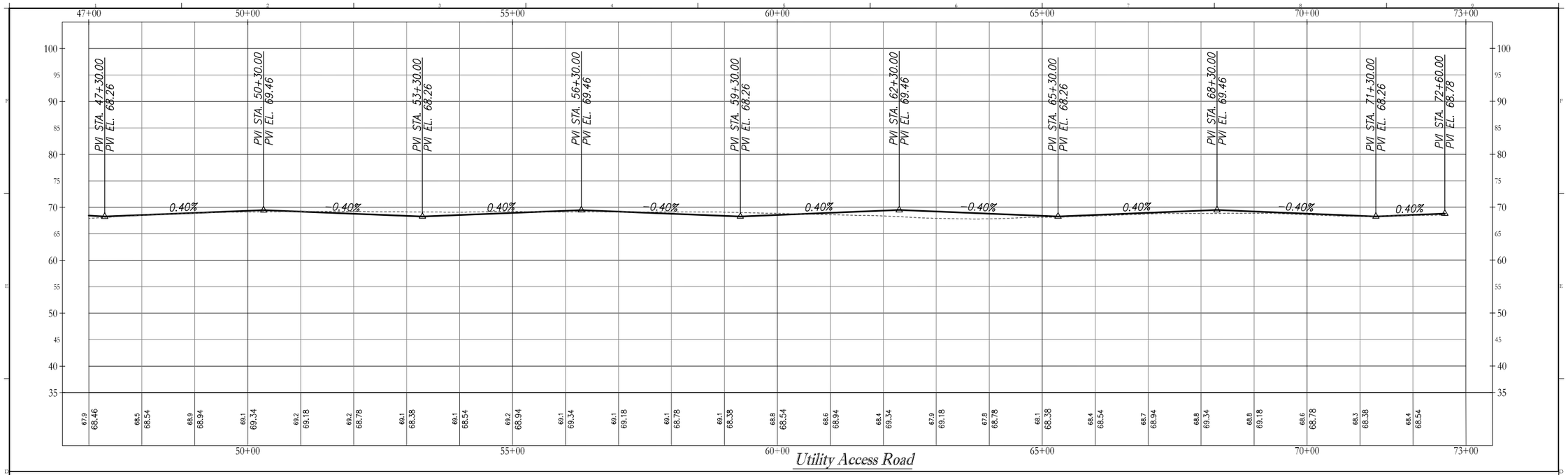

50 0 100 200 HOR.
5 0 10 20 VERT.
SCALE IN FEET

Key Map:

Consultant:

NO.	DATE:	DESCRIPTIONS:
	11/15/17	SUBMIT TO OSCEOLA CO.

SUBMISSIONS/REVISIONS

VERTICAL DATUM:	NAVD 88
JOB NO.:	17-042
DESIGNED BY:	LEN/JLD
DRAWN BY:	JLD
CHECKED BY:	LEN/CMB
APPROVED BY:	CMB
SCALE IN FEET:	1" = 100'

Project Name:

SUNBRIDGE NED CYRILS DRIVE PHASE 1 & UTILITY ACCESS ROAD

(SP17-xxxx) (PS17-00025)
(CP17-00002) (CPA09-009)

Jurisdiction:

OSCEOLA COUNTY, FL

Sheet Title:

DRAINAGE MAP

Sheet No.:

C5.03

Seal:

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LICENSE
No. 67547
STATE OF FLORIDA
PROFESSIONAL ENGINEER

CHRISTINA M BAXTER
P.E. NO. 067547

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N

1:1 MILE

Culvert Locations

EAST LAKE TOHO

Legend

- FLOOD STUDY LIMITS
- NORTHEAST DISTRICT BOUNDARY

Northeast District
Osceola County, Florida
Nodal Link Diagram

DONALD W. MCINTOSH ASSOCIATES, INC.
CIVIL ENGINEERS - LAND PLANNERS - SURVEYORS
2200 PARK AVENUE NORTH
WINTER PARK, FL 32789
PHONE: (407) 644-4068 FAX: (407) 644-8318

Source: Drainage basin data obtained in digital format from SFWMD.

ERP Application No. 180209-328: Sunbridge Northeast District (NED) Master Drainage Report Conceptual Permit Application

6. Culvert/Crossing Information

Node Link	Upstream Node	Downstream Node	Existing 100yr/24hr Stage (ft.)	Proposed 100yr/24hr Stage (ft.)	Existing 50yr/24hr Stage (ft.)	Proposed 50yr/24hr Stage (ft.)
NED10 C	NED10	NED14	71.3	70.9	71.2	70.7
NED01 C	NED01	NED02	67.2	***67.9***	67.2	***67.8***
NED02-1C	NED15	NED02	65.5	***66.0***	65.5	***65.9***
NED15-2P						
NED15-2PBU						
NED15 DBI-1						
BULLOCK-2-C	NED14	BULLOCK	68.4	***68.4***	68.4	68.4
	NED30		69.3	69.3	69.3	69.3
NED16-1 C	NED16	MYRTLE	64.2	64.2	63.9	64.0
NED22-2C	NED22	NED25	69.2	69.3	69.1	69.2
NED22-3C						

The proposed stages within nodes NED01, NED15 and NED22 are slightly increased by 0.7 feet, 0.5 feet and 0.1 feet, for the 100 yr-24 hr storm event, respectively. However, they are still at or within the culvert cross-sections and offsite impacts are minimal. Highlighted culverts are relevant to this application for Sunbridge NED Phase 1 – East of C-30 Canal. Please refer to ICPR outputs for the existing and proposed conditions under Appendix C.

	Node Link	Proposed 50yr/24hr Disch. (cfs)	Culvert Size (units as noted)	Culvert Cross-Sectional Area (ft^2)	Proposed 50yr/24hr Outlet Velocity (ft./sec)
F-22	NED10 C	***46.5***	Two – 36" RCPs	14.14	3.3
	NED01 C	***225.9***	***Three – 5' X 3' Box Culvert***	***45***	***5.0***
F-26	NED02-1C	***297.8***	***Six – 6' X 3' Box Culverts***	***108***	***2.76***
F-25	NED15-2C	***292.0***	***Six – 6' X 3' Box Culverts***	***108***	***2.7***
	NED15-2 PBU	***49.7***	***Four – 6' X 3' Box Culverts***	***72***	***0.7***
	NED22-2C	***0.03***	One – 24" RCP	3.14	0.01
	NED22-3C	***23.8***	Two – 36" RCPs	14.14	1.7

Outlet velocities for the 50 year storm event are less than 4 ft/sec, except for Node Link NED01C, which is higher and will require erosion control protection at the culverts outlet point. Please refer to ICPR Link Max Report for the proposed flows at the various links under Appendix C.

WEST
APPLICATION 171106-4

EAST
APPLICATION 180209-328

THE IMPROVEMENT SHOWN WITHIN THE 350' SFWMD CANAL EASEMENT REQUIRES PERMITTING THROUGH THE SFWMD ROW OCCUPANCY PERMITTING PROCESS AND IS INCLUDED ON THIS EXHIBIT FOR INFORMATIONAL PURPOSES ONLY.

SUNBRIDGE NED BOUNDARY

PHASE 1 EAST OF CANAL PERMIT LIMITS

PHASE 1 BOUNDARY

PLEASE NOTE THAT THE NODAL DIAGRAM IN THIS EXHIBIT IS LIMITED TO THE PROPOSED DEVELOPMENT WITHIN SUNBRIDGE NED PHASE 1 (EAST & WEST OF THE C-30 CANAL). FOR FURTHER DETAILS BEYOND WHAT IS SHOWN HERE, PLEASE REFER TO THE PRE-DEVELOPMENT NODAL MAPS EXHIBITS 10-10.9

CYRIL RD

JACK BRACK RD

ES RD

EDEN DR

NONA RD

ABSHIER LN

LAKE MARY JANE

Lake Myrtle

Lake Bullock

Lake Joel

LEGEND

B-W1 BASIN ID

OVERLAND FLOW

W1 NODE ID

C1 CANAL ID/NODE DISCHARGE LINK

W6 TAILWATER ID

PRIMARY DRAINAGE BASIN LINE

SUNBRIDGE NED BOUNDARY

PHASE 1 BOUNDARY

PHASE 1 EAST OF THE CANAL PERMIT LIMITS

PHASE 1 WEST OF THE CANAL PERMIT LIMITS

WETLANDS

PONDS

LAKE/CANAL

KEY MAP (NTS)

Post-Development Nodal Diagram Phase 1 (West & East Of Canal)

Sunbridge NED

N

1000 0 1000 2000

SCALE IN FEET

May 22, 2018
P & B Job No.: 17-042

2602 E. Livingston St.
Orlando, Florida 32803- 407.487.2594

POULOS & BENNETT

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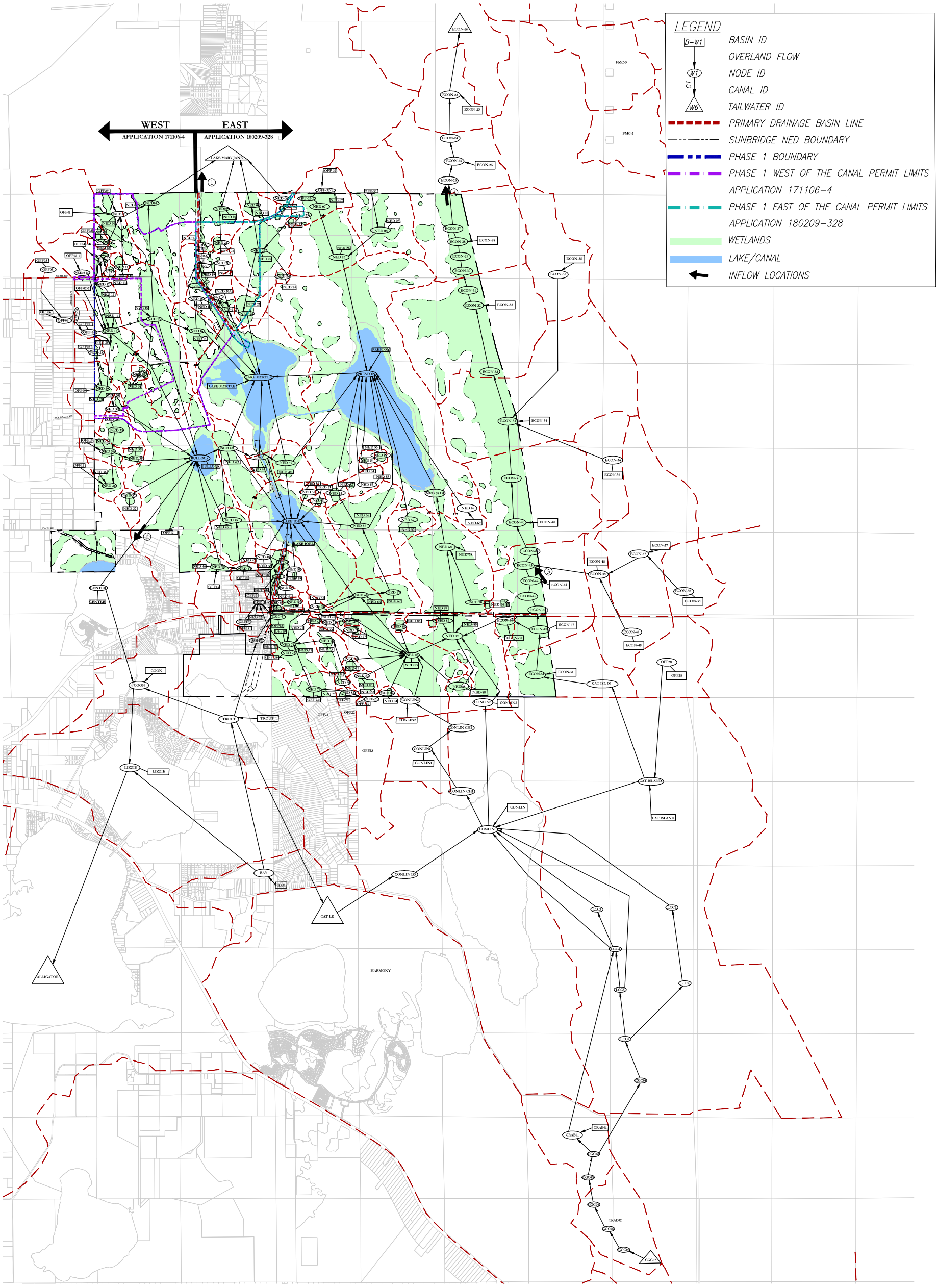
Exhibit 12

Z:\2017\17-042 TAVISTOCK - SUNBRIDGE\MASTER STORMWATER\CAD\EXH & FIGS\17042 POST DEVELOPMENT NODAL MAP (EAST OF CANAL)



NOTES:

1. NAVD 88 was used for Topo Datum.
2. Donald W. McIntosh & Associates provided survey source for topo and existing conditions. (DWMA 10/2009)
3. FEMA LOMR STUDY CASE # 170814-2.

Pre-Development Overall NED Nodal Map

Sunbridge NED

3000' 0 3000' 6000'
SCALE IN FEET

Exhibit 10

May 7, 2018
P & B Job No.: 17-042

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Orlando, Florida 32803- 407.487.2594
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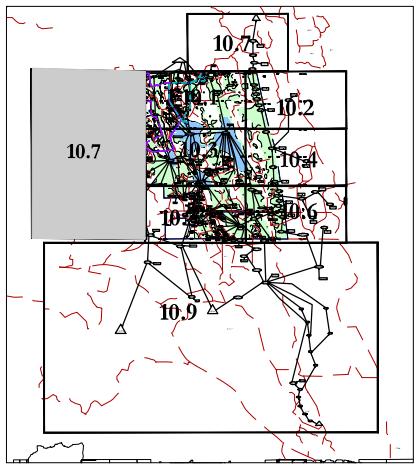
Z:\2017\17-042 TAVISTOCK - SUNBRIDGE\MASTER STORMWATER\CAD\EXH & FIGS\17042 PREDEVELOPMENT OVERALL NODAL MAP



KEY MAP (NTS)

LEGEND

- BASIN ID
- OVERLAND FLOW
- NODE ID
- CANAL ID
- TAILWATER ID
- PRIMARY DRAINAGE BASIN LINE
- SUNBRIDGE NED BOUNDARY
- PHASE 1 BOUNDARY
- PHASE 1 WEST OF TEH CANAL PERMIT LIMITS
- PHASE 1 EAST OF THE CANAL PERMIT LIMITS
- WETLANDS
- LAKE/CANAL
- EXISTING PIPE CULVERTS

OFF29
OFF01
NED 01
OFF03
NED 09
NED 09
OFF04
NED 10
OFF02-1
NED 10
OFF05
OFF05
NED10-1D
CYRIL RD
NED 13
NED 12
EXISTING
2-12" PVC
OFF02-2
NED 12
ABSHER LN
OFF06
OFF06
OFF-7-1
NED 14
OFF07
OFF-7-2
NED 14
CMP 31"x60"
OFF08
NED 28
NED 28
24" CMP
OFF09
NED 29
NED 30
NED 29
NED 30
JACK BRACK RD
NED 33
NED 33
OFF10
OUTBACK RD
NED 34
NED 34
OFF11
NED 36
NED 36
JONES RD
EDEN DR
CENTER
CENTER

Pre-Development Nodal Map

Sunbridge NED

N

1000 0 1000 2000

SCALE IN FEET

Exhibit 10.8

May 7, 2018
P & B Job No.: 17-042

2602 E. Livingston St.
Orlando, Florida 32803- 407.487.2594

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Z:\2017\17-042 TAVISTOCK - SUNBRIDGE\MASTER STORMWATER\CAD\EXH & FIGS\17042 PREDEVELOPMENT OVERALL NODAL MAP

LAKE MARY JANE

CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL DISTRICT
350' EASEMENT
(CANAL C30)
ORB 12, PG 143

NED 02 | NED02 | NED 01 | NED 11 | 13 | NED 15 | NED 16 | NED 17 | NED 18 | NED 19 | NED 20 | NED 20A | NED 21 | NED 22 | NED 23 | NED 24 | NED 25 | NED 26 | NED 04 | NED04 | NED 05 | NED 06 | NED 07 | NED 08

OFF-32-1 | OFF-32-2 | OFF-33

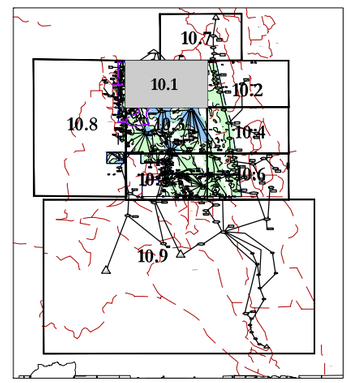
C30-7 | C30-6 | C30-5 | C30-4 | C30-3 | C30-2 | C30-1 | C30S | S-57

Structure S-57
36" CMP
36" CMP
36" CMP
Double 18" RCP
Double 18" RCP

PRE

LEGEND

- BASIN ID (B-W1)
- OVERLAND FLOW
- NODE ID (N1)
- CANAL ID (C1)
- TAILWATER ID (TW)
- PRIMARY DRAINAGE BASIN LINE
- SUNBRIDGE NED BOUNDARY
- PHASE 1 BOUNDARY
- PHASE 1 WEST OF TEH CANAL PERMIT LIMITS
- PHASE 1 EAST OF THE CANAL PERMIT LIMITS
- WETLANDS
- LAKE/CANAL
- EXISTING PIPE CULVERTS



KEY MAP (NTS)

N

600 0 600 1200
SCALE IN FEET

Pre-Development Nodal Map

Sunbridge NED

May 7, 2018
P & B Job No.: 17-042

2602 E. Livingston St.
Orlando, Florida 32803- 407.487.2594

POULOS & BENNETT

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Certificate of Authorization No. 28567

Exhibit 10.1

Z:\2017\17-042 TAVISTOCK - SUNBRIDGE\MASTER STORMWATER\CAD\EXH & FIGS\17042 PREDEVELOPMENT OVERALL NODAL MAP

ERP Application No. 130822-7: Lake Nona South West Mass Grading Ph II Modification and Wetland 34 Removal

DONALD W. McINTOSH
ASSOCIATES, INC.

LAKE NONA SOUTH
WEST MASS GRADING PHASE II MODIFICATION AND WETLAND 34 REMOVAL

CITY OF ORLANDO, FLORIDA

ADDITIONAL STORMWATER CALCULATIONS

Submitted to:
SOUTH FLORIDA WATER MANAGEMENT DISTRICT

CIVIL ENGINEERS

LAND PLANNERS

SURVEYORS

OCTOBER 2013

PREPARED BY:

DONALD W. McINTOSH ASSOCIATES, INC.
2200 PARK AVENUE NORTH
WINTER PARK, FLORIDA 32789
(407) 644-4068

Certification of Authorization No. 68
Dated March 7, 2001

2200 Park Ave. North

Winter Park, FL

32789-2055

Fax 407-644-8318

407-644-4068

http://www.dwma.com

KIRBY L. WHITE, PE
FLORIDA REGISTRATION #44802

DOCUMENTS INCLUDED HEREIN WHICH HAVE BEEN PREPARED BY PROFESSIONALS OTHER THAN DONALD W. McINTOSH ASSOCIATES, INC. ARE NOT COVERED UNDER THE ABOVE REGISTERED ENGINEER'S SIGNATURE AND SEAL.
F:\Proj2013\13088\ENGCalcs\Storm\WMG Ph2 Mod-NAVD88\Cover2.doc

SHEET 3 – 3 | PROJECT: LAKE NONA SOUTH – SOUTHLAKE MASTER STORMWATER
SHEET TITLE: STORMWATER MASTER PLAN
DWG FILE NAME: F:\Proj2013\13088\ENGCalcs\Storm\WMG Ph2 Mod-NAVD88\STORM-PLAT2-NAVD88.dwg
XREF FILE NAME:

OUTFALL
Mud Lake M-1

OUTFALL
Mud Lake M-2

OUTFALL
Boggy Creek

Lake Nona Central

S.R. 417 Central Florida Greeneway

1"=500'

N

DA – 103.2±

W-63
DNW 8

DA-44.0± AC.
SPILLWAY
38"X24"

POND C
DNW 84.1

ZONE A

DA – 56.0± AC.

DA – 39.5± AC.

POND B
DNW 82.8

30"RCP

DA – 22.6± AC. POND 1
DNW 79.5

2-29"X45"RCP

B-1
DA – 26.0± AC.

C-1
DA – 34.7± AC.

SMA-9
DNW 82.6

Road C

Road D

Road E

Laureate Blvd

VAMC Access Road

8-38"X60" RCP

SMA-23 13.7 AC.
DNW 74.5

SMA-18
DNW 78.0
DA-168.2 AC.

SMA-19
DNW 78.0
DA-22.5 AC.

SMA-22
DNW 72.0
DA-57.8 AC.

SMA-20
DNW 77.0
DA-179.4 AC.

BURNHAM
DA-66.3 AC.

Boggy Creek Road

BC-2
DA-21.5 Ac.

SMA-21
DNW 75.0
DA-26.6 AC.

SMA-24
DA-28.6± AC.
DNW 79.0

SMA-25
DA-26.2± AC.
DNW 77.0

PPNW
DA-460.5± AC.

ZONE A

W-36
W-95
W-44
W-37
DA-57.6± AC.
DNW 76.6
W-123
W-111
W-38
DA-7.8± AC.

DA –143.0± AC.

DA – 126.7± AC.

SMA-8
DNW 76.0

SPILLWAY

SMA-12
DNW 76.0

J-1PP
DA-29.7± AC.

W-93
DNW 76.5

6.5± AC.

DA – 213.0± AC.

SMA-8B-1
DNW 79.0

PHASE 2A

SMA-11A
DNW 77.5
DA – 79.5± AC.

DA
16.7± AC.
W-58
DNW 78.2

DA
16.7± AC.
W-91
DNW 76.5

J-2PP
DA-39.6± AC.

SMA-1
DNW 7
DA-28

SPILLWAY

NO.	DATE	REVISIONS	CHK.
10	8/9/13	REVISED FOR WEST MASS GRADING PH2 MOD.	KLW
9	4/9/12	REVISED FOR PARCEL 208 BYPASS SYSTEM	KLW
8	7/13/09	SR 417 PONDS 1 & B MODIFICATION	KLW
7	4/16/09	REVISED FOR SMA-18 MODIFICATION	KLW
6	11/7/08	REVISED SMA-19 DNW ELEVATION	KLW
5	4/30/08	ADDED OFFSITE BASIN BC-2	KLW
4	1/31/08	ADDED WEST SIDE MASTER SYSTEM	KLW
3	12/20/07	REVISED FOR MASS GRADING MODIFICATION	KLW
2	8/8/07	REVISED PER SMA-2 MODIFICATIONS	KLW
1	3/1/07	Added Burnham Phase 1 Mass Grading Area	KLW

DONALD W. McINTOSH ASSOCIATES, INC.
ENGINEERS PLANNERS SURVEYORS
2200 PARK AVENUE NORTH, WINTER PARK, FLORIDA 32789 (407) 644-4068

DONALD W. McINTOSH ASSOCIATES, INC.
CERTIFICATE OF AUTHORIZATION NO. 88

DRAWN BY MPB | DESIGNED BY KLW | CHECKED BY KLW | DATE 4/09 | SCALE 1"=500' | JOB NUMBER 24080

LAKE NONA SOUTH
SOUTHLAKE PARK
CITY OF ORLANDO, FLORIDA
STORMWATER MASTER PLAN WEST

DRAWING STORM-PLAT2
SHEET 3 OF 3

B.61

Lake Nona South
Existing Conditions

Pre

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
530DS	JIM BRANCH	10072PRE	69.90	70.446	66.000	-0.0050	226225	69.63	1265.712	69.78	1265.282
530US	JIM BRANCH	10072PRE	69.55	72.034	68.000	0.0042	752132	69.20	1266.498	69.63	1265.712
BARTONA	HARTEX	10072PRE	0.00	78.200	81.000	0.0000	2	72.00	27.095	0.00	0.000
BARTONB	HARTEX	10072PRE	0.00	75.000	76.000	0.0000	720	64.10	657.465	0.00	0.000
BOGGYCREEK	BOGGY CREEK	10072PRE	0.00	72.000	74.000	0.0000	0	61.25	273.814	0.00	0.000
CIPIPEDS	JIM BRANCH	10072PRE	68.70	77.018	77.000	0.0049	225890	67.08	776.180	68.70	698.450
CIPIPEUS	JIM BRANCH	10072PRE	68.77	77.032	77.000	0.0026	2176821	68.26	692.687	67.08	776.180
H-5	HARTEX	10072PRE	72.00	81.747	80.500	0.0027	3734084	60.75	593.897	72.00	27.095
JCNE	JIM BRANCH	10072PRE	69.63	75.743	79.000	-0.0014	2712952	69.61	820.322	69.77	812.057
JCNW	JIM BRANCH	10072PRE	69.01	77.170	80.000	0.0050	2768376	68.60	551.451	69.16	551.808
LAKETOHO	JIM BRANCH	10072PRE	0.00	60.000	60.000	0.0000	946032	69.22	1315.531	0.00	0.000
M-1	MUD LAKE	10072PRE	65.11	81.824	82.000	0.0029	843149	61.25	119.830	65.11	60.359
M-2	MUD LAKE	10072PRE	61.37	77.209	78.000	0.0044	432527	60.75	387.067	61.37	339.773
MUDLAKE	MUD LAKE	10072PRE	0.00	74.000	76.400	0.0000	384	61.43	385.199	0.00	0.000
Nona Central	HARTEX	10072PRE	0.00	78.900	85.500	0.0000	0	0.00	0.000	18.00	20.800
PL1	JIM BRANCH	10072PRE	67.45	79.523	80.000	0.0012	927053	65.69	256.176	66.41	250.575
PL2	JIM BRANCH	10072PRE	65.11	78.793	79.000	-0.0047	1354524	64.00	197.465	65.03	186.691
POND-1	MUD LAKE	10072PRE	62.55	84.068	84.500	0.0050	276426	60.25	124.954	62.45	20.483
PONDB	MUD LAKE	10072PRE	72.00	86.477	87.300	0.0050	505677	60.00	159.336	72.00	3.130
PONDC	HARTEX	10072PRE	68.43	87.729	89.500	0.0049	473662	60.00	147.024	68.43	5.737
W-103	HARTEX	10072PRE	64.10	75.708	80.000	0.0013	11832328	61.25	1243.912	64.10	657.465
W-107	JIM BRANCH	10072PRE	63.17	81.213	82.000	-0.0021	310480	61.75	77.664	62.43	64.343
W-34	JIM BRANCH	10072PRE	67.27	82.195	82.000	0.0010	1678283	61.50	100.046	67.27	33.980
W-37	JIM BRANCH	10072PRE	66.50	80.092	80.000	-0.0014	3408741	62.50	350.013	66.27	232.244
W-38	JIM BRANCH	10072PRE	66.51	80.094	80.000	-0.0014	572918	61.25	39.543	72.08	23.668
W-58	JIM BRANCH	10072PRE	64.71	81.310	82.000	-0.0042	361967	64.00	133.228	64.71	130.426
W-6182	HARTEX	10072PRE	70.58	85.933	86.000	0.0010	2758679	60.50	155.545	75.70	16.347
W-63	HARTEX	10072PRE	65.74	86.042	86.000	0.0014	3603471	60.50	365.660	65.57	29.006
W-91	JIM BRANCH	10072PRE	64.64	79.235	80.000	-0.0026	445819	64.04	176.539	64.64	173.693
W-93	JIM BRANCH	10072PRE	60.69	78.406	80.000	0.0027	49684	60.50	49.635	60.69	47.407
W104	JIM BRANCH	10072PRE	72.01	80.420	80.000	0.0015	3414785	61.00	248.657	89.14	19.230
W96	JIM BRANCH	10072PRE	66.86	81.007	80.000	0.0023	5192571	61.25	644.850	66.86	208.949
W96W	JIM BRANCH	10072PRE	74.26	77.120	79.000	0.0008	7428823	66.86	208.949	74.78	147.177
WXS5	JIM BRANCH	10072PRE	71.28	79.171	79.000	0.0028	17659435	63.75	639.617	71.26	392.471
XS50	JIM BRANCH	10072PRE	69.33	73.527	73.000	0.0029	4357075	65.20	1357.919	69.20	1266.498
XS8	JIM BRANCH	10072PRE	69.22	64.374	65.000	0.0037	825123	68.96	1315.976	69.22	1315.531

NGVD 29

Appendix C

Field Review Notes

Downstream End of EX-39 (Southwest), Facing South

EX-41, Downstream End, Facing South

EX-38, Upstream End (Northeast), Facing East

Downstream end of EX-1, North side ditch

Upstream end of EX-14, Facing North

Upstream end of EX-2A

Downstream end of EX-12

Upstream end of EX-13

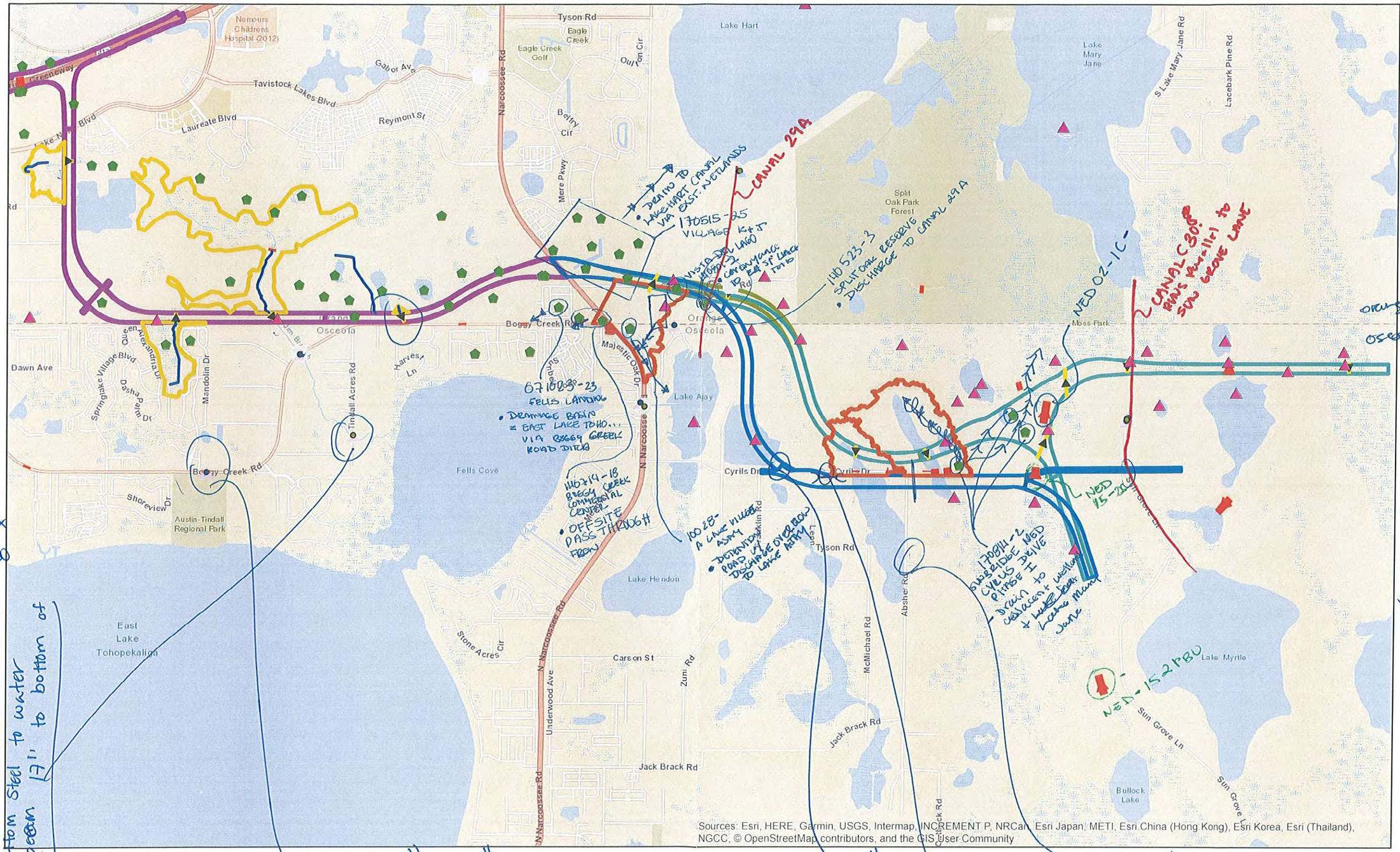
Downstream end of EX-16

EX-46

EX-35

VISTA DEL LAGO = IS IT BUILT?

082004



14" water Stain - degradation

8' wide
8' X 5'
95' X 5'
8' X

5.5' bridge deck to bottom
4.5' bridge deck to water
Chevy Span 84'
W13" bottom Steel to creek
42" bottom Steel to water
Steel began 17' to bottom of Deck

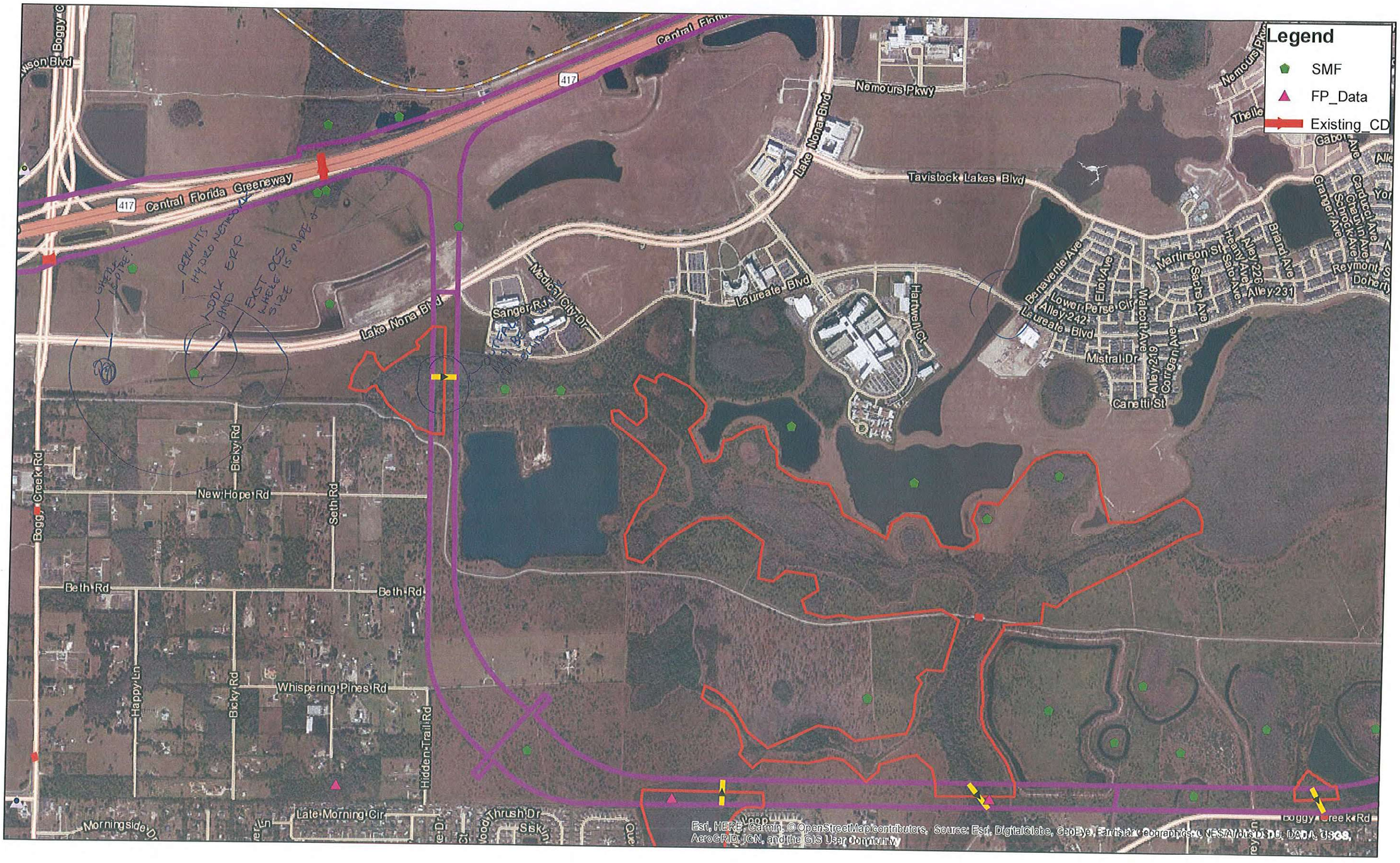
2X30" - filled w/ 9" of silt

2X15" HDPE

SD

2X24" 1" of water flowing

167-


Legend
SMF
FP_Data
Existing_CD
Central Florida Greeneway
417
Lake Nona Blvd
Nemours Pkwy
Tavistock Lakes Blvd
Medical City Dr
Sanger Rd
Laureate Blvd
Hartwell Ct
Benavente Ave
Lower Perse Cir
Alley 242
Laureate Blvd
Elliot Ave
Mistral Dr
Waicott Ave
Alley 219
Canetti St
Martirson St
Sachs Ave
Heany Ave
Alley 226
Alley 231
Briard Ave
Granger Ave
Schrock Ave
Chauvin Ave
Reynolds Ave
Gabor Ave
Doherty
Boggy Creek Rd
New Hope Rd
Seth Rd
Bicky Rd
Beth Rd
Happy Ln
Whispering Pines Rd
Hidden Trail Rd
Late Morning Cir
Morningside Dr
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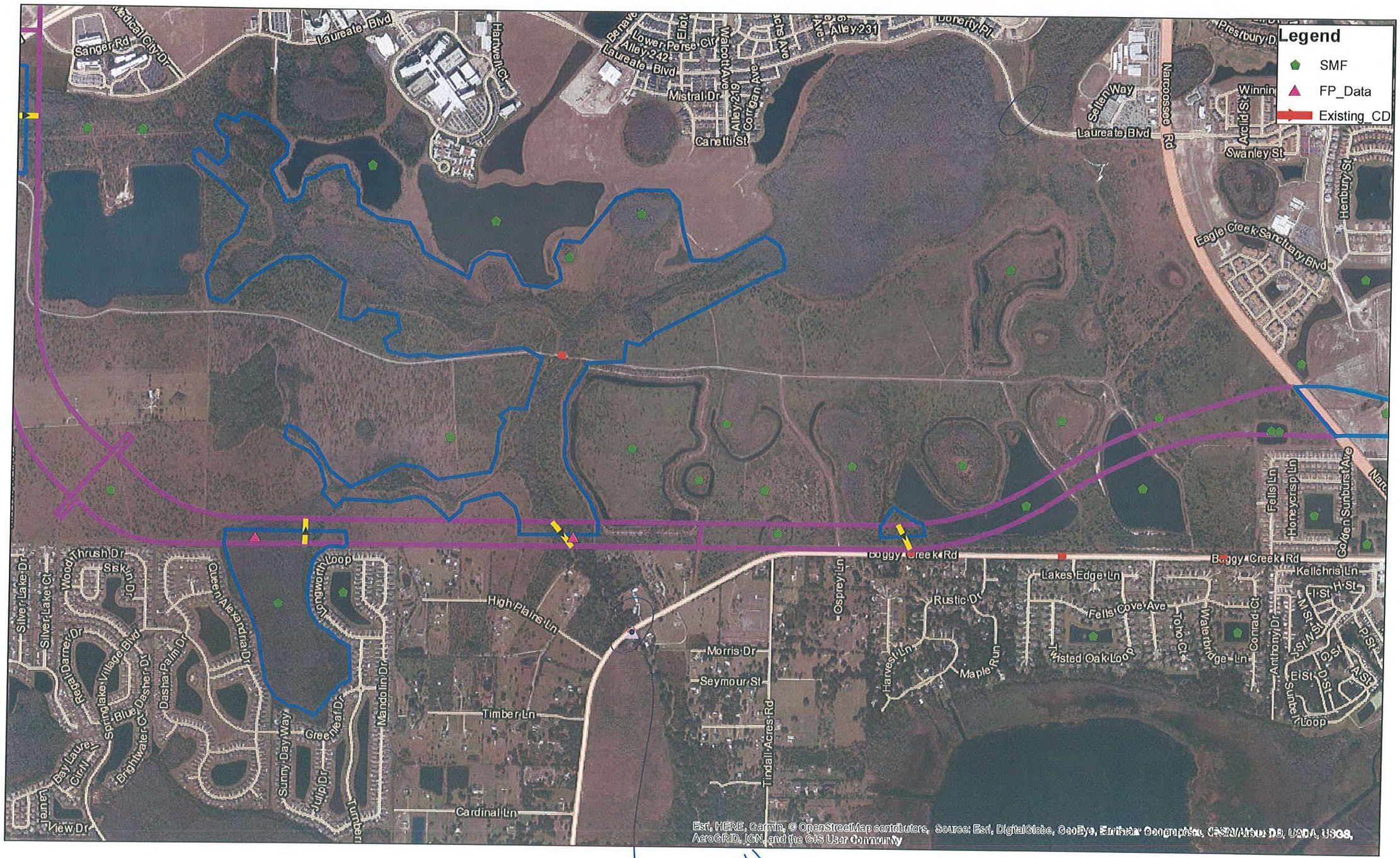
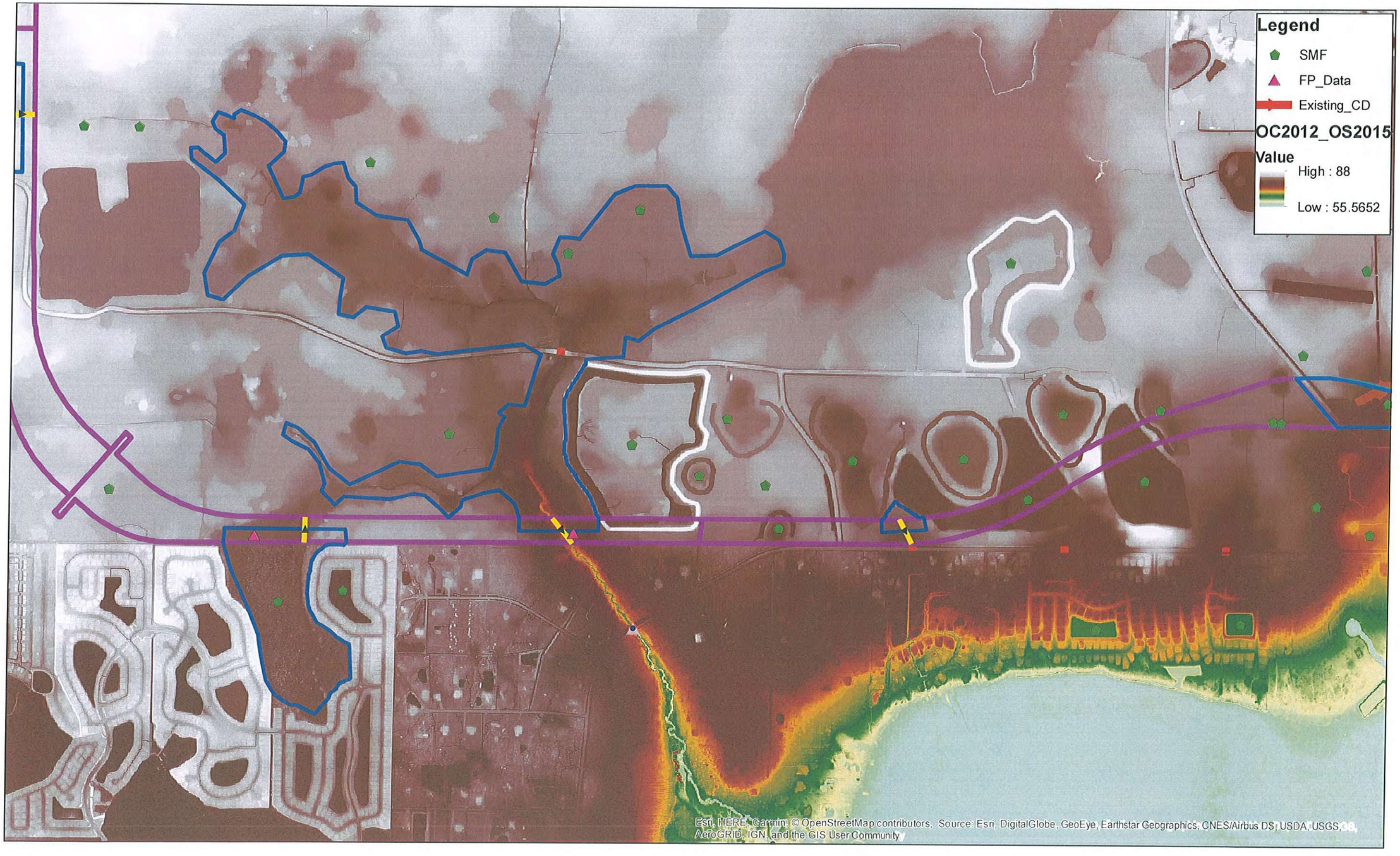


3 (8'x5')
Box Culvert
- 14' water skin
- stable
- stable upstre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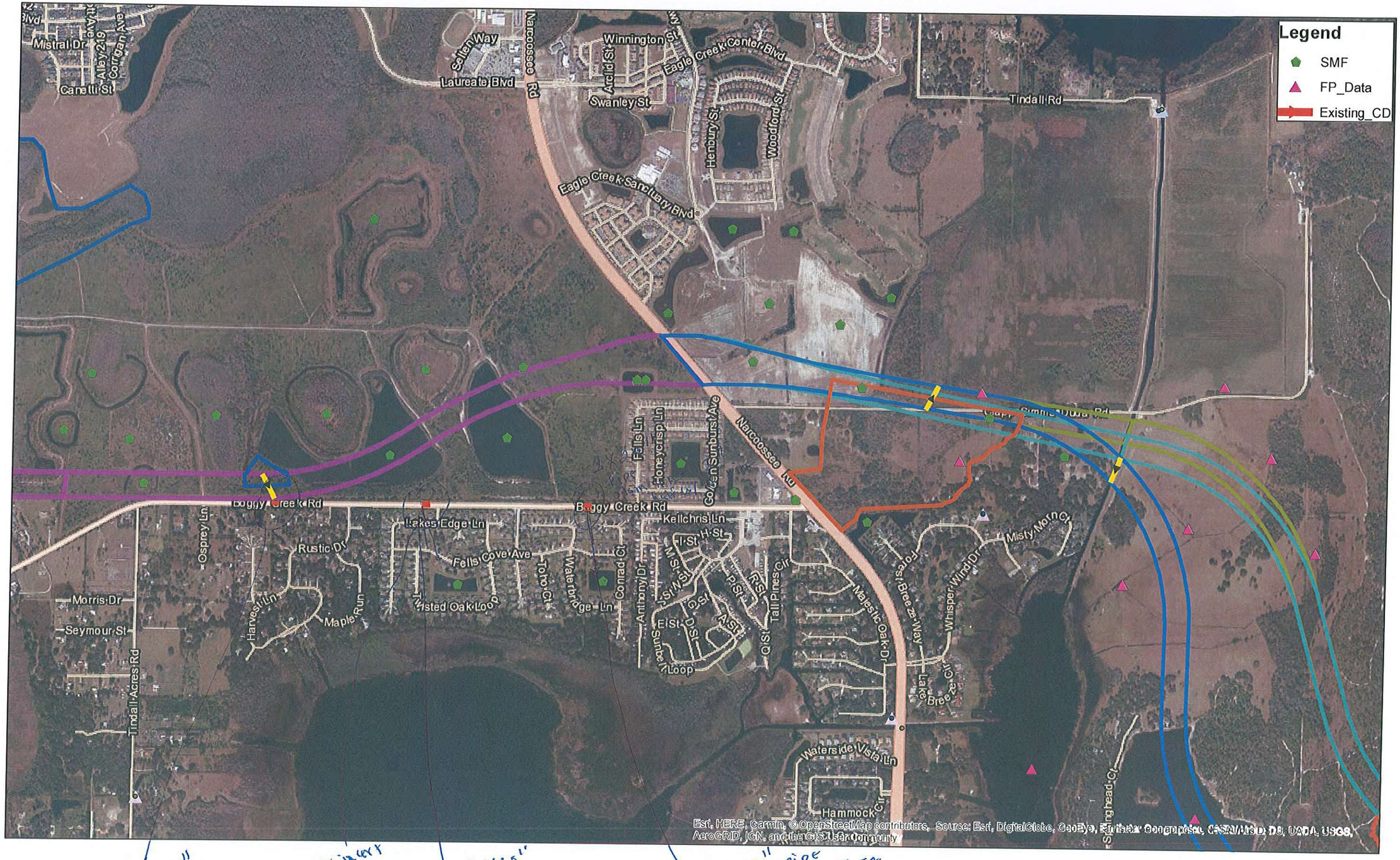
SMF
FP_Data
Existing_CD
OC2012_OS2015
Value
High : 88
Low : 55.5652
Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



2 X 30" wide wall

- Grate to invert 99"
- 36" Pipe size
- 66" soffit to top grate

2 X 30"

36"

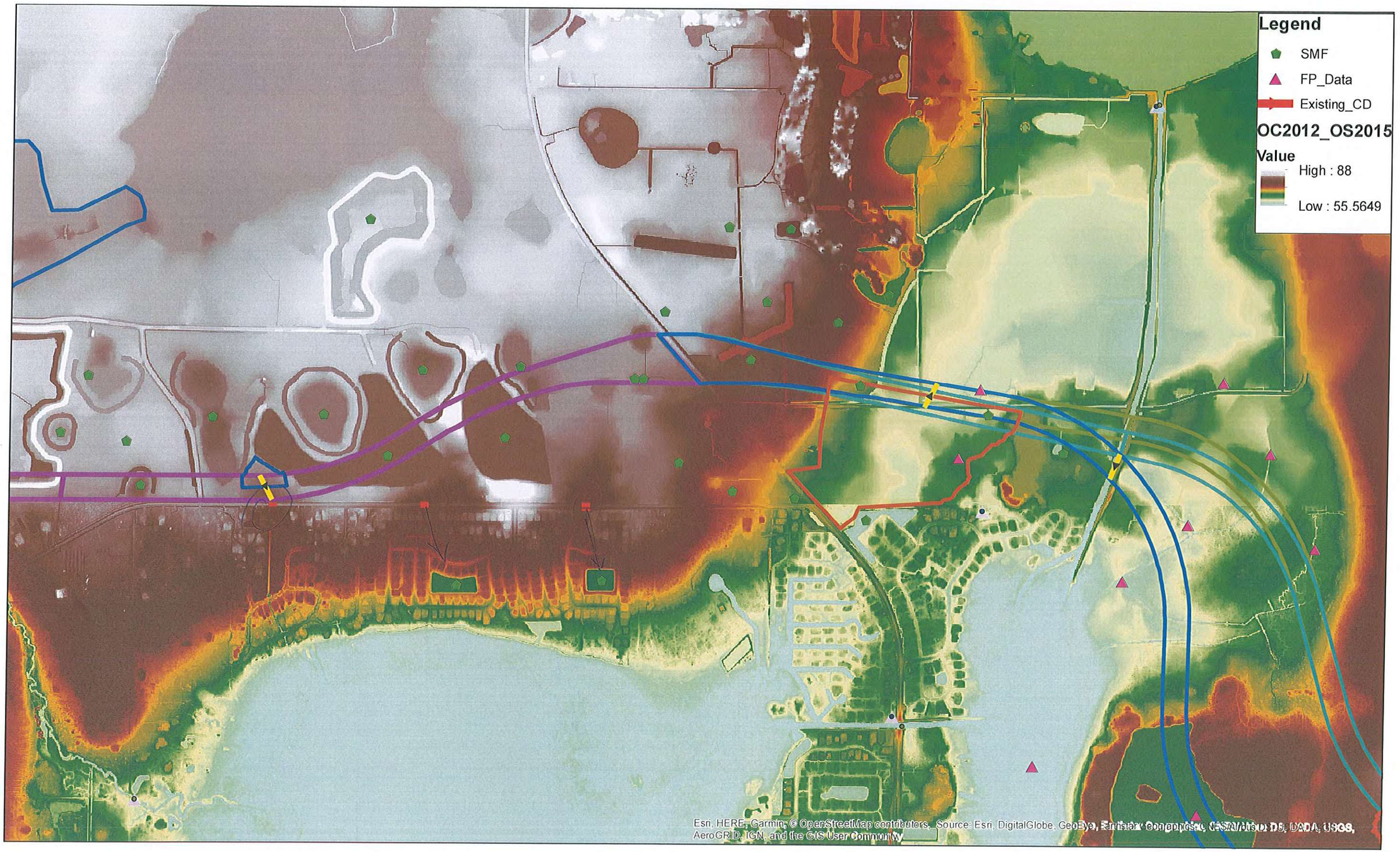
106"

w/ 22" width of concrete to the slot

Slot to bottom of Water Stain 12" / half pipe

- No BERM or Ditch

2 x 24"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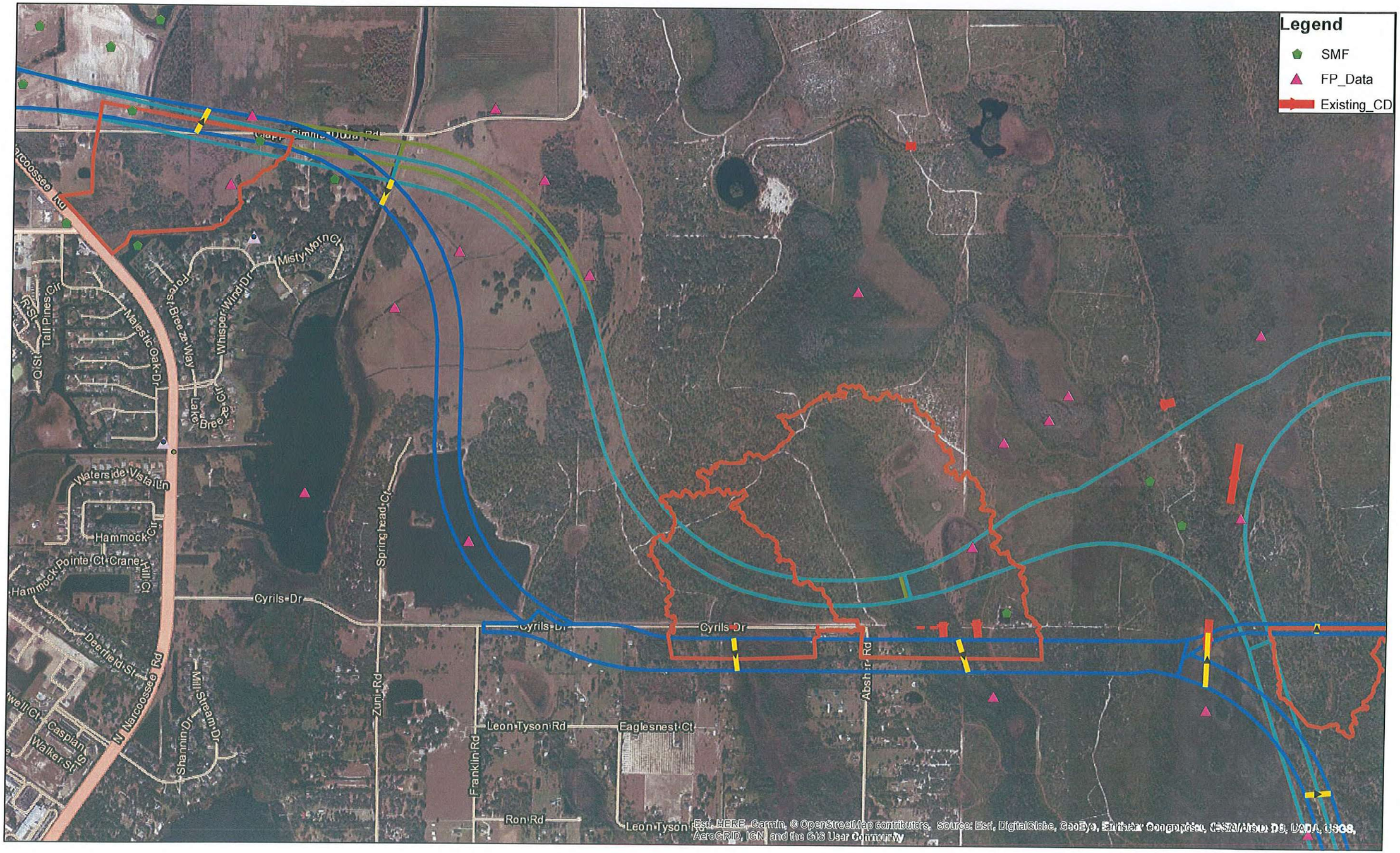
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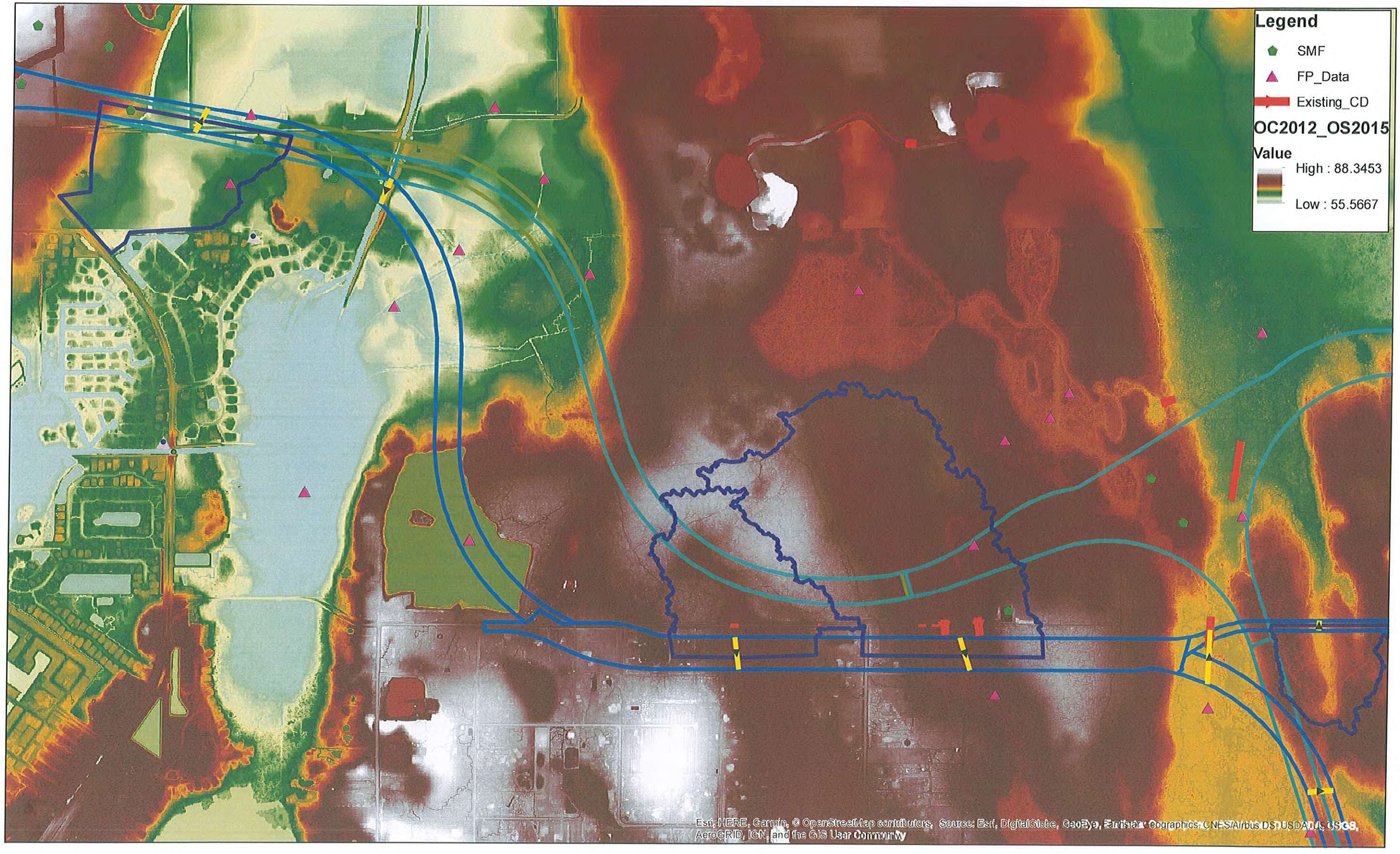
Lake Breeze Cir
Tall Pines Cir
Waterside Vista Ln
Hammock Cir
Hammock Pointe Ct
Crane Hill Cir
Springhead Ct
Cyrils Dr
Deerfield St
N Narcoossee Rd
Mill Stream Dr
Shannin Dr
Zuni Rd
Franklin Rd
Leon Tyson Rd
Eaglesnest Ct
Ron Rd
Caspian Ct
Walker St
Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community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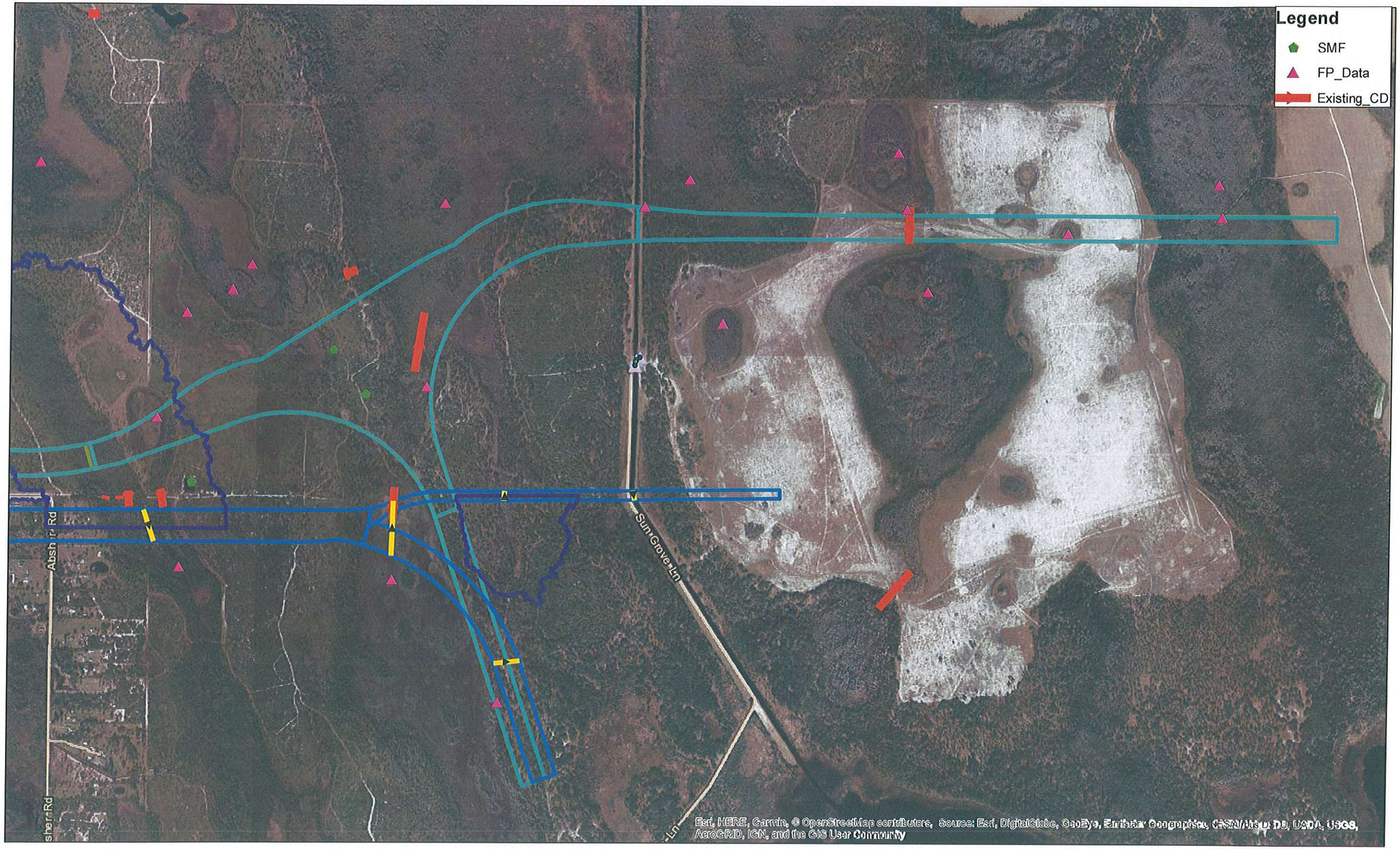
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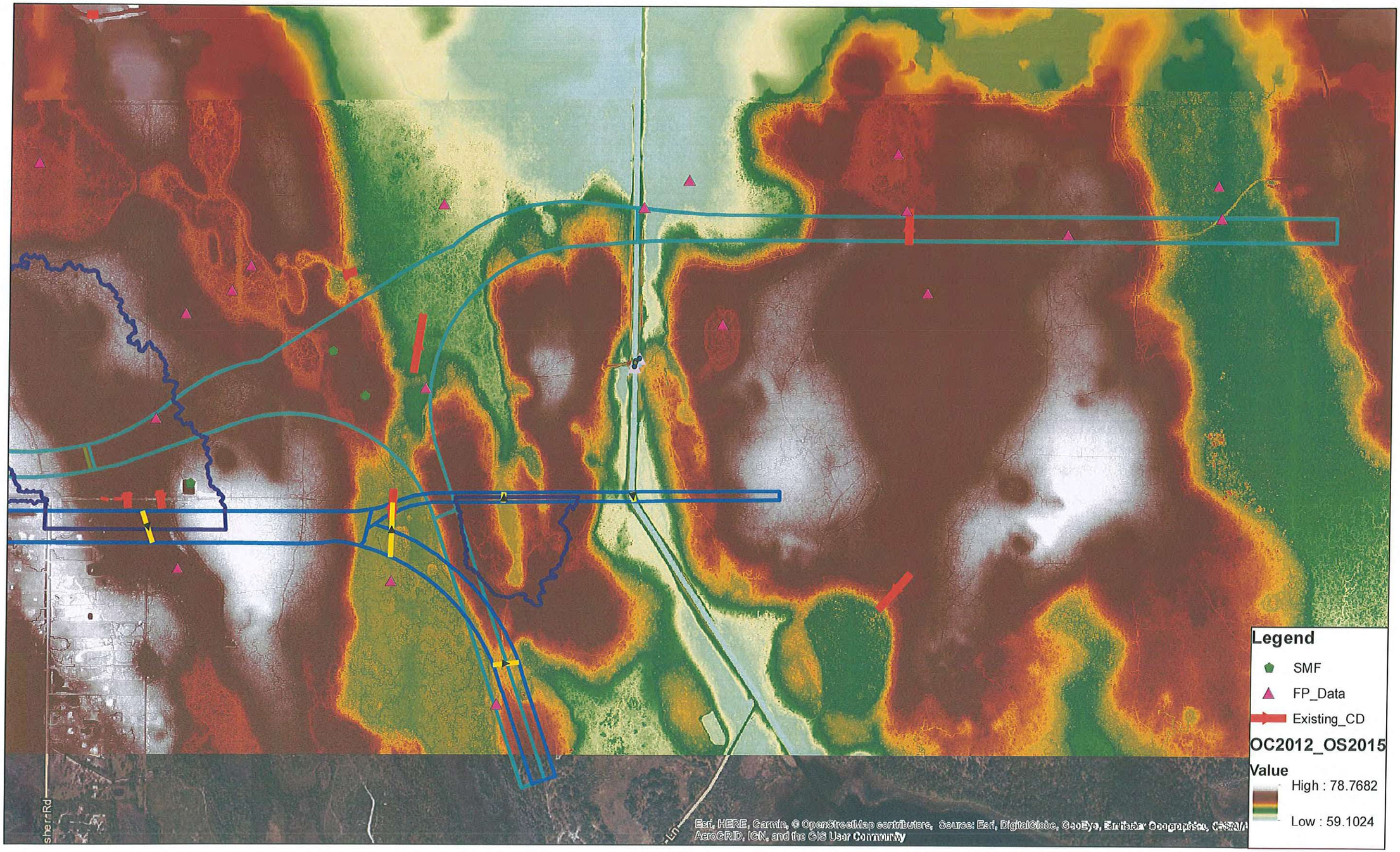
FP_Data
Existing_CD
Absher Rd
Absher Rd
Sun Grove Ln
Ln
Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community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The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

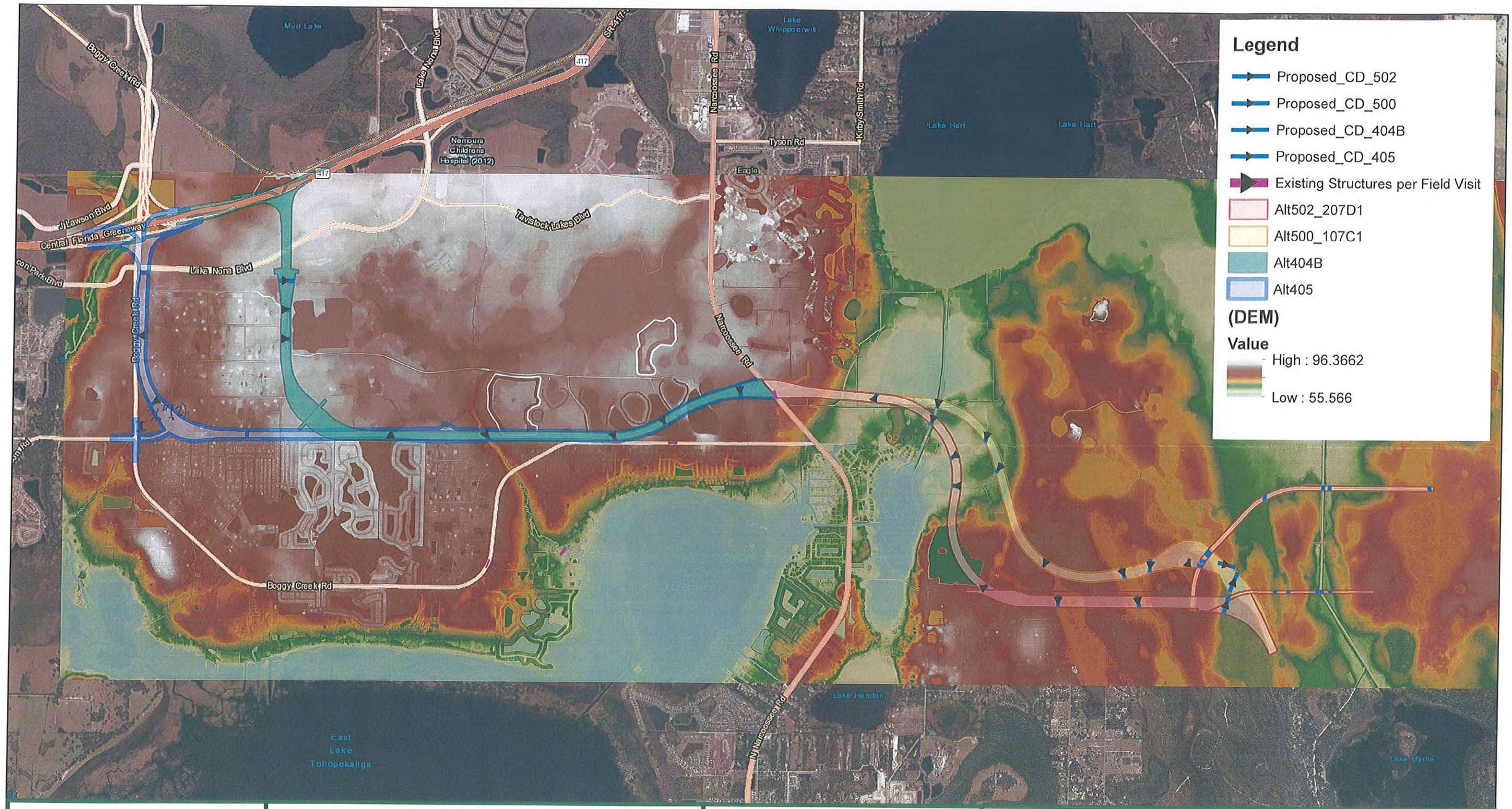
Field Sheets

0 0.35 0.7 1.4 Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018



The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

Field Sheets

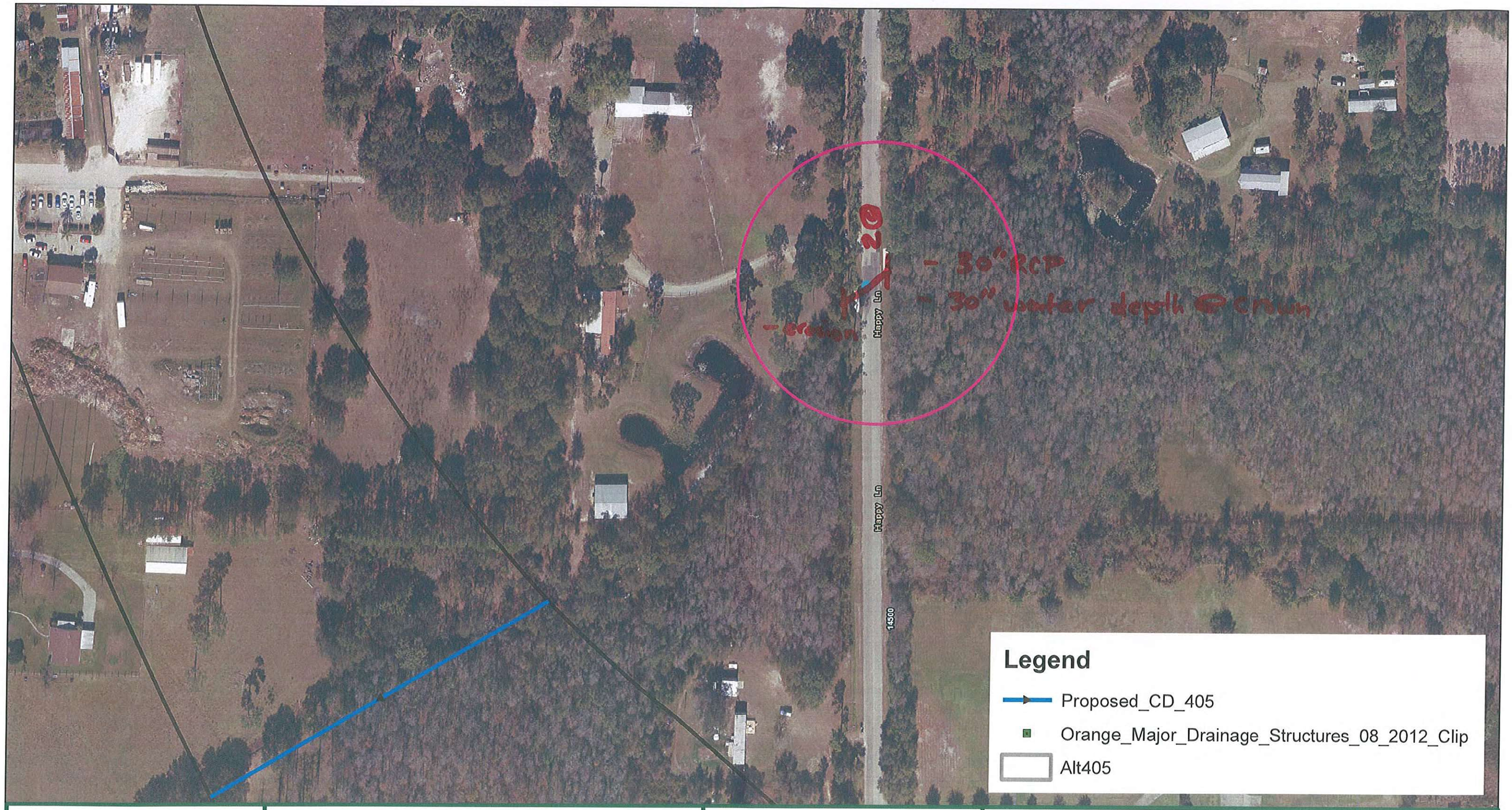
N
W E
S

0 0.35 0.7 1.4 Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018



The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

Field Sheets

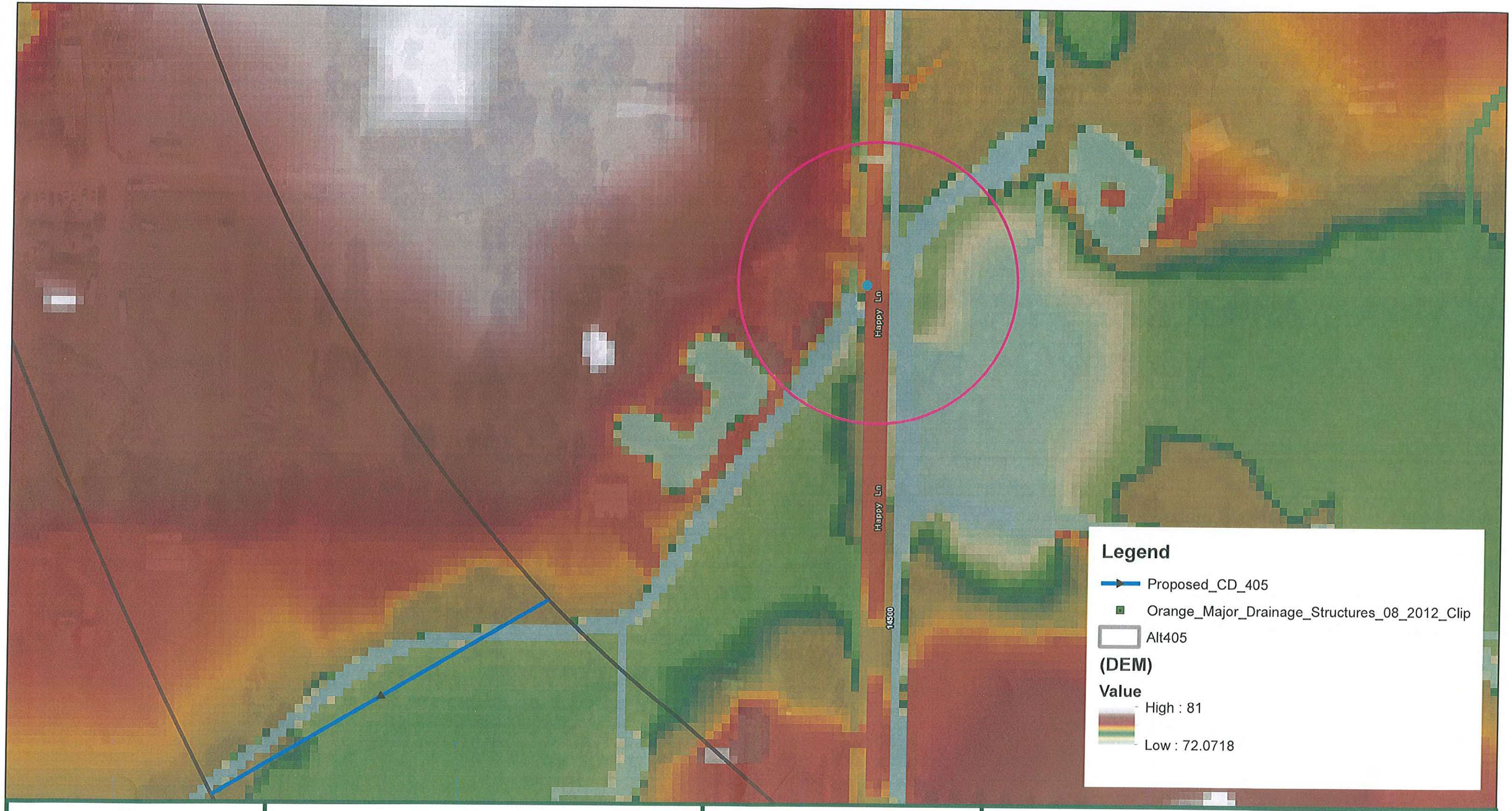
N
W E
S

0 0.01 0.02 0.04
Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018



The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

Field Sheets

N
W E
S

0 0.01 0.02 0.04
Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018

The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

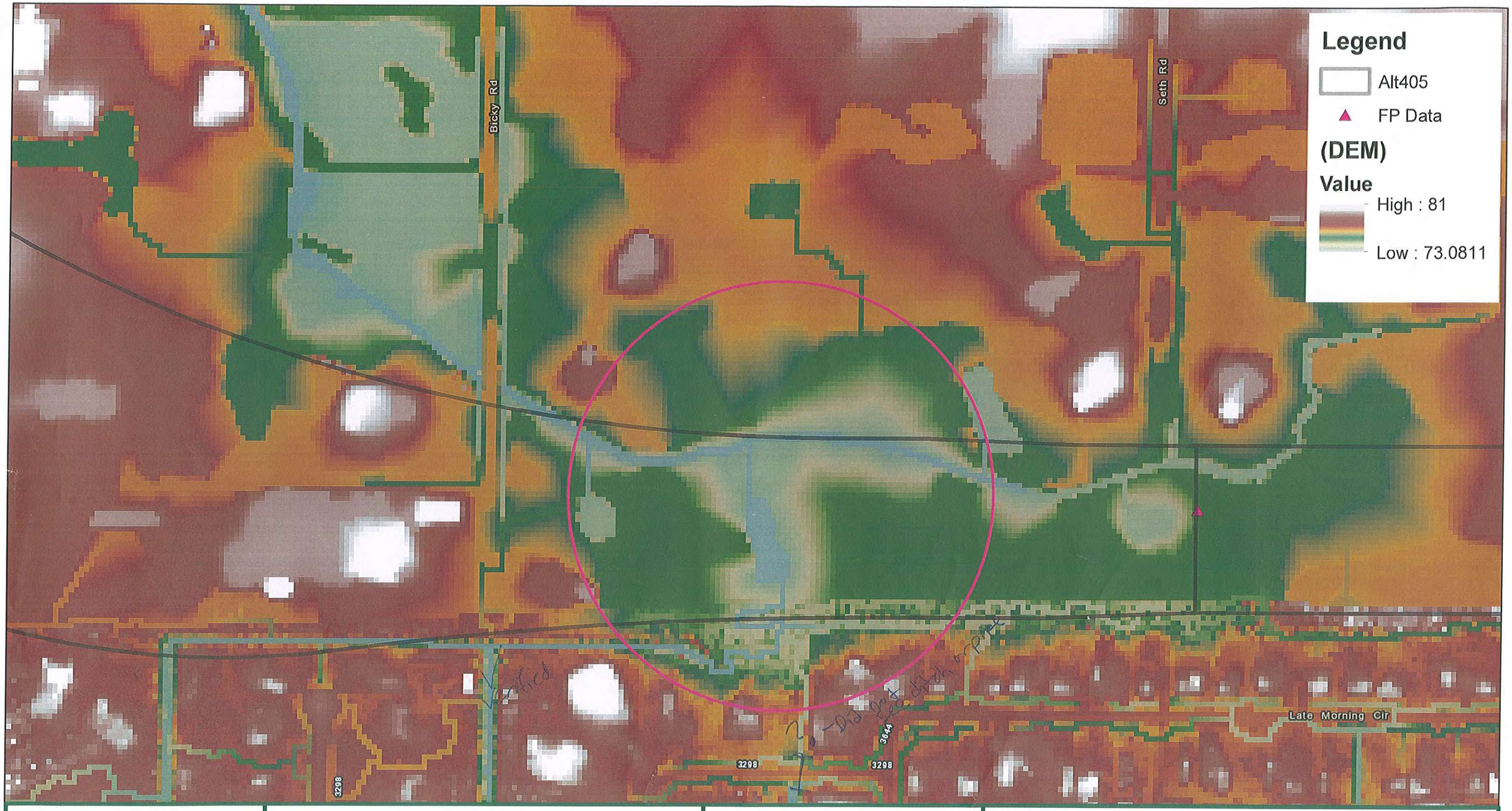
Field Sheets

N
W E
S
0 0.0175 0.035 0.07
Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018



The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

Field Sheets

N
W E
S

0 0.0175 0.035 0.07
Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018

The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

Field Sheets

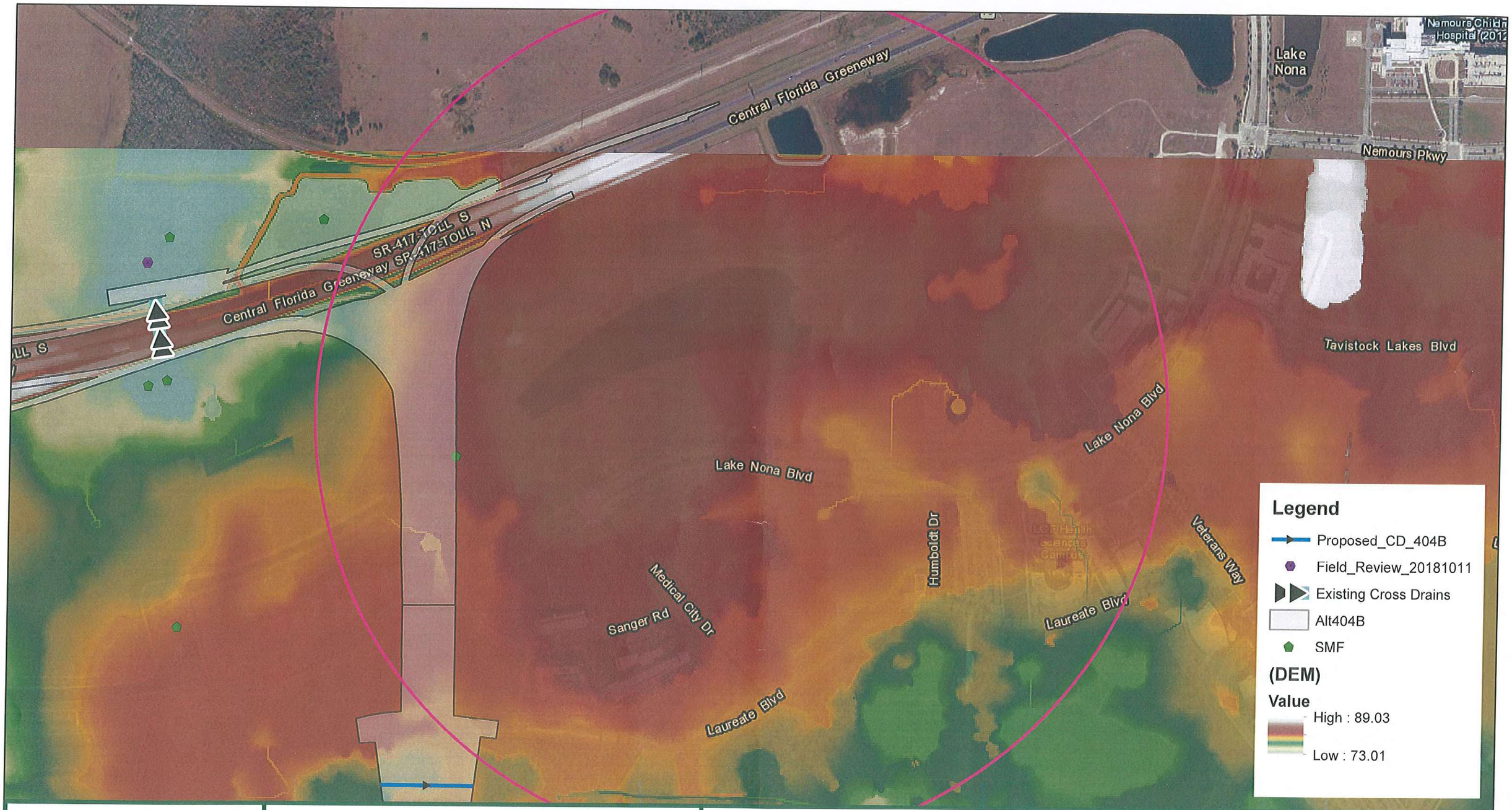
N
W E
S

0 0.05 0.1 0.2 Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018



The Balmoral Group
165 Lincoln Avenue
Winter Park, Florida 32789

Field Sheets

N
W E
S

0 0.05 0.1 0.2
Miles

Location Hydraulics
Cross Drain Methodology

OSCEOLA PARKWAY EXTENSION
CFX PD&E Study
ORANGE & OSCEOLA COUNTY, FLORIDA

12/14/2018

Appendix D

Proposed Hydrologic and Hydraulic Calculations

ALTERNATIVE 404B
SUMMARY OF FLOOD DATA

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-404-01	2 - 36 inch	47.30	80.83	57.64	81.24	--	--	--	--	88.91	82.95	0.2%	500
CD-404-02	24 inch	10.61	79.81	12.08	80.04	--	--	--	--	17.28	81.14	0.2%	500
CD-404-03	24 inch	11.38	78.96	13.19	79.29	--	--	--	--	19.30	80.75	0.2%	500
CD-404-04	3 - 42 inch	84.14	78.39	99.20	78.54	--	--	--	--	145.79	79.17	0.2%	500
CD-404-05	3 - 8' x 5' CBC	--	--	1396.47	73.26	--	--	--	--	--	--	--	--
CD-404-06	2 - 30 inch	--	--	78.88	75.92	--	--	--	--	--	--	--	--
CD-404-07	2 - 48 inch	61.30	77.28	69.81	77.37	--	--	--	--	101.13	77.77	0.2%	500

Note: For CD-404-05 & CD-404-06, the 100-year/24 hr.discharge & stage information was obtained from the Poitras East PD FEMA LOMR Report (002-17137).

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

ALTERNATIVE 405
SUMMARY OF FLOOD DATA

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-405-01	2 - 72 inch	--	--	273.81	72.00	--	--	--	--	--	--	--	--
CD-405-02	2 - 48 inch	67.35	76.56	77.98	76.75	--	--	--	--	115.49	77.65	0.2%	500
CD-405-03	3 - 38" x 60"	--	--	--	--	--	--	--	--	--	--	--	--
CD-405-04	3 - 42 inch	84.14	78.39	99.20	78.54	--	--	--	--	145.79	79.17	0.2%	500
CD-405-05	3 - 5' x 8' CBC	--	--	1354.09	73.65	--	--	--	--	--	--	--	--
CD-405-06	2 - 30 inch	--	--	78.88	75.92	--	--	--	--	--	--	--	--
CD-405-07	2 - 48 inch	61.30	77.28	69.81	77.37	--	--	--	--	101.13	77.77	0.2%	500

Note: For CD-405-01, the 100 yr/72 hr discharge & stage information from Lake Nona South ERP 130822-7 (Node Boggy Creek Pre). For CD-405-05 (Node JB-4) & CD-405-06 (Node W-36), the 100-year/24 hr.discharge & stage information was obtained from the Poitras East PD FEMA LOMR Report (002-17137). No available permit information for CD-405-03.

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

ALTERNATIVE 500 107C-1
SUMMARY OF FLOOD DATA

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-500-01	2 - 42 inch	63.20	63.52	73.34	63.70	--	--	--	--	108.77	64.54	0.2%	500
CD-500-02	Bridge	--	--	--	--	--	--	--	--	--	--	--	--
CD-500-03	3 - 42 inch	85.87	61.98	96.31	62.10	--	--	--	--	137.46	62.73	0.2%	500
CD-500-04	2 - 48 inch	72.03	61.89	79.22	61.97	--	--	--	--	111.36	62.43	0.2%	500
CD-500-05	36 inch	19.87	73.70	22.47	73.81	--	--	--	--	32.44	74.37	0.2%	500
CD-500-06	2 - 36 inch	46.50	71.20	--	--	--	--	--	--	--	--	--	--
CD-500-07	36 inch	21.49	71.11	24.78	71.44	--	--	--	--	36.24	72.96	0.2%	500
CD-500-08	6 - 3' x 6' CBC	292.00	65.50	--	--	--	--	--	--	--	--	--	--

Note: For CD-500-06, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED10 C Pre). For CD-500-08, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED15-2C Pre).

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

ALTERNATIVE 502 207D-1
SUMMARY OF FLOOD DATA

STRUCTURE NO.	Cross Drain Size	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB	50 YR FREQ	1% PROB	100 YR FREQ								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB %	FREQ YR	DISCHARGE	STAGE	PROB %	FREQ YR
CD-502-01	2 - 42 inch	63.20	63.52	73.34	63.70	--	--	--	--	108.77	64.54	0.2%	500
CD-502-02	Bridge	--	--	--	--	--	--	--	--	--	--	--	--
CD-502-03	4 - 42 inch	119.67	61.95	134.08	62.07	--	--	--	--	191.37	62.66	0.2%	500
CD-502-04	6 - 48 inch	218.02	61.85	244.30	61.94	--	--	--	--	364.43	62.48	0.2%	500
CD-502-05	2 - 42 inch	62.50	71.40	70.41	71.54	--	--	--	--	101.51	72.23	0.2%	500
CD-502-06	2 - 36 inch	51.22	61.01	59.86	61.19	161.07	65.50	0.21%	479	--	--	--	--
CD-502-07	2 - 36 inch	46.50	71.20	--	--	--	--	--	--	--	--	--	--
CD-502-08	6 - 3' x 6' CBC	292.00	65.50	--	--	--	--	--	--	--	--	--	--

Note: For CD-502-07, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED10 C Pre). For CD-502-08, the 50 yr/24 hr discharge & stage information from Sunbridge NED ERP 180209-328 (Node NED15-2C Pre).

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND (CFS) AND STAGES ARE IN FEET, NAVD 88.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/04/19

LOCATION: Osceola and Orange County, Florida **CHECKED:** AE **DATE:** 06/04/19

Table B.1 - Proposed Offsite Conveyance Summary

Cross Drain Name	Required Minimum Size	Design Flow (cfs)	Basin Area	Method	Notes
CD-405-01	2 - 72 inch	--	--	Match Exist.	EX-18
CD-405-02	2 - 48 inch	67.35	115.73 acres	Rational	
CD-405-03	3 - 38" x 60"	--	--	Match Exist.	EX-35
CD-405-04, CD-404-04	3 - 42 inch	84.14	--	Match Exist. Flows	Flow from FEMA LOMR 002-17137
CD-405-05, CD-404-05	3 - 5' x 8' CBC	--	--	Match Exist.	EX-12
CD-405-06, CD-404-06	2 - 30 inch	--	--	Match Exist.	EX-13
CD-405-07, CD-404-07	2 - 48 inch	61.30	66.26 acres	Rational	
CD-404-01	2 - 36 inch	47.30	35.65 acres	Rational	
CD-404-02	24 inch	10.61	5.78 acres	Rational	
CD-404-03	24 inch	11.38	8.51 acres	Rational	
CD-500-02	Bridge	--	--	--	Bridge over SFWMD ROW
CD-500-03	3 - 42 inch	85.87	78.97 acres	Rational	
CD-500-04	2 - 48 inch	72.03	96.03 acres	Rational	
CD-500-05	36 inch	19.87	21.92 acres	Rational	
CD-500-06	2 - 36 inch	--	--	Match Exist.	F-22
CD-500-07	36 inch	21.49	17.70 acres	Rational	
CD-500-08	6 - 3' x 6' CBC	--	--	Match Exist.	F-26
CD-500-01, CD-502-01	2 - 42 inch	63.20	48.85 acres	Rational	
CD-502-02	Bridge	--	--	--	Bridge over SFWMD ROW
CD-502-03	4 - 42 inch	119.67	156.37 acres	Rational	
CD-502-04	6 - 48 inch	218.02	432.02 acres	Rational	Receiving flow from CD-502-05
CD-502-05	2 - 42 inch	62.50	72.00 acres	Rational	
CD-502-06	2 - 36 inch	51.22	70.42 acres	Rational	
CD-502-07	2 - 36 inch	--	--	Match Exist.	F-22
CD-502-08	6 - 3' x 6' CBC	--	--	Match Exist.	F-25

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/03/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-405-02
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	156.4

Basin Runoff Calculations

Total Contributing Area (acres)	115.73
Pervious Contributing Area (acres)	110.27
Impervious Contributing Area (acres)	5.46
Weighted Runoff Coefficient[1]	0.28

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	2.06	2.29	N/A
Peak Flow (cfs)	67.35	77.98	115.49

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

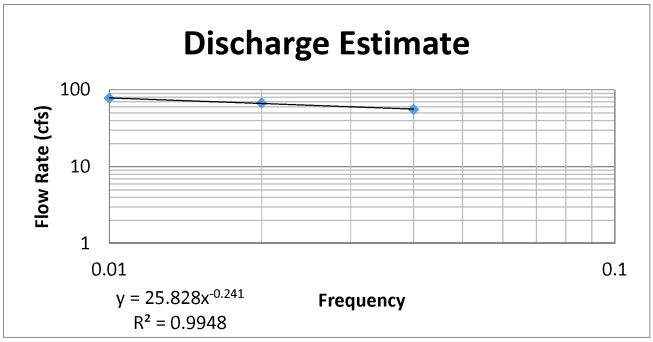
Tailwater Elevation/Source	76.0	*Crown of pipe at ground elevation.*
Minimum Elevation at Edge of Travel Lane	81.0	*Assumed 5-ft above crown*
Upstream Culvert Invert	72.0	
Downstream Culvert Invert	71.8	
Culvert length	290	
Upstream Est. SHWL Elev (ft-NAVD88)	75.0	
Upstream Est. Ground Elev (ft-NAVD88)	76.0	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*22.5 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	2 - 48 inch	
Recommended Culvert Size's Conveyance Area	*25.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 25.828
B= 0.241
y= **115.49 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/03/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-405-04, CD-404-04

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	--	--	--
Peak Flow (cfs)	84.14	99.20	145.79

(100-yr flow derived from 002 - 17137 - Poitras East PD FEMA LOMR Report)
Assumed The Design Storm increase a factor of 1.179 for the 100-year & 1.733 for the 500-yr (from surrounding basins)

Cross Drain Sizing Calculations

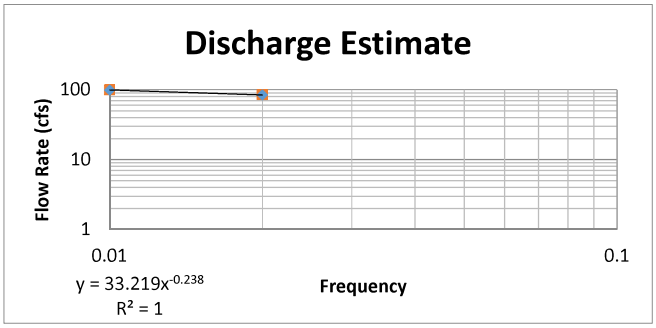
Tailwater Elevation/Source	78.0	*BFE Elevation*
Minimum Elevation at Edge of Travel Lane	83.0	*Assumed 5-ft above crown*
Upstream Culvert Invert	74.5	
Downstream Culvert Invert	74.3	
Culvert length	290	
Upstream Est. SHWL Elev (ft-NAVD88)	76.2	
Upstream Est. Ground Elev (ft-NAVD88)	75.7	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*28.0 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	3 - 42 inch	
Recommended Culvert Size's Conveyance Area	*28.9 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 33.219
B= 0.238
y= **145.79 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:
[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2017).
[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.
[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/04/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/04/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-405-07, CD-404-07
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	81.0

Basin Runoff Calculations

Total Contributing Area (acres)	66.26
Pervious Contributing Area (acres)	63.80
Impervious Contributing Area (acres)	2.46
Weighted Runoff Coefficient[1]	0.27

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	3.38	3.70	N/A
Peak Flow (cfs)	61.30	69.81	101.13

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

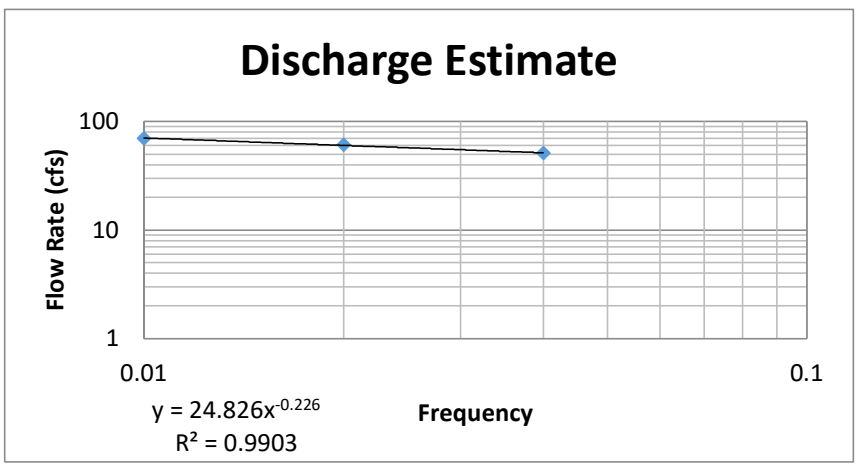
Tailwater Elevation/Source	77.0	*Crown of pipe at ground elevation.*
Minimum Elevation at Edge of Travel Lane	82.0	*Assumed 5-ft above crown*
Upstream Culvert Invert	73.0	
Downstream Culvert Invert	72.8	
Culvert length	372	
Upstream Est. SHWL Elev (ft-NAVD88)	75.8	
Upstream Est. Ground Elev (ft-NAVD88)	77.1	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*20.4 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	2.0 - 48 inch	
Recommended Culvert Size's Conveyance Area	*25.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 24.826
B= 0.226
y= **101.13 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT:	CFX LHR: Osceola Parkway Extension	**PREPARED:**	MP	**DATE:**	06/03/19
LOCATION:	Osceola & Orange County, Florida	**CHECKED:**	AE	**DATE:**	06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-404-01
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	45.7

Basin Runoff Calculations

Total Contributing Area (acres)	35.65
Pervious Contributing Area (acres)	34.18
Impervious Contributing Area (acres)	1.47
Weighted Runoff Coefficient[1]	0.28

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	4.79	5.60	N/A
Peak Flow (cfs)	47.30	57.64	88.91

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

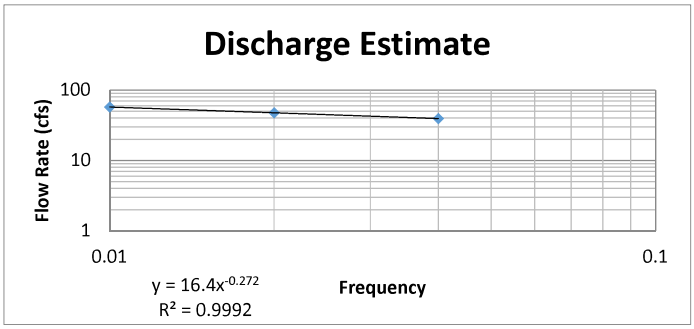
Tailwater Elevation/Source	80.00	*BFE Elevation*
Minimum Elevation at Edge of Travel Lane	85.0	*Assumed 5-ft above crown*
Upstream Culvert Invert	77.0	
Downstream Culvert Invert	76.7	
Culvert length	539	
Upstream Est. SHWL Elev (ft-NAVD88)	79.0	
Upstream Est. Ground Elev (ft-NAVD88)	78.0	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*15.8 sf*	$A = \frac{Q}{V} = (\frac{50\text{-}yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	2 - 36 inch	
Recommended Culvert Size's Conveyance Area	*14.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

$x = \sqrt[B]{\frac{A}{y}}$

A= 16.4
B= 0.272
y= **88.91 cfs**
x= 0.002



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT:	CFX LHR: Osceola Parkway Extension	**PREPARED:**	MP	**DATE:**	06/03/19
LOCATION:	Osceola & Orange County, Florida	**CHECKED:**	AE	**DATE:**	06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-404-02
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	17.4

Basin Runoff Calculations

Total Contributing Area (acres)	5.78
Pervious Contributing Area (acres)	5.73
Impervious Contributing Area (acres)	0.05
Weighted Runoff Coefficient[1]	0.25

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	7.41	8.10	N/A
Peak Flow (cfs)	10.61	12.08	17.28

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

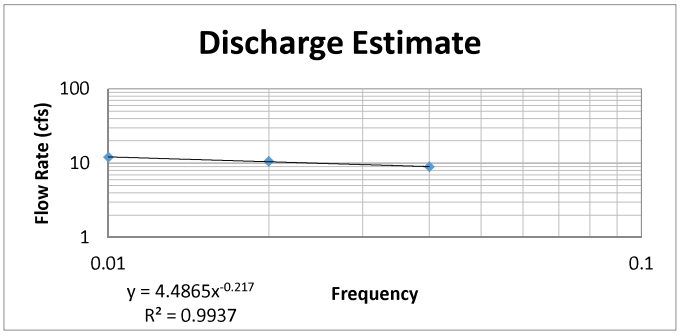
Tailwater Elevation/Source	79.00	*Crown of pipe at ground elevation.*
Minimum Elevation at Edge of Travel Lane	84.0	*Assumed 5-ft above crown*
Upstream Culvert Invert	77.0	
Downstream Culvert Invert	76.8	
Culvert length	290	
Upstream Est. SHWL Elev (ft-NAVD88)	77.0	
Upstream Est. Ground Elev (ft-NAVD88)	79.0	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*3.5 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	1 - 24 inch	
Recommended Culvert Size's Conveyance Area	*3.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 4.4865
B= 0.217
y= **17.28 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT:	CFX LHR: Osceola Parkway Extension	**PREPARED:**	MP	**DATE:**	06/03/19
LOCATION:	Osceola & Orange County, Florida	**CHECKED:**	AE	**DATE:**	06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-404-03
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	33.9

Basin Runoff Calculations

Total Contributing Area (acres)	8.51
Pervious Contributing Area (acres)	8.51
Impervious Contributing Area (acres)	0.00
Weighted Runoff Coefficient[1]	0.24

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	5.57	6.20	N/A
Peak Flow (cfs)	11.38	13.19	19.30

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

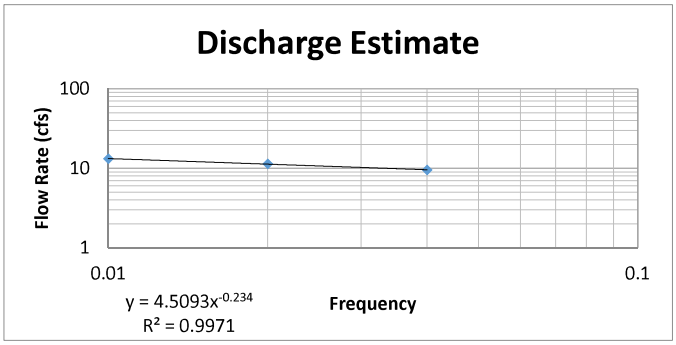
Tailwater Elevation/Source	79.00	*Crown of pipe at ground elevation.*
Minimum Elevation at Edge of Travel Lane	82.08	*Assumed 5-ft above crown*
Upstream Culvert Invert	77.0	
Downstream Culvert Invert	76.8	
Culvert length	304	
Upstream Est. SHWL Elev (ft-NAVD88)	77.0	
Upstream Est. Ground Elev (ft-NAVD88)	79.0	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*3.8 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	1 - 24 inch	
Recommended Culvert Size's Conveyance Area	*3.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 4.5093
B= 0.234
y= **19.30 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/03/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-500-03
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	60.2

Basin Runoff Calculations

Total Contributing Area (acres)	78.97
Pervious Contributing Area (acres)	76.68
Impervious Contributing Area (acres)	2.29
Weighted Runoff Coefficient[1]	0.27

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	4.09	4.40	N/A
Peak Flow (cfs)	85.87	96.31	137.46

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

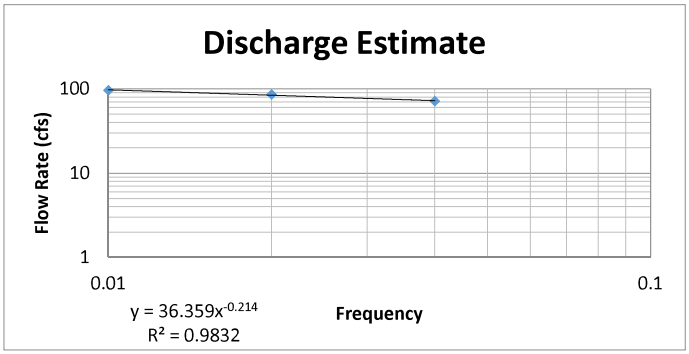
Tailwater Elevation/Source	61.50	*Estimated 100-yr Elevation*
Minimum Elevation at Edge of Travel Lane	66.5	*Assumed 5-ft above crown*
Upstream Culvert Invert	58.0	
Downstream Culvert Invert	57.8	
Culvert length	397	
Upstream Est. SHWL Elev (ft-NAVD88)	60.0	
Upstream Est. Ground Elev (ft-NAVD88)	62.0	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*28.6 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	3 - 42 inch	
Recommended Culvert Size's Conveyance Area	*28.9 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 36.359
B= 0.214
y= **137.46 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/03/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-500-04
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	91.00

Basin Runoff Calculations

Total Contributing Area (acres)	96.03
Pervious Contributing Area (acres)	96.03
Impervious Contributing Area (acres)	0.00
Weighted Runoff Coefficient[1]	0.24

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	3.13	3.30	N/A
Peak Flow (cfs)	72.03	79.22	111.36

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

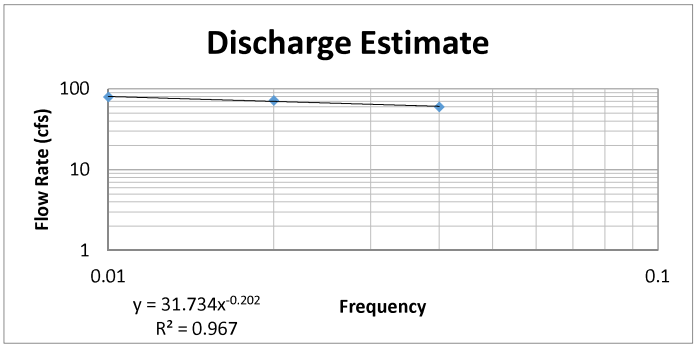
Tailwater Elevation/Source	61.50	*Estimated 100-yr Elevation*
Minimum Elevation at Edge of Travel Lane	66.5	*Assumed 5-ft above crown*
Upstream Culvert Invert	57.5	
Downstream Culvert Invert	57.3	
Culvert length	371	
Upstream Est. SHWL Elev (ft-NAVD88)	59.0	
Upstream Est. Ground Elev (ft-NAVD88)	61.8	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*24.0 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	2 - 48 inch	
Recommended Culvert Size's Conveyance Area	*25.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 31.734
B= 0.202
y= **111.36 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B 5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT:	CFX LHR: Osceola Parkway Extension	**PREPARED:**	MP	**DATE:**	06/03/19
LOCATION:	Osceola & Orange County, Florida	**CHECKED:**	AE	**DATE:**	06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-500-05
Affected Corridor(s)	
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	68.5

Basin Runoff Calculations

Total Contributing Area (acres)	21.92
Pervious Contributing Area (acres)	21.92
Impervious Contributing Area (acres)	0.00
Weighted Runoff Coefficient [1]	0.24

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event [2]	50-year	100-year	500-yr
Intensity (in/hr) [3]	3.78	4.10	N/A
Peak Flow (cfs)	19.87	22.47	32.44

Cross Drain Sizing Calculations

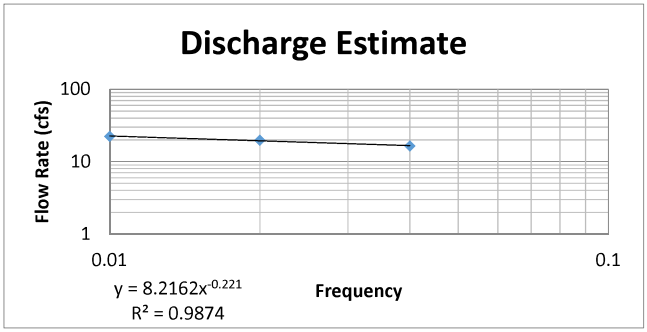
Tailwater Elevation/Source	73.3	*Estimated 100-yr Elevation*
Minimum Elevation at Edge of Travel Lane	78.3	*Assumed 5-ft above crown*
Upstream Culvert Invert	70.3	
Downstream Culvert Invert	70.1	
Culvert length	290.0	
Upstream Est. SHWL Elev (ft-NAVD88)	70.2	
Upstream Est. Ground Elev (ft-NAVD88)	71.6	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*6.6 sf*	$A = \frac{Q}{V} = (\frac{50\text{-}yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	1 - 36 inch	
Recommended Culvert Size's Conveyance Area	*7.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 8.2162
B= 0.221
y= **32.44 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2017).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/03/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-500-07
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	41.15

Basin Runoff Calculations

Total Contributing Area (acres)	17.70
Pervious Contributing Area (acres)	17.70
Impervious Contributing Area (acres)	0.00
Weighted Runoff Coefficient[1]	0.24

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	5.06	5.60	N/A
Peak Flow (cfs)	21.49	24.78	36.24

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

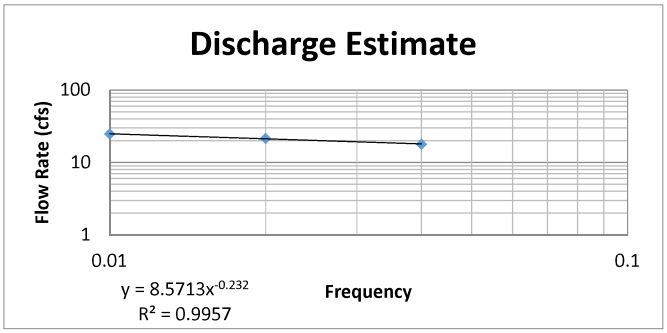
Tailwater Elevation/Source	70.10	*FEMA BFE*
Minimum Elevation at Edge of Travel Lane	75.1	*Assumed 5-ft above crown*
Upstream Culvert Invert	67.1	
Downstream Culvert Invert	66.6	
Culvert length	900	
Upstream Est. SHWL Elev (ft-NAVD88)	69.0	
Upstream Est. Ground Elev (ft-NAVD88)	69.5	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*7.2 sf*	$A = \frac{Q}{V} = (\frac{50\text{-}yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	1 - 36 inch	
Recommended Culvert Size's Conveyance Area	*7.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

A= 8.5713
B= 0.232
y= **36.24 cfs**
x= 0.002

$x = \sqrt[B]{\frac{A}{y}}$



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT:	CFX LHR: Osceola Parkway Extension	**PREPARED:**	MP	**DATE:**	06/03/19
LOCATION:	Osceola and Orange County, Florida	**CHECKED:**	AE	**DATE:**	06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-500-01, CD-502-01
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	74.09

Basin Runoff Calculations

Total Contributing Area (acres)	48.85
Pervious Contributing Area (acres)	42.32
Impervious Contributing Area (acres)	6.53
Weighted Runoff Coefficient[1]	0.36

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	3.59	4.00	N/A
Peak Flow (cfs)	63.20	73.34	108.77

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

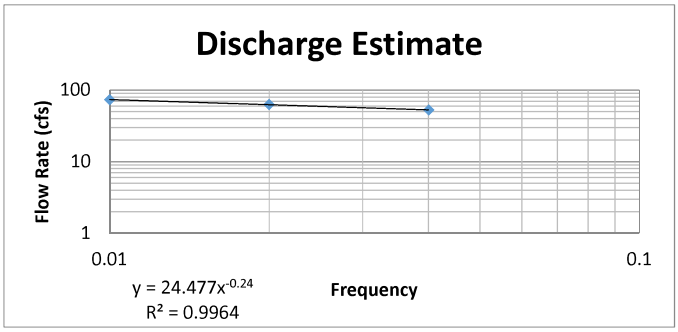
Tailwater Elevation/Source	63.0	*FEMA BFE*
Minimum Elevation at Edge of Travel Lane	68.0	*Assumed 5-ft above crown*
Upstream Culvert Invert	58.1	
Downstream Culvert Invert	57.9	
Culvert length	320	
Upstream Est. SHWL Elev (ft-NAVD88)	57.0	
Upstream Est. Ground Elev (ft-NAVD88)	58.1	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*21.1 sf*	$A = \frac{Q}{V} = (\frac{50\text{-}yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	2 - 42 inch	
Recommended Culvert Size's Conveyance Area	*19.2 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

$x = \sqrt[B]{\frac{A}{y}}$

A= 19.309
B= 0.308
y= **130.93 cfs**
x= 0.002



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT:	CFX LHR: Osceola Parkway Extension	**PREPARED:**	MP	**DATE:**	06/03/19
LOCATION:	Osceola & Orange County, Florida	**CHECKED:**	AE	**DATE:**	06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-502-03
Affected Corridor(s)	
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	97.53

Basin Runoff Calculations

Total Contributing Area (acres)	156.37
Pervious Contributing Area (acres)	153.38
Impervious Contributing Area (acres)	2.99
Weighted Runoff Coefficient [1]	0.26

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event [2]	50-year	100-year	500-yr
Intensity (in/hr) [3]	2.98	3.20	N/A
Peak Flow (cfs)	119.67	134.08	191.37

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

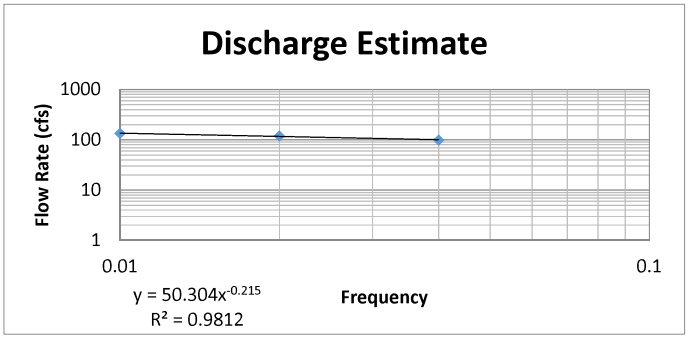
Tailwater Elevation/Source	61.50	*Estimated 100-year Elevation*
Minimum Elevation at Edge of Travel Lane	66.5	*Assumed 5-ft above crown*
Upstream Culvert Invert	58.0	
Downstream Culvert Invert	57.8	
Culvert length	306	
Upstream Est. SHWL Elev (ft-NAVD88)	58.0	
Upstream Est. Ground Elev (ft-NAVD88)	59.5	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*39.9 sf*	$A = \frac{Q}{V} = (\frac{50\text{-}yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	4 - 42 inch	
Recommended Culvert Size's Conveyance Area	*38.5 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

$x = \sqrt[B]{\frac{A}{y}}$

A= 50.304
B= 0.215
y= **191.37 cfs**
x= 0.002



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension PREPARED: MP DATE: 06/03/19
LOCATION: Osceola & Orange County, Florida CHECKED: AE DATE: 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-502-04
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	238.5

Basin Runoff Calculations

Total Contributing Area (acres)	432.02
Pervious Contributing Area (acres)	432.02
Impervious Contributing Area (acres)	0.00
Weighted Runoff Coefficient[1]	0.24

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	1.50	1.61	N/A
Peak Flow (cfs)	155.53	173.89	262.92

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Total Contributing Flow Calculations

Flows from CD-502-05 (cfs)	62.50	*CD-502-05 (50-yr Storm)*
	70.41	*CD-502-05 (100-yr Storm)*
	101.51	*CD-502-05 (500-yr Storm)*
Total Design Peak Flow (cfs)	218.02	
Total Base Flow (cfs)	244.30	
Total Greatest Flow (cfs)	364.43	

Cross Drain Sizing Calculations

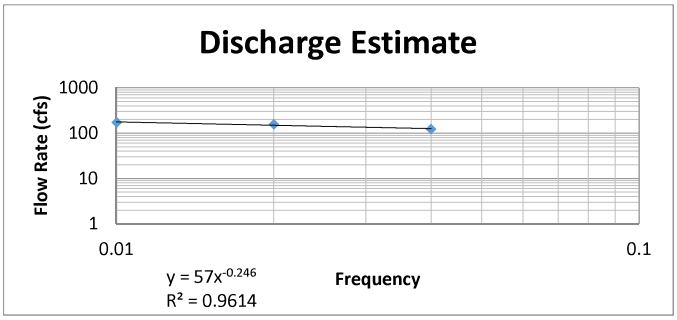
Tailwater Elevation/Source	61.5	*Estimated 100-yr Elevation*
Minimum Elevation at Edge of Travel Lane	66.5	*Assumed 5-ft above crown*
Upstream Culvert Invert	57.5	
Downstream Culvert Invert	57.3	
Culvert length	290	
Upstream Est. SHWL Elev (ft-NAVD88)	58.0	
Upstream Est. Ground Elev (ft-NAVD88)	58.9	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*72.7 sf*	$A = \frac{Q}{V} = (\frac{50\text{-}yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	6 - 48 inch	
Recommended Culvert Size's Conveyance Area	*75.4 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

$x = \sqrt[B]{\frac{A}{y}}$

A= 57
B= 0.246
y= **262.92 cfs**
x= 0.002



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/03/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-502-05
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	102.70

Basin Runoff Calculations

Total Contributing Area (acres)	72.0
Pervious Contributing Area (acres)	67.0
Impervious Contributing Area (acres)	5.0
Weighted Runoff Coefficient[1]	0.30

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	2.87	3.10	N/A
Peak Flow (cfs)	62.50	70.41	101.51

(Used 500-year Log-Log graph to obtain basin runoff flow rate)

Cross Drain Sizing Calculations

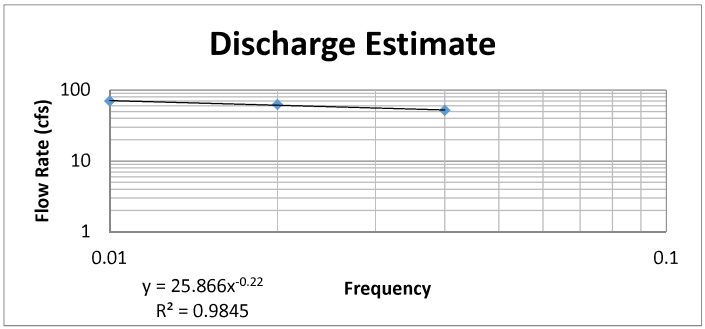
Tailwater Elevation/Source	70.90	*Existing ground elevation*
Minimum Elevation at Edge of Travel Lane	75.9	*Assumed 5-ft above crown*
Upstream Culvert Invert	67.4	
Downstream Culvert Invert	67.2	
Culvert length	316	
Upstream Est. SHWL Elev (ft-NAVD88)	61.0	
Upstream Est. Ground Elev (ft-NAVD88)	70.9	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*20.8 sf*	$A = \frac{Q}{V} = (\frac{50\text{-}yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	2 - 42 inch	
Recommended Culvert Size's Conveyance Area	*19.2 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

$x = \sqrt[B]{\frac{A}{y}}$

A= 25.866
B= 0.22
y= **101.51 cfs**
x= 0.002



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2019).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/03/19
LOCATION: Osceola & Orange County, Florida **CHECKED:** AE **DATE:** 06/03/19

Table B.5 - Proposed Offsite Conveyance Calculations

Cross Drain Name	CD-502-06
FDOT IDF Precipitation Zone	7
Pervious C-Value	0.2
Impervious C-value	0.95
Time of Concentration (min)	95.05

Basin Runoff Calculations

Total Contributing Area (acres)	70.42
Pervious Contributing Area (acres)	70.42
Impervious Contributing Area (acres)	0.00
Weighted Runoff Coefficient[1]	0.24

Rational Method Peak Flow Rate Calculations

	Design	Base	Greatest
Event[2]	50-year	100-year	500-yr
Intensity (in/hr)[3]	3.03	3.40	N/A
Peak Flow (cfs)	51.22	59.86	172.19

Cross Drain Sizing Calculations

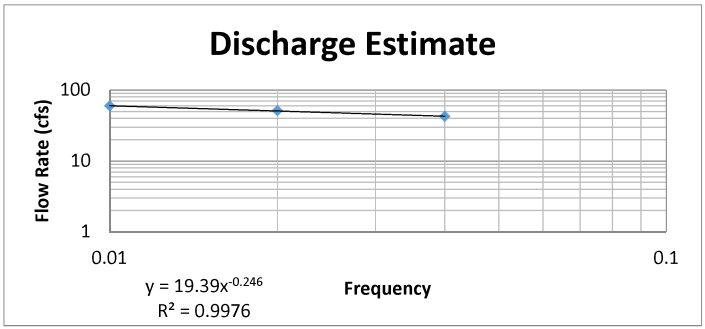
Tailwater Elevation/Source	60.50	*Existing Ground Elevation*
Minimum Elevation at Edge of Travel Lane	65.50	*Assumed 5-ft above crown*
Upstream Culvert Invert	57.5	
Downstream Culvert Invert	57.4	
Culvert length	160.0	
Upstream Est. SHWL Elev (ft-NAVD88)	60.5	
Upstream Est. Ground Elev (ft-NAVD88)	60.5	
Assumed Velocity	*3 ft/s*	
Culvert Conveyance Area for Assumed Velocity	*17.1 sf*	$A = \frac{Q}{V} = (\frac{50-yr\ Peak\ Flow}{Velocity})$
Recommended Culvert Conveyance Size	2 - 36 inch	
Recommended Culvert Size's Conveyance Area	*14.1 sf*	

Solve for 500-year flow rate using log-log graph

$y = Ax^{-B}$

$x = \sqrt[B]{\frac{A}{y}}$

A= 19.39
B= 0.246
y= **89.44 cfs**
x= 0.002



Notes:

[1] Frequency Factor for Pervious Area Runoff Coefficients will be applied per Design Storm Event (Table B-5, FDOT Drainage Design Guide, January 2017).

[2] Per FDOT Drainage Manual, 50-year considered design event for mainline interstates and 100-year used if culvert proposed within regulated floodway.

[3] Design Intensity calculated from FDOT IDF Regression Equations for Tc < 180 minutes. If Tc > 180 minutes, intensity estimated directly from the IDF Curve.

PROJECT: CFX LHR: Osceola Parkway Extension **PREPARED:** MP **DATE:** 06/04/19

LOCATION: Osceola and Orange County, Florida **CHECKED:** JN **DATE:** 06/04/19

Table B.2 - Proposed Time of Concentration Summary

Cross Drain ID	Time of Concentration (min)
CD-405-02	156.4
CD-405-07, CD-404-07	81.0
CD-404-01	45.7
CD-404-02	17.4
CD-404-03	33.9
CD-500-03	60.2
CD-500-04	91.0
CD-500-05	68.5
CD-500-07	41.2
CD-500-01, CD-502-01	74.1
CD-502-03	97.5
CD-502-04	238.5
CD-502-05	102.7
CD-502-06	95.1

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-405-02

Tc or Tt (through subarea)

L = 3,315 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description[T]	Short grass prairie
2. Mannings roughness coeff., n †	0.15
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0199
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.132
Subtotal	**0.13**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	3,215
9. Watercourse slope, s (ft/ft)	0.001
10. Average velocity[†††], V = kS^0.5 (fps)	0.36
11. Compute Tt in hr, Tt = L/3600V	2.48
Subtotal	**2.48**

Time of Concentration, hr. (summation of subtotals)

Hours	2.61
Minutes	156.4
Total	**156.4**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-405-07, CD-404-07

Tc or Tt (through subarea)

L = 2,269 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Range
2. Mannings roughness coeff., n †	0.13
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0023
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.281
Subtotal	**0.28**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	2,169
9. Watercourse slope, s (ft/ft)	0.001
10. Average velocity†††, V = kS^0.5 (fps)	0.56
11. Compute Tt in hr, Tt = L/3600V	1.07
Subtotal	**1.07**

Time of Concentration, hr. (summation of subtotals)

Hours	1.35
Minutes	81.0
Total	**81.0**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-404-01

Tc or Tt (through subarea)

L = 1,551 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Short grass prairie
2. Mannings roughness coeff., n †	0.15
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0093
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.179
Subtotal	**0.18**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	1,451
9. Watercourse slope, s (ft/ft)	0.002
10. Average velocity†††, V = kS^0.5 (fps)	0.69
11. Compute Tt in hr, Tt = L/3600V	0.58
Subtotal	**0.58**

Time of Concentration, hr. (summation of subtotals)		
	Hours	0.76
	Minutes	45.7
	Total	**45.7**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-404-02

Tc or Tt (through subarea)

L = 651 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Short grass prairie
2. Mannings roughness coeff., n †	0.15
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0146
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.149
Subtotal	**0.15**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	551
9. Watercourse slope, s (ft/ft)	0.005
10. Average velocity†††, V = kS^0.5 (fps)	1.09
11. Compute Tt in hr, Tt = L/3600V	0.14
Subtotal	**0.14**

Time of Concentration, hr. (summation of subtotals)		
	Hours	0.29
	Minutes	17.4
	Total	**17.4**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-404-03

Tc or Tt (through subarea)

L = 763 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Light underbrush
2. Mannings roughness coeff., n †	0.4
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0104
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.375
Subtotal	**0.37**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	663
9. Watercourse slope, s (ft/ft)	0.004
10. Average velocity†††, V = kS^0.5 (fps)	0.97
11. Compute Tt in hr, Tt = L/3600V	0.19
Subtotal	**0.19**

Time of Concentration, hr. (summation of subtotals)		
	Hours	0.57
	Minutes	33.9
	Total	**33.9**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-500-03

Tc or Tt (through subarea)

L = 3,018 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Range (natural)
2. Mannings roughness coeff., n †	0.13
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0050
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.204
Subtotal	**0.20**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	2,918
9. Watercourse slope, s (ft/ft)	0.004
10. Average velocity†††, V = kS^0.5 (fps)	1.01
11. Compute Tt in hr, Tt = L/3600V	0.80
Subtotal	**0.80**

Time of Concentration, hr. (summation of subtotals)		
	Hours	1.00
	Minutes	60.2
	Total	**60.2**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-500-04

Tc or Tt (through subarea)

L = 3,905 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Light underbrush
2. Mannings roughness coeff., n †	0.4
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0082
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.413
Subtotal	**0.41**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	3,805
9. Watercourse slope, s (ft/ft)	0.004
10. Average velocity†††, V = kS^0.5 (fps)	0.96
11. Compute Tt in hr, Tt = L/3600V	1.10
Subtotal	**1.10**

Time of Concentration, hr. (summation of subtotals)		
	Hours	1.52
	Minutes	91.0
	Total	**91.0**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-500-05

Tc or Tt (through subarea)

L = 1,246 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Light underbrush
2. Mannings roughness coeff., n †	0.4
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0021
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.711
Subtotal	**0.71**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	1,146
9. Watercourse slope, s (ft/ft)	0.002
10. Average velocity†††, V = kS^0.5 (fps)	0.74
11. Compute Tt in hr, Tt = L/3600V	0.43
Subtotal	**0.43**

Time of Concentration, hr. (summation of subtotals)		
	Hours	1.14
	Minutes	68.5
	Total	**68.5**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-500-07

Tc or Tt (through subarea)

L = 1,451 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Light underbrush
2. Mannings roughness coeff., n †	0.4
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0229
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.273
Subtotal	**0.27**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	1,351
9. Watercourse slope, s (ft/ft)	0.003
10. Average velocity†††, V = kS^0.5 (fps)	0.91
11. Compute Tt in hr, Tt = L/3600V	0.41
Subtotal	**0.41**

Time of Concentration, hr. (summation of subtotals)	Hours	0.69
	Minutes	41.2
	Total	**41.2**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-500-01, CD-502-01

Tc or Tt (through subarea)

L = 3,537 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Short grass prairie
2. Mannings roughness coeff., n †	0.15
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0073
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.197
Subtotal	**0.20**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	3,437
9. Watercourse slope, s (ft/ft)	0.003
10. Average velocity†††, V = kS^0.5 (fps)	0.92
11. Compute Tt in hr, Tt = L/3600V	1.04
Subtotal	**1.04**

Time of Concentration, hr. (summation of subtotals)		
	Hours	1.23
	Minutes	74.1
	Total	**74.1**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-502-03

Tc or Tt (through subarea)

L = 4,760 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Range (natural)
2. Mannings roughness coeff., n †	0.13
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0132
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.139
Subtotal	**0.14**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	4,660
9. Watercourse slope, s (ft/ft)	0.003
10. Average velocity†††, V = kS^0.5 (fps)	0.87
11. Compute Tt in hr, Tt = L/3600V	1.49
Subtotal	**1.49**

Time of Concentration, hr. (summation of subtotals)		
	Hours	1.63
	Minutes	97.5
	Total	**97.5**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-502-04

Tc or Tt (through subarea)

L = 8,427 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Light underbrush
2. Mannings roughness coeff., n †	0.4
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0016
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.793
Subtotal	**0.79**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	8,327
9. Watercourse slope, s (ft/ft)	0.002
10. Average velocity†††, V = kS^0.5 (fps)	0.73
11. Compute Tt in hr, Tt = L/3600V	3.18
Subtotal	**3.18**

Time of Concentration, hr. (summation of subtotals)		
	Hours	3.97
	Minutes	238.5
	Total	**238.5**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension	PREPARED:	MP	DATE:	06/04/19
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-502-05

Tc or Tt (through subarea)

L = 4,079 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Residue cover ≤20%
2. Mannings roughness coeff., n †	0.06
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0045
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.115
Subtotal	**0.12**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	3,979
9. Watercourse slope, s (ft/ft)	0.002
10. Average velocity†††, V = kS^0.5 (fps)	0.69
11. Compute Tt in hr, Tt = L/3600V	1.60
Subtotal	**1.60**

Time of Concentration, hr. (summation of subtotals)		
	Hours	1.71
	Minutes	102.7
	Total	**102.7**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

Time of Concentration

PROJECT:	CFX LHR: Osceola Parkway Extension from Poinciana Pkwy to NE Connector	PREPARED:	MP	DATE:	6/4/2019
LOCATION:	Osceola and Orange County, Florida	CHECKED:	JN	DATE:	06/04/19

Proposed or DEVELOPED / UNDEVELOPED BASIN: CD-502-06

Tc or Tt (through subarea)

L = 2,424 ft

Sheet flow (Applicable to Tc only)

Segment ID	AB
1. Surface description†	Light underbrush
2. Mannings roughness coeff., n †	0.4
3. Flow length, L (total L ≤ 100 ft.)	100
4. 2-year, 24-hour rainfall (in.) ††	4.9
5. Land slope, s (ft./ft.)	0.0021
6. Compute Tt in hr, Tt = $[0.007(nL)^{0.8}] / [P_{24hr}^{0.5} s^{0.4}]$ †††	0.711
Subtotal	**0.71**

Shallow Concentrated Flow

Segment ID	BC
7. Surface description (Paved or Unpaved)	Unpaved
8. Flow length, L (ft)	2,324
9. Watercourse slope, s (ft/ft)	0.002
10. Average velocity†††, V = kS^0.5 (fps)	0.74
11. Compute Tt in hr, Tt = L/3600V	0.87
Subtotal	**0.87**

Time of Concentration, hr. (summation of subtotals)		
	Hours	1.58
	Minutes	95.1
	Total	**95.1**

Notes:

† Values from Table 3-1 of Urban Hydrology for Small Watersheds, Technical Release of TR-55

†† The 2-year, 24-hour rainfall was used based on TR-55 Figure B-3.

††† This equation is derived from TR-55

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: CD-405-02

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-405-02 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
76.30	50-year	67.35	67.35	0.00	1
76.41	100-year	77.98	77.98	0.00	1
76.89	500-year	115.49	115.49	0.00	1
81.00	Overtopping	273.90	273.90	0.00	Overtopping

Rating Curve Plot for Crossing: CD-405-02

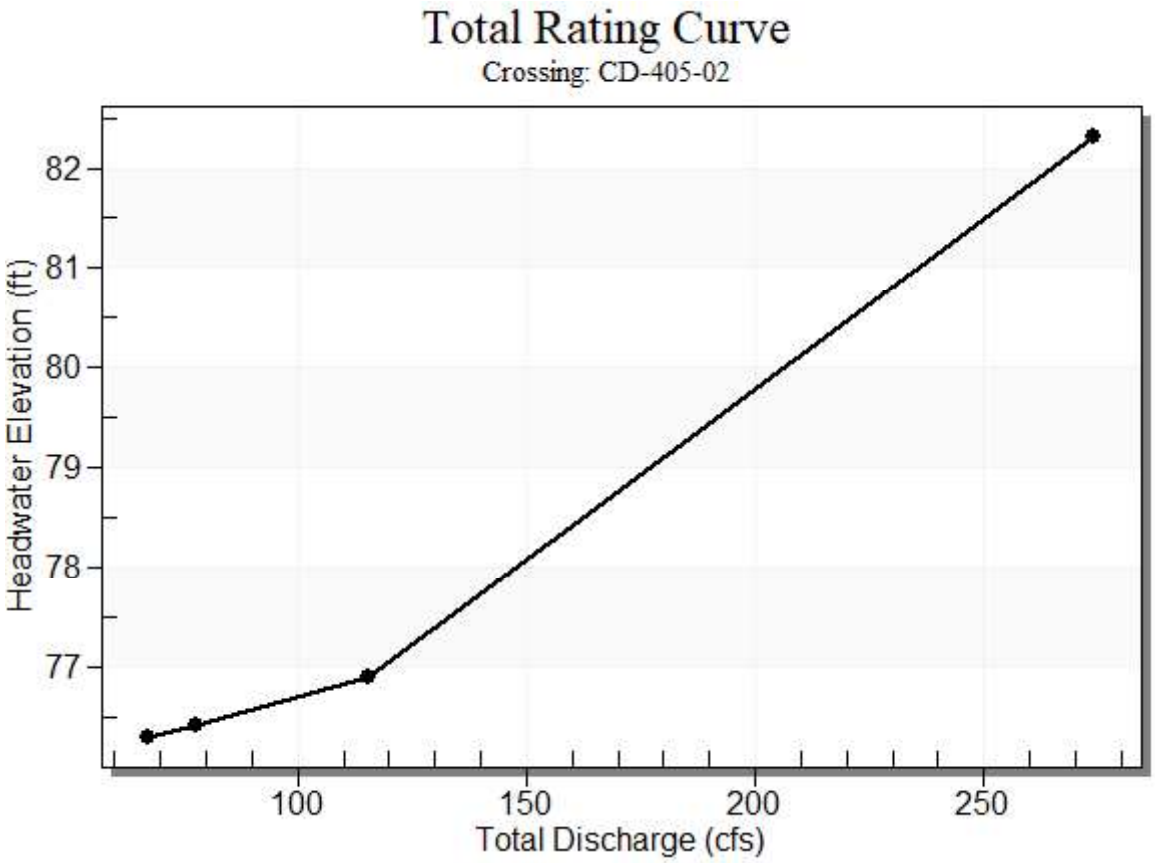


Table 2 - Culvert Summary Table: CD-405-02

Discharge Names	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)
50-year	67.35	67.35	76.30	2.481	4.302	4-FFf	2.692	1.723	4.000	4.200	2.680
100-year	77.98	77.98	76.41	2.715	4.405	4-FFf	3.040	1.863	4.000	4.200	3.103
500-year	115.49	115.49	76.89	3.456	4.889	4-FFf	4.000	2.283	4.000	4.200	4.595

****

Straight Culvert

Inlet Elevation (invert): 72.00 ft, Outlet Elevation (invert): 71.80 ft

Culvert Length: 290.00 ft, Culvert Slope: 0.0007

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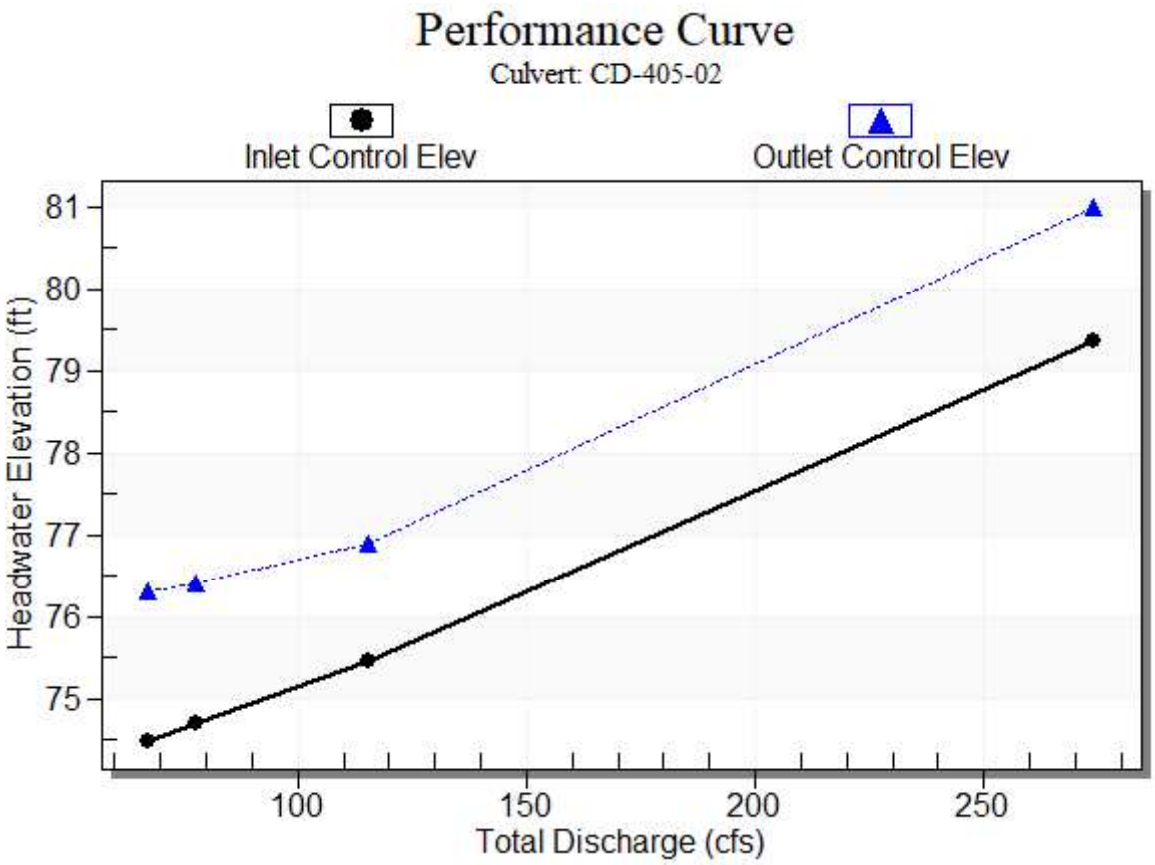
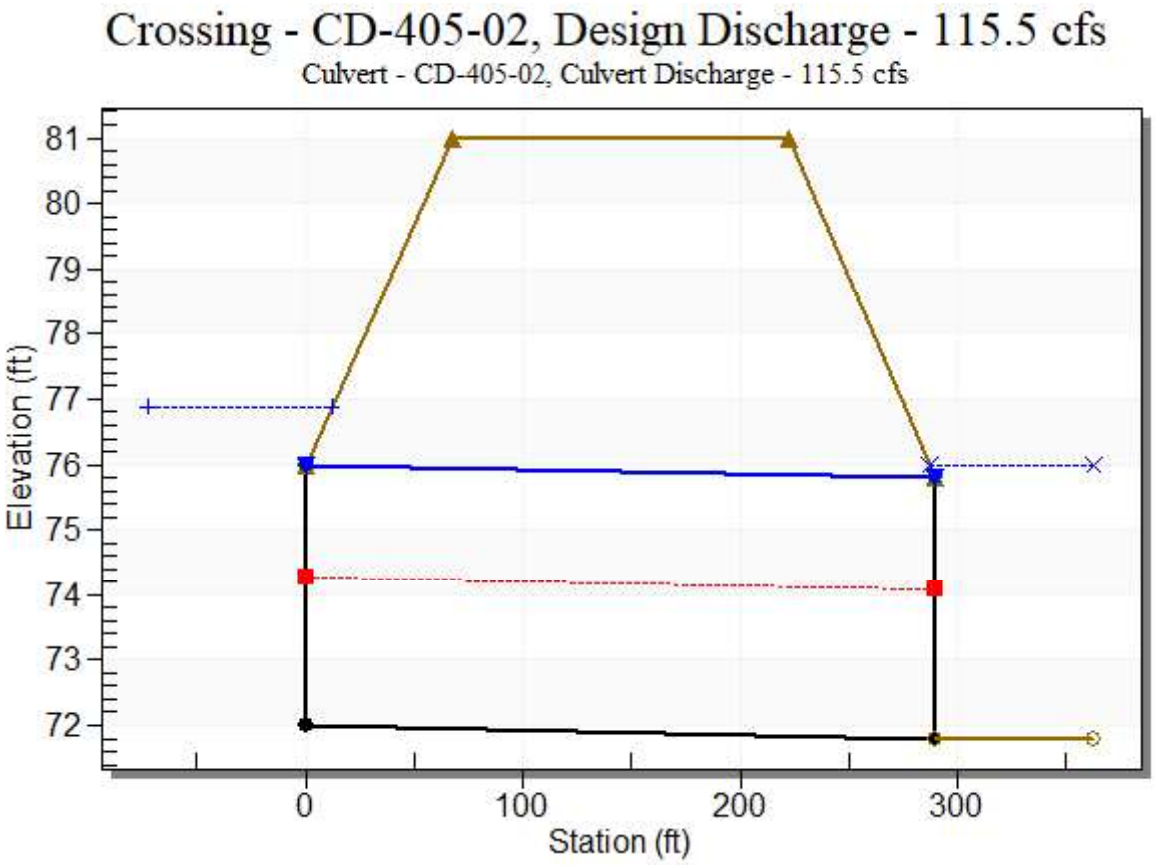
Culvert Performance Curve Plot: CD-405-02



Water Surface Profile Plot for Culvert: CD-405-02



Site Data - CD-405-02

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 72.00 ft

Outlet Station: 290.00 ft

Outlet Elevation: 71.80 ft

Number of Barrels: 2

Culvert Data Summary - CD-405-02

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-405-02)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
67.35	76.00	4.20
77.98	76.00	4.20
115.49	76.00	4.20

Tailwater Channel Data - CD-405-02

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 76.00 ft

Roadway Data for Crossing: CD-405-02

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 81.00 ft

Roadway Surface: Paved

Roadway Top Width: 154.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 4 - Summary of Culvert Flows at Crossing: CD-405-04, CD-404-04

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-405-04, CD-404-04 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
78.39	50-year	84.14	84.14	0.00	1
78.54	100-year	99.20	99.20	0.00	1
79.17	500-year	145.79	145.79	0.00	1
83.00	Overtopping	301.70	301.70	0.00	Overtopping

Rating Curve Plot for Crossing: CD-405-04, CD-404-04

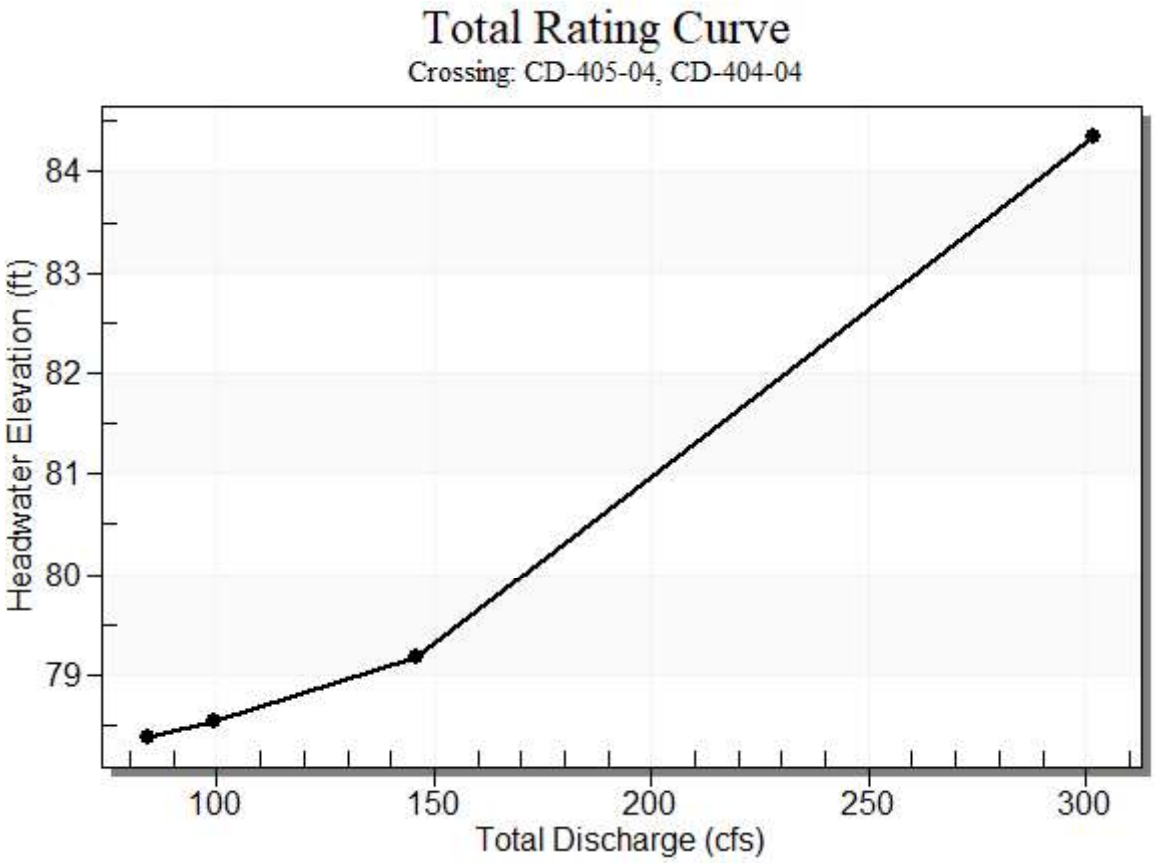


Table 5 - Culvert Summary Table: CD-405-04, CD-404-04

Discharge Names	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)
50-year	84.14	84.14	78.39	2.382	3.889	4-FFf	2.731	1.634	3.500	3.700	2.915
100-year	99.20	99.20	78.54	2.634	4.041	4-FFf	3.500	1.780	3.500	3.700	3.437
500-year	145.79	145.79	79.17	3.358	4.668	4-FFf	3.500	2.174	3.500	3.700	5.051

****

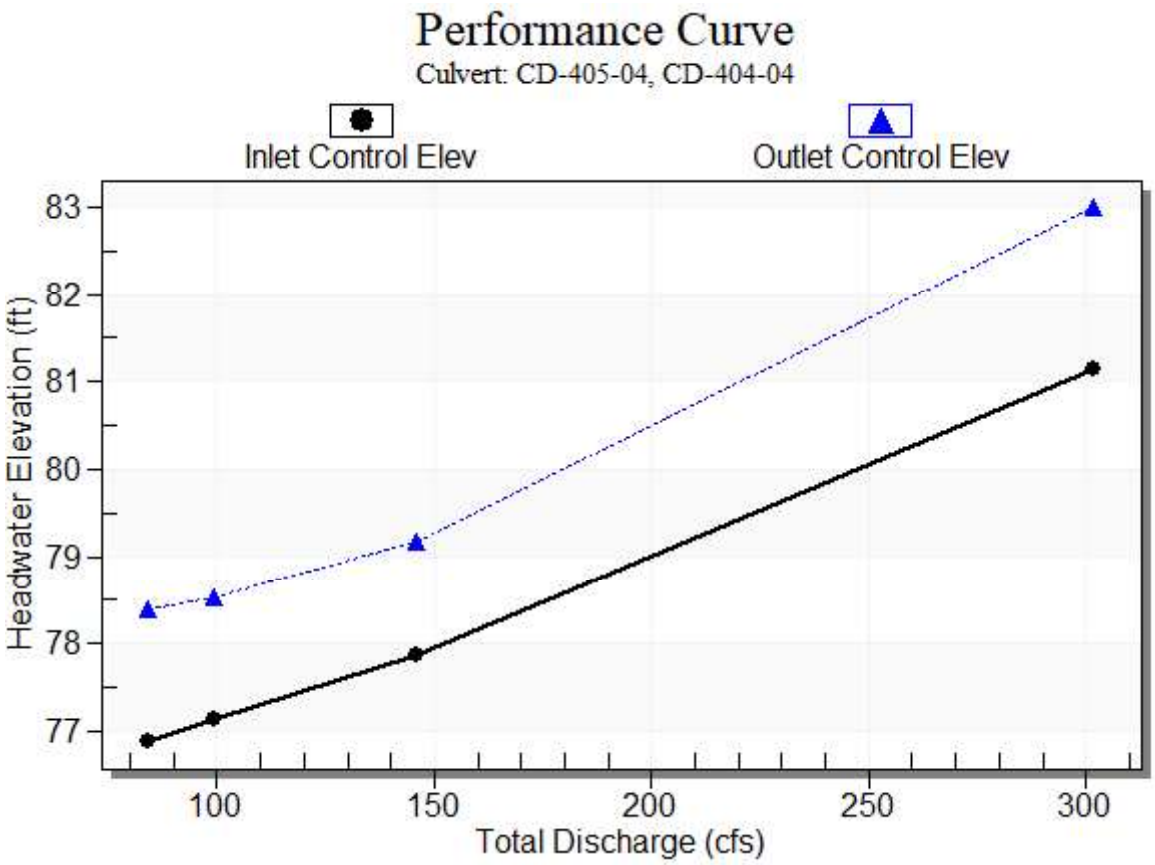
Straight Culvert

Inlet Elevation (invert): 74.50 ft, Outlet Elevation (invert): 74.30 ft

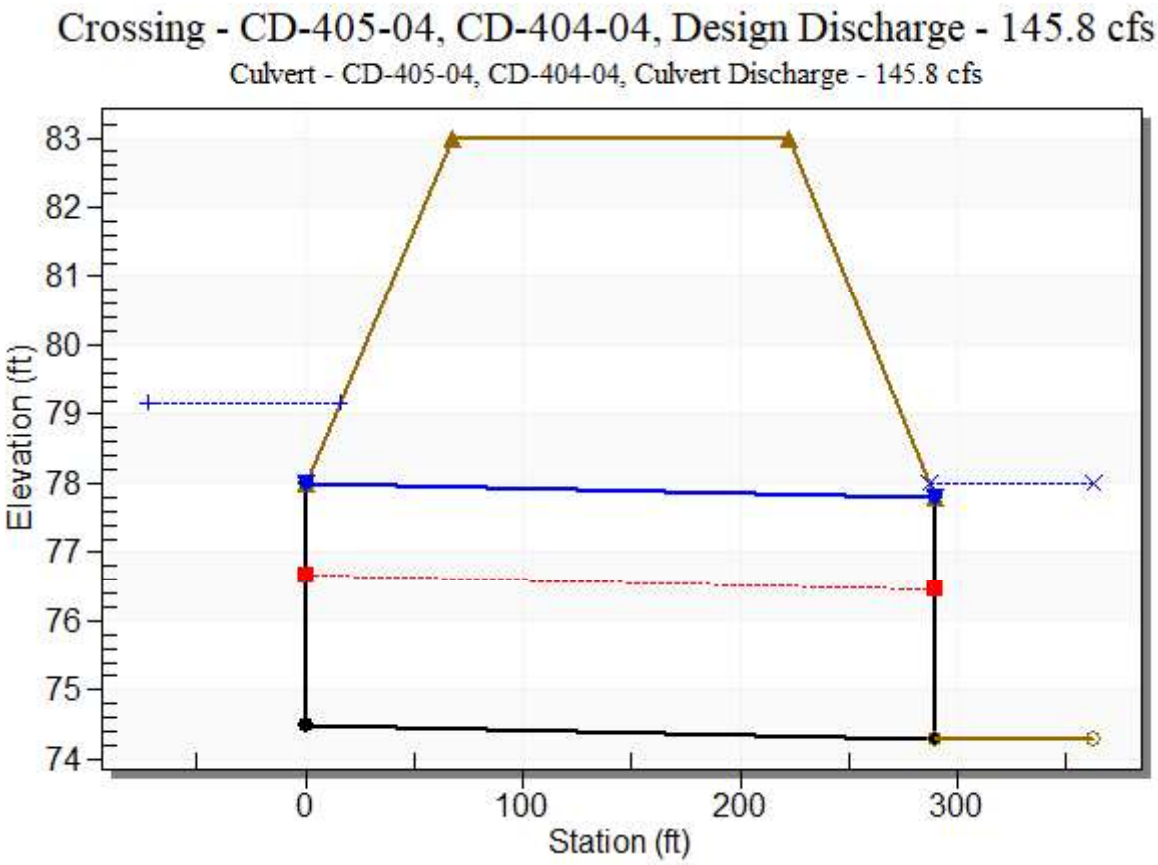
Culvert Length: 290.00 ft, Culvert Slope: 0.0007

****

Culvert Performance Curve Plot: CD-405-04, CD-404-04



Water Surface Profile Plot for Culvert: CD-405-04, CD-404-04



Site Data - CD-405-04, CD-404-04

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 74.50 ft

Outlet Station: 290.00 ft

Outlet Elevation: 74.30 ft

Number of Barrels: 3

Culvert Data Summary - CD-405-04, CD-404-04

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: CD-405-04, CD-404-04)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
84.14	78.00	3.70
99.20	78.00	3.70
145.79	78.00	3.70

Tailwater Channel Data - CD-405-04, CD-404-04

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 78.00 ft

Roadway Data for Crossing: CD-405-04, CD-404-04

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 83.00 ft

Roadway Surface: Paved

Roadway Top Width: 154.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: CD-405-07, CD-404-07

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-405-07, CD-404-07 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
77.28	50-year	61.30	61.30	0.00	1
77.37	100-year	69.81	69.81	0.00	1
77.77	500-year	101.13	101.13	0.00	1
82.00	Overtopping	258.08	258.08	0.00	Overtopping

Rating Curve Plot for Crossing: CD-405-07, CD-404-07

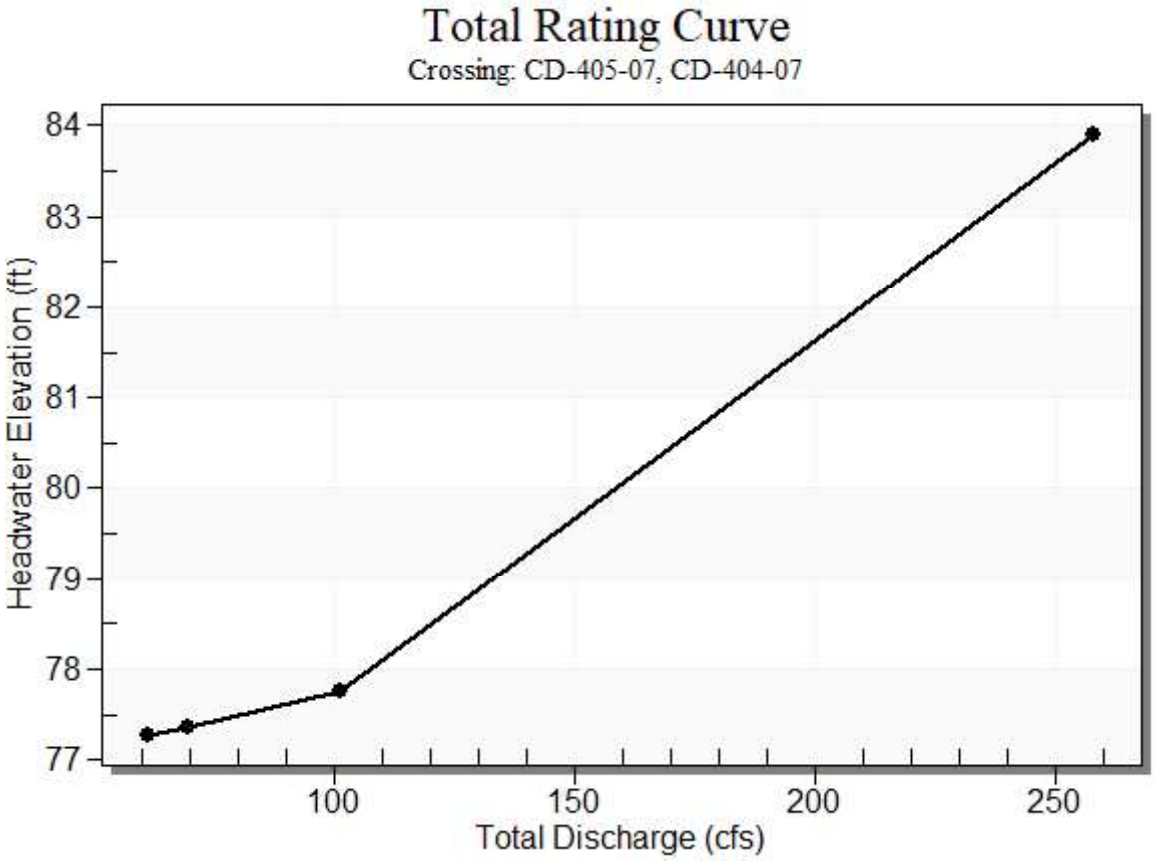


Table 2 - Culvert Summary Table: CD-405-07, CD-404-07

Discharge Names	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)
50-year	61.30	61.30	77.28	2.339	4.282	4-FFf	2.755	1.637	4.000	4.200	2.439
100-year	69.81	69.81	77.37	2.537	4.366	4-FFf	3.080	1.756	4.000	4.200	2.778
500-year	101.13	101.13	77.77	3.183	4.768	4-FFf	4.000	2.130	4.000	4.200	4.024

****

Straight Culvert

Inlet Elevation (invert): 73.00 ft, Outlet Elevation (invert): 72.80 ft

Culvert Length: 372.00 ft, Culvert Slope: 0.0005

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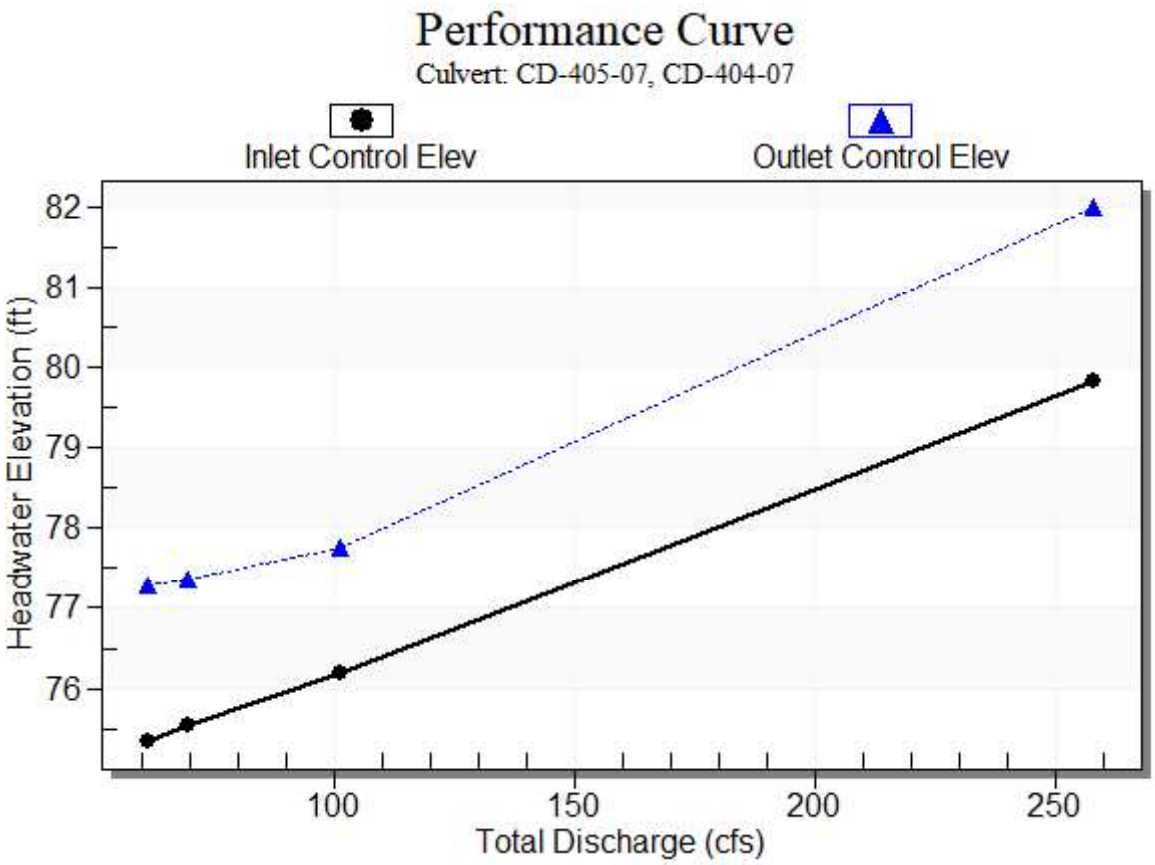
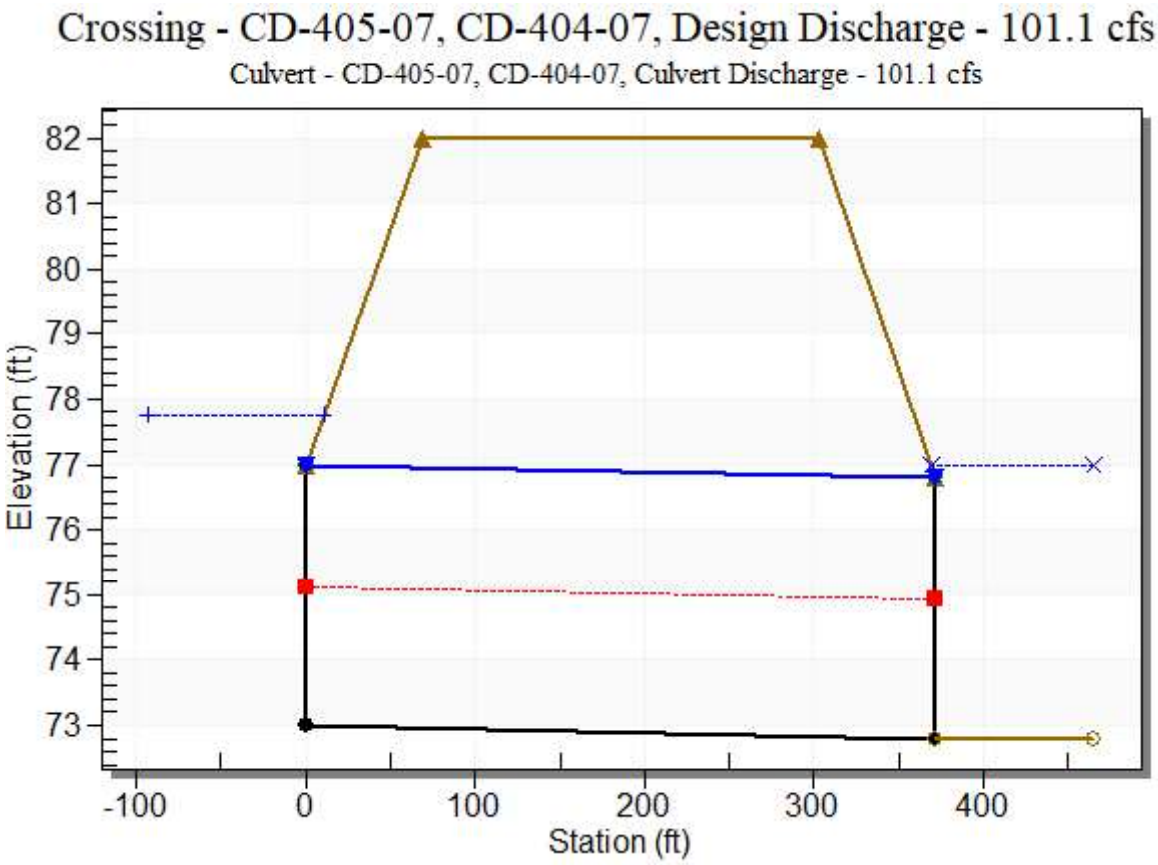
Culvert Performance Curve Plot: CD-405-07, CD-404-07



Water Surface Profile Plot for Culvert: CD-405-07, CD-404-07



Site Data - CD-405-07, CD-404-07

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 73.00 ft

Outlet Station: 372.00 ft

Outlet Elevation: 72.80 ft

Number of Barrels: 2

Culvert Data Summary - CD-405-07, CD-404-07

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-405-07, CD-404-07)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
61.30	77.00	4.20
69.81	77.00	4.20
101.13	77.00	4.20

Tailwater Channel Data - CD-405-07, CD-404-07

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 77.00 ft

Roadway Data for Crossing: CD-405-07, CD-404-07

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 82.00 ft

Roadway Surface: Paved

Roadway Top Width: 235.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 10 - Summary of Culvert Flows at Crossing: CD-404-01

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-404-01 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
80.83	50-year	47.30	47.30	0.00	1
81.24	100-year	57.64	57.64	0.00	1
82.95	500-year	88.91	88.91	0.00	1
85.00	Overtopping	115.74	115.74	0.00	Overtopping

Rating Curve Plot for Crossing: CD-404-01

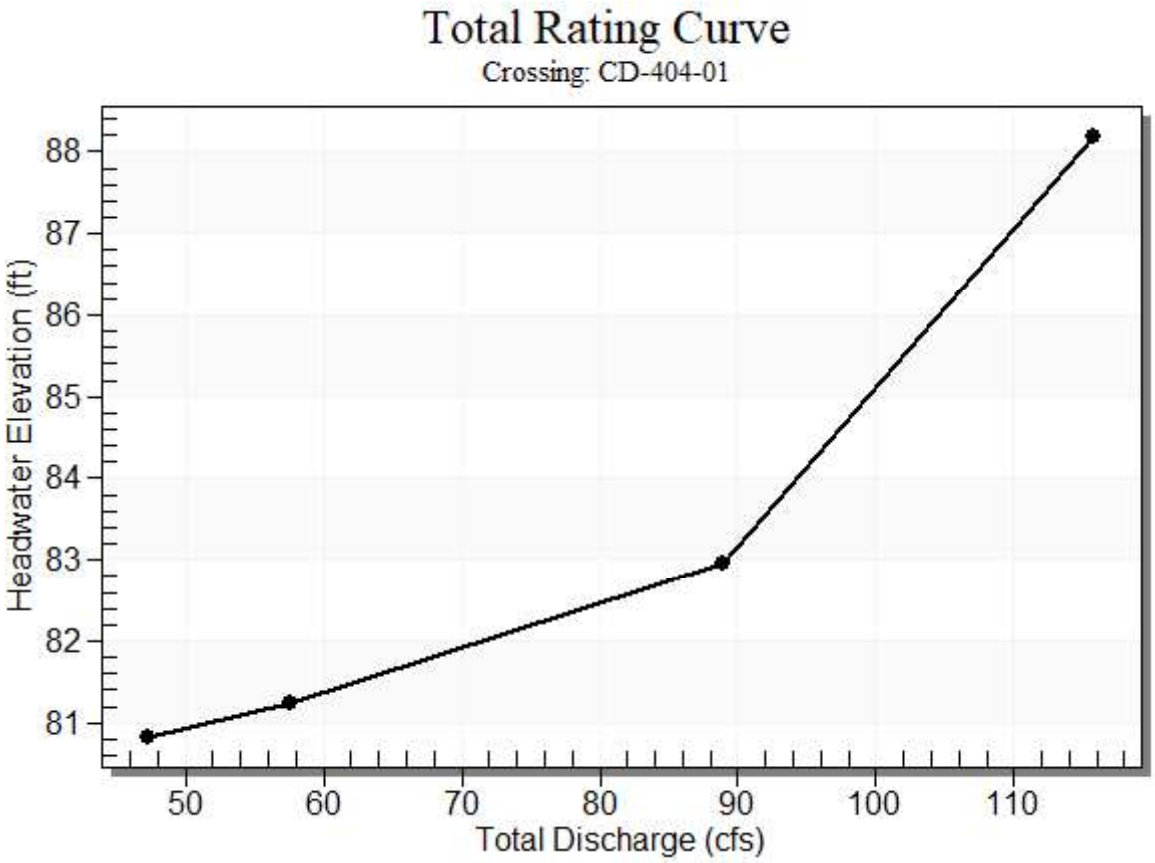


Table 11 - Culvert Summary Table: CD-404-01

Discharge Names	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)
50-year	47.30	47.30	80.83	2.328	3.835	4-FFf	3.000	1.565	3.000	3.300	3.346
100-year	57.64	57.64	81.24	2.632	4.240	4-FFf	3.000	1.734	3.000	3.300	4.077
500-year	88.91	88.91	82.95	3.597	5.950	4-FFf	3.000	2.170	3.000	3.300	6.289

****

Straight Culvert

Inlet Elevation (invert): 77.00 ft, Outlet Elevation (invert): 76.70 ft

Culvert Length: 539.00 ft, Culvert Slope: 0.0006

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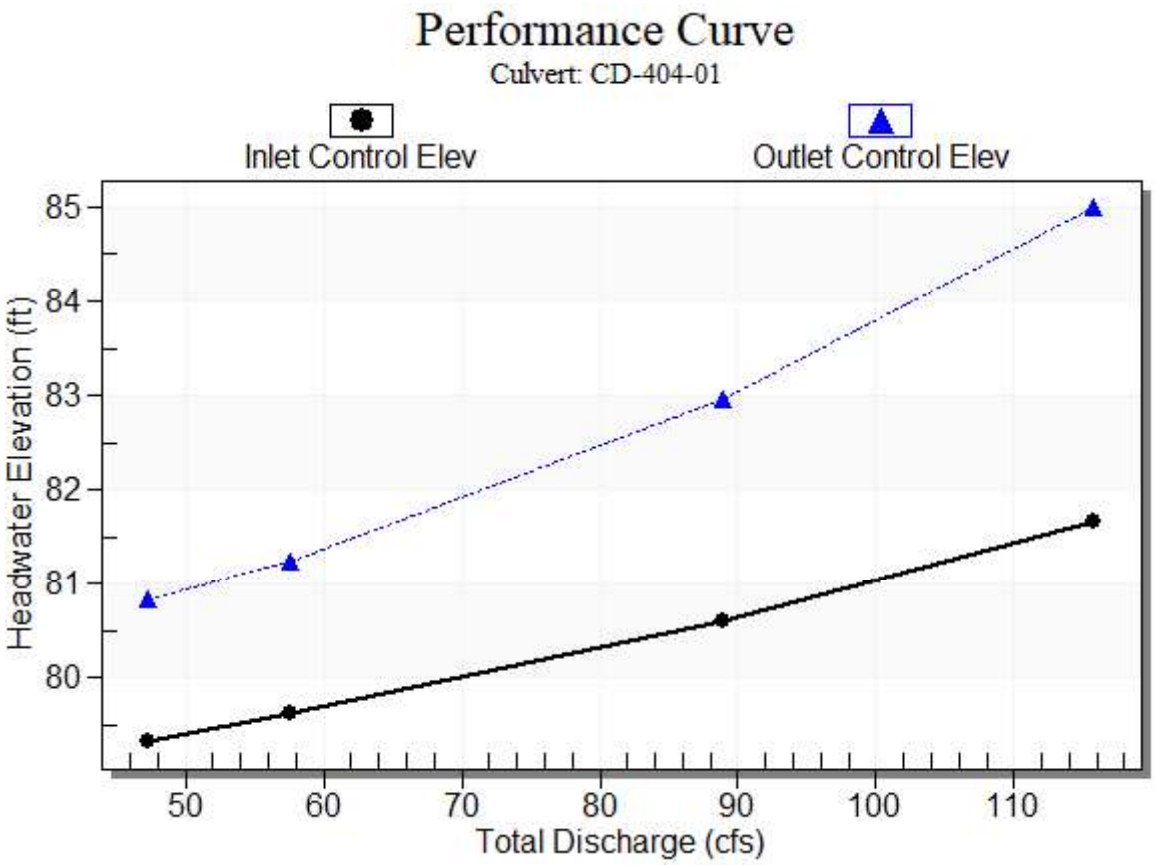
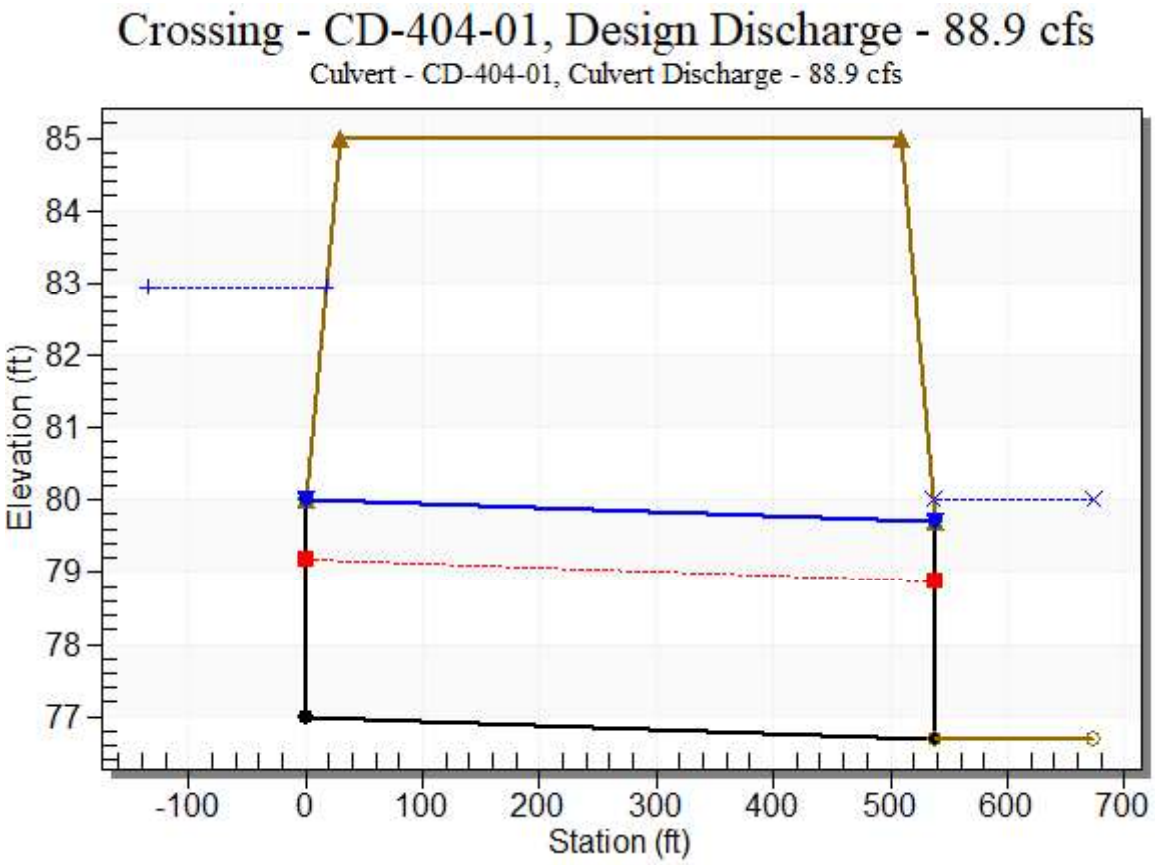
Culvert Performance Curve Plot: CD-404-01



Water Surface Profile Plot for Culvert: CD-404-01



Site Data - CD-404-01

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 77.00 ft

Outlet Station: 539.00 ft

Outlet Elevation: 76.70 ft

Number of Barrels: 2

Culvert Data Summary - CD-404-01

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 12 - Downstream Channel Rating Curve (Crossing: CD-404-01)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
47.30	80.00	3.30
57.64	80.00	3.30
88.91	80.00	3.30

Tailwater Channel Data - CD-404-01

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 80.00 ft

Roadway Data for Crossing: CD-404-01

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 85.00 ft

Roadway Surface: Paved

Roadway Top Width: 479.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 13 - Summary of Culvert Flows at Crossing: CD-404-02

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-404-02 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
79.81	50-year	10.61	10.61	0.00	1
80.04	100-year	12.08	12.08	0.00	1
81.14	500-year	17.28	17.28	0.00	1
84.00	Overtopping	26.42	26.42	0.00	Overtopping

Rating Curve Plot for Crossing: CD-404-02

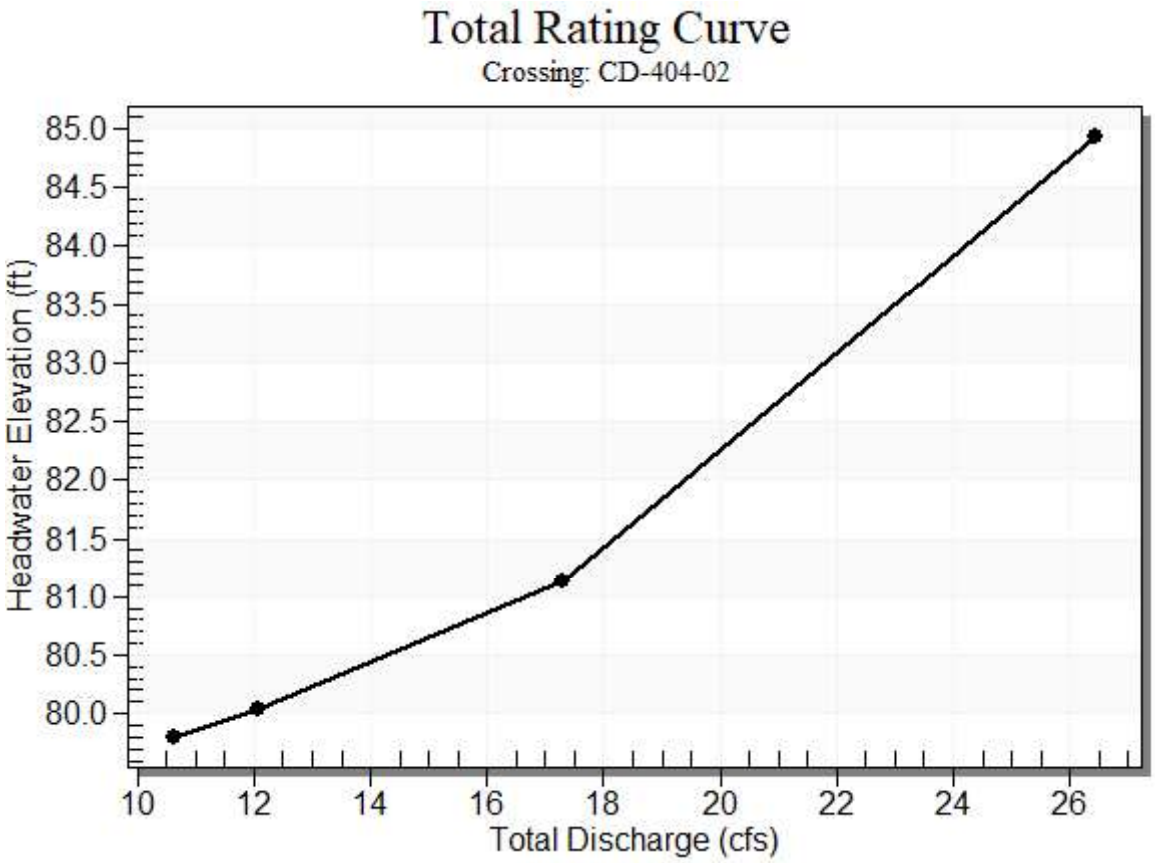


Table 14 - Culvert Summary Table: CD-404-02

Discharge Names	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)
50-year	10.61	10.61	79.81	1.771	3.806	4-FFf	2.000	1.164	2.000	3.200	3.377
100-year	12.08	12.08	80.04	1.928	4.045	4-FFf	2.000	1.243	2.000	3.200	3.845
500-year	17.28	17.28	81.14	2.547	5.138	4-FFf	2.000	1.496	2.000	3.200	5.500

****

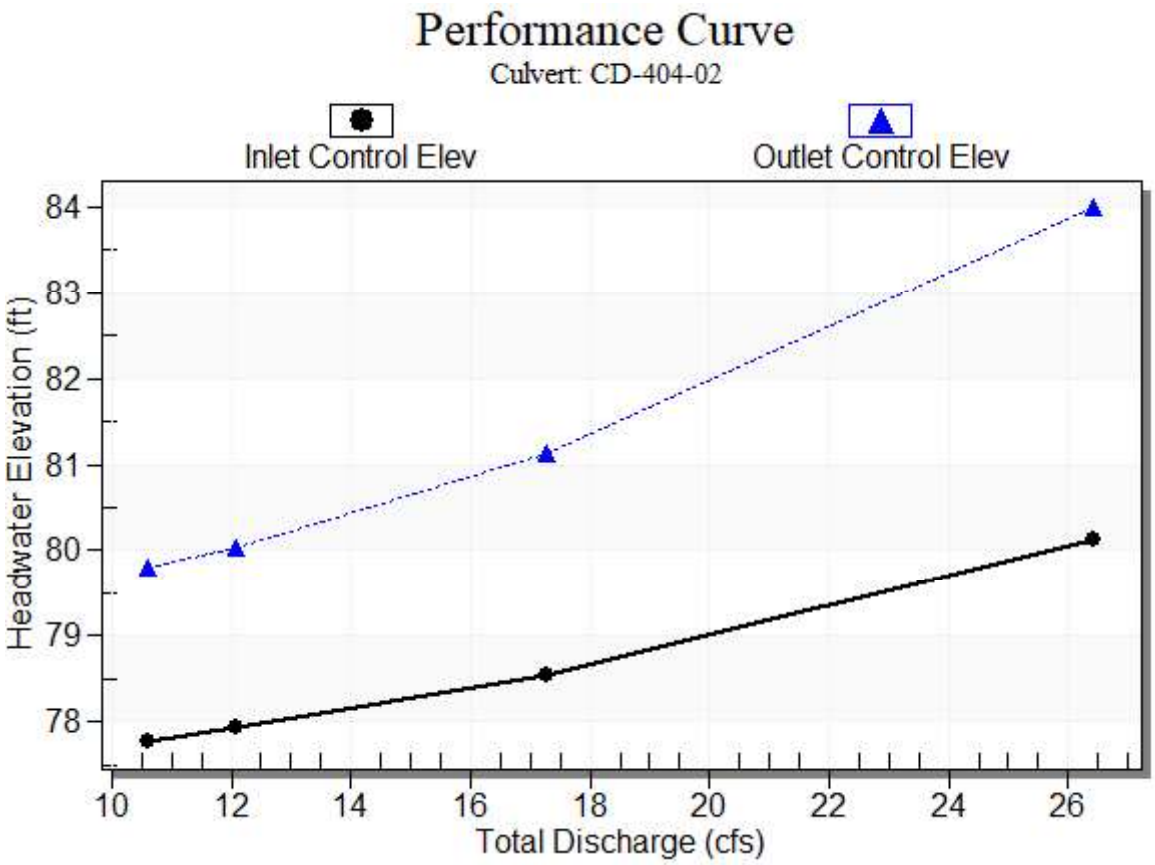
Straight Culvert

Inlet Elevation (invert): 76.00 ft, Outlet Elevation (invert): 75.80 ft

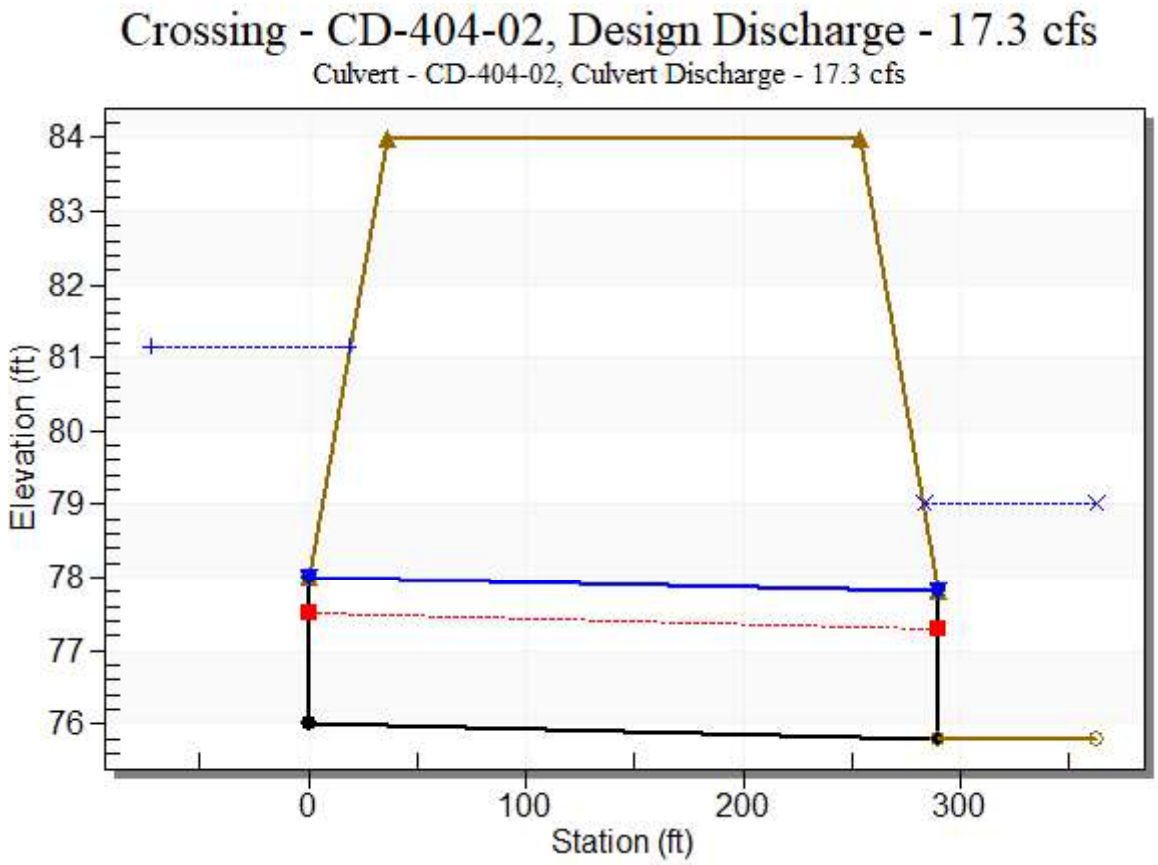
Culvert Length: 290.00 ft, Culvert Slope: 0.0007

****

Culvert Performance Curve Plot: CD-404-02



Water Surface Profile Plot for Culvert: CD-404-02



Site Data - CD-404-02

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 76.00 ft

Outlet Station: 290.00 ft

Outlet Elevation: 75.80 ft

Number of Barrels: 1

Culvert Data Summary - CD-404-02

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 15 - Downstream Channel Rating Curve (Crossing: CD-404-02)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
10.61	79.00	3.20
12.08	79.00	3.20
17.28	79.00	3.20

Tailwater Channel Data - CD-404-02

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 79.00 ft

Roadway Data for Crossing: CD-404-02

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 84.00 ft

Roadway Surface: Paved

Roadway Top Width: 217.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 16 - Summary of Culvert Flows at Crossing: CD-404-03

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-404-03 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
79.96	50-year	11.38	11.38	0.00	1
80.29	100-year	13.19	13.19	0.00	1
81.75	500-year	19.30	19.30	0.00	1
83.00	Overtopping	23.26	23.26	0.00	Overtopping

Rating Curve Plot for Crossing: CD-404-03

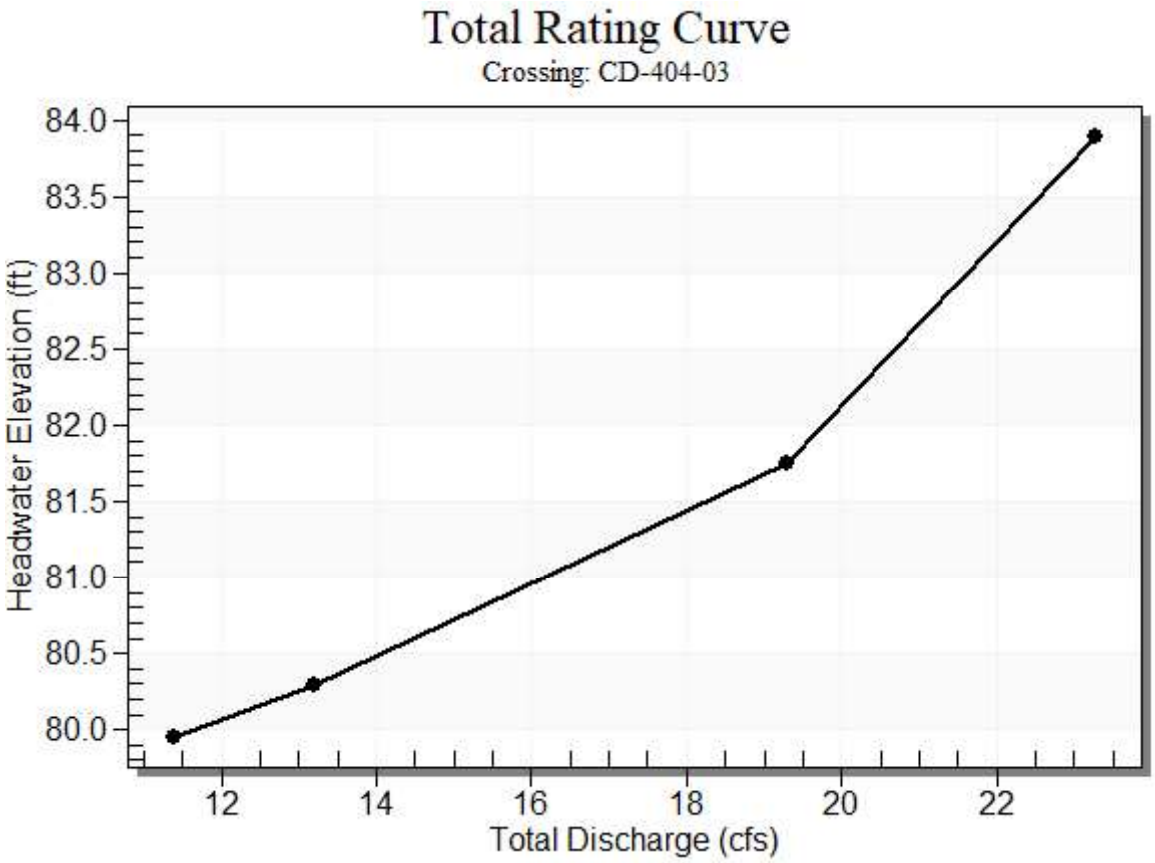


Table 17 - Culvert Summary Table: CD-404-03

Discharge Names	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)
50-year	11.38	11.38	79.96	1.853	3.957	4-FFf	2.000	1.206	2.000	3.200	3.622
100-year	13.19	13.19	80.29	2.050	4.286	4-FFf	2.000	1.304	2.000	3.200	4.199
500-year	19.30	19.30	81.75	2.835	5.754	4-FFf	2.000	1.578	2.000	3.200	6.143

****

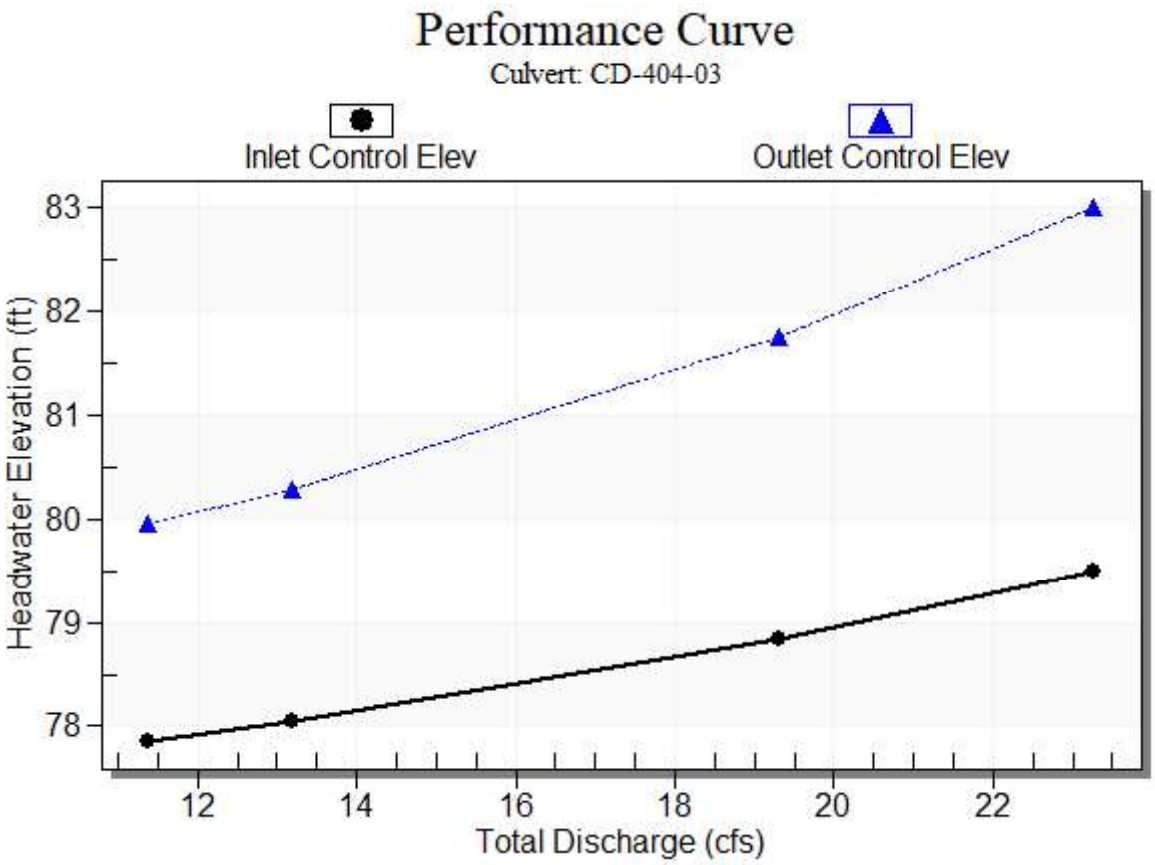
Straight Culvert

Inlet Elevation (invert): 76.00 ft, Outlet Elevation (invert): 75.80 ft

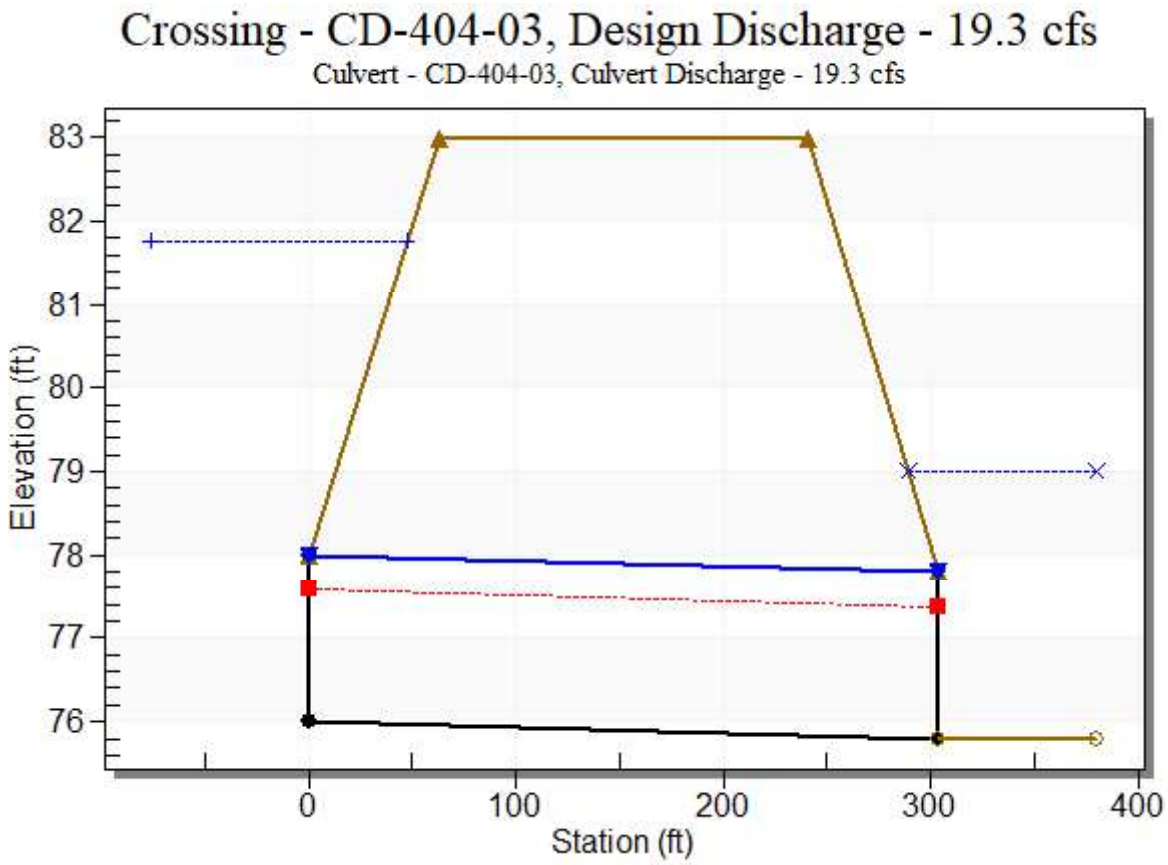
Culvert Length: 304.00 ft, Culvert Slope: 0.0007

****

Culvert Performance Curve Plot: CD-404-03



Water Surface Profile Plot for Culvert: CD-404-03



Site Data - CD-404-03

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 76.00 ft

Outlet Station: 304.00 ft

Outlet Elevation: 75.80 ft

Number of Barrels: 1

Culvert Data Summary - CD-404-03

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 18 - Downstream Channel Rating Curve (Crossing: CD-404-03)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
11.38	79.00	3.20
13.19	79.00	3.20
19.30	79.00	3.20

Tailwater Channel Data - CD-404-03

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 79.00 ft

Roadway Data for Crossing: CD-404-03

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 83.00 ft

Roadway Surface: Paved

Roadway Top Width: 178.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 19 - Summary of Culvert Flows at Crossing: CD-500-03

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-500-03 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
61.98	50-year	85.87	85.87	0.00	1
62.10	100-year	96.31	96.31	0.00	1
62.73	500-year	137.46	137.46	0.00	1
66.50	Overtopping	277.60	277.60	0.00	Overtopping

Rating Curve Plot for Crossing: CD-500-03

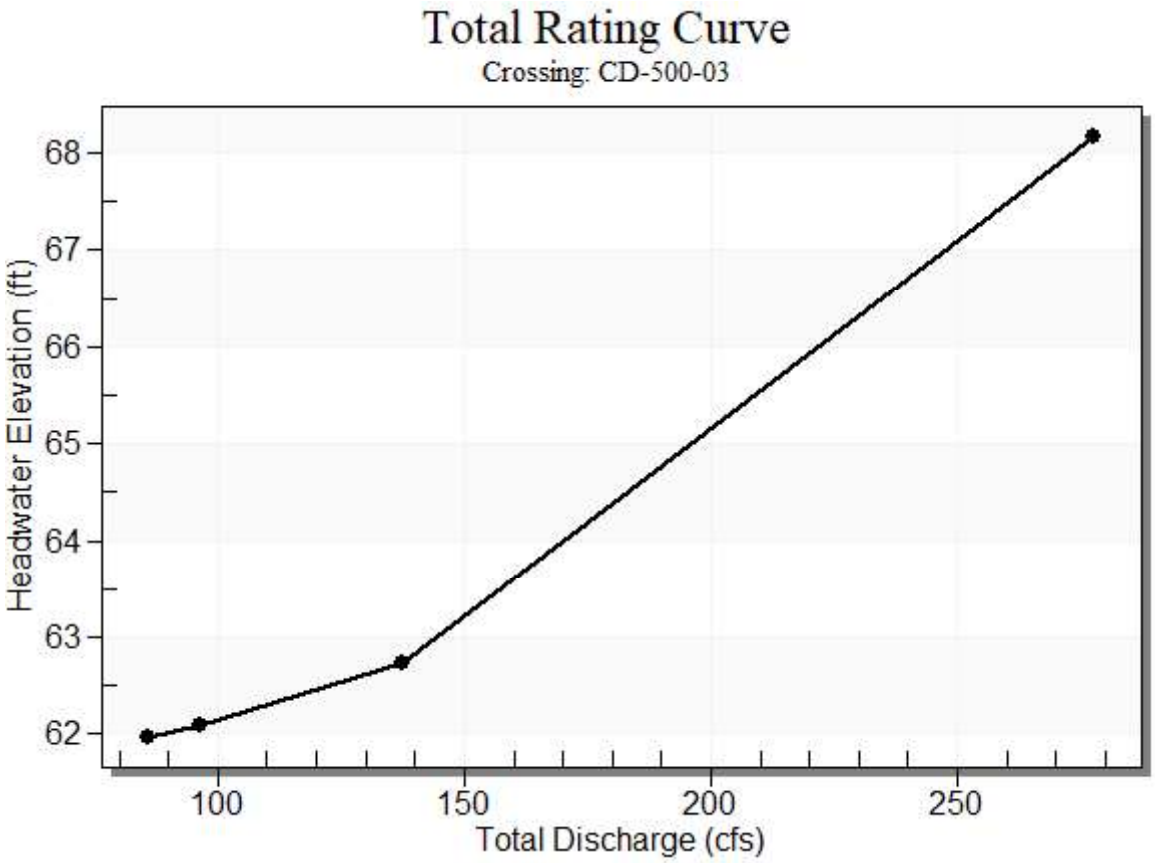


Table 20 - Culvert Summary Table: CD-500-03

Discharge Names	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)
50-year	85.87	85.87	61.98	2.412	3.978	4-FFf	3.500	1.651	3.500	3.700	2.975
100-year	96.31	96.31	62.10	2.587	4.102	4-FFf	3.500	1.753	3.500	3.700	3.337
500-year	137.46	137.46	62.73	3.230	4.726	4-FFf	3.500	2.109	3.500	3.700	4.762

****

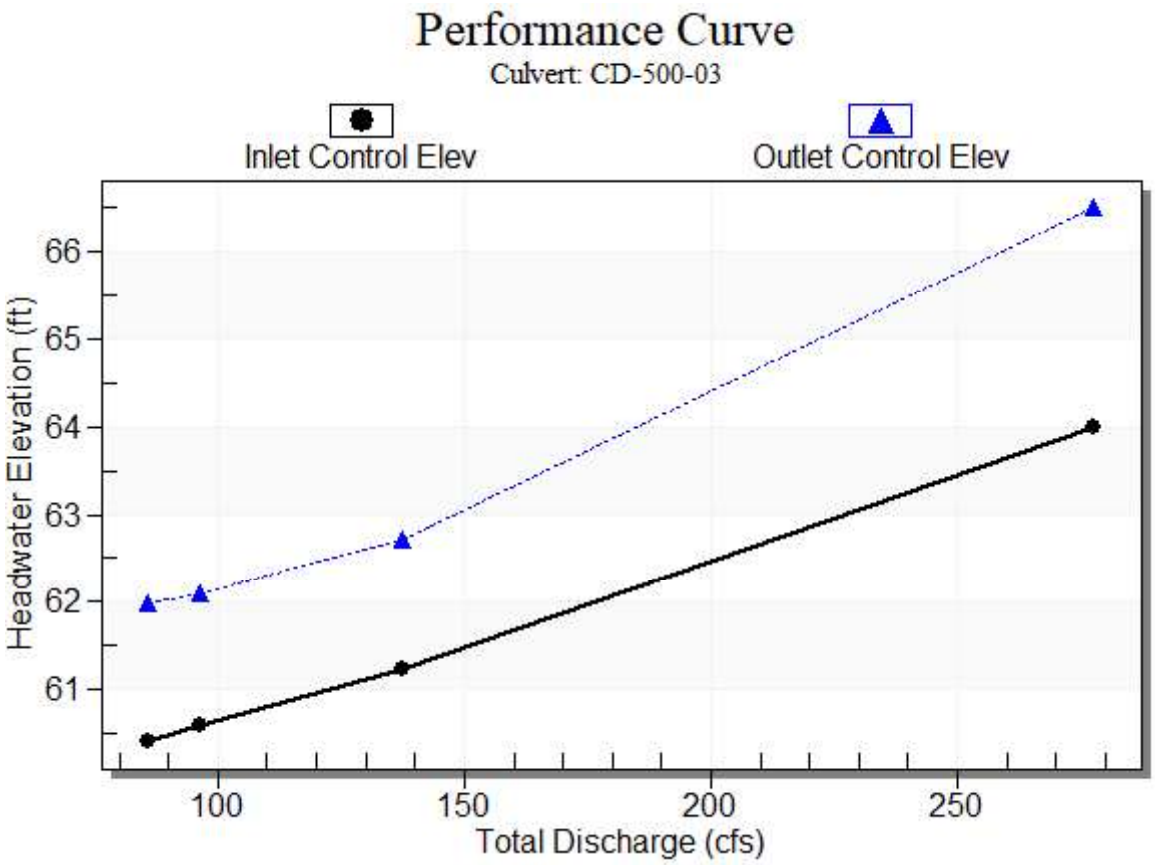
Straight Culvert

Inlet Elevation (invert): 58.00 ft, Outlet Elevation (invert): 57.80 ft

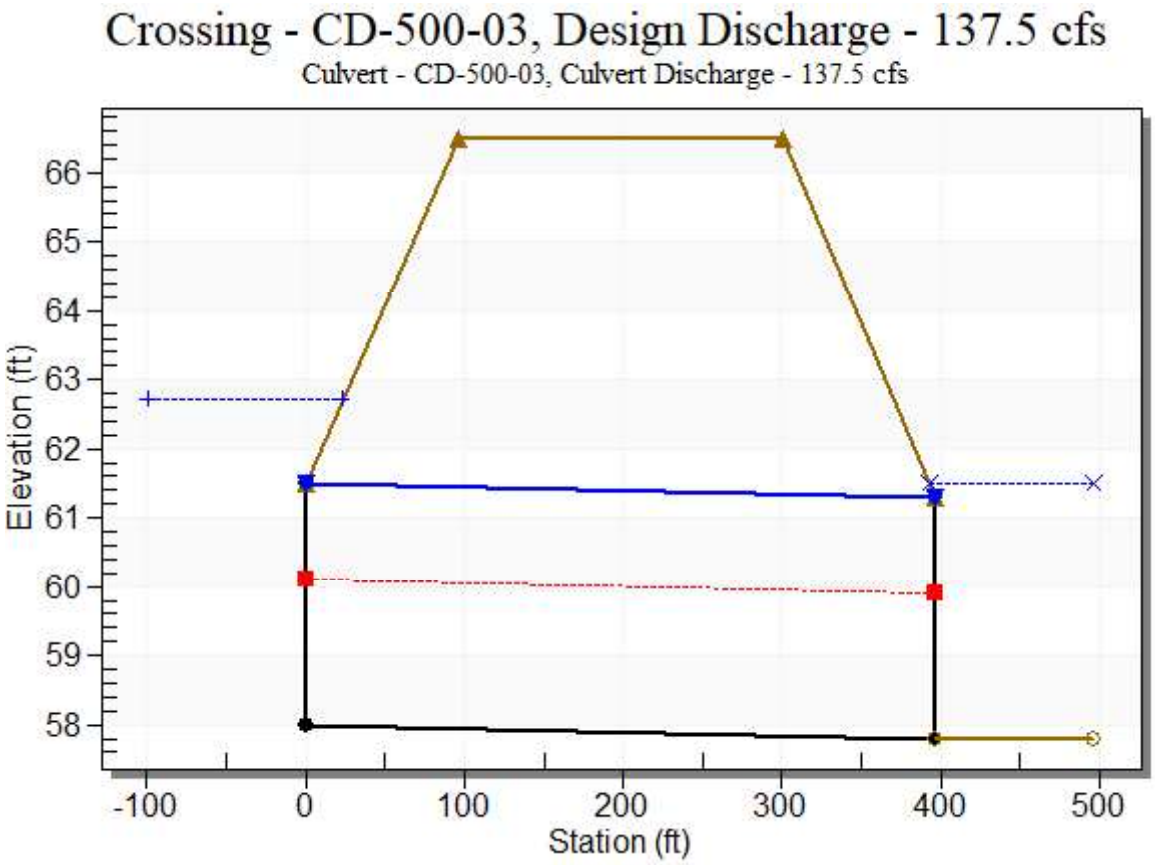
Culvert Length: 397.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: CD-500-03



Water Surface Profile Plot for Culvert: CD-500-03



Site Data - CD-500-03

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 58.00 ft

Outlet Station: 397.00 ft

Outlet Elevation: 57.80 ft

Number of Barrels: 3

Culvert Data Summary - CD-500-03

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 21 - Downstream Channel Rating Curve (Crossing: CD-500-03)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
85.87	61.50	3.70
96.31	61.50	3.70
137.46	61.50	3.70

Tailwater Channel Data - CD-500-03

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 61.50 ft

Roadway Data for Crossing: CD-500-03

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 66.50 ft

Roadway Surface: Paved

Roadway Top Width: 204.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 22 - Summary of Culvert Flows at Crossing: CD-500-04

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-500-04 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
61.89	50-year	72.03	72.03	0.00	1
61.97	100-year	79.22	79.22	0.00	1
62.43	500-year	111.36	111.36	0.00	1
66.50	Overtopping	258.26	258.26	0.00	Overtopping

Rating Curve Plot for Crossing: CD-500-04

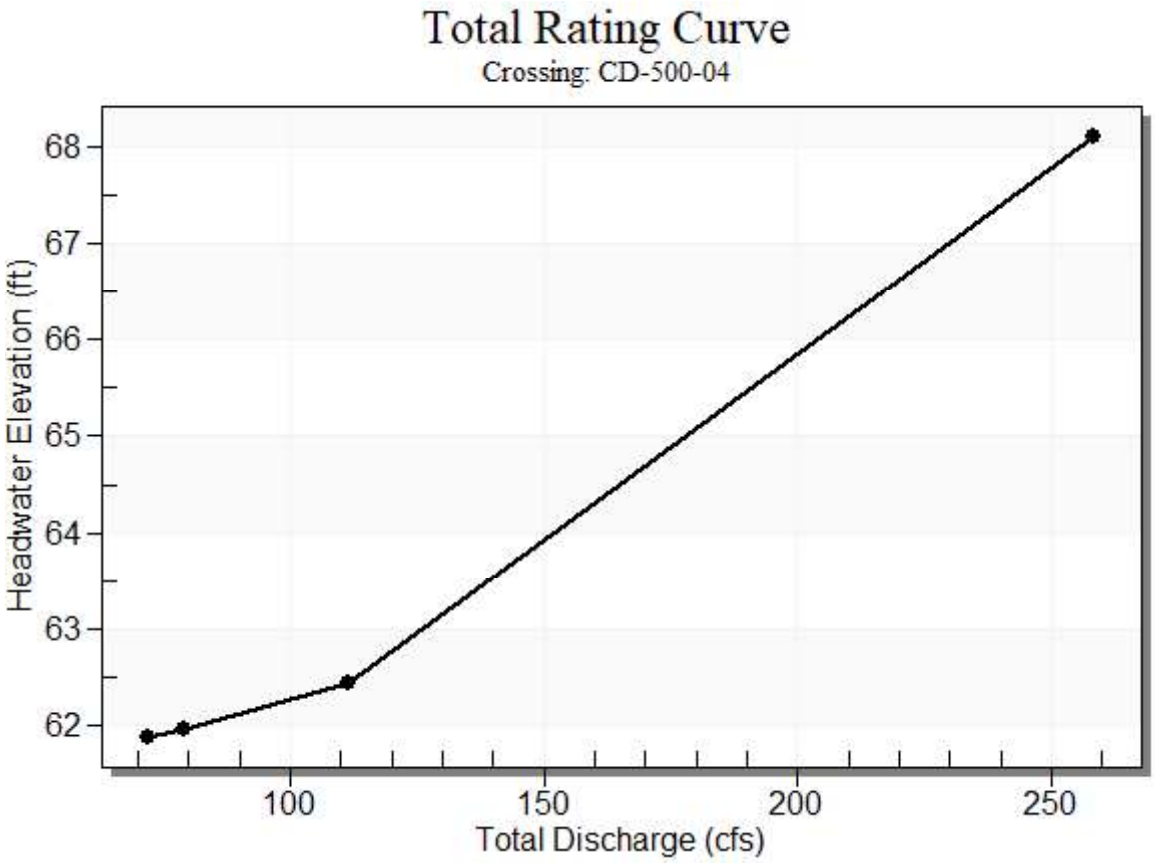


Table 23 - Culvert Summary Table: CD-500-04

Discharge Names	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)
50-year	72.03	72.03	61.89	2.586	4.389	4-FFf	3.176	1.786	4.000	4.200	2.866
100-year	79.22	79.22	61.97	2.742	4.470	4-FFf	4.000	1.878	4.000	4.200	3.152
500-year	111.36	111.36	62.43	3.378	4.930	4-FFf	4.000	2.241	4.000	4.200	4.431

****

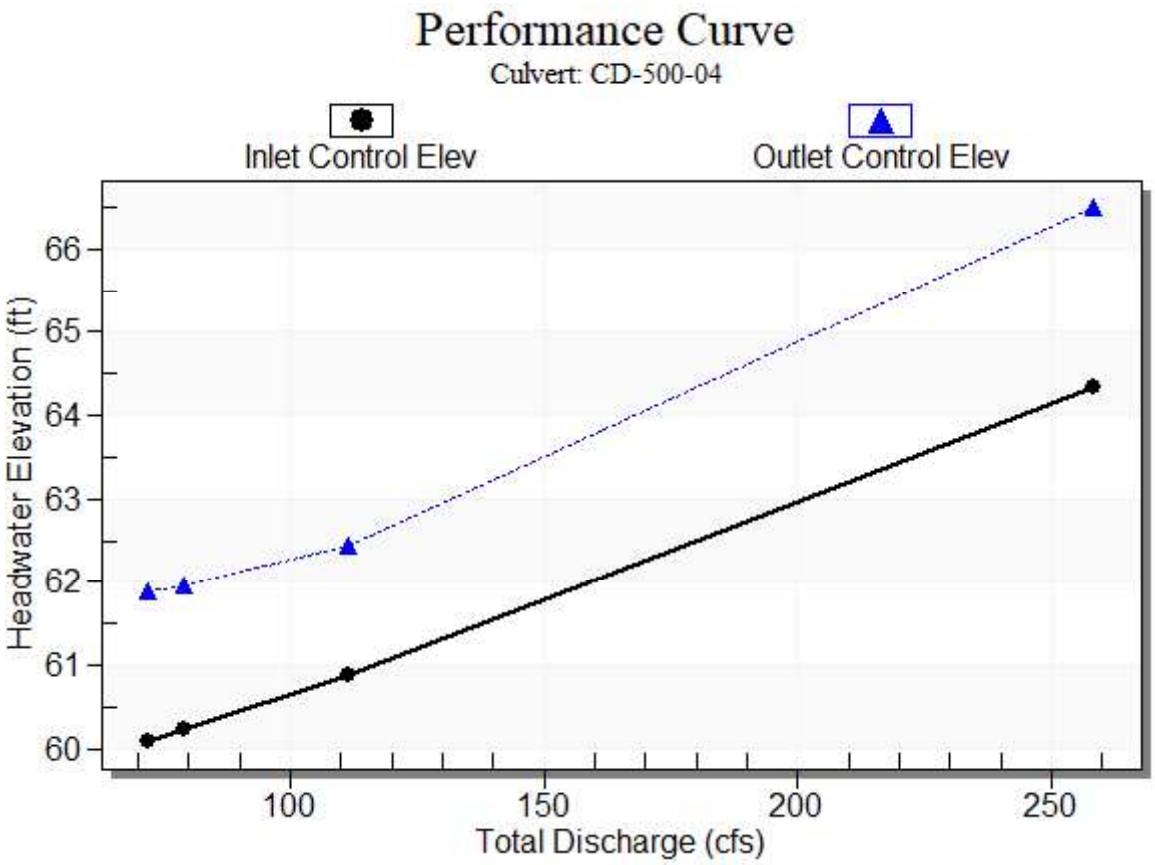
Straight Culvert

Inlet Elevation (invert): 57.50 ft, Outlet Elevation (invert): 57.30 ft

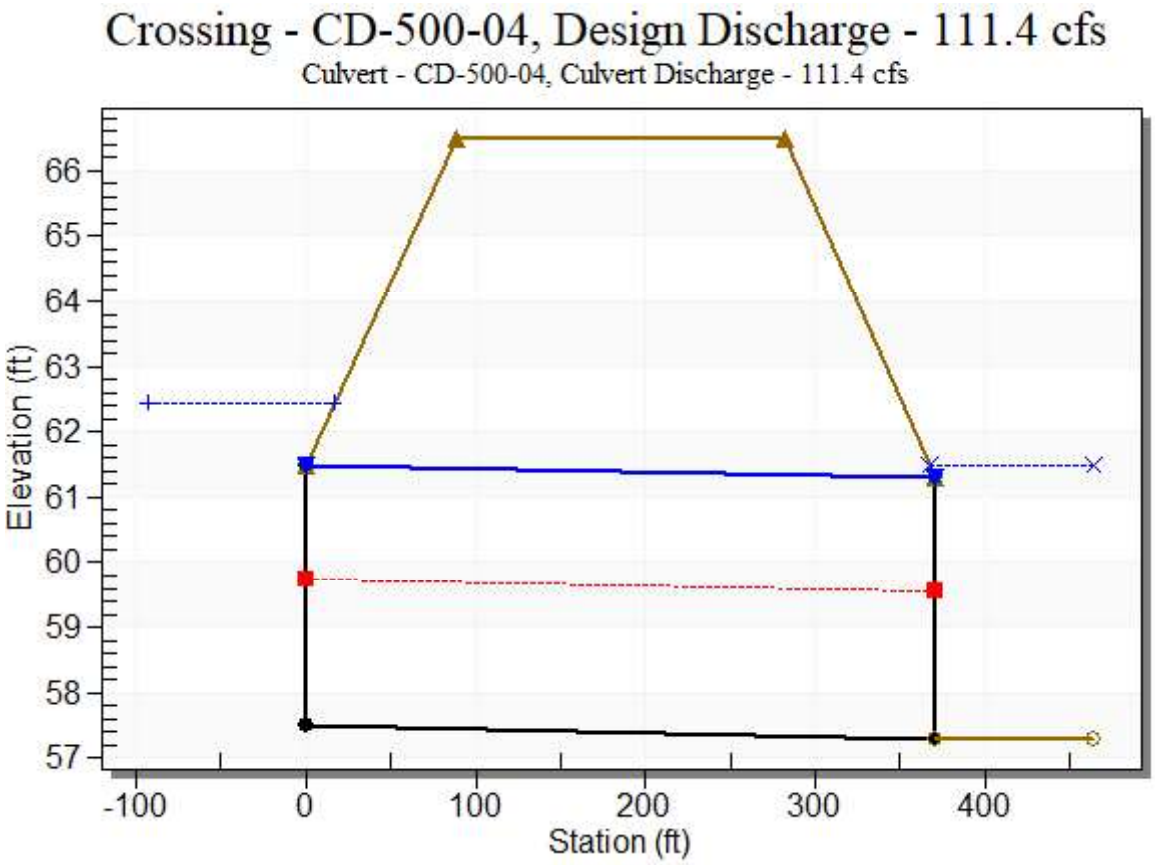
Culvert Length: 371.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: CD-500-04



Water Surface Profile Plot for Culvert: CD-500-04



Site Data - CD-500-04

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 57.50 ft

Outlet Station: 371.00 ft

Outlet Elevation: 57.30 ft

Number of Barrels: 2

Culvert Data Summary - CD-500-04

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 24 - Downstream Channel Rating Curve (Crossing: CD-500-04)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
72.03	61.50	4.20
79.22	61.50	4.20
111.36	61.50	4.20

Tailwater Channel Data - CD-500-04

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 61.50 ft

Roadway Data for Crossing: CD-500-04

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 66.50 ft

Roadway Surface: Paved

Roadway Top Width: 193.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 25 - Summary of Culvert Flows at Crossing: CD-500-07

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-500-07 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
71.11	50-year	21.49	21.49	0.00	1
71.44	100-year	24.78	24.78	0.00	1
72.96	500-year	36.24	36.24	0.00	1
75.10	Overtopping	47.89	47.89	0.00	Overtopping

Rating Curve Plot for Crossing: CD-500-07

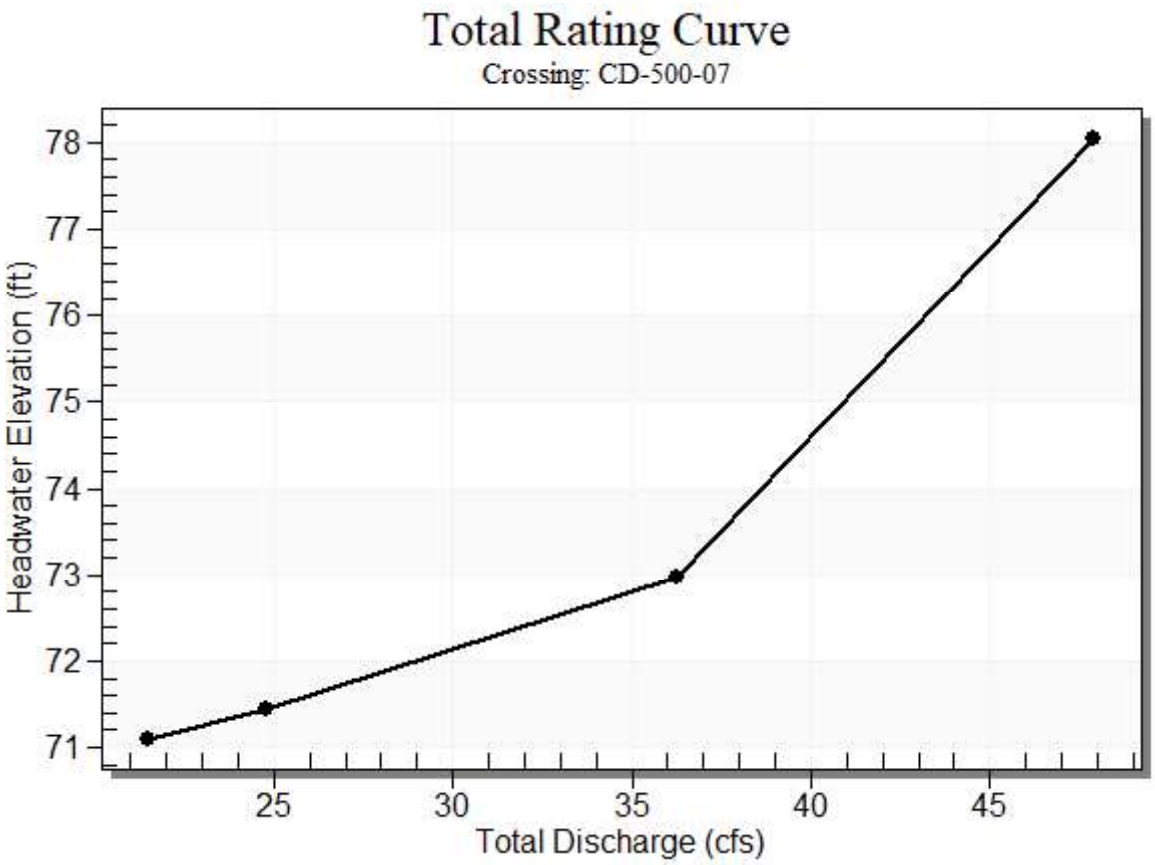


Table 26 - Culvert Summary Table: CD-500-07

Discharge Names	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)
50-year	21.49	21.49	71.11	2.196	4.007	4-FFf	3.000	1.490	3.000	3.500	3.040
100-year	24.78	24.78	71.44	2.396	4.339	4-FFf	3.000	1.602	3.000	3.500	3.506
500-year	36.24	36.24	72.96	3.068	5.863	4-FFf	3.000	1.953	3.000	3.500	5.127

****

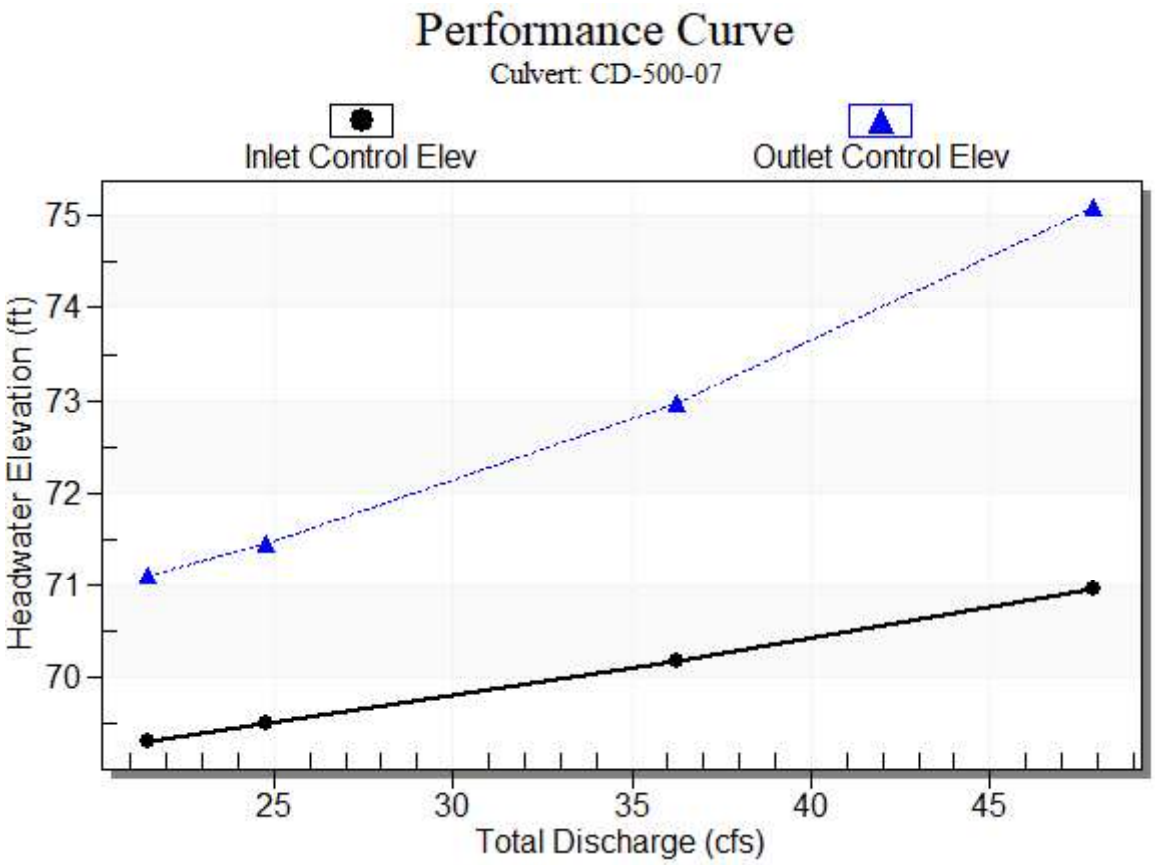
Straight Culvert

Inlet Elevation (invert): 67.10 ft, Outlet Elevation (invert): 66.60 ft

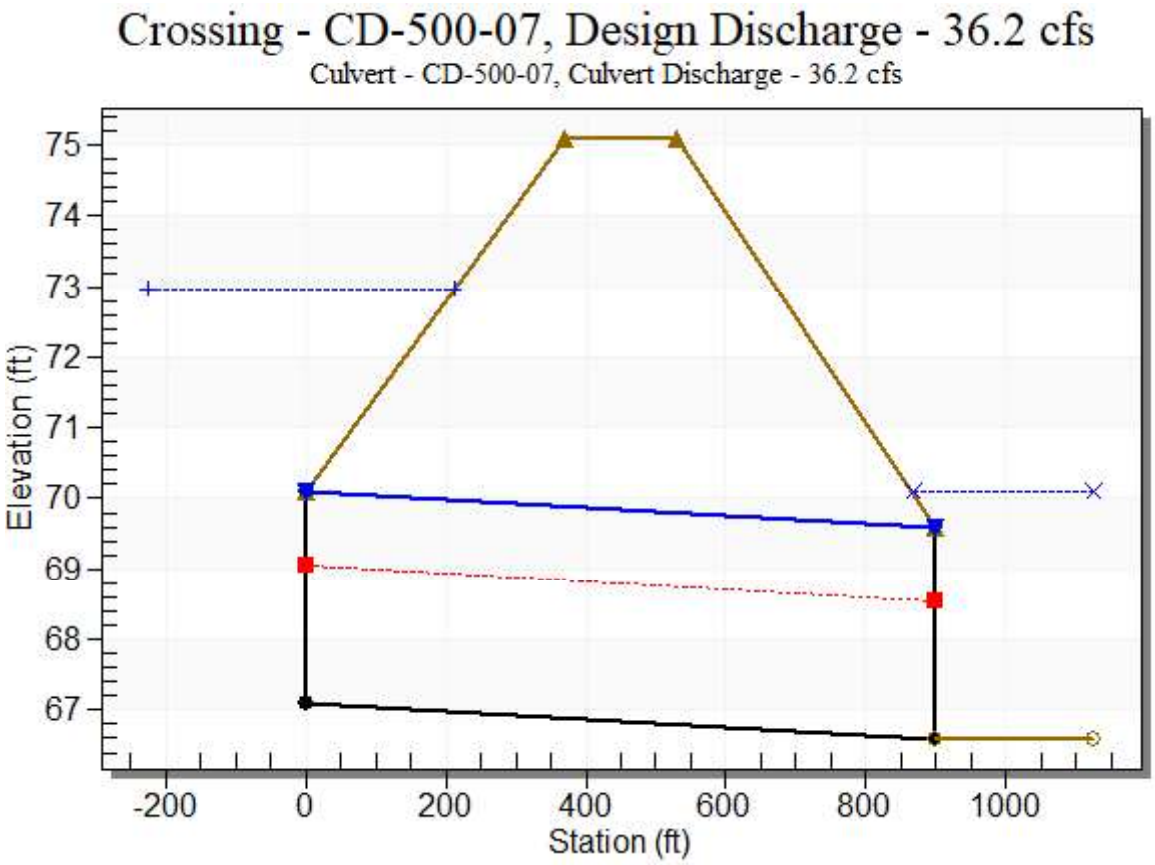
Culvert Length: 900.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: CD-500-07



Water Surface Profile Plot for Culvert: CD-500-07



Site Data - CD-500-07

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 67.10 ft

Outlet Station: 900.00 ft

Outlet Elevation: 66.60 ft

Number of Barrels: 1

Culvert Data Summary - CD-500-07

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 27 - Downstream Channel Rating Curve (Crossing: CD-500-07)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
21.49	70.10	3.50
24.78	70.10	3.50
36.24	70.10	3.50

Tailwater Channel Data - CD-500-07

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 70.10 ft

Roadway Data for Crossing: CD-500-07

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 75.10 ft

Roadway Surface: Paved

Roadway Top Width: 159.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 28 - Summary of Culvert Flows at Crossing: CD-500-01, CD-502-01

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-500-01, CD-502-01 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
63.52	50-year	63.20	63.20	0.00	1
63.70	100-year	73.34	73.34	0.00	1
64.54	500-year	108.77	108.77	0.00	1
68.00	Overtopping	196.20	196.20	0.00	Overtopping

Rating Curve Plot for Crossing: CD-500-01, CD-502-01

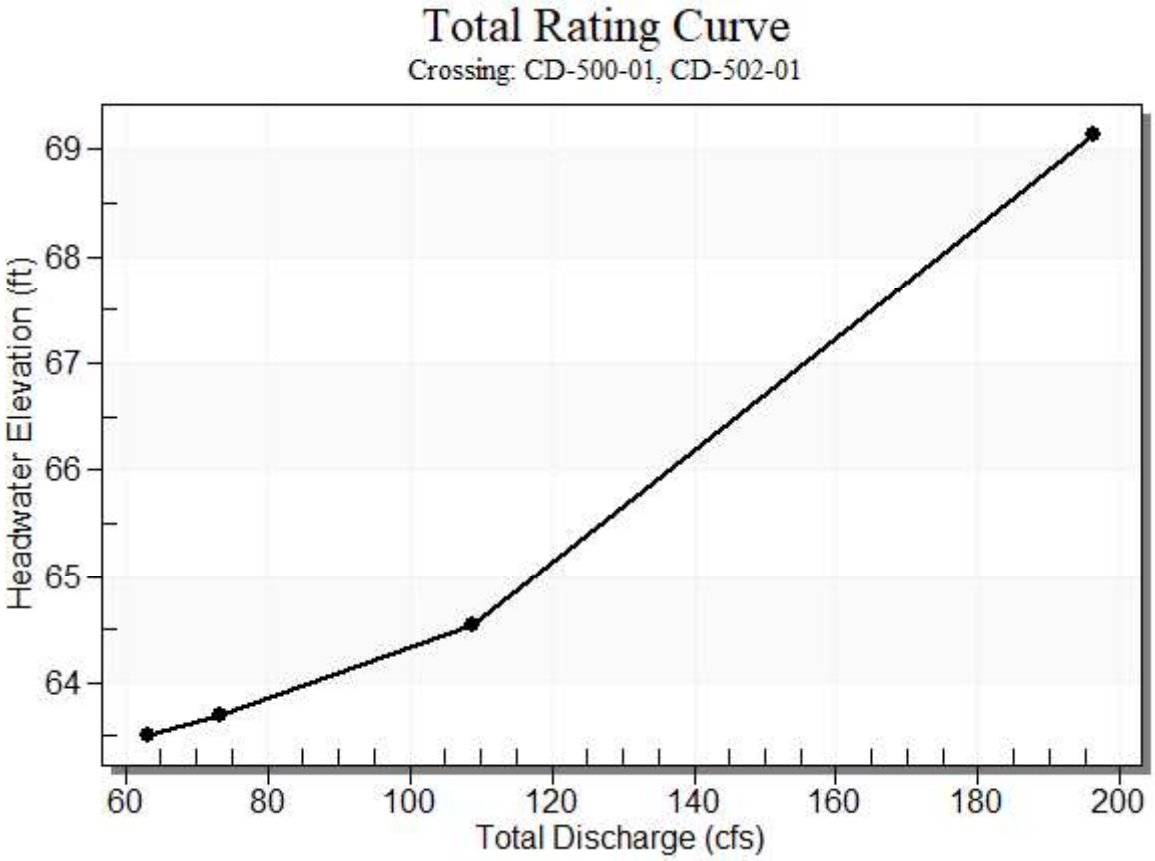


Table 29 - Culvert Summary Table: CD-500-01, CD-502-01

Discharge Names	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)
50-year	63.20	63.20	63.52	2.562	5.419	4-FFf	3.500	1.739	3.500	5.100	3.284
100-year	73.34	73.34	63.70	2.806	5.599	4-FFf	3.500	1.876	3.500	5.100	3.811
500-year	108.77	108.77	64.54	3.633	6.436	4-FFf	3.500	2.303	3.500	5.100	5.653

****

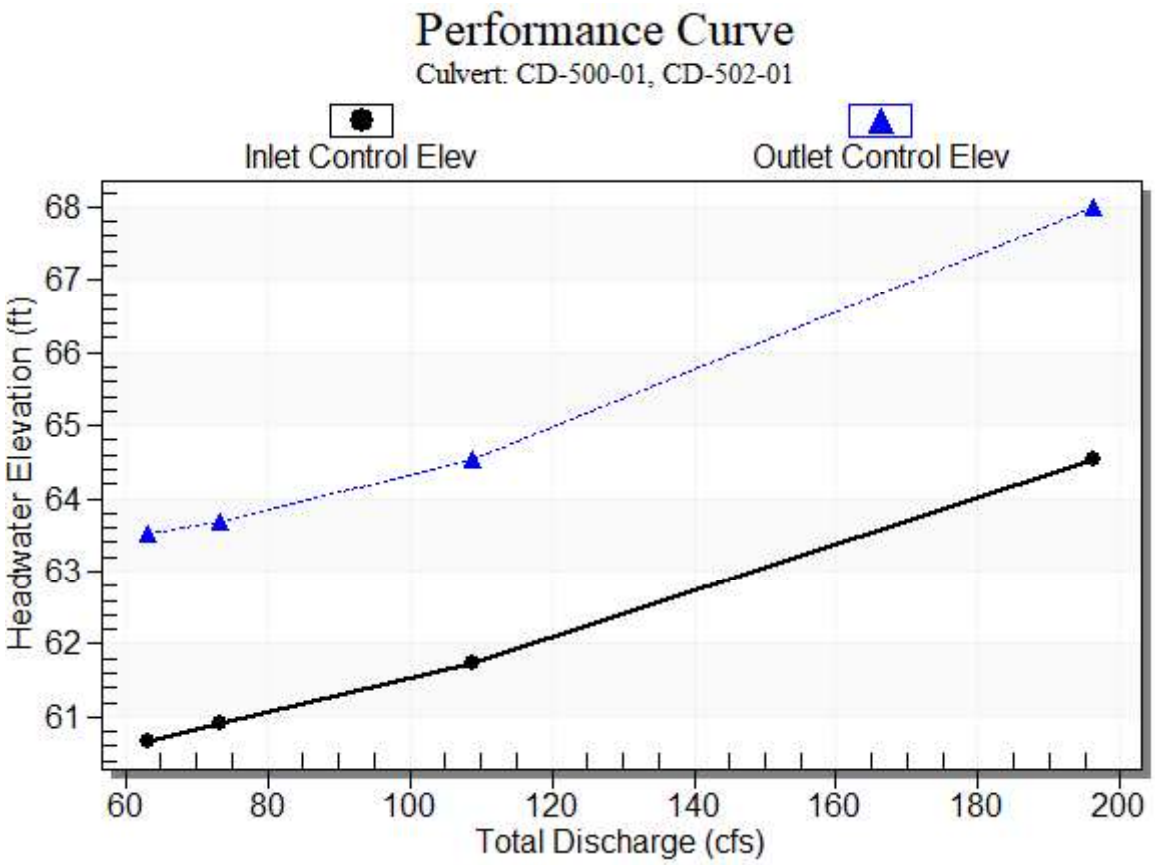
Straight Culvert

Inlet Elevation (invert): 58.10 ft, Outlet Elevation (invert): 57.90 ft

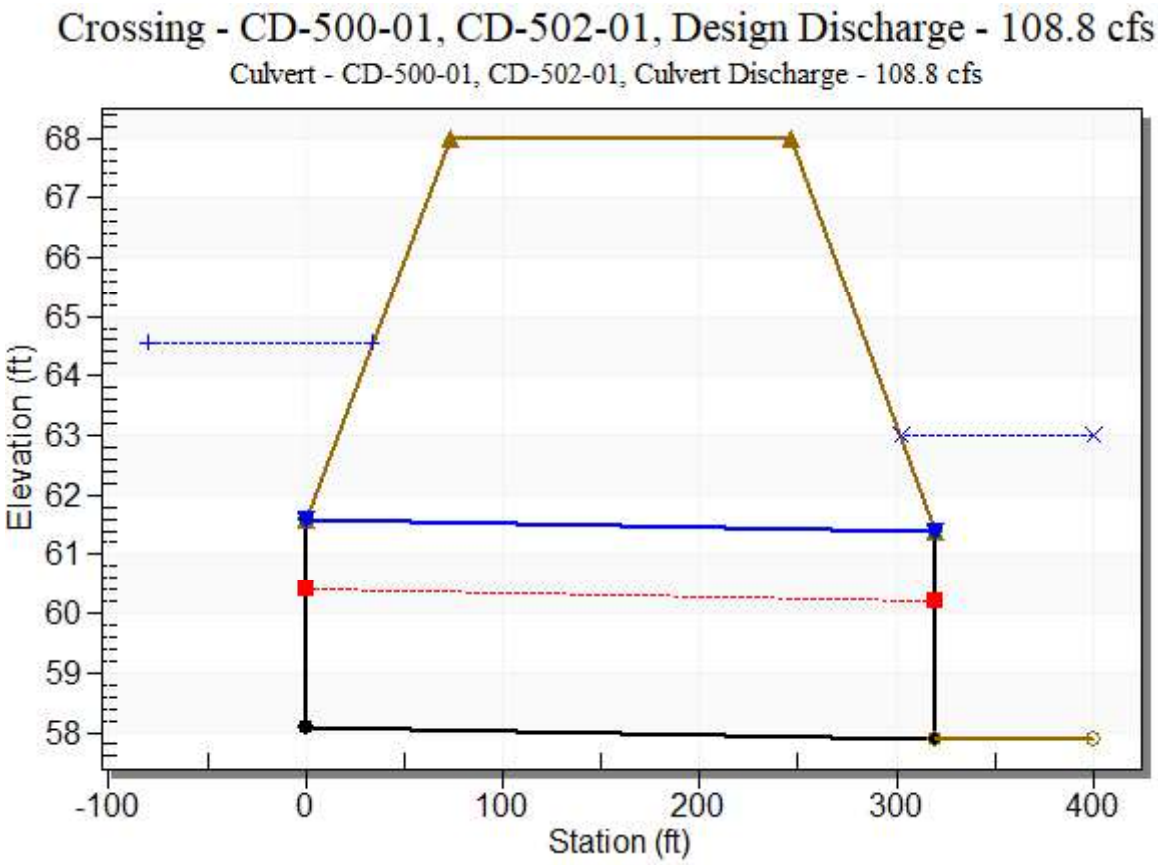
Culvert Length: 320.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: CD-500-01, CD-502-01



Water Surface Profile Plot for Culvert: CD-500-01, CD-502-01



Site Data - CD-500-01, CD-502-01

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 58.10 ft

Outlet Station: 320.00 ft

Outlet Elevation: 57.90 ft

Number of Barrels: 2

Culvert Data Summary - CD-500-01, CD-502-01

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 30 - Downstream Channel Rating Curve (Crossing: CD-500-01, CD-502-01)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
63.20	63.00	5.10
73.34	63.00	5.10
108.77	63.00	5.10

Tailwater Channel Data - CD-500-01, CD-502-01

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 63.00 ft

Roadway Data for Crossing: CD-500-01, CD-502-01

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 68.00 ft

Roadway Surface: Paved

Roadway Top Width: 172.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 31 - Summary of Culvert Flows at Crossing: CD-502-03

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-502-03 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
61.95	50-year	119.67	119.67	0.00	1
62.07	100-year	134.08	134.08	0.00	1
62.66	500-year	191.37	191.37	0.00	1
66.50	Overtopping	396.93	396.93	0.00	Overtopping

Rating Curve Plot for Crossing: CD-502-03

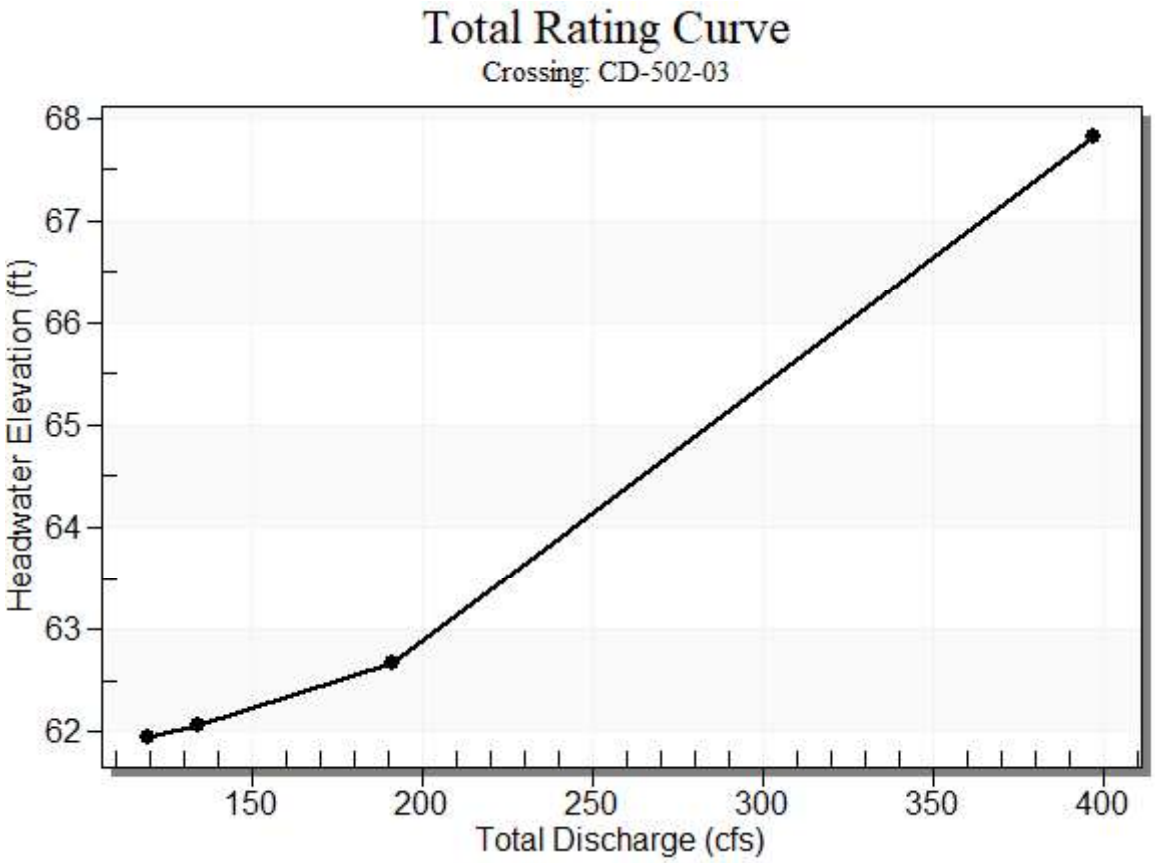


Table 32 - Culvert Summary Table: CD-502-03

Discharge Names	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)
50-year	119.67	119.67	61.95	2.478	3.954	4-FFf	3.500	1.690	3.500	3.700	3.110
100-year	134.08	134.08	62.07	2.656	4.071	4-FFf	3.500	1.792	3.500	3.700	3.484
500-year	191.37	191.37	62.66	3.323	4.662	4-FFf	3.500	2.156	3.500	3.700	4.973

****

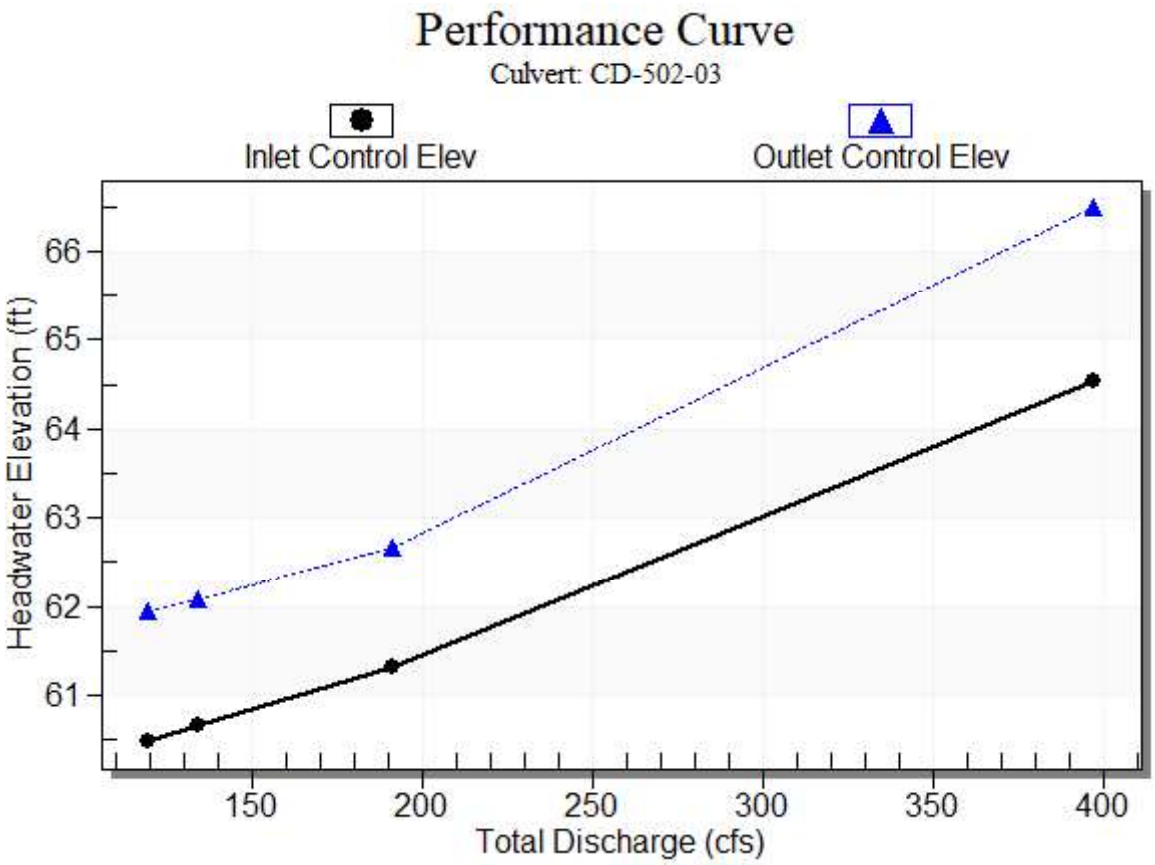
Straight Culvert

Inlet Elevation (invert): 58.00 ft, Outlet Elevation (invert): 57.80 ft

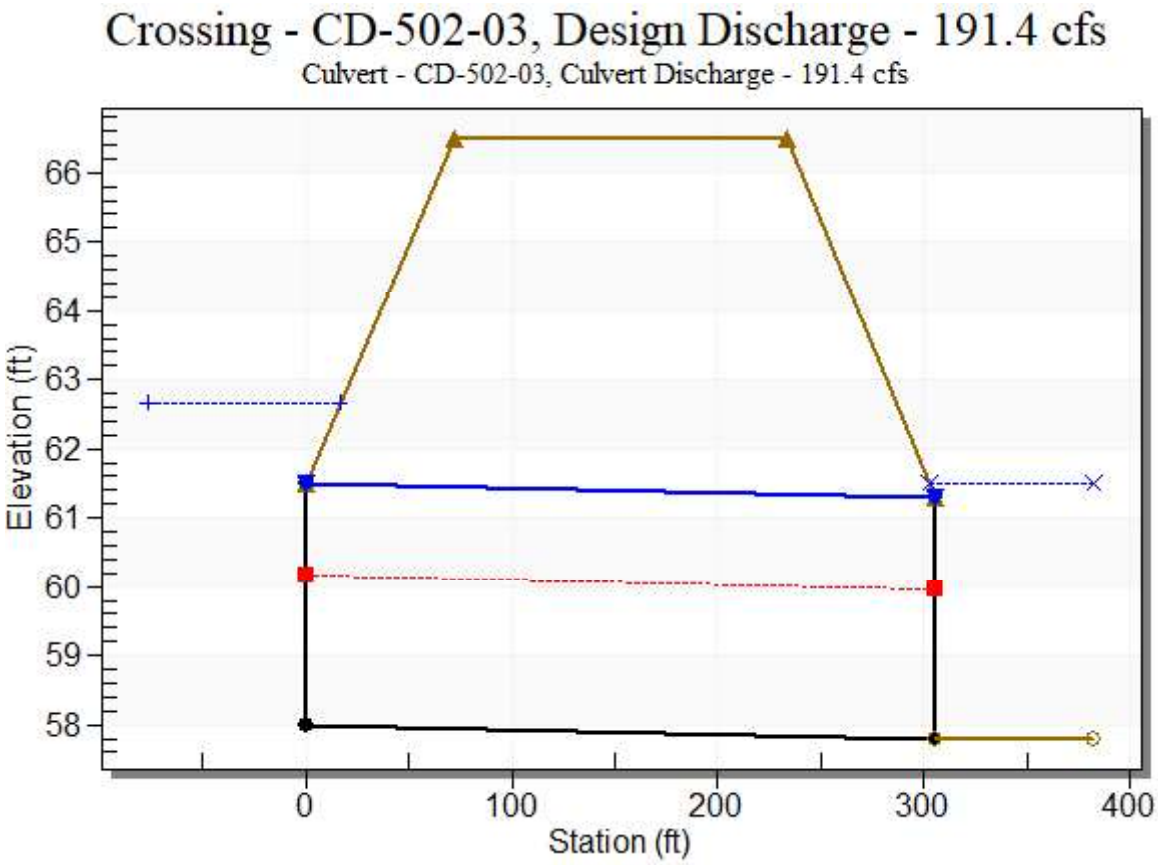
Culvert Length: 306.00 ft, Culvert Slope: 0.0007

****

Culvert Performance Curve Plot: CD-502-03



Water Surface Profile Plot for Culvert: CD-502-03



Site Data - CD-502-03

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 58.00 ft

Outlet Station: 306.00 ft

Outlet Elevation: 57.80 ft

Number of Barrels: 4

Culvert Data Summary - CD-502-03

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 33 - Downstream Channel Rating Curve (Crossing: CD-502-03)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
119.67	61.50	3.70
134.08	61.50	3.70
191.37	61.50	3.70

Tailwater Channel Data - CD-502-03

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 61.50 ft

Roadway Data for Crossing: CD-502-03

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 66.50 ft

Roadway Surface: Paved

Roadway Top Width: 161.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 34 - Summary of Culvert Flows at Crossing: CD-502-04

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-502-04 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
61.85	50-year	218.02	218.02	0.00	1
61.94	100-year	244.30	244.30	0.00	1
62.48	500-year	364.43	364.43	0.00	1
66.50	Overtopping	821.68	821.68	0.00	Overtopping

Rating Curve Plot for Crossing: CD-502-04

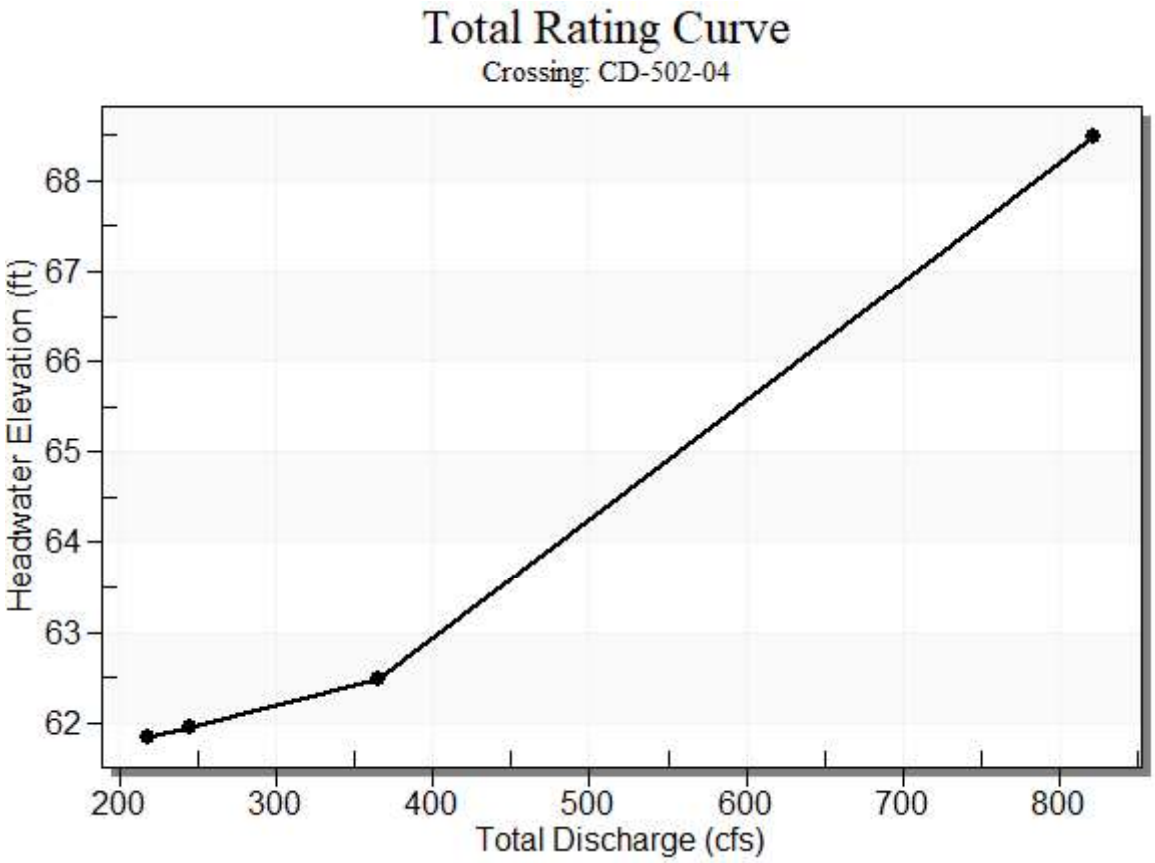


Table 35 - Culvert Summary Table: CD-502-04

Discharge Names	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)
50-year	218.02	218.02	61.85	2.600	4.352	4-FFf	2.857	1.795	4.000	4.200	2.892
100-year	244.30	244.30	61.94	2.788	4.442	4-FFf	3.175	1.906	4.000	4.200	3.240
500-year	364.43	364.43	62.48	3.569	4.983	4-FFf	4.000	2.346	4.000	4.200	4.833

****

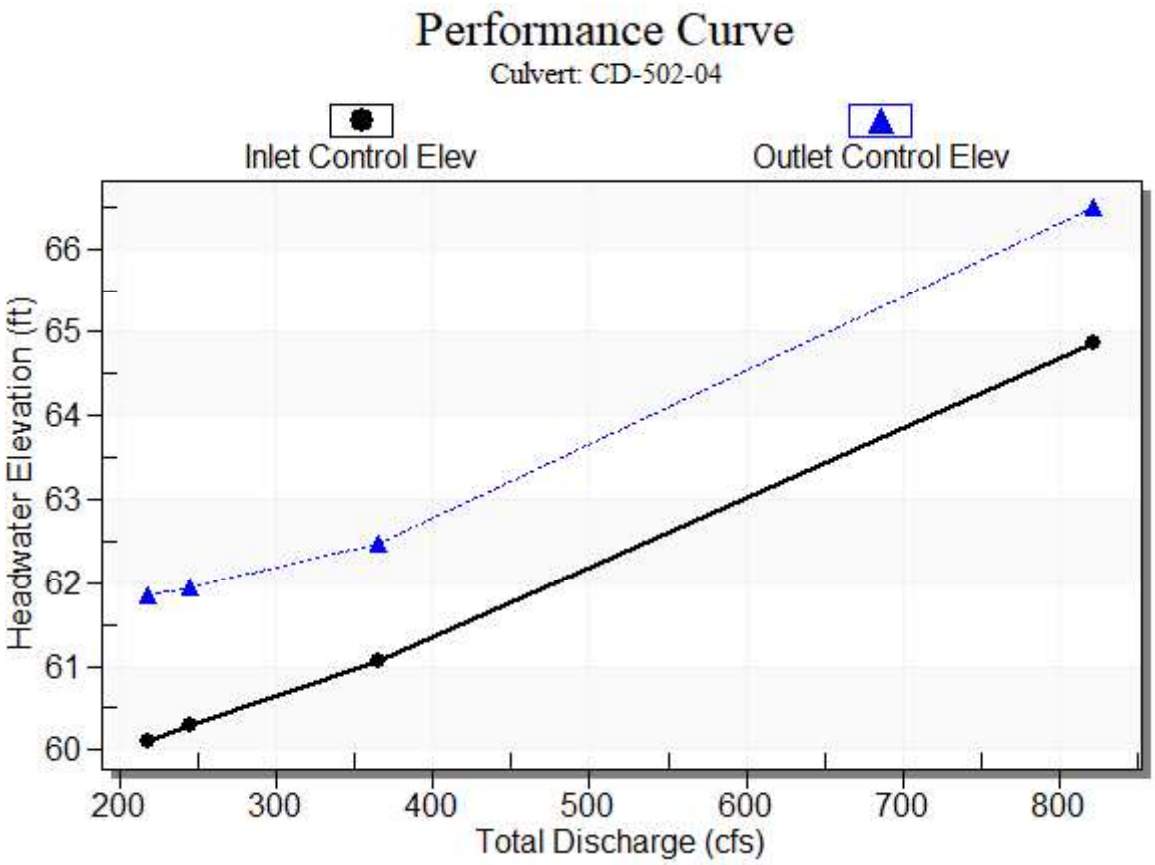
Straight Culvert

Inlet Elevation (invert): 57.50 ft, Outlet Elevation (invert): 57.30 ft

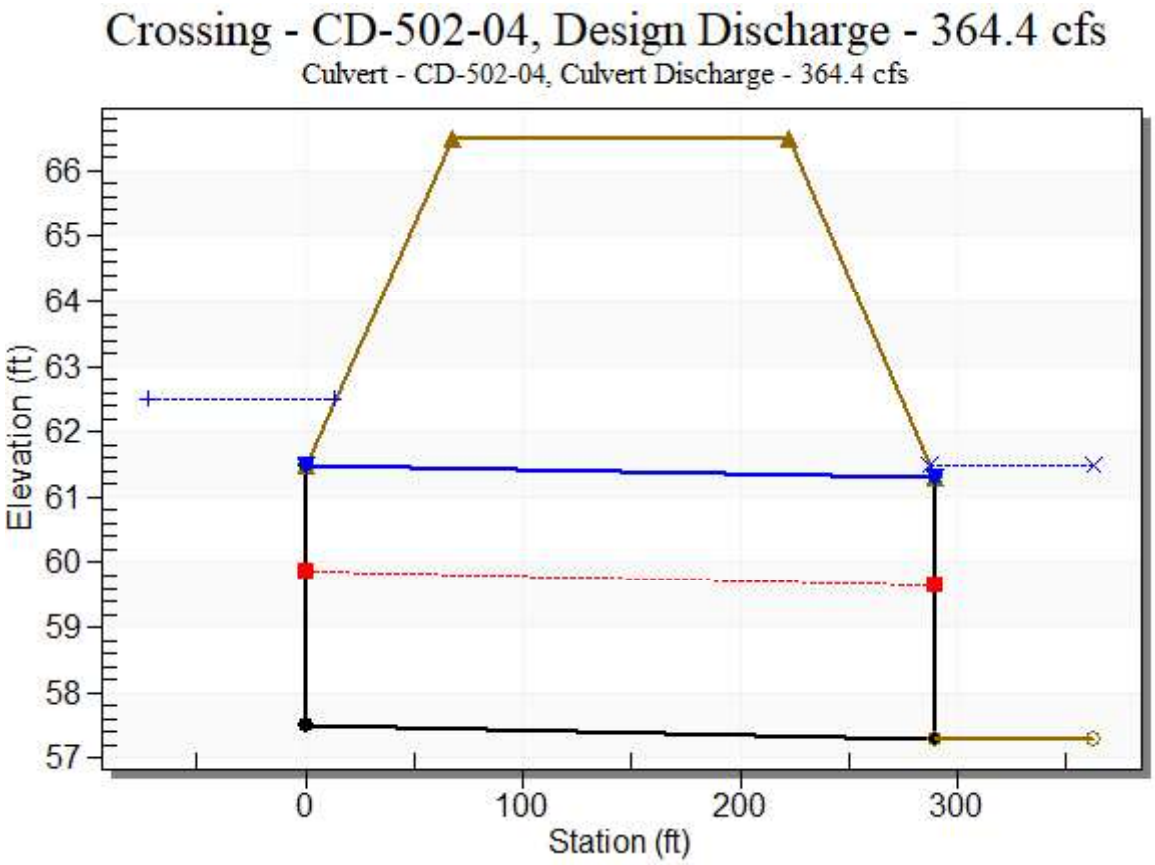
Culvert Length: 290.00 ft, Culvert Slope: 0.0007

****

Culvert Performance Curve Plot: CD-502-04



Water Surface Profile Plot for Culvert: CD-502-04



Site Data - CD-502-04

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 57.50 ft

Outlet Station: 290.00 ft

Outlet Elevation: 57.30 ft

Number of Barrels: 6

Culvert Data Summary - CD-502-04

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 36 - Downstream Channel Rating Curve (Crossing: CD-502-04)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
218.02	61.50	4.20
244.30	61.50	4.20
364.43	61.50	4.20

Tailwater Channel Data - CD-502-04

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 61.50 ft

Roadway Data for Crossing: CD-502-04

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 66.50 ft

Roadway Surface: Paved

Roadway Top Width: 154.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 37 - Summary of Culvert Flows at Crossing: CD-502-05

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-502-05 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
71.40	50-year	62.50	62.50	0.00	1
71.54	100-year	70.41	70.41	0.00	1
72.23	500-year	101.51	101.51	0.00	1
75.90	Overtopping	196.84	196.84	0.00	Overtopping

Rating Curve Plot for Crossing: CD-502-05

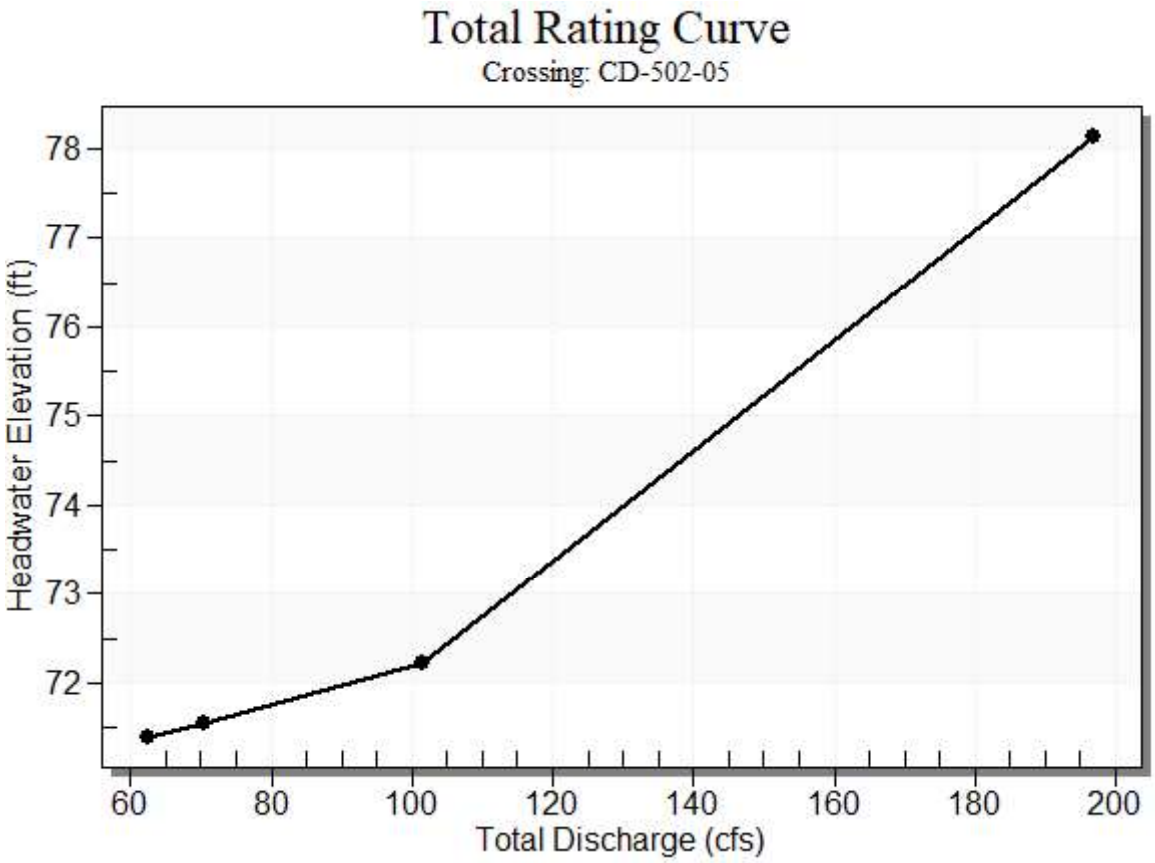


Table 38 - Culvert Summary Table: CD-502-05

Discharge Names	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)
50-year	62.50	62.50	71.40	2.545	4.004	4-FFf	3.500	1.729	3.500	3.700	3.248
100-year	70.41	70.41	71.54	2.737	4.140	4-FFf	3.500	1.837	3.500	3.700	3.659
500-year	101.51	101.51	72.23	3.459	4.830	4-FFf	3.500	2.223	3.500	3.700	5.275

****

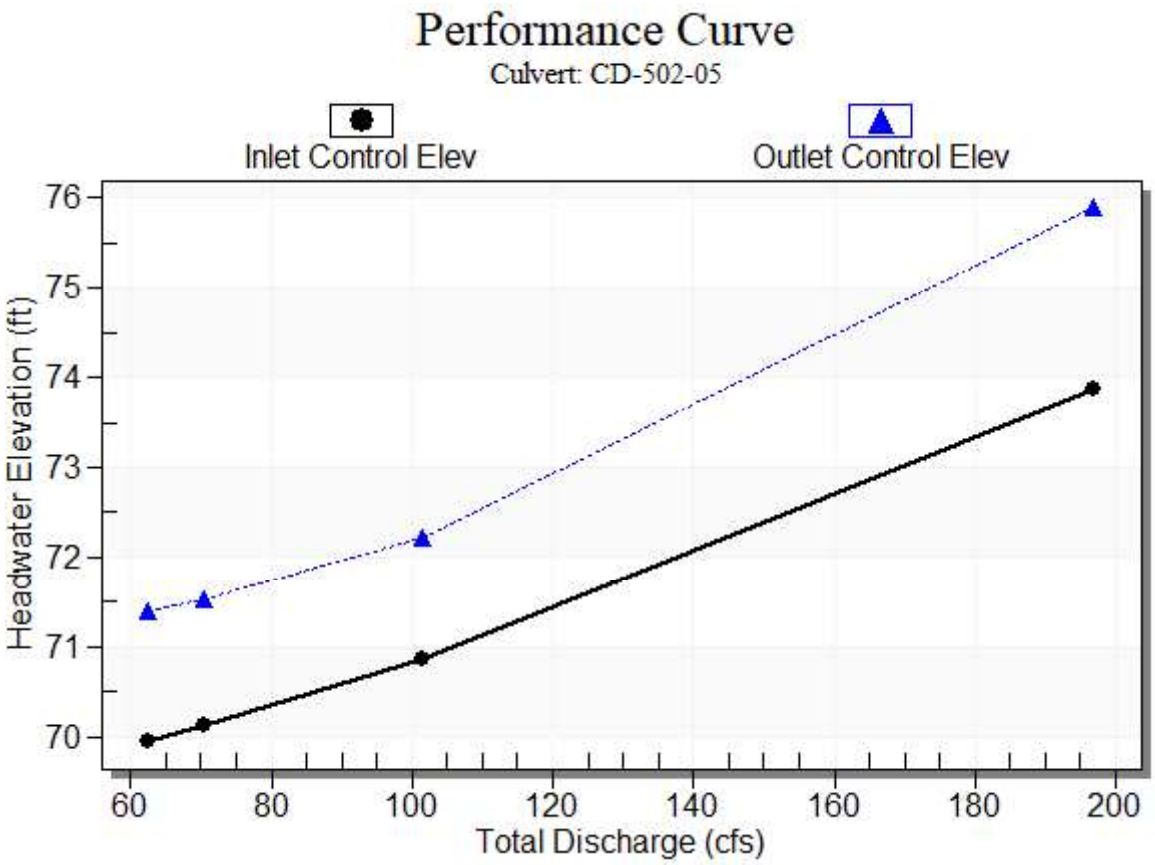
Straight Culvert

Inlet Elevation (invert): 67.40 ft, Outlet Elevation (invert): 67.20 ft

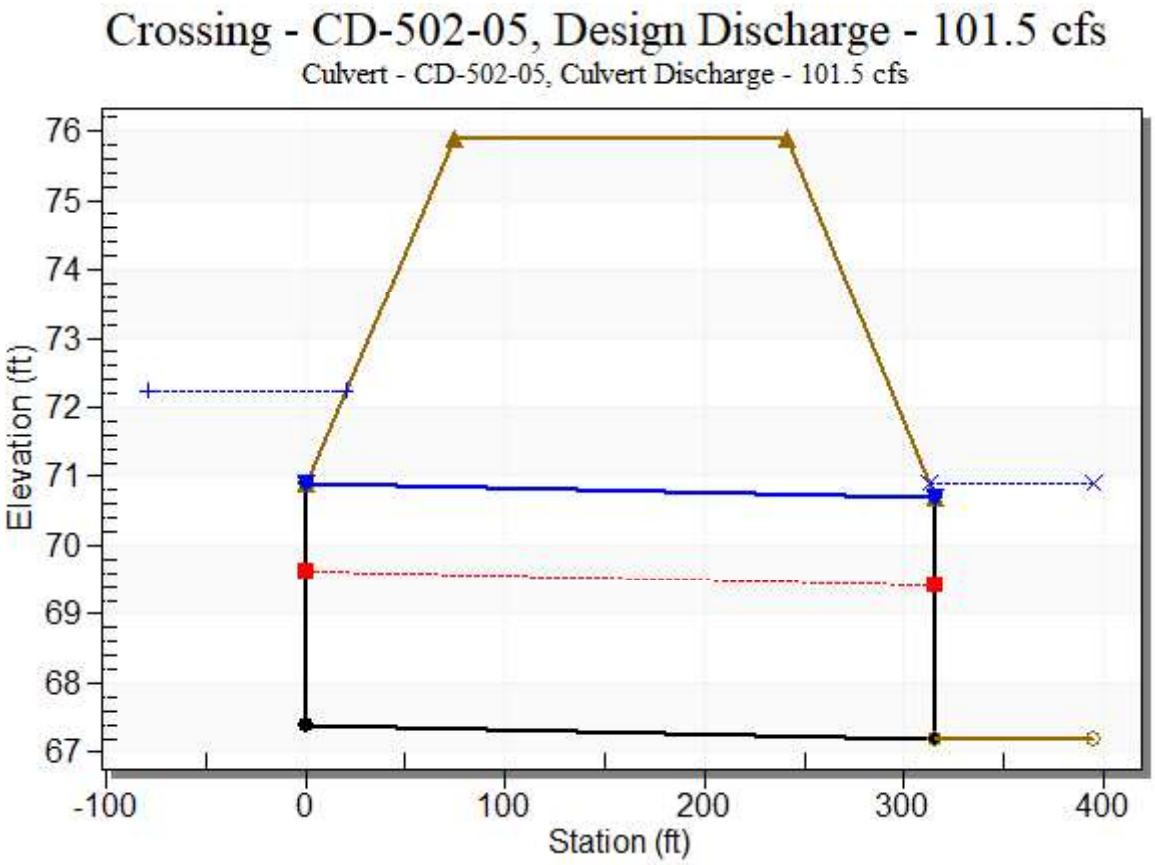
Culvert Length: 316.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: CD-502-05



Water Surface Profile Plot for Culvert: CD-502-05



Site Data - CD-502-05

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 67.40 ft

Outlet Station: 316.00 ft

Outlet Elevation: 67.20 ft

Number of Barrels: 2

Culvert Data Summary - CD-502-05

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 39 - Downstream Channel Rating Curve (Crossing: CD-502-05)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
62.50	70.90	3.70
70.41	70.90	3.70
101.51	70.90	3.70

Tailwater Channel Data - CD-502-05

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 70.90 ft

Roadway Data for Crossing: CD-502-05

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 75.90 ft

Roadway Surface: Paved

Roadway Top Width: 166.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 40 - Summary of Culvert Flows at Crossing: CD-502-08

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-502-08 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
65.83	50-year	72.50	72.50	0.00	1
65.95	100-year	84.90	84.90	0.00	1
66.53	500-year	127.89	127.89	0.00	1
70.50	Overtopping	281.49	281.49	0.00	Overtopping

Rating Curve Plot for Crossing: CD-502-08

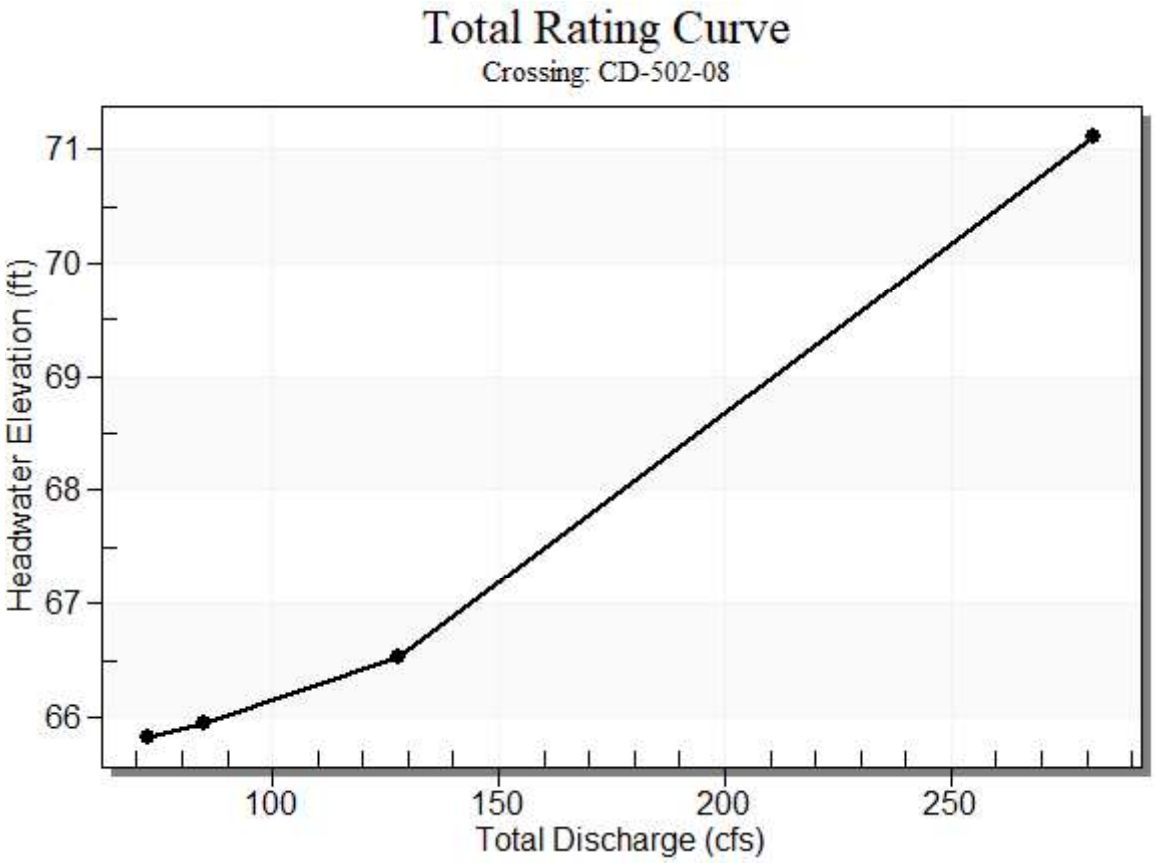


Table 41 - Culvert Summary Table: CD-502-08

Discharge Names	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)
50-year	72.50	72.50	65.83	3.186	6.332	4-FFf	3.497	2.273	6.000	6.000	2.564
100-year	84.90	84.90	65.95	3.520	6.455	4-FFf	3.895	2.467	6.000	6.000	3.003
500-year	127.89	127.89	66.53	4.530	7.032	4-FFf	6.000	3.059	6.000	6.000	4.523

****

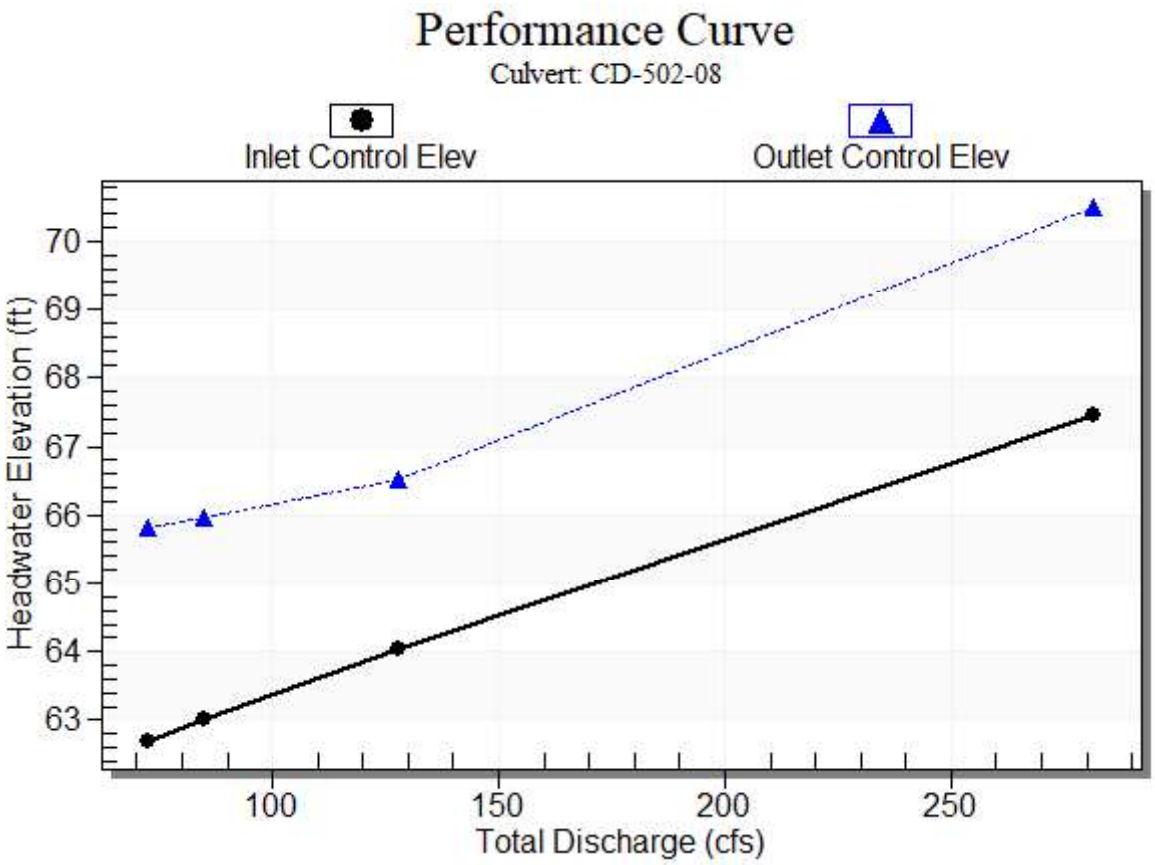
Straight Culvert

Inlet Elevation (invert): 59.50 ft, Outlet Elevation (invert): 59.10 ft

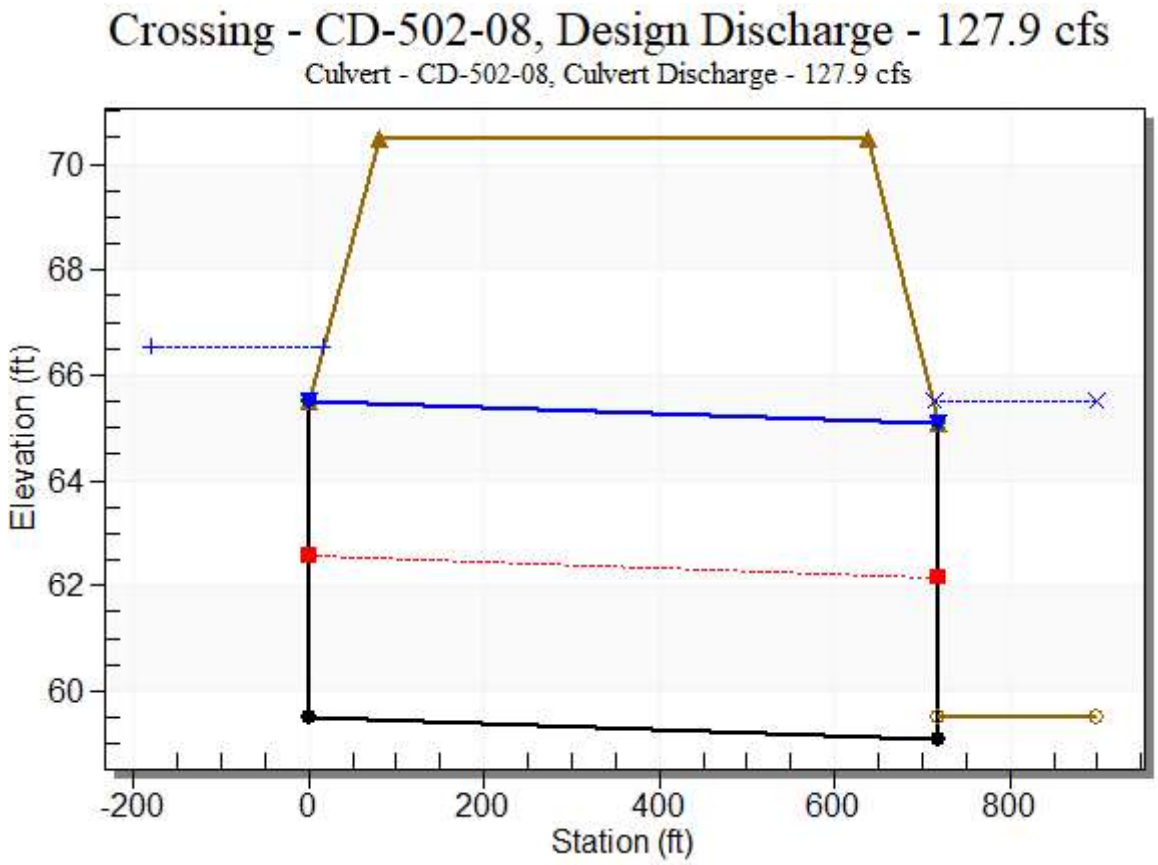
Culvert Length: 719.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: CD-502-08



Water Surface Profile Plot for Culvert: CD-502-08



Site Data - CD-502-08

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 59.50 ft

Outlet Station: 719.00 ft

Outlet Elevation: 59.10 ft

Number of Barrels: 1

Culvert Data Summary - CD-502-08

Barrel Shape: Circular

Barrel Diameter: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 42 - Downstream Channel Rating Curve (Crossing: CD-502-08)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
72.50	65.50	6.00
84.90	65.50	6.00
127.89	65.50	6.00

Tailwater Channel Data - CD-502-08

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 65.50 ft

Roadway Data for Crossing: CD-502-08

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 70.50 ft

Roadway Surface: Paved

Roadway Top Width: 557.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 43 - Summary of Culvert Flows at Crossing: CD-500-05

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-500-05 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
73.70	50-year	19.87	19.87	0.00	1
73.81	100-year	22.47	22.47	0.00	1
74.37	500-year	32.44	32.44	0.00	1
78.30	Overtopping	70.06	70.06	0.00	Overtopping

Rating Curve Plot for Crossing: CD-500-05

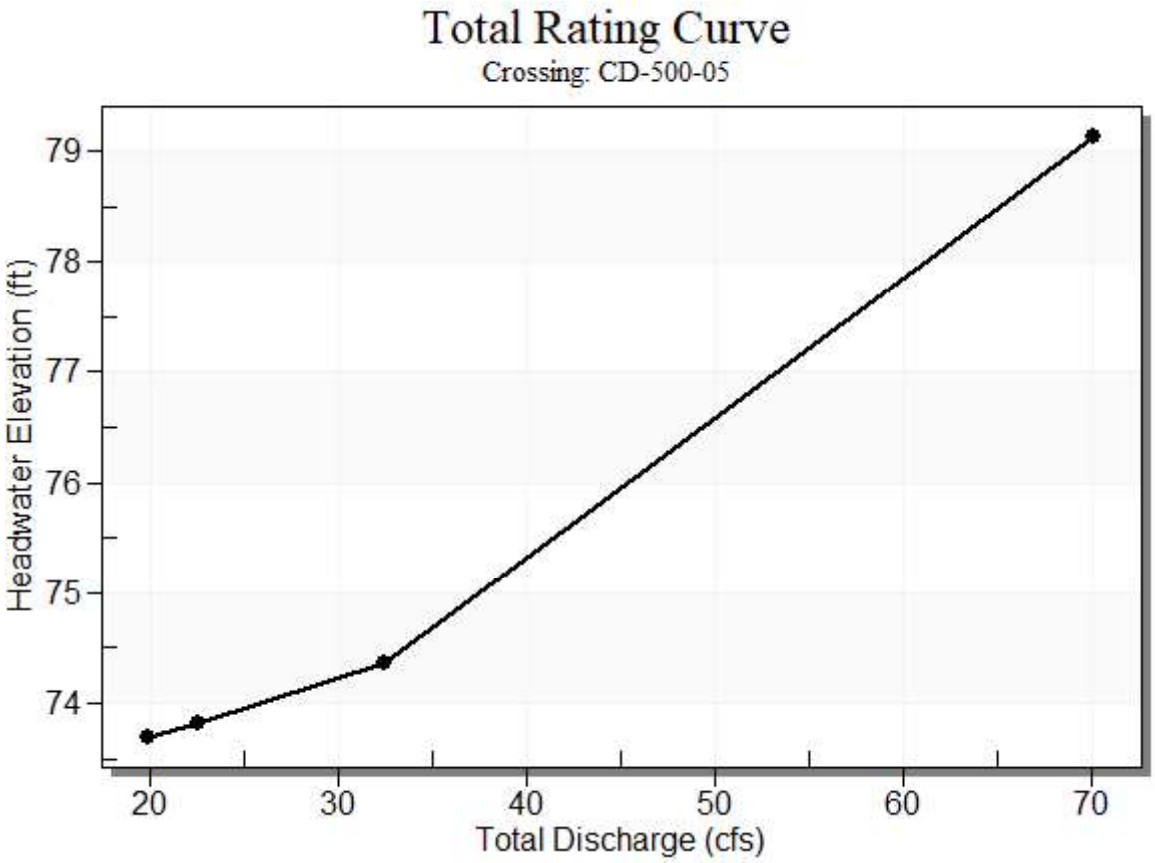


Table 44 - Culvert Summary Table: CD-500-05

Discharge Names	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)
50-year	19.87	19.87	73.70	2.093	3.402	4-FFf	3.000	1.431	3.000	3.200	2.811
100-year	22.47	22.47	73.81	2.256	3.514	4-FFf	3.000	1.525	3.000	3.200	3.179
500-year	32.44	32.44	74.37	2.842	4.072	4-FFf	3.000	1.845	3.000	3.200	4.589

****

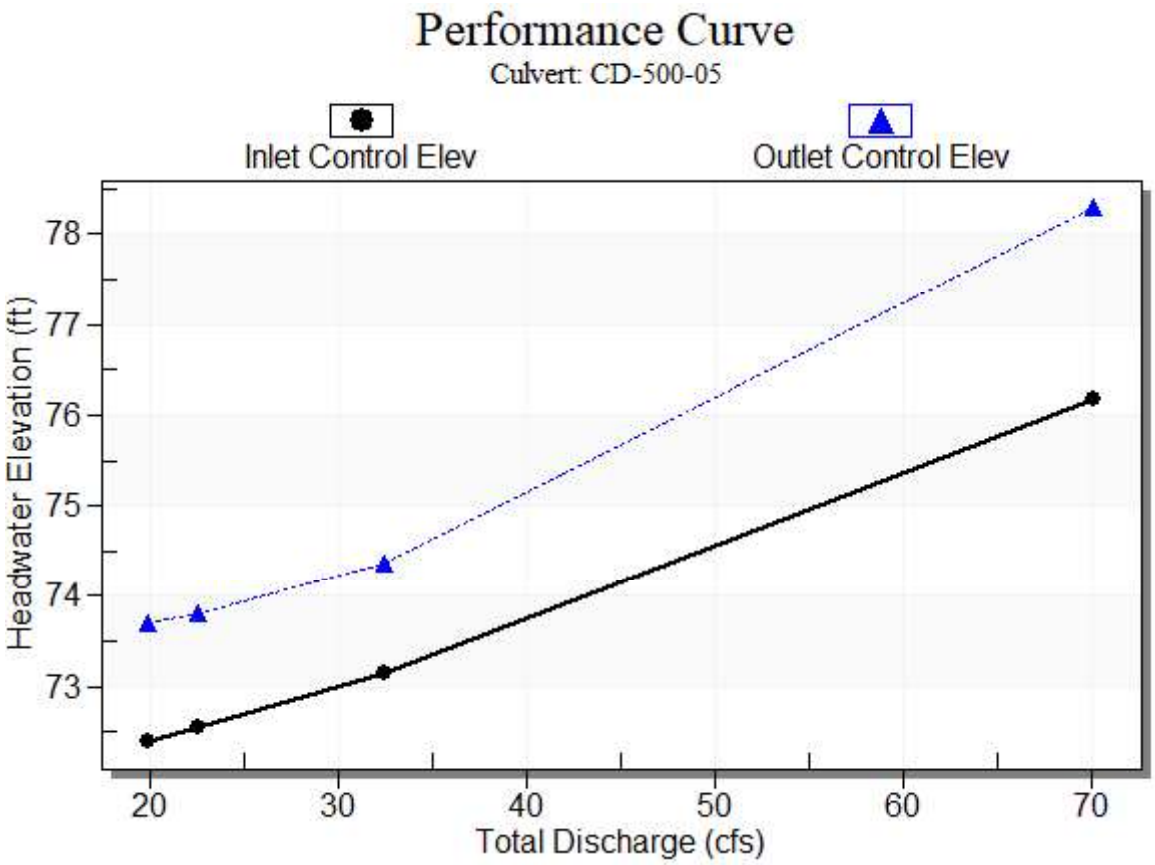
Straight Culvert

Inlet Elevation (invert): 70.30 ft, Outlet Elevation (invert): 70.10 ft

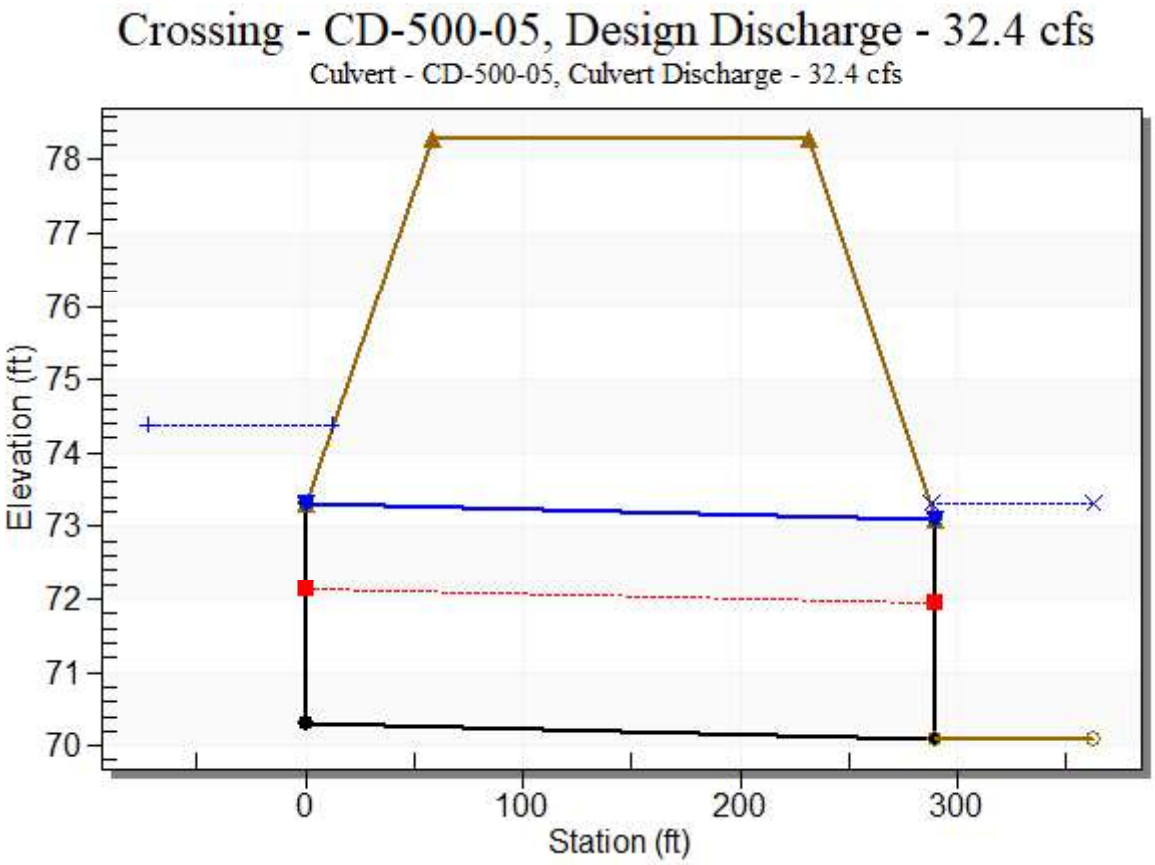
Culvert Length: 290.00 ft, Culvert Slope: 0.0007

****

Culvert Performance Curve Plot: CD-500-05



Water Surface Profile Plot for Culvert: CD-500-05



Site Data - CD-500-05

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 70.30 ft

Outlet Station: 290.00 ft

Outlet Elevation: 70.10 ft

Number of Barrels: 1

Culvert Data Summary - CD-500-05

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 45 - Downstream Channel Rating Curve (Crossing: CD-500-05)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
19.87	73.30	3.20
22.47	73.30	3.20
32.44	73.30	3.20

Tailwater Channel Data - CD-500-05

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 73.30 ft

Roadway Data for Crossing: CD-500-05

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 78.30 ft

Roadway Surface: Paved

Roadway Top Width: 173.00 ft

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 46 - Summary of Culvert Flows at Crossing: CD-502-06

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CD-502-06 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
61.01	50-year	51.22	51.22	0.00	1
61.19	100-year	59.86	59.86	0.00	1
65.60	500-year	172.19	162.68	9.30	16
65.50	Overtopping	161.07	161.07	0.00	Overtopping

Rating Curve Plot for Crossing: CD-502-06

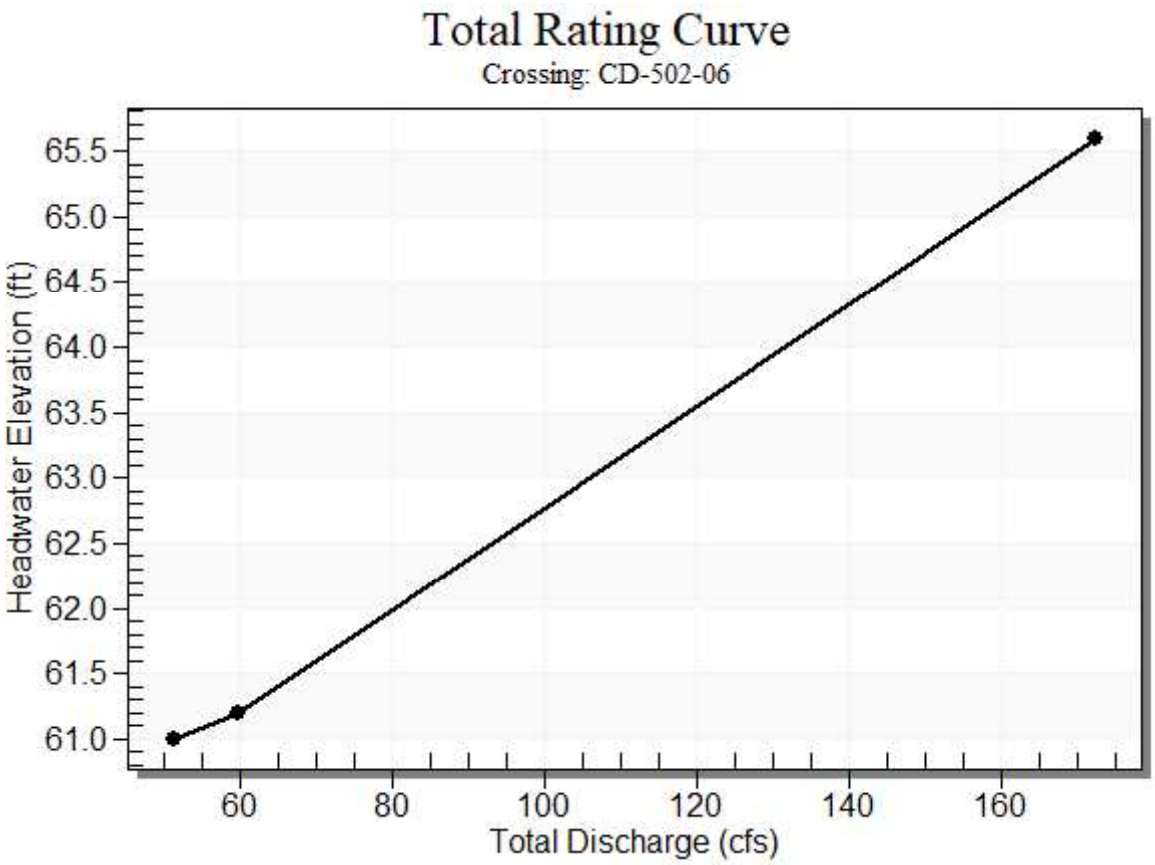


Table 47 - Culvert Summary Table: CD-502-06

Discharge Names	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)
50-year	51.22	51.22	61.01	2.445	3.506	4-FFf	3.000	1.629	3.000	3.100	3.623
100-year	59.86	59.86	61.19	2.696	3.691	4-FFf	3.000	1.767	3.000	3.100	4.234
500-year	172.19	162.68	65.60	7.254	8.100	4-FFf	3.000	2.780	3.000	3.100	11.507

****

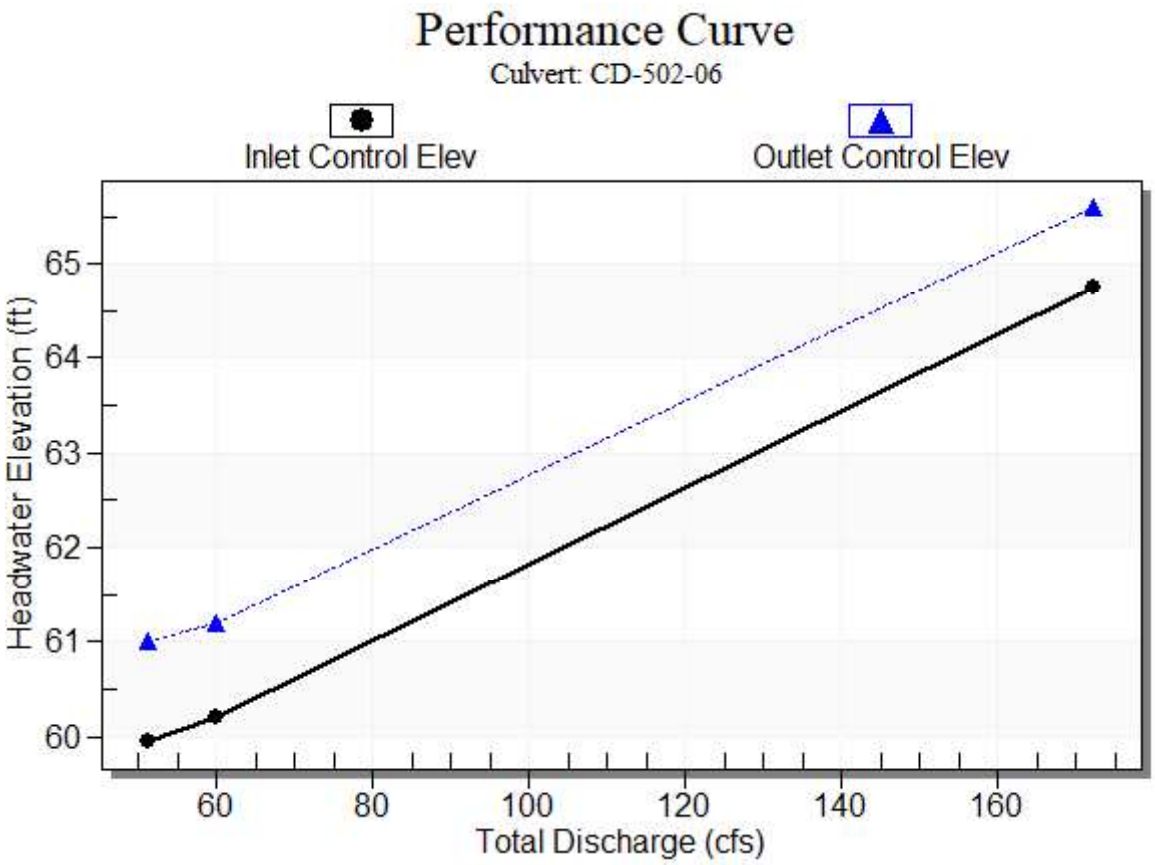
Straight Culvert

Inlet Elevation (invert): 57.50 ft, Outlet Elevation (invert): 57.40 ft

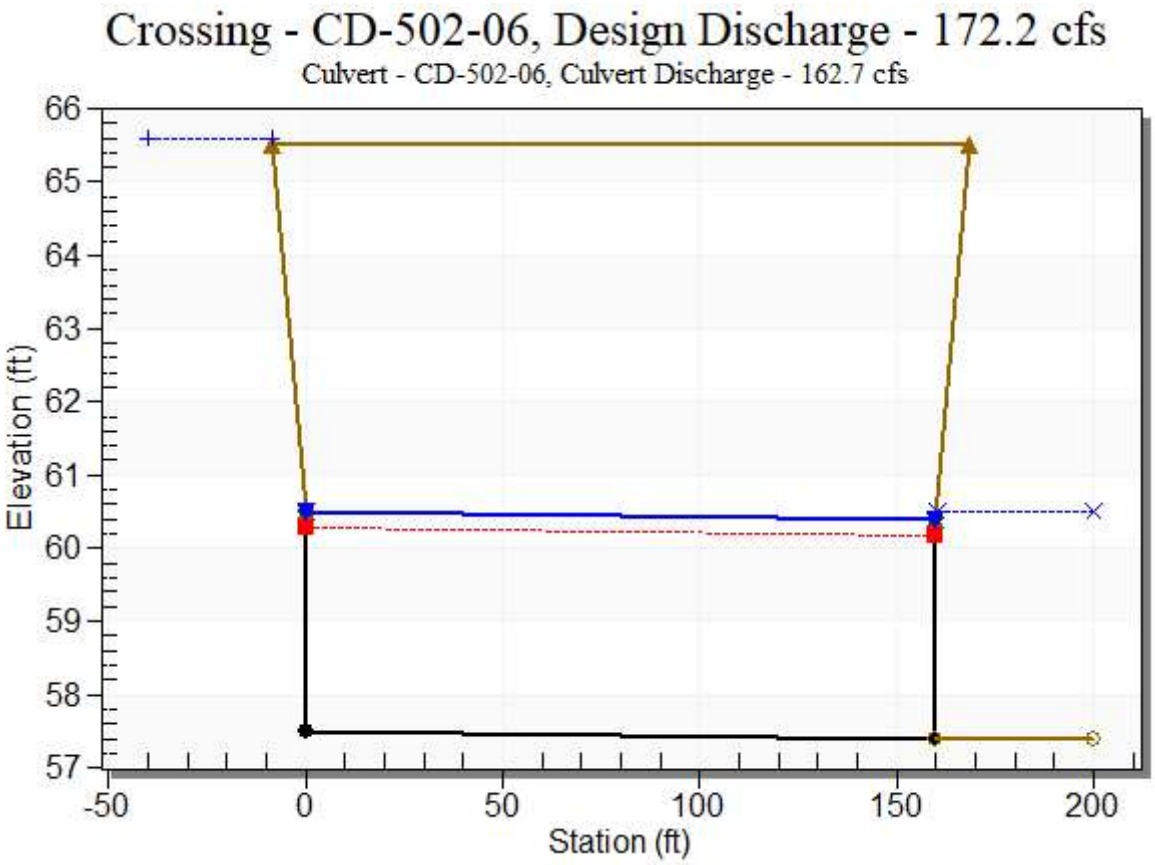
Culvert Length: 160.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: CD-502-06



Water Surface Profile Plot for Culvert: CD-502-06



Site Data - CD-502-06

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 57.50 ft

Outlet Station: 160.00 ft

Outlet Elevation: 57.40 ft

Number of Barrels: 2

Culvert Data Summary - CD-502-06

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 48 - Downstream Channel Rating Curve (Crossing: CD-502-06)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.22	60.50	3.10
59.86	60.50	3.10
172.19	60.50	3.10

Tailwater Channel Data - CD-502-06

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 60.50 ft

Roadway Data for Crossing: CD-502-06

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 65.50 ft

Roadway Surface: Paved

Roadway Top Width: 177.00 ft

Appendix E

Correspondence

MEETING NOTES

SFWMD Pre-Application Meeting

Osceola Parkway Extension (599-223) & Poinciana Parkway Extension (599-224A) Project Development & Environmental (PD&E) Study

Osceola and Orange Counties

Location: SFWMD Orlando Service Center; Date: Tuesday, November 27, 2018; Time: 8:30 am

1. **INTRODUCTION – See Attached Sign In sheet**

2. **PROJECTS OVERVIEW and STATUS**
   a. Osceola Parkway Extension - Construct new limited access facility from SR 417 to Sunbridge Parkway; Permit for 8-lane typical section (Osceola and Orange County)
   b. Poinciana Parkway Extension – Construct new limited access facility from Poinciana Parkway to CR 532; (Osceola and Polk County)

3. **STORMWATER CRITERIA**
   a. Water Quantity
      i. Mr. Daron confirmed that SFWMD will follow the attenuation criteria set forth by Counties (Orange and Osceola) as this is considered the historic discharge rates for these areas:
         1. Osceola County: 10-year/72-hour storm event (using SFWMD72 distribution) (8.0 inches)
         2. Orange County: 25-year/24-hour with Orange distribution (8.6 inches) (*Osceola Parkway Extension only*)
   b. Water Quality
      i. Standard Wet detention criteria: Greater of the first one (1) inch of runoff from the total developed project or runoff from two and one-half (2.5) inches over the net new impervious area
      ii. Additional treatment and/or nutrient loading requirements are required if the proposed improvements are within an impaired WBID:
         1. Mr. Daron confirmed that Phosphorous Loading calculations are not required if the only basis is because the project is within the Lake Okeechobee BMAP
         2. *Poinciana Parkway Extension*- Mr. Ady recommended that CFX follow the criteria set forth in the previous Poinciana Parkway permit as a template for this project
      iii. In the area of the Reedy Creek Mitigation Bank, alternative treatment systems may be considered such as providing linear treatment swales which discharge via sheet flow to the adjacent wetlands, but are not sized for attenuation in order to avoid wetland impacts.
   c. Floodplain compensation options -
      i. Cup for Cup between the 100-year elevation and estimated average wet season water table
      ii. Can be provided within the proposed stormwater ponds
      iii. Mr. Daron confirmed that stormwater modeling is not allowed to demonstrate compensation, only cup for cup
   d. Other-
      i. As part of the permit application, a list of impacted permitted facilities should be provided for the District's use in tracking future compliance

ii. Mr. Daron confirmed that the District will allow flexibility in the dimensional criteria for wet detention ponds for linear transportation projects
iii. Any impacts to District lands (i.e. conservation, Canal R/W, etc.) will require further coordination outside of the Regulatory department.
iv. Existing borrow pits
    1. If they were previously permitted to provide floodplain compensation, then any impacts to this volume would need to be mitigated. If the borrow pits were not permitted for floodplain compensation, then floodplain impacts would not need to be considered.
    2. Existing borrow pits can be evaluated to be converted into stormwater ponds
    3. Permitted Pre-development discharge can provide proof of discharge, but may need to be evaluated for reasonableness prior to use in comparison against the post-development discharge
    4. Pre-post volume may be required where there was no permitted pre-development discharge

4. ENVIRONMENTAL

a. Osceola Parkway Extension
    i. Advanced Notification Package originally submitted by Florida's Turnpike in April 2012
    ii. PEIR completed in May 2017. Recommended alternative included 144 acres of wetland impacts
    iii. PEIR Reevaluation initiated in July 2017 to evaluate additional alternatives
        1. Ms. Gough outlined that the goal of this reevaluation was to develop an avoidance alternative for impacts to Split Oak Forest and to work with some of the adjacent landowners.
        2. Ms. Gough noted that there has been ongoing discussion with Florida Communities Trust regarding potential impacts to Split Oak Forest.
    iv. Mr. Dailey outlined the alternatives which are currently under consideration.
        1. Boggy Creek Alternative (west of Narcoossee Road)
        2. Lake Nona Alternative (west of Narcoossee Road)
        3. Alternative 107C-1 (east of Narcoossee Road)
        4. Alternative 207D-1 (Split Oak Forest avoidance alternative)
    v. Natural Resource Evaluation update being prepared to evaluate wetland and potential species habitat effects.
        1. Mr. Dailey noted that there are several bald eagle nests located within the project corridor and the project is also within the consultation area for the caracara and scrub-jay.
        2. Mr. Ady noted that either of the alignments will impact District-owned lands.
        3. Mr. Ady noted that it will be important to demonstrate avoidance and minimization of wetland impacts.
    vi. Mitigation Opportunities – there are multiple mitigation bank options in this area.
    vii. Permit discussion: Mr. Daron noted that if the project impacts an existing permitted facility, the permittee will be responsible for making sure that they are still in compliance.

b. Poinciana Parkway Extension
    i. Advanced Notification Package submitted in September 2018.
    ii. Environmental Advisory Group Meeting held August 15, 2018. SFWMD in attendance.
    iii. Alternatives 1, 4 and 5 carried forward from previous Feasibility Study.
    iv. Alternatives 4 and 5 extend into Reedy Creek Mitigation Bank and Upper Lakes Basin Watershed. Alternative 1 minimizes impacts to Reedy Creek Mitigation Bank, and avoids Upper Lakes Basin. But Alternative 1 has greater impacts to existing and proposed

developments, listed species and business/residential impacts.

v. Natural Resource Evaluation being prepared to evaluate wetland and species habitat effects.
vi. Evaluating avoidance, minimization and mitigation.
vii. Open discussion regarding effects

Mr. Ady suggested the existing Poinciana Parkway permit is a good template for evaluating the impacts, direct and secondary, the wetland assessments etc.

Ms. Gough asked about the lead agency for future permitting because the alternative alignments fall within both SFWMD and Southwest Florida Water Management District jurisdiction. Hydrologically the drainage basins discharge /drain to Reedy Creek. There could be a Memorandum of Agreement (MOA) between the SFWMD and SWFWMD, but Mr. Ady suggested that we meet with SWFWMD to discuss as they would need to agree.

Need to look at avoidance and minimization strategies and the previous permit provides a good template for this consideration as well.

Mitigation may be within the Reedy Creek bank, but sufficient credits may not be available. Additional mitigation options may be evaluated. Additionally, an evaluation of the effects on the bank needs to be evaluated and again the District indicated the previous permit may be a good template. The team has begun coordination with the bank owners/consultants.

Because there are impacts to the SFWMD Upper Lakes Basin, coordination with SFWMD Real Estate division will be needed during design and permitting.

Mr. Ady stressed the point that impacts need to be minimized.

Modica and Associates with Kimley-Horn has conducted field evaluations of the wetlands and listed species surveys will begin in January. All of this will be summarized in the PD&E documentation.

5. ACTION ITEMS

SIGN IN SHEET

SFWMD Pre-Application Meeting

Osceola Parkway Extension (599-223) & Poinciana Parkway Extension (599-224A) Project Development & Environmental (PD&E) Study Osceola and Orange Counties

Location: SFWMD Orlando Service Center; Date: Tuesday November 27, 2018; Time: 8:30 pm

NAME	AGENCY/FIRM	PHONE NUMBER	EMAIL	INITIALS
Mark Daron, P.E.	SFWMD	407-858-6100	mdaron@sfwmd.gov	
Marc Ady	SFWMD	407-858-6100	mady@sfwmd.gov	
Nicole Gough	Dewberry (CFX GEC)	407-843-5120	ngough@dewberry.com	
John Rice, P.E.	RS&H	407-893-5843	john.rice@rsandh.com	
Chris Dailey	RS&H	813-636-2722	chirs.dailey@rsandh.com	
Clif Tate, P.E.	Kimley-Horn	407-427-1628	clif.tate@kimley-horn.com	
Lynn Kiefer	Kimley-Horn	772-794-4075	lynn.kiefer@kimley-horn.com	
Gregory Seidel, P.E.	The Balmoral Group	407-629-2185 Ext. 103	gseidel@balmoralgroup.us	
Jennifer Nunn, P.E.	The Balmoral Group	407-629-2185 Ext. 108	jnunn@balmoralgroup.us	

MEETING NOTES *(in italics)*

CFX and Tavistock Drainage Coordination Meeting

Osceola Parkway Extension (599-223)
Project Development & Environmental (PD&E) Study
Osceola and Orange Counties

Location: D. W McIntosh and Associates Office – Winter Park, FL; Date: Wednesday, November 21, 2018; Time: 10:30 am

1. **PURPOSE –**

   The purpose of the meeting is to coordinate existing floodplain and seasonal high water table elevations through the Poitros Property currently owned by Tavistock.

2. **INTRODUCTIONS**

3. **PROJECTS OVERVIEW and STATUS**

   PD&E Study for proposed Osceola Parkway Extension - Construct new limited access facility from SR 417 to Sunbridge Parkway; Permit for 8-lane typical section (Osceola and Orange County)

   Mr. Seidel presented the attached exhibits showing the current alignments under evaluation and the results of the current research with relation to existing Floodplain elevations, what is considered a floodplain and existing seasonal high water elevations.

4. **COORDINATION ITEMS**

   a. Seasonal High Groundwater

      Mr. Seidel indicated CFX's interest in coordinating the hydrologic data associated with the Poitros property so that proper estimates may be made during the PD&E study to size pond sites and floodplain compensation sites. He noted that the groundwater elevations are critical in determining the vertical storage available in the ponds and floodplain compensation areas.

      Mr. McIntosh indicated that some of these items were still in the preliminary stages across the length of the alignment.

   b. FEMA Floodplain Elevations

      Mr. McIntosh indicated that a pre-application meeting was being held with the SFWMD to discuss the disposition of the borrow areas with relation to FEMA mapped floodplains along with other project elements and that his firm would be better able to coordinate both these items after the meeting with SFWMD.

      Mr. Jackson (via phone) asked about possible pond sites at this time. Mr. Seidel responded that the pond sites would be evaluated once the sizes were determined based on multiple factors that include environmental impact and hydraulic feasibility. He noted that different pond

site locations may have different sizes based on topography and outfall locations. Mr. Seidel also noted that once the stormwater management needs of CFX are determined and pond and floodplain compensation areas sized, it is possible that joint use pond discussions would follow.

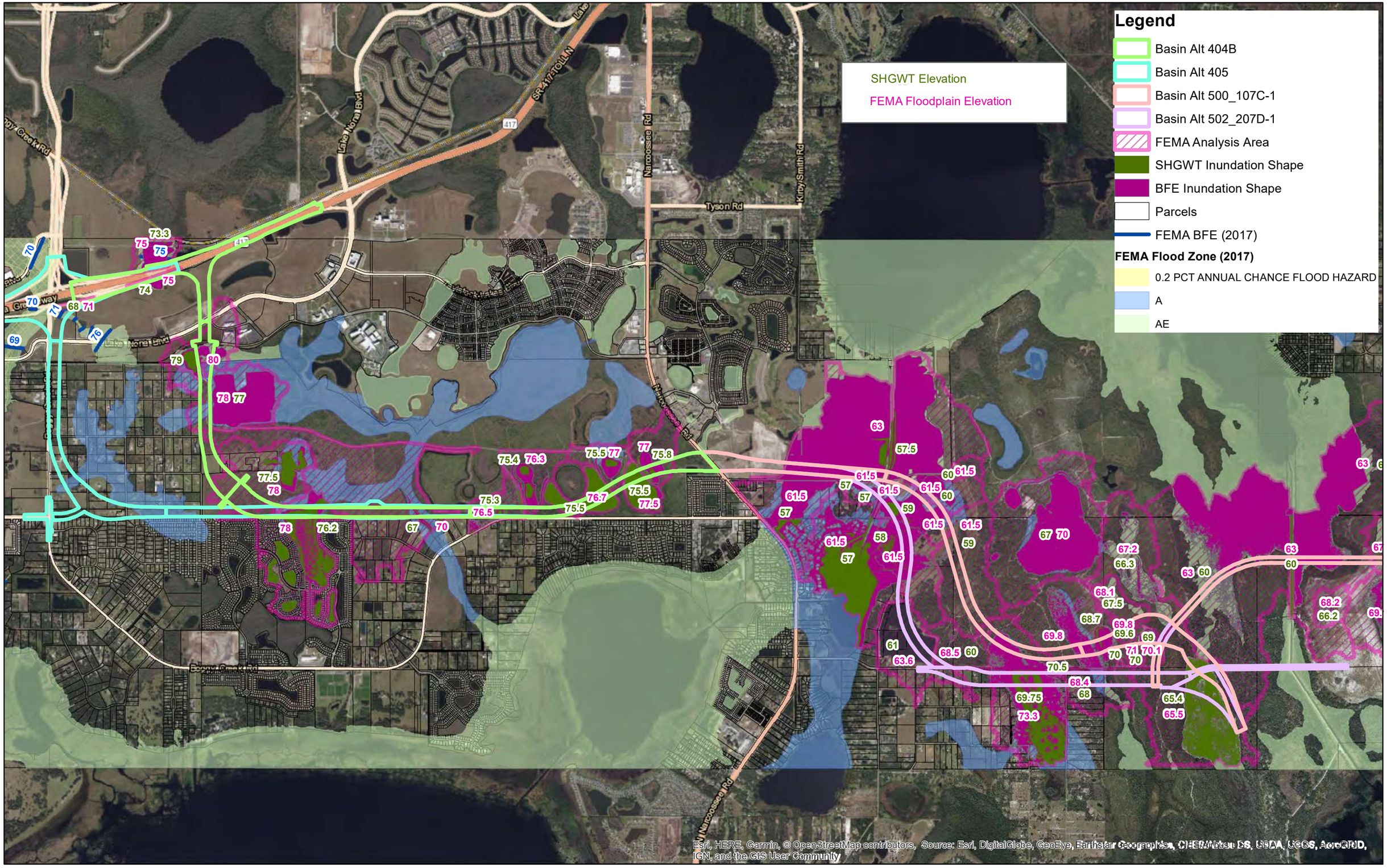
5. ACTION ITEMS

a. *McIntosh to meet with SFWMD.*

b. *CFX to continue analysis and adjust calculations once seasonal high water tables and floodplains are provided by Tavistock.*

ATTENDEES

NAME	AGENCY/FIRM	PHONE NUMBER	EMAIL
Lance Jackson	Tavistock	407.816.6679	lance.jackson@tavistock.com
Donald McIntosh	McIntosh	407.644.4068	dmcintosh@dwma.com
Jeff Newton	McIntosh	407.644.4068	jjnewton@dwma.com
Garth Ritter	McIntosh	407.644.4068	gritter@dwma.com
Greg Seidel	Balmoral Group	407.629.2185	gseidel@balmoralgroup.us


SHGWT Elevation
FEMA Floodplain Elevation
Legend
Basin Alt 404B
Basin Alt 405
Basin Alt 500_107C-1
Basin Alt 502_207D-1
FEMA Analysis Area
SHGWT Inundation Shape
BFE Inundation Shape
Parcels
FEMA BFE (2017)
FEMA Flood Zone (2017)
0.2 PCT ANNUAL CHANCE FLOOD HAZARD
A
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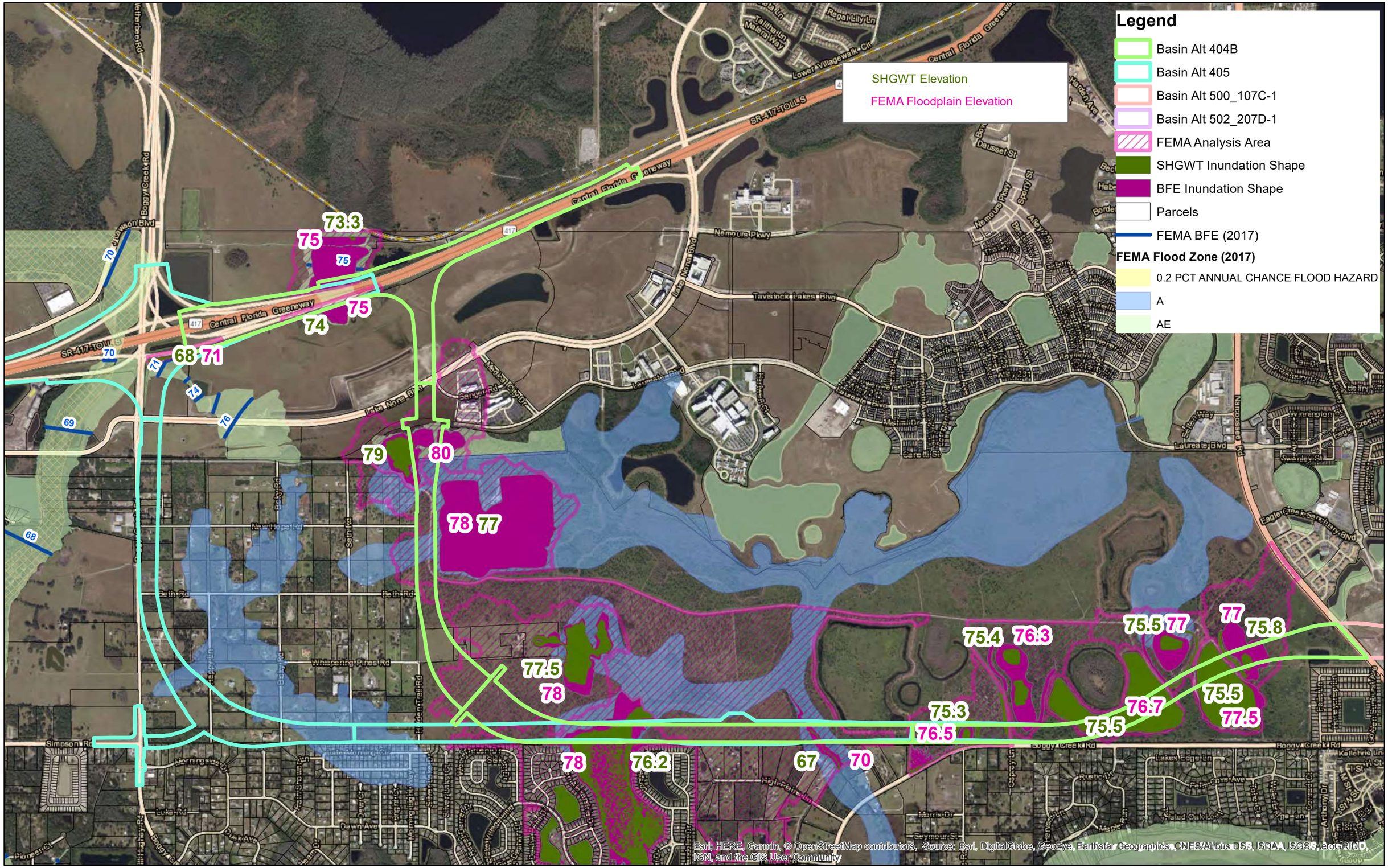
Lake Nona Blvd
SR 417-TOLL N
Narcoossee Rd
Kirby Smith Rd
Tyson Rd
Boggy Creek Rd
417
Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


SHGWT Elevation
FEMA Floodplain Elevation
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Basin Alt 404B
Basin Alt 405
Basin Alt 500_107C-1
Basin Alt 502_207D-1
FEMA Analysis Area
SHGWT Inundation Shape
BFE Inundation Shape
Parcels
FEMA BFE (2017)
FEMA Flood Zone (2017)
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Central Florida Greeneway
SR-417-TOLLS
Lake Nona Blvd
Tavistock Lakes Blvd
Nemours Pkwy
Laureate Blvd
Boggy Creek Rd
Narcoossee Rd
Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Amanda Exposito

From: Grace.ChuaCorn@ocfl.net
Sent: Tuesday, June 19, 2018 6:09 PM
To: Jennifer Nunn
Cc: Daniel.Negron@ocfl.net; Mike.Drozeck@ocfl.net
Subject: RE: CFX Osceola Parkway - LiDAR information

Hello Jennifer,

I am not aware of any more recent LiDAR data in Public Works. My division have some ongoing LiDAR acquisition efforts but they are not yet complete. You can reach out to Orange County GIS by email, GIS@ocfl.net or by phone, 407-836-0066 to find out more information.

Based on US Interagency Elevation Inventory, the recently publicly available Osceola County FL LiDAR might cover or partly cover your study area. It was collected in January 2016 as part of USGS 3DEP partnership with SFWMD and I recommend reaching out to Christine Carlson, Lead Geospatial Data Steward for SFWMD by phone, 561-682-6143 on how to request for the data.

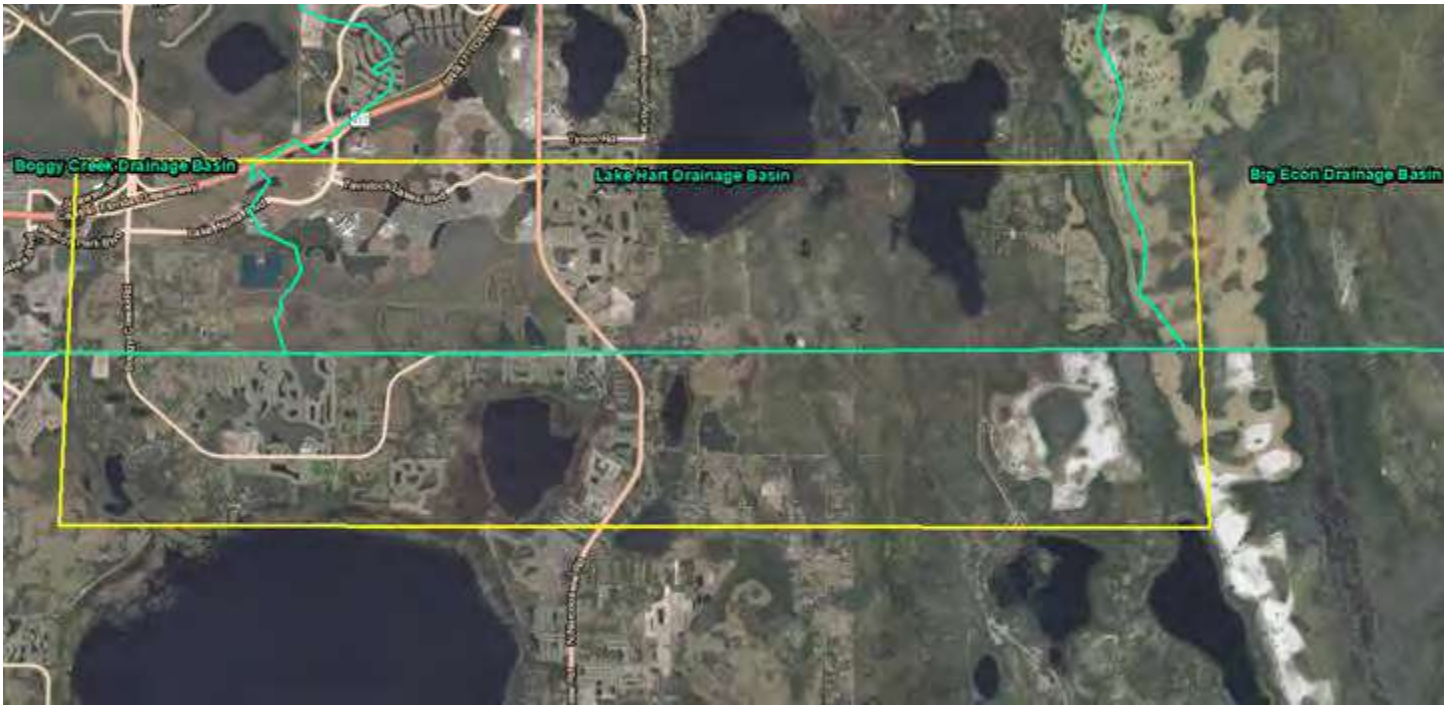
Regards,

Grace L. Chua Corn, EI, CFM, GISP
Stormwater Management Division
Orange County Public Works
4200 South John Young Parkway
Orlando, Florida 32839
407.836.7965
Grace.ChuaCorn@ocfl.net

From: Jennifer Nunn [mailto:jnunn@balmoralgroup.us]
Sent: Tuesday, June 19, 2018 10:34 AM
To: Chua Corn, Grace L <Grace.ChuaCorn@ocfl.net>
Subject: CFX Osceola Parkway - LiDAR information

Grace,
We are currently performing the drainage evaluation for the Osceola Parkway PD&E study for the Central Florida Expressway Authority which crosses the Boggy Creek and Lake Hart watersheds within Orange County. I was wondering if there is any recent topo (LiDAR) information available for this area to assist with our analysis. The most recent information I have is 2012.

Please let me know if there is someone else I should be coordinating with. Thanks for your help.



Thanks,

Jennifer A. Nunn, P.E., D.WRE

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