PRELIMINARY POND SITING REPORT

Florida Department of Transportation
District One

SR 29 from Oil Well Road to SR 82
Project Development and
Environment Study

Collier County, Florida

Financial Management Number: 417540-1-22-01
ETDM Number: 3752

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

August 2018

PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with H. W. Lochner, Inc., a corporation authorized to operate as an engineering business, Certificate of Authorization Number 894, by the State of Florida, Department of Business & Professional Regulation, Board of Professional Engineers. I have prepared or approved the evaluation, findings, opinions and conclusions as reported for:

PROJECT:	SR 29 from Oil Well Road to SR 82
FINANCIAL PROJECT ID:	417540-1-22-01
ETDM PROJECT NUMBER:	3752
LOCATION:	Collier County, Florida
CLIENT:	FDOT, District One
FDOT PROJECT MANAGER:	Gwen Pipkin

I acknowledge that the procedures and references used to develop the results contained in this **Preliminary Pond Siting Report** are standard to the professional practices of Civil Engineering as applied through design standards and criteria set forth by federal, state and local regulatory agencies, as well as professional judgment and experience.

SIGNATURE: Theresa D. Ellison

NAME:	Theresa D. Ellison, PE
FIRM:	H. W. Lochner, Inc.
FL PE NO:	53918
DATE:	August 2018

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Executive Summary

The Florida Department of Transportation (FDOT) District One is conducting a Project Development and Environment (PD&E) Study, in accordance with the National Environmental Policy Act (NEPA), to assess the need for capacity and traffic operational improvements along a two-lane undivided section of SR 29 extending 15.6 miles from Oil Well Road [southern terminus] to SR 82 [northern terminus] in unincorporated Collier County, Florida. The project entails the potential widening of existing two-lane undivided sections of SR 29 up to four lanes, as well as the addition of a new four-lane roadway bypassing the downtown area of the City of Immokalee.

Presently, the No Build Alternative and two Build Alternatives are being considered as part of the PD&E Study.

The purpose of this Preliminary Pond Siting Report (PPSR) is to develop engineering concepts, analyze environmental data and document information which will aid the FDOT and the Federal Highway Administration (FHWA) in determining the type, design and location of stormwater management facilities required for the proposed improvements.

This PPSR presents potential pond site locations for meeting applicable stormwater management criteria. This report provides pond site alternatives that are hydraulically feasible and environmentally permittable based on the best available information. Alternatives were analyzed and evaluated for the following:

- Environmental impacts including wetlands/surface waters and protected species involvement
- Contamination and hazardous materials
- Cultural resources potential
- Economic factors
- Hydrologic factors such as soil types and seasonal high groundwater table (SHWT) elevations
- Stormwater conveyance and hydraulic parameters

Due to the normally high groundwater elevations along the project, the stormwater management facilities will treat, attenuate and recover the required volumes through wet detention. Flows produced by off-site areas will be kept separate from the roadway runoff, thereby reducing the required pond sizes.

For this project, forty-one (41) drainage basins were delineated for each alignment alternative, [Central 1R and Central 2] based on the following characteristics:

- Existing as-built plans and environmental resource permits
- Existing topographic features (elevations)
- Physical barrier (creek)
- Historical drainage patterns
- Environmentally sensitive regions

Basins 1 through 24 and Basins 33 through 41 are identical for each alignment alternative. A proposed wet detention pond has been identified within each of these basins, with the exception of Basin 2 which does not require stormwater management. Through the central "bypass" portion of the study area, basins were delineated for each alignment alternative: Basins 25-1R through 32-1R for Central 1R; and, Basins 25-2 through 32-2 for Central 2. A proposed wet detention pond has been identified within each of these central alternative basins, as well. The only exception is Basin 28-2 which does not require stormwater management.

Design criteria from the South Florida Water Management District (SFWMD) and the FDOT were used to determine the size of the stormwater management facilities. The required treatment and attenuation volumes were calculated and areas for the proposed pond site alternatives were established based on these volumes.

The potential pond sites, based on hydraulic location and environmental impacts, are shown in **Table ES-1**. The Pond Site Evaluation Matrix is included in **Section 8.0** of this report.

This project was not scoped for an Environmental Look Around (ELA); however, opportunities for regional stormwater management, such as using the Barron Canal, mines and partnering with HCP, may exist and should be explored during the design phase of the project.

Table ES-1
Potential Pond Sites

Basin	Potential Pond Site	Pond Size (acres)
1	1	1.68
2	-	-
3	3	1.18
4	4	1.32
5	5	1.82
6	6	1.73
7	7	1.26
8	8	1.53
9	9	1.32
10	10	2.12
11	11	1.61
12	12	1.32
13	13	1.82
14	14	1.75
15	15	1.67
16	16	1.67
17	17	1.74
18	18	1.67
19	19	1.67
20	20	2.29
21	21	2.79
22	22	1.30
23	23	1.88
24	24	1.21
25	25	3.31
26-1R	26-1R	3.36
26-2	26-2	2.40
27-1R	27-1R	2.83
27-2	27-2A	3.44
	27-2B	0.64
28-1R	28-1R	1.18

Table ES-1
Potential Pond Sites

Basin	Potential Pond Site	Pond Size (acres)
28-2	-	-
29-1R	29-1R	2.53
29-2	29-2	2.88
30-1R	30-1R	1.76
30-2	30-2	1.23
31-1R	31-1R	1.32
31-2	31-2	2.84
32-1R	32-1R	3.31
32-2	32-2	3.31
33	33	2.13
34	34	1.33
35	35	1.95
36	36	2.41
37	37	3.54
38	38	1.59
39	39	2.86
40	40	2.67
41	41	1.33

1.0 Introduction

1.1 Project Overview

The Florida Department of Transportation (FDOT) District One is conducting a Project Development and Environment (PD&E) Study, in accordance with the National Environmental Policy Act (NEPA), to assess the need for capacity and traffic operational improvements along a two-lane undivided section of SR 29 extending 15.6 miles from Oil Well Road [southern terminus] to SR 82 [northern terminus] in unincorporated Collier County, Florida. The project section of SR 29 specifically traverses the unincorporated community of Immokalee in eastern Collier County. **Figure 1-1** shows the location of the project.

The PD&E Study for this project commenced in 2007. An Environmental Assessment with a Finding of No Significant Impact is being pursued. The PD&E Study provides documented environmental and engineering analyses to assist FDOT in reaching a decision on the location and conceptual design for improvements to SR 29. Additional products of the PD&E Study include preliminary engineering conceptual plans, environmental studies, a public outreach program, and other information that can be directly used in the final design of the project.

1.2 Project Description and Need

The project segment of SR 29 is designated as an Emerging Strategic Intermodal System (SIS) highway corridor. Additionally, SR 29 is classified as a rural principal arterial from Oil Well Road to south of Farm Worker Way and from north of Westclox Road/CR 29A to SR 82; the roadway is also classified as an urban principal arterial from south of Farm Worker Way to north of Westclox Road/CR 29A. Speed limits of 40 – 60 miles per hour (mph) are posted for the majority of the corridor. However, the speed limit is 35 mph from south of CR 846/Airport Road to west of 9th Street due to frequent activity of commercial and agricultural trucks, as well as daily activity of pedestrians and bicyclists, using this section of SR 29.

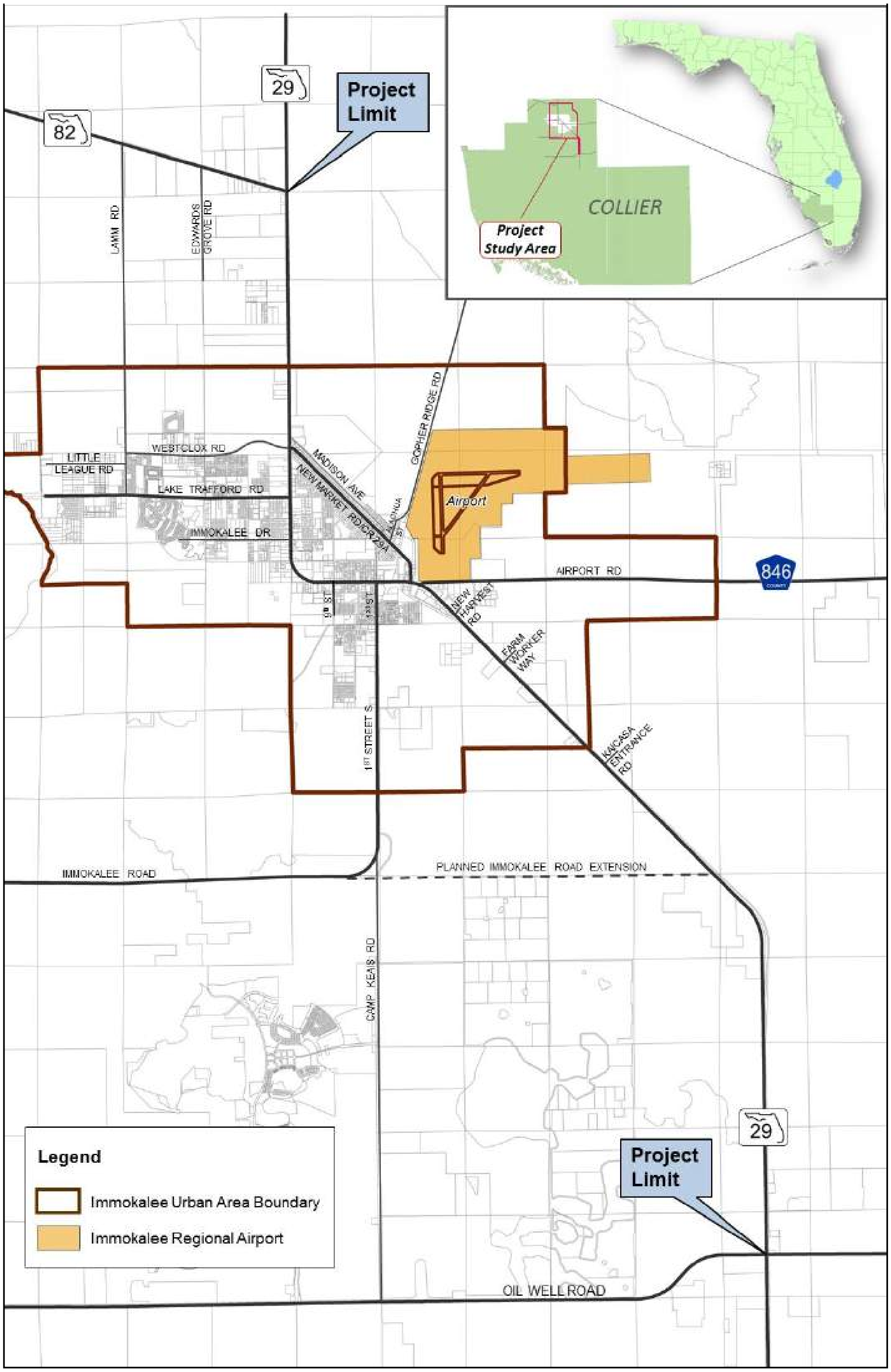
The project entails the potential widening of existing two-lane undivided sections of SR 29 up to four lanes, as well as the addition of a new four-lane roadway bypassing the downtown area of the City of Immokalee, in order to meet the following needs:

- Enhance economic competitiveness of the area,
- Improve regional connections,
- Correct current roadway design deficiencies/improve safety conditions,

- Reduce truck traffic in downtown Immokalee,
- Support future growth/accommodate projected travel demand, and
- Improve emergency evacuation capabilities.

No improvements are currently proposed to the existing SR 29 project segment between Immokalee Road and New Market Road North.

Figure 1-1
Project Location Map



1.3 Alternatives

Presently, the No Build Alternative and two Build Alternatives are being considered as part of the PD&E Study.

The No Build Alternative assumes that no lanes will be added to SR 29 from Oil Well Road to SR 82 through the 2045 design year.

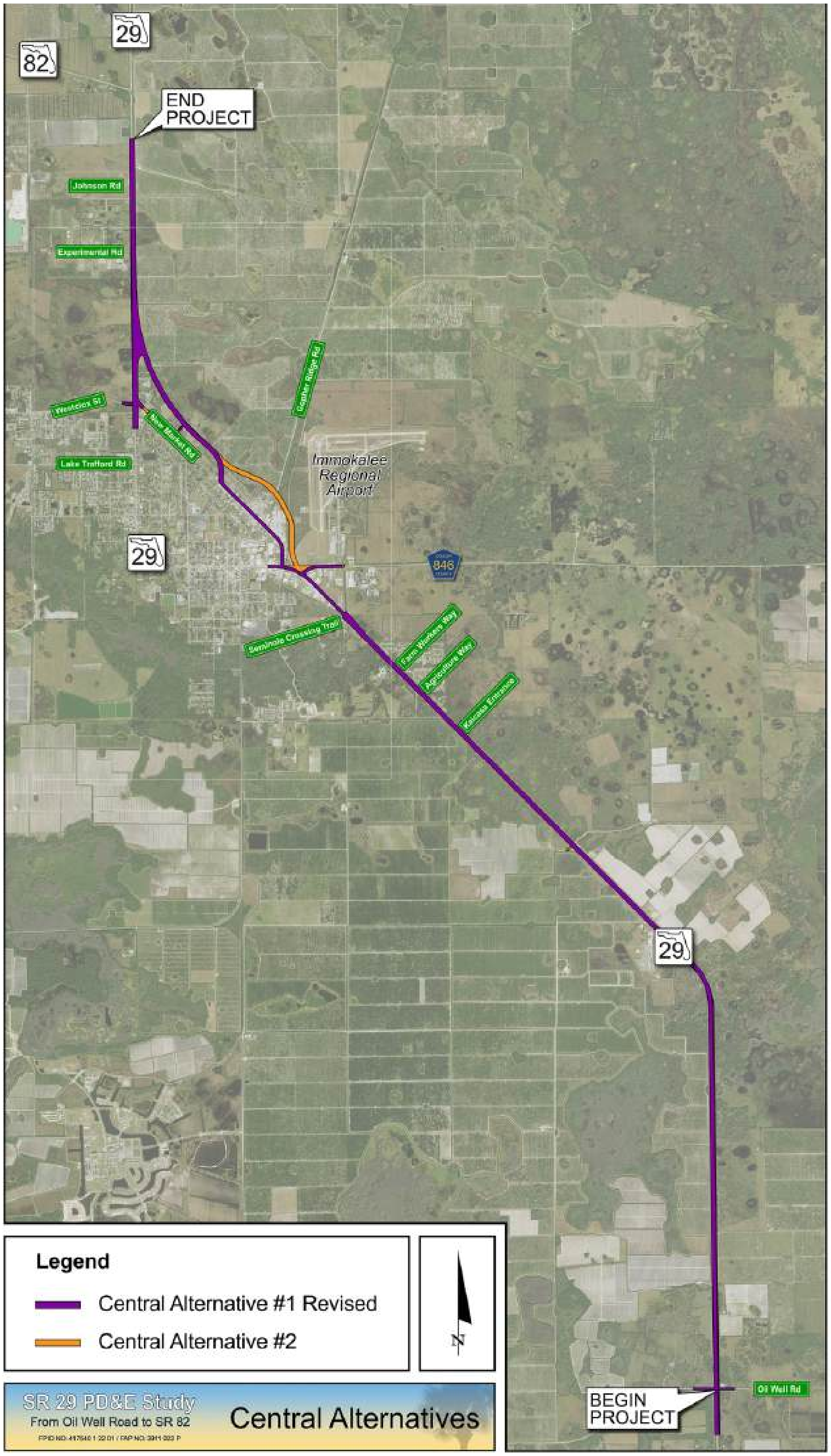
The two Build Alternatives [Central Alternative #1 Revised and Central Alternative #2] follow the existing alignment of SR 29 from Oil Well Road to south of Farm Workers Village and use similar typical four-lane sections.

At CR 846/Airport Road, Central Alternative #1 Revised follows the eastern portion of New Market Road providing direct access to the agribusiness/commercial areas of Immokalee and State Farmers Market. This alternative continues just past Flagler Street then turns northward on new alignment to avoid a residential neighborhood. It parallels Madison Avenue then skirts the east side of Collier Health Services Medical Center and the Florida State University College of Medicine before reconnecting to SR 29. From this point, Central Alternative #1 Revised follows SR 29 to SR 82. A roundabout is being considered at SR 29 north of Westclox Street.

At CR 846/Airport Road, Central Alternative #2 travels north from SR 29 on new alignment along the west side of the Immokalee Regional Airport to avoid the commercial/industrial areas of Immokalee and the State Farmers Market to the west. This alternative then turns to the northwest just past Gopher Ridge Road to parallel Madison Avenue and New Market Road. It then travels along the east side of Collier Health Services Medical Center and the Florida State University College of Medicine before reconnecting to SR 29. From this point, Central Alternative #2 follows SR 29 to SR 82. A roundabout is being considered at SR 29 north of Westclox Street.

Figure 1-2 shows the location of the two project Build Alternatives [Central Alternative #1 Revised and Central Alternative #2].

Figure 1-2
Project Build Alternatives



2.0 Data Collection

The data collection efforts consisted of the following resources:

- United States Department of Agriculture, Natural Resource Conservation Service, Soil Survey of Collier County, Florida
- Federal Emergency Management Agency Flood Insurance Rate Map Numbers:
    - 12021C0290H (Effective Date: May 16, 2012)
    - 12021C0280H (Effective Date: May 16, 2012)
    - 12021C0165H (Effective Date: May 16, 2012)
    - 12021C0145H (Effective Date: May 16, 2012)
    - 12021C0135H (Effective Date: May 16, 2012)
- Straight Line Diagram (SLD) for SR 29 in Collier County, Florida
- Straight Line Diagram (SLD) for SR 82 in Collier County, Florida
- FDOT Drainage Manual (January 2018)
- FDOT Project Development and Environment Manual, Part 2, Chapter 11: Water Quality and Water Quantity and Chapter 13: Floodplains (June 2017)
- Environmental Resource Permit Applicant's Handbook Volume I (General And Environmental) (October 2013)
- Environmental Resource Permit Applicant's Handbook Volume II for use within the Geographic Limits of the South Florida Water Management District (May 2016)
- South Florida Water Management District (SFWMD) Environmental Resource Permits (Various in Collier County)
- SFWMD ERP No. 11-00592-S for State Project Nos. 03080-3530 and 03080-3517, SR 29 from N of CR 858 (Oil Well Road) to CR 846
- SFWMD Coordination Meeting, February 13, 2009
- Collier County Floodplain Management Plan (2010)
- Stormwater Management Basin Map, Collier County, Florida (June 2015)
- Collier County Surface Water Canal System Facilities Geographic Information Systems Web Map (updated May 2018)

3.0 Design Criteria

The design of the stormwater management facilities (ponds) for this project is regulated by the rules and criteria set forth by the Florida Department of Transportation (FDOT), the South Florida Water Management District (SFWMD) and the Florida Department of Environmental Protection (FDEP). The requirements of each agency are discussed in the following sections and summarized in **Table 3-1**.

3.1 FDOT Criteria

The design of stormwater management systems for Department projects shall comply with the water quality, rate, and quantity requirements of Section 334.044(15), F.S., Chapter 14-86, F.A.C., Rules of the Department of Transportation only in closed basins or areas subject to historical flooding.

3.1.1 Water Quality

FDOT's requirement is to fully comply with state, water management district, and local government stormwater management programs per Section 373.4596, F.S.

3.1.2 Water Quantity

FDOT's requirement is to fully comply with state, water management district, and local government stormwater management programs per Section 373.4596, F.S.

There are no closed basins within the limits of this PD&E Study.

3.1.3 Stormwater Management Facilities

Based on the 2018 FDOT Drainage Manual and Chapter 9 of the 2016 FDOT Drainage Design Guide, the following criteria were used in the design of the pond alternatives for this project.

- Ponds shall be designed with a minimum 20 feet of horizontal clearance between the top edge of the control elevation and the right-of-way line. A minimum of 15 feet adjacent to the pond shall be sloped at 1:8 (vertical: horizontal) or flatter.
- Side slopes will be no steeper than 1:4 (vertical: horizontal) out to a depth of two feet below the control elevation.
- One (1) foot of freeboard is required above the maximum design stage. The freeboard shall be measured from the inside edge of the maintenance berm.

Please refer to **Appendix G** for *Figure 5.1 Minimum Clearance Retention-Detention Ponds*, excerpted from the 2018 FDOT Drainage Manual.

3.2 SFWMD Criteria

The design of the project stormwater management facilities will comply with the requirements of Chapter 40E-4, F.A.C., rules of the South Florida Water Management District.

3.2.1 Water Quality

Projects shall be designed and operated so that off-site discharges will meet State water quality standards.

Retention, detention, or both retention and detention in the overall system, including swales, lakes, canals, greenways, etc., shall be provided for one of the three following criteria or equivalent combinations thereof:

- Wet detention volume shall be provided for the first inch of runoff from the developed project, or the total runoff of 2.5 inches times the percentage of imperviousness, whichever is greater.
- Dry detention volume shall be provided equal to 75 percent of the amount computed for wet detention.
- Retention volume shall be provided equal to 50 percent of the amount computed for wet detention. Retention volume included in flood protection calculations requires a guarantee of long term operation and maintenance of system bleed-down ability.

Systems which have a direct discharge to an Outstanding Florida Water (OFW) must provide an additional 50 percent of the required treatment.

Systems discharging to a waterbody that has been identified as impaired by the Florida Department of Environmental Protection (FDEP) pursuant to 403.067, F.S. shall be designed in accordance with the procedures in Appendix E of the Environmental Resource Permit Applicant's Handbook Volume II for use within the Geographic Limits of the South Florida Water Management District. See **Section 3.3** of this report for additional information.

The water surface area meeting dimensional criteria may be subtracted from the total site area when making final water quality treatment volume calculations.

Runoff shall be discharged from impervious surfaces through retention areas, detention devices, filtering and cleansing devices, or subjected to some other type of Best Management Practice (BMP) prior to discharge from the project site. For projects which include substantial paved areas, such as shopping centers, large highway intersections with frequent stopped traffic, and high density developments, provisions shall be made for the removal of oil, grease and sediment from storm water discharges.

Gravity control devices shall be sized based upon a maximum design discharge of one half of the detention volume in 24 hours.

Treatment of off-site areas is not required.

3.2.2 Water Quantity

Off-site discharge rate is limited to rates not causing adverse impacts to existing off-site properties, and:

a) Historic discharge rates; or
b) Rates determined in previous Agency permit actions; or
c) Rates specified in District criteria (see Appendix A to this Volume).

Unless otherwise specified by previous Agency permits or criteria, a storm event of 3 day duration and 25 year return frequency shall be used in computing off-site discharge rates. Please refer to **Appendix G** for *Figure C-8. 3-Day Rainfall: 25-year Return Period*, excerpted from Appendix C of the Environmental Resource Permit Applicant's Handbook Volume II for use within the Geographic Limits of the South Florida Water Management District.

Where multiple off-site discharges are designed to occur, if the combined discharges meet all other requirements of Chapter 62-330, F.A.C., and discharge to the same receiving waterbody, the Agency will allow the total post-development peak discharge not to exceed the pre-development peak discharge for the combined discharges rather than for each individual discharge.

No net encroachment into the floodplain, between the average wet season water table and that encompassed by the 100 year event, which will adversely affect the existing rights of others, will be allowed.

Provision must be made to replace or otherwise mitigate the loss of historic basin storage provided by the project site.

3.3 Florida Department of Environmental Protection (FDEP)

The design of the project stormwater management facilities will comply with the requirements of Chapter 62-302, F.A.C., rules of the Florida Department of Environmental Protection.

3.3.1 Impaired Waters

Chapter 62-303, F.A.C. describes impaired water bodies. Water bodies that have been assessed and determined to be impaired by the FDEP due to pollutant discharges are included on the "Verified List" adopted by FDEP Secretarial Order. Within the limits of this PD&E Study, the following water bodies are on the Verified List:

Waterbody Identifier (WBID) - Waterbody Name	Parameter Assessed
3278W - Silver Strand	Dissolved Oxygen (Nutrients)
3278L - Immokalee Basin	Dissolved Oxygen (Nutrients), Fecal Coliform
3278E - Cow Slough	Fecal Coliform
3235L - Townsend Canal	Nutrients, Dissolved Oxygen

A site-specific water quality analysis is required that demonstrates that a net improvement will occur in an impaired water body of any parameter which is impaired. Highway runoff does not contribute fecal coliform; therefore, net improvement is not required for WBID 3278E. However, a pre-development versus post-development pollutant loading analysis **will** be required for all of the basins within WBID 3278W, WBID 3278L and WBID 3235L. The analysis will comply with the guidelines set forth by FDOT's Memorandum, "Nutrient Loading Calculations for FDOT Projects" dated July 7, 2011. The University of Central Florida's BMPTRAINS model spreadsheet will be used to calculate pollutant loadings for this Preliminary Pond Siting Report.

3.3.2 National Pollutant Discharge Elimination System (NPDES)

To minimize and prevent pollutants in stormwater discharges, the National Pollutant Discharge Elimination System (NPDES) Stormwater Program regulates point source discharges from three potential sources: Municipal Separate Storm Sewer Systems (MS4s), construction activities and industrial activities. Regulated discharges within the limits of this PD&E Study include:

- <u>Discharges to surface waters of the state through a MS4</u>
  To protect these resources, municipalities are required to use stormwater controls, known as Best Management Practices (BMPs), to manage their runoff.
- <u>Discharges that are associated with construction activities that disturb at least one or more acres of land</u>
  Operators of construction activities must implement appropriate pollution prevention techniques to minimize erosion and sedimentation and properly manage stormwater. Therefore, a Stormwater Pollution Prevention Plan (SWPPP) must be developed and implemented.

3.4 Permits

Permits are expected to be required from the following agencies:

- South Florida Water Management District
  - Environmental Resource Permit
- United States Army Corps of Engineers
  - Section 404, Dredge and Fill Permit
- United States Environmental Protection Agency
  - National Pollutant Discharge Elimination System Permit

Table 3-1
Water Quality and Quantity Criteria

Design Parameter	SFWMD Criteria	FDOT Criteria	Criteria to be used
Design Frequency	25-year	Specified by the Regulatory Agency	SFWMD
Design Storm Duration	3-day	Specified by the Regulatory Agency	SFWMD
Rainfall Distributions	SFWMD Distribution Table, Section 5.7.2(a) of the ERP Applicant's Handbook Volume II for use within the Geographic Limits of the SFWMD	FDOT Rainfall Distributions	SFWMD
Water Quality/ Treatment (Wet Detention)	Greater of: 1" over the developed project area, or 2.5" times the new impervious area	Specified by the Regulatory Agency	SFWMD
Water Quantity/ Attenuation	Post-development peak discharge less than pre-development peak discharge for the 25-year/3-day storm event	FDOT Critical Duration - not required (no closed basins)	SFWMD
Off-site Flows	N/A	Commingling with onsite flow acceptable (House Bill 599)	FDOT
Pond Configuration (Wet Detention)	**Area:** 0.5 acre minimum measured at the control elevations **Width:** 100' minimum for linear areas in excess of 200' in length **Depth:** minimum shallow, littoral area shall be the lesser of 20% of the wet retention/ detention area or 2.5% of the total of the retention/detention area plus the basin contributing area.	Specified by the Regulatory Agency (SFWMD)	SFWMD
Residence Time (Wet Detention)	14 days minimum	Specified by the Regulatory Agency	SFWMD

Table 3-1
Water Quality and Quantity Criteria

Design Parameter	SFWMD Criteria	FDOT Criteria	Criteria to be used
Recovery Rate	Maximum design discharge of one half inch of the detention volume in 24 hours	Specified by the Regulatory Agency	SFWMD
Orifice/Bleeder Devices (Wet Detention)	Gravity control devices shall be sized based upon a maximum design discharge of one half of the detention volume in 24 hours. Devices shall incorporate dimensions no smaller than 6 square inches of cross sectional area, two inches minimum dimension, and 20 degrees for "V" notches	Specified by the Regulatory Agency	SFWMD
Skimmer	N/A	Design to function from an elevation 6” below the elevation of inflow to the outfall control structure to an elevation equal to the DHW of the pond	FDOT
Maintenance Berms	Minimum width of 20’ and slopes no steeper than 1:4 provided beyond the control elevation water line	20’ clearance between top edge of normal pool elevation and R/W line sloped at 1:8 or flatter; lowest point of the berm at least 1’ above the top of the treatment volume; inside edge of the berm shall have a minimum 30’ radius	FDOT
Pond Side Slopes	Side slopes no steeper than 1:4 from top of bank out to a minimum depth of two feet below the control elevation	1:4 side slope for maintenance	SFWMD
Tailwater Conditions for Ponds	Maximum stage which would exist in the receiving water from a storm equal to the project design storm	Specified by the Regulatory Agency	SFWMD

Table 3-1
Water Quality and Quantity Criteria

Design Parameter	SFWMD Criteria	FDOT Criteria	Criteria to be used
Minimum Freeboard	N/A	1' between the maximum design stage elevation of the pond and the inside edge of the berm	FDOT
Floodplain Encroachment/ Compensation	Any required compensating storage shall be equivalently provided between the seasonal high water level and the 100-year flood level	Specified by the Regulatory Agency	SFWMD

4.0 Existing Conditions

4.1 Roadway

Within the project limits, SR 29 can be broken up into the following seven typical sections:

From Oil Well Road to Farm Worker Way

SR 29 is a two-lane undivided roadway with one 12-foot lane in each direction and 4-foot shoulders on either side of the roadway. There is an open drainage system and the corridor is classified as an Emerging SIS Highway. The existing right-of-way (ROW) varies from 173.75 feet to 181 feet. **Figure 4-1** depicts this typical section.

From Farm Worker Way to Seminole Crossing Trail

SR 29 is a two-lane undivided roadway with one 12-foot lane in each direction, 4-foot shoulders on either side of the roadway, and an 8-foot sidewalk on the west side of the roadway. There is an open drainage system and the corridor is classified as an Emerging SIS Highway. The existing ROW varies from 177.95 feet to 183 feet. **Figure 4-2** depicts this typical section.

From Seminole Crossing Trail to New Market Road

SR 29 is a two-lane undivided roadway with one 12-foot lane in each direction, 5-foot shoulders on either side of the roadway, and an 8-foot sidewalk on the west side of the roadway. There is an open drainage system and the corridor is classified as an Emerging SIS Highway. The existing ROW is from 100 feet. **Figure 4-3** depicts this typical section.

From New Market Road to North 1st Street

SR 29 is a six-lane divided roadway with two 12-foot through lanes and one 8-foot right turn lane in each direction, an 18-foot median, and 5-foot sidewalks on each side of the roadway. There is a closed drainage system with curb and gutter and the corridor is classified as an Emerging SIS Highway. The existing ROW is from 100 feet. **Figure 4-4** depicts this typical section.

From North 1st Street to North 9th Street

SR 29 is a four-lane divided roadway with two 12-foot lanes in each direction, 8 feet of on street parking on each side of the roadway, an 18-foot median, and 5-foot sidewalks on each side of the roadway. There is a closed drainage system with curb and gutter and the corridor is classified as an Emerging SIS Highway. The existing ROW is from 100 feet. **Figure 4-5** depicts this typical section.

<u>From North 9th Street to Westclox Street/New Market Road</u>

SR 29 is a two-lane divided roadway with one 12-foot lane in each direction, 4-foot shoulders on either side of the roadway, a 14-foot shared left turn lane, and 5-foot sidewalks on each side of the roadway. There is an open drainage system and the corridor is classified as an Emerging SIS Highway. The existing ROW varies from 100 feet to 200 feet. **Figure 4.6** depicts this typical section.

<u>From Westclox Street/New Market Road to South of SR 82</u>

SR 29 is a two-lane undivided roadway with one 12-foot lane in each direction and 4-foot shoulders on either side of the roadway. There is an open drainage system and the corridor is classified as an Emerging SIS Highway. The existing ROW varies from 100 feet to 200 feet. **Figure 4-7** depicts this typical section.

The posted speed limit along SR 29 from Oil Well Road to south of Agriculture Way is 60 miles per hour (mph), the posted speed decreases to 55 mph and then to 45 mph south of Agriculture Way, and then decreases again to 35 mph at 13th Street and remains at 35 mph to North 9th Street. At North 9th Street, the posted speed limit on SR 29 increases to 40 mph, the posted speed limit increases again to 45 mph at 7th Avenue, and to 55 mph and 60 mph north of Westclox Street/New Market Road and remains at 60 mph to SR 82.

There are six (6) signalized and four (4) stop controlled study intersections within the study limits. All intersections are at-grade. The signalized intersections are:

- SR 29 and Farm Worker Way
- SR 29 and North 1st Street
- SR 29 and North 9th Street
- SR 29 and Immokalee Drive
- SR 29 and Lake Trafford Road
- New Market Road and Charlotte Street

Figure 4-1
SR 29 Existing Typical Section from Oil Well Road to Farm Worker Way

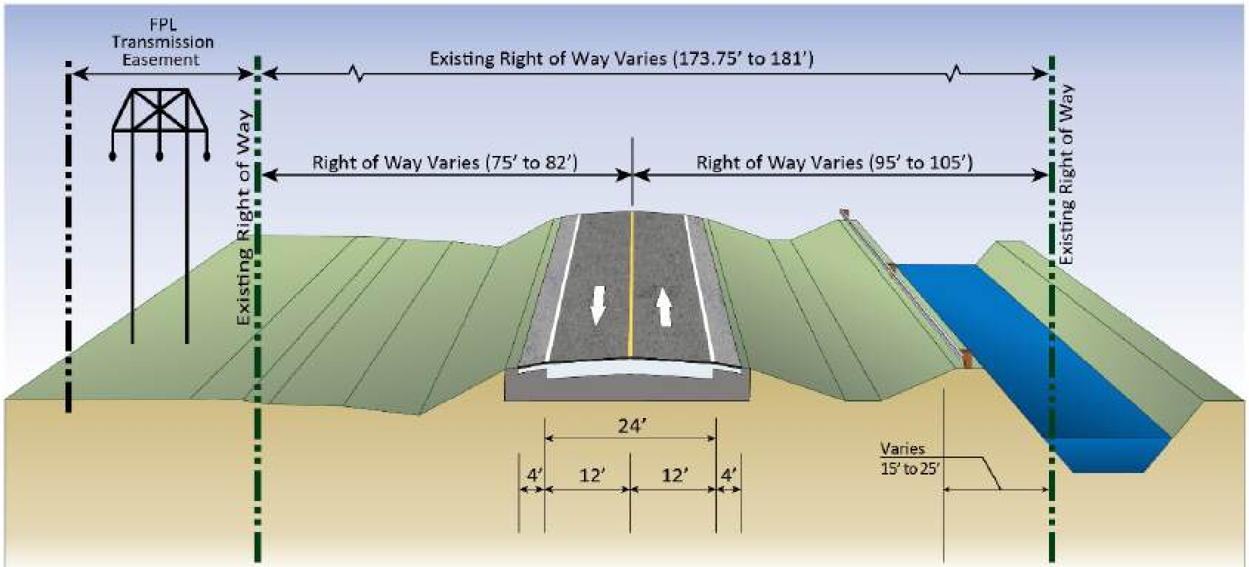


Figure 4-2
SR 29 Existing Typical Section from Farm Worker Way to Seminole Crossing Trail

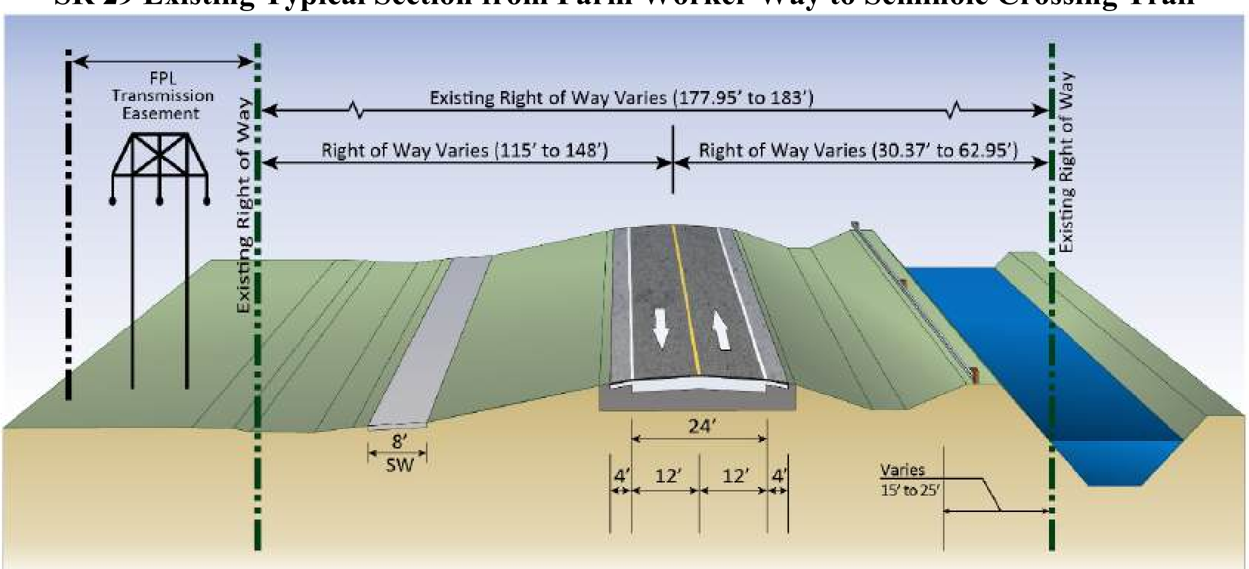


Figure 4-3
SR 29 Existing Typical Section from Seminole Crossing Trail to New Market Road

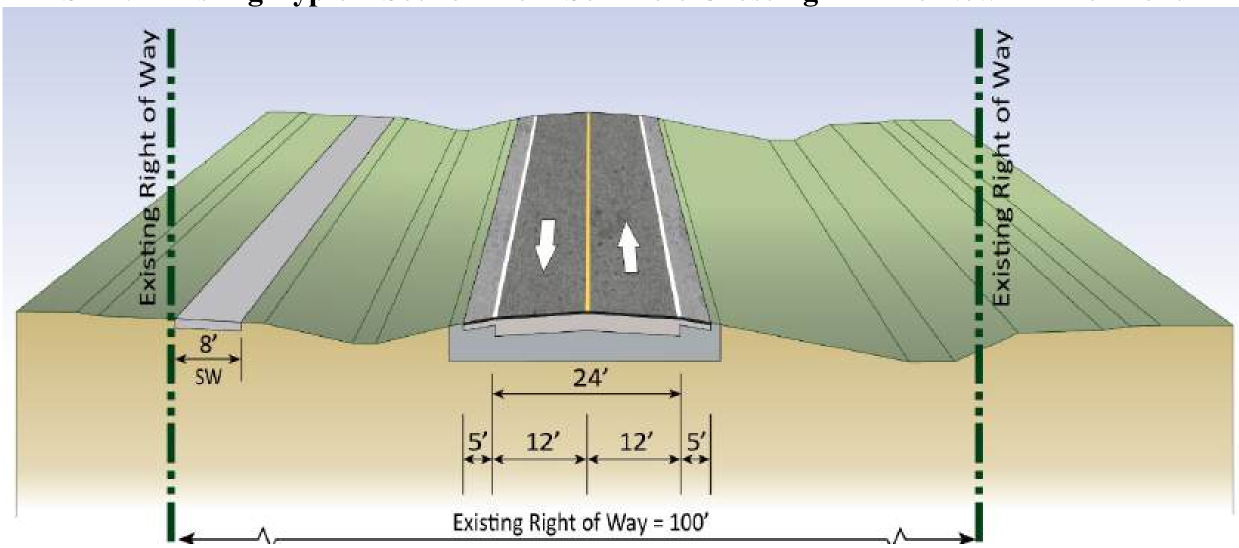


Figure 4-4
SR 29 Existing Typical Section from New Market Road to North 1st Street

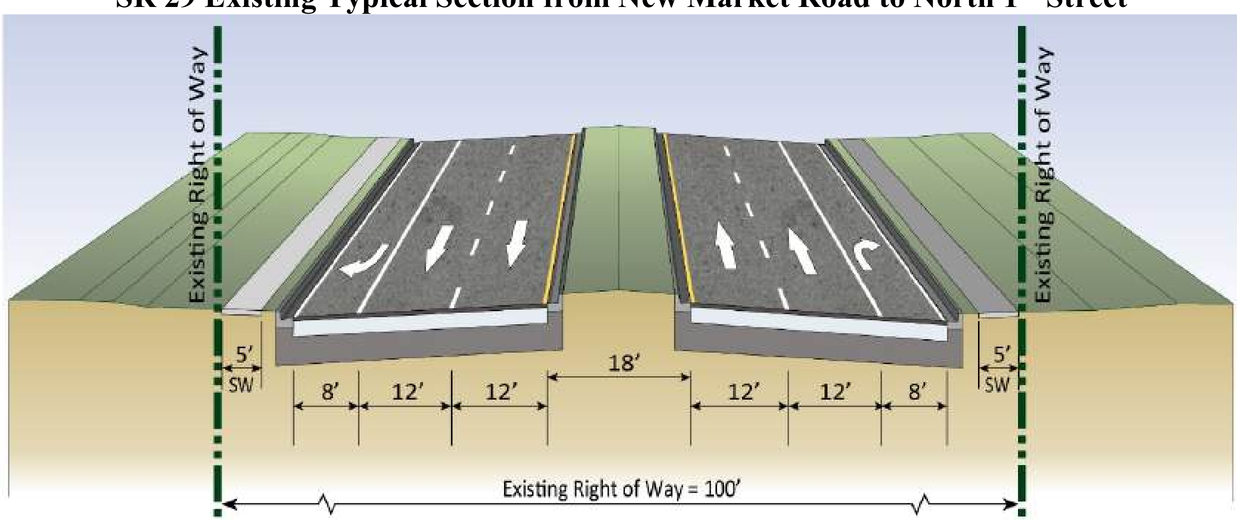


Figure 4-5
SR 29 Existing Typical Section from North 1St Street to North 9th Street

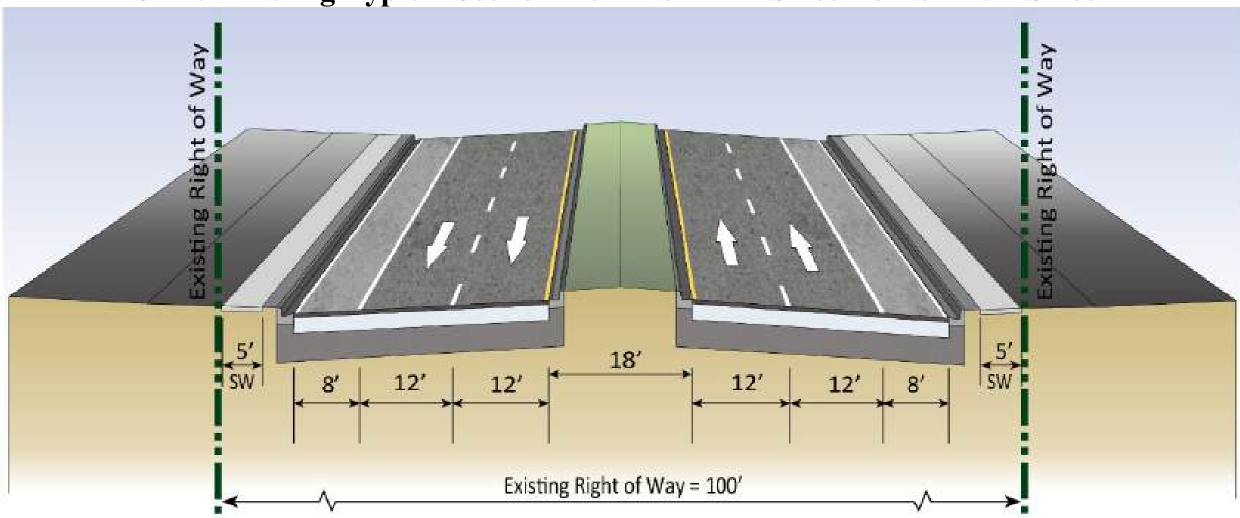


Figure 4-6
SR 29 Existing Typical Section from North 9th Street to Westclox Street/New Market Road

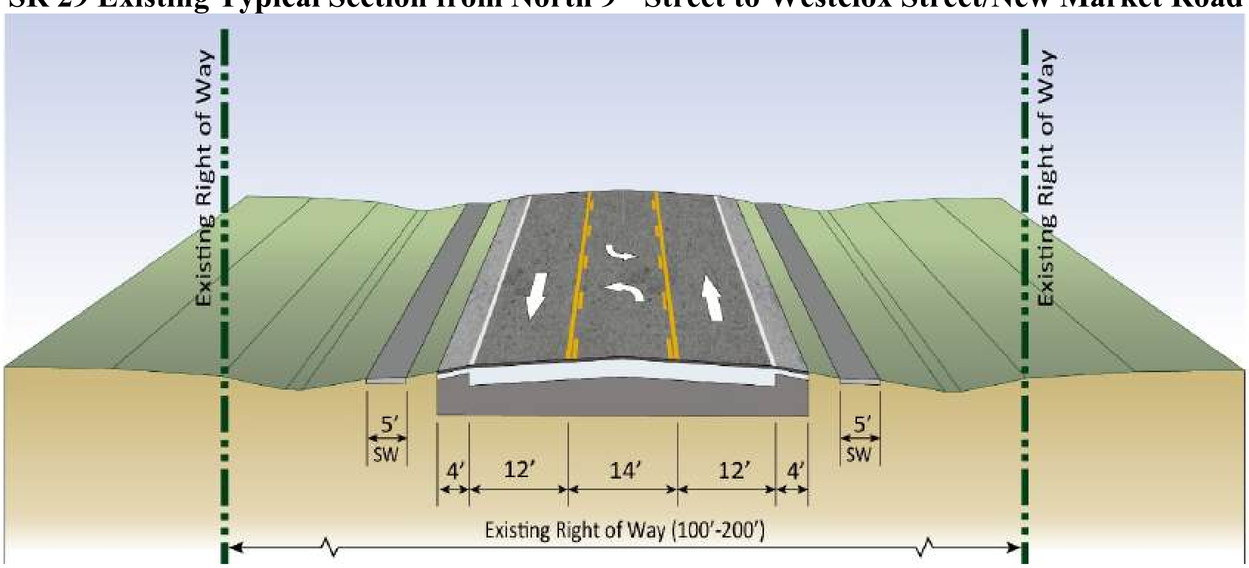
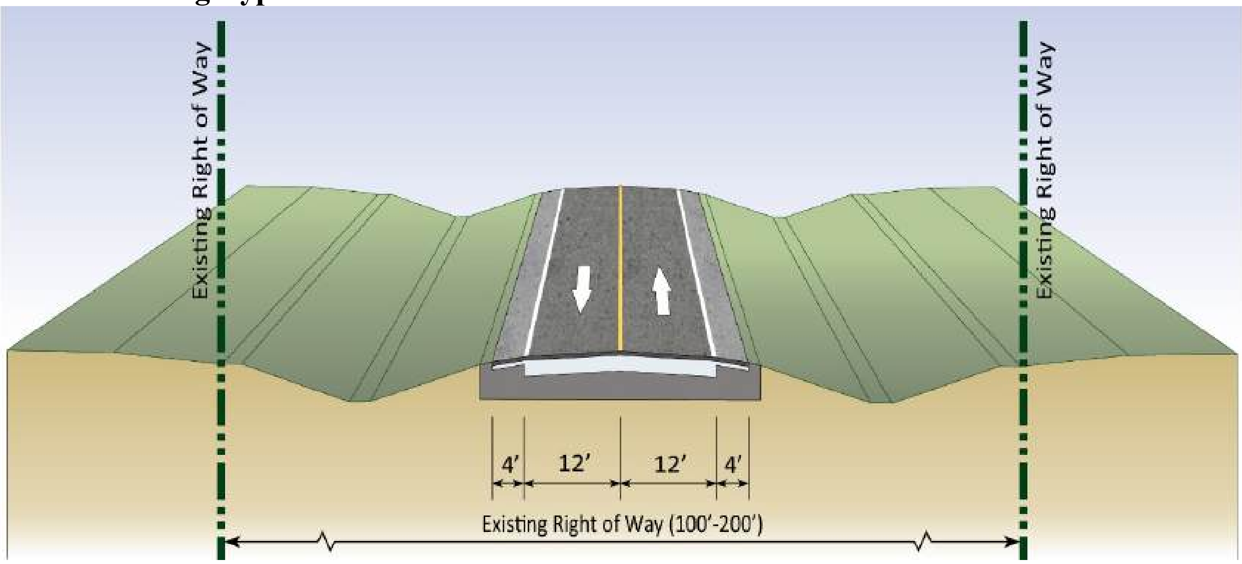


Figure 4-7
SR 29 Existing Typical Section from Westclox Street/New Market Road to South of SR 82



4.2 Drainage

The topography along SR 29 is relatively flat with elevations ranging from a low of approximately 20 feet at the beginning of the study area at Oil Well Road to a high of approximately 40 feet in the vicinity of SR 82. All elevations are referenced to the North American Vertical Datum (NAVD 88). Please see the USGS Quadrangle Map, included as **Figure 4-8**.

Drainage along the existing roadway is accomplished through collection and conveyance by open roadside ditches, side drains, ditch bottom inlets and cross drains. Typically, roadside ditches are present for the length of the project. These ditches and depressional areas provide some degree of attenuation and water quality treatment. The runoff in the ditches is co-mingled with offsite runoff and ultimately conveyed to the outfall. From 13th Street to 9th Street, runoff is collected by curb and gutter and conveyed to the outfall by a storm drain system. The SR 29 study corridor traverses three major watersheds within the project study area, Okaloacochee Watershed, Cocohatchee-Corkscrew and the Caloosahatchee River Watershed. Within these watersheds, there are four regional drainage basins as described in **Table 4-1** and shown in **Figure 4-9**.

Figure 4-8
USGS Quadrangle Map

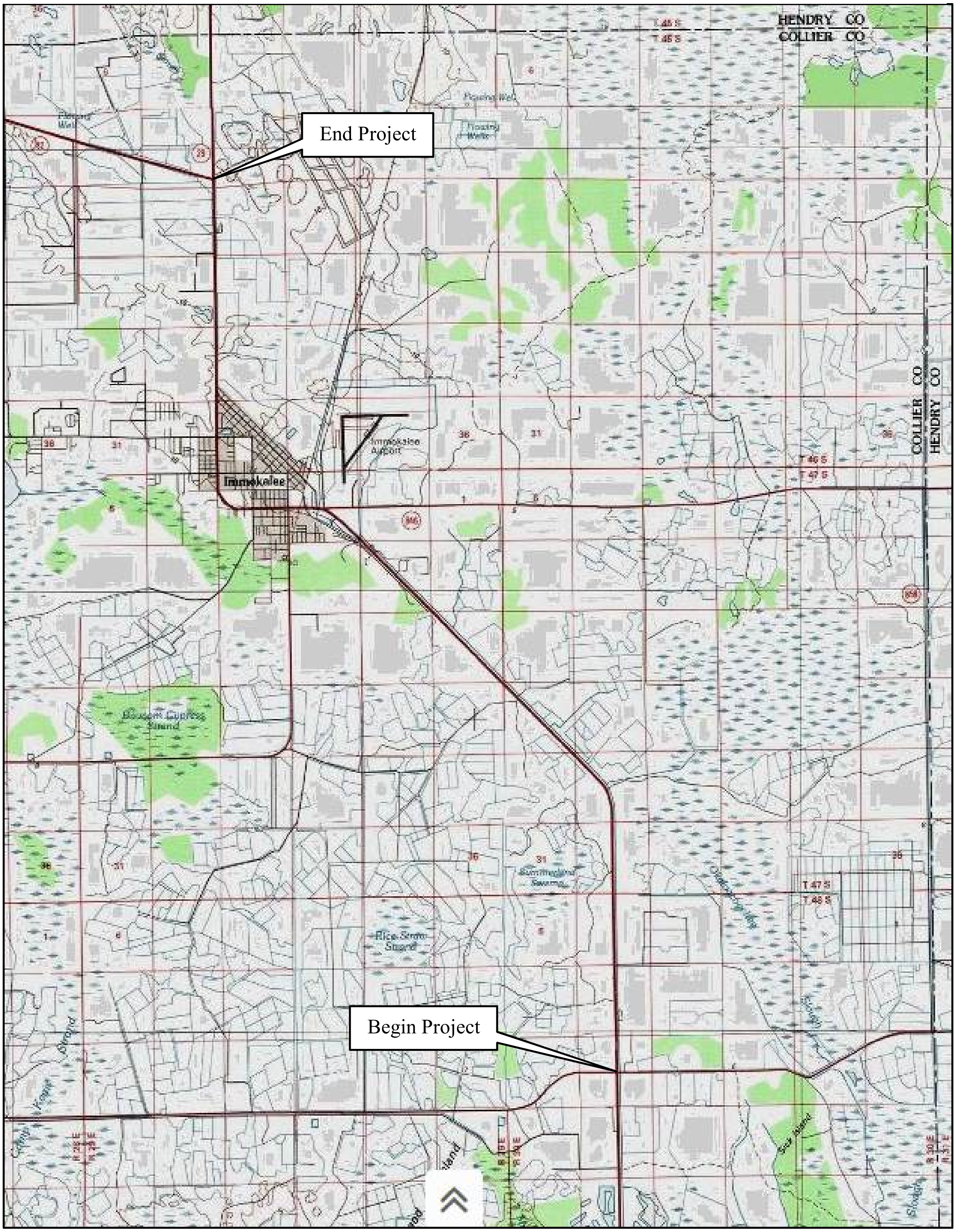


Table 4-1
Regional Drainage Basins

Watershed	Drainage Basin	Water Body ID (WBID)
Okaloacochee-SR 29	Barron River Canal (North)	3278W - Silver Strand
Cocohatchee-Corkscrew	Urban Immokalee Corkscrew Slough	3278L - Immokalee Basin 3278E - Cow Slough
Caloosahatchee	Townsend Canal	3235L – Townsend Canal

The project study area was further subdivided into forty-one (41) roadway basins, 1 through 41, as shown in **Appendix B**, Existing Drainage Maps. **Table 4-2** summarizes the existing characteristics of each basin.

According to Fidel Herrera, Maintenance Manager/Field Operations for Ferrovial Services (FDOT Asset Management Consultant), there are no issues with the existing drainage structures or function of the drainage system. In addition, aside from occasional nuisance ponding, there are no known flooding problems within the project limits. Please refer to **Appendix G**.

A portion of SR 29 was permitted under SFWMD ERP Modification Number 11-00968-S, issued on March 14, 1996. The limits of this ERP begin approximately 1.5 miles north of Oil Well Road and extend north approximately 2.4 miles to just south of CR 846. Basins 8 through 25 are within the limits of this ERP, which was obtained due to the widening of SR 29 under State Project Nos. 03080-3517, 03080-3529 and 03080-3530. Water quality treatment for the east side of SR 29 is provided in shallow retention areas between the road and the Barron Canal. Runoff from the west side of SR 29 sheet flows directly to existing grade with no permitted treatment. Stormwater quantity attenuation was not required under this permit.

Figure 4-9
Regional Drainage Basins

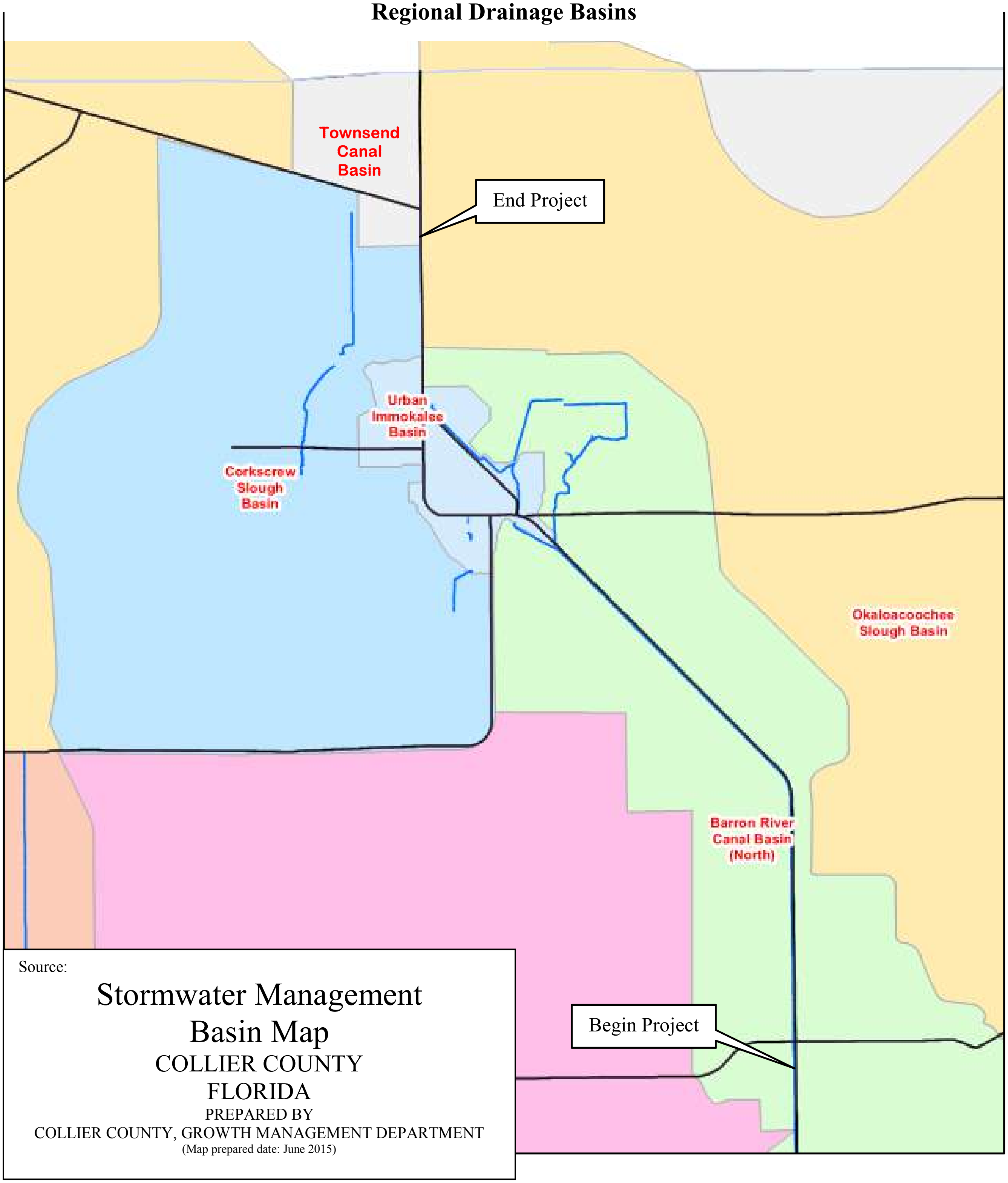


Table 4-2
Existing Roadway Basin Characteristics

Basin Name	From Station	To Station	Basin Area (acres)	Existing Outfall	FEMA Zone	FEMA EL (ft, NAVD)	Basin Soil Types	Hydrologic Soil Group	Weighted Curve Number	Comments
1	1414+60 BL SR 29	30+00 CL SR 29	9.28	CD-1 36"	AH	19.5	21	A/D	83.6	
2	29+50	30+50	1.88	Barron Canal	AH	20.0	21	A/D	86.7	Oil Well Road
3	29+50	30+50	2.68	Existing ditch	AH	20.0	21	A/D	84.4	Oil Well Road
4	30+00	45+10	6.17	CD-2 36"	AH	20.0	21	A/D	84.0	
5	45+10	68+00	9.47	CD-3 36"	AH	20.5	27	A/D	83.4	
6	68+00	94+00	10.65	CD-4 36"	AH	20.5	17, 27	A/D	83.5	
7	94+00	109+20	6.16	CD-5 43"x 68"	AH	21.0	7	B/D	83.4	
8	109+20	133+10	9.72	CD-6 (2)-24"	AH	21.0	7	B/D	83.5	
9	133+10	151+20	7.29	CD-6 (2)-24"	AH	21.0	7	B/D	83.5	
10	151+20	178+65	11.07	CD-7 24"	AH	21.5	7, 17	B/D, A/D	83.5	
11	178+65	197+10	7.45	CD-8 (2)-24"	AH	21.5	3, 22	A/D, C/D	83.5	
12	197+10	217+30	8.21	CD-9 (2)-9'x 5'	AH	22.0	20	A/D	83.4	

Table 4-2
Existing Roadway Basin Characteristics

Basin Name	From Station	To Station	Basin Area (acres)	Existing Outfall	FEMA Zone	FEMA EL (ft, NAVD)	Basin Soil Types	Hydrologic Soil Group	Weighted Curve Number	Comments
13	217+30	239+80	9.26	CD-9 (2)-9'x 5'	AH	22.0	28	C/D	83.4	
14	239+80	259+00	7.90	CD-10 (2)-24"	AH	22.0	27, 28	C/D, A/D	83.4	
15	259+00	281+35	9.23	CD-11/12 (2)-24"/24"	AH	22.5	16	A/D	83.6	
16	281+35	306+80	10.49	CD-13 (2)-24"	AH	22.5	16	A/D	83.9	
17	306+80	334+20	11.24	CD-14 24"	AH	23.0	16	A/D	84.0	
18	334+20	359+25	10.20	CD-15 36"	AH	23.0	28	C/D	83.8	
19	359+25	384+60	10.21	CD-15 36"	AH	23.5	43	C/D	83.4	
20	384+60	399+50	5.94	CD-16 (2)-10'x5'	AH	23.5	43	C/D	83.6	
21	399+50	420+00	8.16	CD-17 (3)-24"	AH	24.0	22	C/D	84.6	
22	420+00	435+00	6.04	CD-18 (4)-24"	AH	24.5	29	A/D	83.8	
23	435+00	463+40	11.42	CD-18/19 (4)-24"/24"	AH	25.5	29	A/D	84.9	
24	463+40	470+15	4.43	CD-20 (2)-24"	AH	25.5	37	B/D	87.2	
25	470+15	500+90	11.13	CD-20 (2)-24"	AH	27.5	7	B/D	84.5	

Table 4-2
Existing Roadway Basin Characteristics

Basin Name	From Station	To Station	Basin Area (acres)	Existing Outfall	FEMA Zone	FEMA EL (ft, NAVD)	Basin Soil Types	Hydrologic Soil Group	Weighted Curve Number	Comments
26	500+90	533+95	7.60	CD-21 (3)-10'x5'	AH	31.0	7, 16	B/D, A/D	91.3	
27	524+60	537+00	17.60	Airport Perimeter Canal	AH	31.5	7, 34	B/D	90.3	CR 846
28	533+95	548+25	4.00	CD-22 (2)-10'x5'	AH	31.5	34	B/D	93.7	
29-1R	130+50	152+70	5.60	CD-23 (2)-24"	AH	33.0	34	B/D	88.8	New Market Road
29-2	124+15	161+00	9.60	Immokalee Main Canal	AH	33.0	7, 8	B/D, A/D	80.0	New Alignment
30-1R	152+70	190+95	10.40	Madison Creek Ditch	AH	33.5	34	B/D	87.5	New Market Road
30-2	161+00	168+85	3.00	Madison Creek Ditch	AH	33.5	8, 34	A/D, B/D	80.0	New Alignment
31-1R	190+95	205+40	6.50	Madison Creek Ditch	AH	34.0	7, 27	B/D, A/D	80.0	New Alignment
31-2	168+85	205+40	16.80	Madison Creek Ditch	AH	34.0	27, 34	A/D, B/D	80.0	New Alignment
32-1R	205+40	251+60	21.20	Madison Creek Ditch	AH	35.0	15, 16, 27	A, A/D	80.0	New Alignment
32-2	205+40	251+60 CL SR 29	21.20	Madison Creek Ditch	AH	35.0	15, 16	A, A/D	80.0	New Alignment
33	2075+25 BL SR 29	2100+60	12.70	CD-29 42"	AH	35.0	7	B/D	86.8	New Alignment
34	2100+60	2107+05	4.70	CD-30 36"	AH	35.0	7	B/D	85.4	

Table 4-2
Existing Roadway Basin Characteristics

Basin Name	From Station	To Station	Basin Area (acres)	Existing Outfall	FEMA Zone	FEMA EL (ft, NAVD)	Basin Soil Types	Hydrologic Soil Group	Weighted Curve Number	Comments
35	2107+05	2126+60	19.75	CD-31 36”	AH	34.5	7	B/D	81.9	
36	251+60	293+70	12.90	CD-32 (2)-48”	AH	34.5	8, 15, 17	A/D, A	82.9	
37	2126+60	2154+80	28.70	CD-32 (2)-48”	AH	34.5	7, 15, 17	B/D, A, A/D	80.0	
38	2154+80 BL SR 29	313+90 CL SR 29	9.40	CD-33 36”	AH	35.5	7, 17	B/D, A/D	83.5	
39	313+90	341+55	12.70	CD-34 36”	AH	36.5	7, 16	B/D, A/D	83.1	
40	341+55	379+00 LT 393+30 RT	20.40	CD-35 (2)-36”	AH	39.0	16, 22, 27	A/D, C/D	83.5	
41	379+00 LT 393+30 RT	401+20	9.80	CD-37 (3)-42”	AH	36.5	16, 22	A/D, C/D	84.0	

4.3 Soils

Based on a review of the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey of Collier County, Florida, much of the project corridor consists of nearly level, poorly drained soils. Generally, the natural seasonal high groundwater table (SHWT) is at depths of about 6 to 18 inches below the natural grade within the project limits.

The Soil Survey indicates that there are eighteen (18) mapped soil units along the project corridor. According to the Hydric Soils of Florida Handbook (Hurt, 2007), 10 of the 18 soil types identified within the project study area are classified as hydric. **Table 4-3** lists the acreage and percentage of each mapped soil type within the study limits.

Please see **Appendix D** for the Soils Map and soils descriptions.

4.4 Land Use

Primary land uses along the project corridor include transportation, agriculture, residential subdivisions, individual residences, schools, commercial, and industrial complexes. Within the urban areas, the existing right-of-way generally abuts commercial properties along with some residential properties. Within the rural areas, the land uses adjacent to the project are generally pasture lands as well as some commercial and undeveloped properties. Pasture land and agricultural land (citrus groves) are the primary land uses to the north of the city. To the north and south of the city, the primary land uses adjacent to the existing SR 29 right-of-way are agricultural land (citrus groves and cultivated row crops) and pasture land with dispersed residential, commercial, and undeveloped properties. One school and one planned residential community are adjacent to the existing SR 29 right-of-way at Farm Worker Way in southeast Immokalee.

4.5 Cross Drains

Existing cross drains were located based on existing construction plans, USGS Quadrangle Maps, Flood Insurance Rate Maps (FIRMs), survey/GIS data and field investigations. A review of this information indicates that there are 37 cross drain structures within the study limits. The cross drains, along with their respective drainage basin location, are listed in **Table 4-4** and can be located on the Existing Drainage Maps in **Appendix B**.

Table 4-3
Soil Types and Coverage within the Project Study Area

Soil Type	Hydric Y/N	Central Alternative #1 Revised		Central Alternative #2	
		Area (acres)	% of Total	Area (acres)	% of Total
3 - Malabar fine sand, 0 to 2 percent slopes	Y	4.22	1.14	4.31	1.13
7 - Immokalee fine sand, 0 to 2 percent slopes	N	69.20	18.78	75.41	19.73
8 - Myakka fine sand, 0 to 2 percent slopes	N	14.11	3.83	15.38	4.02
10 - Oldsmar fine sand, limestone substratum	N	4.71	1.31	4.71	1.23
15 - Pomello fine sand, 0 to 2 percent slopes	N	16.33	4.42	16.42	4.30
16 - Oldsmar fine sand, 0 to 2 percent slopes	N	74.12	20.1	74.42	19.47
17 - Basinger fine sand, 0 to 2 percent slopes	Y	30.10	8.17	30.10	7.87
20 - Fort Drum, and Malabar, high fine sands	N	11.01	3.01	11.01	2.89
21 - Boca fine sand, 0 to 2 percent slopes	Y	14.22	3.81	14.37	3.75
22 - Chobee, Winder, and Gator soils, depressional	Y	6.11	1.69	6.31	1.64
23 - Holopaw and Okeelanta soils, depressional	Y	0.30	0.1	0.30	0.08
25 - Boca, Riviera, limestone substratum and Copeland fine sands, depressional	Y	1.36	0.37	1.62	0.43
27 - Holopaw fine sand, 0 to 2 percent slopes	Y	21.19	5.67	31.27	8.18
28 - Pineda and Riviera fine sands	Y	16.51	4.52	16.70	4.37
29 - Wabasso fine sands, 0 to 2 percent slopes	N	19.12	5.23	19.12	5.01
34 - Urban land -Immokalee-Oldsmar , limestone substratum complex	N	31.66	8.58	26.34	6.89
37 - Tuscawilla fine sand	Y	12.71	3.4	12.76	3.33
43 - Winder, Riviera, limestone substratum and Chobee soils, depressional	Y	21.65	5.87	21.71	5.68
Total		**368.60**	**100%**	**382.26**	**100%**

Table 4-4
Existing Cross Drain Inventory

Structure No.	Station	Size	Drainage Basin
CD-1	1414+64 BL SR 29	36”	1
CD-2	39+64 CL SR 29	36”	4
CD-3	54+69	36”	5
CD-4	79+12	36”	6
CD-5	94+00	43”x68”	7
CD-6	133+13	(2)-24”	8, 9
CD-7	169+55	24”	10
CD-8	182+34	(2)-24”	11
CD-9 (1)	217+29	(2)-9’x5’ CBC Gator Creek	12, 13
CD-10	247+92	(2)-24”	14
CD-11	262+17	(2)-24”	15
CD-12	277+00	24”	15
CD-13	293+34	(2)-24”	16
CD-14	317+28	24”	17
CD-15	359+25	36”	18, 19
CD-16 (1)	384+60	(2)-10’x5’ CBC Milton’s Creek	20
CD-17	407+55	(3)-24”	21
CD-18	435+00	(4)-24”	22, 23
CD-19	459+00	24”	23
CD-20	474+12	(2)-24”	24, 25
CD-21 (1)	500+80	(3)-10’x5’ CBC Dry Gulch Creek	26

Table 4-4
Existing Cross Drain Inventory

Structure No.	Station	Size	Drainage Basin
CD-22 [1]	540+50	(2)-10'x5' CBC Eutopia Canal	28
CD-23	138+70	(2)-24"	29-1R
CD-24	168+00	24"	30-1R
CD-25	174+50	24"	30-1R
CD-26	175+00	24"	30-1R
CD-27	186+00	24"	30-1R
CD-28	186+60	24"	30-1R
CD-29	2075+25 BL SR 29	42"	33
CD-30	2107+10	36"	34
CD-31	2119+90	36"	35
CD-32	2133+90	(2)-48"	37
CD-33	301+27 CL SR 29	36"	38
CD-34	314+00	36"	39
CD-35	379+00	(2)-36"	40
CD-36	396+10	(2)-36"	41
CD-37	SR 82	(3)-42"	41

(1) Denotes bridge culvert

4.6 Bridge Structures

There are four bridge structures, all bridge culverts, within the project limits. All are currently owned and maintained by FDOT.

Bridge No. 030303 carries SR 29 over Gator Creek and is located from begin milepost (MP) 30.749 to end MP 30.758. The structure is a 49.9' long concrete flat slab bridge that was constructed in 1999. According to the latest FDOT Bridge Inspection Report dated March 8, 2016, the structure has a Sufficiency Rating of 95.9 and a Health Index of 98.37.

Bridge No. 030304 carries SR 29 over Milton's Canal and is located at MP 33.926. The structure is a double 10-foot x 5-foot reinforced concrete box culvert that was constructed in 1999. According to the latest FDOT Bridge Inspection Report dated March 10, 2016, the structure has a Sufficiency Rating of 95.9 and a Health Index of 77.09.

Bridge No. 030305 carries SR 29 over Dry Gulch Creek and is located at MP 36.125. The structure is a triple 10-foot x 5-foot reinforced concrete box culvert that was constructed in 1999. According to the latest FDOT Bridge Inspection Report dated March 24, 2016, the structure has a Sufficiency Rating of 93.9 and a Health Index of 70.60.

Bridge Culvert No. 030019 carries SR 29 over Eutopia Canal and is located at MP 36.873. The structure is a double 10-foot x 5-foot reinforced concrete box culvert that was constructed in 1965. According to the latest FDOT Bridge Inspection Report dated March 8, 2016, the structure has a Sufficiency Rating of 81.0 and a Health Index of 80.73.

4.7 Floodplains and Floodways

The Federal Emergency Management Agency (FEMA) has designated locations of the 100-year base floodplain within the project corridor. The entire project is within Zone AH, which is the flood insurance rate zone that corresponds to areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from detailed hydraulic analyses are shown at selected intervals within this zone. The base flood elevation ranges from elevation 19 feet just south of Oil Well Road to elevation 36.5 feet at SR 82.

FEMA has compiled Flood Insurance Rate Maps (FIRMs) and has conducted a Flood Insurance Study (FIS) for Collier County. FIRMs covering the project area are listed in **Table 4-5**. The FEMA FIRMs are shown in **Appendix E**.

Table 4-5
Flood Insurance Rate Maps (FIRMs) – Collier County

Map Number	Date
12021C0290H	May 16, 2012
12021C0280H	May 16, 2012
12021C0165H	May 16, 2012
12021C0145H	May 16, 2012
12021C0135H	May 16, 2012

There are no FEMA regulatory floodways located within the project limits.

5.0 Proposed Conditions

5.1 Roadway

The two Build Alternatives described below use similar typical four-lane sections.

- Central Alternative #1 Revised: This alternative follows the existing alignment of SR 29 from Oil Well Road to south of Farm Workers Village. At CR 846/Airport Road, it follows the eastern portion of New Market Road and provides direct access to the agribusiness/commercial areas of Immokalee and State Farmers Market. This alternative continues just past Flagler Street then turns northward on new alignment to avoid a residential neighborhood. It parallels Madison Avenue then skirts the east side of Collier Health Services Medical Center and the Florida State University College of Medicine before reconnecting to SR 29. From this point, Central Alternative #1 Revised follows SR 29 to SR 82. A roundabout is being considered at SR 29 north of Westclox Street.

- Central Alternative #2: This alternative follows the existing alignment of SR 29 from Oil Well Road to south of Farm Workers Village. At CR 846/Airport Road, this alternative travels north from SR 29 on new alignment along the west side of the Immokalee Regional Airport to avoid the commercial/industrial areas of Immokalee and the State Farmers Market to the west. This alternative then turns to the northwest just past Gopher Ridge Road to parallel Madison Avenue and New Market Road. It then travels along the east side of Collier Health Services Medical Center and the Florida State University College of Medicine before reconnecting to SR 29. From this point, Central Alternative #2 follows SR 29 to SR 82. A roundabout is being considered at SR 29 north of Westclox Street.

5.1.1 SR 29 Typical Sections

Typical sections have been developed for the portions of SR 29 south and north of the SR 29 Bypass Junction. No changes have been proposed for the portion of SR 29 that passed through downtown Immokalee, from the southern to the northern SR 29 Bypass Junctions. Therefore, new typical sections have not been developed along SR 29 from New Market Road (the southern SR 29 Bypass terminus) to Westclox Street/New Market Road (south of the northern SR 29 Bypass terminus).

Within the project limits, SR 29 can be broken up into the following six typical sections:

From Oil Well Road to South of Kaicasa Entrance

Central Alternative 1R and Central Alternative 2

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 12-foot lanes in each direction and a 40-foot median), with a 5-foot sidewalk on the west side of the corridor. There is an open drainage system, the design speed is 65 MPH, and the corridor is classified as an Emerging SIS Highway.

The existing ROW varies from 173.75 feet to 181 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-1** depicts this typical section.

From South of Kaicasa Entrance to Seminole Crossing Trail

Central Alternative 1R and Central Alternative 2

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 12-foot travel lanes in each direction and a 30-foot median), with a 10-foot shared use path on the west side of the corridor. There is an open drainage system, the design speed is 55 MPH, and the corridor is classified as an Emerging SIS Highway.

The existing ROW varies from 173.75 feet to 181 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-2** depicts this typical section.

From Seminole Crossing Trail to New Market Road

Central Alternative 1R Only

The existing 2-lane to 4-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 11-foot travel lanes in each direction and a 22-foot median), with 7-foot buffered bicycle lanes and 6-foot sidewalks in each direction. There is a closed drainage system with curb and gutter, the design speed is 45 MPH, and the corridor is classified as an Emerging SIS Highway.

The existing ROW is 100 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-3** depicts this typical section.

<u>From Seminole Crossing Trail to CR 846</u>

Central Alternative 2 Only

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 11-foot lanes in each direction and a 22-foot median), with 7-foot buffered bicycle lanes and 6-foot sidewalks in each direction. There is a closed drainage system with curb and gutter, the design speed is 45 MPH, and the corridor is classified as an Emerging SIS Highway.

The existing ROW is 100 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-4** depicts this typical section.

<u>From North of Westclox Street to the SR 29 Bypass Junction</u>

Central Alternative 1R and Central Alternative 2

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 12-foot travel lanes in each direction and a 30-foot median), with a 10-foot shared use path on the west side of the corridor. There is an open drainage system and the design speed is 50 MPH.

The existing ROW is 200 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-5** depicts this typical section.

<u>From the SR 29 Bypass Junction to Experimental Road</u>

Central Alternative 1R and Central Alternative 2

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 12-foot travel lanes in each direction and a 30-foot median), with a 10-foot shared use path on the west side of the corridor. There is an open drainage system, the design speed is 55 MPH, and the corridor is classified as an Emerging SIS Roadway.

The existing ROW is 200 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-6** depicts this typical section.

<u>From Experimental Road to South of SR 82</u>

Central Alternative 1R and Central Alternative 2

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 12-foot travel lanes in each direction and a 40-foot median), with a 10-foot shared use path on the west side of the corridor. There is an open drainage system, the design speed is 65 MPH, and the corridor is classified as an Emerging SIS Roadway.

The existing ROW is 200 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-7** depicts this typical section.

Figure 5-1
SR 29 Typical Section from Oil Well Road to South Kaicasa Entrance

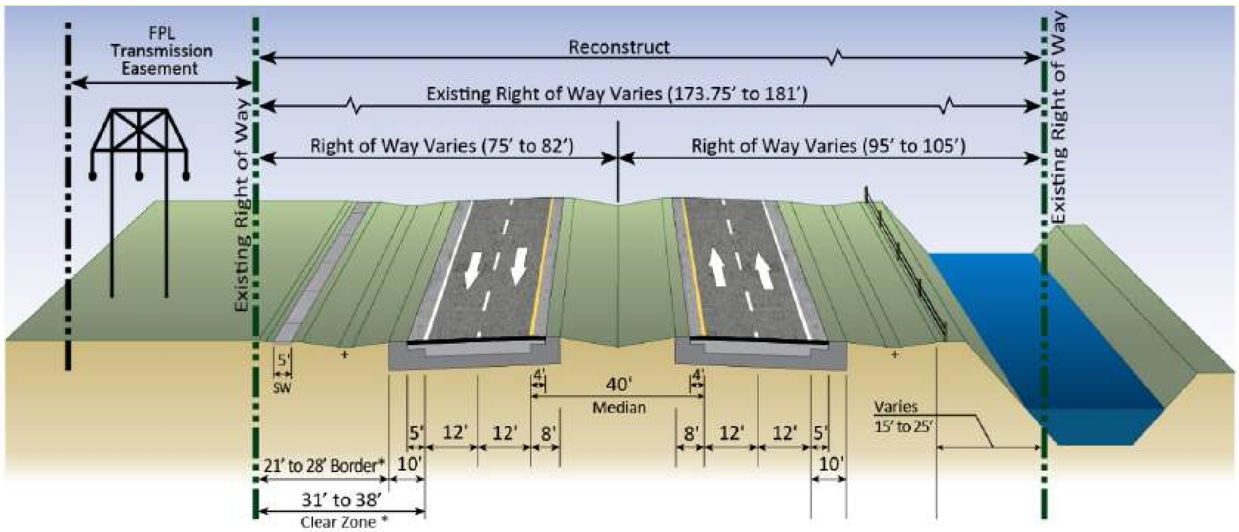


Figure 5-2
SR 29 Typical Section from South of Kaicasa Entrance to Seminole Crossing Trail

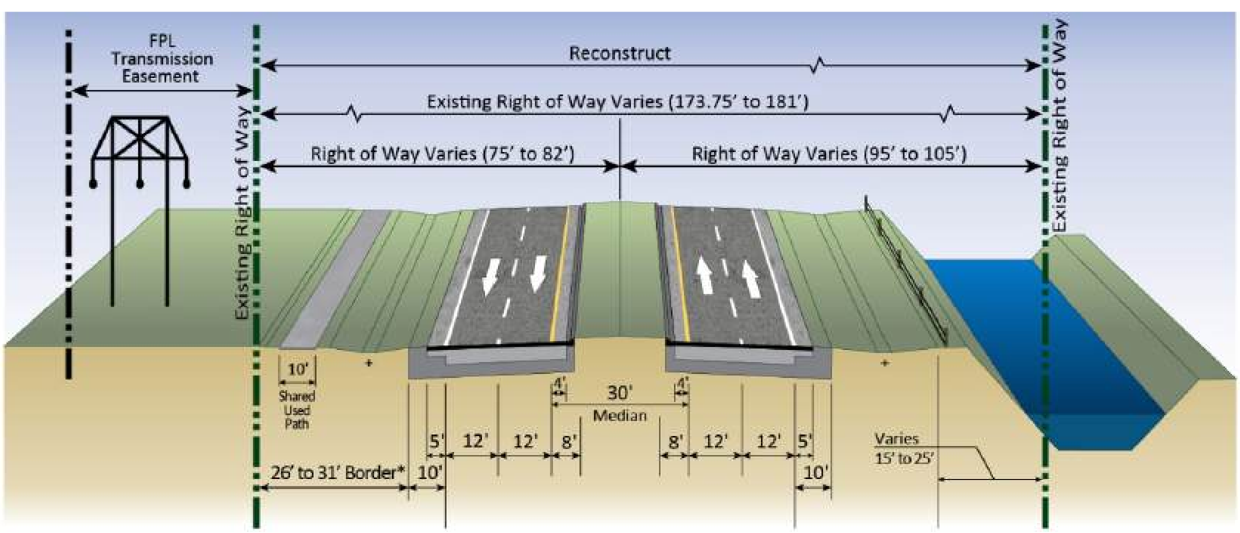


Figure 5-3
SR 29 Typical Section from Seminole Crossing Trail to New Market Road
(Central Alternative #1 Revised)

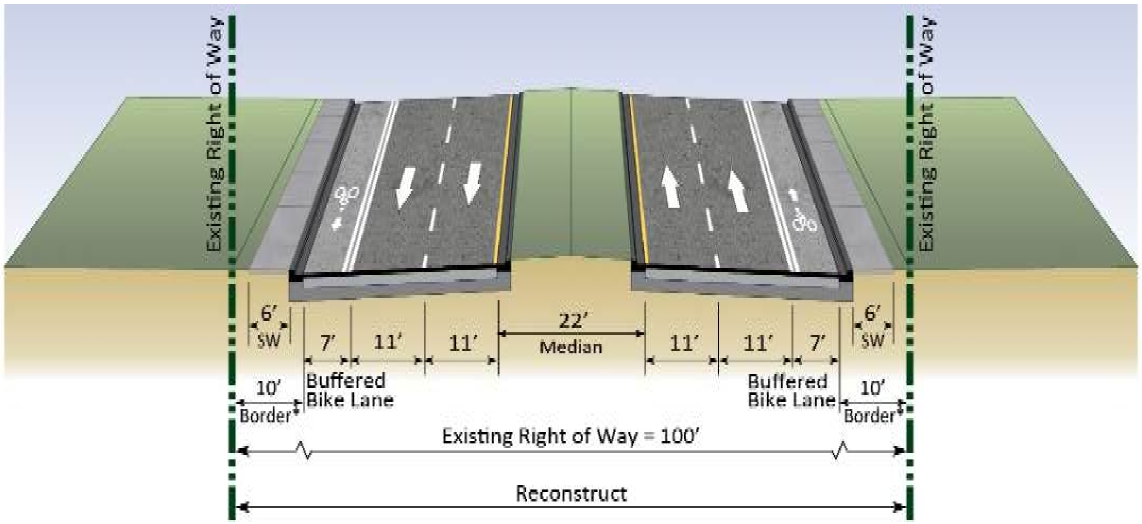


Figure 5-4
SR 29 Typical Section from Seminole Crossing Trail to CR 846
(Central Alternative #2)

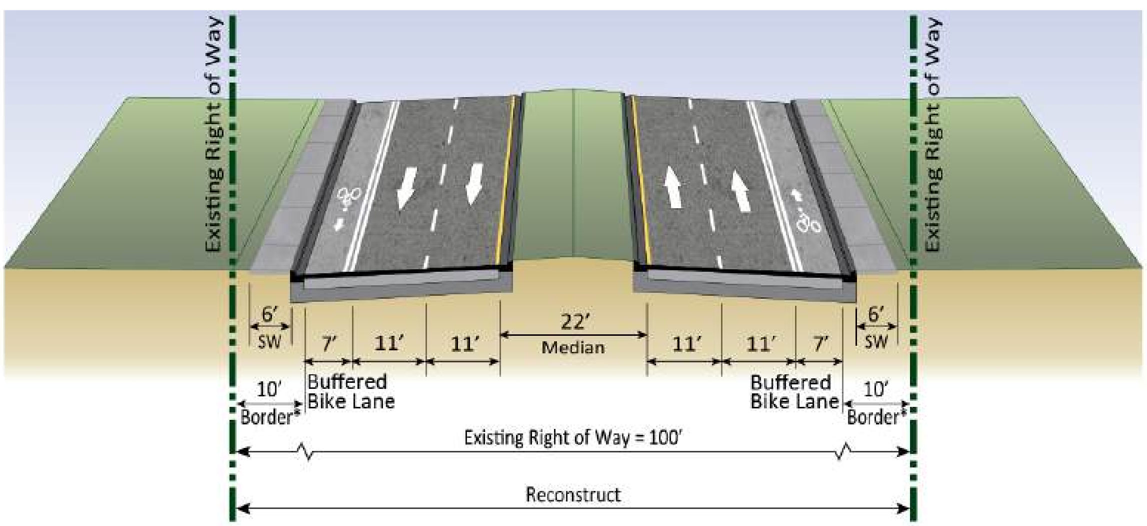


Figure 5-5
SR 29 Typical Section from North of Westclox Street to the SR 29 Bypass Junction

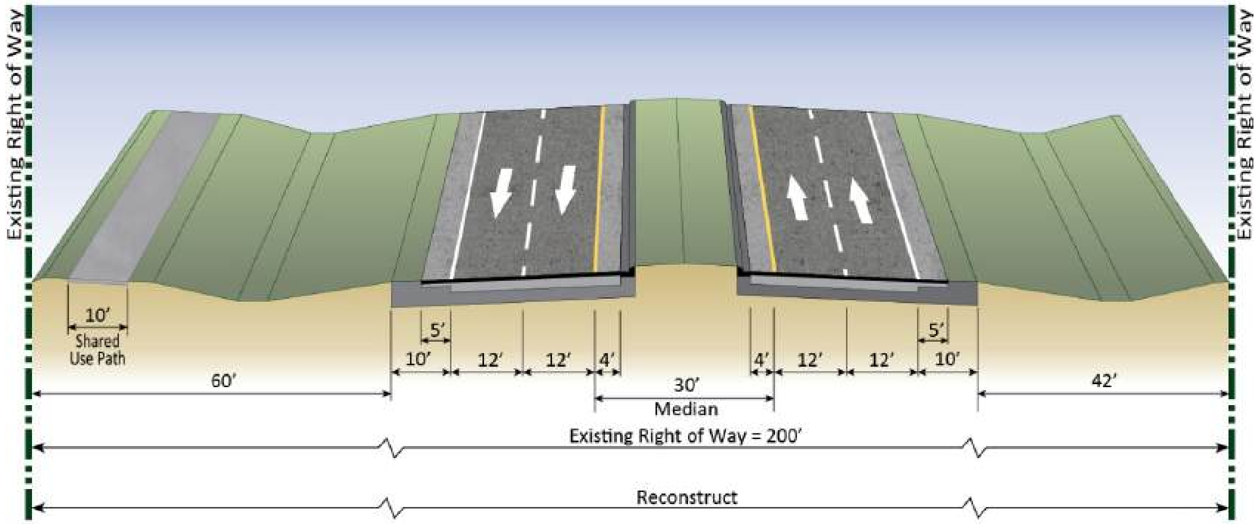


Figure 5-6
SR 29 Typical Section from the SR 29 Bypass Junction to Experimental Road

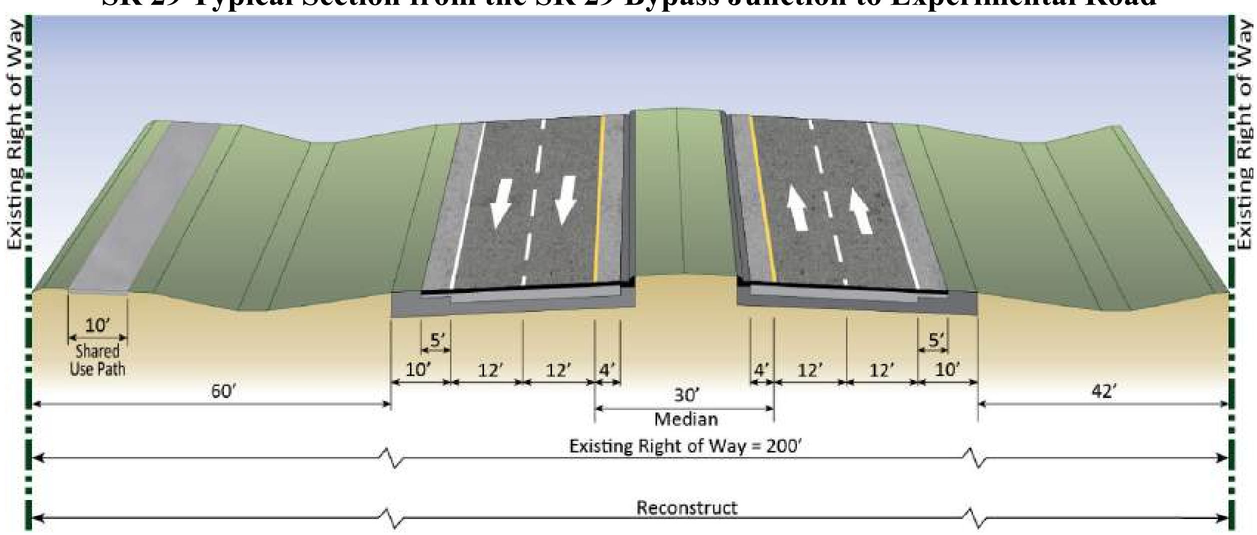
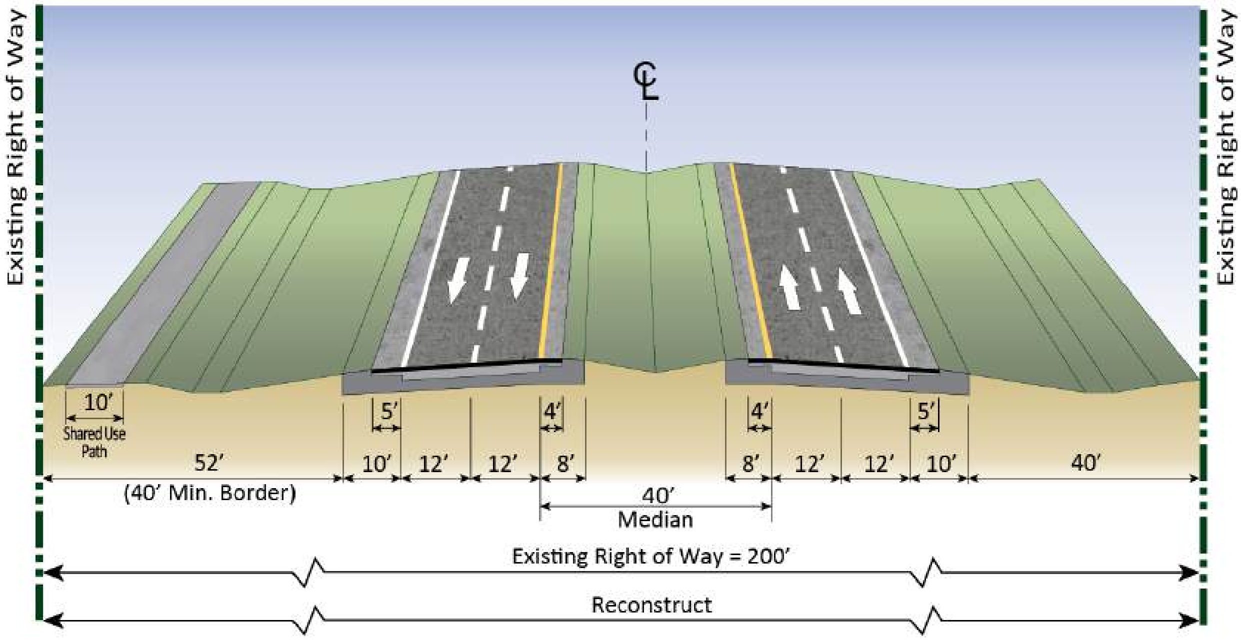


Figure 5-7
SR 29 Typical Section from Experimental Road to South of SR 82



5.1.2 New Market Road Typical Sections

Within the project limits, New Market Road can be broken up into the following two typical sections.

<u>From SR 29 to North of Airport Access</u>

Central Alternative 1R Only

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 11-foot travel lanes in each direction and a 22-foot median), with 7-foot buffered bicycle lanes and 6-foot sidewalks in each direction. There is a closed drainage system with curb and gutter, the design speed is 45 MPH, and the corridor is classified as an Emerging SIS Highway.

The existing ROW is 80 feet. The ROW width needed for this typical section is 100 feet. Additional ROW may be needed for turn lanes. **Figure 5-8** depicts this typical section.

<u>From North of Airport Access to Flagler Street</u>

Central Alternative 1R Only

The existing 2-lane undivided roadway is widened to a 4-lane divided typical section (two (2) 11-foot travel lanes in each direction and a 22-foot median), with 7-foot buffered bicycle lanes and 6-foot sidewalks in each direction. There is a closed drainage system with curb and gutter, the design speed is 45 MPH, and the corridor is classified as an Emerging SIS Highway.

The existing ROW is 100 feet. The ROW width needed for this typical section can be accommodated within the existing ROW limits. Additional ROW may be needed for turn lanes. **Figure 5-9** depicts this typical section.

Figure 5-8
New Market Road Typical Section from SR 29 to North of Airport Access
(Central Alternative #1 Revised)

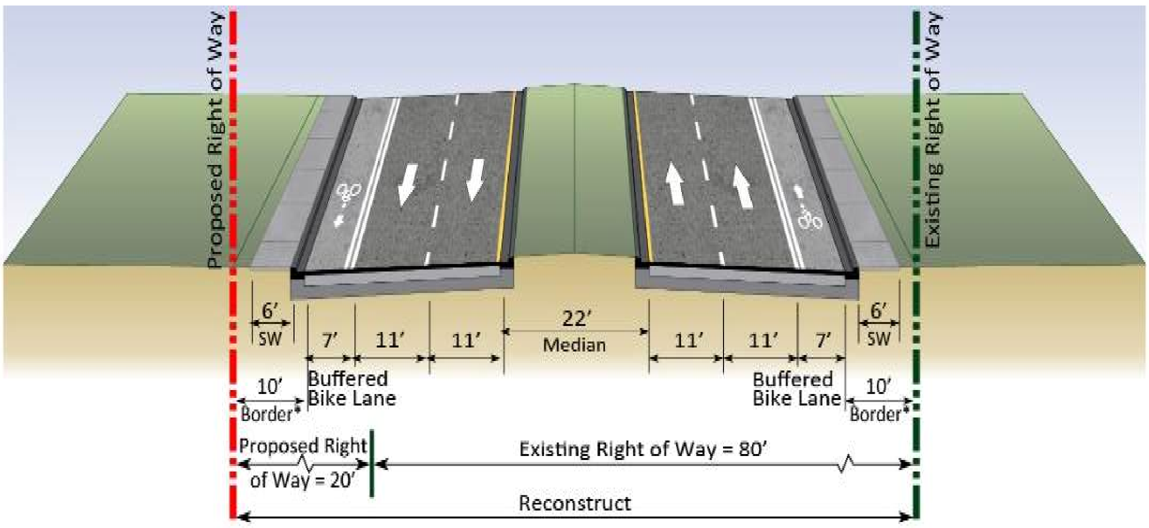
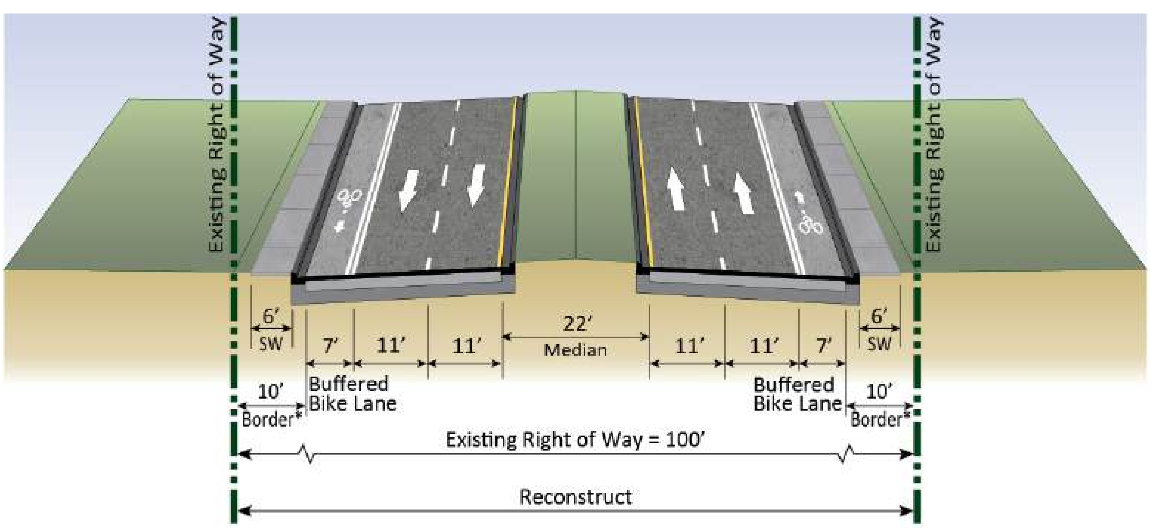


Figure 5-9
New Market Road Typical Section from North of Airport Access to Flagler Street
(Central Alternative #1 Revised)



5.1.3 SR 29 Bypass Typical Sections

Within the project limits, the proposed SR 29 Bypass can be described by the following typical sections.

From Flagler Street to SR 29

Central Alternative 1R Only

A 4-lane divided typical section (two (2) 12-foot travel lanes in each direction and a 30-foot median) is proposed, with a 10-foot shared use path on the west side of the corridor. There is an open drainage system, the design speed is 50 MPH, and the corridor is classified as an Emerging SIS Roadway.

The ROW width needed for this typical section is 200 feet. Additional ROW may be needed for turn lanes. **Figure 5-10** depicts this typical section.

From CR 846 to Gopher Ridge Road

Central Alternative 2 Only

A 4-lane divided typical section (two (2) 11-foot travel lanes in each direction and a 22-foot median) is proposed, with 7-foot buffered bicycle lanes and 6-foot sidewalks in each direction. There is a closed drainage system with curb and gutter, the design speed is 45 MPH, and the corridor is classified as an Emerging SIS Highway.

The ROW width needed for this typical section is 108 feet. Additional ROW may be needed for turn lanes. **Figure 5-11** depicts this typical section.

From Gopher Ridge Road to SR 29

Central Alternative 2 Only

A 4-lane divided typical section (two (2) 12-foot travel lanes in each direction and a 30-foot median) is proposed, with a 10-foot shared use path on the west side of the corridor. There is an open drainage system, the design speed is 50 MPH, and the corridor is classified as an Emerging SIS Highway.

The ROW width needed for this typical section is 200 feet. Additional ROW may be needed for turn lanes. **Figure 5-12** depicts this typical section.

Figure 5-10
SR 29 Bypass Typical Section from Flagler Street to SR 29
(Central Alternative #1 Revised)

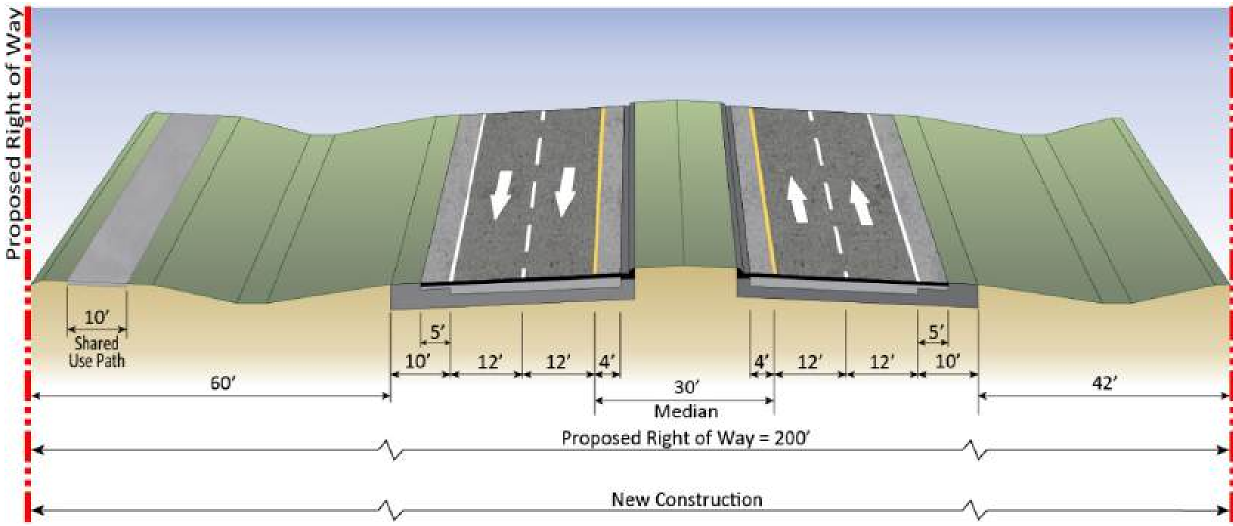


Figure 5-11
SR 29 Bypass Typical Section from CR 846 to Gopher Ridge Road
(Central Alternative #2)

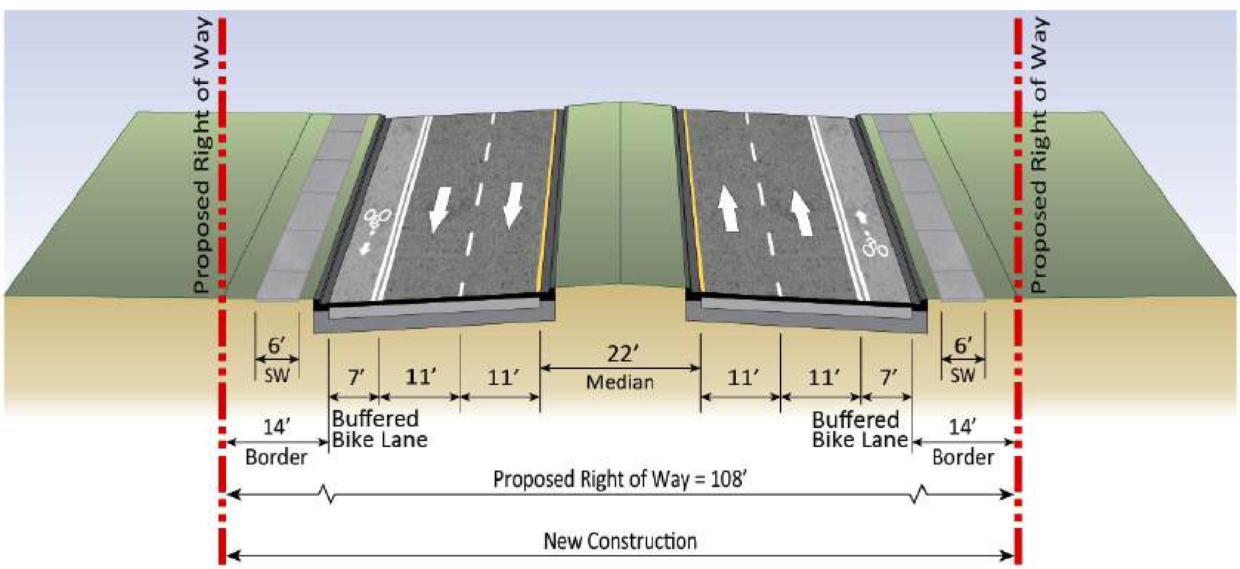
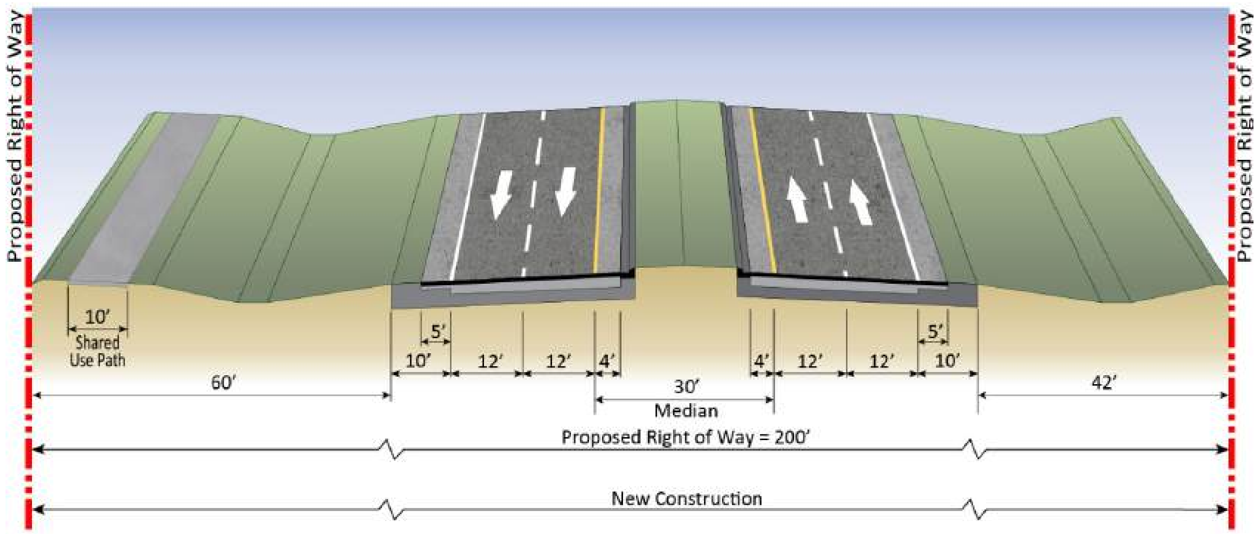


Figure 5-12
SR 29 Bypass Typical Section from Gopher Ridge Road to SR 29
(Central Alternative #2)



5.1.4 Intersections

For both build alternatives, signalized intersections have been proposed at each of the existing stop controlled intersections. Also, capacity increases, from 2-lane to 4-lane facilities, have been proposed along the existing SR 29 and New Market corridors north and south of the SR 29 Bypass. Additional left and right turn lanes have been proposed at various intersections along the study corridor. No geometric changes to SR 29 within downtown Immokalee, from New Market Road to Westclox Street/New Market Road, have been proposed.

The FDOT Step 1 Roundabout Screening was conducted for each of the study intersections within each build alternative. The intersections at Westclox Street/New Market Road and the northern SR 29 Bypass Junction were advanced to the Step 2 Benefit-Cost Evaluation for Central Alternative #1 Revised.

5.2 Drainage

The project consists of 41 drainage basins for each alignment alternative, Central 1R and Central 2. Basins 1 through 24 and Basins 33 through 41 are identical for each alignment alternative. A proposed wet detention pond has been identified within each of these basins. Through the central "bypass" portion of the study area, basins were delineated for each alignment alternative: Basins 25-1R through 32-1R for Central 1R; and, Basins 25-2 through 32-2 for Central 2. A proposed wet detention pond has been identified within each of these central alternative basins, as well.

In the proposed condition, the proposed ponds outfall to the same localized point as the existing basins. Portions of some of the existing basins have been rerouted to adjacent basins for treatment and attenuation in order to reduce the overall number of ponds required. Therefore, not all basins have a proposed pond; however, existing basin limits were used to determine allowable post-development runoff volumes. Basin limits and pond alternatives are shown in **Appendix C**, Proposed Drainage Maps.

Existing flow patterns will be maintained and stormwater management facilities will be utilized to provide the necessary stormwater management (water quality and quantity). Pond site alternatives are discussed in detail in Section 7.0, Stormwater Management.

It is assumed that the existing offsite stormwater runoff will be "passed through" the proposed ponds, where necessary, with no additional treatment required. Weir structures and pipes must be sized to accommodate the additional offsite flows passing through the proposed ponds.

5.3 Soils

The eighteen (18) primary soil-mapping units present within the project study area are shown on the Soils Map in **Appendix D**. Most of the soils present with the study limits are designated as Hydrologic Soil Group B/D. For this Preliminary Pond Siting Report, curve numbers for these soils groups were chosen based on the "D" soils. This approach yielded curve numbers consistent with adjacent permits in the area. Also, seasonal high water table (SHWT) elevations were estimated based on the soil type present at the proposed pond site unless a permitted SHWT could be utilized.

5.4 Land Use

The Collier County Community Planning Section is currently updating several Collier County area land use plans. This PD&E Study is located within two of the four areas currently being assessed in the eastern portion of the county, the Rural Lands Stewardship Area and the Immokalee Area.

The Rural Lands Stewardship Area is approximately 185,000 acres surrounding the Immokalee area. The original plan for this area was adopted in 2002. A 5-year restudy of the Overlay was completed in 2009 and resulted in several policy change recommendations. The current restudy effort will consider the previous recommendations, procure new data and analysis where needed, and determine if further changes will have positive results. The Future Land Use Map is shown as **Figure 5-13**.

The Immokalee Area Master Plan has undergone significant restudy in the past few years. The current restudy effort will determine if any further changes will improve the Immokalee Area Master Plan. The Immokalee Future Land Use Map is shown as **Figure 5-14**.

5.5 Cross Drains

Most of the cross drains listed in **Table 4-3** in Section 4.5 of this report will require lengthening or other modifications as part of the proposed improvements. During the final design phase, the exact nature of the modifications will be determined and the cross drains will be analyzed.

5.6 Bridge Structures

The widening of SR 29 for Central Alternative #1 Revised requires the lengths of three existing bridge culverts (Bridge Nos. 030019, 030304 and 030305) to be extended. All of the bridge culverts have Load Resistance Factor (LRF) ratings above 1.0, which makes them suitable for widening.

The widening of SR 29 also requires the addition of a new bridge over Gator Creek adjacent to Bridge No. 030303. The existing concrete flat slab existing bridge was constructed in 1999. It has a Sufficiency Rating of 95.9 and a LRF rating over 1.0, which indicates that it is in good overall condition and is suitable to remain in service. The existing bridge will carry the two northbound lanes of traffic and the new bridge will carry the two southbound lanes.

Replacement of the existing pedestrian overpass Bridge No. 039001 over SR 29 is required due to insufficient bridge length to accommodate the widening of SR 29.

Figure 5-13
Future Land Use Map

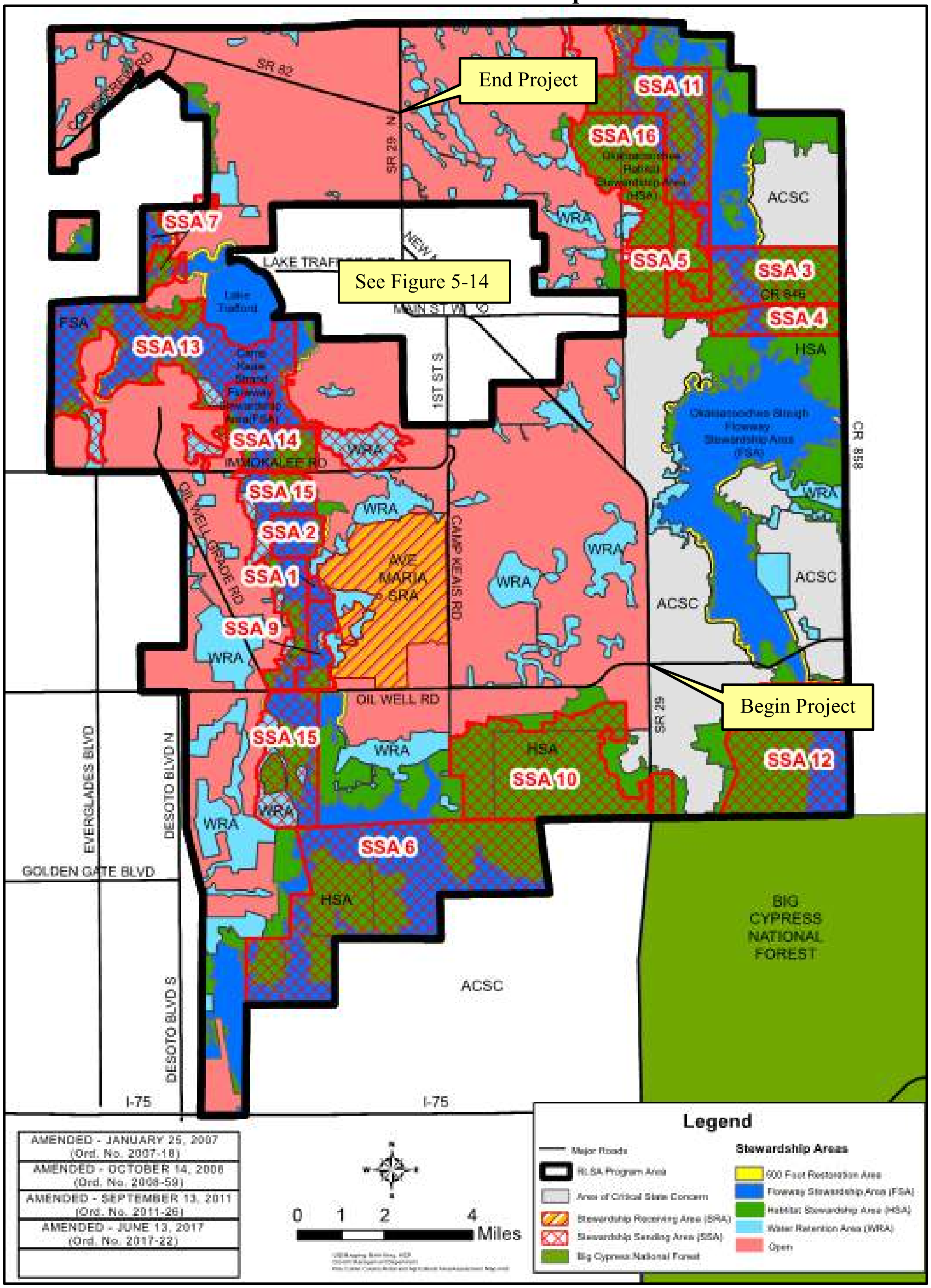
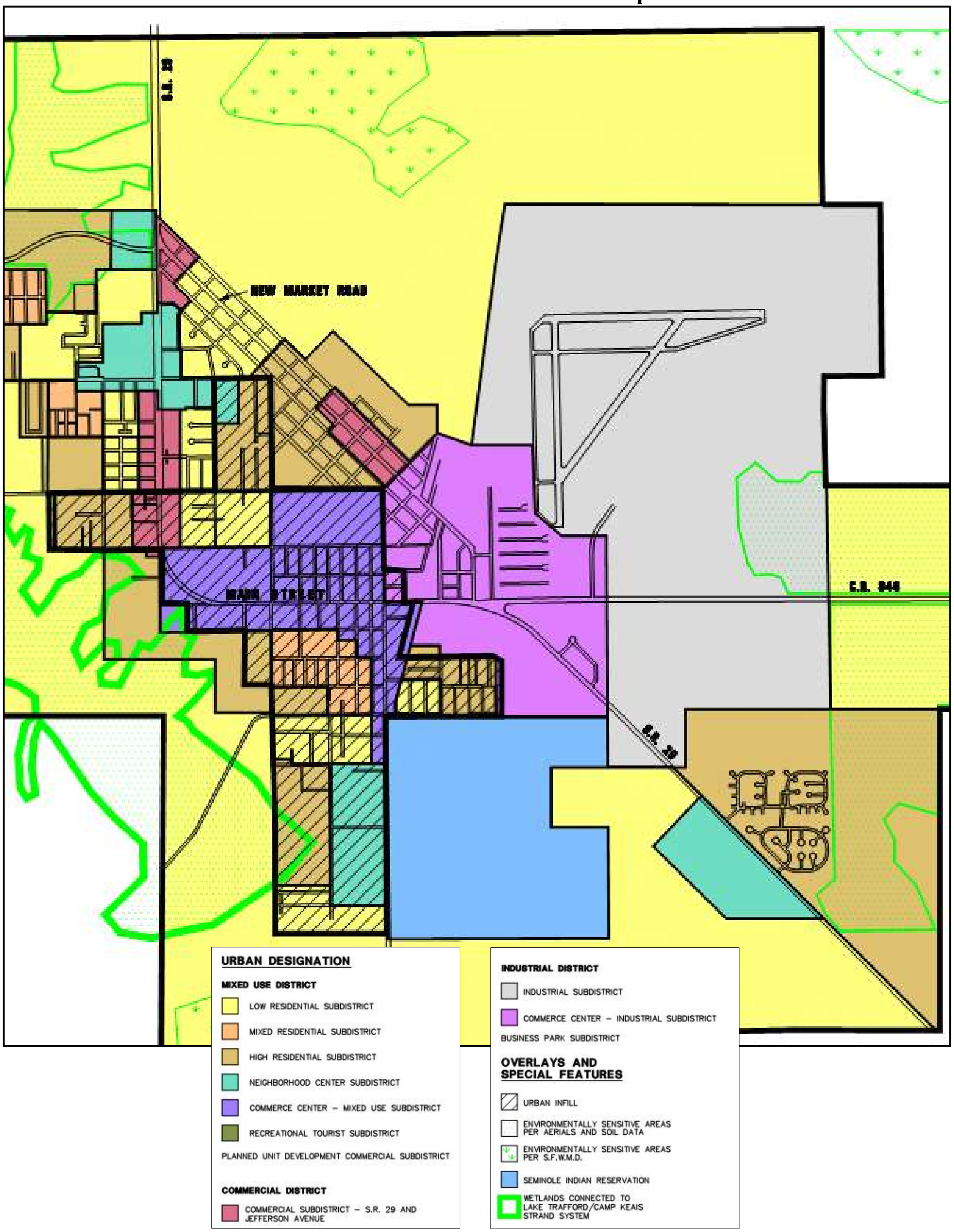


Figure 5-14
Immokalee Future Land Use Map



5.7 Floodplains and Floodways

The entire project is within the 100-year base floodplain designated as Zone AH, which is the flood insurance rate zone that corresponds to areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from detailed hydraulic analyses are shown at selected intervals within this zone. The base flood elevation ranges from elevation 19 feet just south of Oil Well Road to elevation 36.5 feet at SR 82. According to the Collier County maintenance staff, SR 29 has not experienced any overtopping or flooding problems.

In order to quantify/estimate floodplain impacts, the project area was divided into three impact areas, identified as F-1, F-2 and F-3. Potential floodplain encroachment was evaluated and documented in the Location Hydraulic Report, a separate document prepared for this PD&E Study. Estimated encroachment volumes, based on the proposed concept plans and typical sections, are shown in **Table 5-1**. Please refer to the Location Hydraulic Report for estimated floodplain impact calculations.

Table 5-1
Estimated Total Floodplain Impacts

Floodplain Impact	Encroachment (ac-ft)	Excavation (ac-ft)	Comment
F-1	25.36	-	
F-2	-	6.37	No compensation required
F-3	-	7.90	No compensation required

Compensation for the 25.36 acre-feet of floodplain impacts associated with F-1 will require purchasing right-of-way and constructing floodplain compensation (FPC) ponds. FPC-A, FPC-B, FPC-C and FPC-D were identified to provide the necessary compensation volume. These sites are described below and shown on the Proposed Drainage Maps in **Appendix C**.

FPC-A is located west of SR 29 near Sta. 55+00, approximately ½ mile north of Oil Well Road. It is 4.4 acres in size and provides compensation between the estimated seasonal high groundwater table elevation of 19.0 ft. NAVD and the estimated 100-year floodplain elevation of 20.2 ft. NAVD.

FPC-B is located west of SR 29 near Sta. 213+30, just before SR 29 curves to the northwest. It is 4.5 acres in size and provides compensation between the estimated seasonal high groundwater table elevation of 19.0 ft. NAVD and the estimated 100-year floodplain elevation of 22.0 ft. NAVD.

FPC-C is located west of SR 29 near Sta. 300+70, approximately 0.4 miles north of Sunniland Nursery Road. It is 10.3 acres in size and provides compensation between the estimated seasonal high groundwater table elevation of 21.0 ft. NAVD and the estimated 100-year floodplain elevation of 22.5 ft. NAVD.

FPC-D is located west of SR 29 near Sta. 438+00, approximately 800 feet southwest of Agriculture Way. It is 2.6 acres in size and provides compensation between the estimated seasonal high groundwater table elevation of 23.0 ft. NAVD and the estimated 100-year floodplain elevation of 25.0 ft. NAVD.

The areas of new alignment north of the city of Immokalee associated with the SR 29 Bypass alternatives have sufficient right-of-way to balance floodplain impacts (cut/fill); therefore, there will be no net encroachment into the base floodplain for the new alignment portions of Central Alternative 1R and Central Alternative 2.

Please refer to **Appendix E** for FEMA FIRMs.

6.0 Stormwater Management

6.1 Stormwater Management Methodology

In addition to the environmental considerations (see Section 7.0), stormwater management methodology and criteria were used to determine the pond site alternatives.

The project was divided into 41 roadway basins, Basins 1 through 41. Portions of some of the existing basins have been rerouted to adjacent basins for treatment and attenuation; however, existing basin limits were used to determine allowable post-development runoff volumes.

Each basin providing stormwater management has one (1) off-site pond alternative, with the exception of Basin 28-1R, Basin 36 and Basin 37, which each have one on-site alternative and Basin 27-2, which utilizes a combined on-site and off-site alternative. The provided treatment and attenuation volumes were calculated and areas for the proposed pond site alternatives were established using these volumes and the estimated seasonal high groundwater elevation. For detailed calculations associated with the pond siting and sizing, see **Appendix F** – Stormwater Management Calculations. The pond site alternatives are shown in **Appendix C** – Proposed Drainage Maps.

The following parameters for each site were analyzed in the selection process:

- Soil Type
- Estimated average ground elevation and edge of pavement elevations – based on 2-foot digital contours from LiDAR data for Collier County
- Estimated Seasonal High Groundwater Table (SHWT) elevations – estimated based on the NRCS soil information at the pond site
- Permitted SHWT elevations– obtained from existing SFWMD Environmental Permits

6.2 Stormwater Management Design Alternatives

Several stormwater management facility types were considered including wet detention systems, dry detention systems, retention systems, swale systems and underground exfiltration trench systems. SFWMD's water quantity requirements specify the peak post-development runoff rate shall not exceed the peak pre-development runoff rate for the 25-year/3-day design storm event. The required water quality volume is based on the type of treatment system proposed. The following is a list of design methodologies and their associated rules.

6.2.1 Wet Detention Systems

This method involves storing stormwater runoff in a wet bottom pond, above the normal water surface. The discharge rate from the wet bottom pond is controlled by an outlet structure to prevent downstream flooding and erosion. SFWMD requires a wet detention treatment system for public roads to treat 1.0 inch of runoff from the contributing area. An additional 50% above the proposed basin treatment volume must be provided for discharge to Outstanding Florida Waters (OFW). Due to the normally high groundwater elevations along the project, long conveyance distances, and depth of the storm drain system inverts, wet detention systems were selected as the most feasible method for stormwater treatment and attenuation.

6.2.2 Dry Detention Systems

This method involves storing stormwater runoff in a dry bottom pond, above the seasonal high groundwater table elevation. Filtering the stormwater runoff through the pond bottom to the groundwater table provides water quality treatment. The use of dry detention systems would be prohibitive due to the anticipated depth of the storm drain system inverts and the normally high groundwater elevations along the project. Therefore, dry detention systems were only considered as an alternative stormwater management facility for basins that do not meet nutrient removal requirements through wet detention alone.

6.2.3 Retention Systems

This concept provides storage and water quality treatment through retention. Retention systems are designed to prevent discharge of a given volume of runoff by complete on-site storage. The high water table and low permeability rates in 'D' type soils present on this project discourage the use of this method. The retention system design must assure that long-term recovery and flood protection is provided. For this project, the discharge limitation would require a pond size too large to be accommodated within the land available. Therefore, this option would be too cost-prohibitive and was not used.

6.2.4 Swale Systems

This method involves storing stormwater runoff in a dry bottom swale, above the seasonal high groundwater table elevation. Filtering of the stormwater runoff through the swale bottom to the groundwater table provides water quality treatment. The use of swales would not provide sufficient volume to attenuate and treat the proposed runoff volumes for this project. However, dry bottom swales were considered as an alternative/additional stormwater management facility for basins that do not meet nutrient removal requirements through wet detention alone.

6.2.5 Underground Exfiltration Trench Systems

This concept provides storage and water quality treatment through exfiltration into the surrounding soils. Exfiltration is accomplished using a perforated pipe laid in a rock-filled trench that allows the runoff to percolate into the surrounding ground. Exfiltration systems are costly and have high maintenance requirements due to very large pipe sizes and sediment buildup. Moreover, exfiltration systems would not provide sufficient volume to capture and treat stormwater runoff effectively. Exfiltration is generally used as a last resort. A high ground water table normally discourages the use of this method. Therefore, exfiltration systems are not considered a viable solution for this project.

6.3 Proposed Stormwater Management Design

Wet detention ponds are the selected method of stormwater management for the project. Wet detention was chosen due to the predominantly poorly drained soils, seasonal depths to groundwater ranging from 2.0 feet above to 3.5 feet below ground and storm drain system requirements. Additionally, the storm drain systems require the pond inflow structures to be below the control water level (CWL) or normal water level (NWL) of the proposed ponds. Additional dry retention (in series with wet detention) is required in ten (10) of the basins (Basins 14-16, Basins 18-22, Basin 29-2 and Basin 30-2) in order to meet nutrient removal criteria.

6.3.1 SFWMD Pond Sizing Criteria

The SFWMD rules dictate the use of the 25-year/3-day design storm event. The required treatment volume was calculated for each basin (the greater of 2.5-inches over the new roadway impervious area; or, 1-inch over the total basin area). The NRCS method was used to calculate pre-development and post-development runoff volumes. The runoff volume difference between pre-development and post-development conditions was used to determine the pond volume required for attenuation of the design storm event. The attenuation volume calculated was added to the required treatment volume to size each pond alternative. The design analysis is strictly a Volumetric Analysis for the purposes of this report (see **Appendix F**).

6.3.2 Impaired Waters

The project lies within three impaired WBIDs as described in Section 3.3.1: WBID 3278W, WBID 3278L and WBID 3235L. Therefore, a pre-development versus post-development pollutant loading analysis (net improvement) has been performed for all of the basins within these impaired waterbodies using The University of Central Florida's BMPTRAINS model spreadsheet. District One EMC values were utilized per the 2011 Memorandum (see **Appendix G**). As illustrated in **Table 6-1**, wet detention provided the required nutrient removal for a majority of the basins; however, additional dry retention (in series with the wet detention pond) was required in some basins in order to meet nutrient removal criteria. Please refer to **Appendix F**.

Table 6-1
BMP Analysis Results for Impaired WBIDs

Impaired WBID	Basins within WBID	BMP	
		Wet Detention Sufficient	Dry Retention (in series) Required
3278W	1-27, 31	1-13, 17, 23-27	14-16, 18-22
3278L	28-30, 32-33	28, 29-1R, 30-1R, 32-33	29-2, 30-2
3235L	40-41	40-41	-

6.3.3 Curve Numbers

Runoff curve numbers were obtained from the FDOT Drainage Handbook - Hydrology, Table T-7 (see **Appendix G**). When soils in a dual hydrologic group, such as B/D, were encountered, curve numbers for group D soils were utilized to be consistent with adjacent existing permits. Since ground cover is good throughout the study area, Open Spaces, Good Condition was chosen for the Land Use Description. Please refer to **Appendix F**.

6.3.4 Seasonal High Groundwater Table Elevation (SHWT)

6.3.4.1 Existing SFWMD Environmental Resource Permits (ERPs)

Existing SFWMD ERPs adjacent to the project were obtained from the SFWMD ePermitting website. **Table 6-2** shows the nearest ERP for each pond site alternative and indicates whether or not the permitted SHWT is applicable to the pond site alternative. If the SHWT was considered applicable, it was used in the calculations (see **Appendix F**).

Table 6-2
Existing SFWMD Environmental Resource Permits

Pond Site	Nearest ERP	ERP Name	Permitted Elevation (NAVD 88)
1	11-00223-S	Silver Strand Farm	SHWT = 17.3
29-1R	11-00999-S	Immokalee Airport Expansion	SHWT = 30.5
29-2	11-00999-S	Immokalee Airport Expansion	SHWT = 30.5
33	11-03470-P	Suncoast Federal Credit Union	SHWT = 33.0
34	11-00805-S	Immokalee Health Clinic	SHWT = 32.7
35	11-00805-S	Immokalee Health Clinic	SHWT = 32.7

6.3.4.2 Soil Survey

For the pond site alternatives that did not have applicable permitted SHWT elevations, the NRCS Soil Survey for Collier County was used to obtain estimated SHWT elevations. The SHWT is defined by the Natural Resource Conservation Service (NRCS) as the highest level of saturated zone in the soil in a year with normal rainfall, which persists in the soil for more than a few weeks. Along most of the project alignment, the SHWT levels are estimated to be 0 to 1.0 feet below the natural ground surface. SHWT elevations were estimated based on the NRCS soil information for the pond site alternative.

6.3.4.3 Vertical Limitations

For ponds adjacent to the road, the maximum design stage is limited to the low edge of pavement (LEOP) elevation in the basin minus the conveyance loss to the outfall. In addition, one foot of clearance is provided as "freeboard" for the pavement. These criteria were used to establish the available depth for treatment and attenuation as illustrated below:

Available depth for treatment & attenuation = LEOP – conveyance loss – 1' – SHWT elevation

6.3.4.4 Conclusion

Pond alternatives were sized based on the combination of treatment and attenuation volumes calculated per SFWMD requirements. The maximum volume required was determined by using the treatment requirements to establish a pollution abatement volume and the volume difference between pre-development and post-development conditions for the 25-year/3-day storm event. The two volumes were then added together to approximate a required pond size for the basin. Alternate pond sites have been analyzed for minimum area, outfall characteristics, land use, and environmental conditions. All of the pond site alternatives are summarized in **Table 6-3**: Pond Site Characteristics.

Each pond design includes:

- 20-foot flat maintenance berm;
- 1:4 side slopes from the top of the bank to the control (SHWT) elevation;
- If permanent pool is required, 1:2 side slopes from two (2) feet below the control (SHWT) elevation to the pond bottom; and
- 1-foot of freeboard measured from the inside edge of the maintenance berm

The wet detention pond design will be used for all pond site alternatives.

A 10% contingency was added to each pond alternative size to account for limited site-specific data. Please refer to **Appendix F**.

6.4 Proposed Drainage Basins

Basin 1

Basin 1 begins at Sta. 1414+60, BL SR 29 and ends at Oil Well Road (Sta. 30+00, CL SR 29). The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 9.3 acres and the proposed improvements will generate approximately 1.33 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 2

Basin 2 extends approximately 860' east of SR 29 along Oil Well Road (Sta. 30+00, CL SR 29). The drainage area consists of the roadway right-of-way. The proposed basin area is 1.9 acres. The proposed runoff volume of 1.19 acre-feet is equal to the existing runoff volume of 1.19 acre-feet; therefore, a stormwater management facility is not required. The basin outfalls directly into the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 3

Basin 3 extends approximately 1200' west of SR 29 along Oil Well Road (Sta. 30+00, CL SR 29). The drainage area consists of the roadway right-of-way. The proposed basin area is 2.7 acres and the proposed improvements will generate approximately 0.25 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 4

Basin 4 begins at Oil Well Road (Sta. 30+00) and ends at Sta. 45+10. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 6.2 acres and the proposed improvements will generate approximately 1.15 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 5

Basin 5 begins at Sta. 45+10 and ends at Sta. 68+00. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 9.5 acres and the proposed improvements will generate approximately 1.70 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 6

Basin 6 begins at Sta. 68+00 and ends at Sta. 94+00. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 10.7 acres and the proposed improvements will generate approximately 2.26 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 7

Basin 7 begins at Sta. 94+00 and ends at Sta. 109+20. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 6.2 acres and the proposed improvements will generate approximately 1.14 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 8

Basin 8 begins at Sta. 109+20 and ends at Sta. 133+10. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 9.7 acres and the proposed improvements will generate approximately 1.95 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the

Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 9</u>

Basin 9 begins at Sta. 133+10 and ends at Sta. 151+20. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 7.3 acres and the proposed improvements will generate approximately 1.33 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 10</u>

Basin 10 begins at Sta. 151+20 and ends at Sta. 178+65. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 11.1 acres and the proposed improvements will generate approximately 2.15 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 11</u>

Basin 11 begins at Sta. 178+65 and ends at Sta. 197+10. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 7.5 acres and the proposed improvements will generate approximately 1.50 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is

located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 12

Basin 12 begins at Sta. 197+10 and ends at Sta. 217+30. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 8.2 acres and the proposed improvements will generate approximately 1.49 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 13

Basin 13 begins at Sta. 217+30 and ends at Sta. 239+80. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 9.3 acres and the proposed improvements will generate approximately 1.75 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 14

Basin 14 begins at Sta. 239+80 and ends at Sta. 259+00. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 7.9 acres and the proposed improvements will generate approximately 1.77 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.2 inches over the basin (0.13 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 15

Basin 15 begins at Sta. 259+00 and ends at Sta. 281+35. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 9.2 acres and the proposed improvements will generate approximately 2.59 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.25 inches over the basin (0.19 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 15 is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 16

Basin 16 begins at Sta. 281+35 and ends at Sta. 306+80. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 10.5 acres and the proposed improvements will generate approximately 2.45 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is

located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.1 inches over the basin (0.09 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 17</u>

Basin 17 begins at Sta. 306+80 and ends at Sta. 334+20. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 11.2 acres and the proposed improvements will generate approximately 2.41 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 18</u>

Basin 18 begins at Sta. 334+20 and ends at Sta. 359+25. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 10.2 acres and the proposed improvements will generate approximately 2.57 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.1 inches over the basin (0.09 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the

Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 19</u>

Basin 19 begins at Sta. 359+25 and ends at Sta. 384+60. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 10.2 acres and the proposed improvements will generate approximately 2.54 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.15 inches over the basin (0.13 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 20</u>

Basin 20 begins at Sta. 384+60 and ends at Sta. 399+50. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 5.9 acres and the proposed improvements will generate approximately 1.95 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.2 inches over the basin (0.10 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 21

Basin 21 begins at Sta. 399+50 and ends at Sta. 420+00. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 8.2 acres and the proposed improvements will generate approximately 2.49 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.3 inches over the basin (0.21 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 22

Basin 22 begins at Sta. 420+00 and ends at Sta. 435+00. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 6.0 acres and the proposed improvements will generate approximately 1.74 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 0.15 inches over the basin (0.08 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 23

Basin 23 begins at Sta. 435+00 and ends at Sta. 463+40. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 11.4 acres and the proposed improvements will generate approximately 2.95 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is

located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 24</u>

Basin 24 begins at Sta. 463+40 and ends at Sta. 470+15. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 4.4 acres and the proposed improvements will generate approximately 0.38 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

<u>Basin 25</u>

Basin 25 begins at Sta. 470+15 and ends at Sta. 500+90. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 14.0 acres and the proposed improvements will generate approximately 1.95 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

This basin is within the limits of SFWMD ERP No. 11-00968-S and currently provides water quality treatment for the east side of SR 29 in shallow retention areas between the road and the Barron Canal. For the purposes of this report, this existing volume was not considered in the proposed condition. During design, this existing treatment volume may be utilized if it is not impacted by the proposed improvements, potentially reducing the size of the wet detention pond.

Basin 26-1R

Basin 26-1R begins at Sta. 500+90 and ends at Sta. 533+95. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 7.80 acres, increased from 7.60 acres by adjusting the basin boundary with Basins 27-1R and 28-1R. The proposed improvements will generate approximately 2.08 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to a bridge culvert located at the convergence of the Immokalee Main Canal and the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 26-2

Basin 26-2 begins at Sta. 500+90 and ends at Sta. 535+80. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 7.70 acres, increased from 7.60 acres by adjusting the basin boundary with Basins 27-2 and 28-2. The proposed improvements will generate approximately 1.57 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to a bridge culvert located at the convergence of the Immokalee Main Canal and the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 27-1R

Basin 27-1R extends 0.58 miles east along CR 846 from the intersection of SR 29 and New Market Road. The drainage area consists of the CR 846 roadway right-of-way, as well as six commercial parcels south of CR 846. The proposed basin area is 16.20 acres, reduced from 17.60 acres by rerouting 1.4 acres to Pond 28-1R and adjusting the basin boundary with Basin 28-1R. The proposed improvements will generate approximately 1.50 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Airport Perimeter Canal which flows south into the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 27-2

Basin 27-2 extends 0.58 miles east along CR 846 from the intersection of SR 29 and New Market Road. The drainage area consists of the CR 846 roadway right-of-way, as well as six commercial parcels south of CR 846. The proposed basin area is 17.90 acres, increased from 17.60 acres by adjusting the basin boundaries with Basin 26-2 and Basin 28-2. The proposed improvements will generate approximately 2.43 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Airport Perimeter Canal which flows south into the Barron Canal on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 28-1R

Basin 28-1R begins at Sta. 533+95 and ends at Sta. 548+25. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 4.00 acres and the proposed improvements will generate approximately 0.29 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal is achieved through wet detention. The basin outfalls to a bridge culvert and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 28-2

Basin 28-2 begins at Sta. 535+80 and ends at Sta. 548+25. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 3.80 acres, reduced from 4.00 acres by adjusting the basin boundary with Basins 26-2 and 27-2. The proposed impervious area of 1.78 acres is less than the existing impervious area of 2.10 acres and the proposed runoff volume of 2.65 acre-feet is less than the existing runoff volume of 2.83 acre-feet; therefore, a stormwater management facility is not required. The basin outfalls to a bridge culvert and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 29-1R

Basin 29-1R begins at Sta. 130+50 at the intersection of SR 29 and New Market Road. It extends along New Market Road to Sta. 152+70, just south of Nixon Drive. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 5.60 acres and the proposed improvements will generate approximately 1.52 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 29-2

Basin 29-2 begins at Sta. 124+15 at CR 846 and ends at Sta. 161+00 at the Immokalee Canal adjacent to the Immokalee Regional Airport property line. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 9.60 acres and the proposed improvements will generate approximately 4.00 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 1.1 inches over the basin (0.88 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 30-1R

Basin 30-1R begins at Sta. 152+70, just south of Nixon Drive and ends just north of Madison Avenue West (Sta. 190+95). The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 10.40 acres and the proposed improvements will generate approximately 2.32 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal is achieved through wet detention. The basin outfalls to existing roadside ditches that flow north to the Madison Creek Ditch. This ditch flows east, under Gopher Ridge Road and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 30-2

Basin 30-2 begins at Sta. 161+00 at the Immokalee Canal, adjacent to the Immokalee Regional Airport property line, and ends at Sta. 168+65 at the Madison Creek Ditch. The drainage area consists of the roadway right-of-way between these stations, as well as a portion of Gopher Ridge Road. The proposed basin area is 3.00 acres and the proposed improvements will generate approximately 1.14 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal cannot be achieved through wet detention alone;

therefore, a retention area in series with the wet detention pond is required. A retention depth of 1.0 inches over the basin (0.25 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Madison Creek Ditch and flows east, under Gopher Ridge Road and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 31-1R

Basin 31-1R begins just north of Madison Avenue West (Sta. 190+95) and ends at Sta. 205+40. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 6.50 acres and the proposed improvements will generate approximately 1.59 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Madison Creek Ditch and flows east, under Gopher Ridge Road and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 31-2

Basin 31-2 begins at Sta. 168+65 at the Madison Creek Ditch and ends at Sta. 205+40. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 16.80 acres and the proposed improvements will generate approximately 4.03 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278W) and the required nutrient removal is achieved through wet detention. The basin outfalls to the Madison Creek Ditch and flows east, under Gopher Ridge Road and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 32-1R

Basin 32-1R begins at Sta. 205+40 and ends at Sta. 251+60. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 21.20 acres and the proposed improvements will generate approximately 5.15 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal is achieved through wet detention. The basin outfalls to existing roadside ditches that flow north to the Madison Creek Ditch. This ditch flows east, under Gopher Ridge Road and into the Immokalee

Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 32-2

Basin 32-2 begins at Sta. 205+40 and ends at Sta. 251+60. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 21.20 acres and the proposed improvements will generate approximately 5.15 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal cannot be achieved through wet detention alone; therefore, a retention area in series with the wet detention pond is required. A retention depth of 1.0 inches over the basin (0.25 ac-ft) will be provided within the existing right-of-way. The basin outfalls to the Madison Creek Ditch and flows east, under Gopher Ridge Road and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 33

Basin 33 begins at Sta. 2075+25, approximately 500' north of Lake Trafford Road and ends at Westclox Road (Sta. 2100+60). The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 12.70 acres and the proposed improvements will generate approximately 0.10 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in an impaired water body (WBID 3278L) and the required nutrient removal is achieved through wet detention. The basin outfalls to the east through a 42" cross drain under SR 29 and into an existing stormwater management facility. The discharge from this existing pond eventually makes its way into the Madison Creek Ditch which flows east under Gopher Ridge Road and into the Immokalee Main Canal. This canal flows south/southeast, under SR 29, where it converges with the Airport Perimeter Canal. The Barron Canal begins here, on the east side of SR 29. Barron Canal then flows south through the Everglades and ultimately into the Gulf of Mexico.

Basin 34

Basin 34 begins at Westclox Road (Sta. 2100+60) and ends at Sta. 2107+05. The drainage area consists of the roadway right-of-way between these stations, as well as the skewed intersection with New Market Road. The proposed basin area is 4.70 acres and the proposed improvements will generate approximately 0.60 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the west and into existing wetlands.

Flow eventually makes its way west into Fish Branch Creek which flows south and ultimately into the Gulf of Mexico.

Basin 35

Basin 35 begins at Sta. 2107+05 and ends at Sta. 2126+60. The drainage area consists of the roadway right-of-way between these stations, as well as a portion of the intersection with the SR 29 Bypass. The proposed basin area is 16.10 acres, reduced from 19.75 acres by revising the basin boundary with Basin 36. The proposed improvements will generate approximately 1.04 acres of new pavement. A wet detention pond will be utilized to provide the required treatment volume. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the west and into existing wetlands. Flow eventually makes its way west into Fish Branch Creek which flows south and ultimately into the Gulf of Mexico.

Basin 36

Basin 36 begins at Sta. 251+60 (SR 29 Bypass) and ends at Sta. 293+70. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 13.60 acres, increased from 12.90 acres by revising the basin boundary with Basin 35. The proposed improvements will generate approximately 0.21 acres of new pavement. A wet detention pond, located within the infield area of the SR 29 Bypass junction, will be utilized to provide the required treatment and attenuation volumes. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the west and into existing wetlands. Flow eventually makes its way west into Fish Branch Creek which flows south and ultimately into the Gulf of Mexico.

Basin 37

Basin 37 begins at Sta. 2126+60 and ends at Sta. 2154+80. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 28.70 acres and the proposed improvements will generate approximately 5.22 acres of new pavement. A wet detention pond, located within the infield area of the SR 29 Bypass junction, will be utilized to provide the required treatment and attenuation volumes. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the west and into existing wetlands. Flow eventually makes its way west into Fish Branch Creek which flows south and ultimately into the Gulf of Mexico.

Basin 38

Basin 38 begins at Sta. 2154+80 (BL SR 29) and ends at Sta. 313+90 (CL SR 29). The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 9.40 acres and the proposed improvements will generate approximately 0.93 acres of new pavement.

A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the west and into existing wetlands. Flow eventually makes its way west into Fish Branch Creek which flows south and ultimately into the Gulf of Mexico.

Basin 39

Basin 39 begins at Sta. 313+90 and ends at Sta. 341+55. The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 12.70 acres and the proposed improvements will generate approximately 2.34 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the west and into existing wetlands. Flow eventually makes its way west into Fish Branch Creek which flows south and ultimately into the Gulf of Mexico.

Basin 40

Basin 40 begins at Sta. 341+55 and ends at Sta. 379+00 (LT) and Sta. 393+30 (RT). The drainage area consists of the roadway right-of-way between these stations. The proposed basin area is 20.40 acres and the proposed improvements will generate approximately 2.83 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the north, under SR 82 and eventually makes its way makes its way into the Townsend Canal which eventually outfalls into the Caloosahatchee River.

Basin 41

Basin 41 begins at Sta. 379+00 (LT) and Sta. 393+30 (RT) and ends at SR 82. The drainage area consists of the roadway right-of-way between these stations, as well as a portion of SR 82. The proposed basin area is 9.80 acres and the proposed improvements will generate approximately 0.62 acres of new pavement. A wet detention pond will be utilized to provide the required treatment and attenuation volumes. This basin is located in WBID 3278E, which is not an impaired water body. The basin outfalls to the north, under SR 82 and eventually makes its way makes its way into the Townsend Canal which eventually outfalls into the Caloosahatchee River.

Table 6-3
Pond Site Characteristics

Pond Name	Station	Offset	Required Pond Area (ac)	Avg. Exist. Ground Elev. @ Pond Site (ft, NAVD)	Low EOP within basin (ft, NAVD)	Estimated SHWT Elevation (ft, NAVD)	Hydrologic Soil Groups	Soil Types	Existing Land Use	Outfall Location	Required Treatment & Attenuation Volumes (ac-ft)	Comments
1	1424+20 BL SR 29	LT	1.68	18.0	20.0	17.5	A/D	21	Undeveloped	CD-1 to Barron Canal @ Sta. 1414+60	1.02	
3	31+40 CL SR 29	LT	1.18	18.0	20.0	17.5	A/D	21	Undeveloped	CD-2 to Barron Canal @ Sta. 39+60	0.27	
4	36+00	LT	1.32	20.0	22.0	19.5	A/D	21	Undeveloped	CD-2 to Barron Canal @ Sta. 39+60	0.75	
5	60+50	LT	1.82	20.0	22.0	19.5	A/D	27	Agricultural	CD-3 to Barron Canal @ Sta. 54+70	1.15	
6	88+80	LT	1.73	20.0	22.0	19.1	B/D, A/D	7, 17	Agricultural/ Undeveloped	CD-5 to Barron Canal @ Sta. 94+00	1.36	
7	96+10	LT	1.26	20.0	22.0	19.0	B/D, A/D	7, 17	Agricultural/ Undeveloped	CD-5 to Barron Canal @ Sta. 94+00	0.75	
8	130+85	LT	1.53	20.0	22.0	19.0	B/D	7	Agricultural/ Undeveloped	CD-6 to Barron Canal @ Sta. 133+00	1.22	
9	135+10	LT	1.32	20.0	22.0	19.0	B/D	7	Agricultural/ Undeveloped	CD-6 to Barron Canal @ Sta. 133+00	0.89	
10	169+55	LT	2.12	20.0	22.0	19.5	A/D, C/D	17, 22	Agricultural/ Undeveloped	CD-7 to Barron Canal @ Sta. 169+55	1.37	
11	187+90	LT	1.61	20.0	22.0	19.5	A/D	3	Agricultural/ Undeveloped	CD-8 to Barron Canal @ Sta. 182+30	0.94	
12	213+25	LT	1.32	20.0	22.0	19.0	C/D	28	Undeveloped	CD-9 to Barron Canal @ Sta. 217+30	1.00	Wetland Impacts
13	231+15	LT	1.82	20.0	22.0	19.5	A/D, C/D	21, 28	Undeveloped	CD-9 to Barron Canal @ Sta. 217+30	1.14	

Table 6-3
Pond Site Characteristics

Pond Name	Station	Offset	Required Pond Area	Avg. Exist. Ground Elev. @ Pond Site	Low EOP within basin	Estimated SHWT Elevation	Hydrologic Soil Groups	Soil Types	Existing Land Use	Outfall Location	Required Treatment & Attenuation Volumes	Comments
			(ac)	(ft, NAVD)	(ft, NAVD)	(ft, NAVD)					(ac-ft)	
14	251+25	LT	1.75	20.0	22.0	19.5	A/D, C/D	27, 28	Undeveloped	CD-10 to Barron Canal @ Sta. 248+00	1.03	
15	267+55	LT	1.67	22.0	24.0	21.0	A/D	16	Agricultural	CD-11 to Barron Canal @ Sta. 262+00	1.29	
16	293+35	LT	1.67	22.0	24.0	21.0	A/D	16	Agricultural/ Undeveloped	CD-13 to Barron Canal @ Sta. 293+30	1.38	
17	318+55	LT	1.74	22.0	24.0	21.0	A/D	16	Agricultural/ Undeveloped	CD-14 to Barron Canal @ Sta. 317+30	1.44	
18	357+35	LT	1.67	22.0	24.0	21.0	C/D	43	Undeveloped	CD-15 to Barron Canal @ Sta. 359+30	1.38	
19	361+30	LT	1.67	21.0	23.0	20.0	C/D	43	Undeveloped	CD-15 to Barron Canal @ Sta. 359+30	1.37	
20	387+40	LT	2.29	22.0	24.0	22.0	C/D	43	Undeveloped	CD-16 to Barron Canal @ Sta. 384+60	0.89	Wetland Impacts
21	405+70	LT	2.79	22.0	24.0	22.0	A/D, C/D	21, 22, 29	Undeveloped	CD-17 to Barron Canal @ Sta. 407+50	1.19	Wetland Impacts
22	433+60	LT	1.30	24.0	26.0	23.0	A/D	29	Undeveloped	CD-18 to Barron Canal @ Sta. 435+00	0.86	
23	437+20	LT	1.88	24.0	26.0	23.0	A/D	29	Undeveloped	CD-18 to Barron Canal @ Sta. 435+00	1.57	
24	470+70	LT	1.21	24.0	26.0	23.0	B/D	37	Undeveloped	CD-20 to Barron Canal @ Sta. 474+00	0.52	
25	476+00	LT	3.31	26.0	28.0	25.0	B/D	37	Undeveloped	CD-20 to Barron Canal @ Sta. 474+00	3.35	
26-1R	509+70	RT	3.36	30.0	31.5	29.5	B/D	34	Commercial/ Undeveloped	Exist. Ditch to Barron Canal @ Sta. 501+00	1.17	

Table 6-3
Pond Site Characteristics

Pond Name	Station	Offset	Required Pond Area	Avg. Exist. Ground Elev. @ Pond Site	Low EOP within basin	Estimated SHWT Elevation	Hydrologic Soil Groups	Soil Types	Existing Land Use	Outfall Location	Required Treatment & Attenuation Volumes	Comments
			(ac)	(ft, NAVD)	(ft, NAVD)	(ft, NAVD)					(ac-ft)	
26-2	509+20	RT	2.40	30.0	31.5	29.5	B/D	34	Commercial/ Undeveloped	Exist. Ditch to Barron Canal @ Sta. 501+00	0.98	
27-1R	518+10	RT	2.83	31.0	32.0	30.0	B/D	7	Commercial/ Undeveloped	Exist. Ditch to Barron Canal @ Sta. 518+10	1.35	
27-2A*	518+10	RT	3.78	31.0	32.0	30.0	B/D	7	Commercial/ Undeveloped	Exist. Ditch to Barron Canal @ Sta. 518+10	2.04	
27-2B*	532+00	RT	3.78	31.0	32.0	30.0	B/D	34	Commercial/ Undeveloped	Exist. Ditch to Barron Canal @ Sta. 532+00	2.04	
28-1R	536+10	RT	1.18	30.0	31.0	29.0	B/D	34	Commercial/ Undeveloped	Eutopia Canal @ Sta. 540+30	0.36	
29-1R	137+00	RT	2.53	31.5	32.0	30.5	B/D	34	Commercial/ Industrial	Eutopia Canal @ Sta. 137+00	0.66	
29-2	137+80	RT	2.88	32.0	33.0	30.5	B/D	7	Commercial/ Undeveloped	Eutopia Canal @ Sta. 137+80	2.05	
30-1R	170+80	RT	1.76	32.0	33.5	31.0	B/D	34	Residential/ Undeveloped	Exist. Ditch to Eutopia Canal @ Sta. 168+00	1.13	
30-2	164+60	RT	1.23	32.0	33.5	31.0	A/D	8	Undeveloped	Eutopia Canal @ Sta. 164+60	0.56	
31-1R	195+00	LT	1.32	32.0	34.0	31.0	A/D	27	Agricultural	Eutopia Canal @ Sta. 193+00	0.97	
31-2	178+75	RT	2.84	32.0	34.0	31.0	B/D, A/D	7, 27	Undeveloped	Eutopia Canal @ Sta. 177+00	2.71	
32-1R	208+00	LT	3.31	34.0	36.0	33.0	A, A/D, B/D	15, 16, 34	Undeveloped	Eutopia Canal @ Sta. 206+50	3.24	
32-2	208+10 CL SR 29	LT	3.31	34.0	36.0	33.0	A, A/D, B/D	15, 16, 34	Undeveloped	Eutopia Canal @ Sta. 206+50	3.24	

Table 6-3
Pond Site Characteristics

Pond Name	Station	Offset	Required Pond Area (ac)	Avg. Exist. Ground Elev. @ Pond Site (ft, NAVD)	Low EOP within basin (ft, NAVD)	Estimated SHWT Elevation (ft, NAVD)	Hydrologic Soil Groups	Soil Types	Existing Land Use	Outfall Location	Required Treatment & Attenuation Volumes (ac-ft)	Comments
33	2078+20 BL SR 29	LT	2.13	34.0	35.5	33.0	B/D, A	7, 15	Undeveloped	CD-39 to Exist. Ditch and Pond @ Sta. 2075+25	1.06	
34	2104+00	RT	1.33	34.0	35.5	32.7	B/D	7	Undeveloped	CD-40 to Wetland Area @ Sta. 2107+00	0.59	Wetland Impacts
35	2121+55	RT	1.95	34.0	35.5	32.7	B/D	7	Undeveloped	CD-41 to Wetland Area @ Sta. 2120+00	1.34	
36	2129+60	RT	2.41	34.0	36.0	33.0	B/D, A, A/D	7, 15, 17	Undeveloped	CD-42 to Wetland Area @ Sta. 2133+20	2.20	
37	2142+45 BL SR 29	LT	3.54	34.0	36.0	32.0	A/D	8, 17	Roadway/ Undeveloped	Exist. Ditch to Wetland Area @ Sta. 2137+00	4.47	
38	302+00 CL SR 29	RT	1.59	34.0	36.0	33.0	A/D	17	Agricultural/ Undeveloped	CD-43 to Wetland Area @ Sta. 301+25	1.20	
39	317+20	RT	2.86	35.0	36.5	34.0	B/D, A/D	7, 16	Agricultural/ Undeveloped	CD-44 to Exist. Ditch and Wetland Area @ Sta. 314+00	1.73	
40	376+30	RT	2.67	36.0	38.0	35.0	A/D	16, 27	Agricultural/ Undeveloped	CD-45 to Wetland Area @ Sta. 379+00	2.54	Wetland/Ditch Impacts
41	393+80	LT	1.33	36.0	38.0	35.0	A/D, C/D	16, 22	Undeveloped	Exist. Ditch and Wetland Area @ Sta. 394+80	0.93	Wetland Impacts

* Ponds combine to satisfy stormwater management requirements for Basin 27-2

7.0 Environmental Evaluation

7.1 Jurisdictional Wetland Involvement

The alternative pond and FPC sites were evaluated for the presence of wetlands in accordance with Presidential Executive Order 11990 entitled "Protection of Wetlands", United States Department of Transportation Order 5660.1A, "Preservation of the Nation's Wetlands", and Part 2, Chapter 9 of the FDOT PD&E Manual. Potential pond and FPC sites were designed outside of wetlands to the best extent feasible. However, wetland impacts resulting from the proposed surface water management system may be unavoidable and will depend on the final roadway design. The purpose of the alternative pond and FPC site evaluation is for early identification of potential wetland and/or protected species issues so that avoidance and minimization measures can be incorporated into the project design to greatest extent practicable.

Final impact acreages to jurisdictional wetlands can only be determined following the establishment of agency approved wetlands limits and upon completion of final pond design. This includes maintenance of hydrology and provisions for adequate wetland buffering (15-foot minimum and 25-foot average set back from wetlands) to minimize secondary impacts. Where feasible, measures to avoid or minimize wetland and water quality impacts will be implemented during final pond site design. Required mitigation will likely be provided pursuant to S.373.4137 F.S. to satisfy Part IV, Chapter 373 F.S. and 33 U.S. C., § 1344.

Please refer to **Appendix H** for the Evaluation of Pond and Floodplain Compensation Sites, excerpted from the Natural Resources Evaluation (NRE).

7.2 Protected Species

Each alternative pond and FPC site was reviewed for potential occurrences of federal and state-listed plant and animal species in accordance with Section 7 of the Endangered Species Act of 1973, as amended, the Fish and Wildlife Conservation Act, the Migratory Bird Treaty Act, Part 2 – Chapter 16 of the PD&E Manual, and Chapters 5B-40 and 68A-27 FAC. The sites were also evaluated for the occurrence of federally-designated Critical Habitat as defined by Congress in 50 CFR 17. Based on this evaluation, it was determined that no federally-designated Critical Habitat is present within or adjacent to any of the alternative pond or FPC sites.

These sites occur within the FWS Consultation Areas for the eastern indigo snake, Audubon's crested caracara, Florida scrub jay, Florida panther, Florida bonneted bat, snail kite, wood stork, and Florida grasshopper sparrow; and many are also located within either Primary or Secondary Habitat Zone for the Florida panther. Florida scrub jays have also been previously documented along the project corridor and were observed by project biologists during various field evaluations. The project study area falls within the core foraging area (CFA) of seven (7) active nesting wood stork colonies.

Please refer to **Appendix H** for the Evaluation of Pond and Floodplain Compensation Sites, excerpted from the Natural Resources Evaluation (NRE).

7.3 Contamination

A contamination screening evaluation was conducted based on historical aerial photograph and topographic map and soil survey reviews, government database reviews and site reconnaissance.

As part of the CSER, 47 proposed pond locations and 5 floodplain compensation (FPC) areas were evaluated. Of the 52 evaluated locations, five proposed pond locations (Pond 27-1R, Pond 27-2A, Pond 27-2B, Pond 28-1R, Pond 29-1R) were given a "Medium" potential for impacts from sites identified through the CSER.

In addition, 15 of the 52 evaluated locations are within or partly within existing citrus groves and were given a "Low" potential for impacts. These include Ponds 6, 7, 8, 9, 10, 11, 15, 16, 17, 31-C2, 38, 39 and 40, and FPC areas C and E. Surface and subsurface soils likely contain application levels of pesticides and herbicides. Evaluation of these ponds and FPC areas is suggested using laboratory analyses for pesticides (EPA Method 8081), herbicides (EPA Method 8051), and EDB (EPA Method 504.1). Additional evaluation is recommended if contaminants are discovered above action levels.

For sites ranked "No", no additional work is recommended at this time. Should a facility's permitting or regulatory status change between now and the time acquisitions are initiated, additional screening should be conducted.

Please refer to **Appendix H** for the Pond Siting Evaluation, excerpted from the Contamination Screening Evaluation Report (CSER).

Note: FPC E was eliminated after the contamination screening was completed.

7.4 Cultural Resources

No previously recorded archaeological sites were identified within any of the study areas. In general, soils associated with the study areas are predominantly poorly drained soils associated with flatwoods, swamps, or marshes. General Land Office (GLO) historic maps and associated surveyors notes also indicate that the study areas south of Immokalee are in former pinelands, wet and dry prairies, cypress flats, and grass ponds. The study areas south of the airport and east of downtown Immokalee are in former dry prairie. The study areas to the north and west of downtown Immokalee are in a former prairie and an area of scrubby pine land. No hammocks or cultural features were noted on the maps or in the surveyor's notes. The 1940 and 1947 historic aerials illustrate the area as predominantly wet prairie with numerous ponds.

Based on these factors, the study areas for the ponds and FPC sites have a low probability for archaeological sites. A total of 16 historic resources identified during the CRAS for the SR 29 PD&E Study from Oil Well Road (CR 858) to SR 82 in Collier County, Florida (Janus Research 2018) are located in several study areas. Although the report had not yet been reviewed by the SHPO, the surveyor considered all 16 resources to be National Register–ineligible. In addition to these resources, there is a potential for 12 unrecorded resources within the study areas. A preliminary analysis suggests that these resources are Masonry Vernacular buildings that exhibit a simple form and style commonly found throughout the region and are likely National Register–ineligible.

Please refer to **Appendix H** for the Cultural Resources Desktop Analysis of Proposed Ponds and Floodplain Compensation Sites.

8.0 Results

8.1 Pond Site Evaluation Matrix

A pond site evaluation matrix was developed to present the alternative in each basin with respect to environmental impacts as discussed in **Section 7.0**. **Table 8-1**: Pond Site Evaluation Matrix shows all of the evaluated pond sites.

Pond sizes and configurations in this report are based on preliminary assumptions and calculations. Final pond sizes and configurations will be determined in the design phase and could be different from those used in this report and presented in the following tables as more detailed information on seasonal high groundwater table, wetland normal pool elevations, final roadway design, geotechnical data, etc. becomes available.

This project was not scoped for an Environmental Look Around (ELA); however, opportunities for regional stormwater management, such as using the Barron Canal, mines and partnering with HCP, may exist and should be explored during the design phase of the project.

8.2 Cost Estimates

Since only one pond alternative was evaluated for each basin, right-of-way, construction, and wetland mitigation costs were not considered.

A right-of-way cost estimate was prepared by FDOT and included the offsite ponds and floodplain compensation sites with the overall cost.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
1	Low	Medium	No	Low	Undeveloped forested uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
3	Low	Medium	No	Low	Undeveloped forested uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
4	Low	Medium	No	Low	Undeveloped forested uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
5	Low	Medium	No	Low	Improved/unimproved pastures with active cattle grazing. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
6	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
7	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
8	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
9	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
10	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
11	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
12	High	Medium	No	Low	Undeveloped forested uplands and wetlands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
13	Low	Medium	No	Low	Undeveloped shrub uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
14	Low	Medium	No	Low	Undeveloped shrub uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
15	Low	Low	Low	Low	Field used for cultivation of landscape plants for adjacent nursery facility. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
16	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
17	Low	Low	No	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Primary Panther Habitat Zone. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
18	Low	Medium	No	Low	Undeveloped shrub uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
19	Low	Medium	No	Low	Undeveloped shrub uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
20	High	Medium	No	Low	Undeveloped shrub uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
21	High	Medium	No	Low	Undeveloped forested wetlands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
22	Low	Medium	No	Low	Undeveloped forested wetlands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
23	Low	Medium	No	Low	Undeveloped forested uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
24	Low	Medium	No	Low	Undeveloped forested uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.
25	Low	Medium	No	Low	Undeveloped forested uplands. Seasonal Surveys for 1 or more species required. FWS Primary Panther Habitat Zone.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
26-1R	Low	Low	Low	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat.
26-2	Low	Low	Low	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat.
27-1R	Low	Low	Medium	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat. Site No. 19, Fertilizer Plant, 10,000 gal diesel AST 180' away.
27-2	Low	Low	Medium	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat. **27-2A**: Site No. 19, Fertilizer Plant, 10,000 gal diesel AST 180' away. **27-2B**: Site No. 28 & 38, filling stations.
28-1R	Low	Low	Medium	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat. Site No. 28, filling station.
29-1R	Low	Low	Medium	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat. Site No. 35 & 37, Automotive repair facilities, filling stations.
29-2	Low	Low	Low	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
30-1R	Low	Low	Low	Low	Industrial/Commercial development. No wetlands/OSWs. No suitable wildlife habitat.
30-2	Low	Medium	No	Low	Improved/unimproved pastures. No wetlands/OSWs. Limited suitable wildlife habitat. Seasonal Surveys for 1 or mores species required.
31-1R	Low	Medium	No	Low	Improved/unimproved pastures. No wetlands/OSWs. Limited suitable wildlife habitat. Seasonal Surveys for 1 or mores species required.
31-2	Low	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. No wetlands/OSWs. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
32-1R	High	Medium	No	Low	Improved/unimproved pastures with active cattle grazing. Seasonal Surveys for 1 or mores species required.
32-2	High	Medium	No	Low	Improved/unimproved pastures with active cattle grazing. Seasonal Surveys for 1 or more species.
33	Low	Medium	No	Low	2.14ac upland forest. 0.02ac roadway. Fragmented forest habitat within Immokalee. Seasonal Surveys for 1 or more species required.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
34	High	Medium	No	Low	0.2ac upland forest, 1.01ac wetland, 0.13ac roadway. Fragmented habitat within Immokalee. Seasonal Surveys for 1 or more species required.
35	Low	Medium	No	Low	Improved/unimproved pastures. Seasonal Surveys for 1 or more species required. FWS Secondary Panther Habitat Zone.
36	Medium	Medium	No	Low	Improved/unimproved pastures. Seasonal Surveys for 1 or more species required. FWS Secondary Panther Habitat Zone.
37	Low	Medium	No	Low	2.42ac roadway. Existing SR 29. Seasonal Surveys for 1 or more species required. FWS Secondary Panther Habitat Zone.
38	Medium	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Secondary Panther Habitat Zone. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
39	Medium	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Secondary Panther Habitat Zone. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.

Table 8-1
Pond Site Evaluation Matrix

Pond Name	Wetland Involvement Potential	Protected Species Involvement Potential	Environmental Contamination Risk Ranking	Archaeological Site Potential	Comments
40	High	Low	Low	Low	Active row crop production. No suitable habitat for state/federally listed species. FWS Secondary Panther Habitat Zone. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.
41	High	Medium	Low	Low	Seasonal Surveys for 1 or more species required. FWS Secondary Panther Habitat Zone. 0.47ac mixed wetland hardwoods. Surface/Subsurface soils likely contain pesticides/herbicides from citrus groves.

APPENDICES

Appendix A

Build Alternative Concept Plans

APPENDIX A
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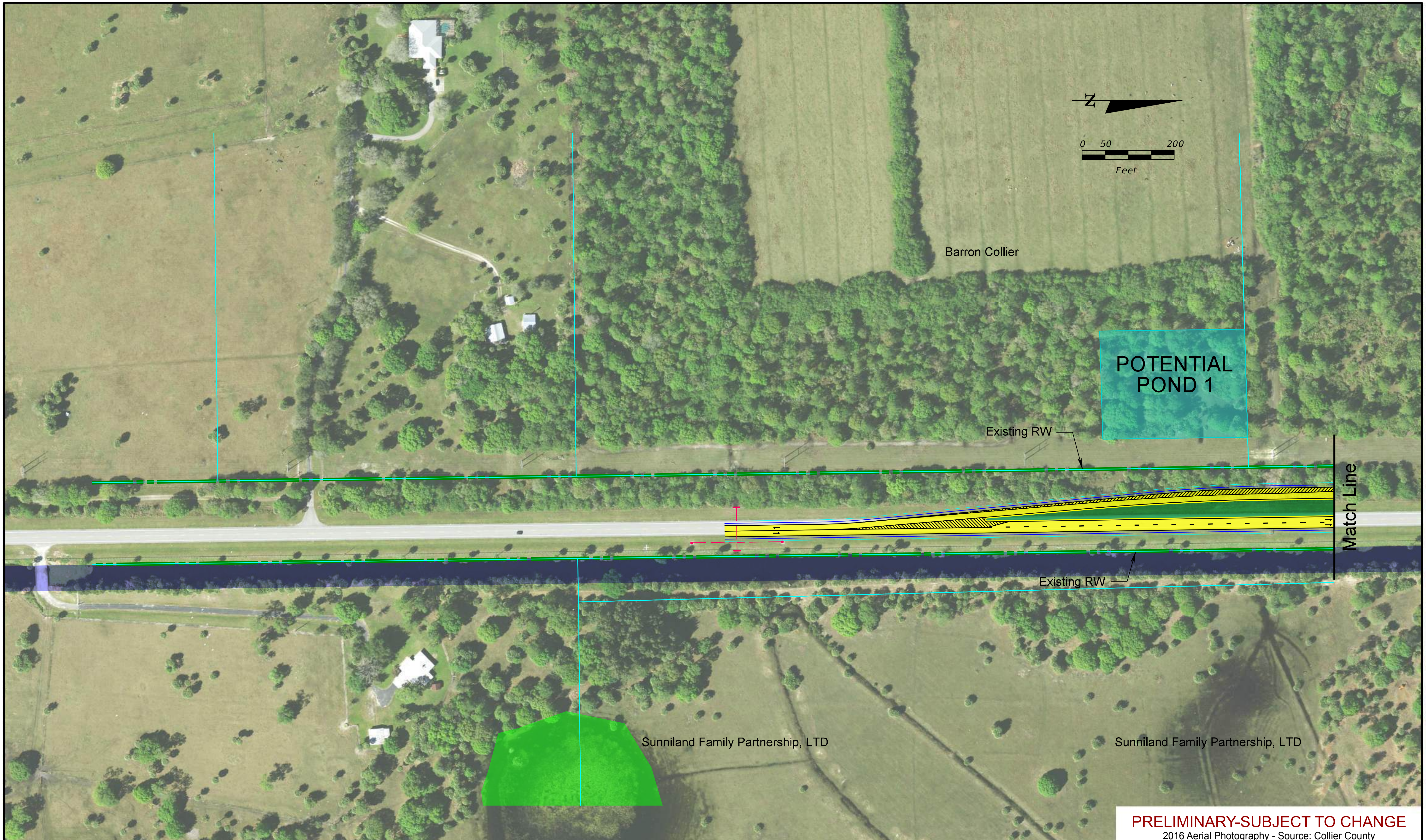

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
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- Traffic Signal
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- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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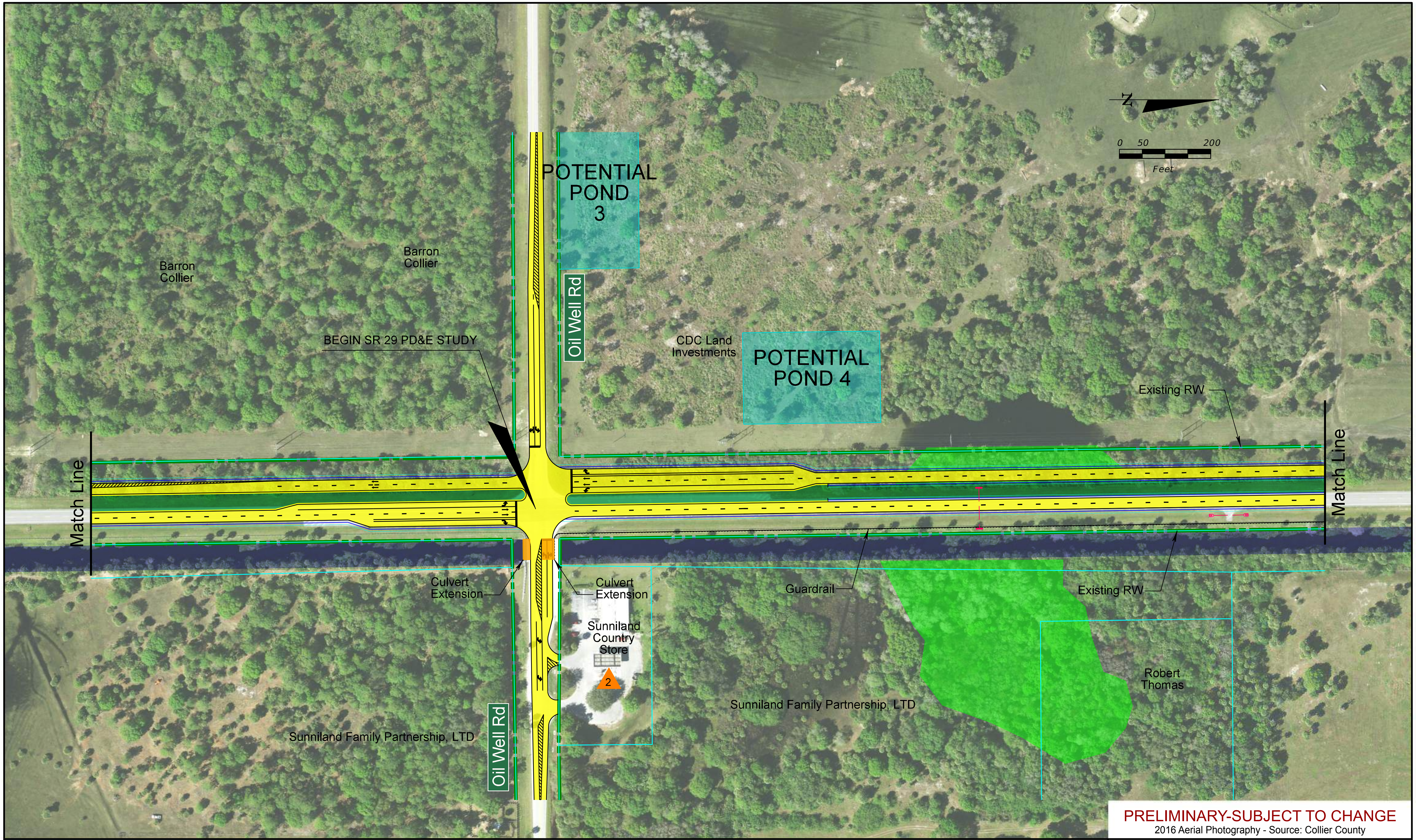

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetland	Proposed Pavement	Proposed Guardrail
Parcels	Potential Pond	Proposed Median/Border	Potential Business Relocation
Proposed Right-of-Way	Potential Flood Plain Compensation	Proposed Sidewalks	Potential Contamination (Low)
Water/Canal	Traffic Signal	Proposed Structure	Potential Contamination (Medium or High)
Seminole Land			

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SR 29 PD&E Study
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Legend

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From Oil Well Road to SR 82

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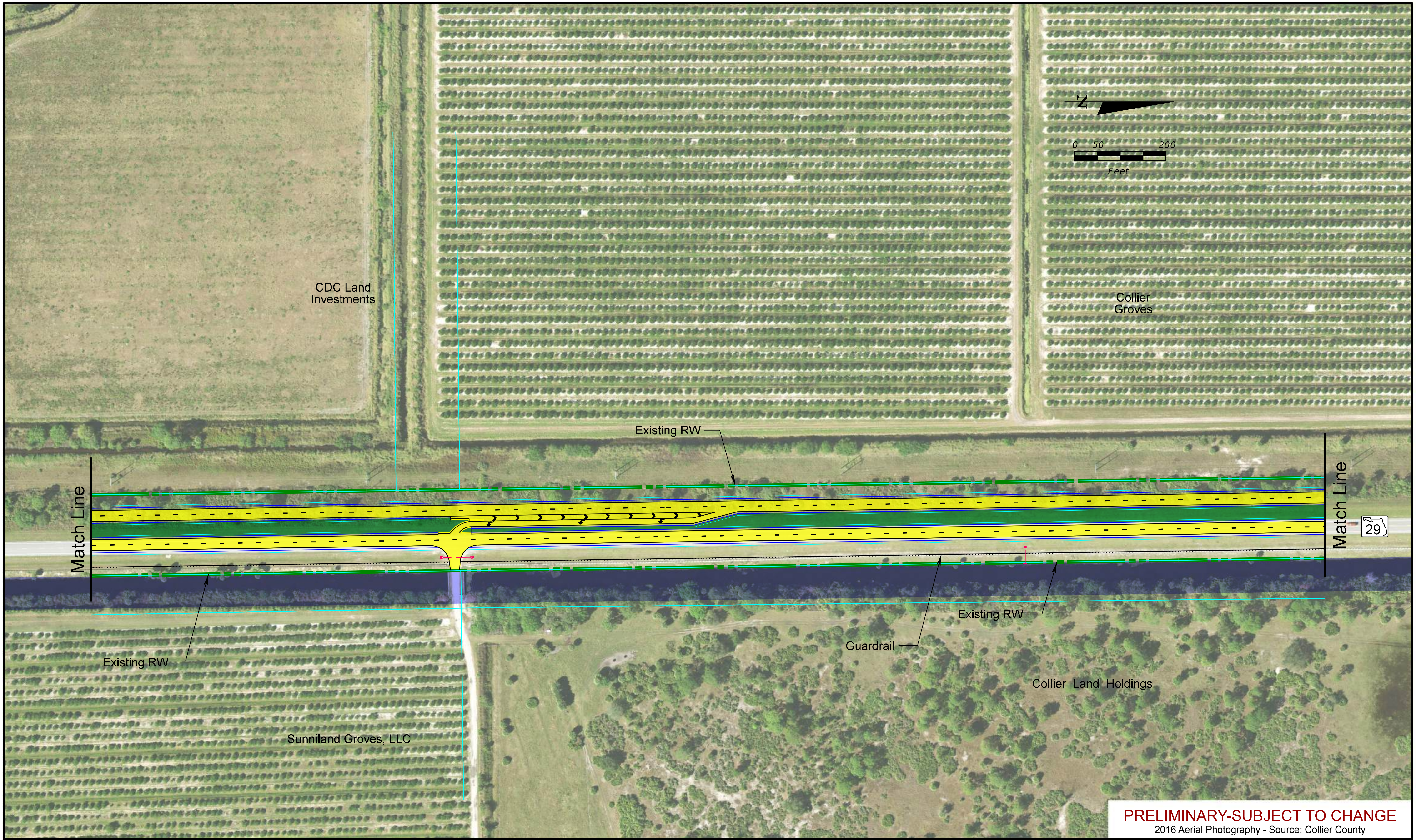

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

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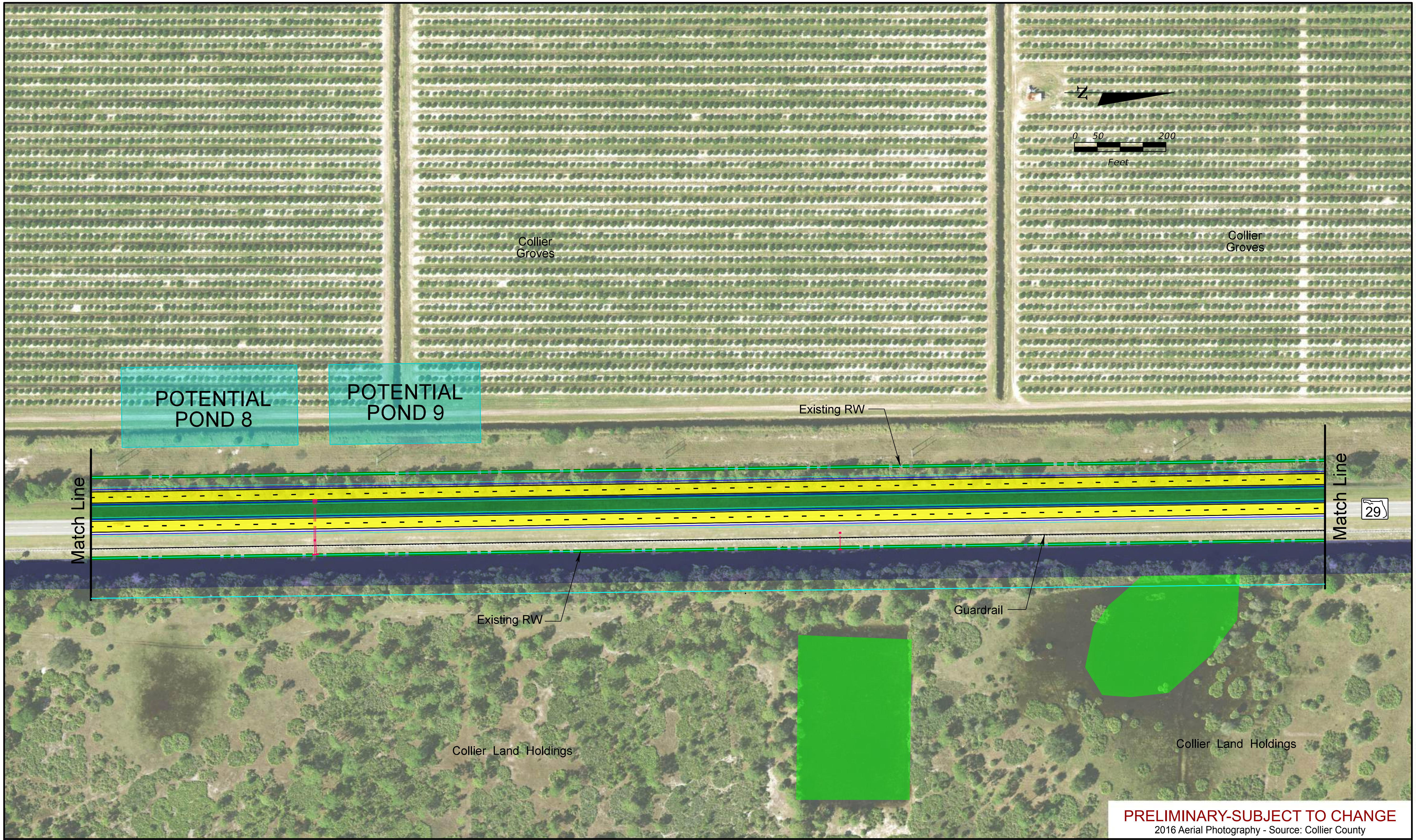

SR 29 PD&E Study

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Legend

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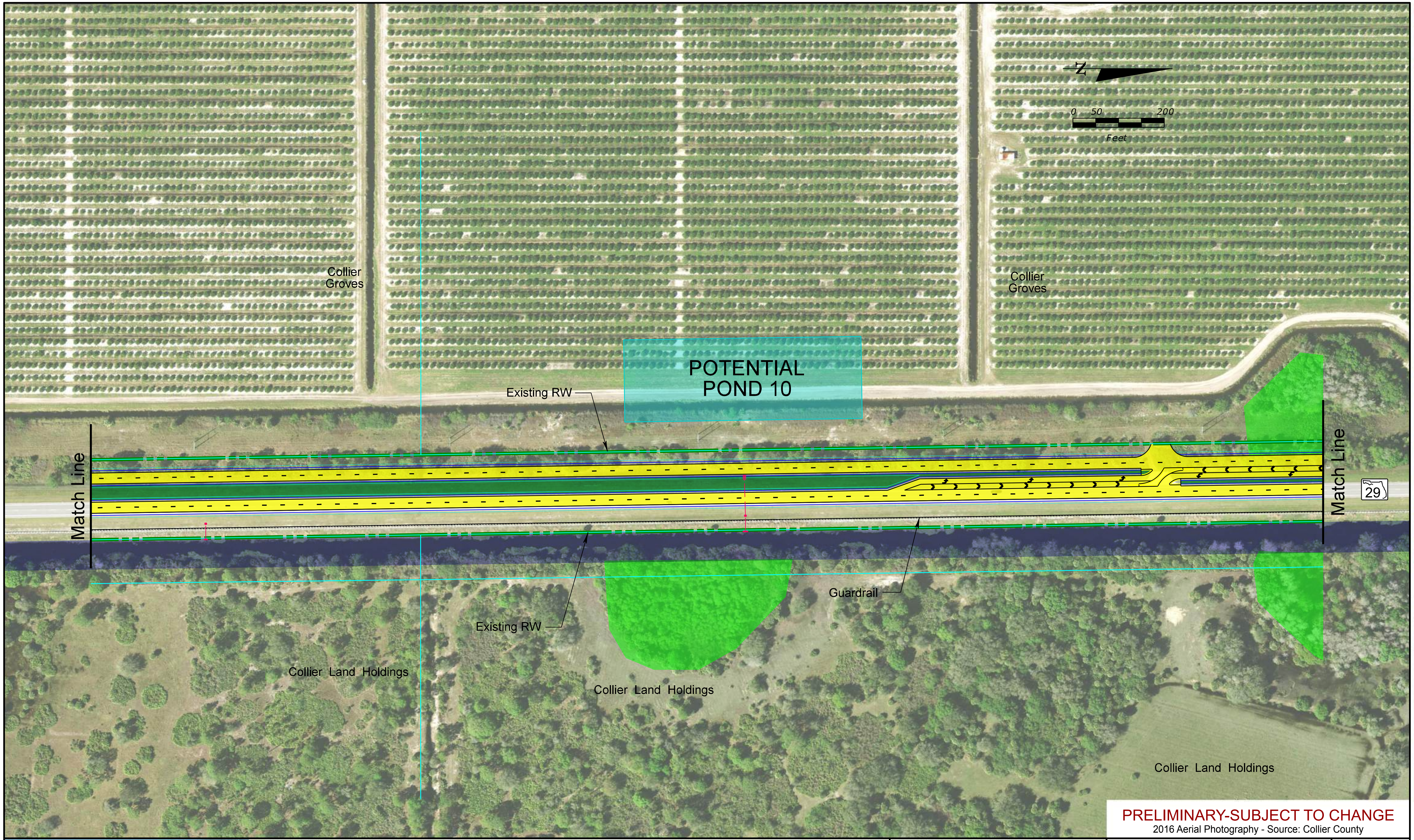

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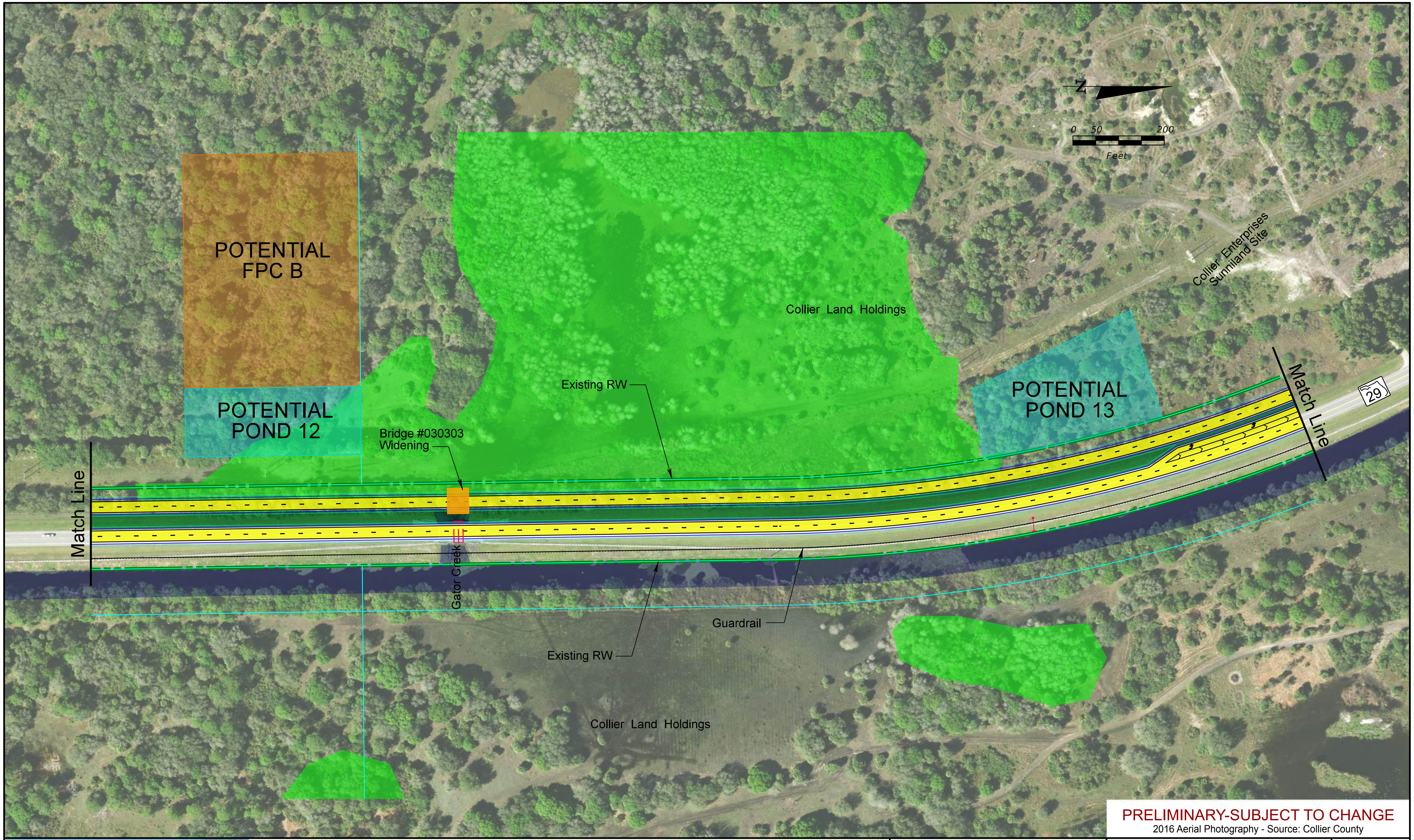

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

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Parcels	Potential Pond	Proposed Median/Border	Potential Business Relocation
Proposed Right-of-Way	Potential Flood Plain Compensation	Proposed Sidewalks	Potential Contamination (Low)
Water/Canal		Proposed Structure	Potential Contamination (Medium or High)
Seminole Land	Traffic Signal		

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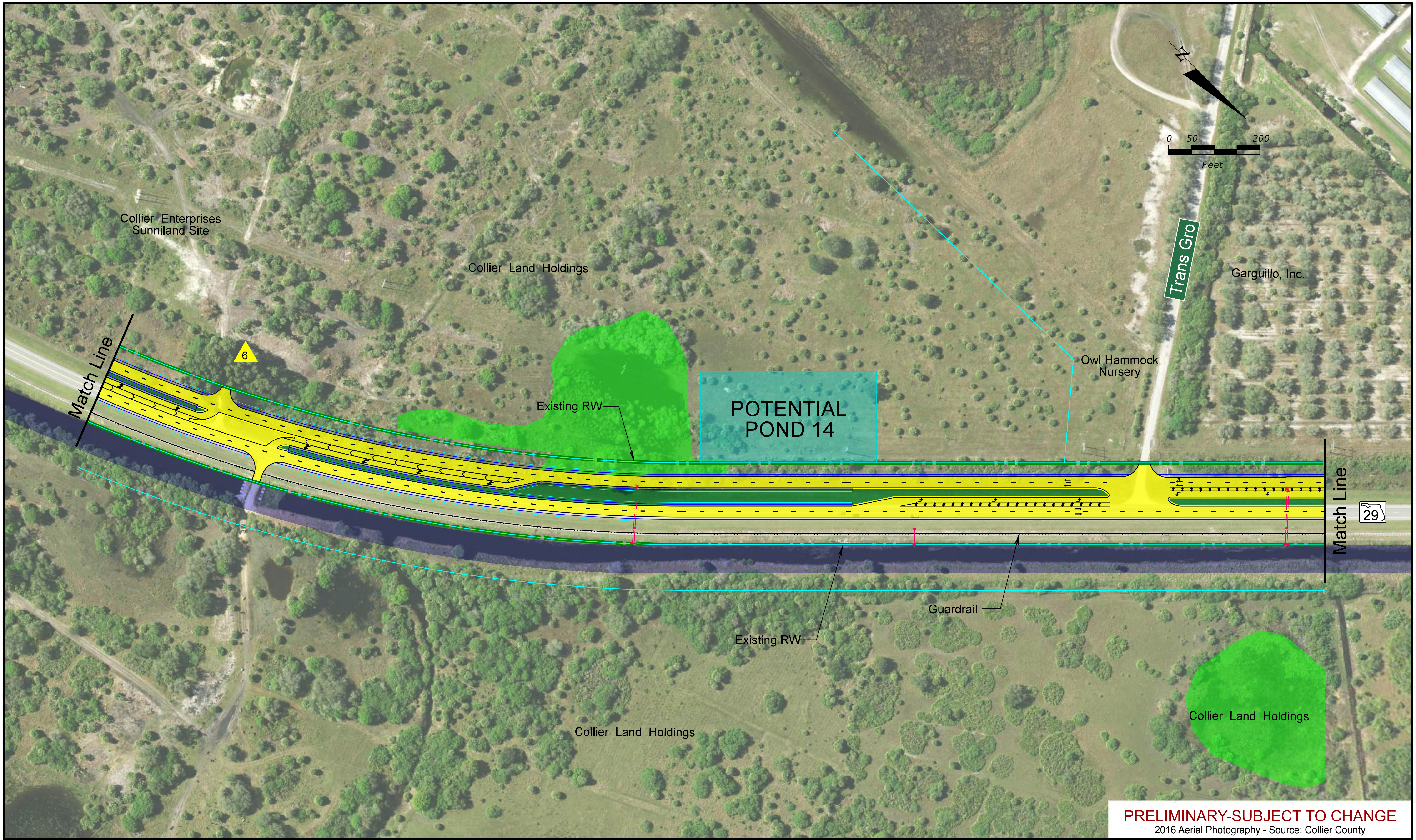

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

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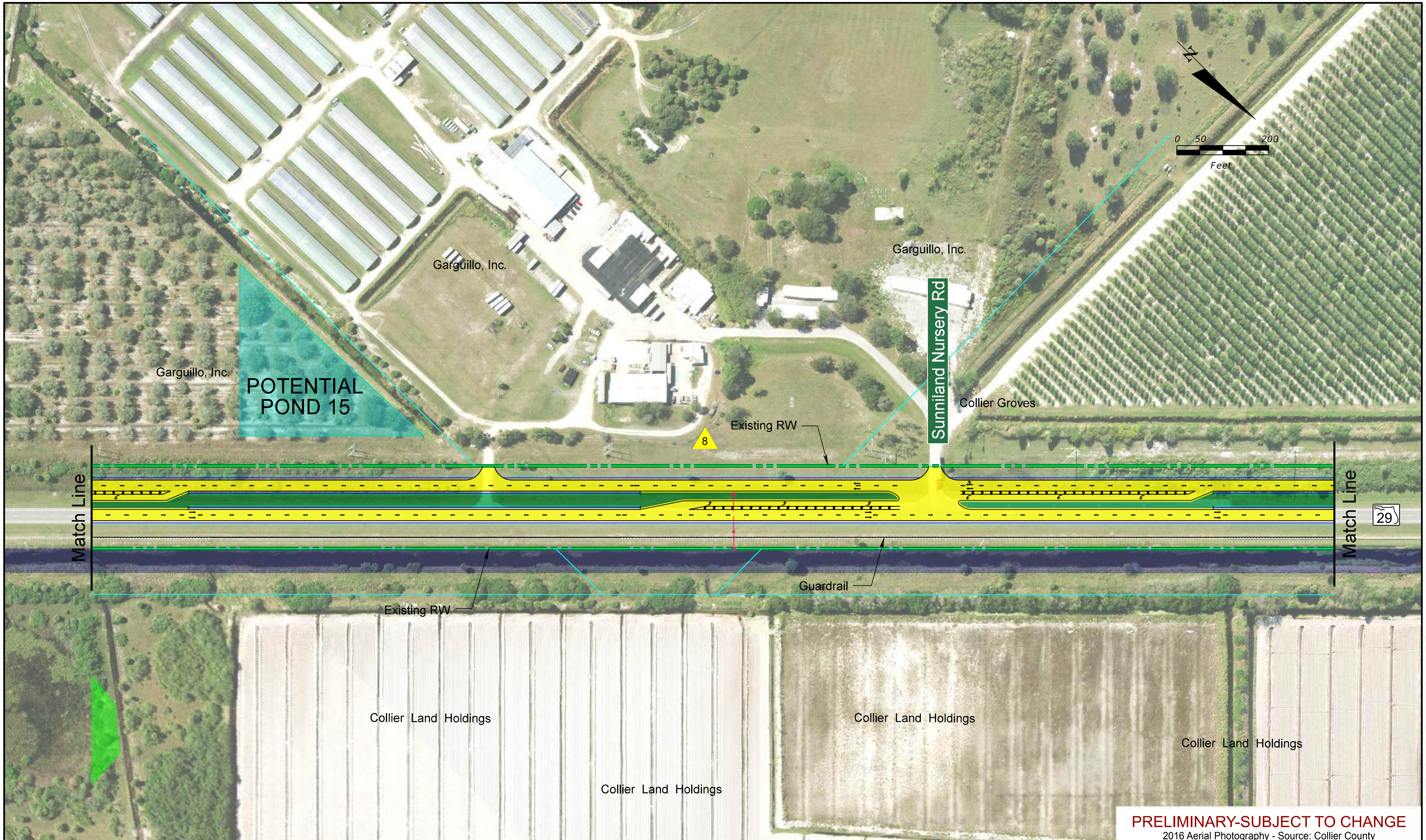

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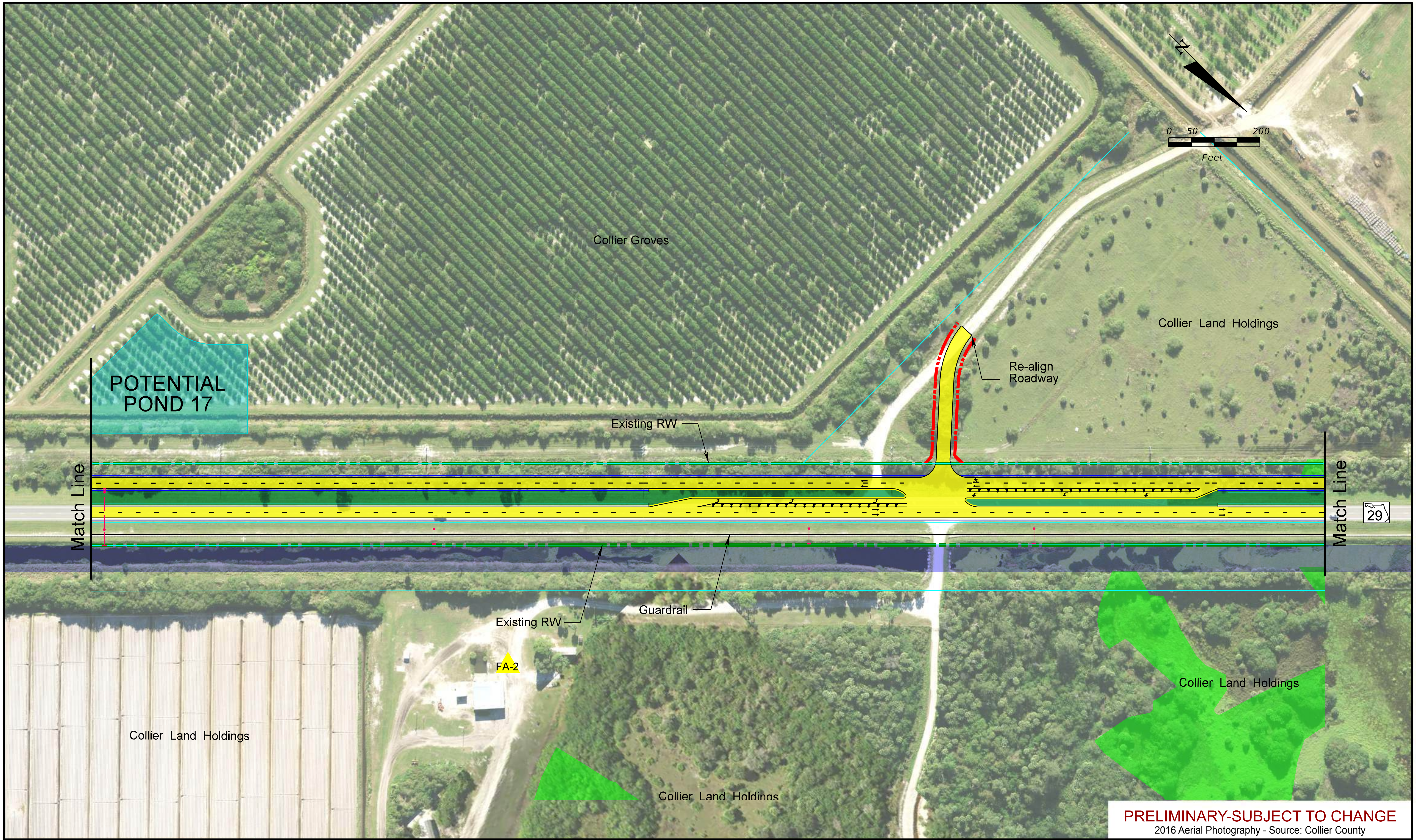

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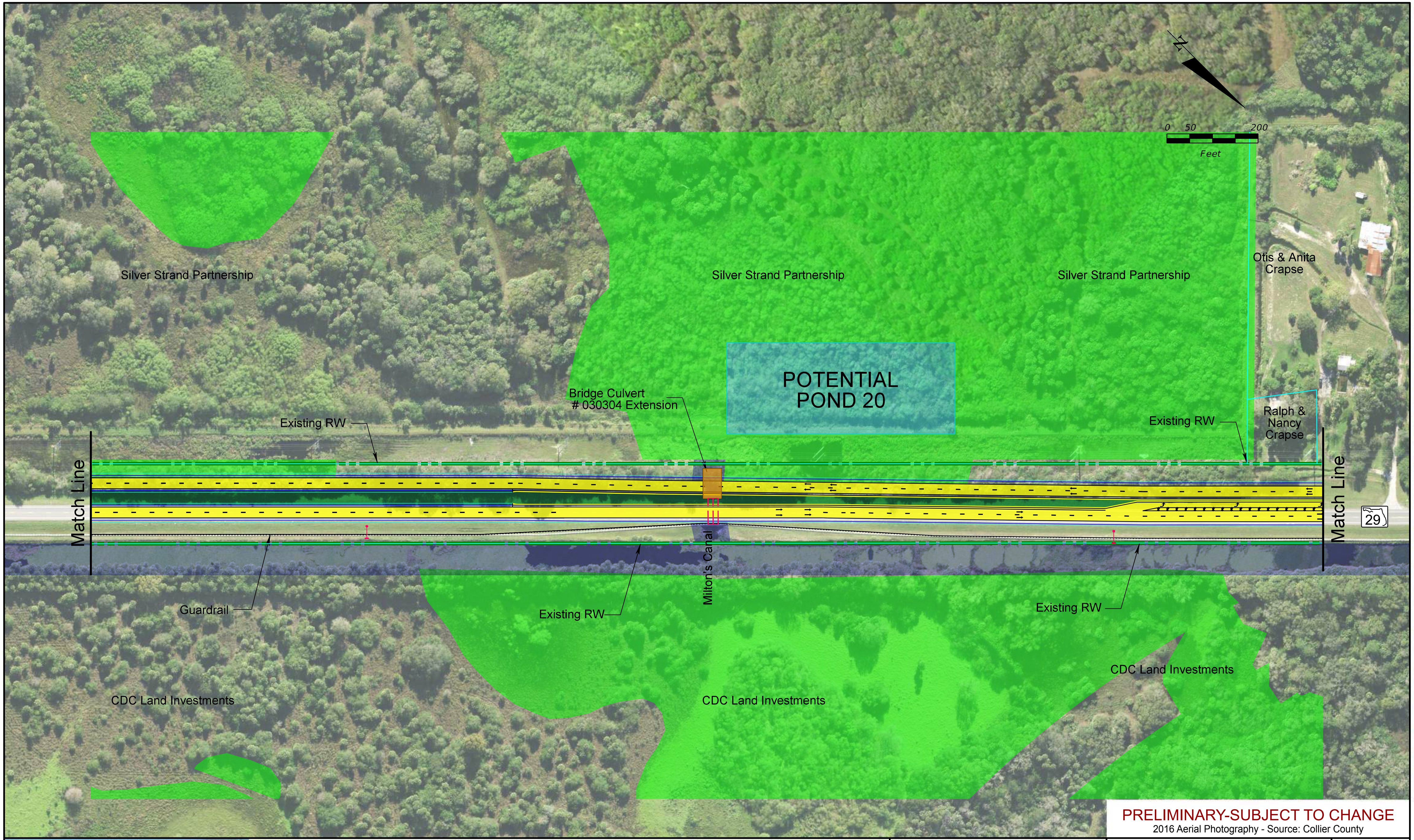

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

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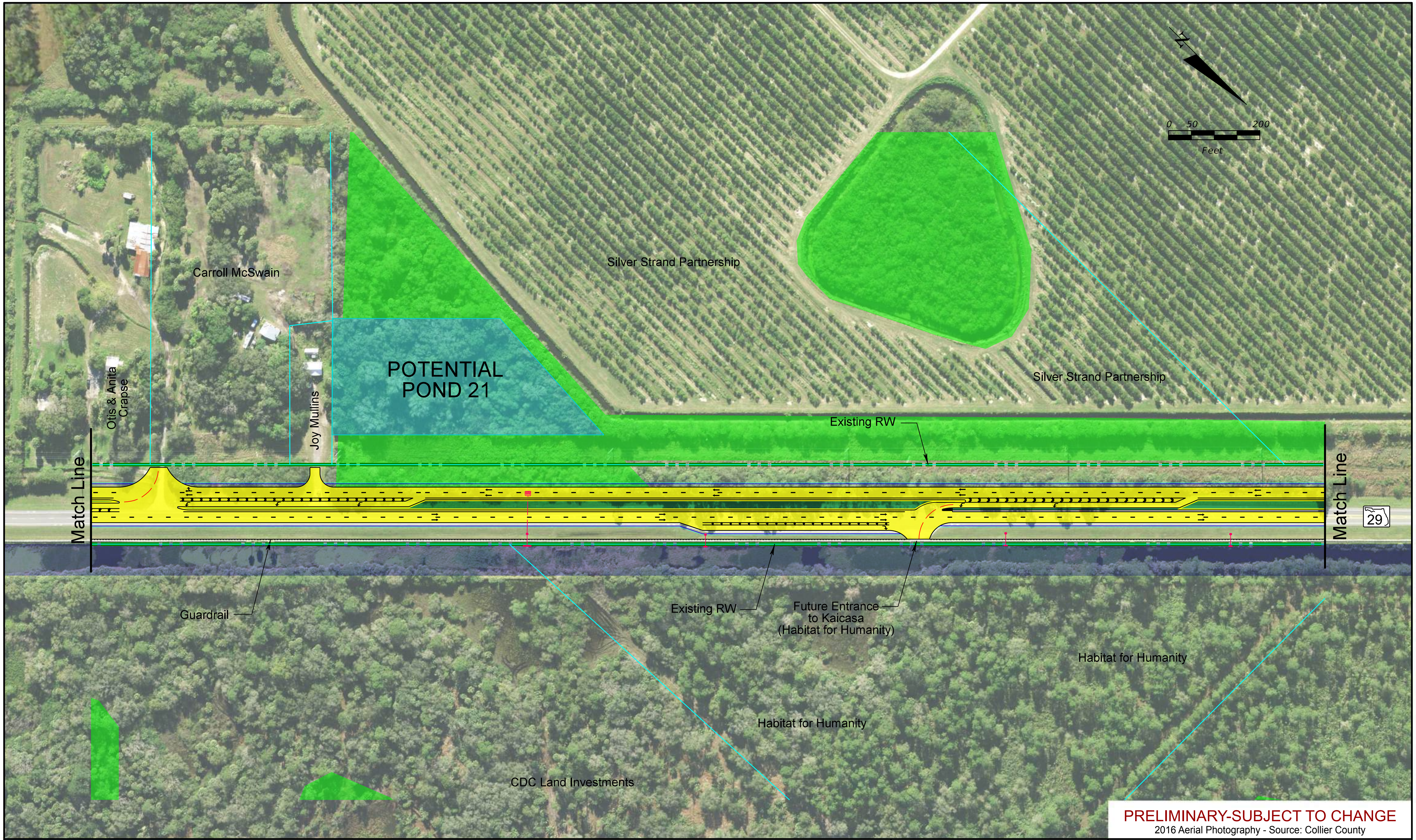

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

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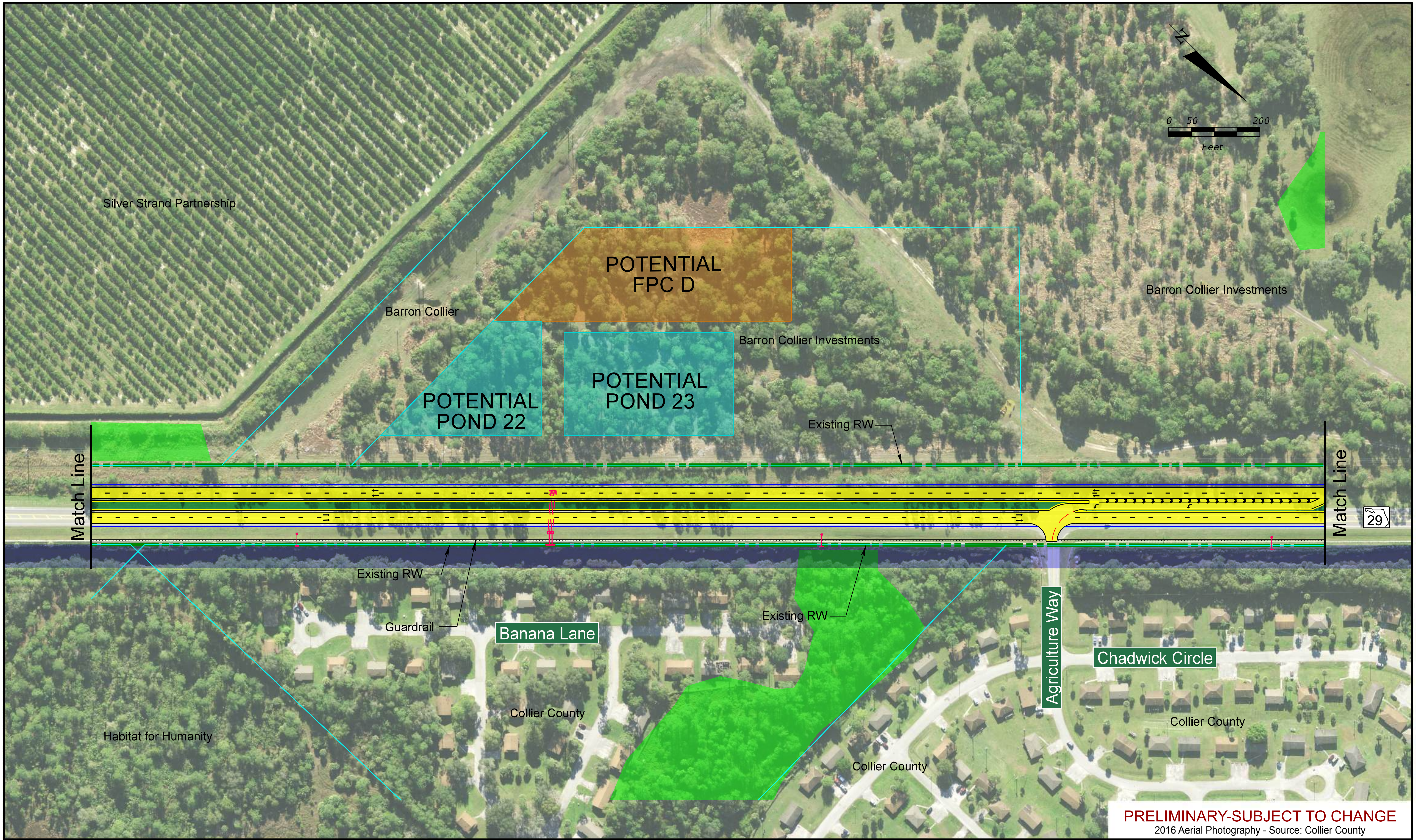

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

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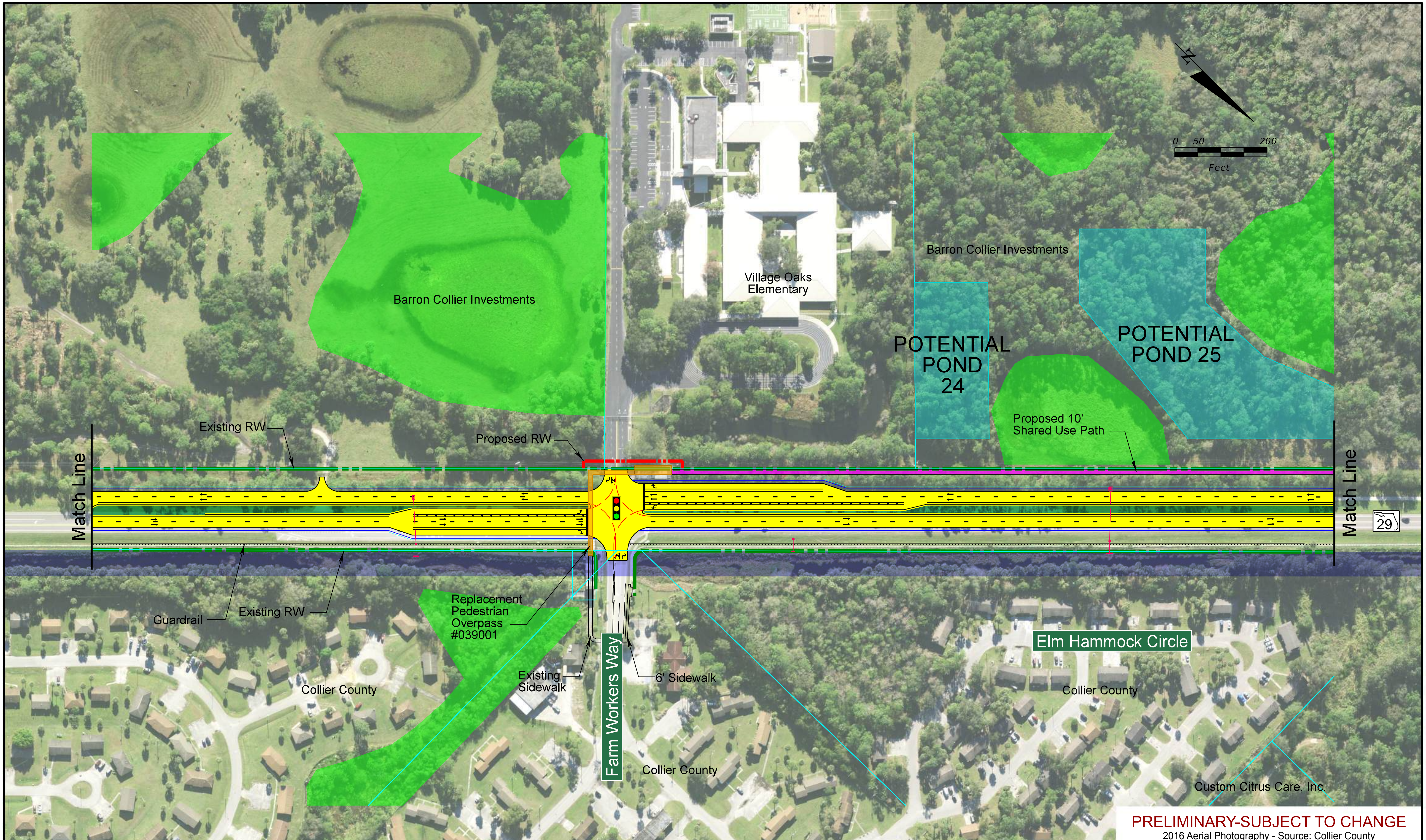

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2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
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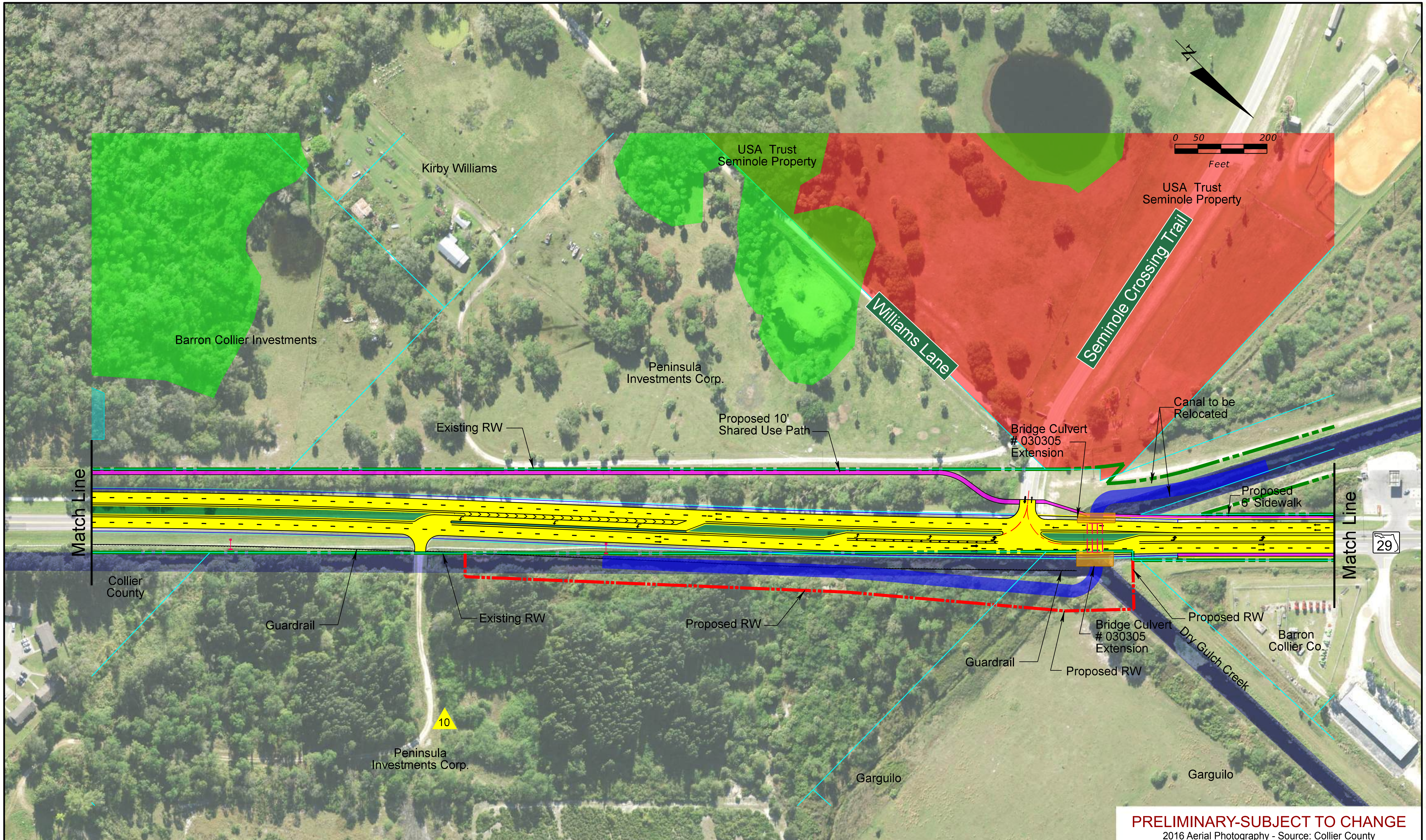

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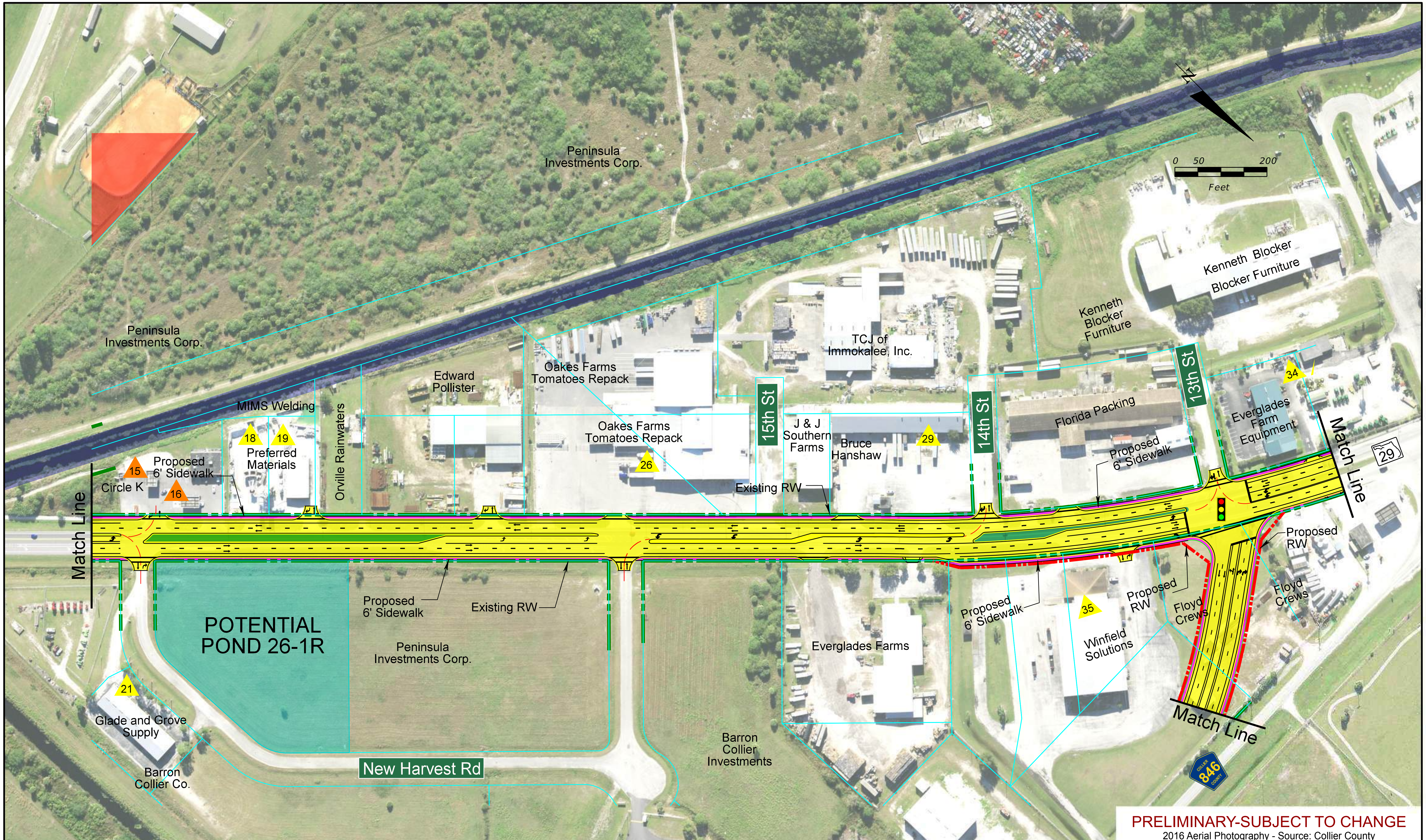

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2016 Aerial Photography - Source: Collier County

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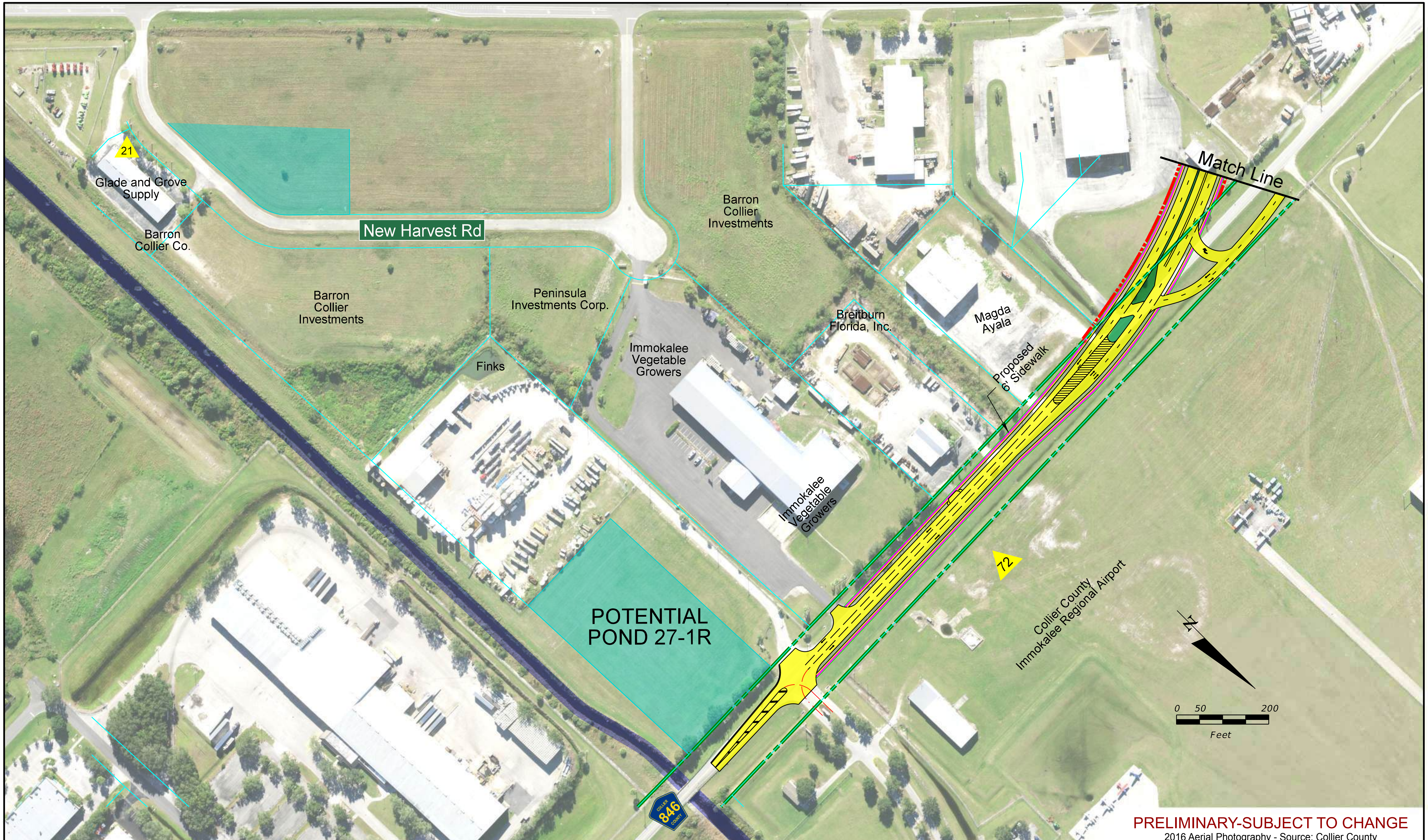

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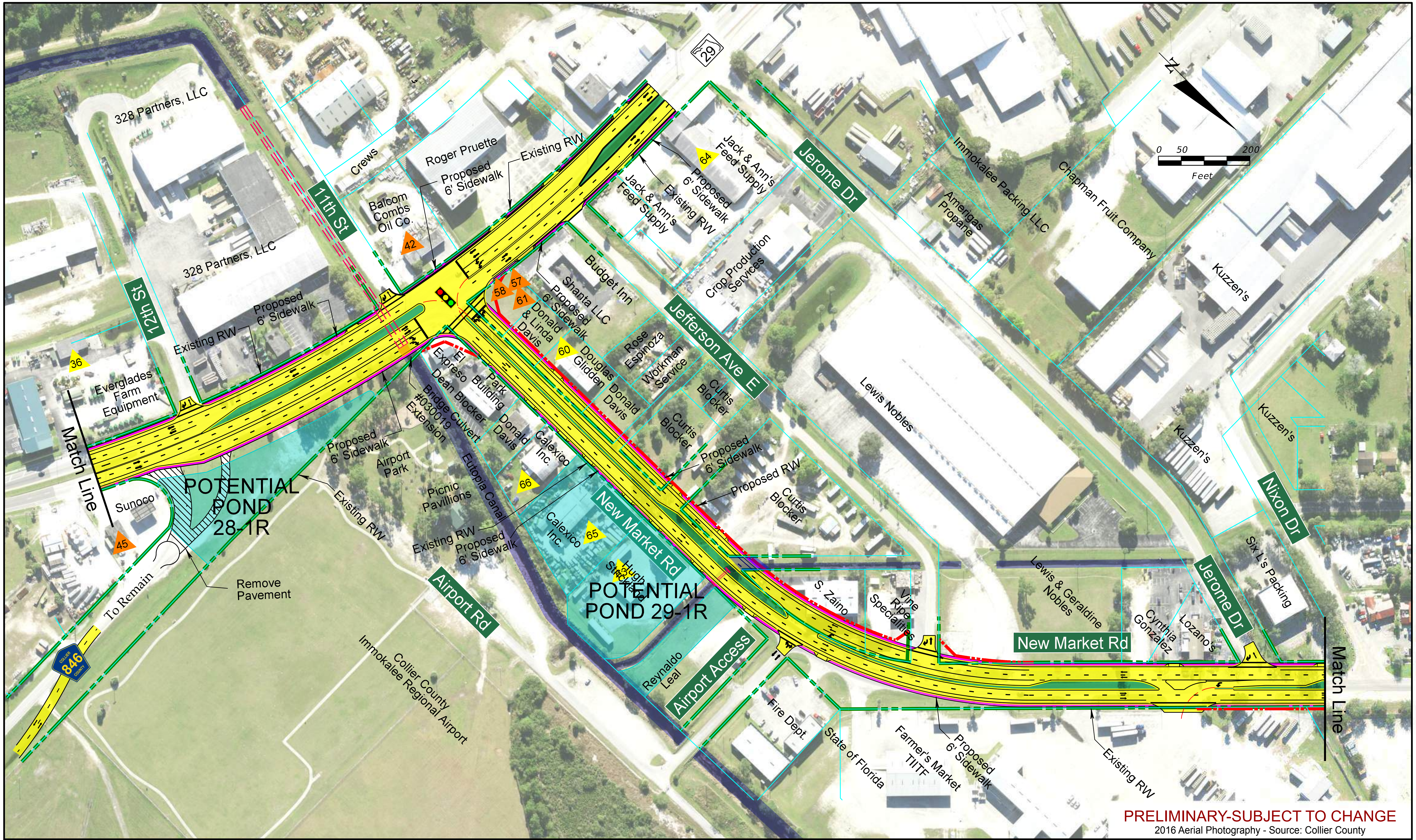

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Central Alternative #1 Revised

Sheet No.

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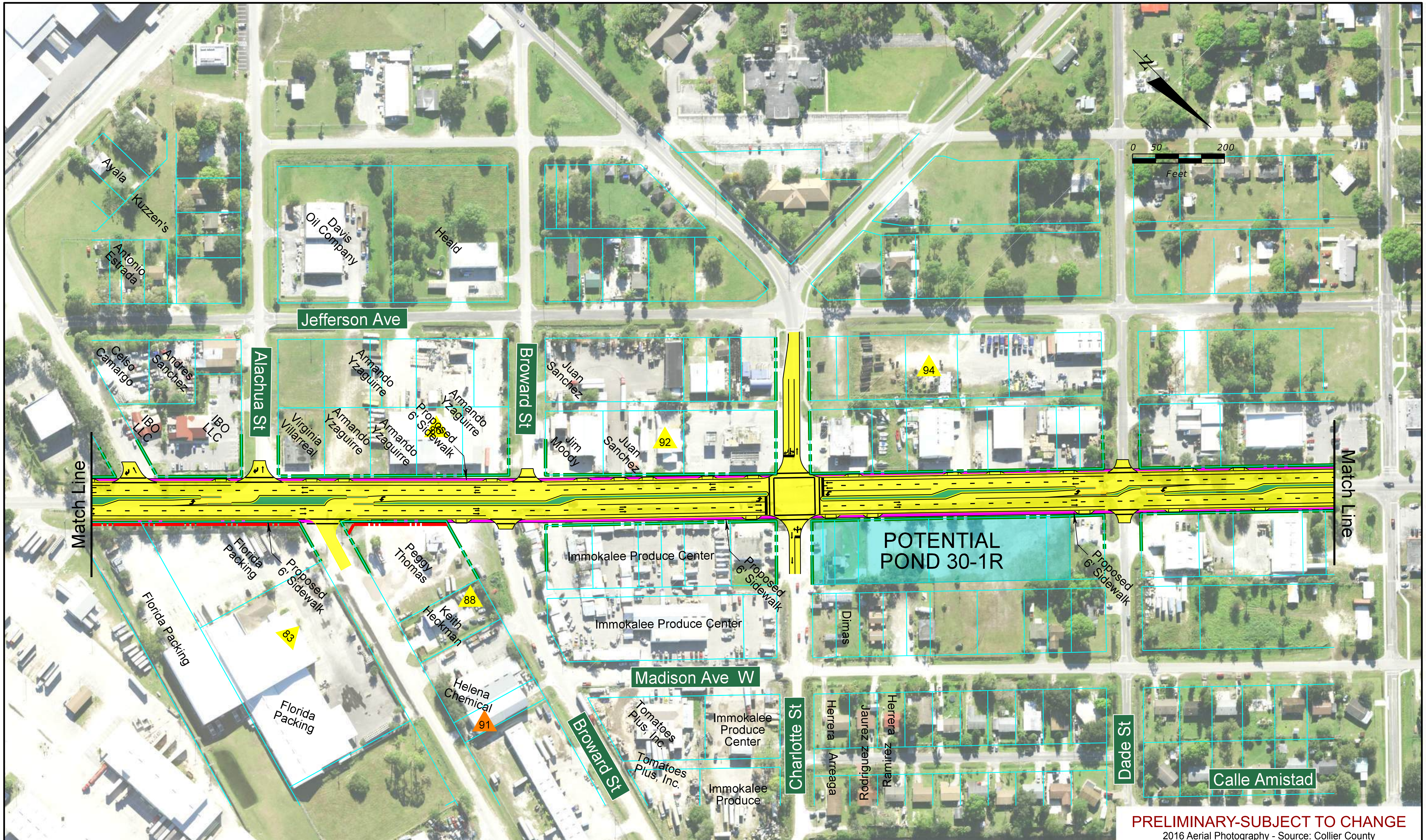

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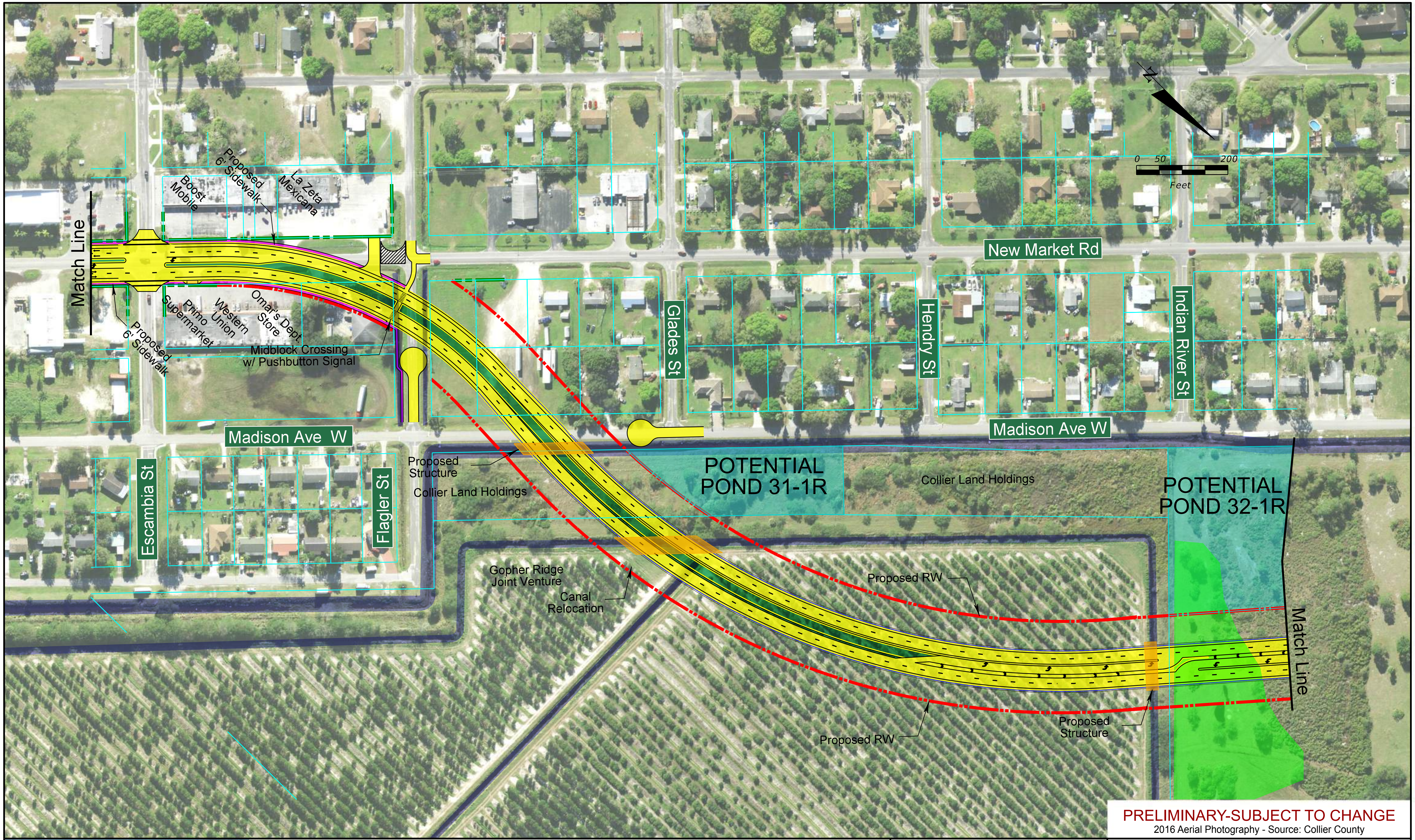

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- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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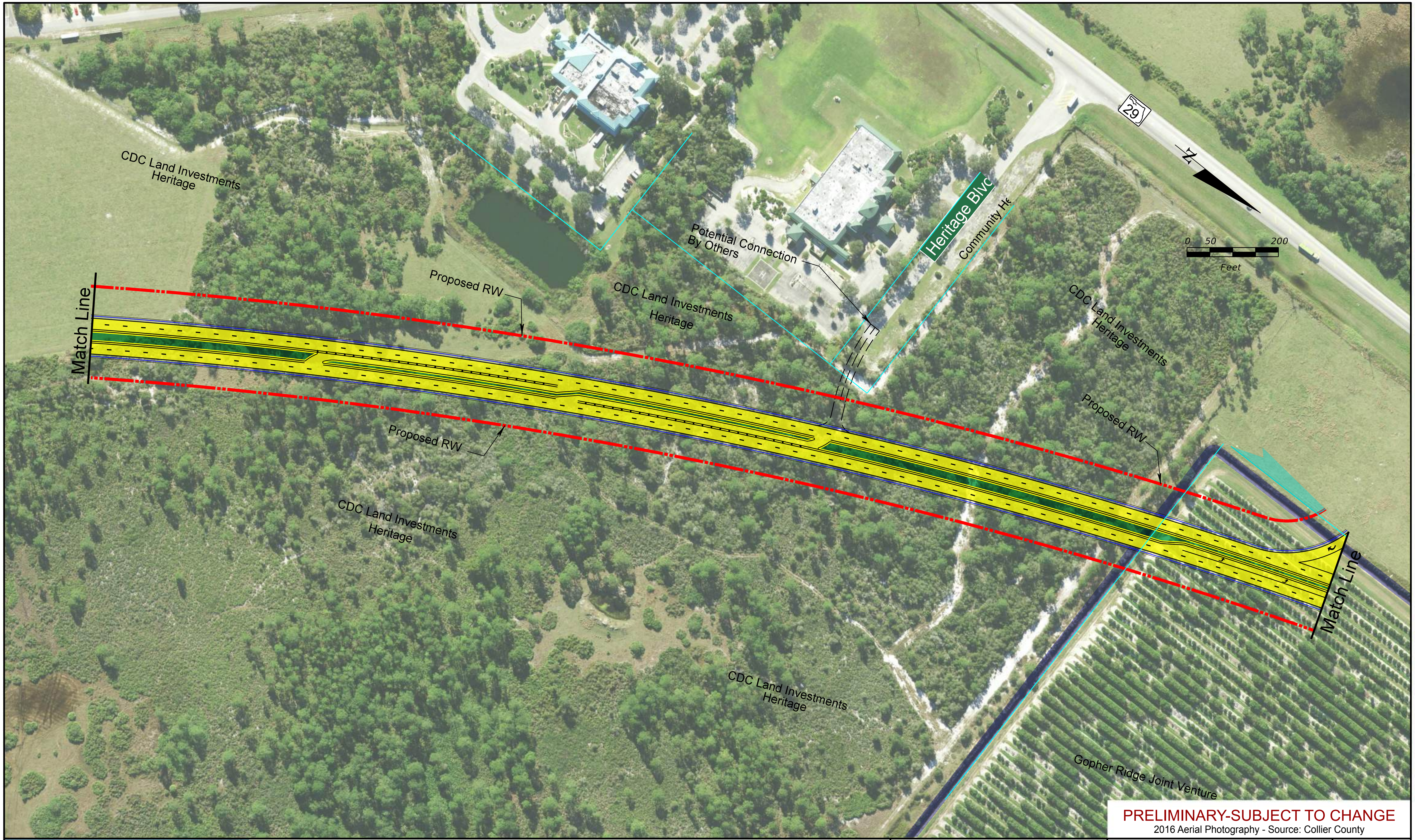
Central Alternative #1 Revised

Sheet No. A-25



PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
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- Proposed Sidewalks
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- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative
#1 Revised

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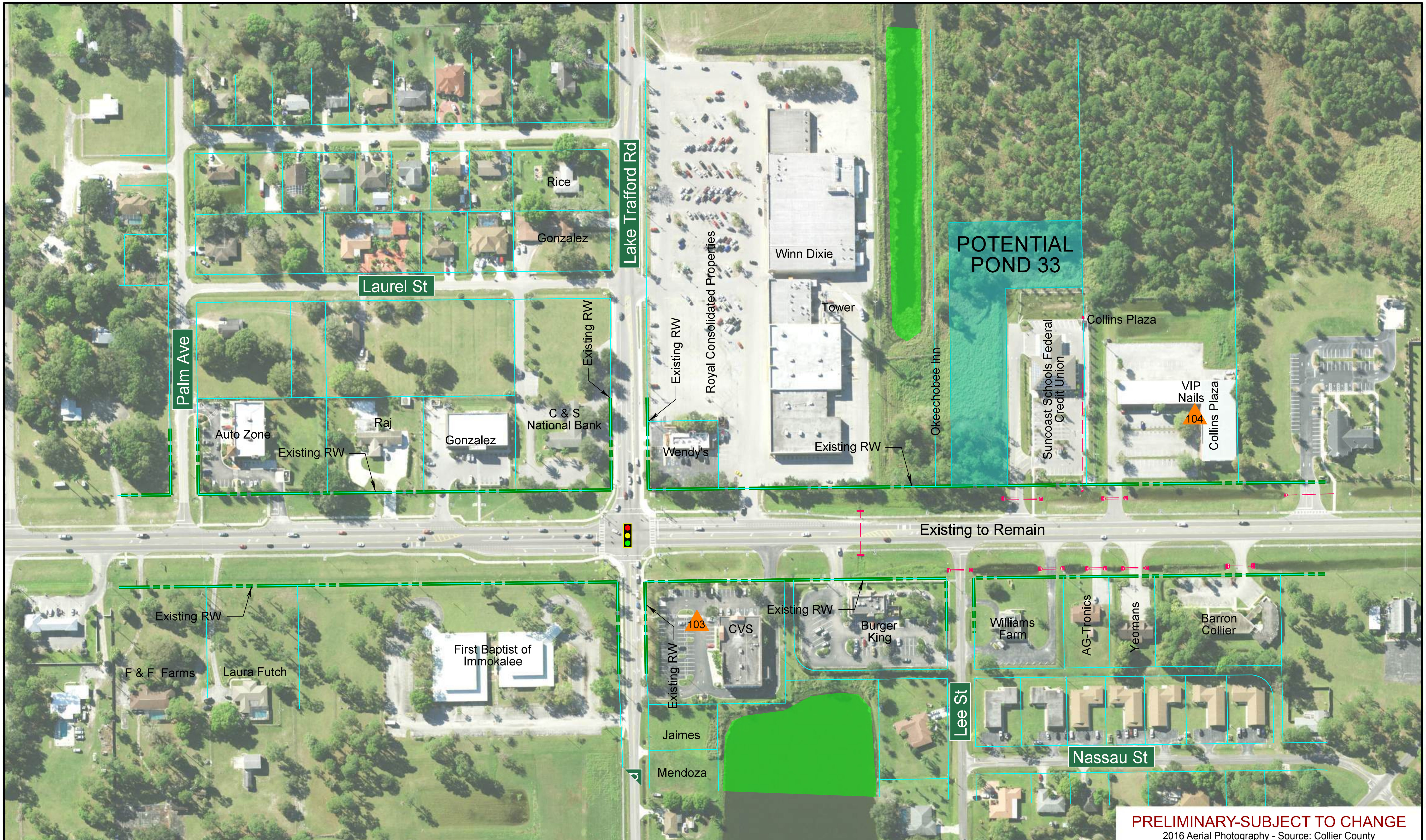

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative #1 Revised

Sheet No.
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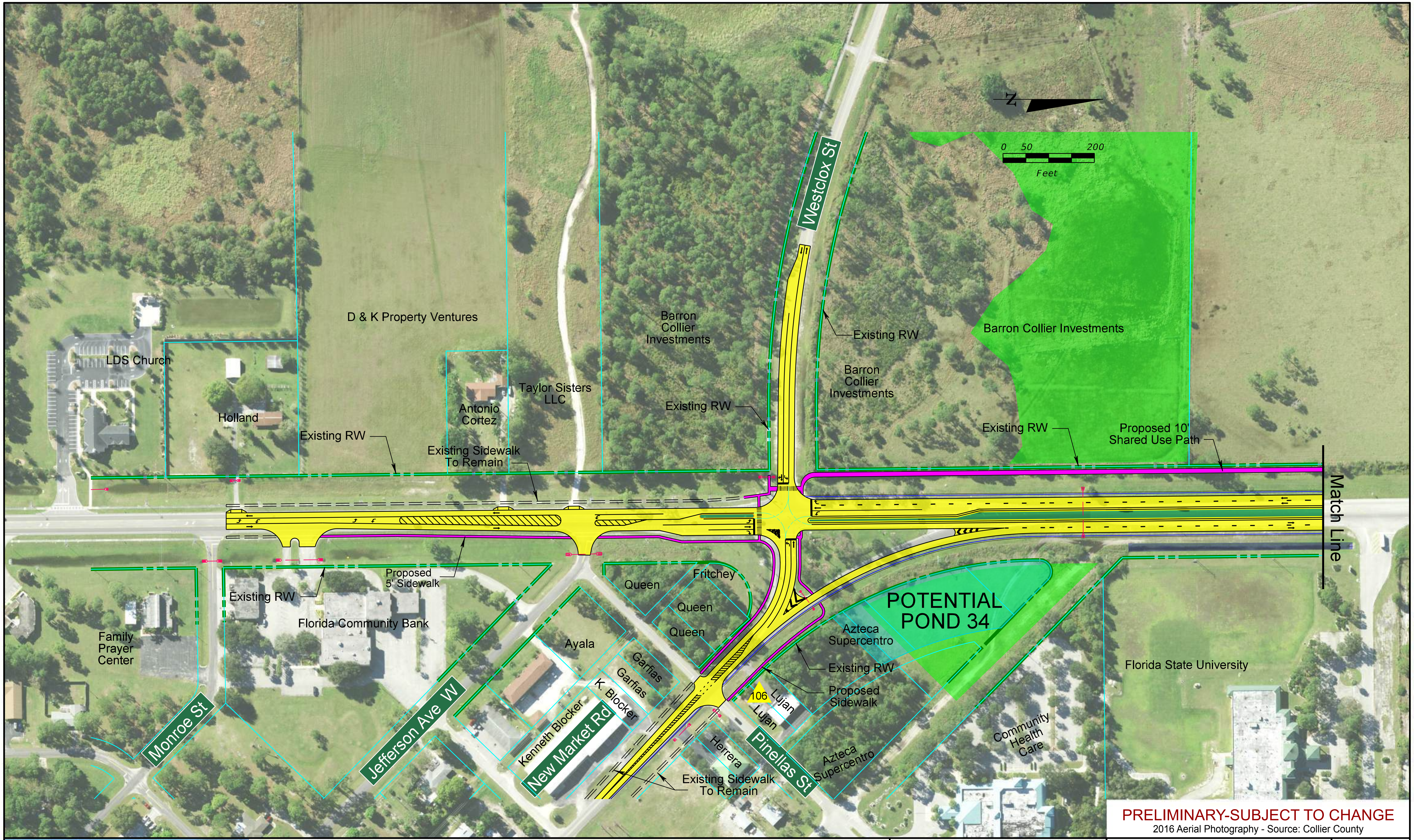

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
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- Proposed Structure
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Central Alternative #1 Revised

Sheet No.

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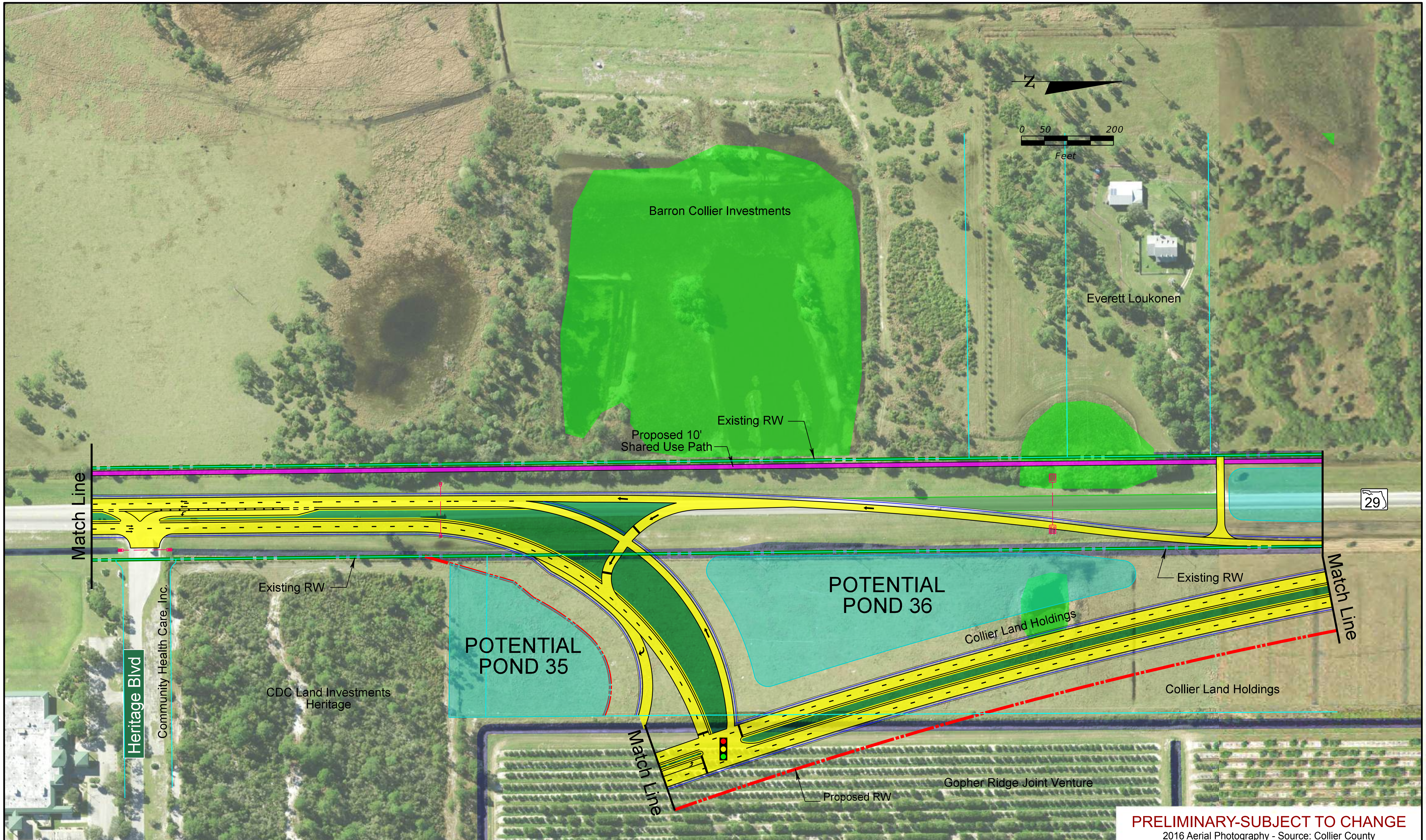

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
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- Proposed Sidewalks
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- Potential Business Relocation
- Potential Contamination (Low)
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Central Alternative
#1 Revised

Sheet No.
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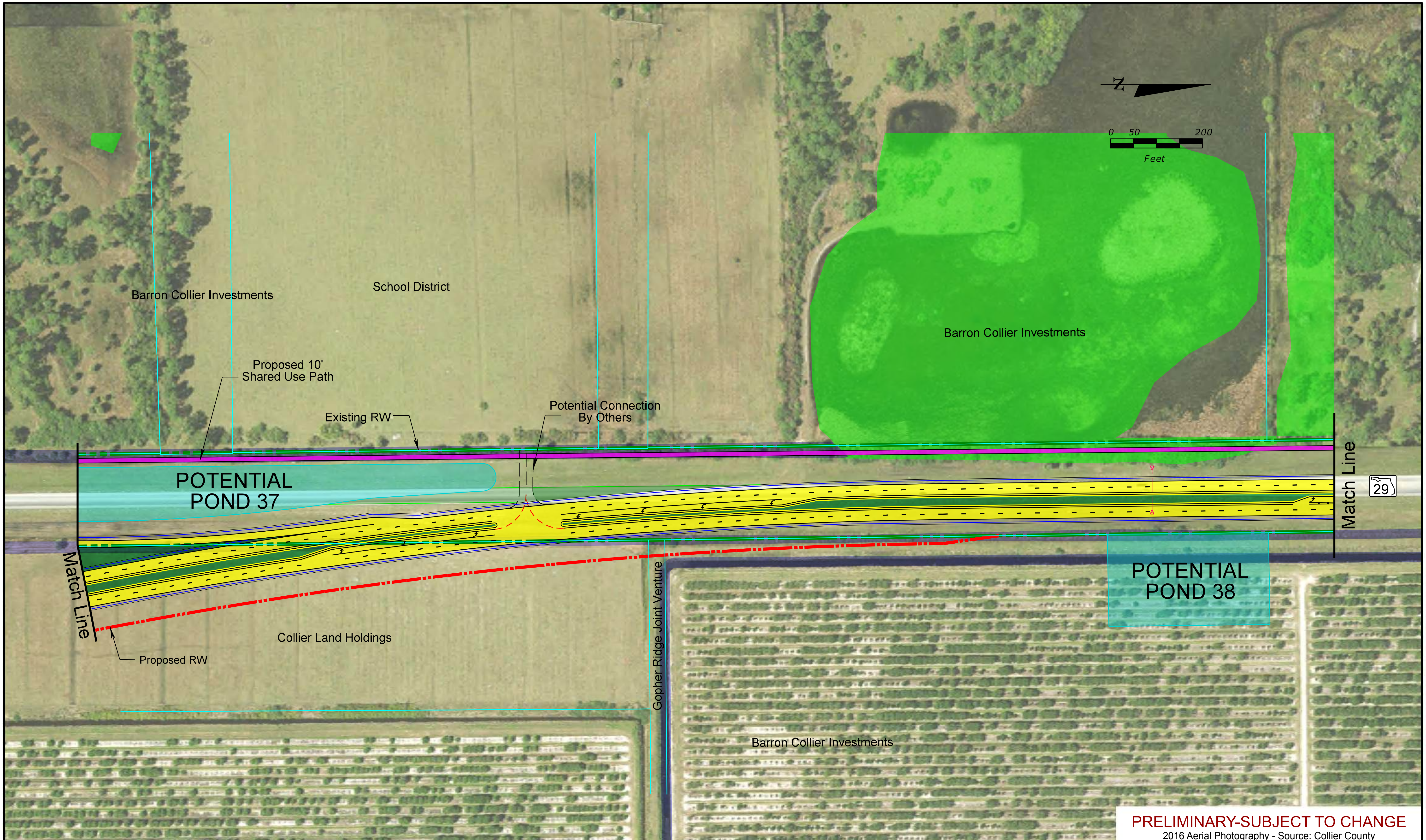

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetland	Proposed Pavement	Proposed Guardrail
Parcels	Potential Pond	Proposed Median/Border	Potential Business Relocation
Proposed Right-of-Way	Potential Flood Plain Compensation	Proposed Sidewalks	Potential Contamination (Low)
Water/Canal	Traffic Signal	Proposed Structure	Potential Contamination (Medium or High)
Seminole Land			

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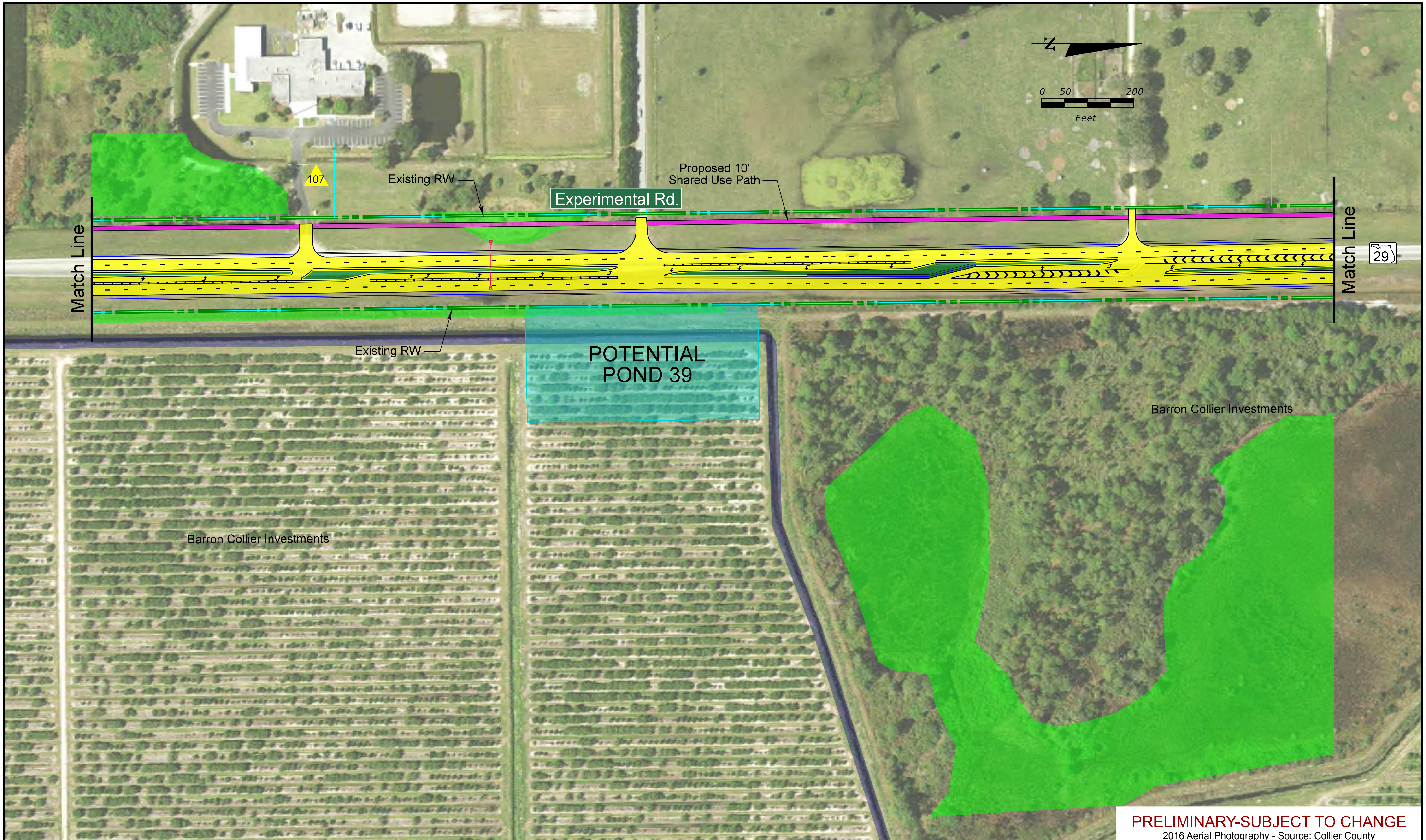

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
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- Proposed Sidewalks
- Proposed Structure
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- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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SR 29 PD&E Study

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FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative
#1 Revised

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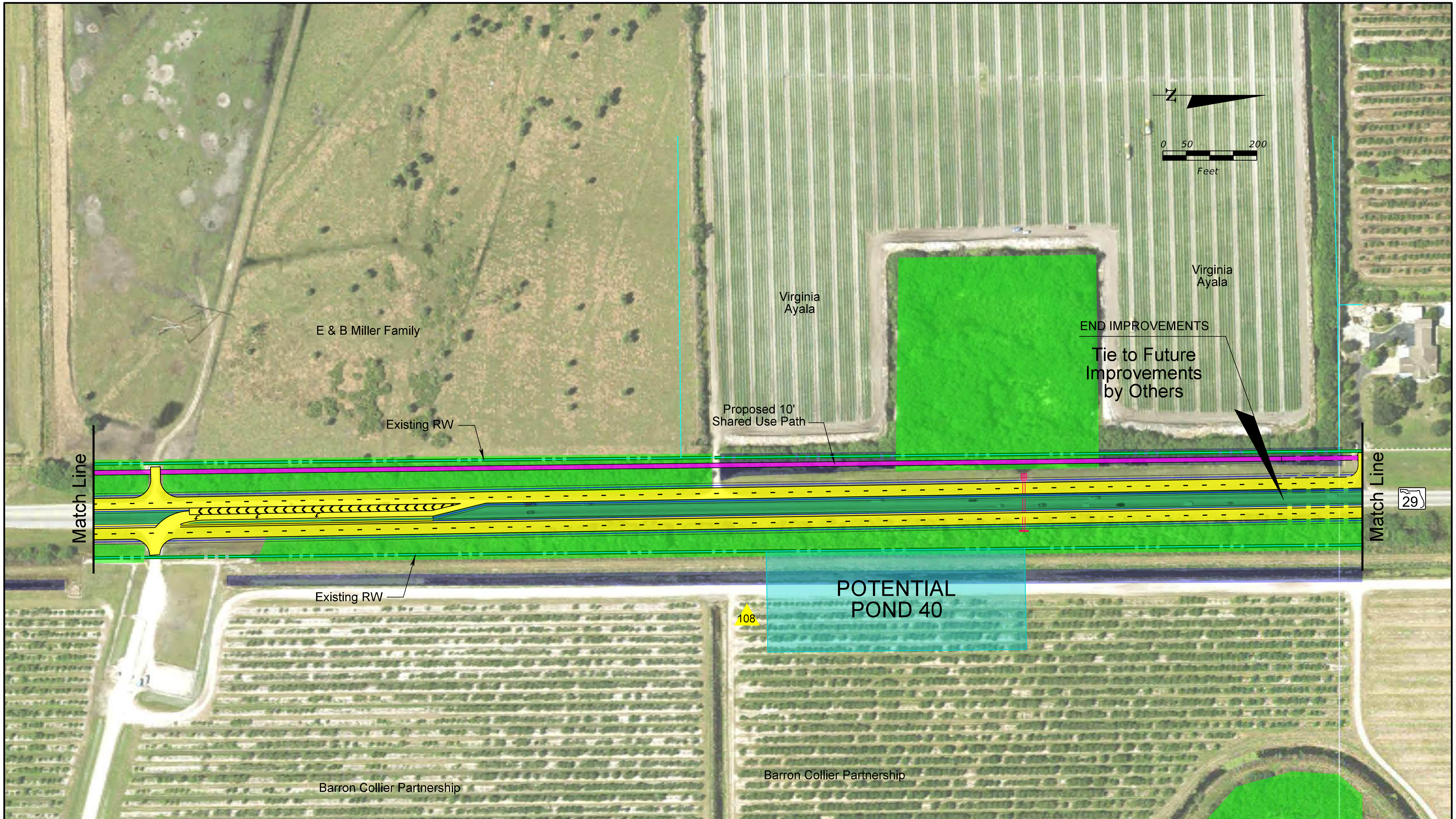

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
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- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
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- Wetland
- Potential Pond
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- Proposed Median/Border
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Central Alternative #1 Revised

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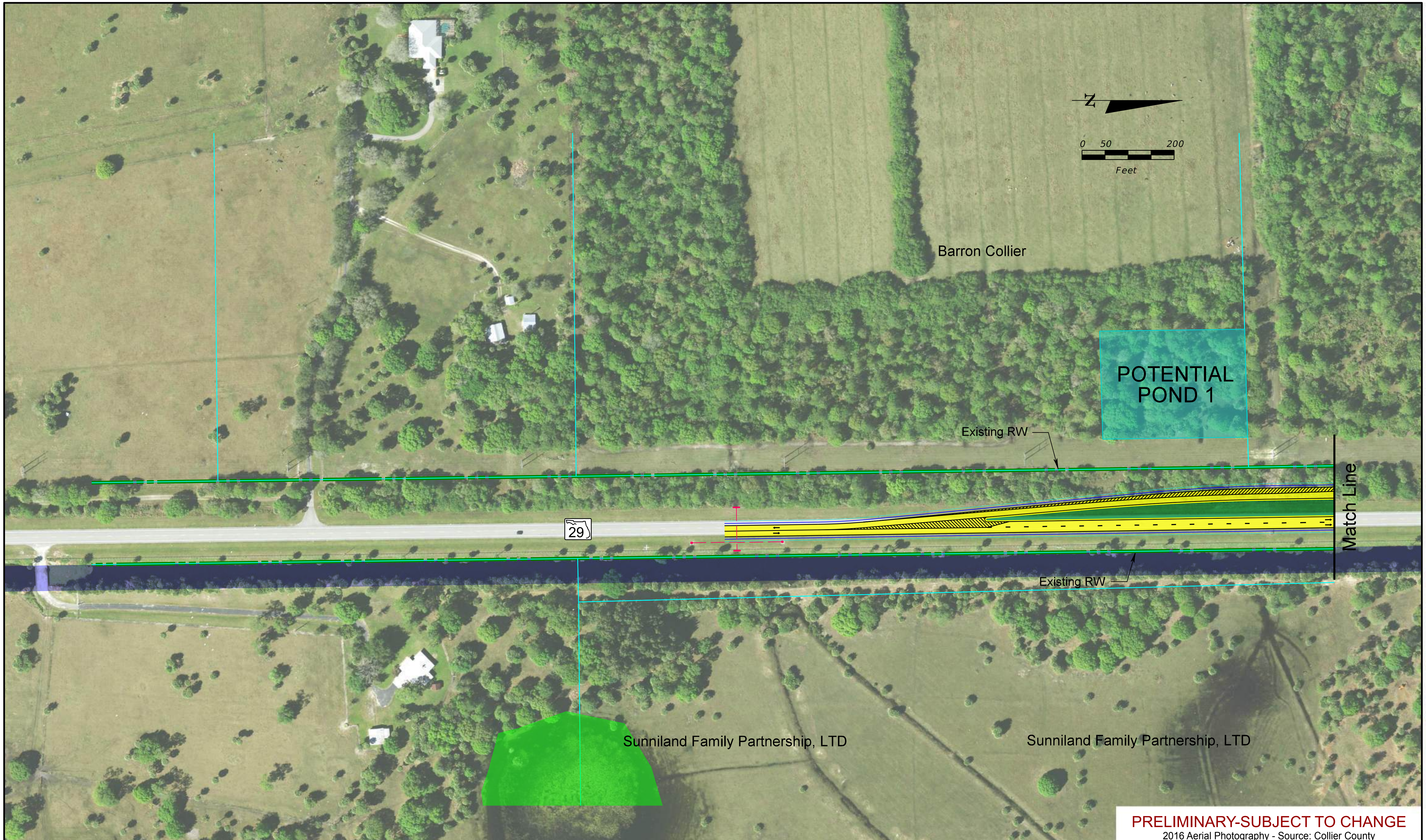

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
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- Proposed Sidewalks
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- Potential Contamination (Medium or High)

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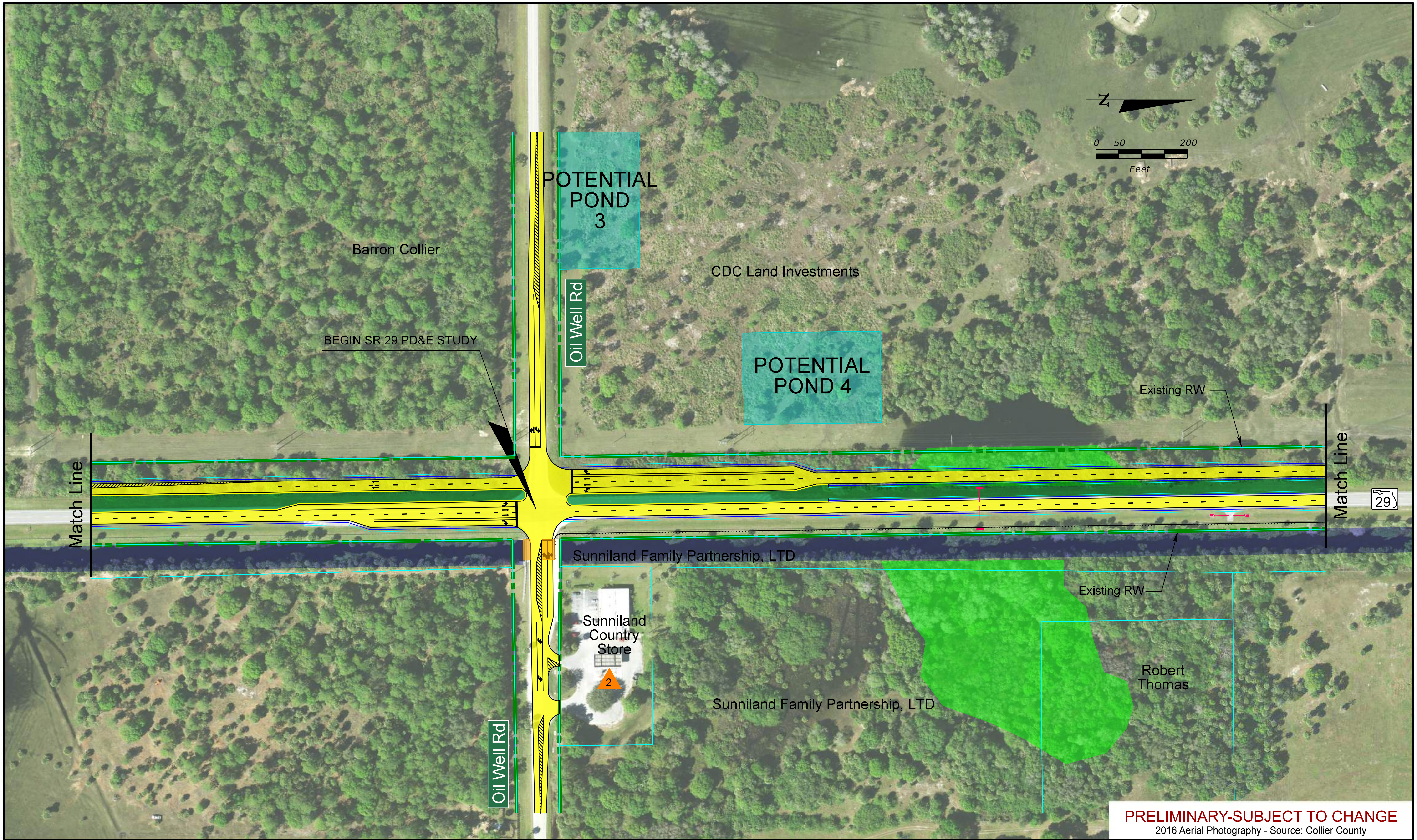

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3011 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
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SR 29 PD&E Study

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FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
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- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
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Central Alternative #2

Sheet No.

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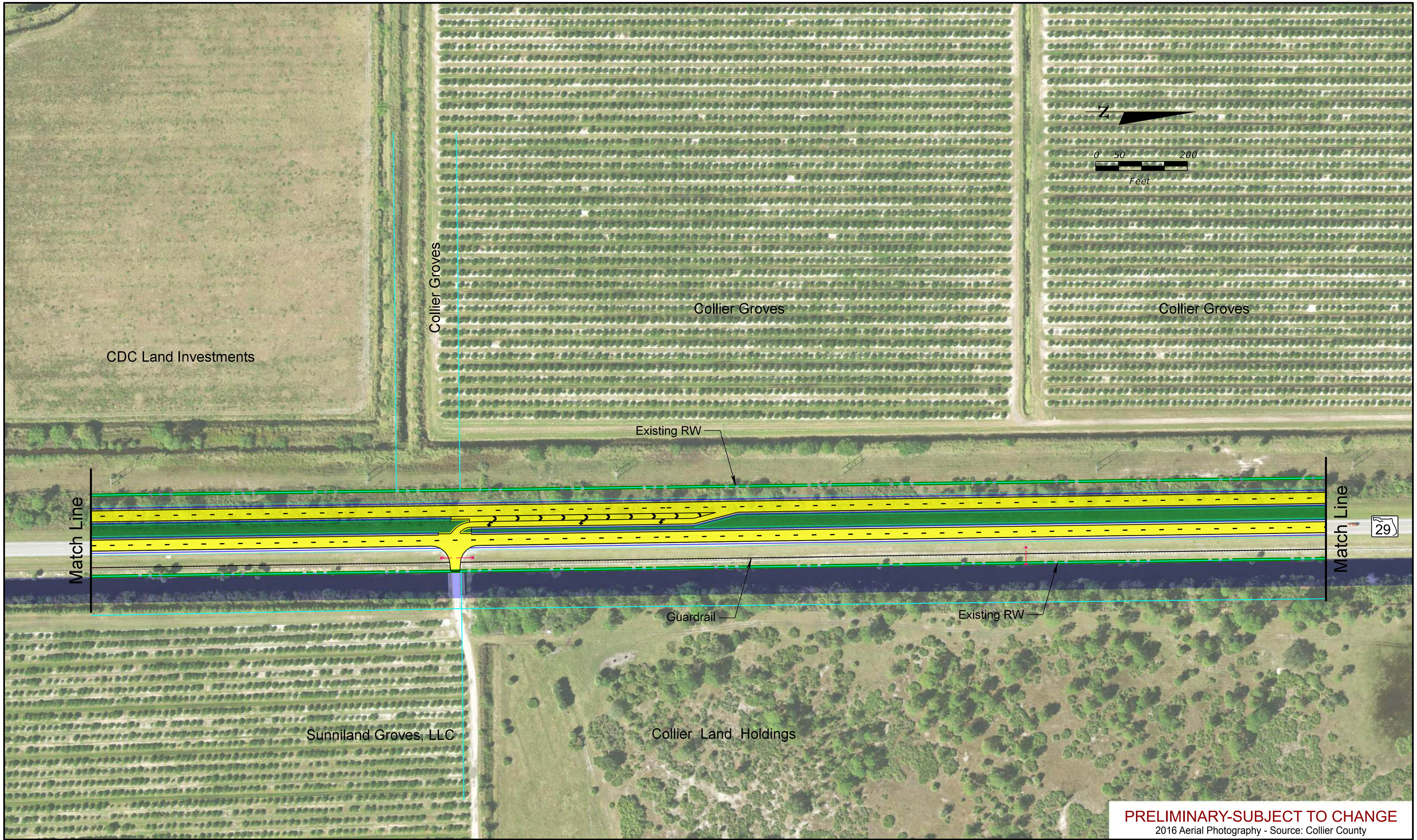

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
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Central Alternative #2

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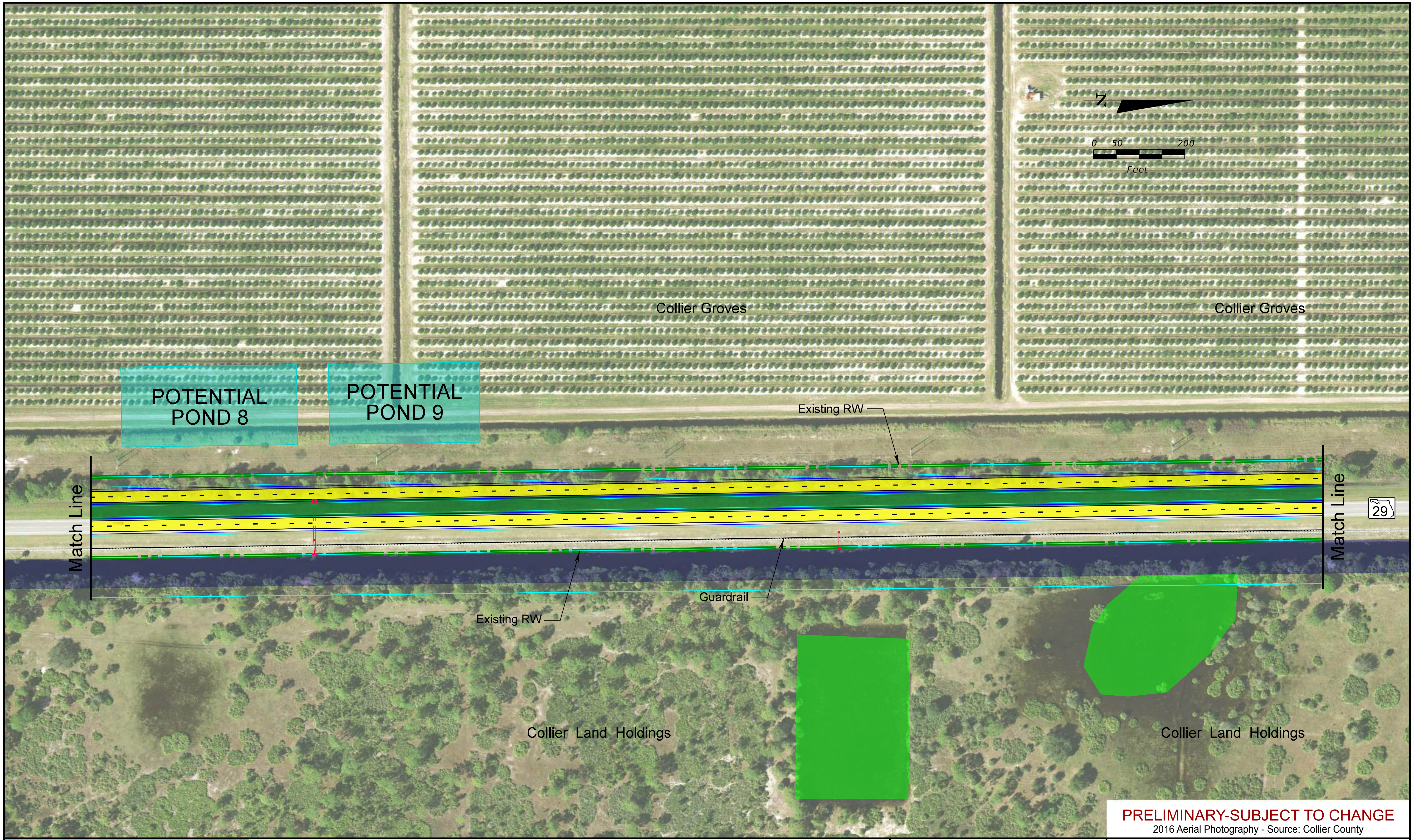

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
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- Potential Contamination (Medium or High)

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Central Alternative #2

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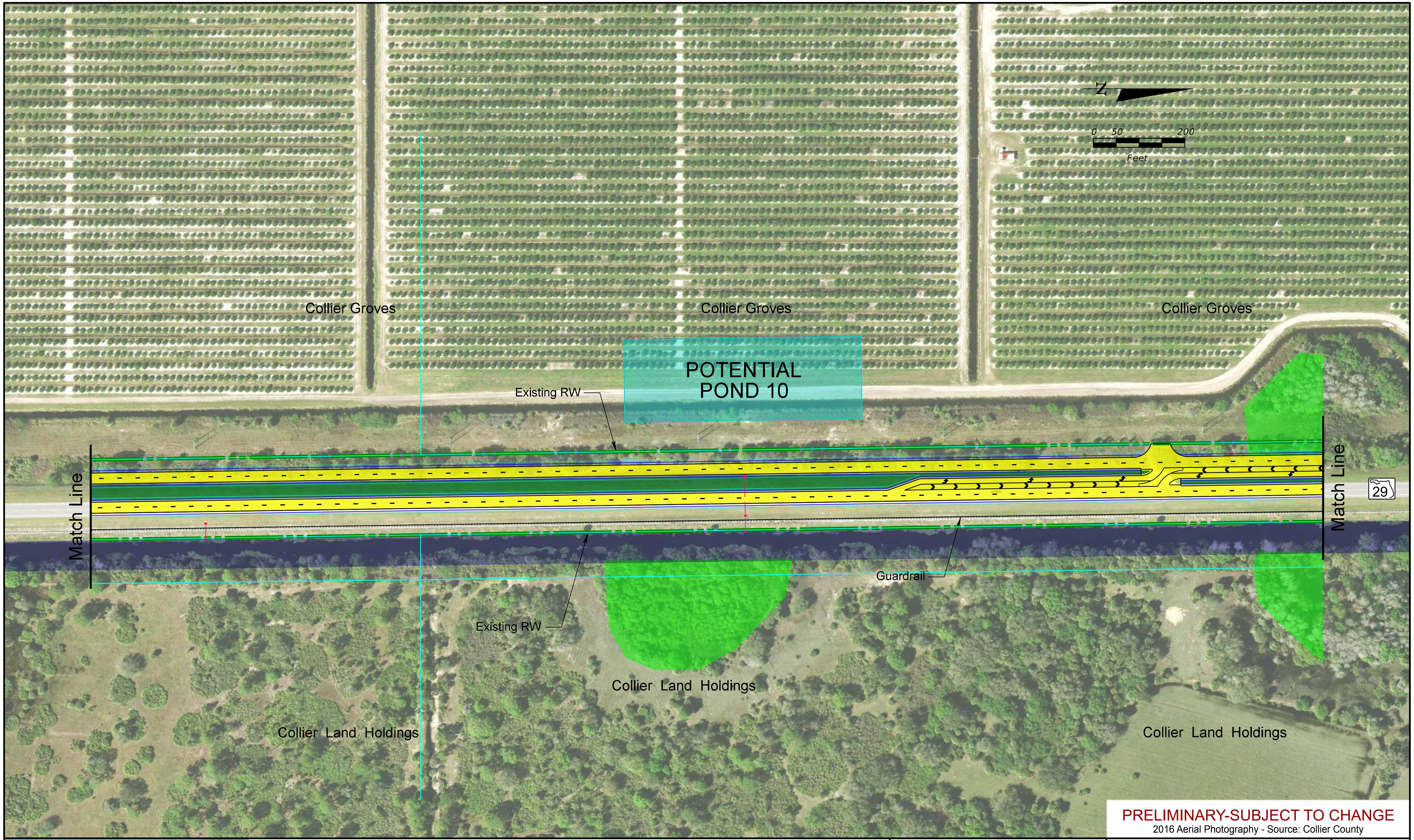

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
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PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
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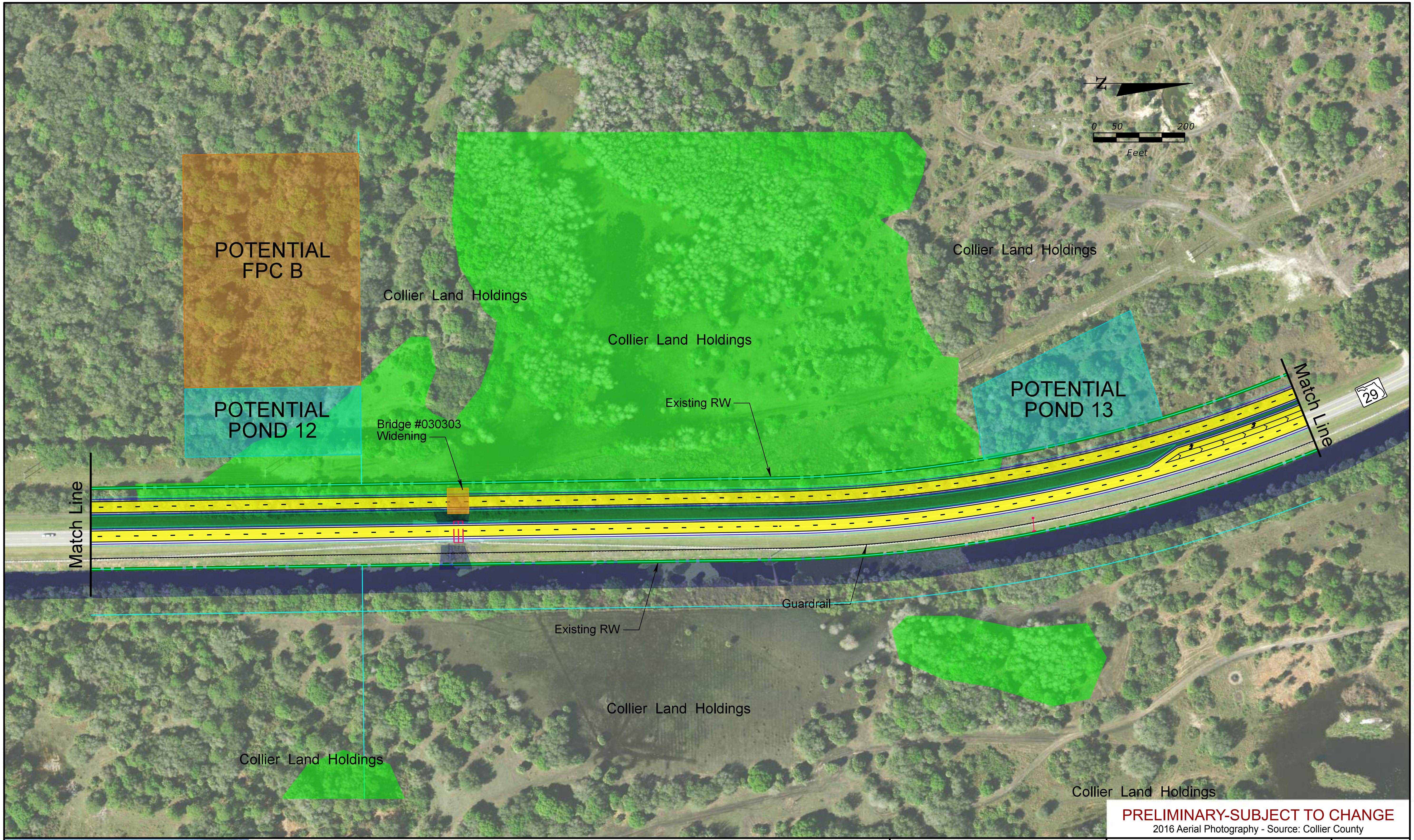

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
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- Potential Flood Plain Compensation
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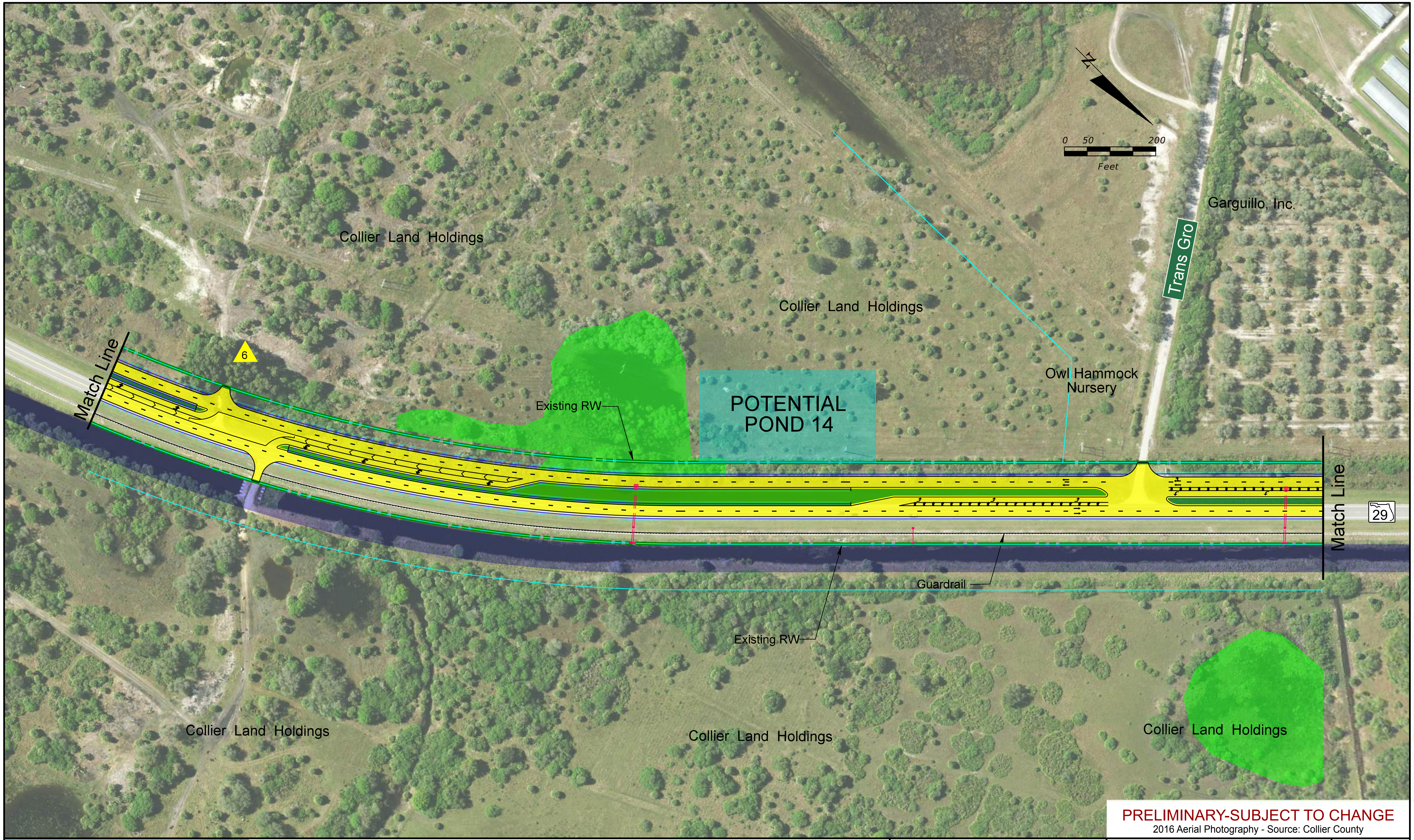

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
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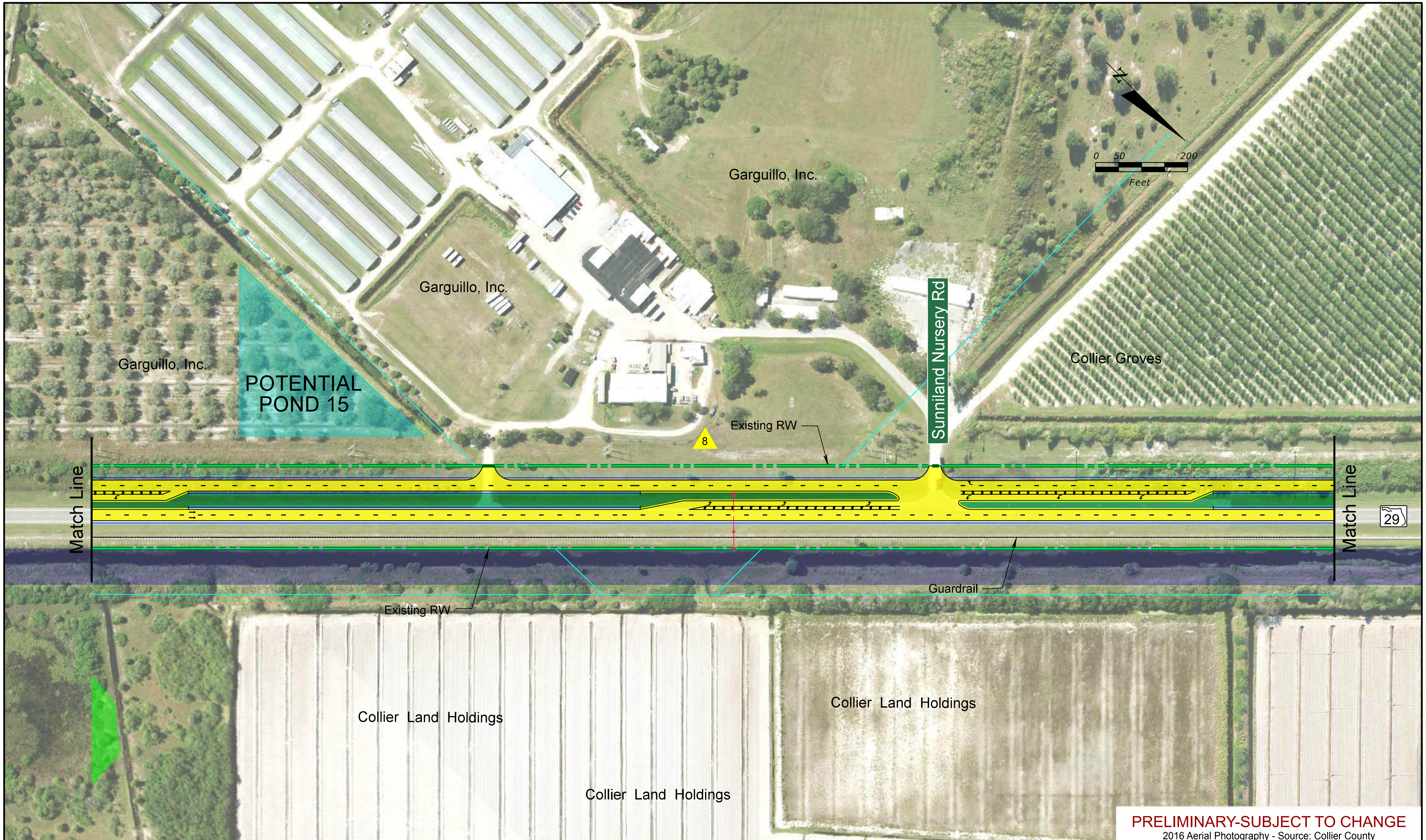

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
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- Traffic Signal
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PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
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- Seminole Land
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- Potential Flood Plain Compensation
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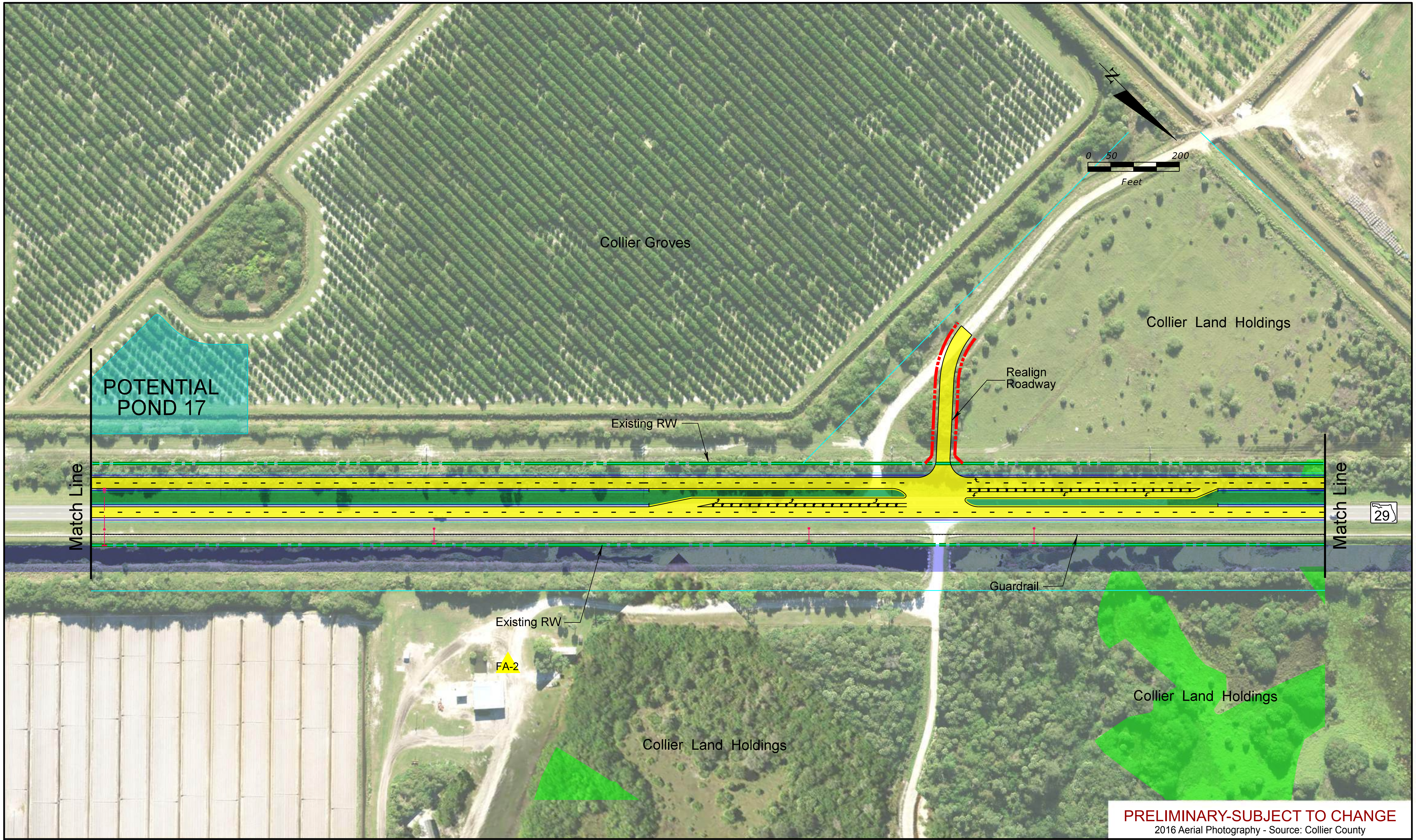

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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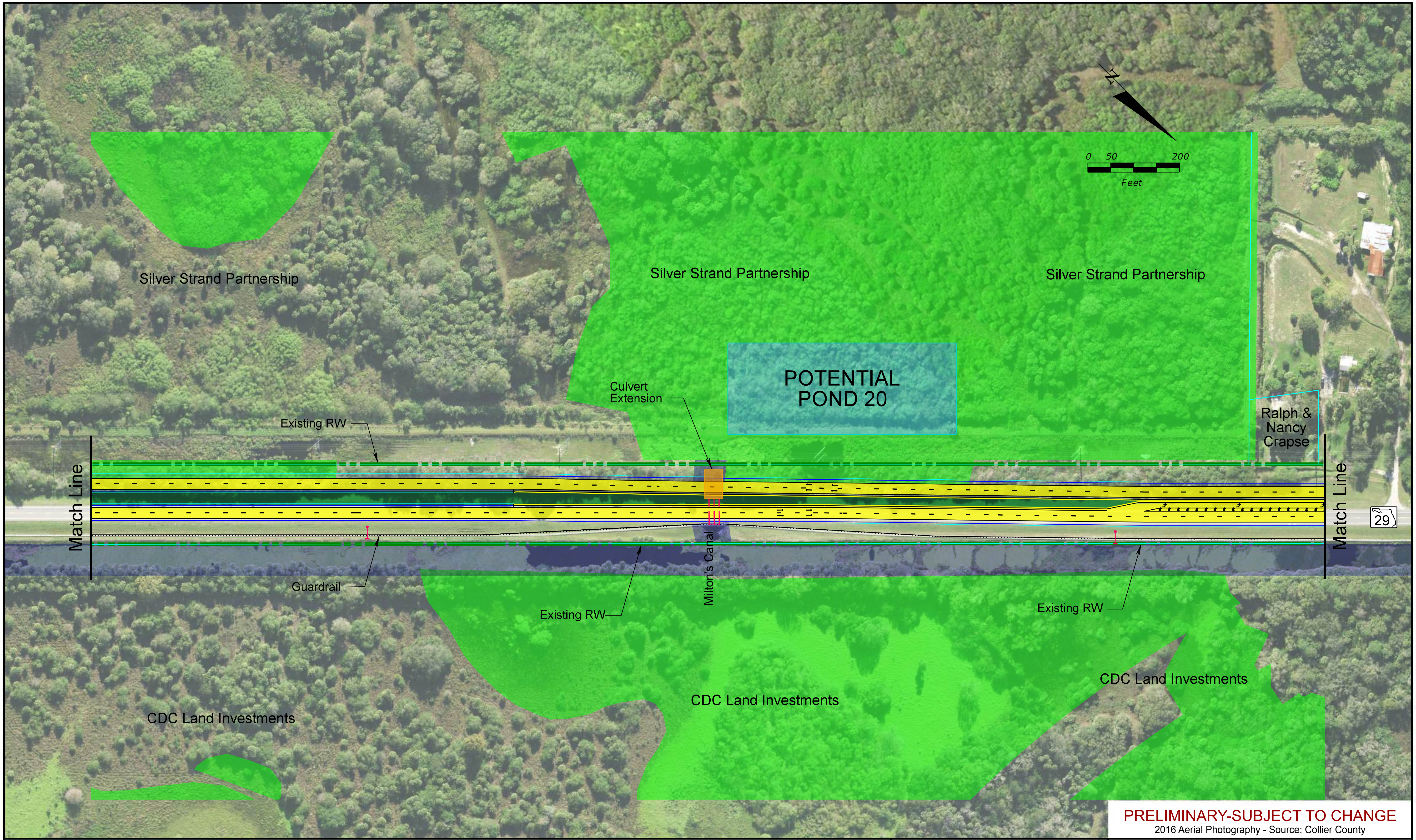

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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Sheet No.
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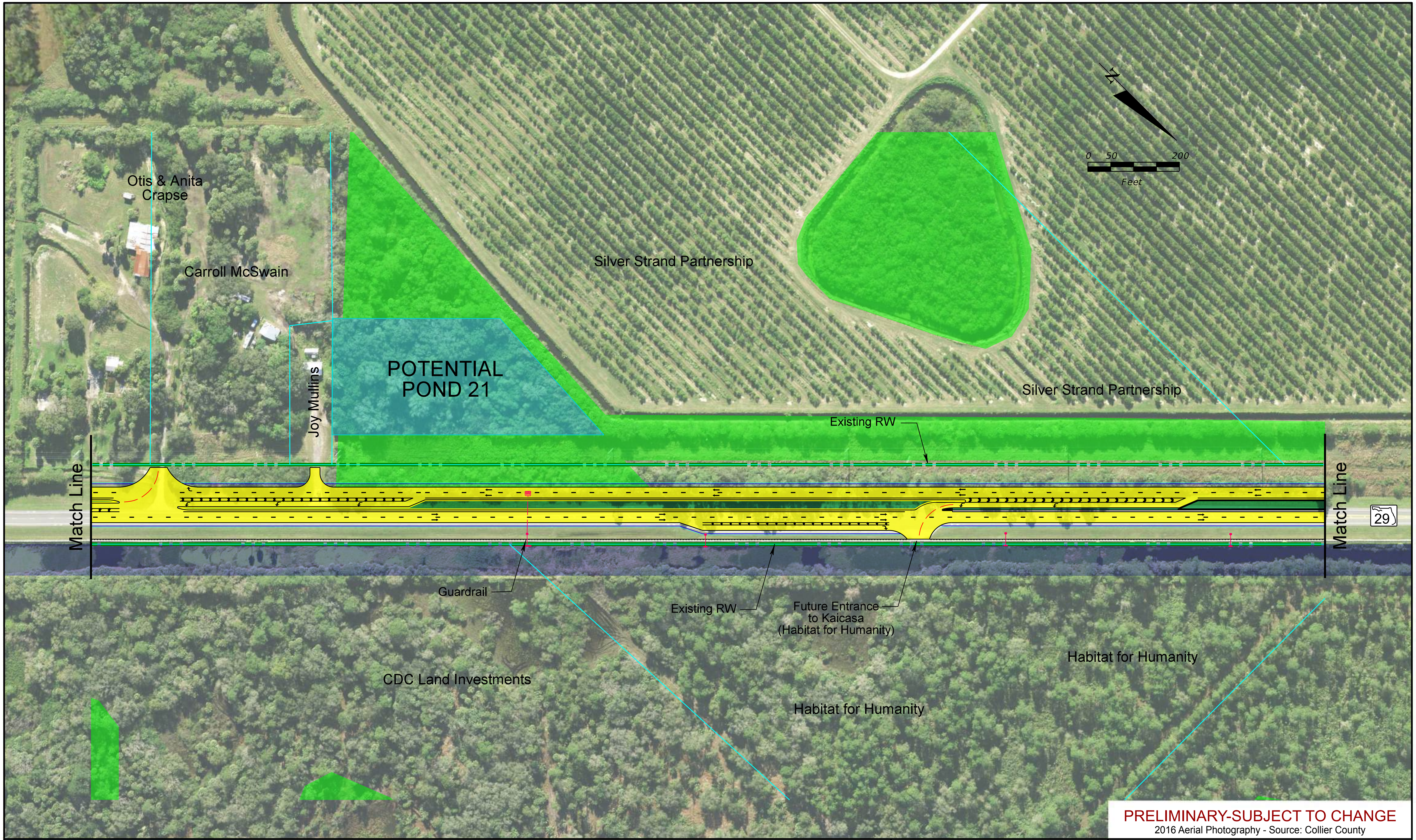

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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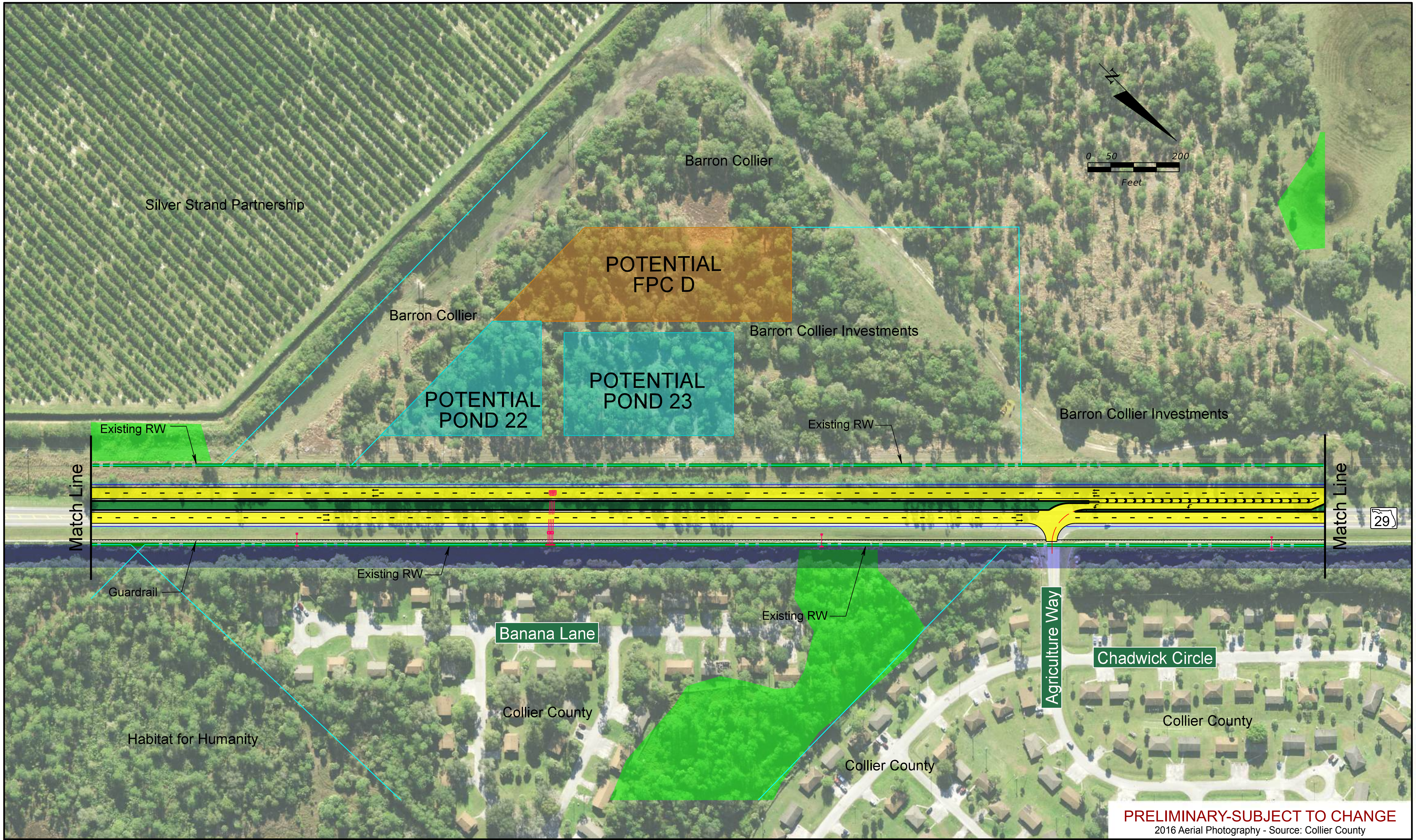
Central Alternative #2

Sheet No.
A-50



PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
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Sheet No.
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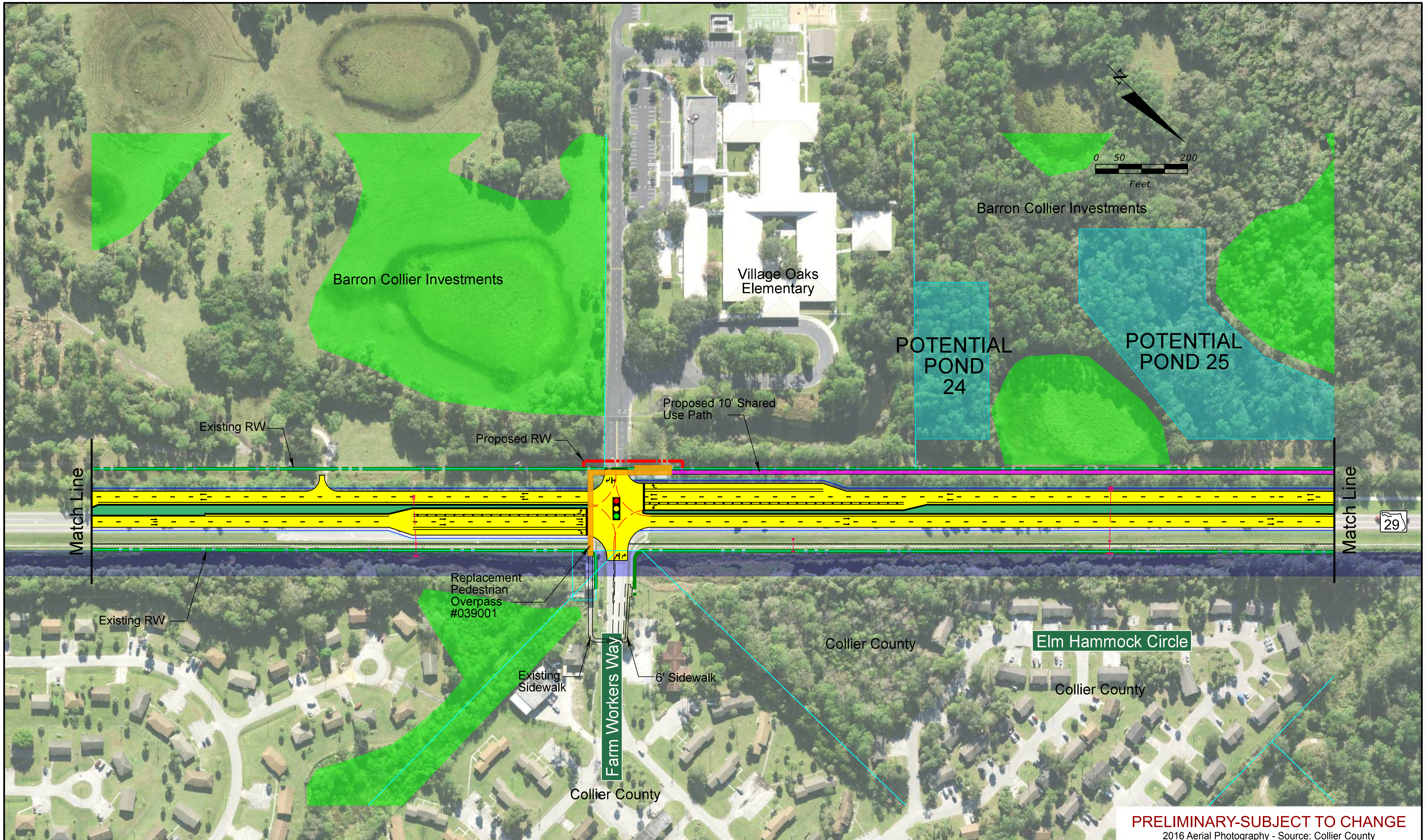

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
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- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Sheet No.
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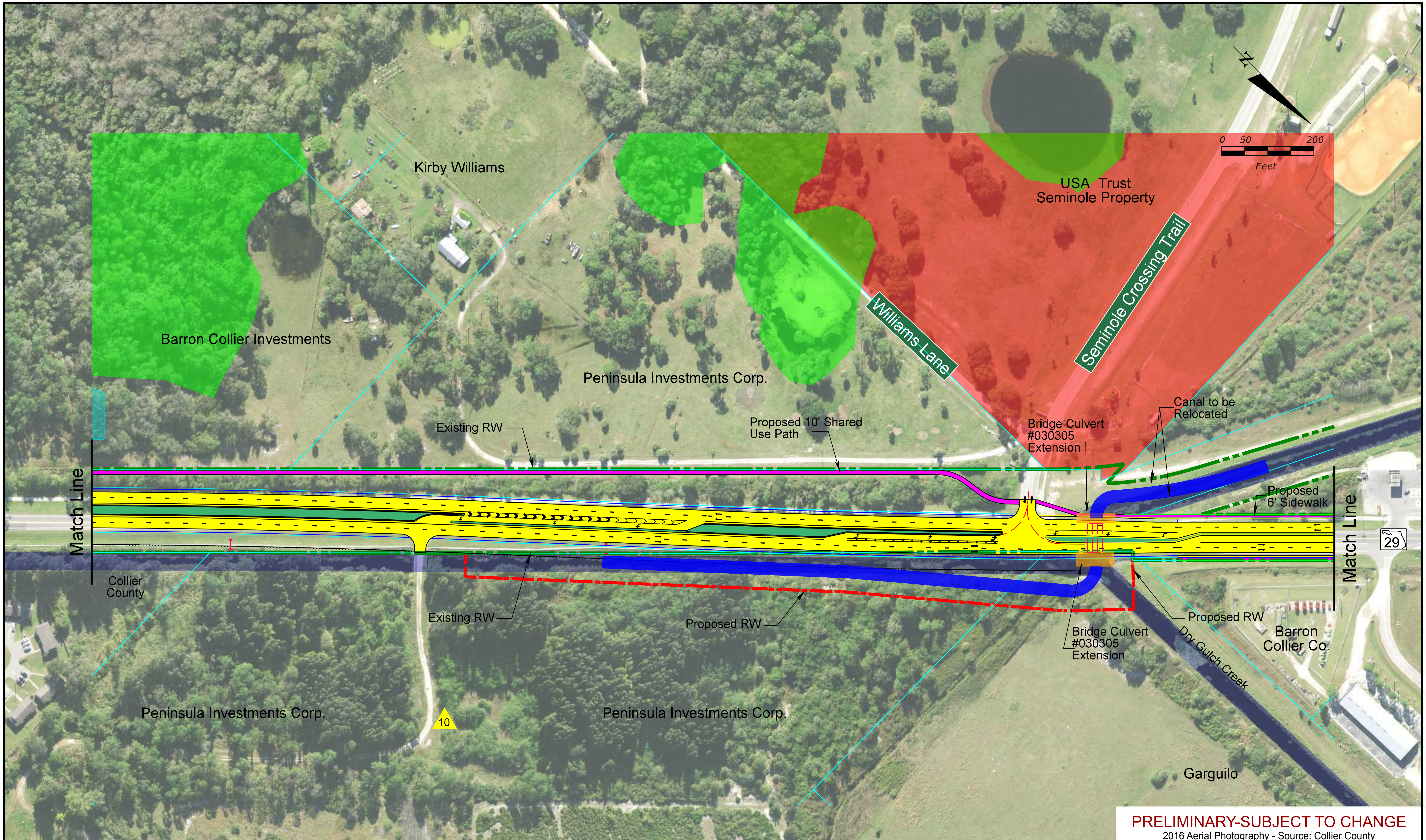

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative #2

Sheet No.

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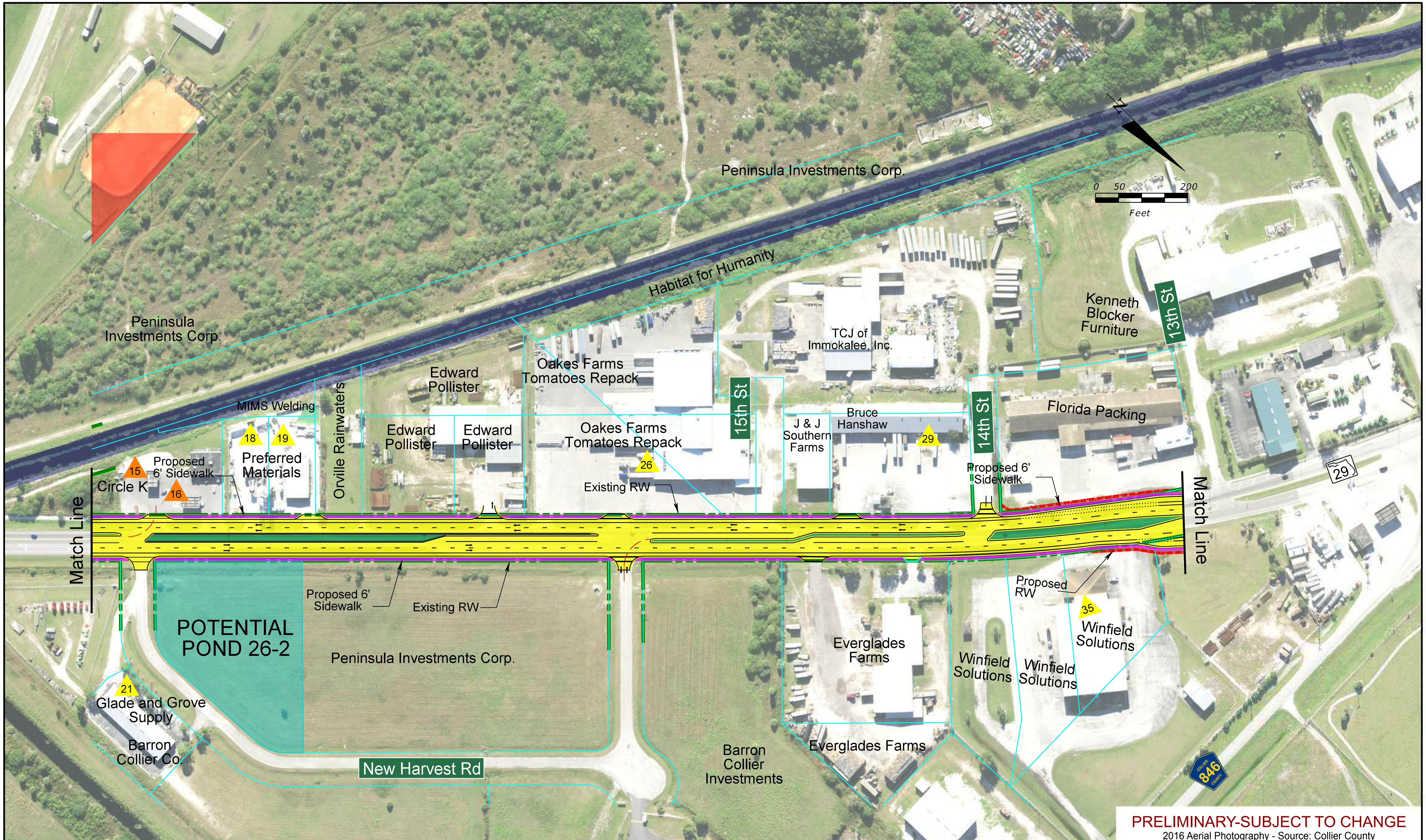

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetland	Proposed Pavement	Proposed Guardrail
Parcels	Potential Pond	Proposed Median/Border	Potential Business Relocation
Proposed Right-of-Way	Potential Flood Plain Compensation	Proposed Sidewalks	Potential Contamination (Low)
Water/Canal	Traffic Signal	Proposed Structure	Potential Contamination (Medium or High)
Seminole Land			

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Sheet No.

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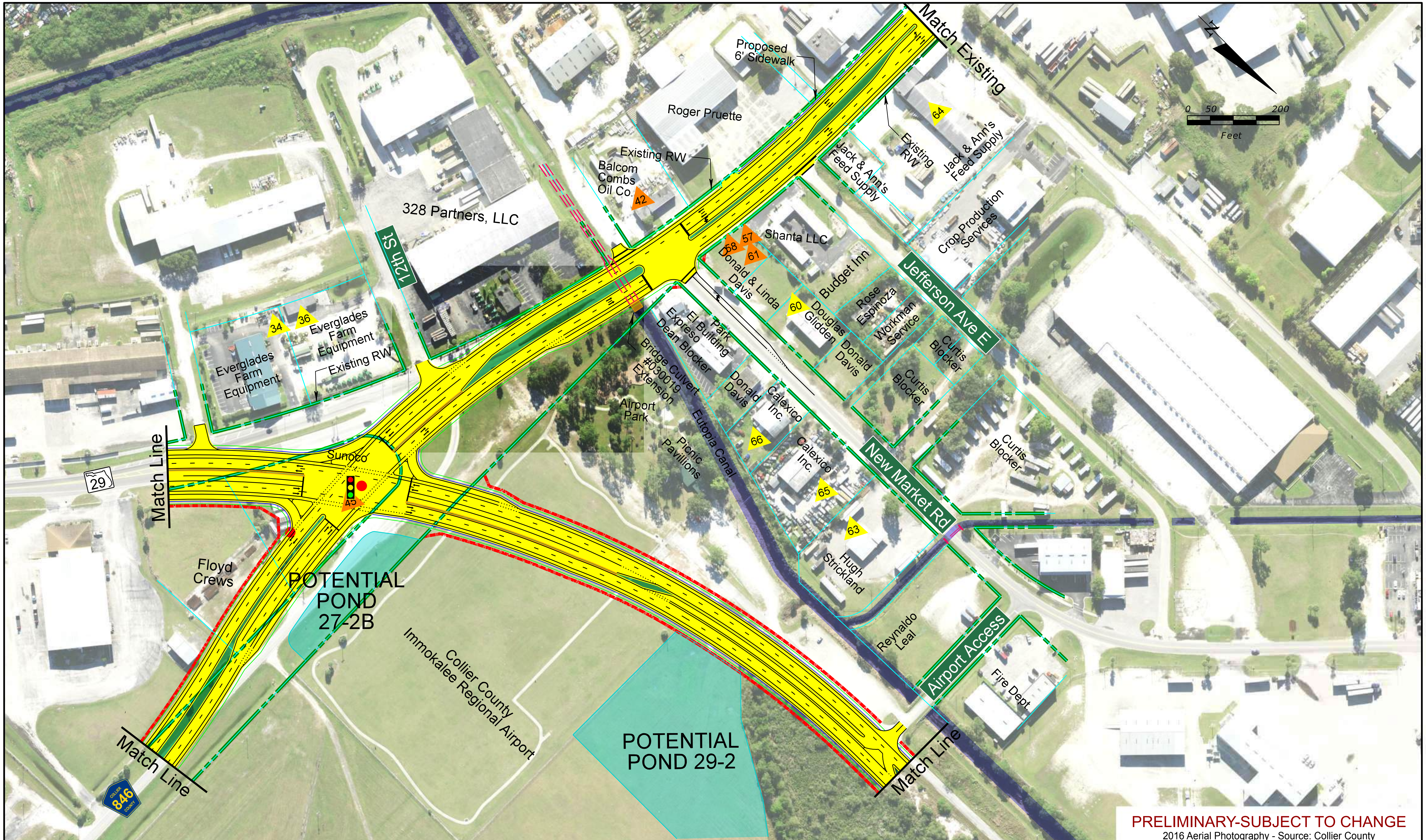

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative #2

Sheet No.
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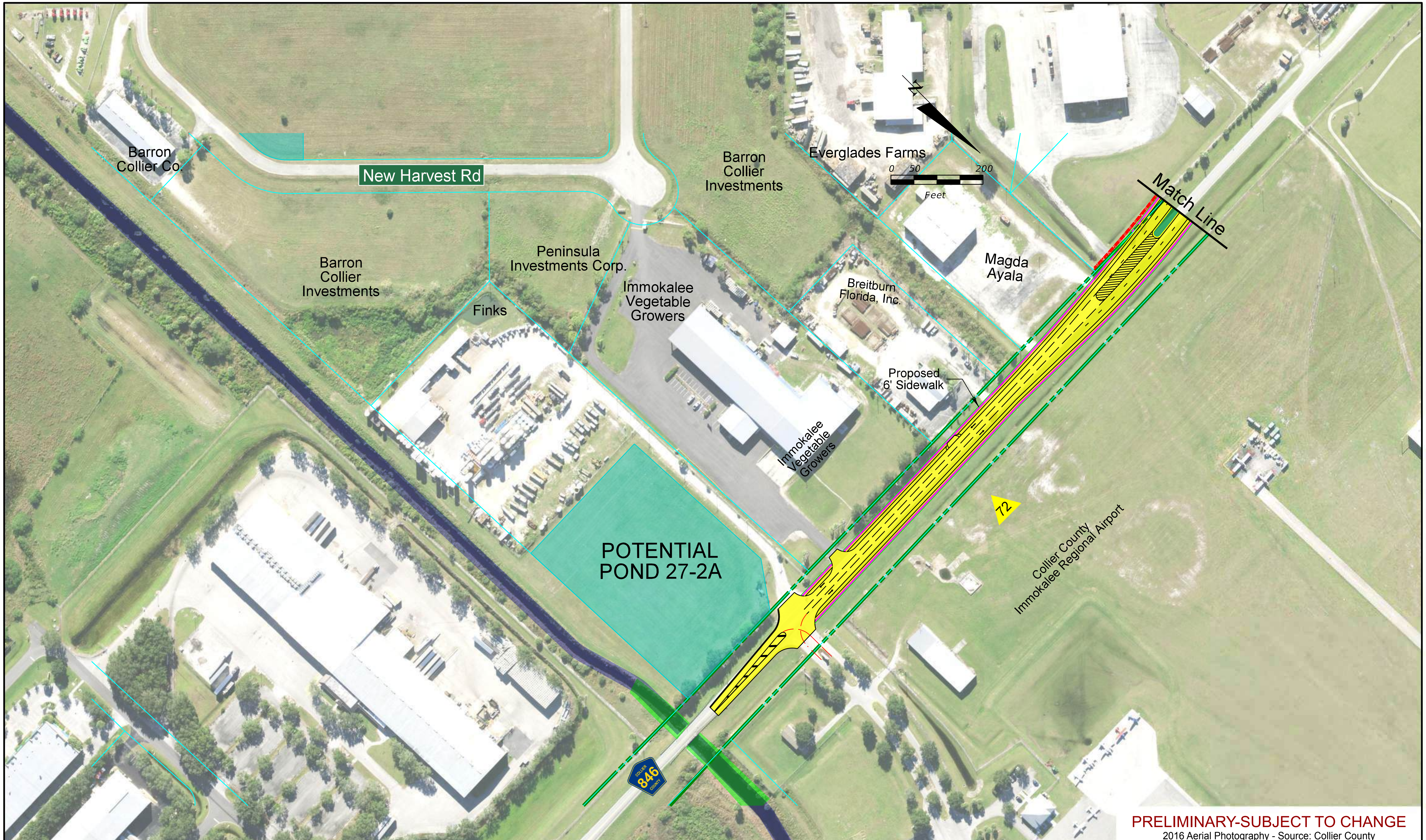

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetland	Proposed Pavement	Proposed Guardrail
Parcels	Potential Pond	Proposed Median/Border	Potential Business Relocation
Proposed Right-of-Way	Potential Flood Plain Compensation	Proposed Sidewalks	Potential Contamination (Low)
Water/Canal	Traffic Signal	Proposed Structure	Potential Contamination (Medium or High)
Seminole Land			

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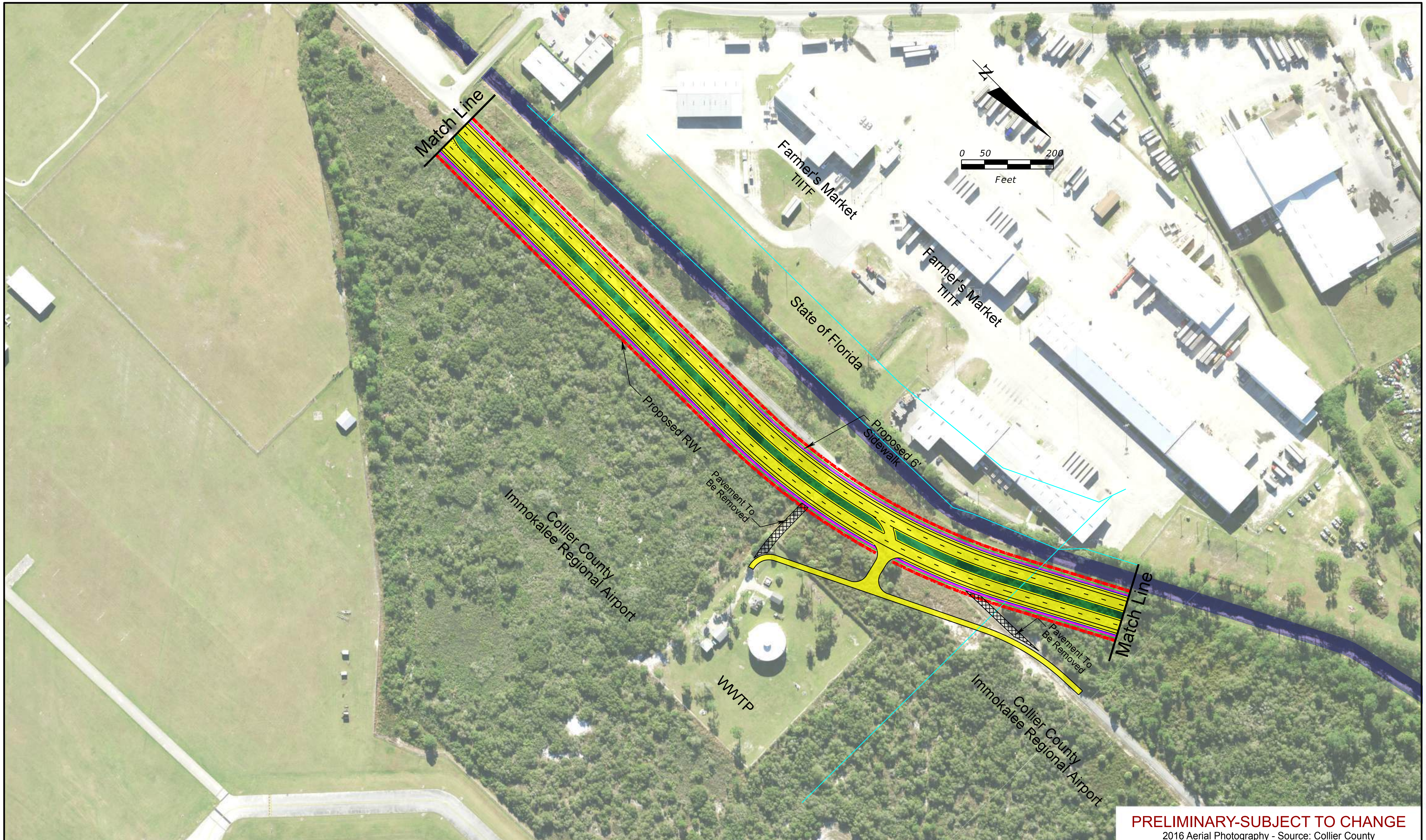

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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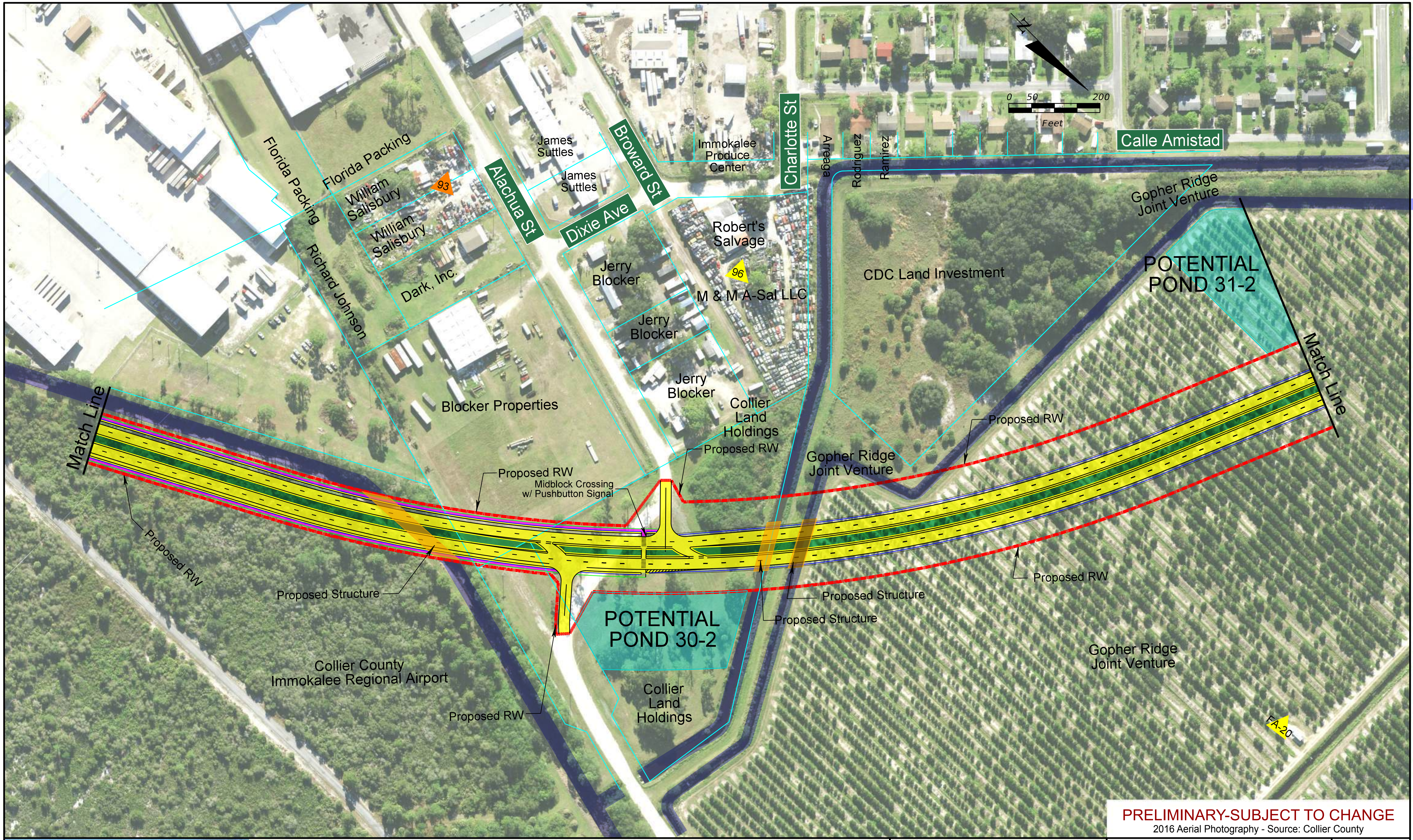

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
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- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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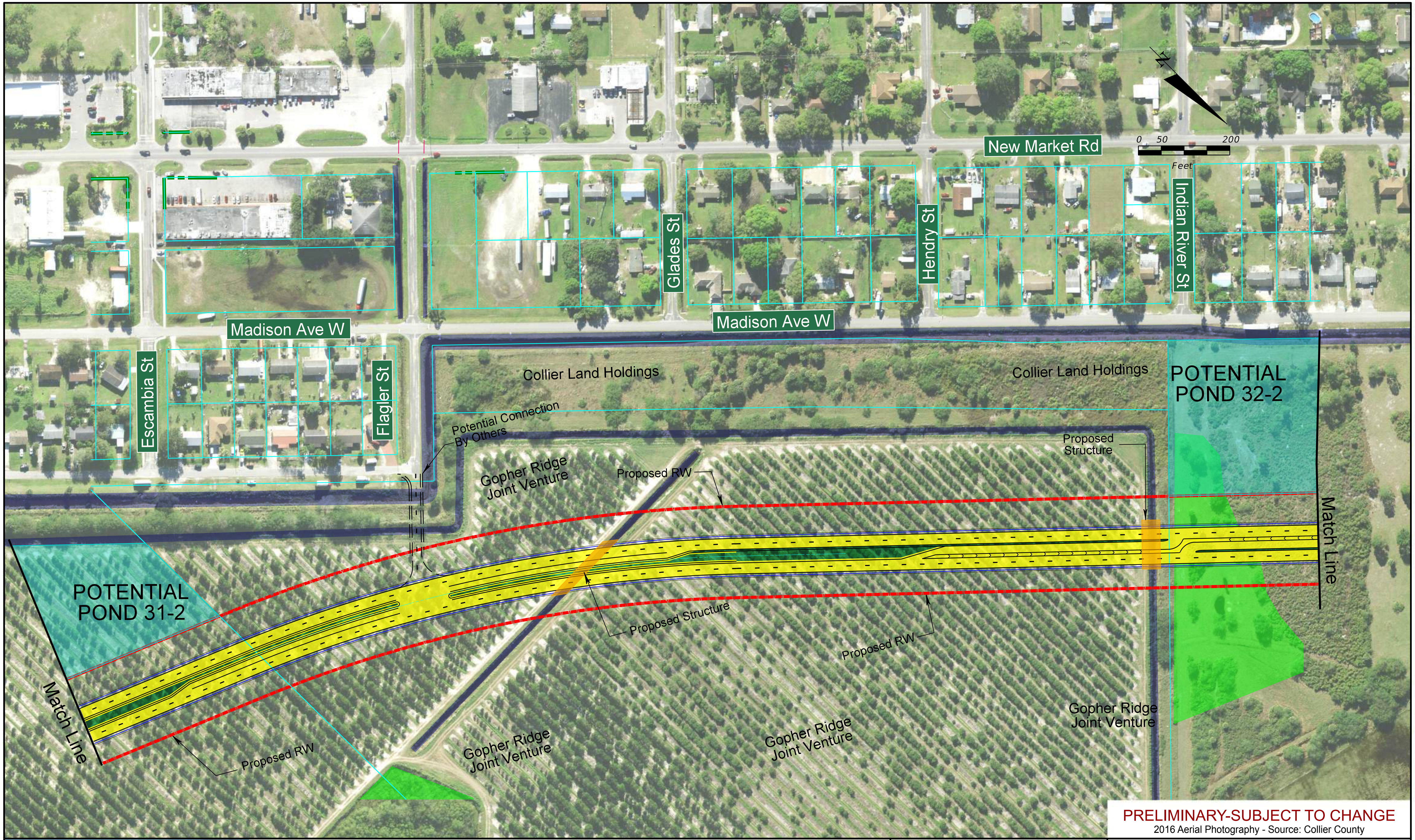

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Sheet No.

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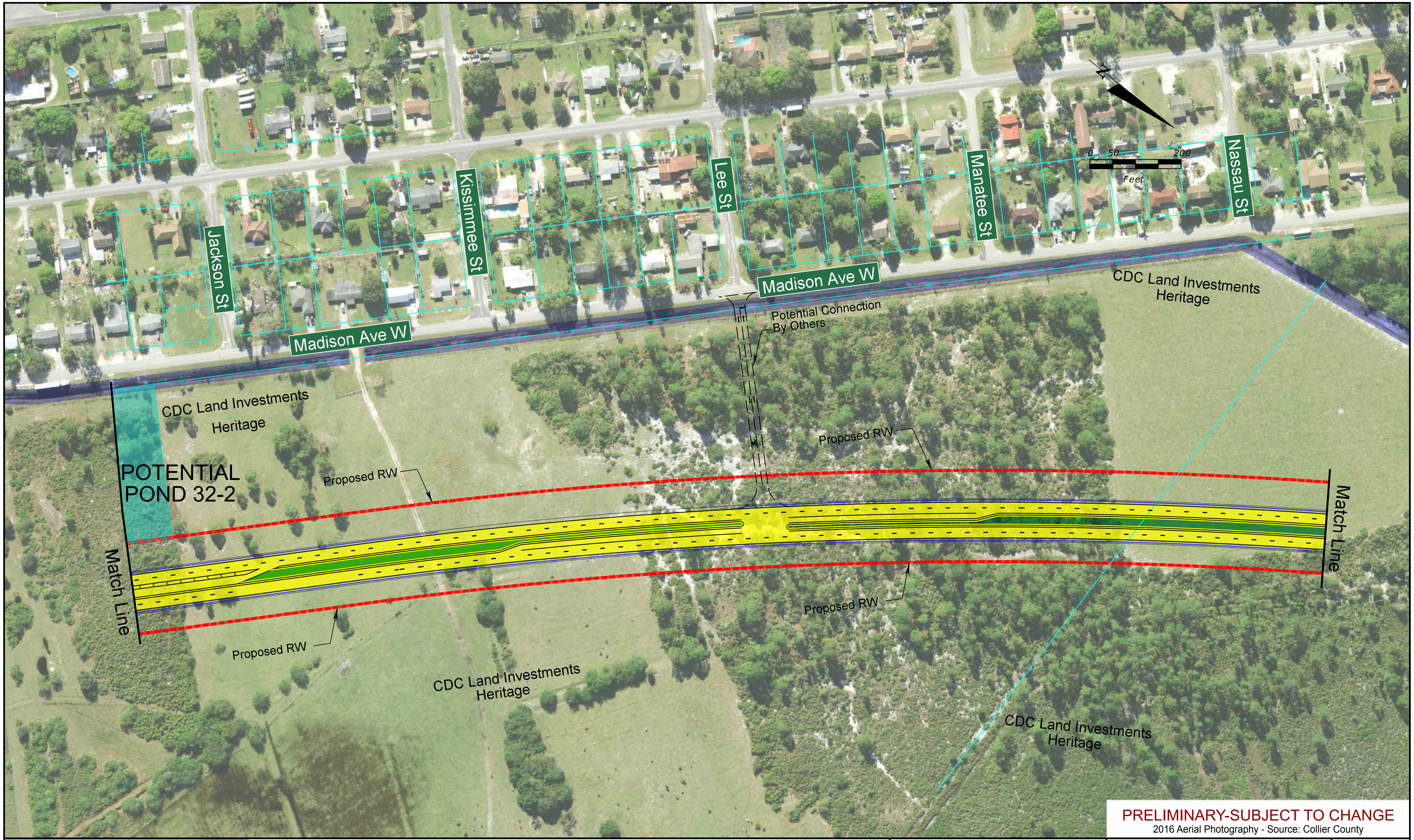

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
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- Potential Pond
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- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
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- Potential Contamination (Medium or High)

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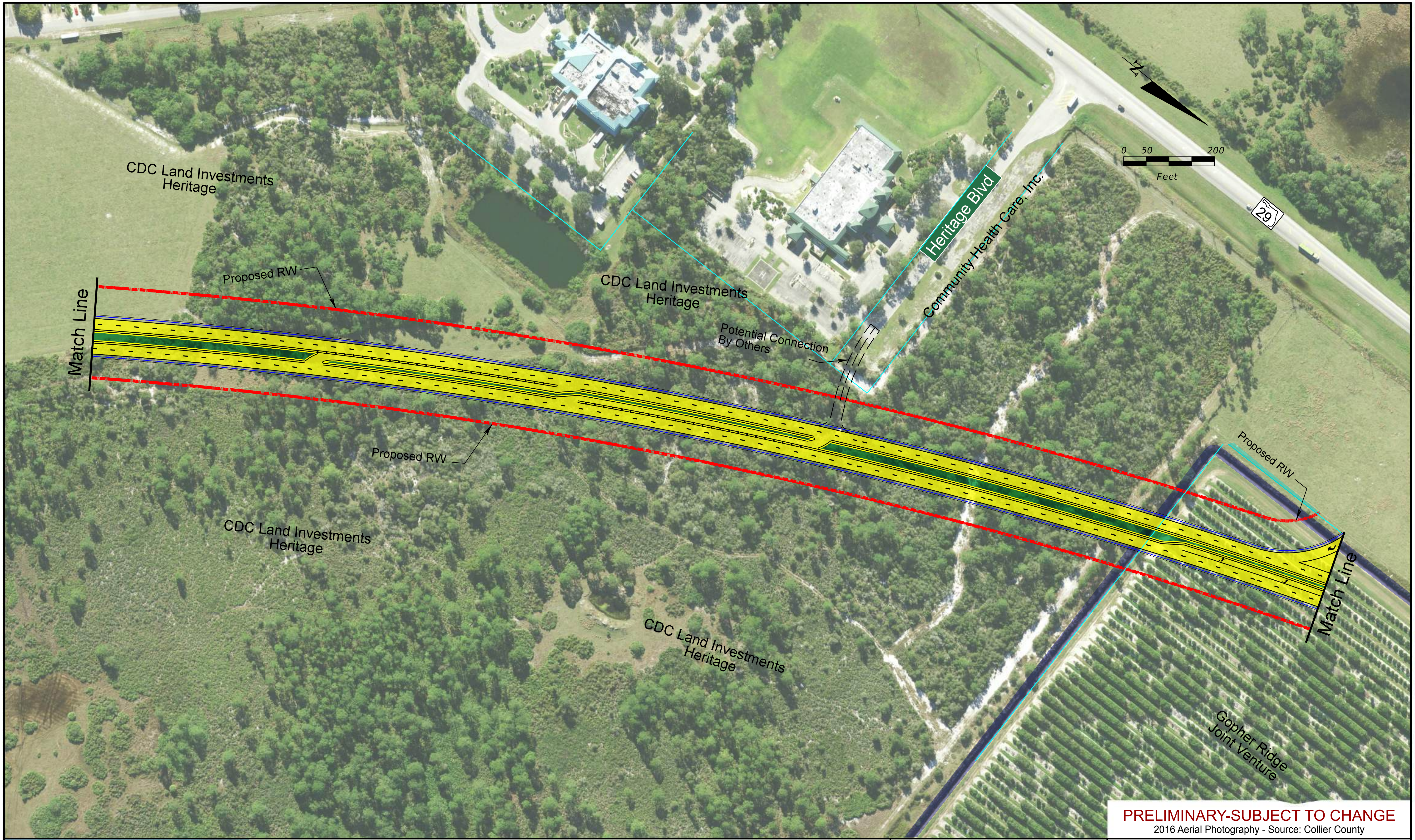

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetland	Proposed Pavement	Proposed Guardrail
Parcels	Potential Pond	Proposed Median/Border	Potential Business Relocation
Proposed Right-of-Way	Potential Flood Plain Compensation	Proposed Sidewalks	Potential Contamination (Low)
Water/Canal	Traffic Signal	Proposed Structure	Potential Contamination (Medium or High)
Seminole Land			

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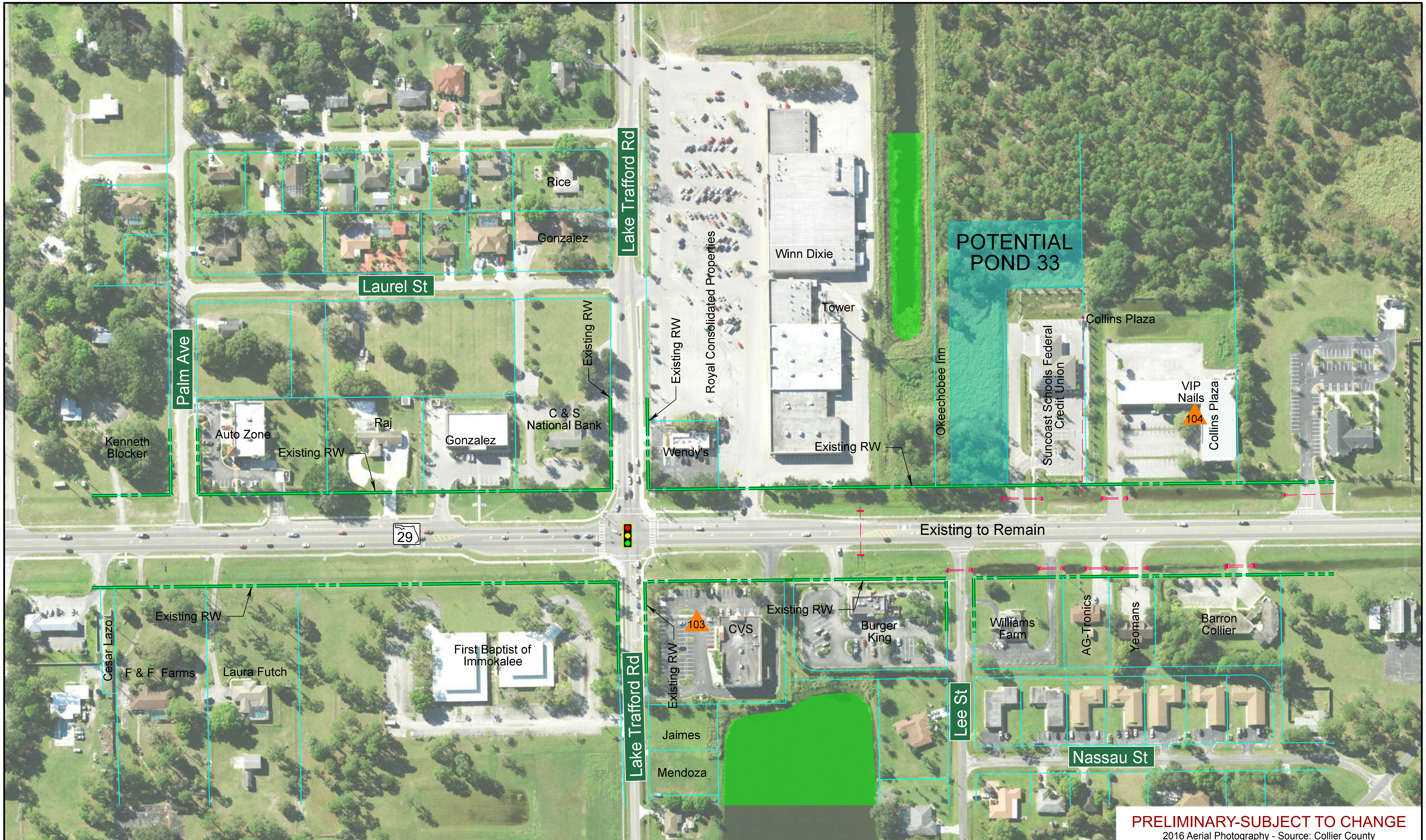

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
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- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Sheet No.
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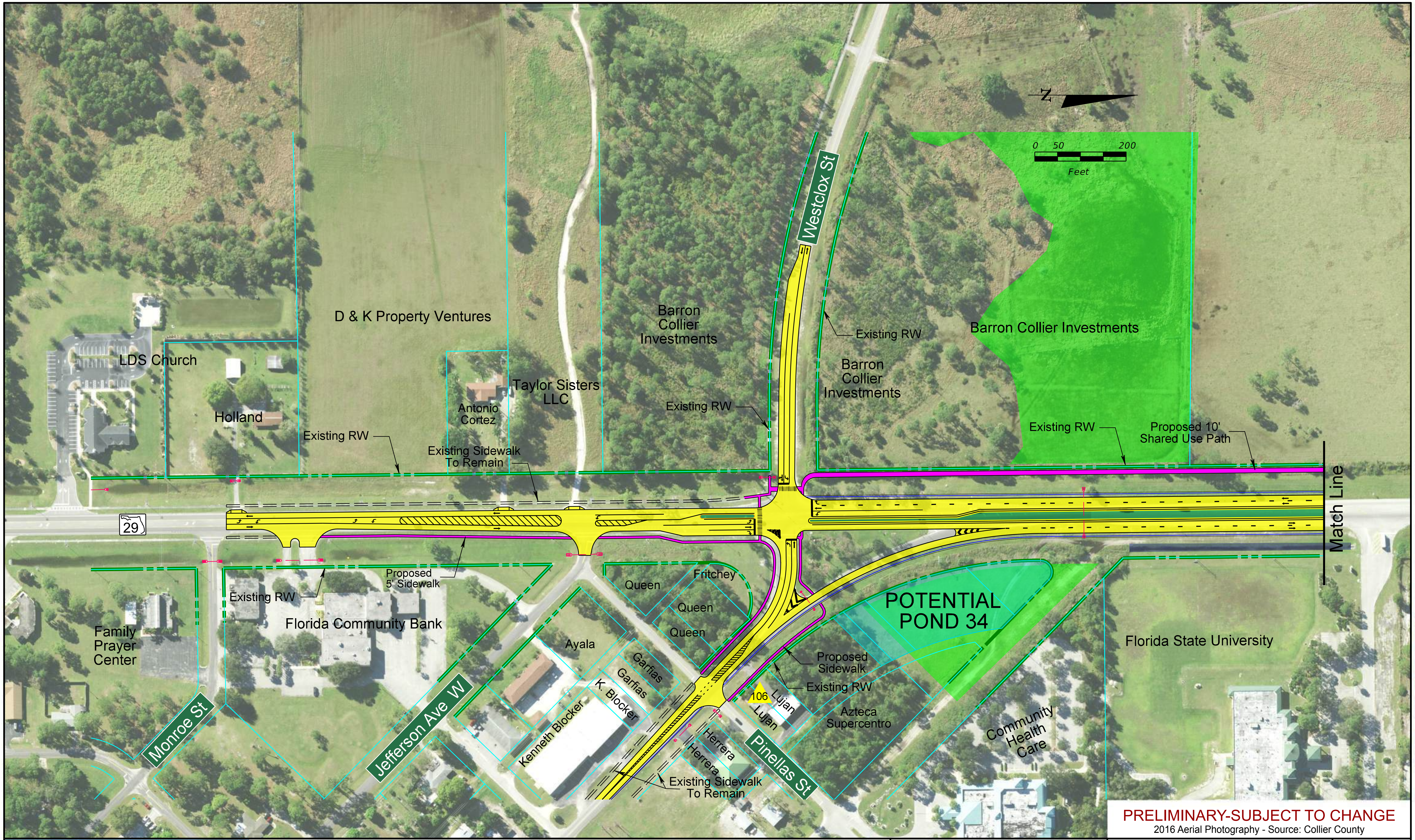

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
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- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Sheet No.
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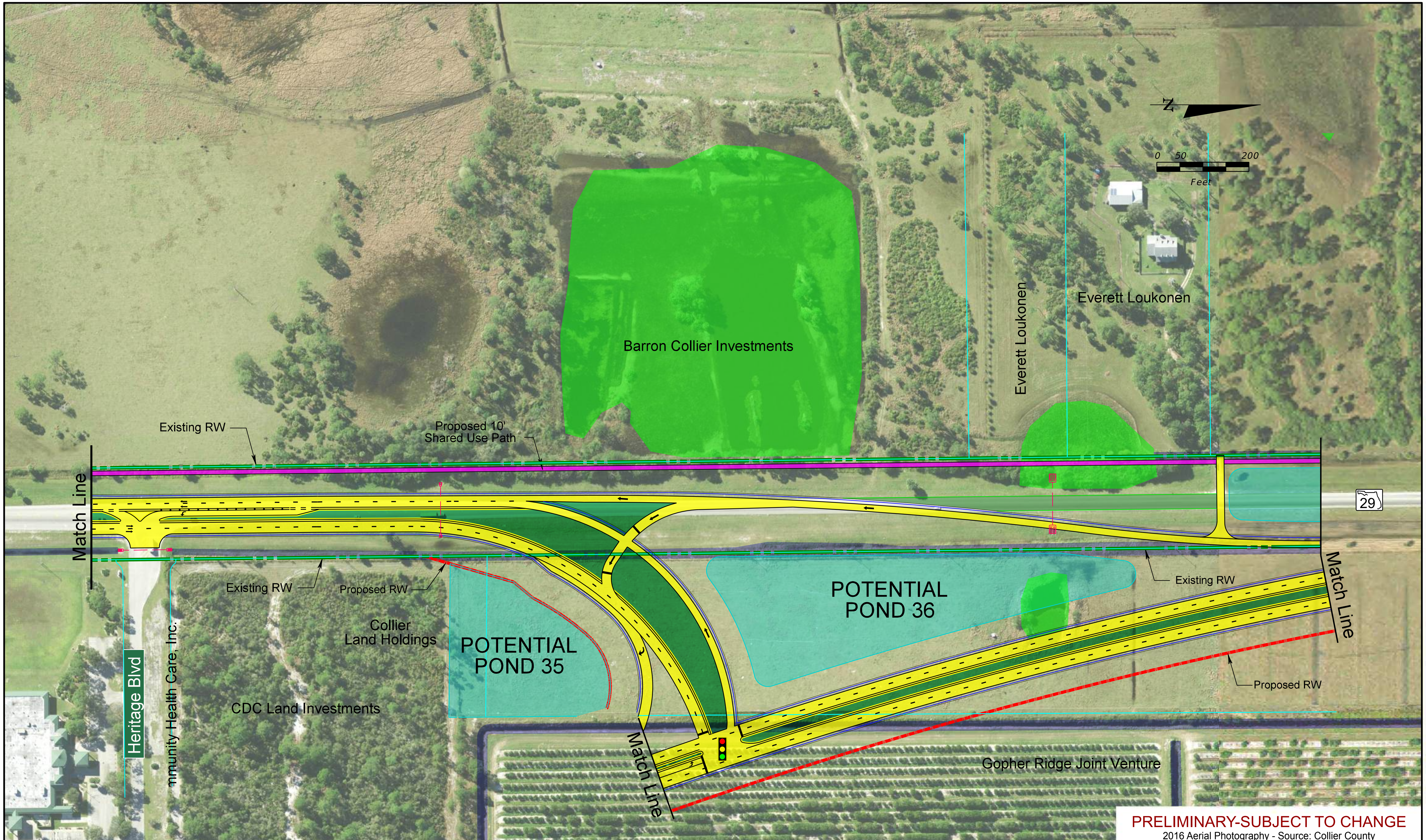

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
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- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative #2

Sheet No.
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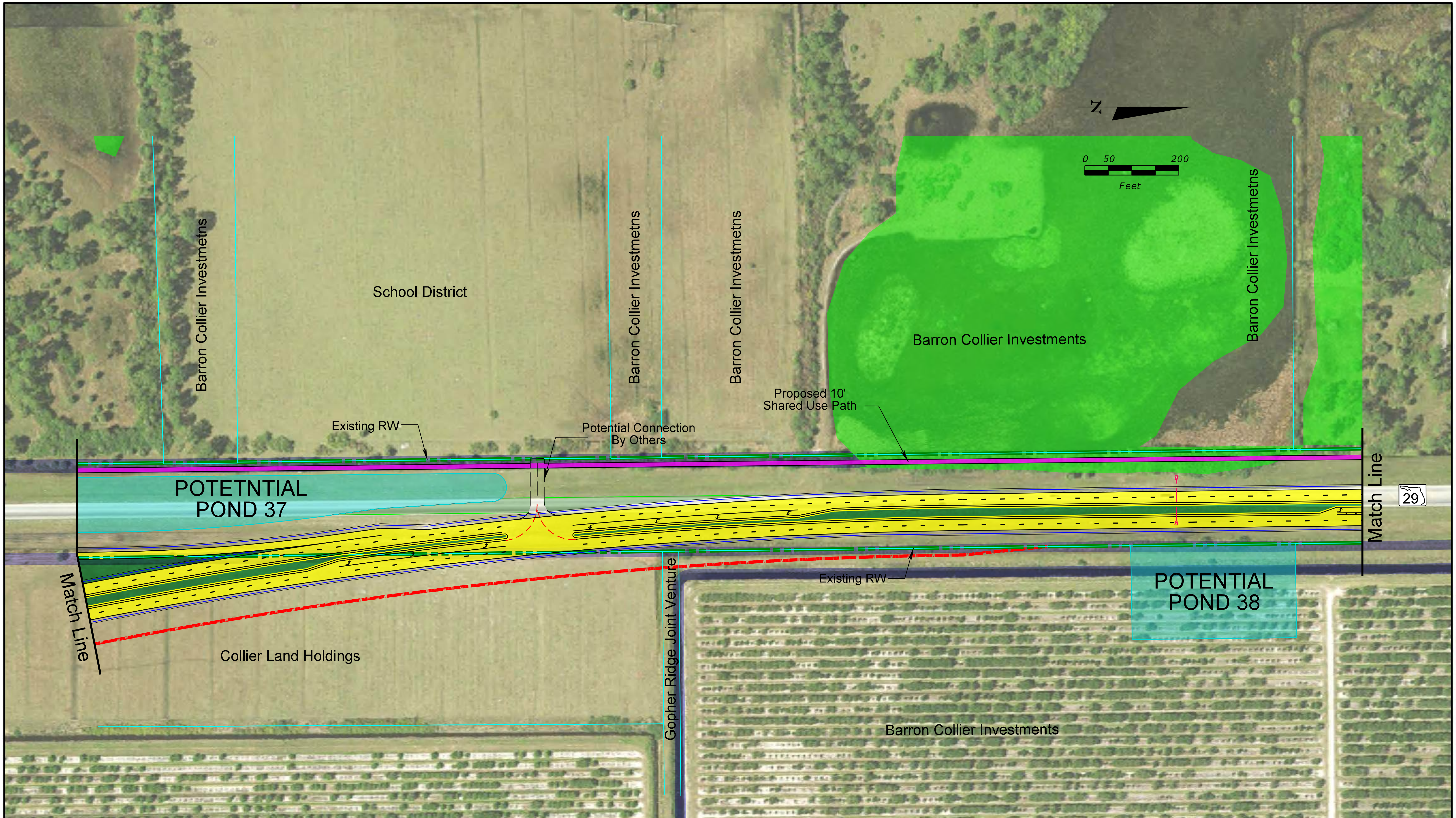

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

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Sheet No.
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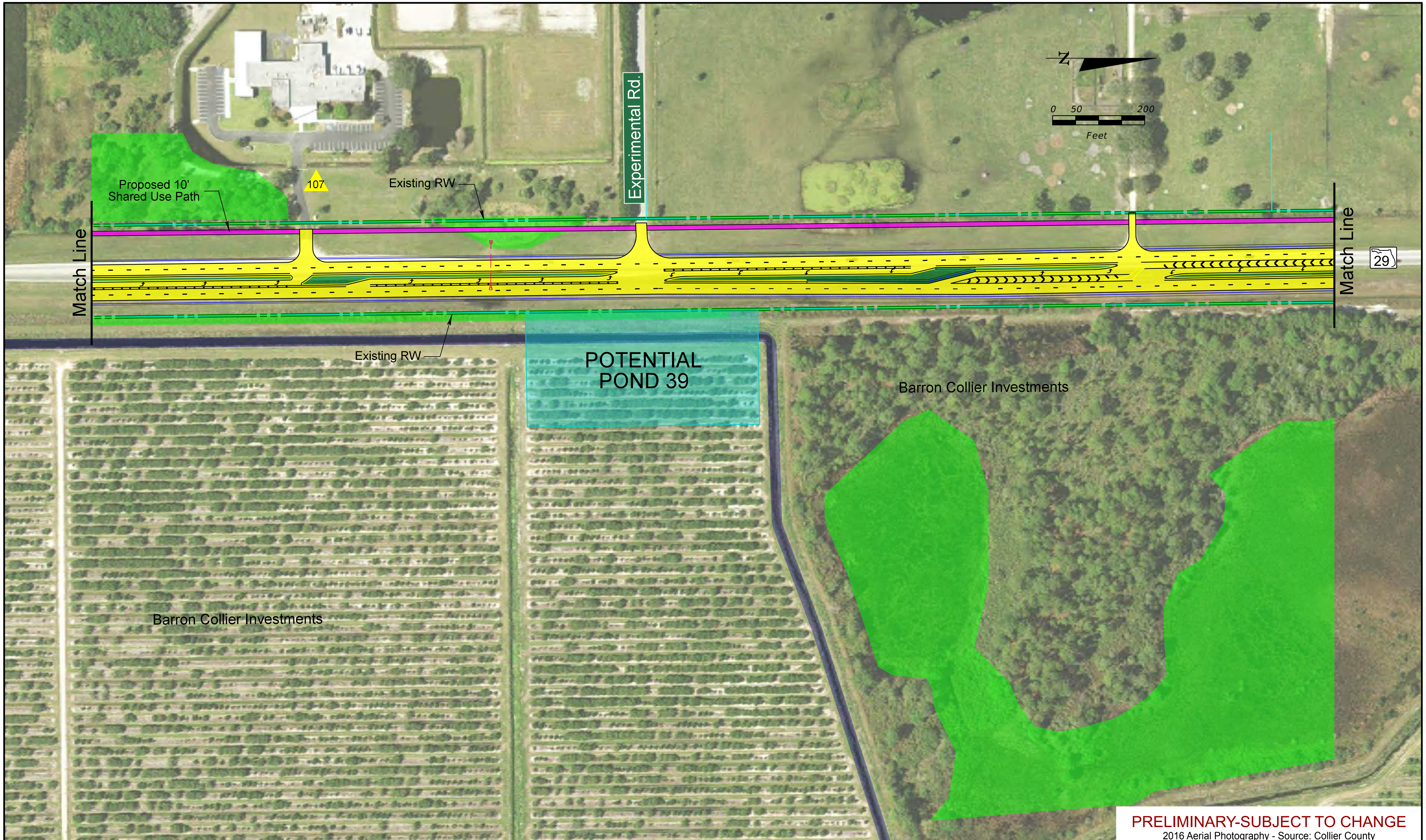

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative #2

Sheet No.
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PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
- Proposed Pavement
- Proposed Median/Border
- Proposed Sidewalks
- Proposed Structure
- Proposed Guardrail
- Potential Business Relocation
- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Central Alternative #2

Sheet No.
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Appendix B

Existing Drainage Maps

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
B-1

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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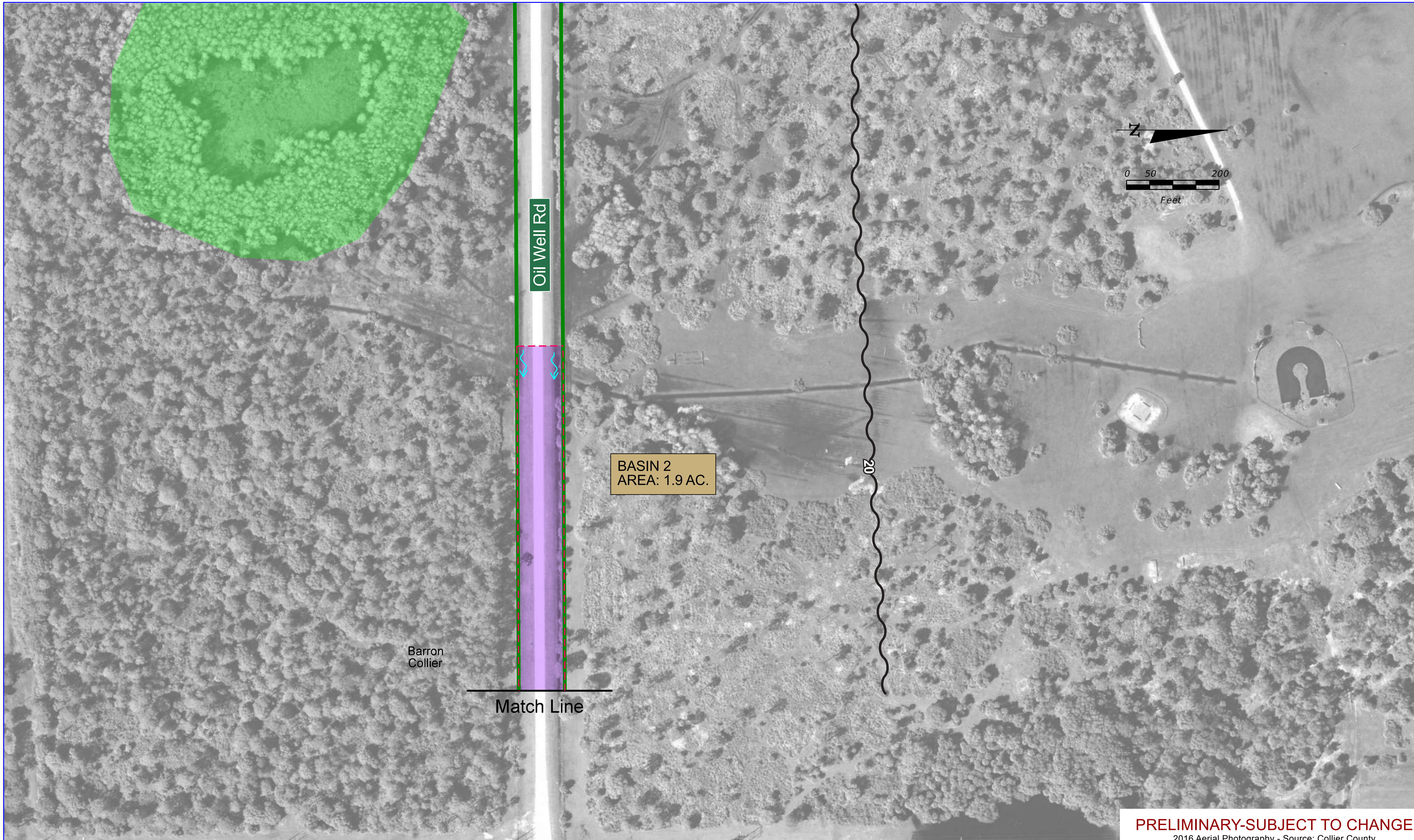
Existing Drainage Maps

Sheet No.

B-2



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.

B-3

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
B-4

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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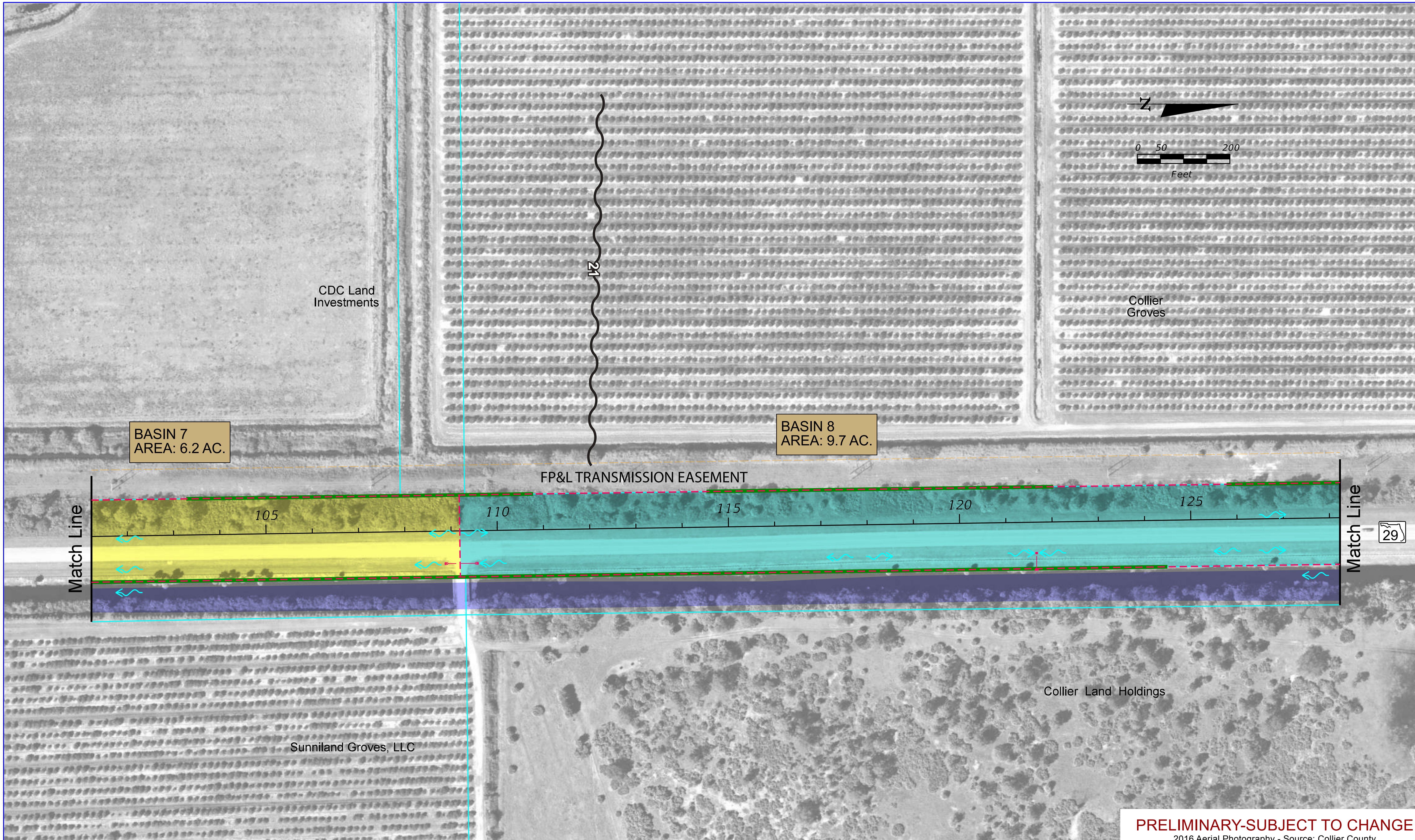
Existing Drainage Maps

Sheet No.
B-5



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
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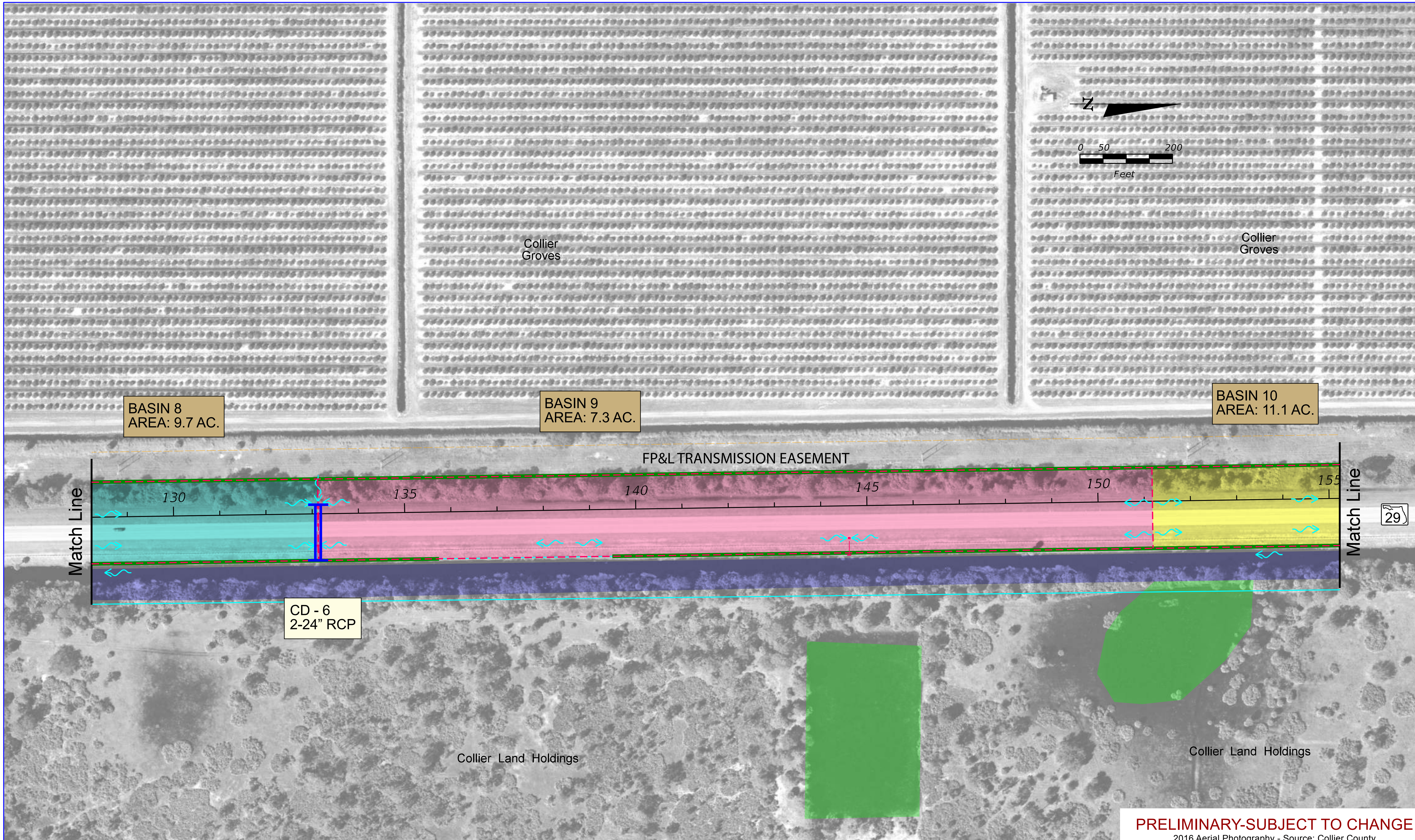

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
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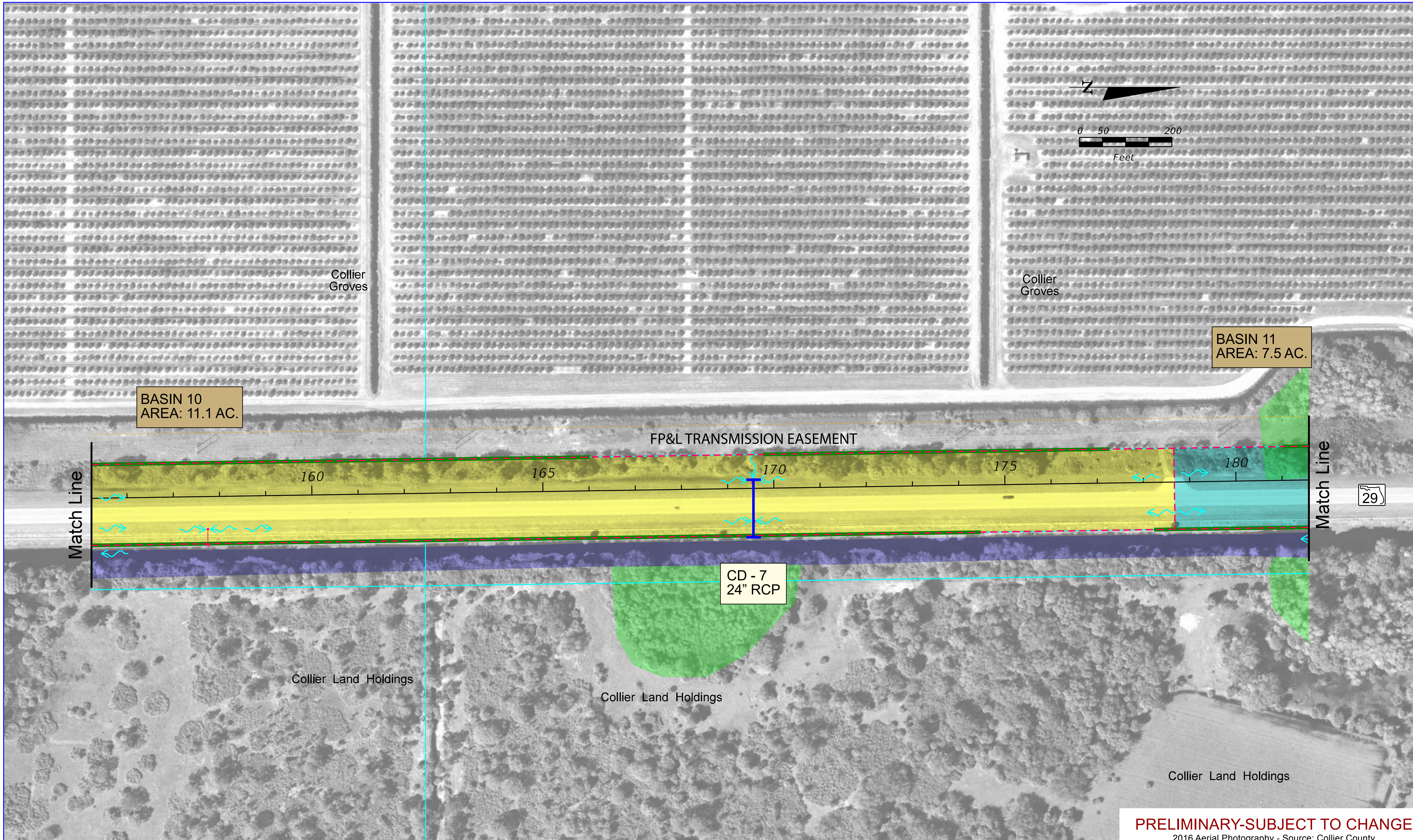

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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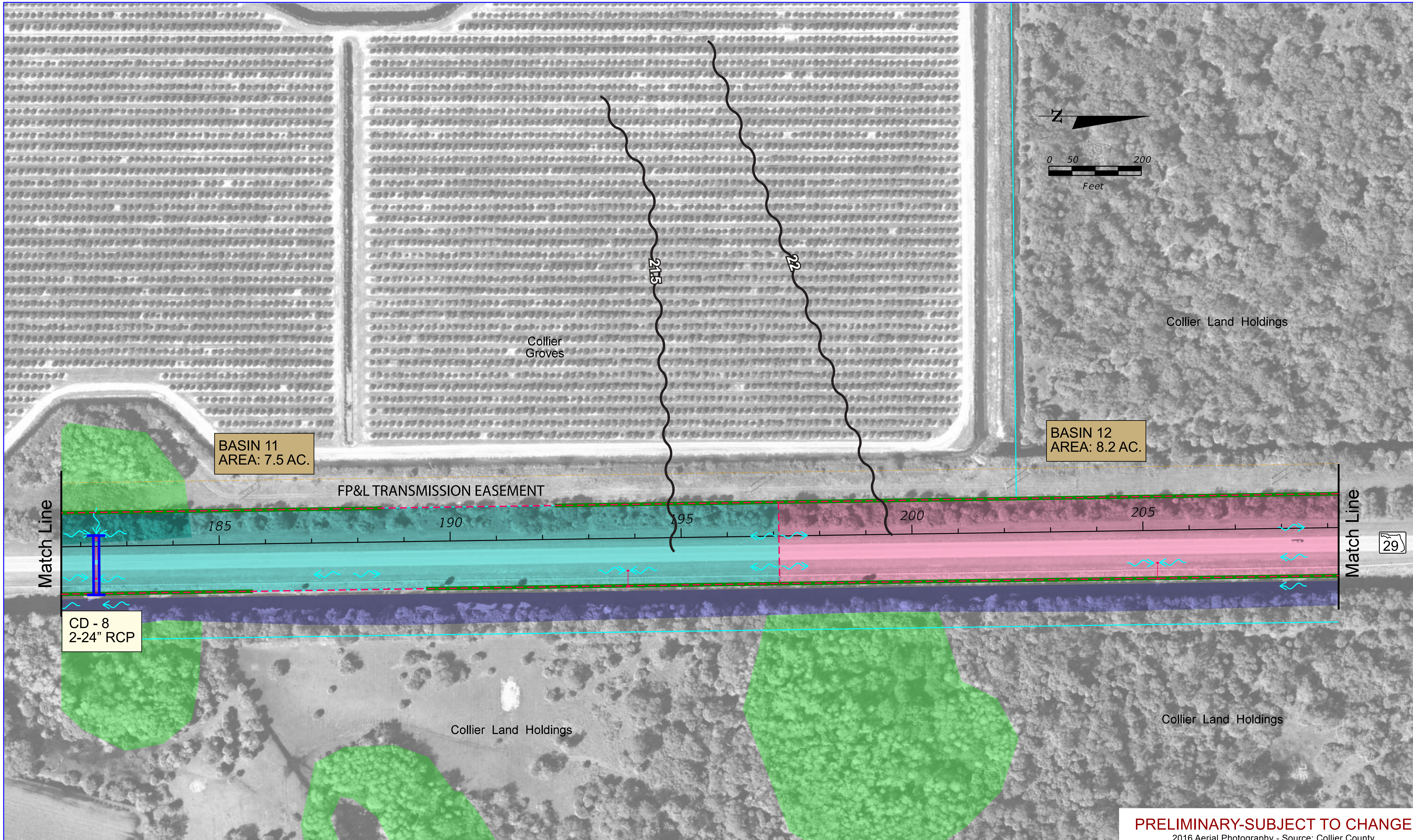
Existing Drainage Maps

Sheet No.
B-8



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3811 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Existing Drainage Maps

Sheet No.
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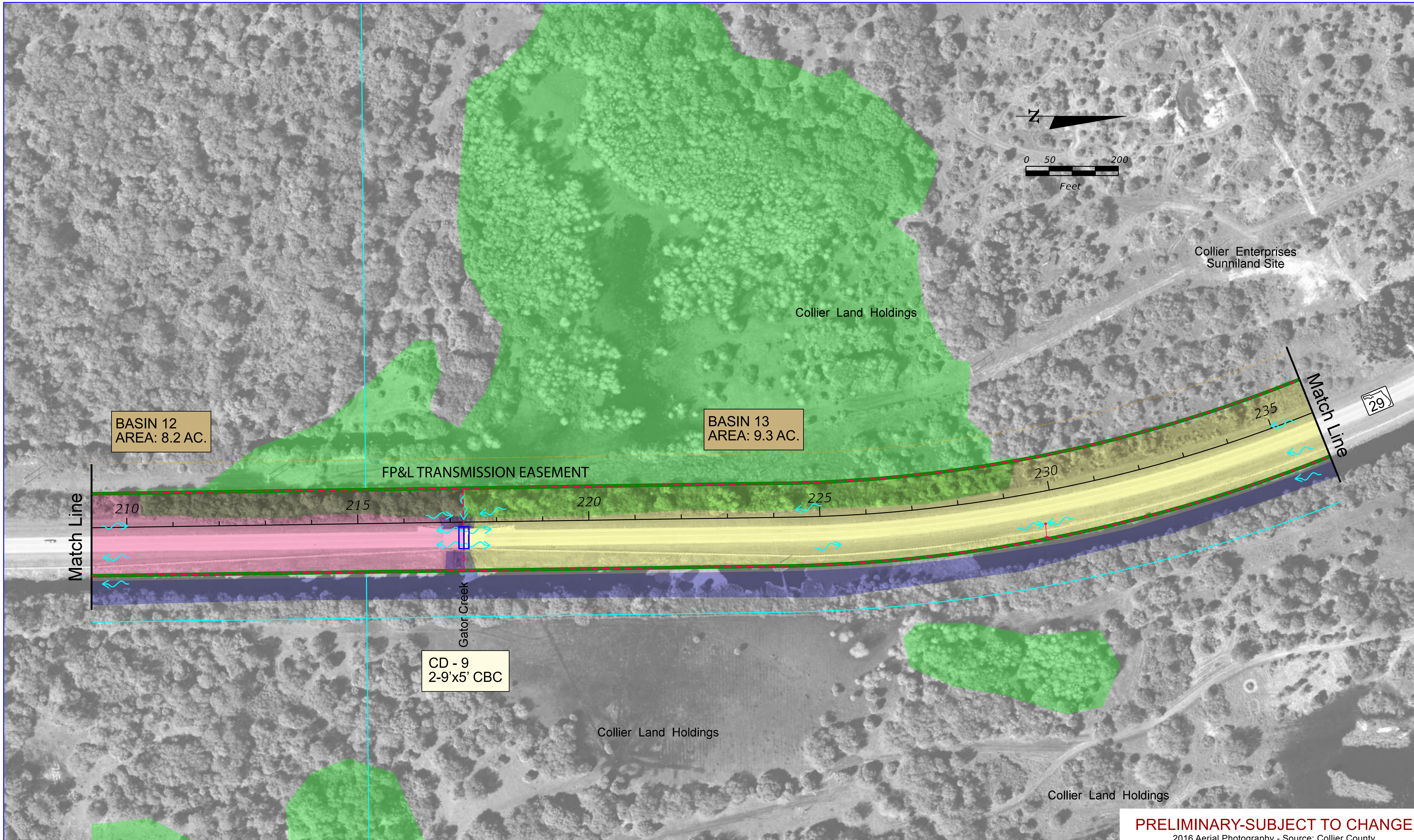

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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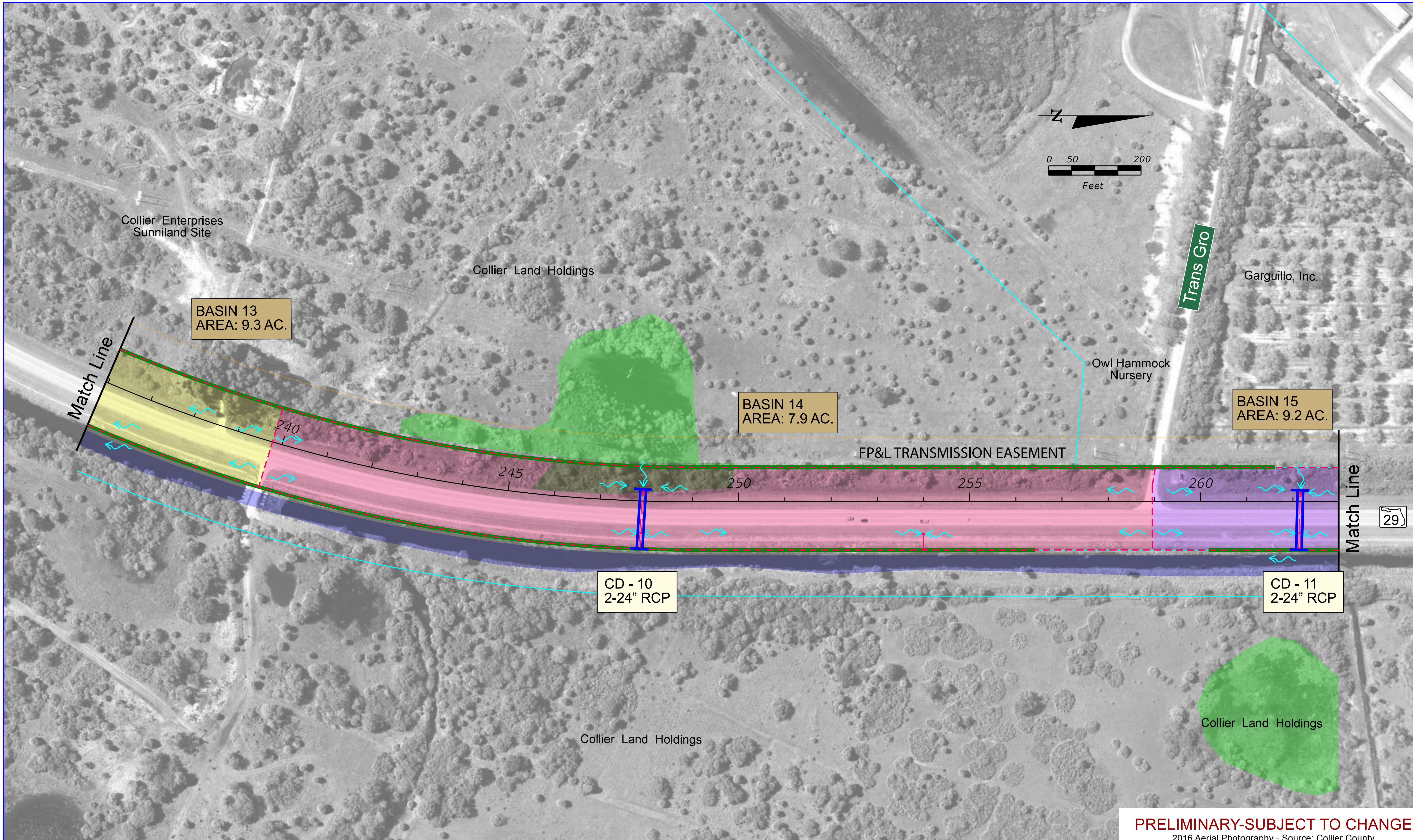
Existing Drainage Maps

Sheet No.
B-10



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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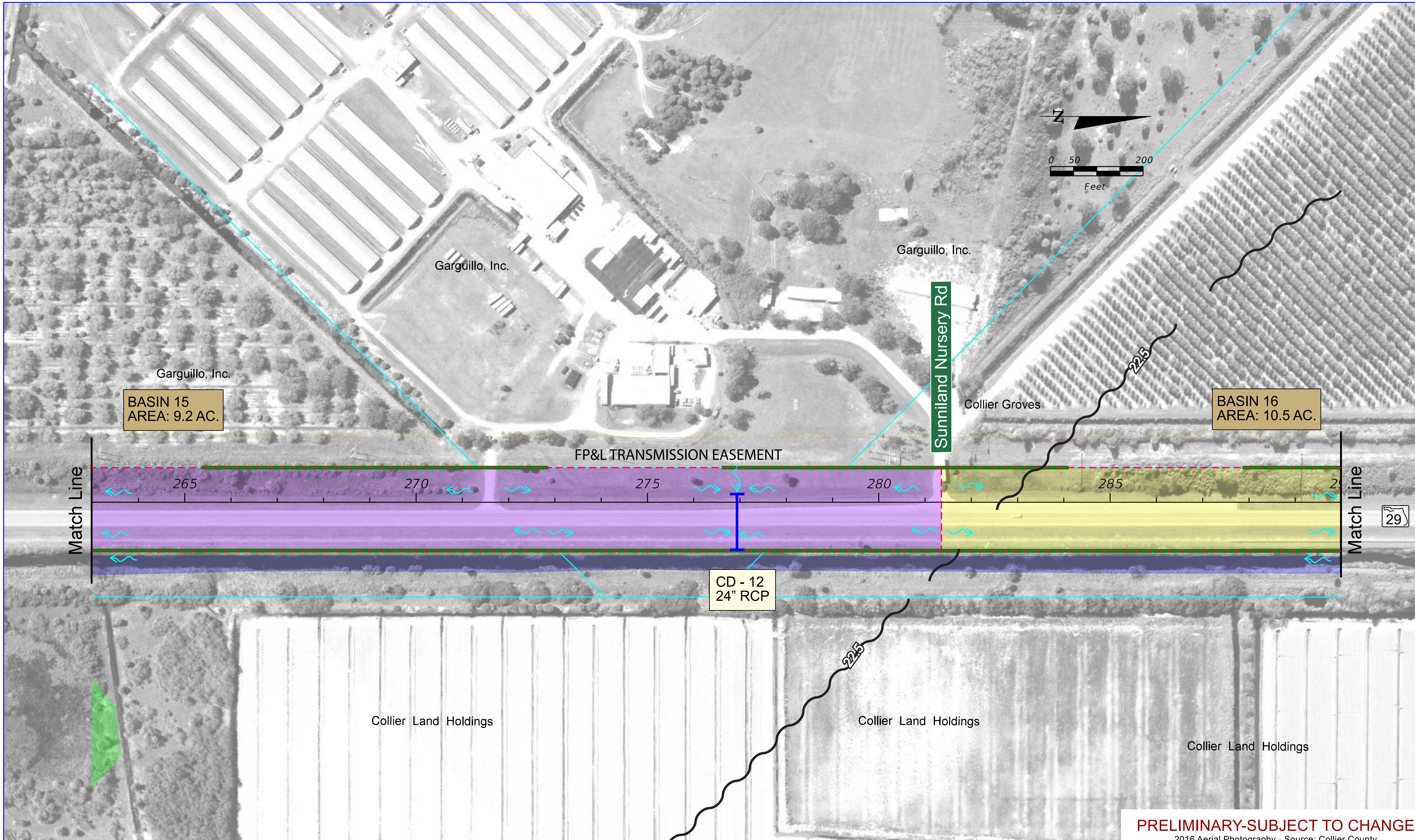

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
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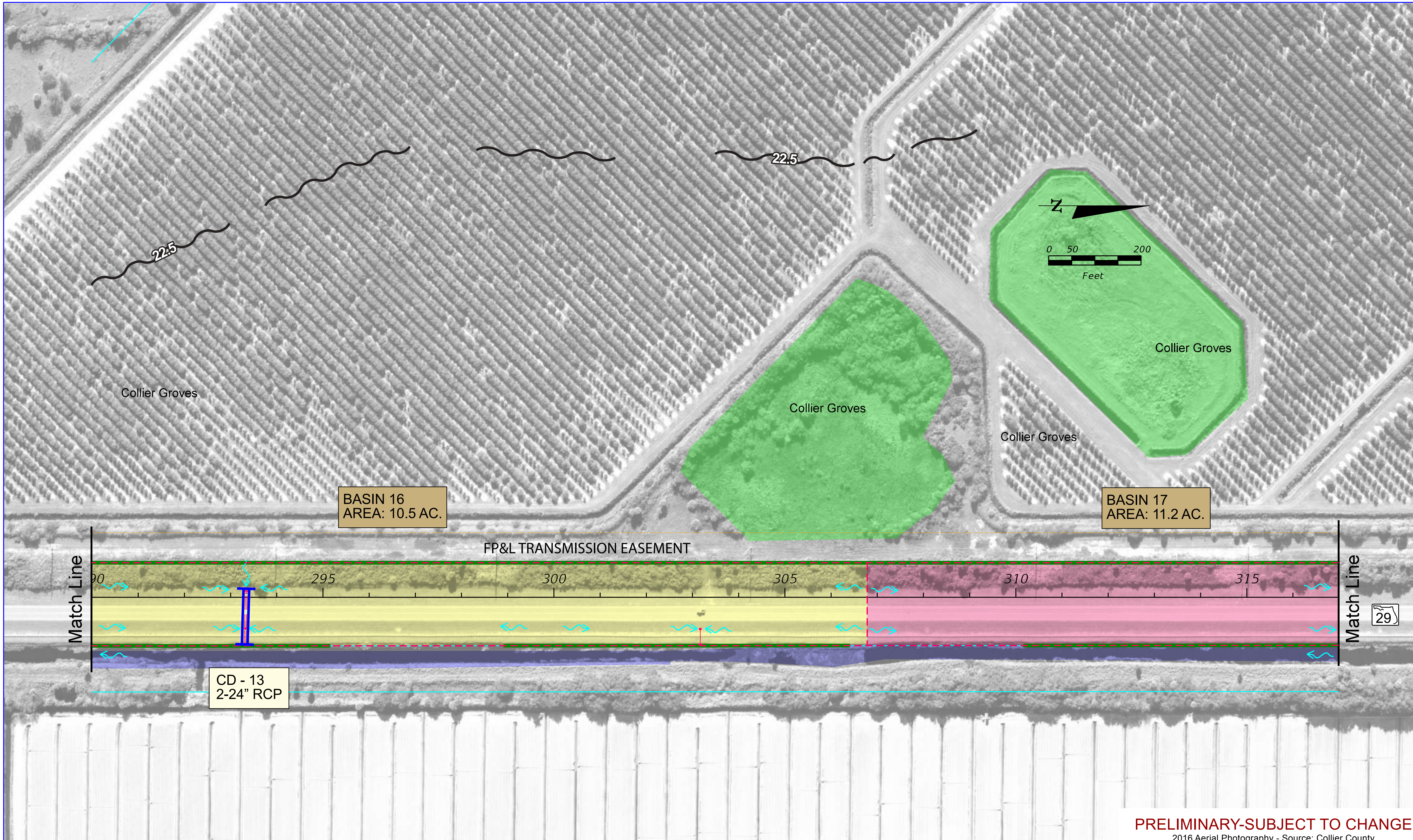

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
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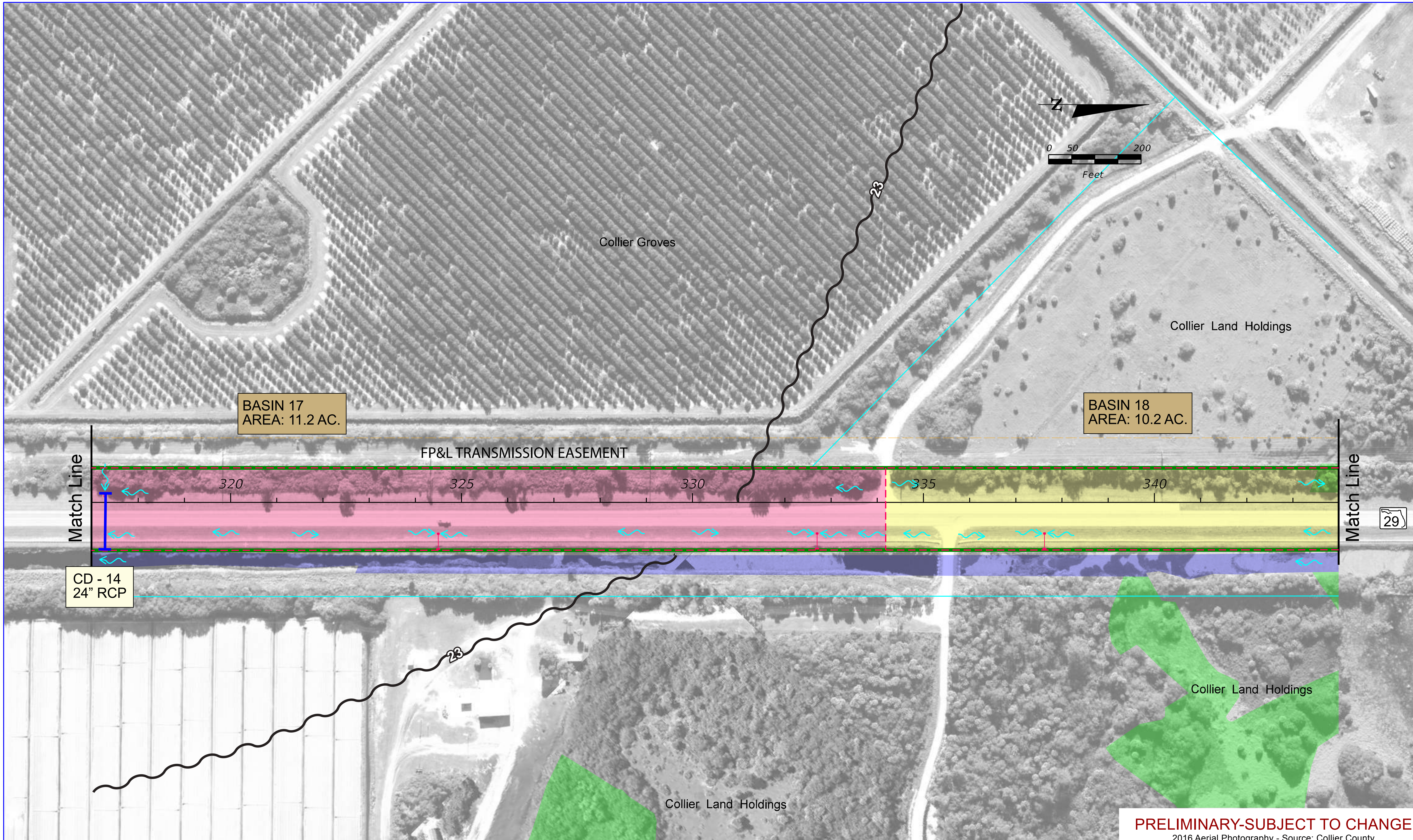

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Existing Drainage Maps

Sheet No.

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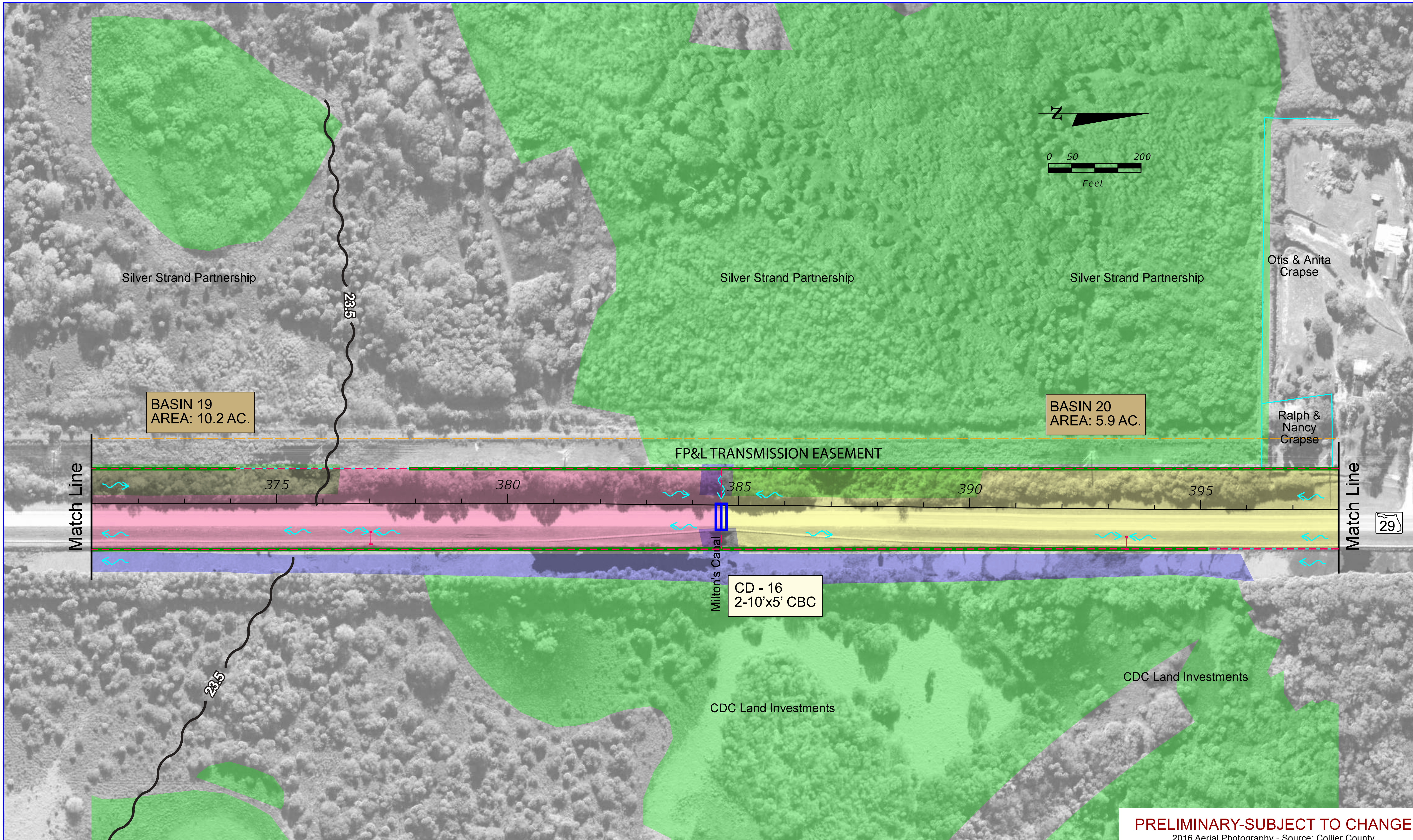

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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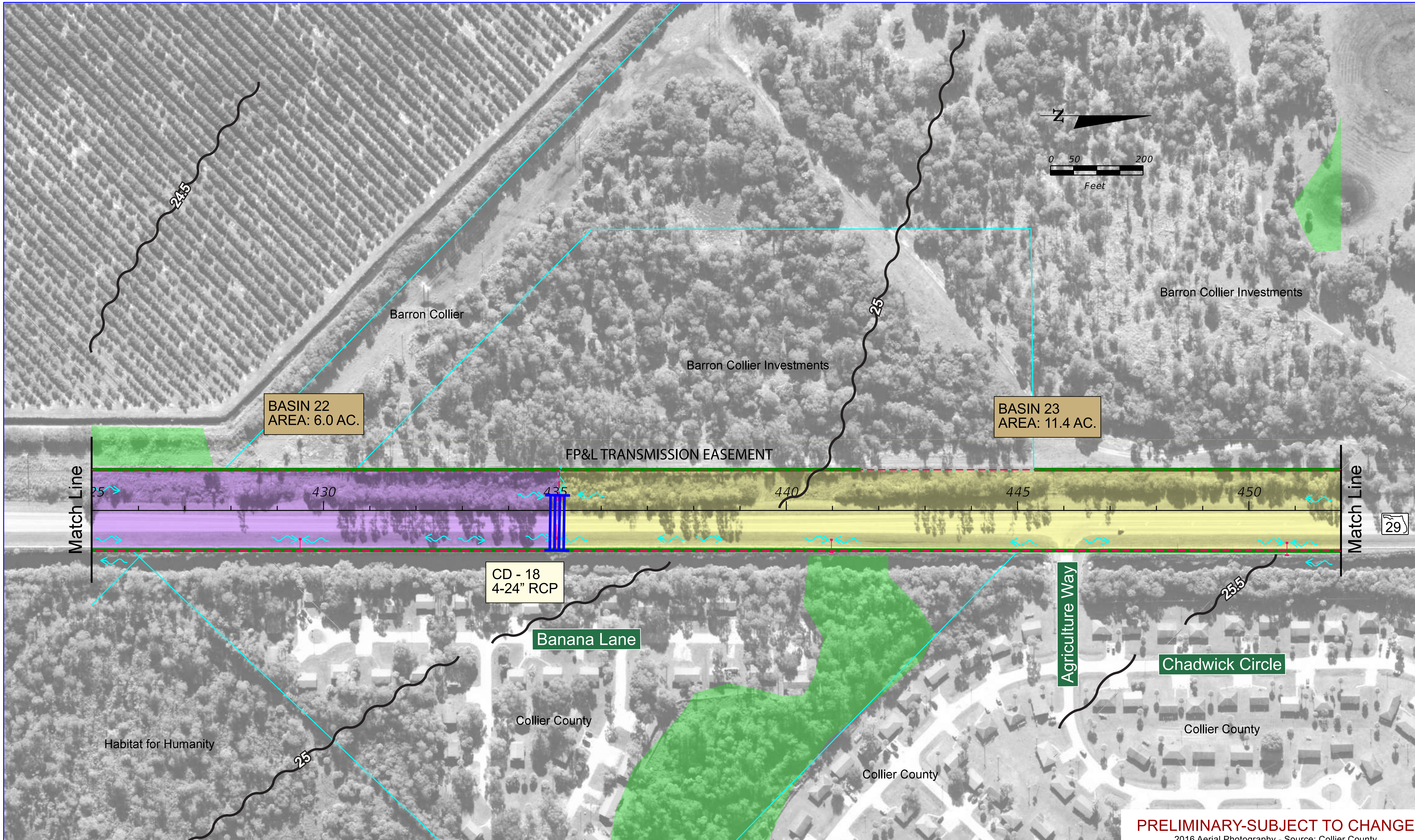
Existing Drainage Maps

Sheet No. B-17



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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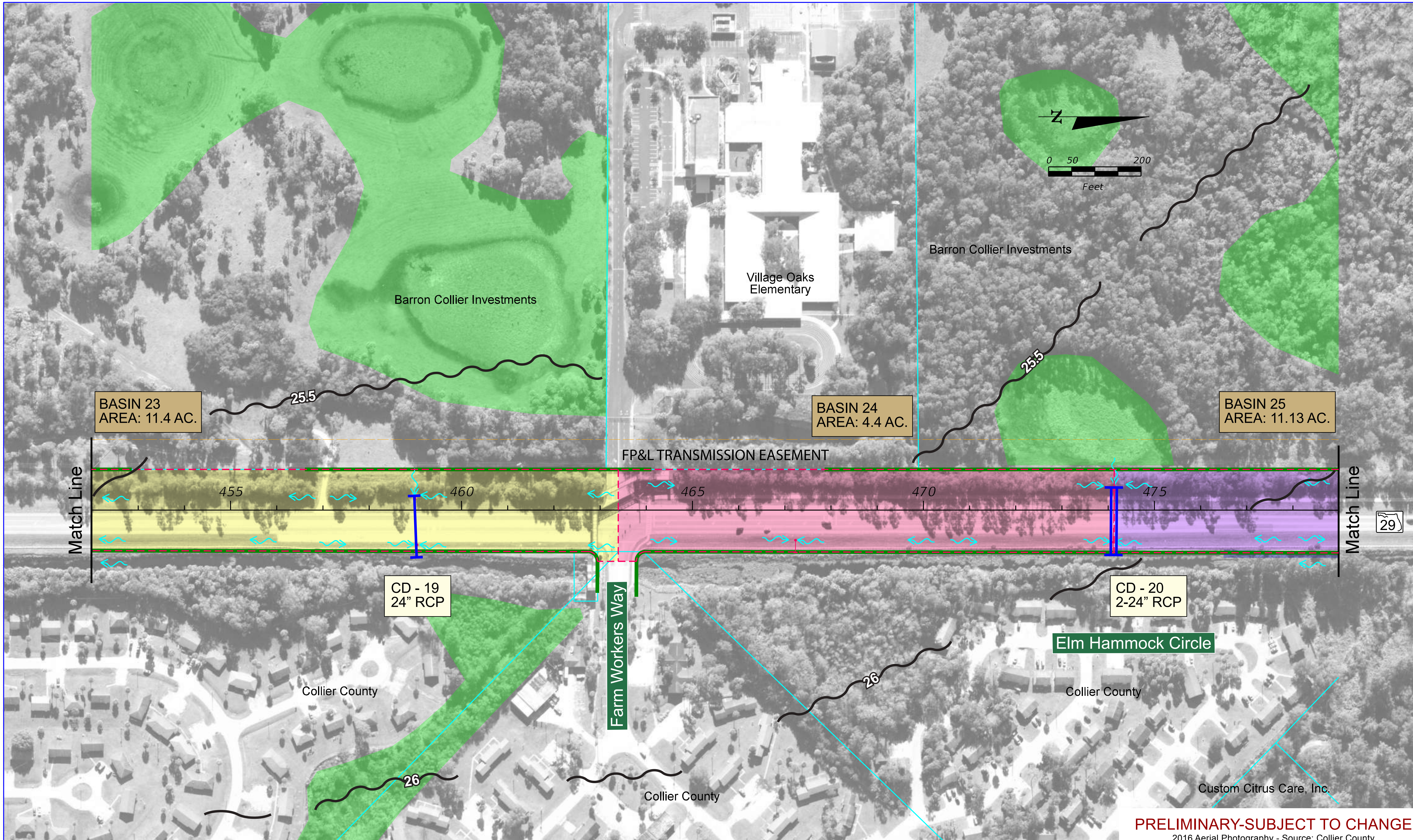

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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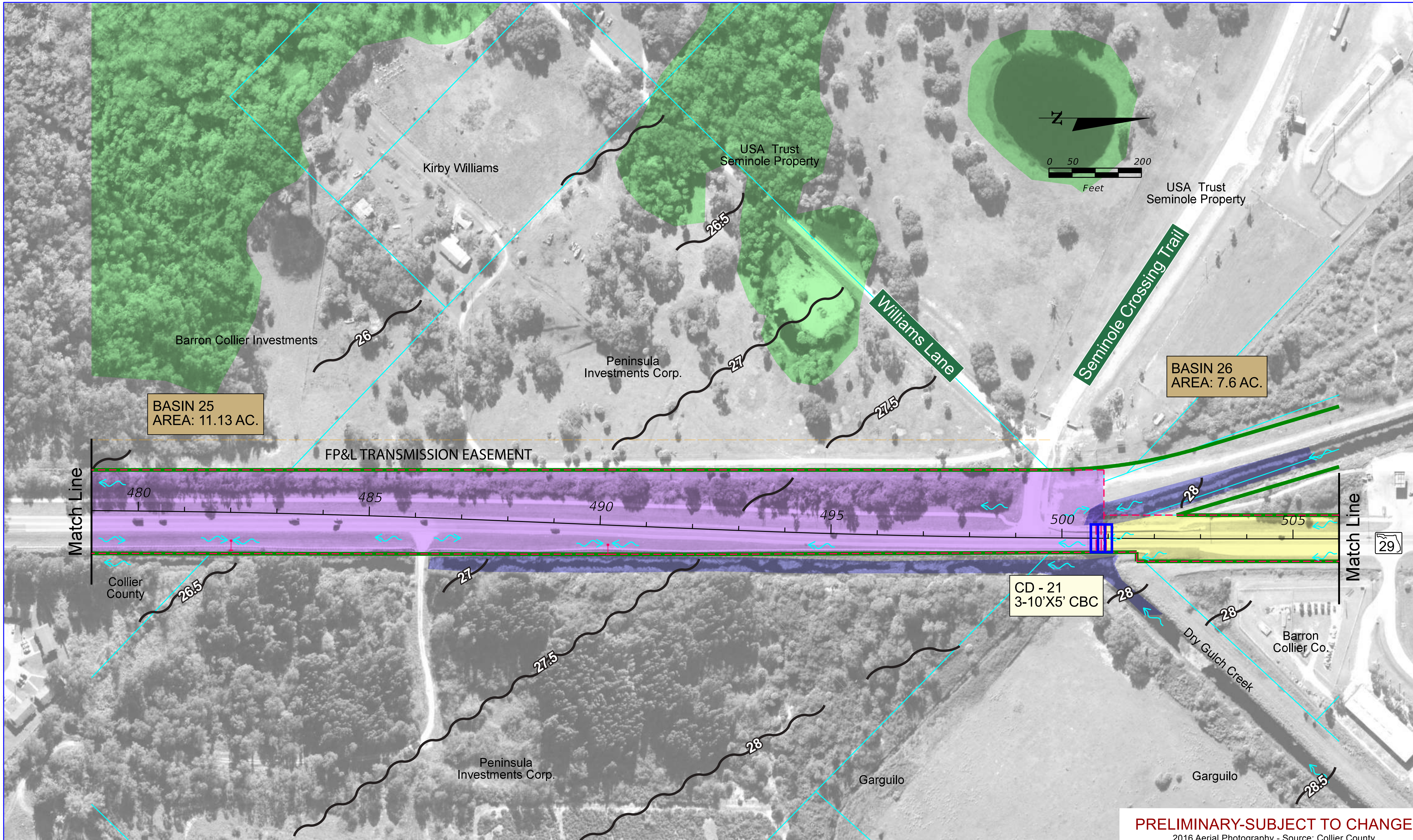

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3111 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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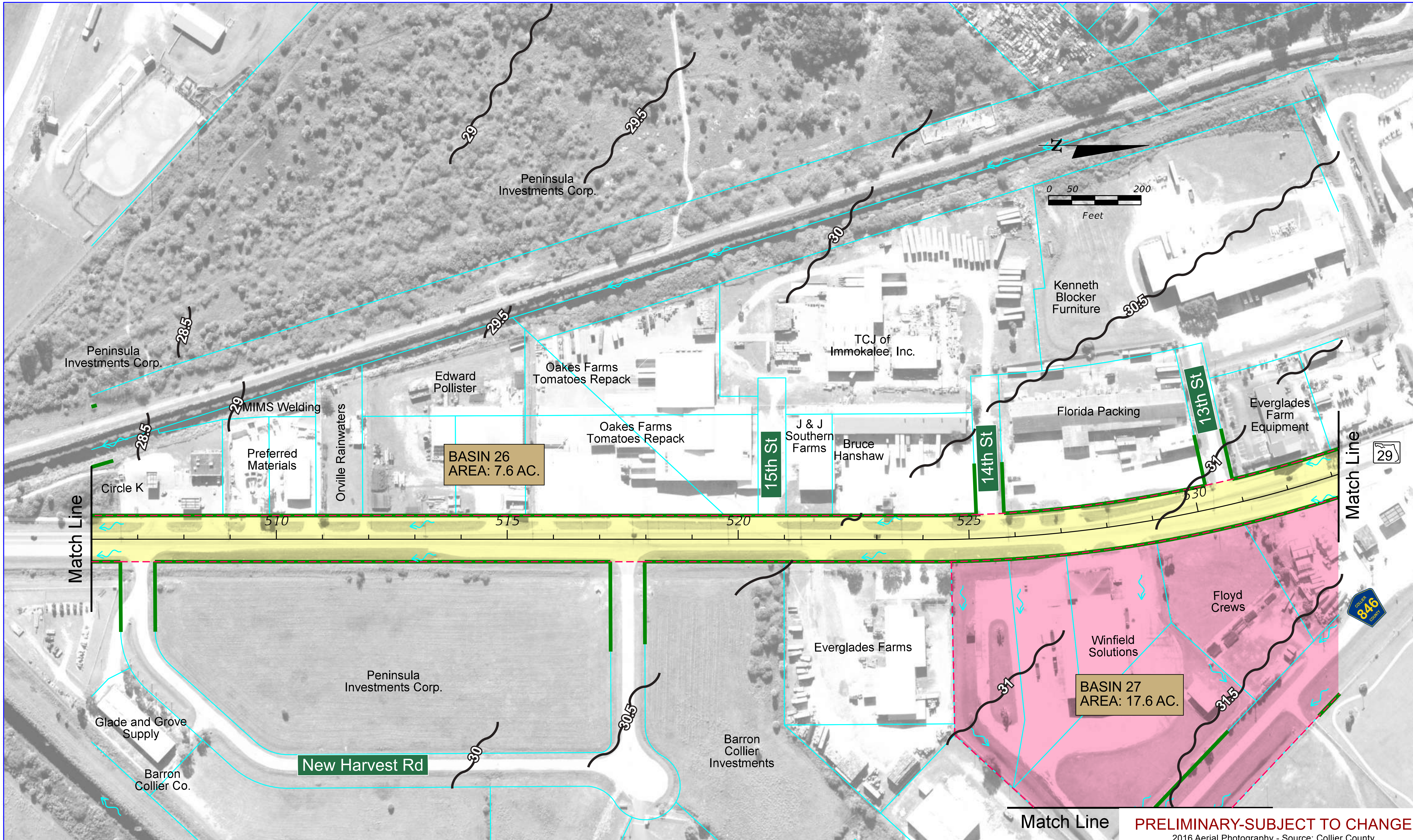

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3011 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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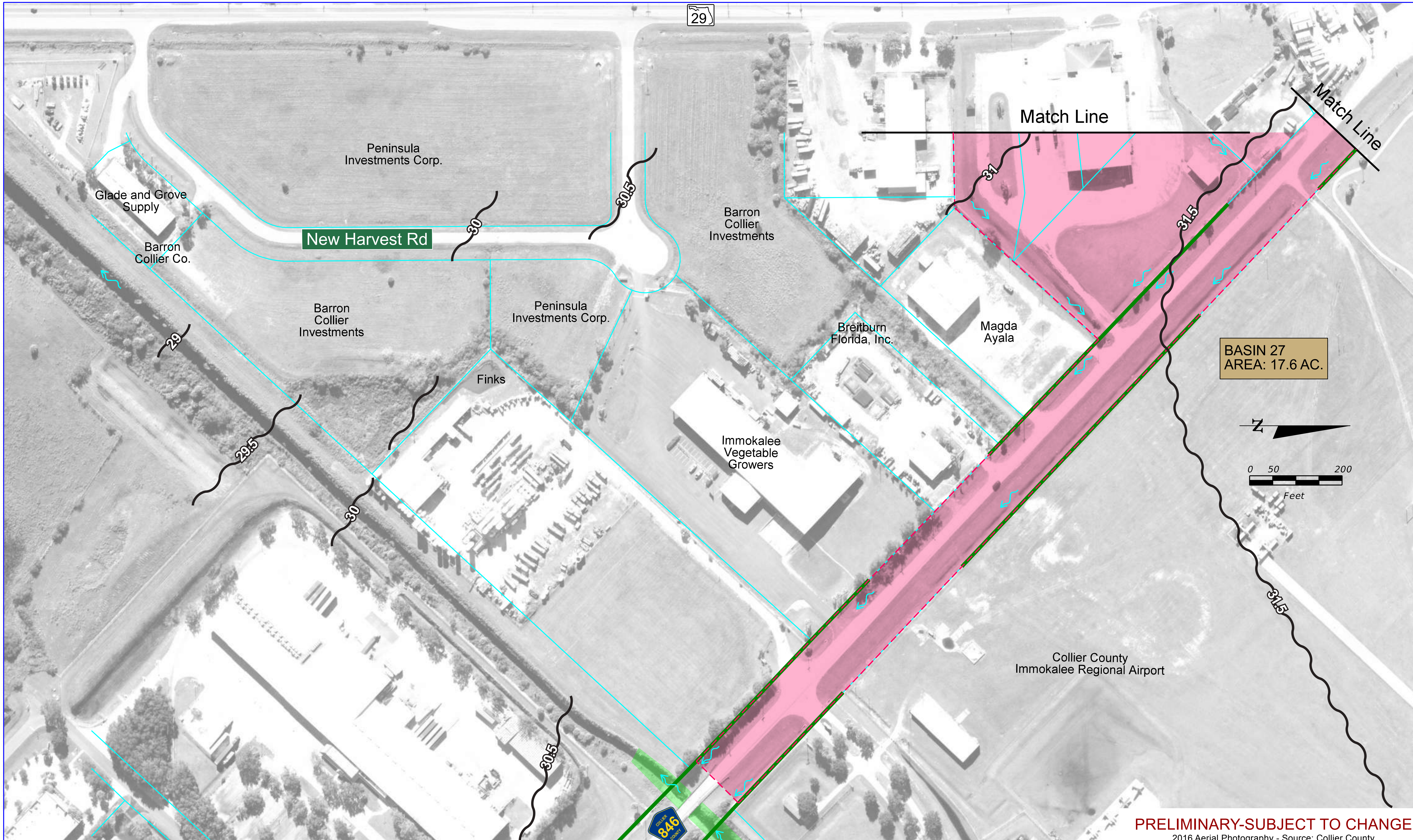
Existing Drainage Maps

Sheet No. B-21



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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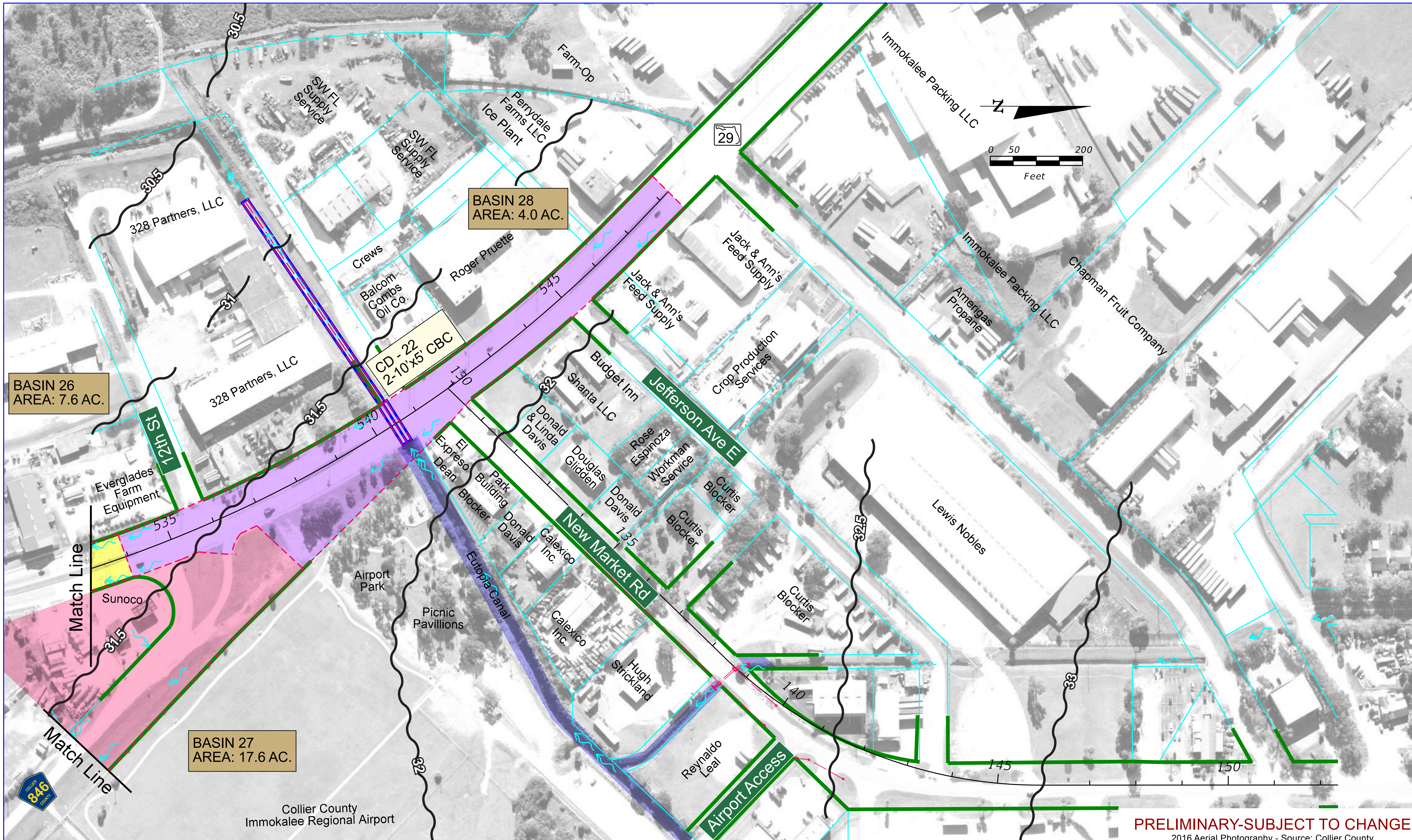
Existing Drainage Maps



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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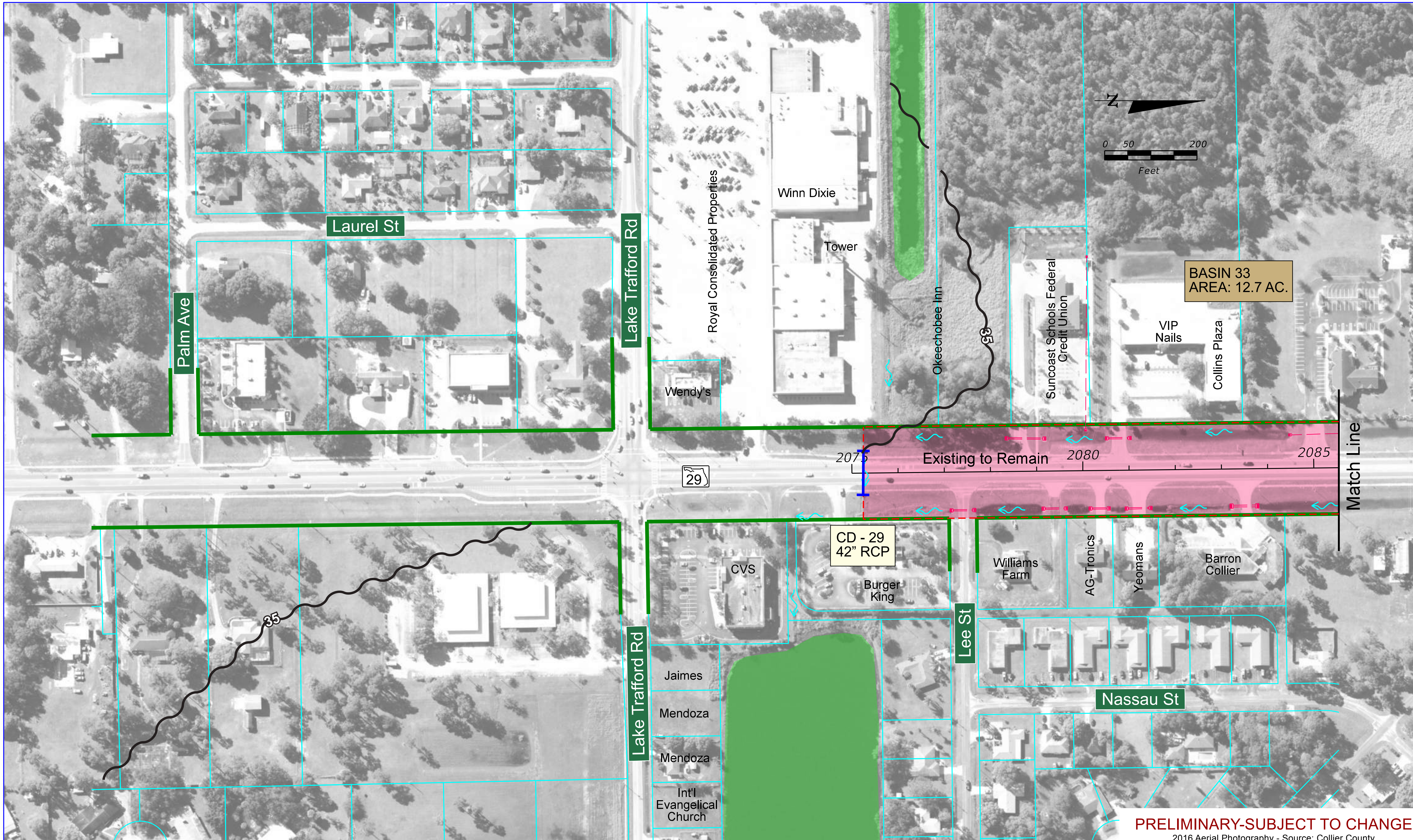

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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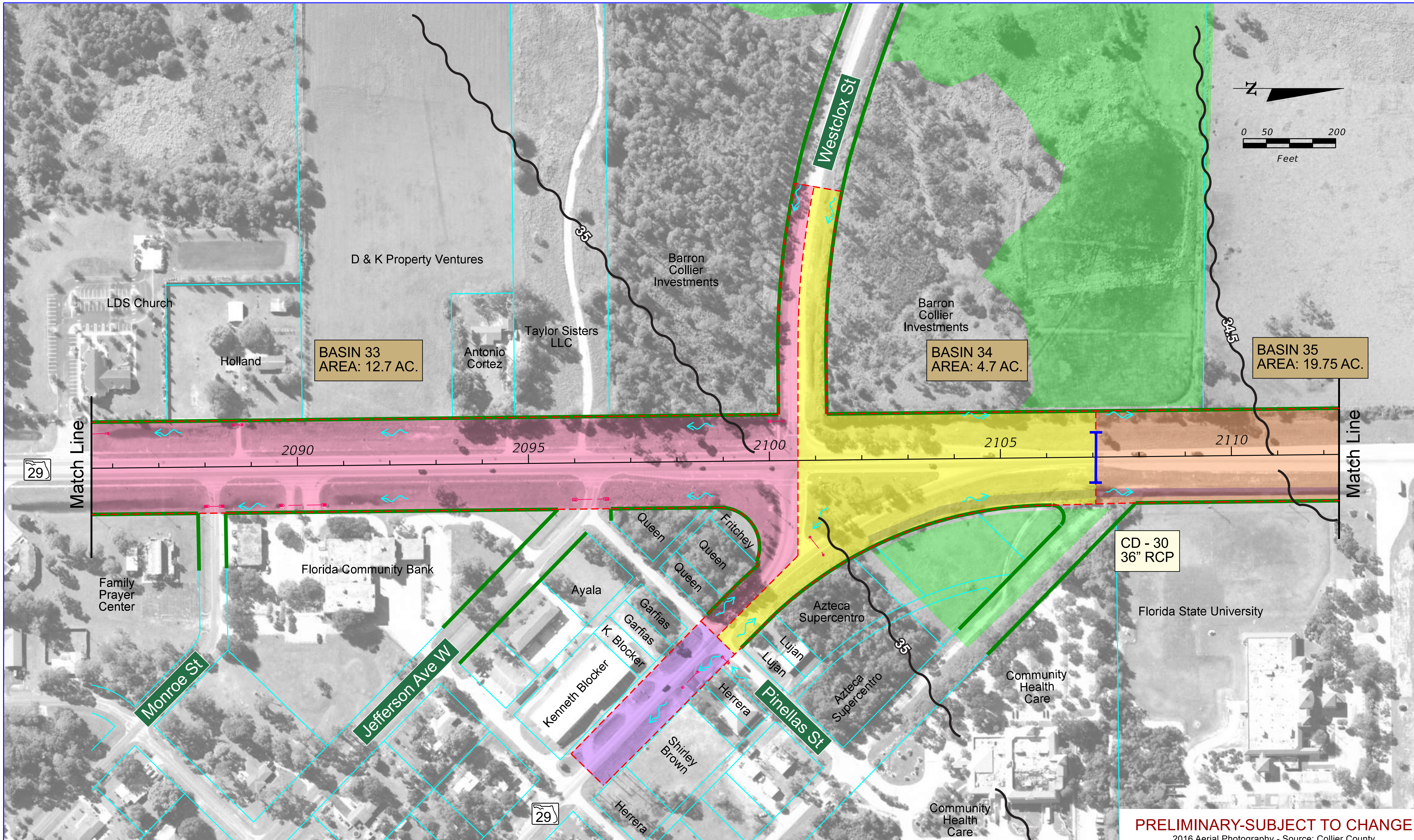

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.
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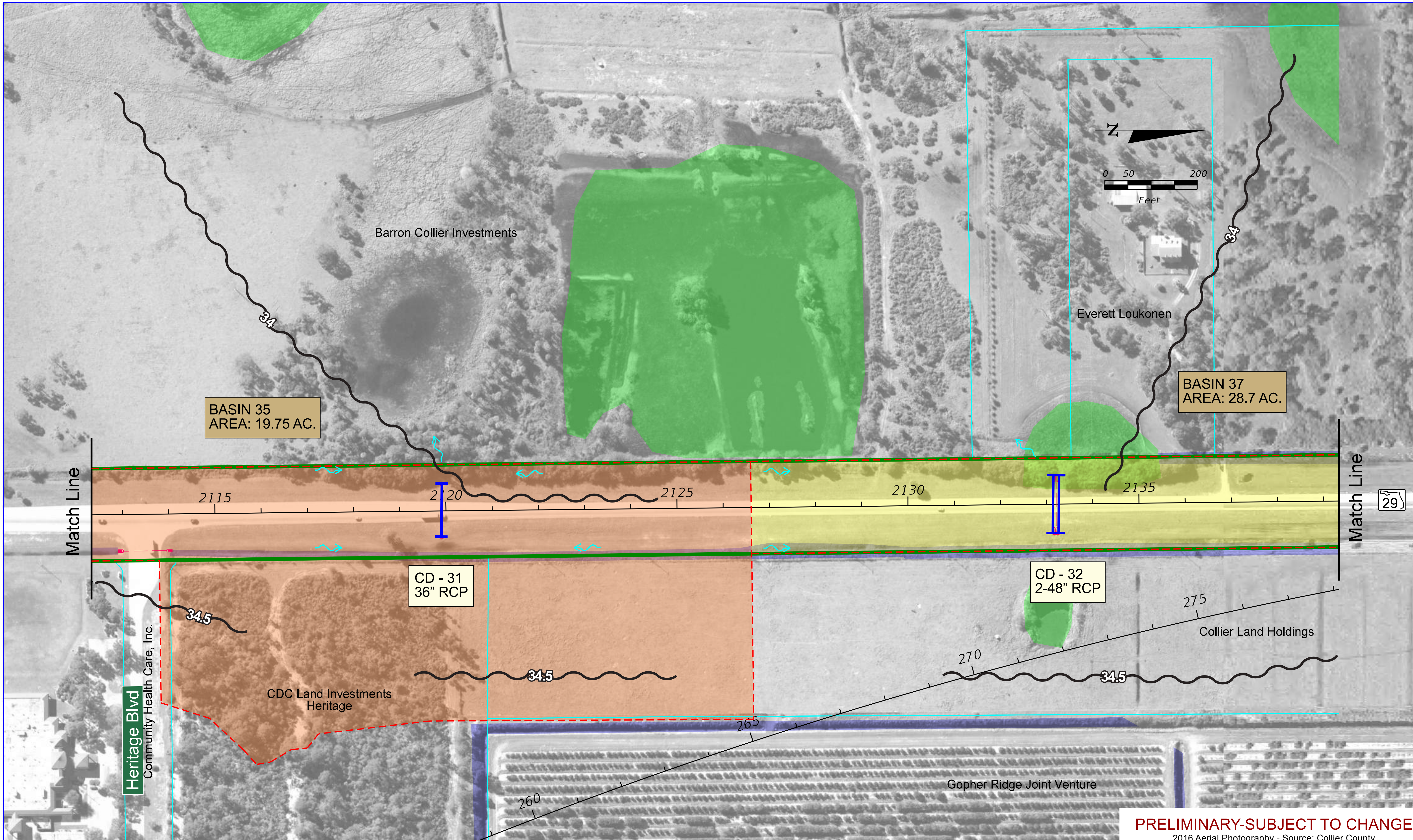

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Existing Drainage Maps

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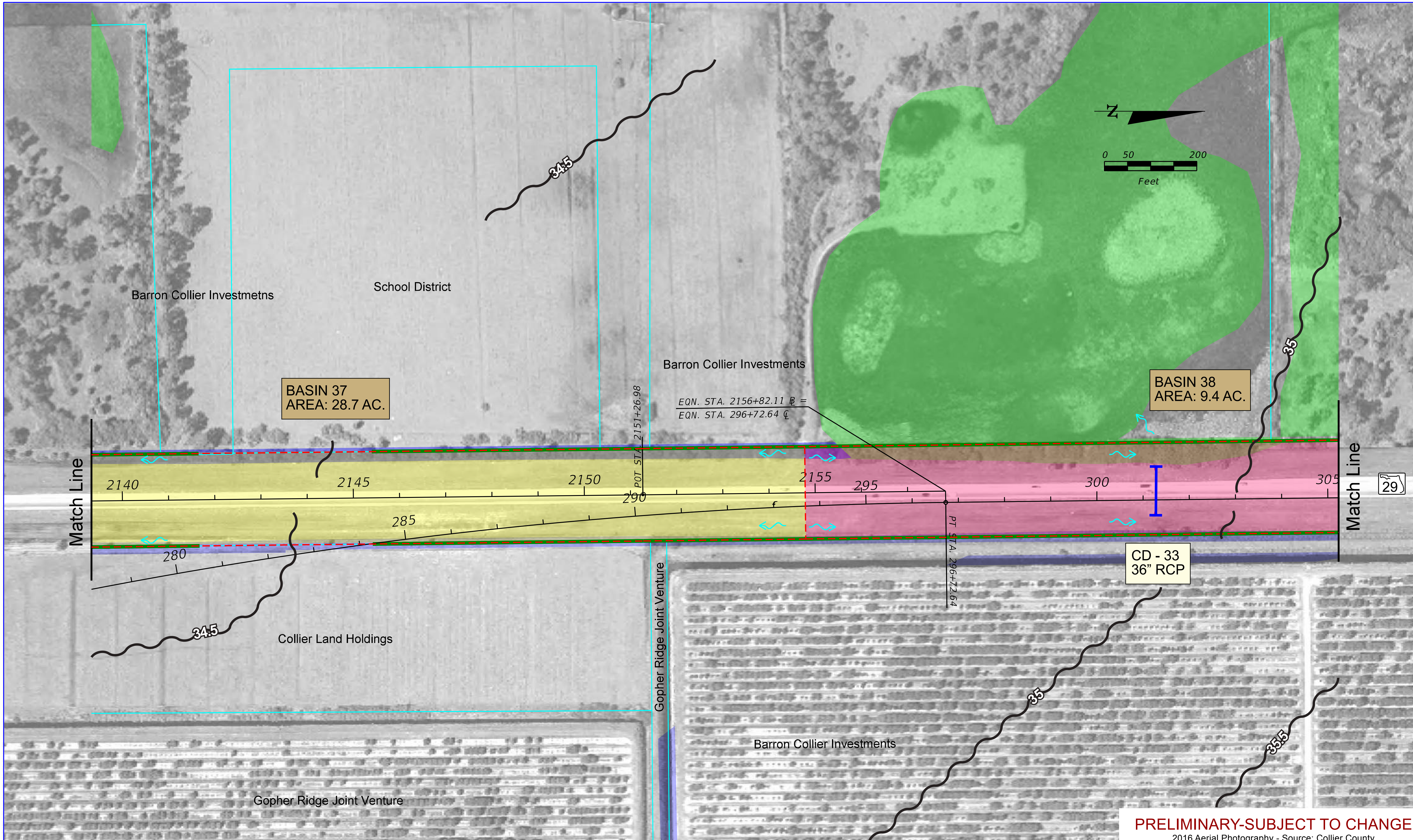

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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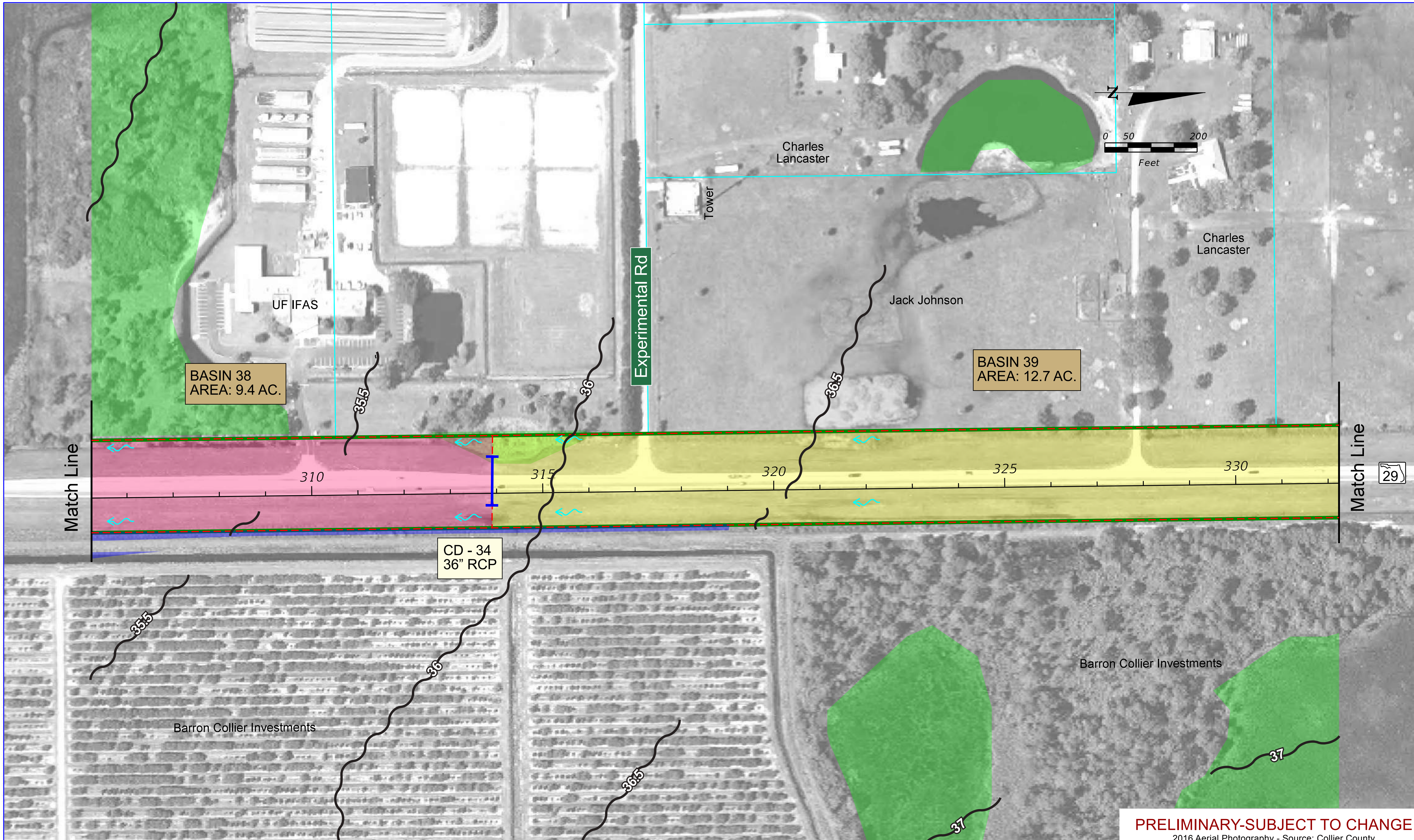

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

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Existing Drainage Maps

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PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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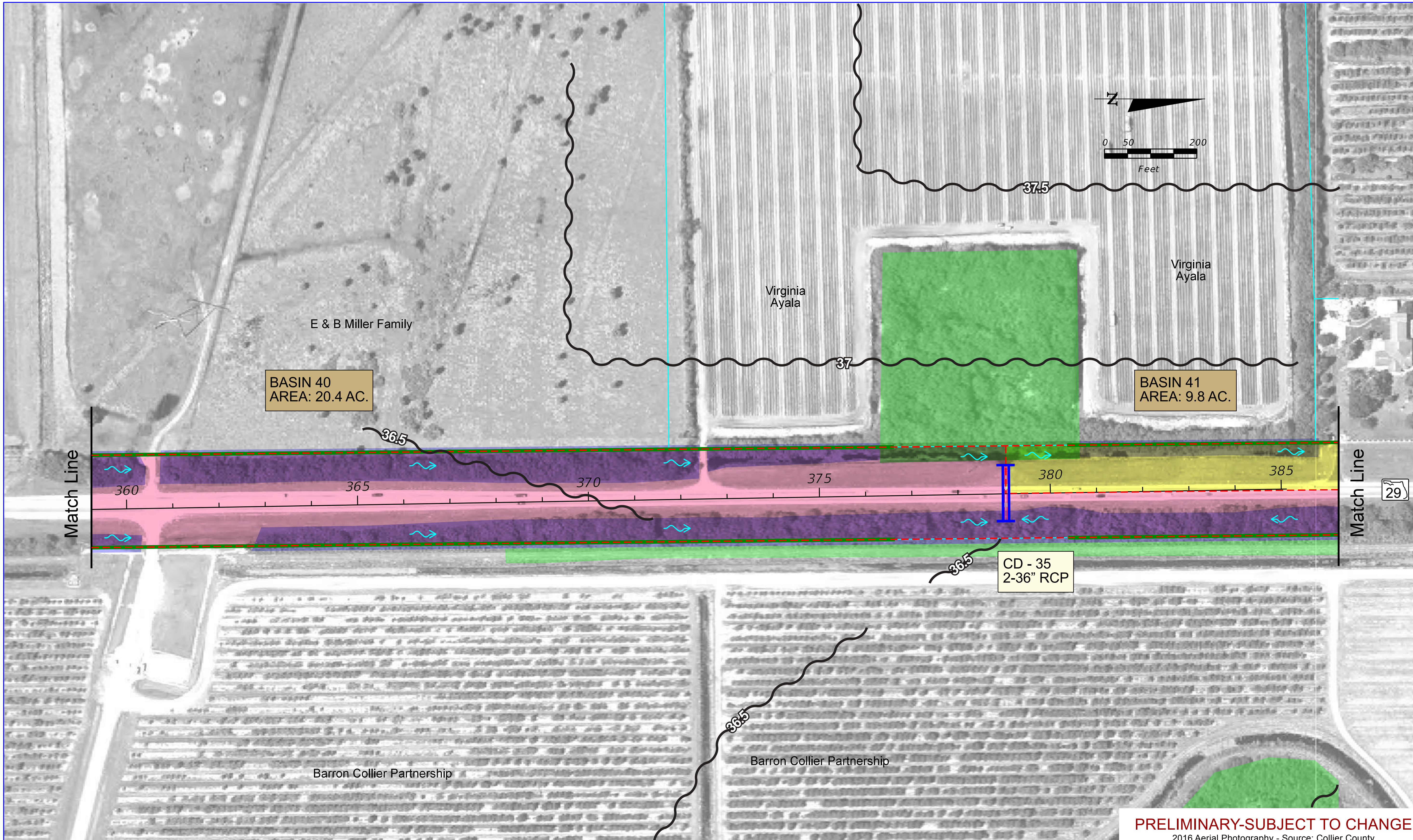
Existing Drainage Maps

Sheet No.
B-29



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

Sheet No.

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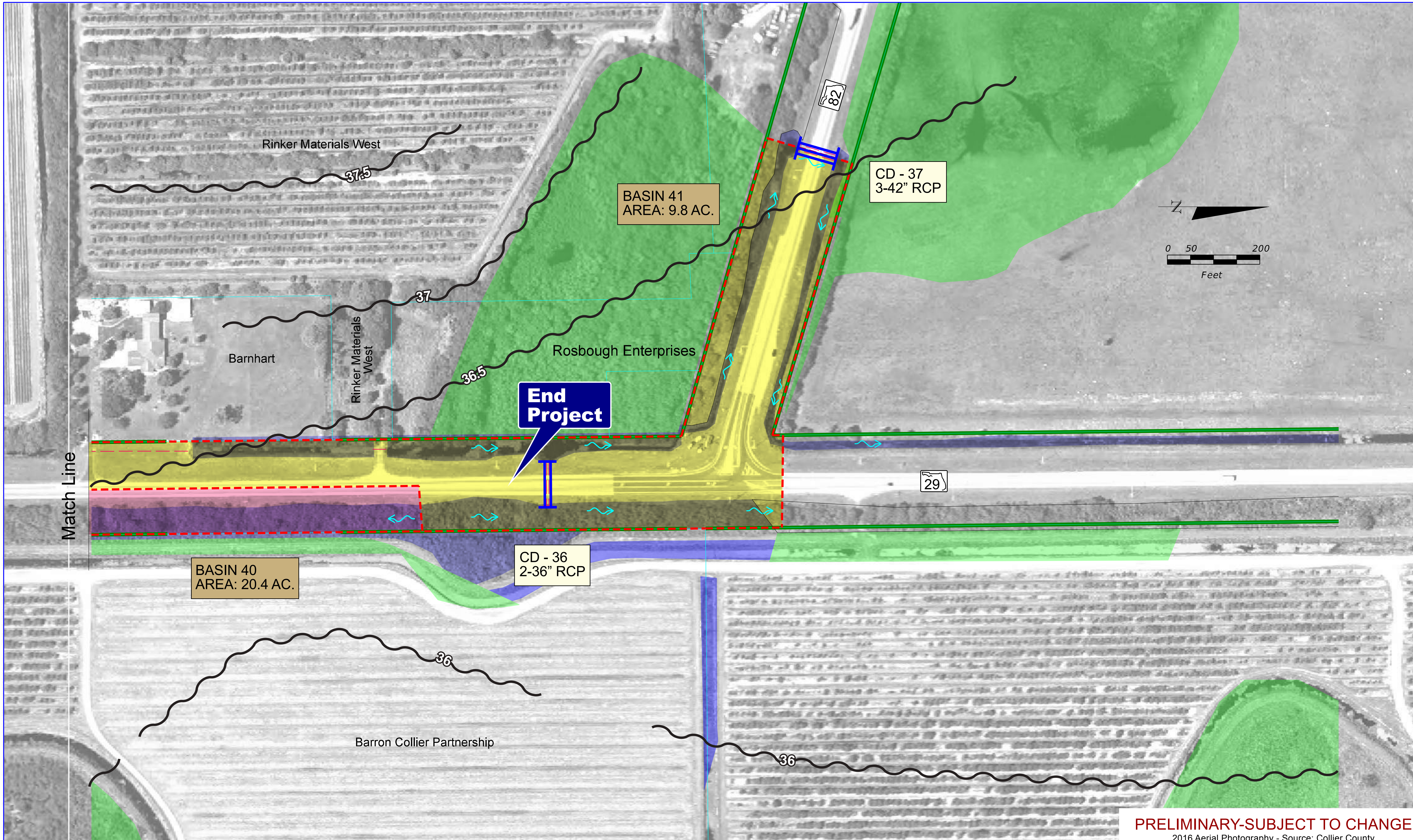

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3111 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Existing Drainage Maps

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Appendix C
Proposed Drainage Maps

APPENDIX C
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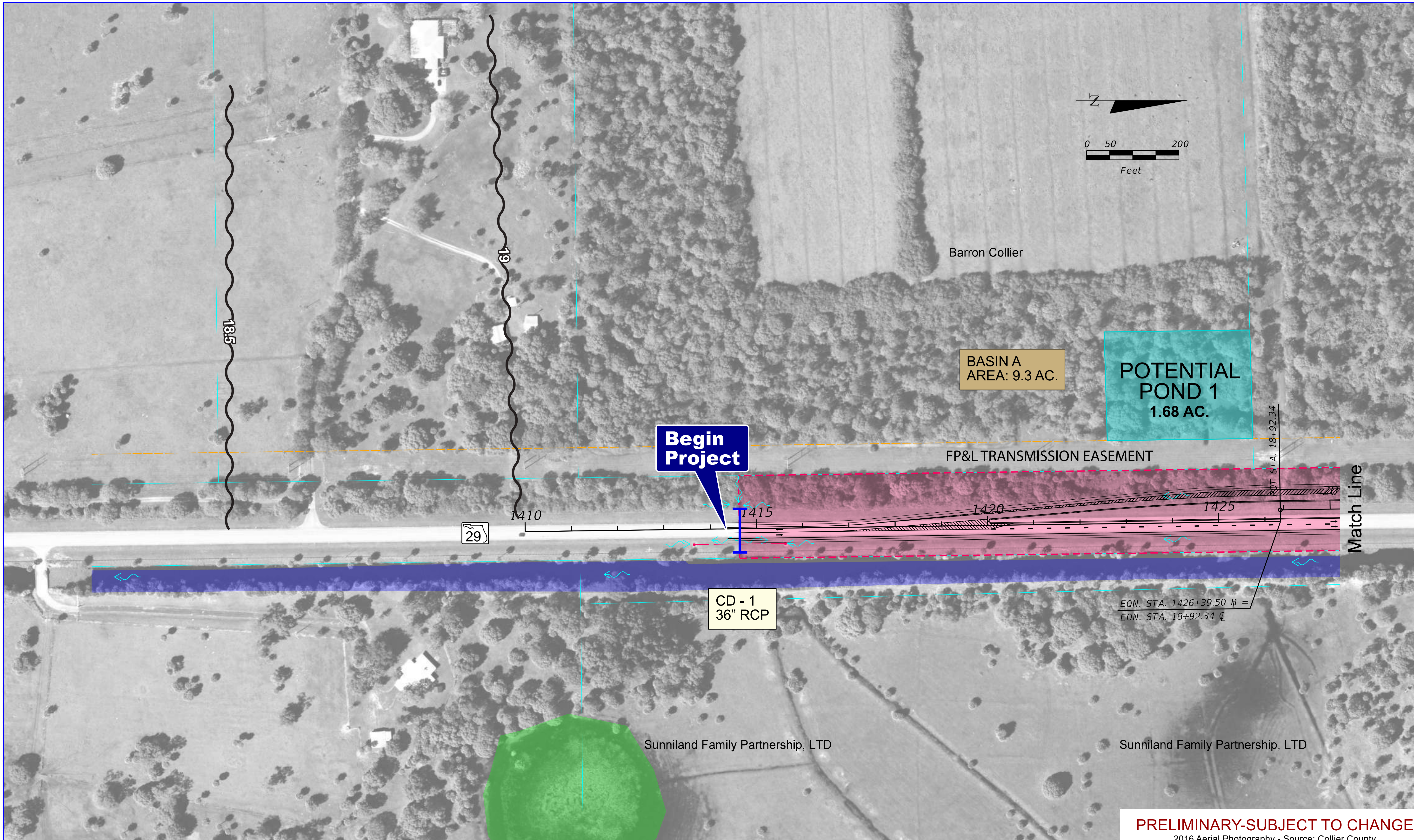

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed
Drainage Maps
Alternative #1 R

Sheet No.
C-1

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way
Property Lines
Proposed Right-of-Way
Flow Arrow
Cross Drain
Wetlands
Potential Pond
Potential Floodplain
Barron Canal
Base Flood Elevation

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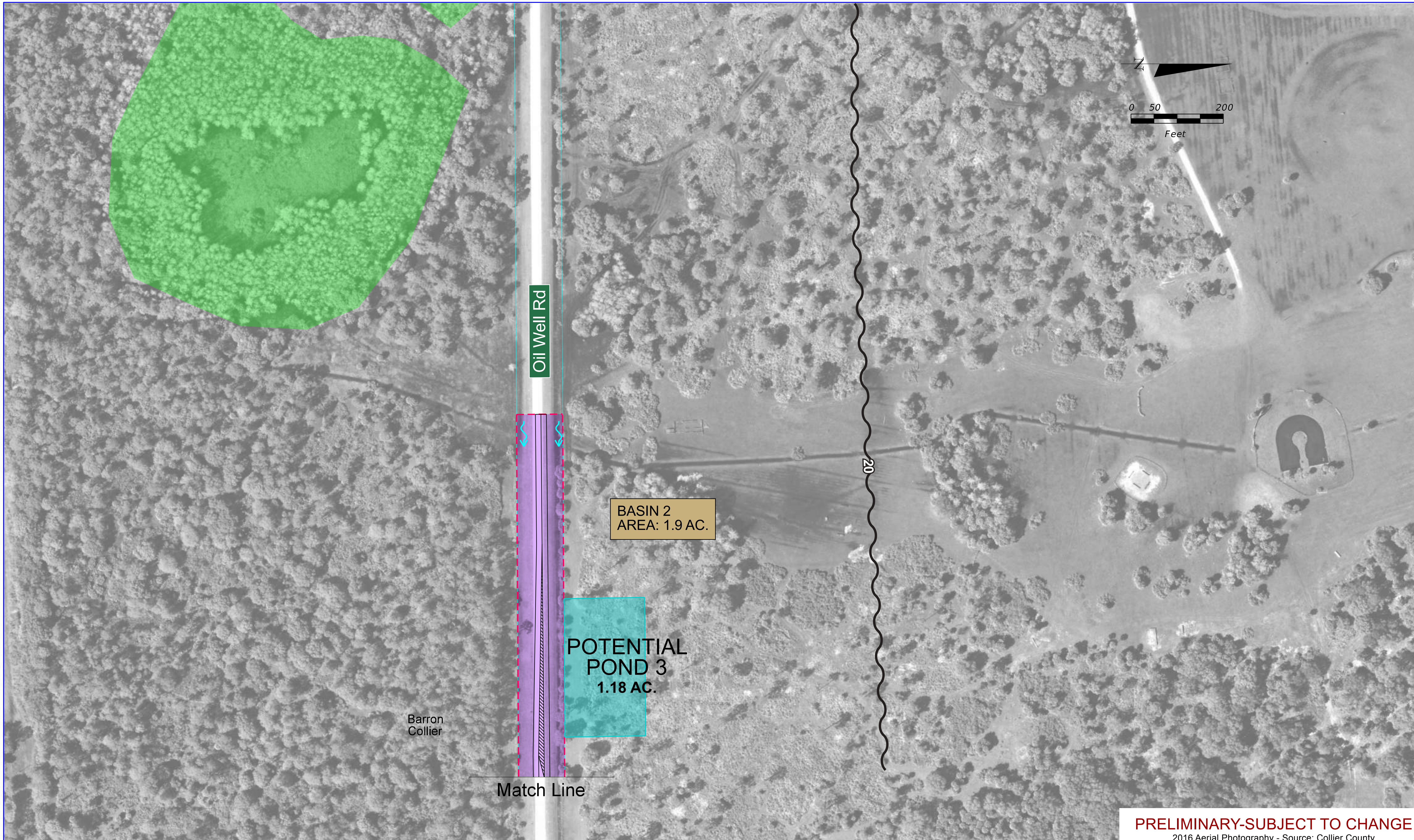
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-2



PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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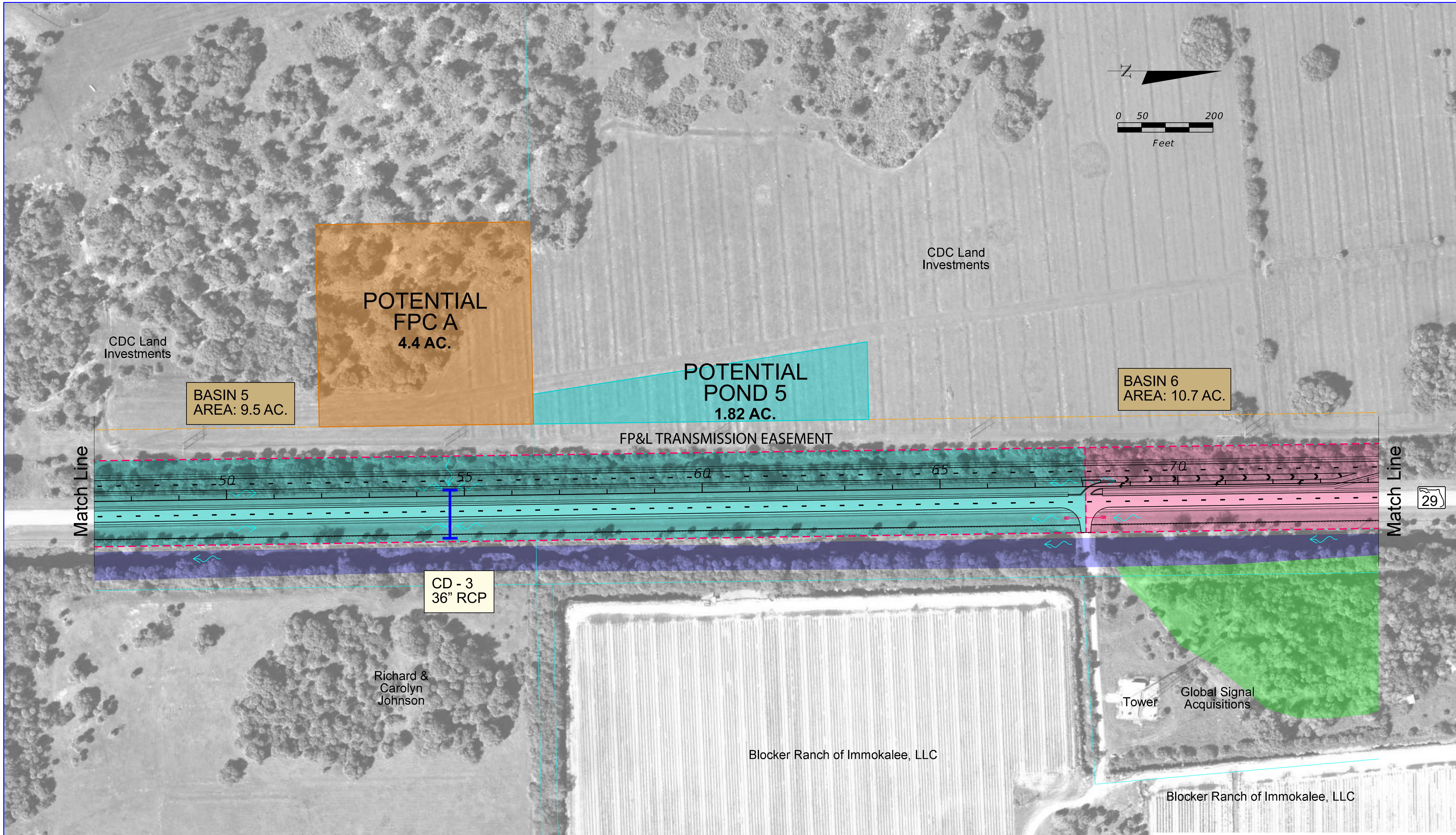
Proposed Drainage Maps Alternative #1 R

Sheet No. C-3



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.
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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

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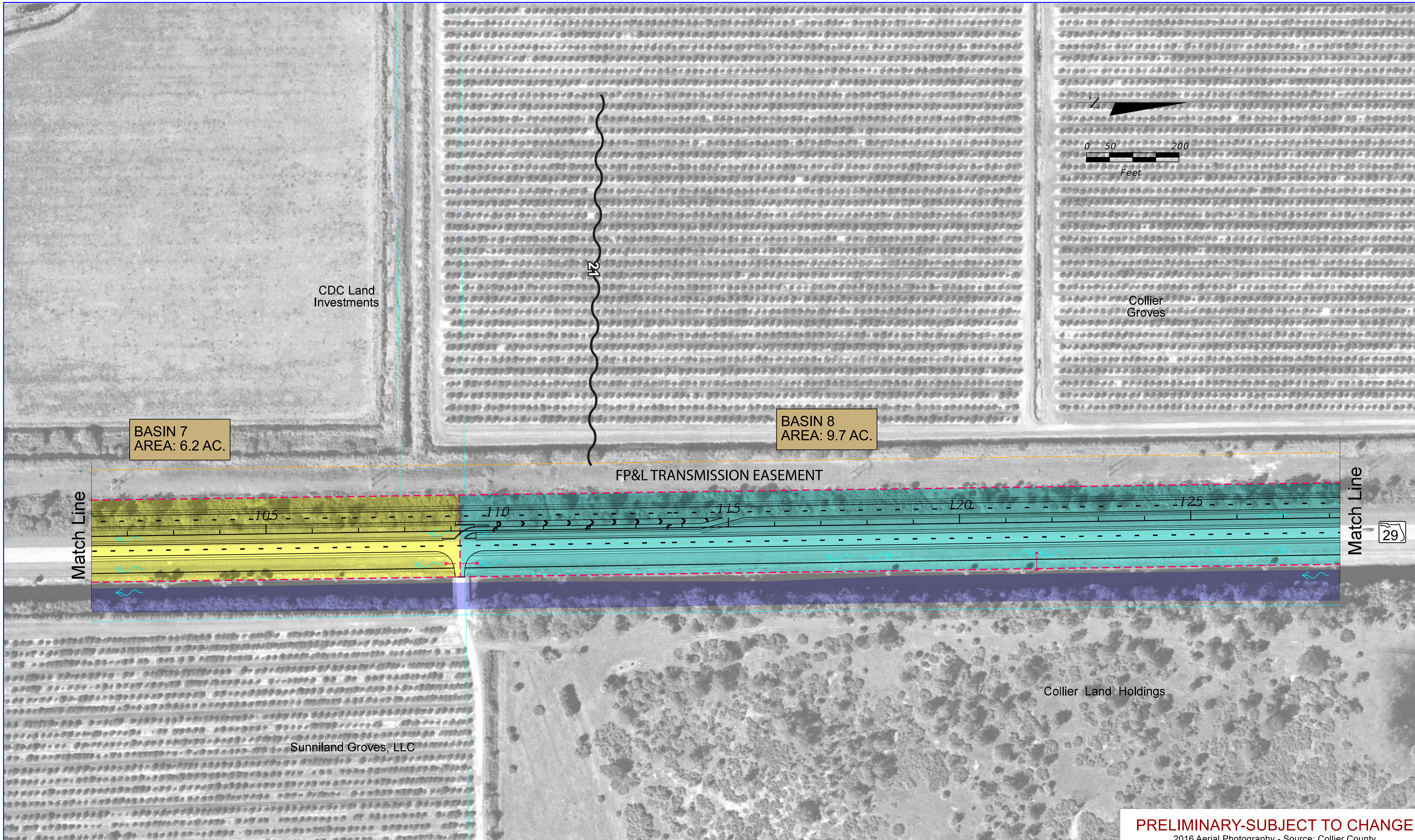

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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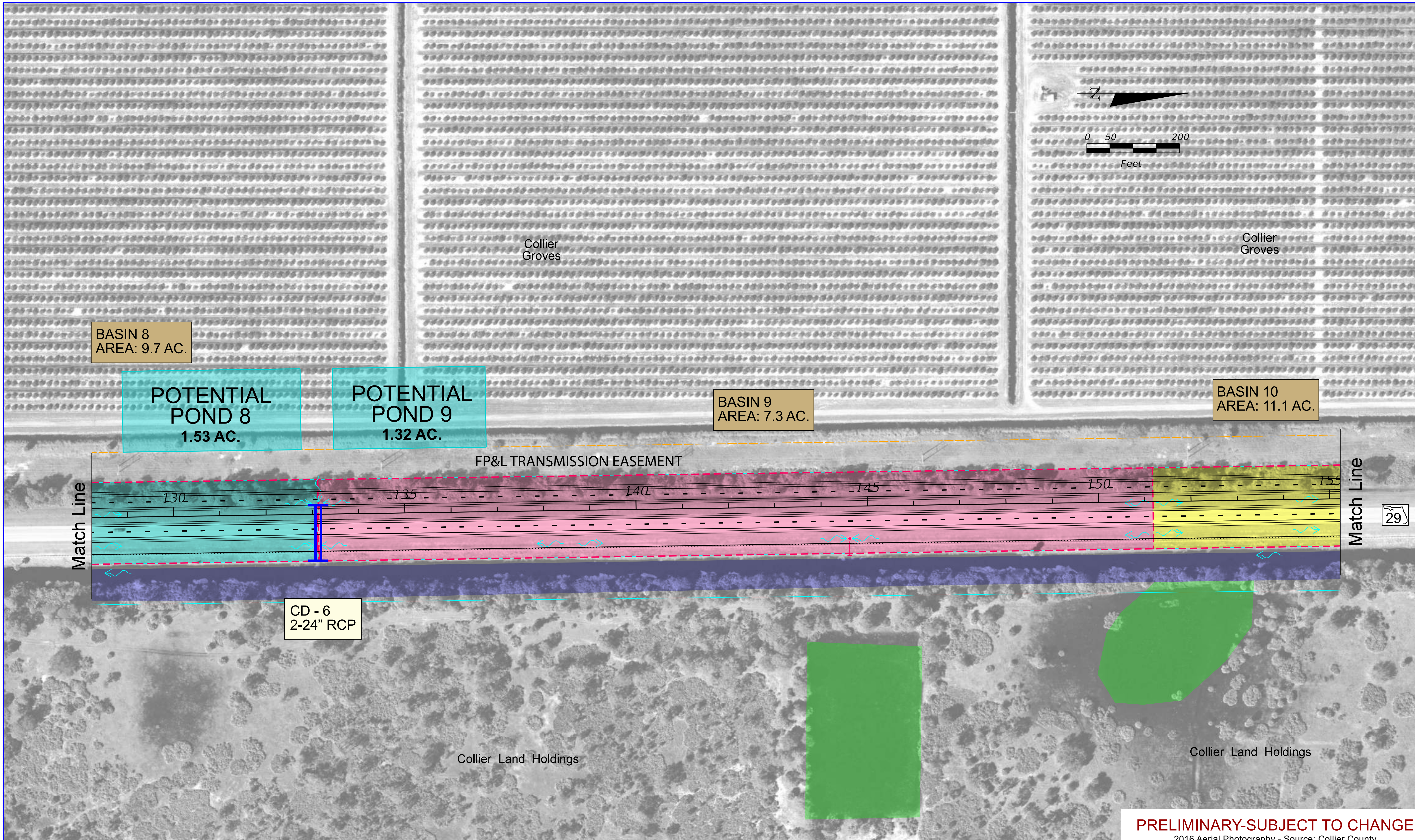
Proposed Drainage Maps Alternative #1 R

Sheet No. C-6



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No. C-7

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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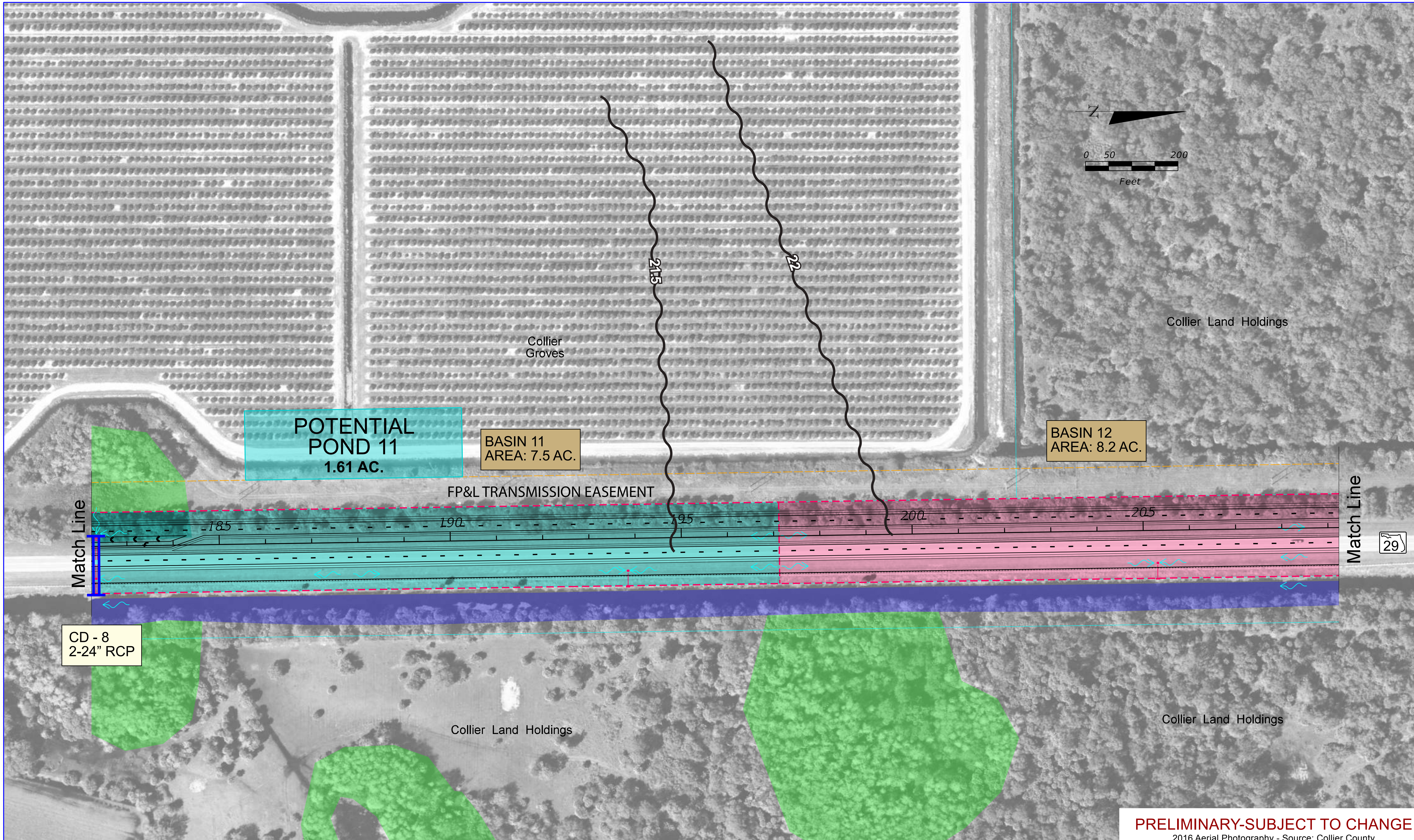
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-8



SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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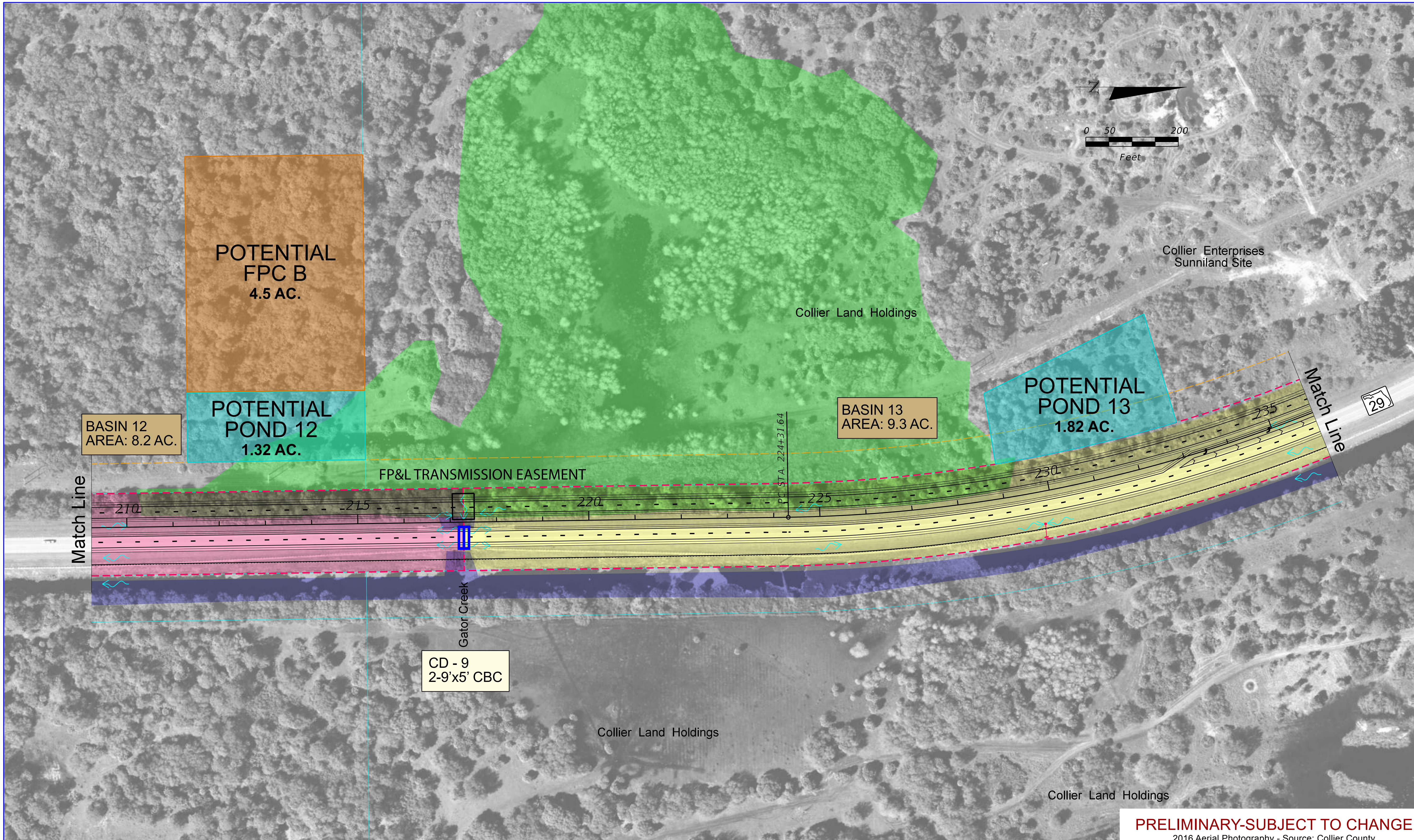
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-9



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.
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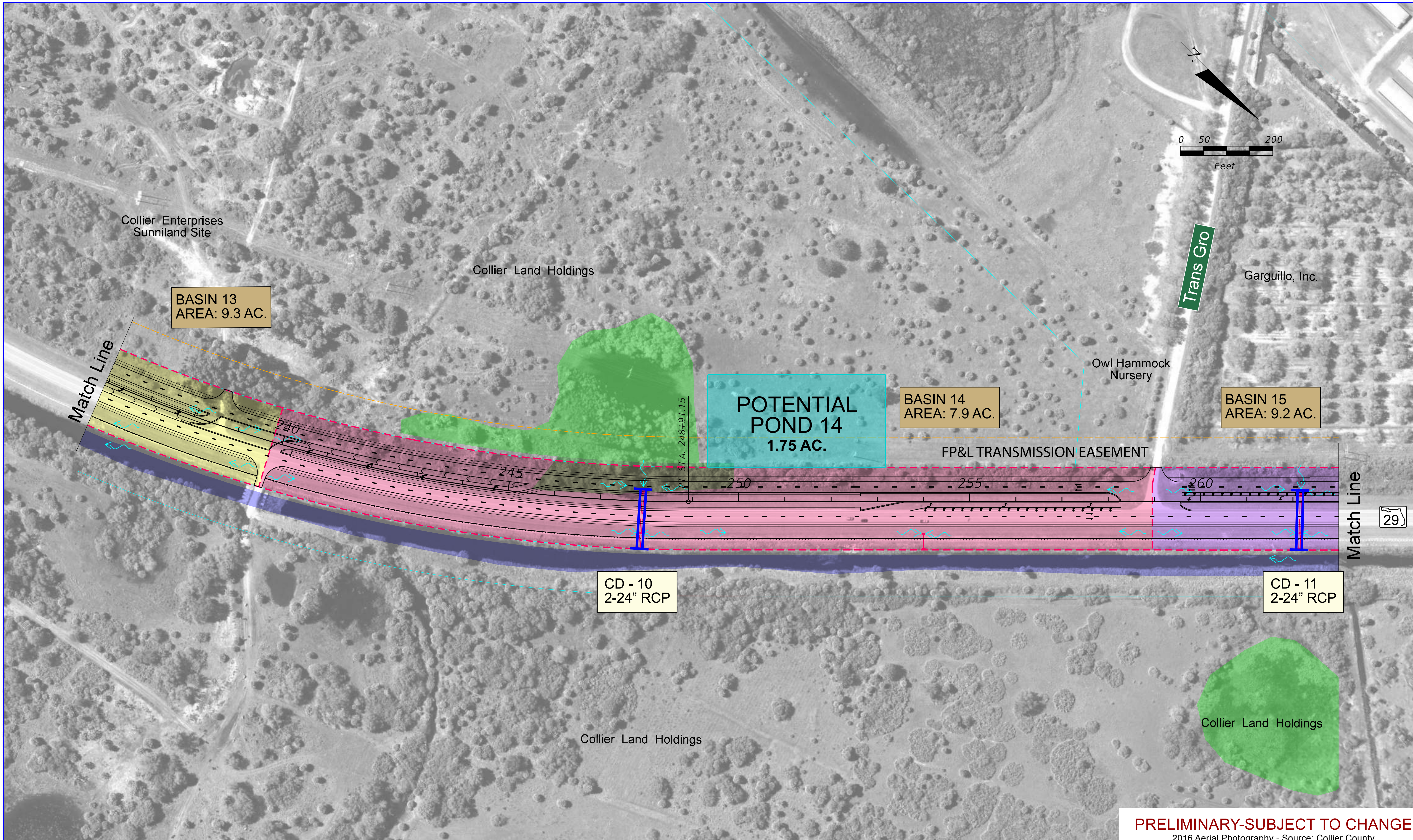

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.
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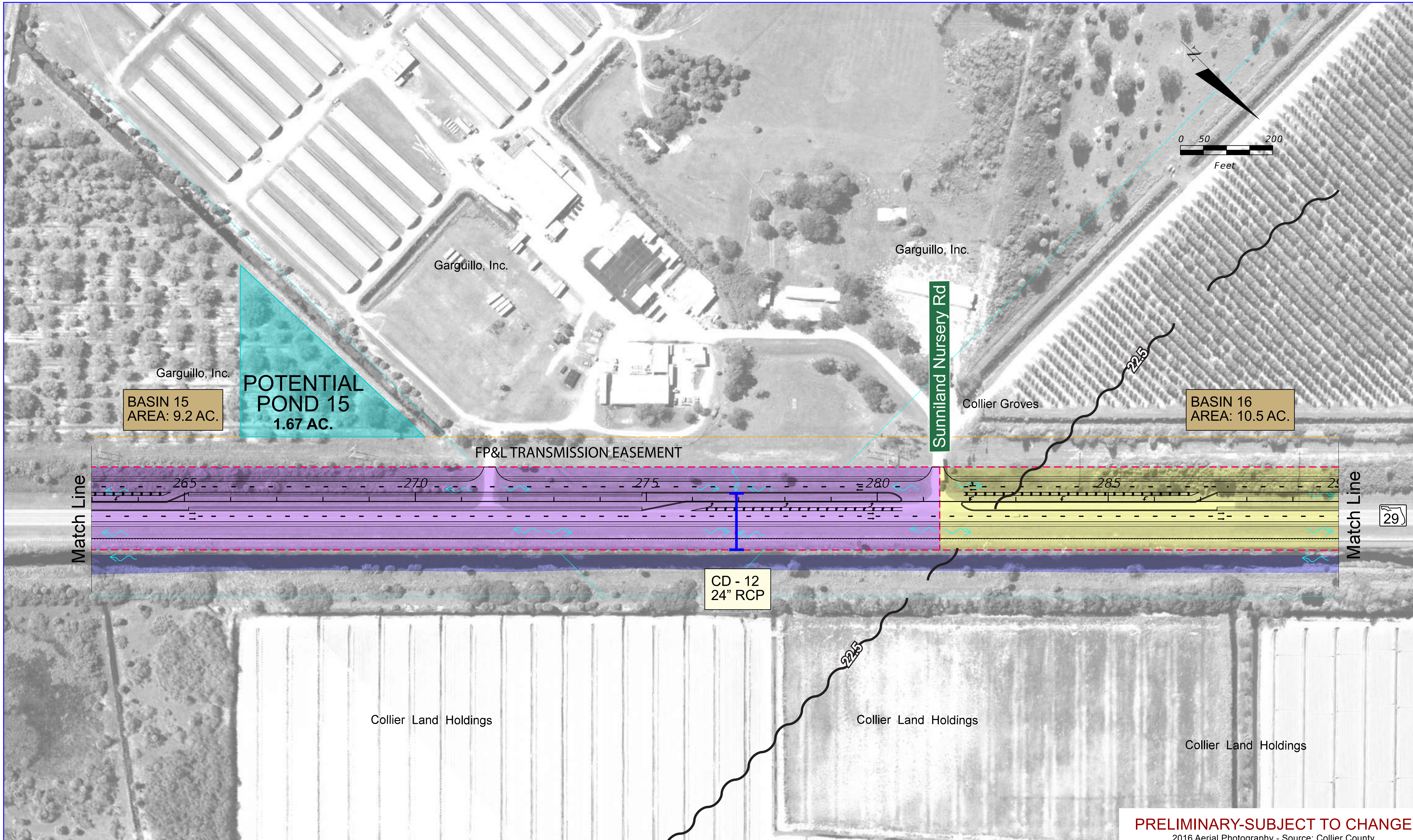

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.
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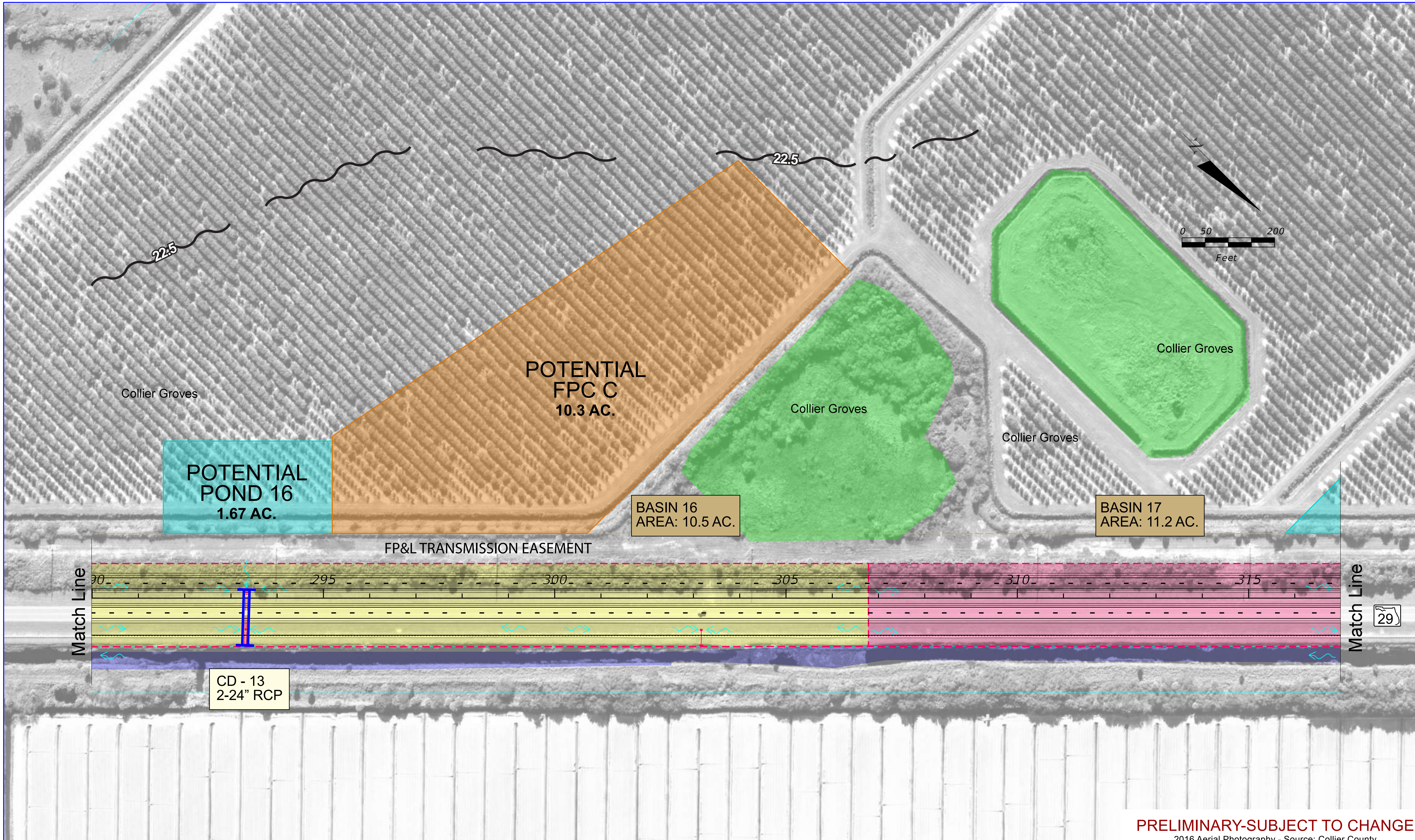

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
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- Base Flood Elevation

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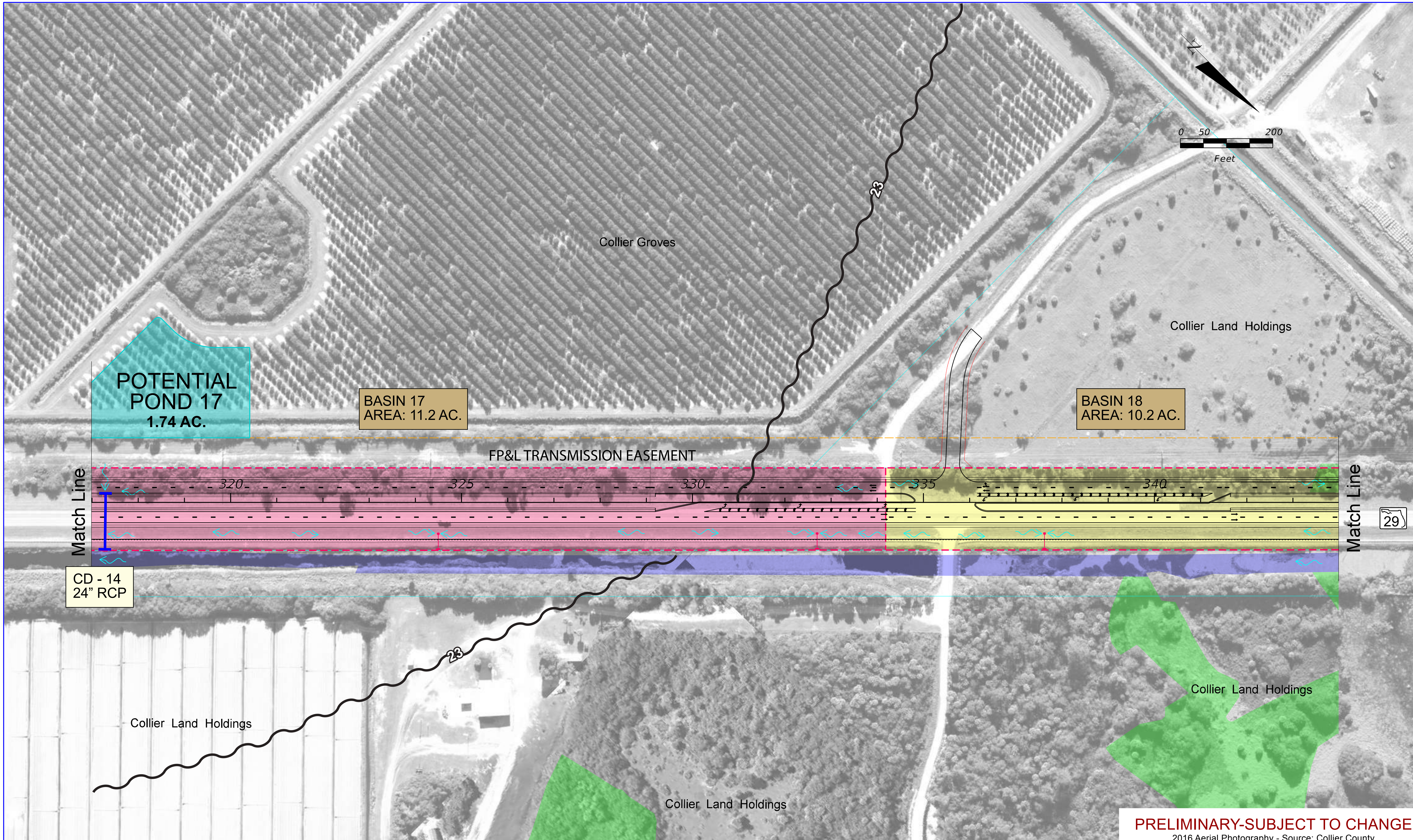
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-13



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.
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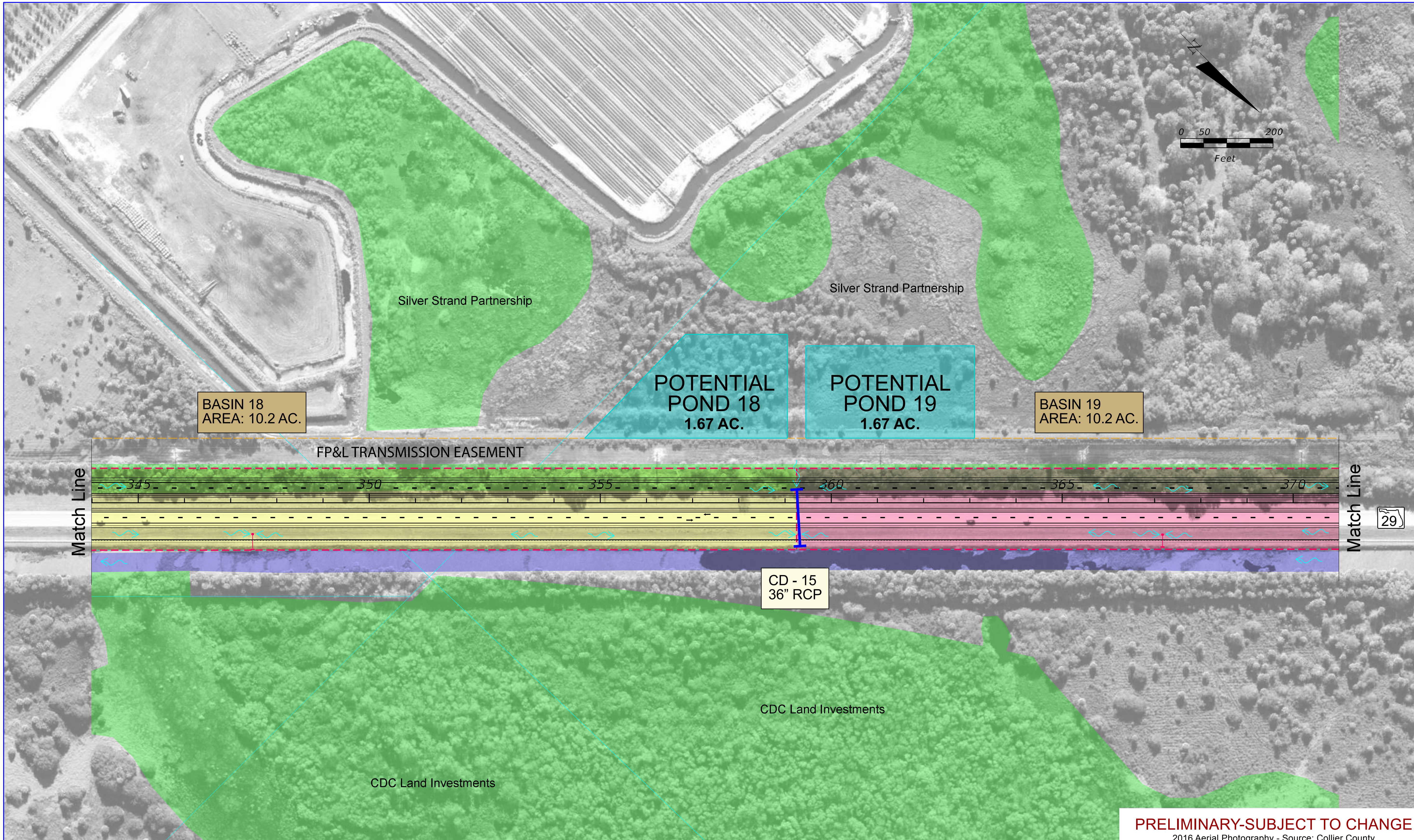

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
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- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.
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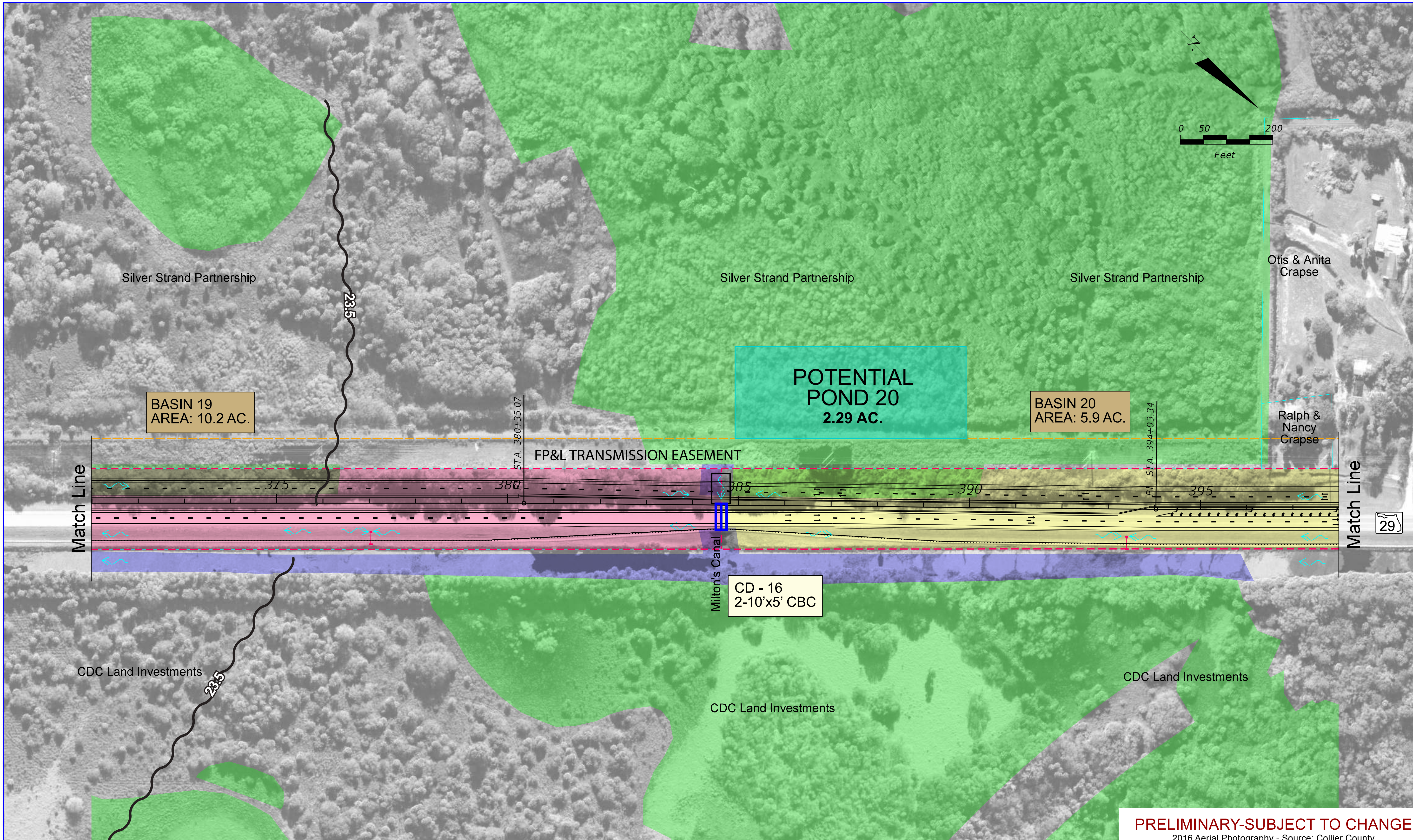

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

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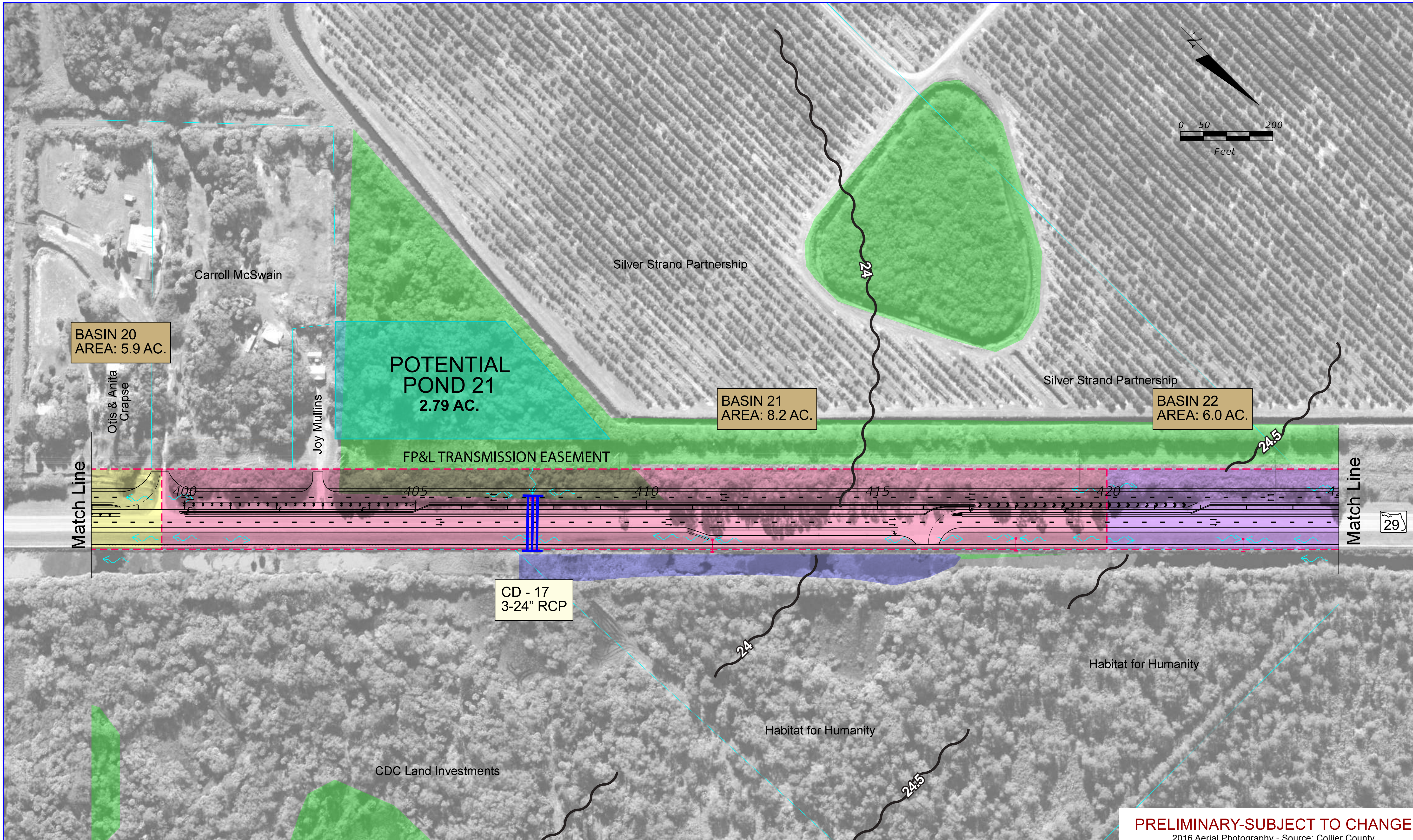

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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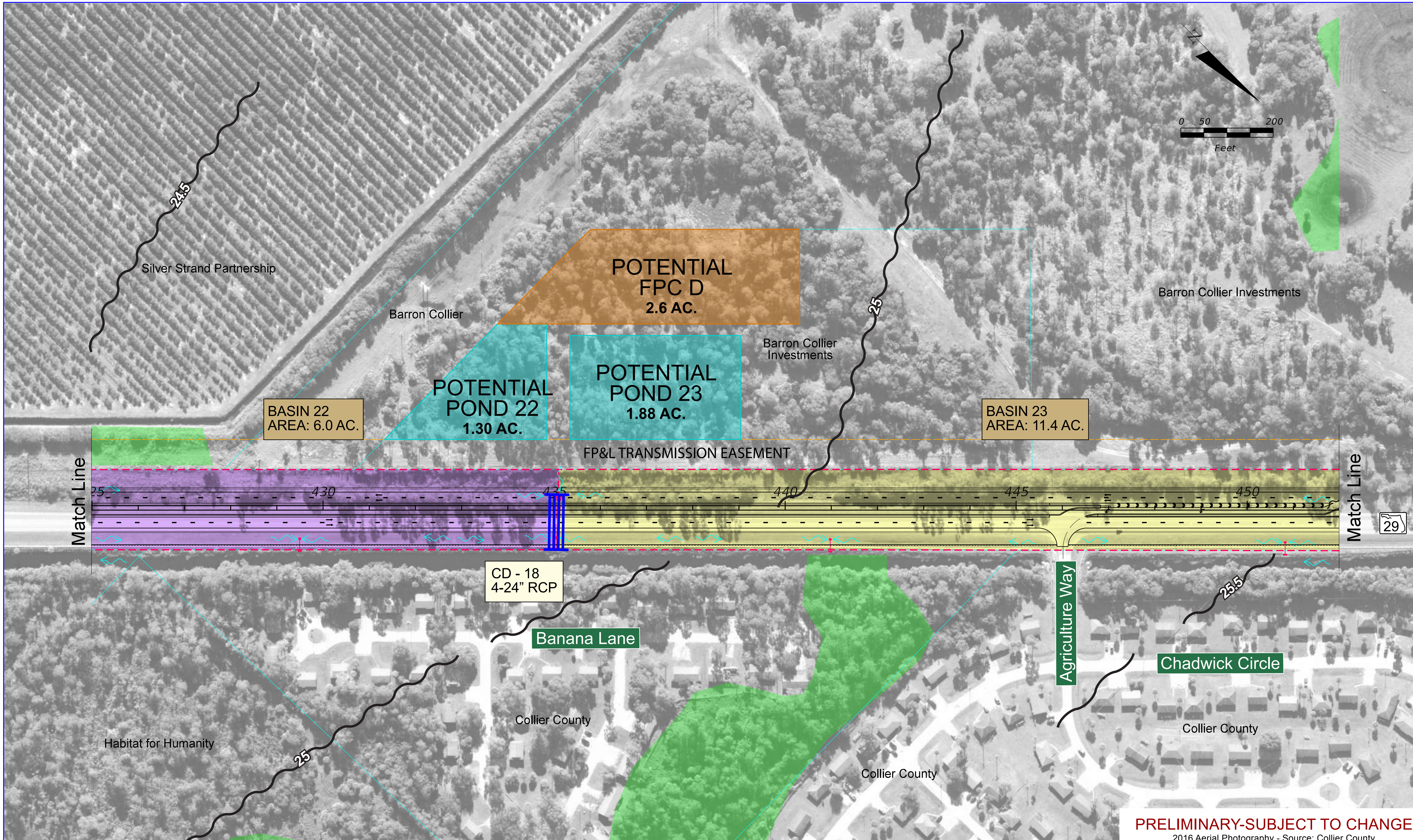
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-17



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

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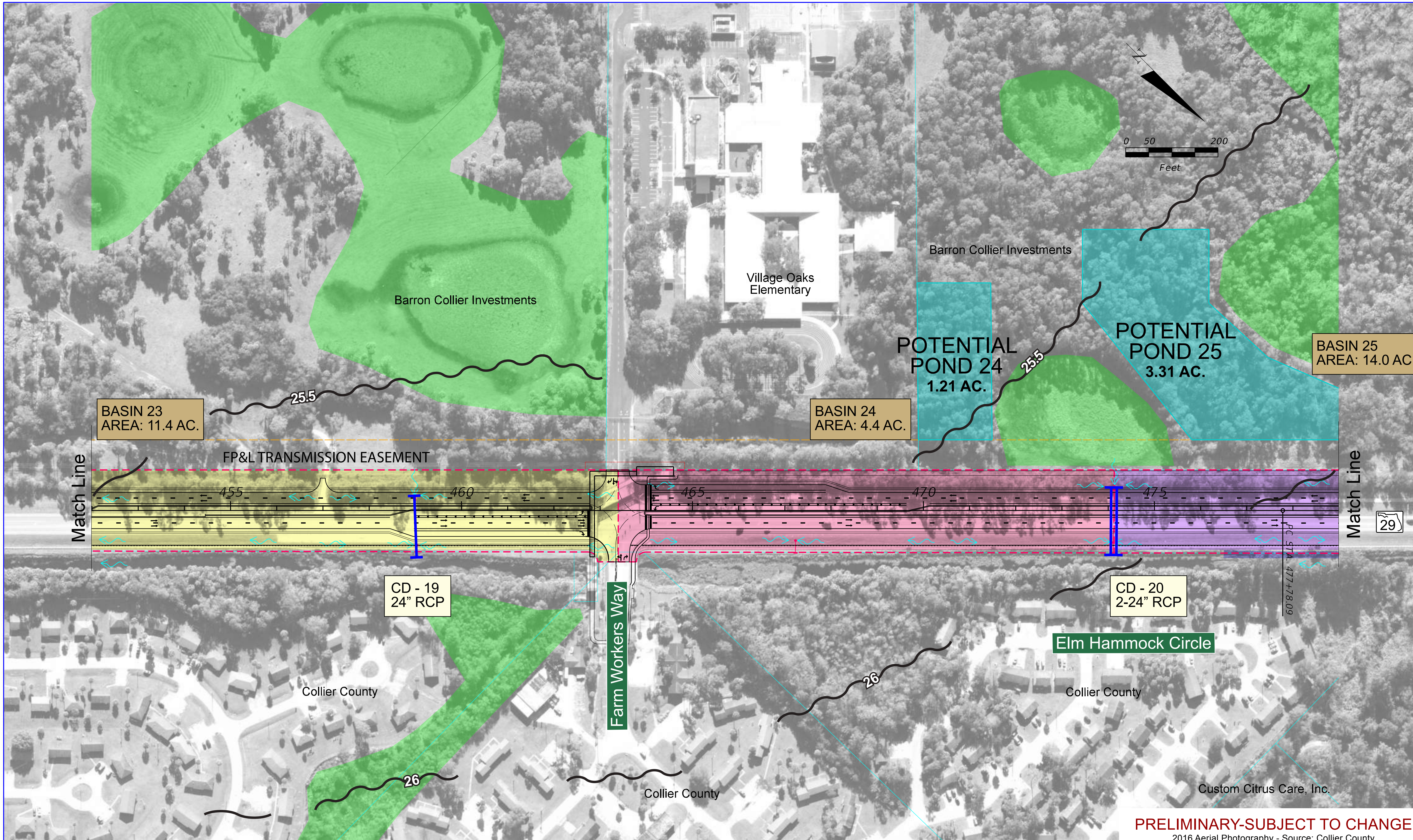

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
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- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

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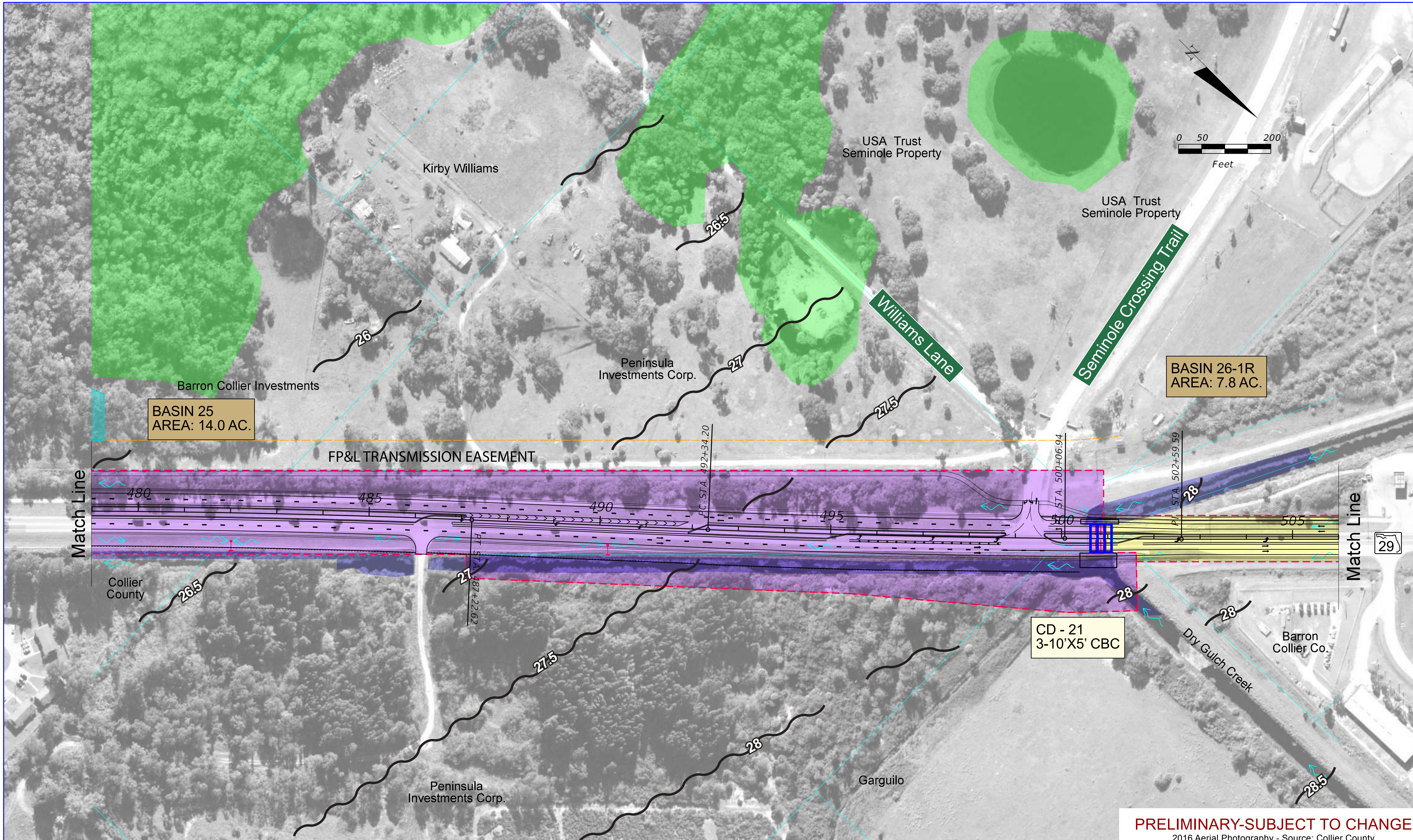

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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- Proposed Right-of-Way
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Proposed Drainage Maps Alternative #1 R

Sheet No.
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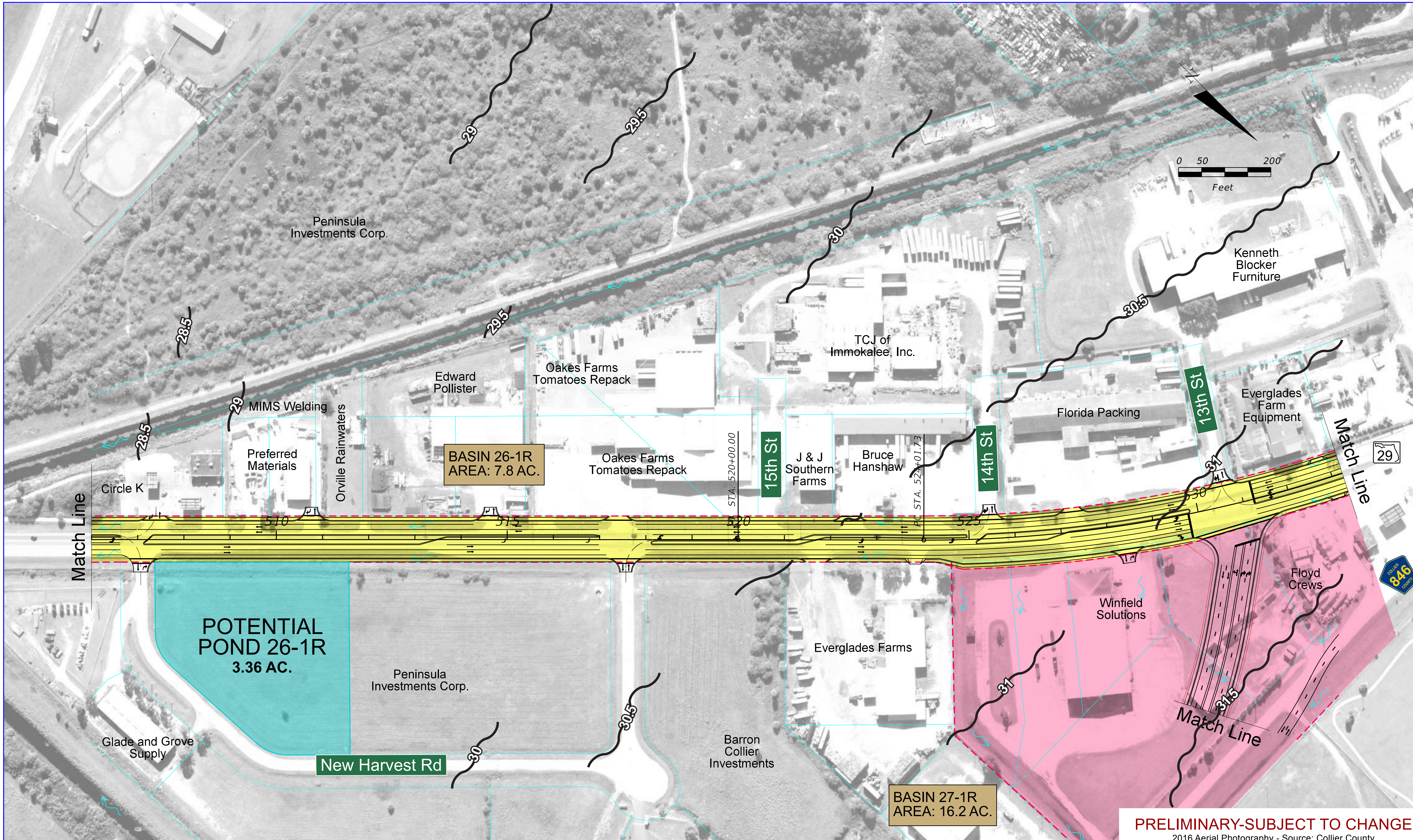

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

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Sheet No.
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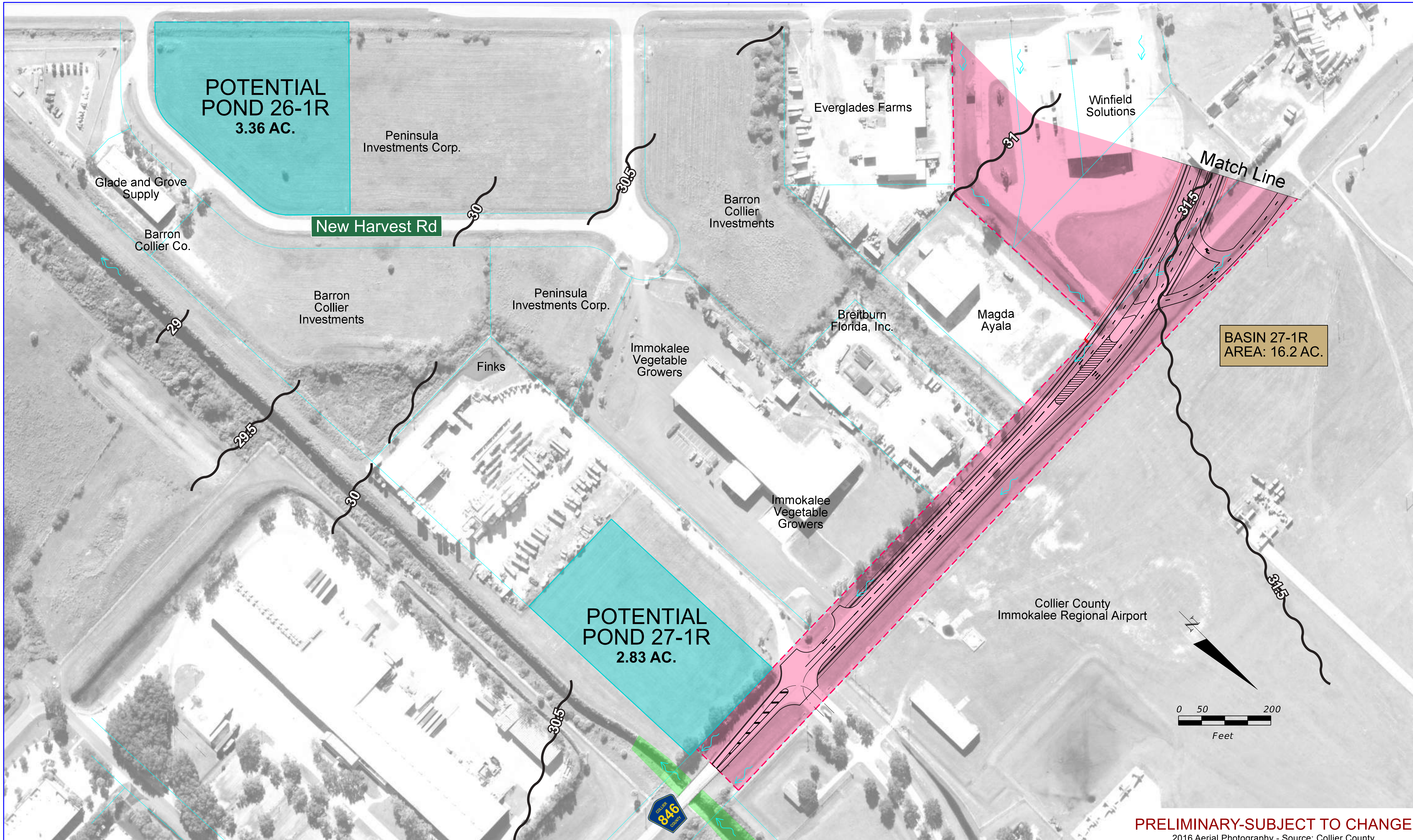

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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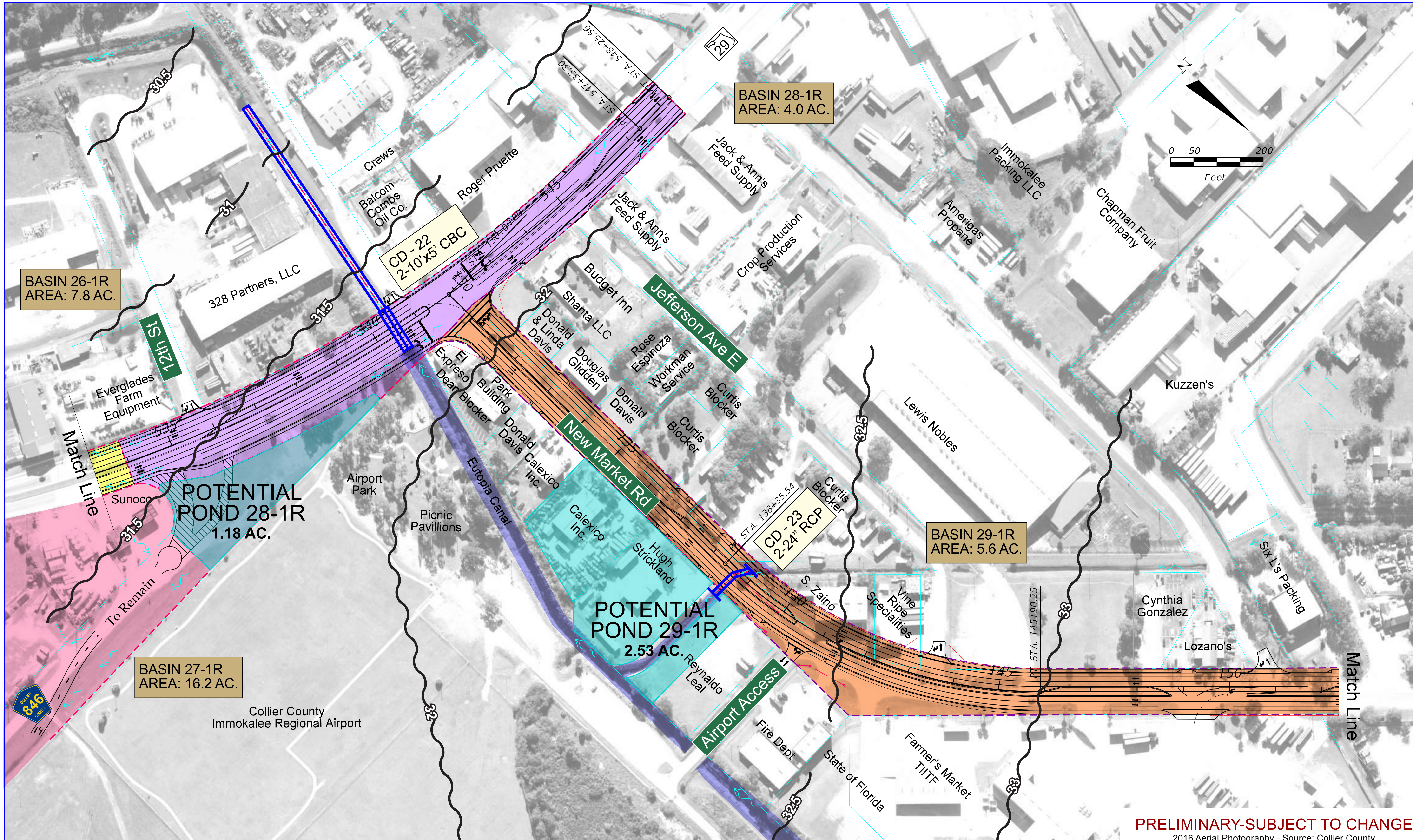
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-22



SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
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- Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.
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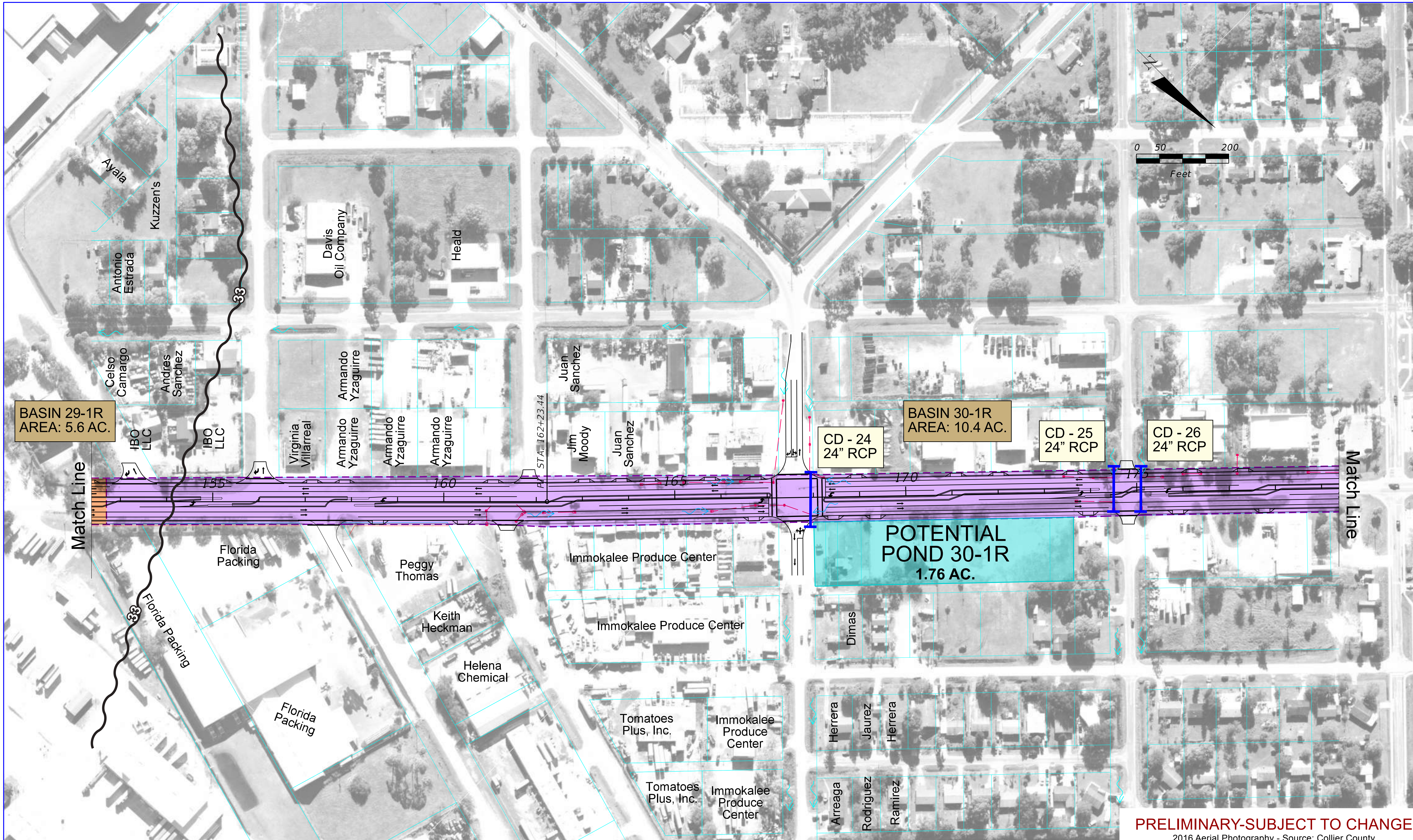

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

Sheet No.

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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- Proposed Right-of-Way
- Flow Arrow
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- Wetlands
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- Base Flood Elevation

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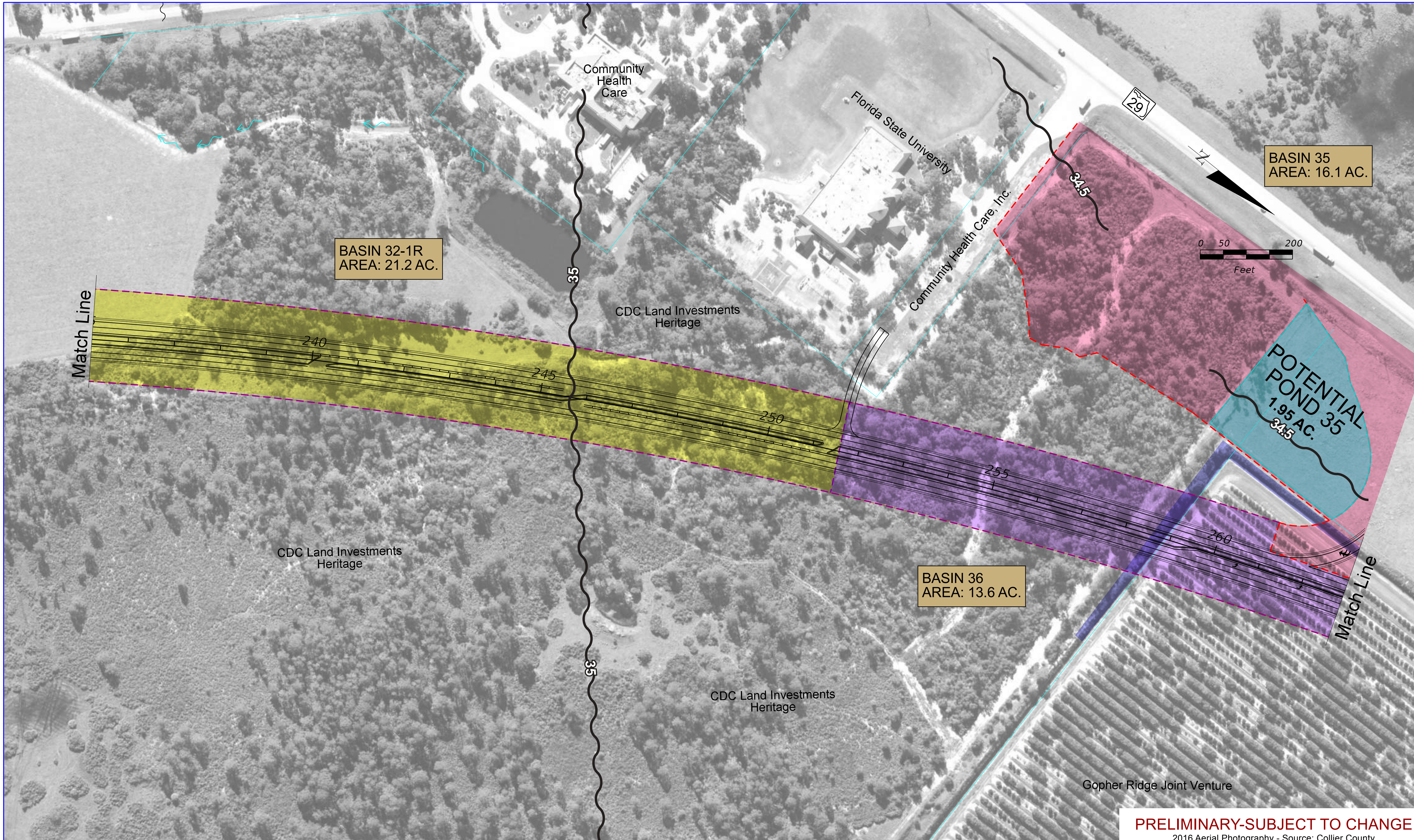
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-26



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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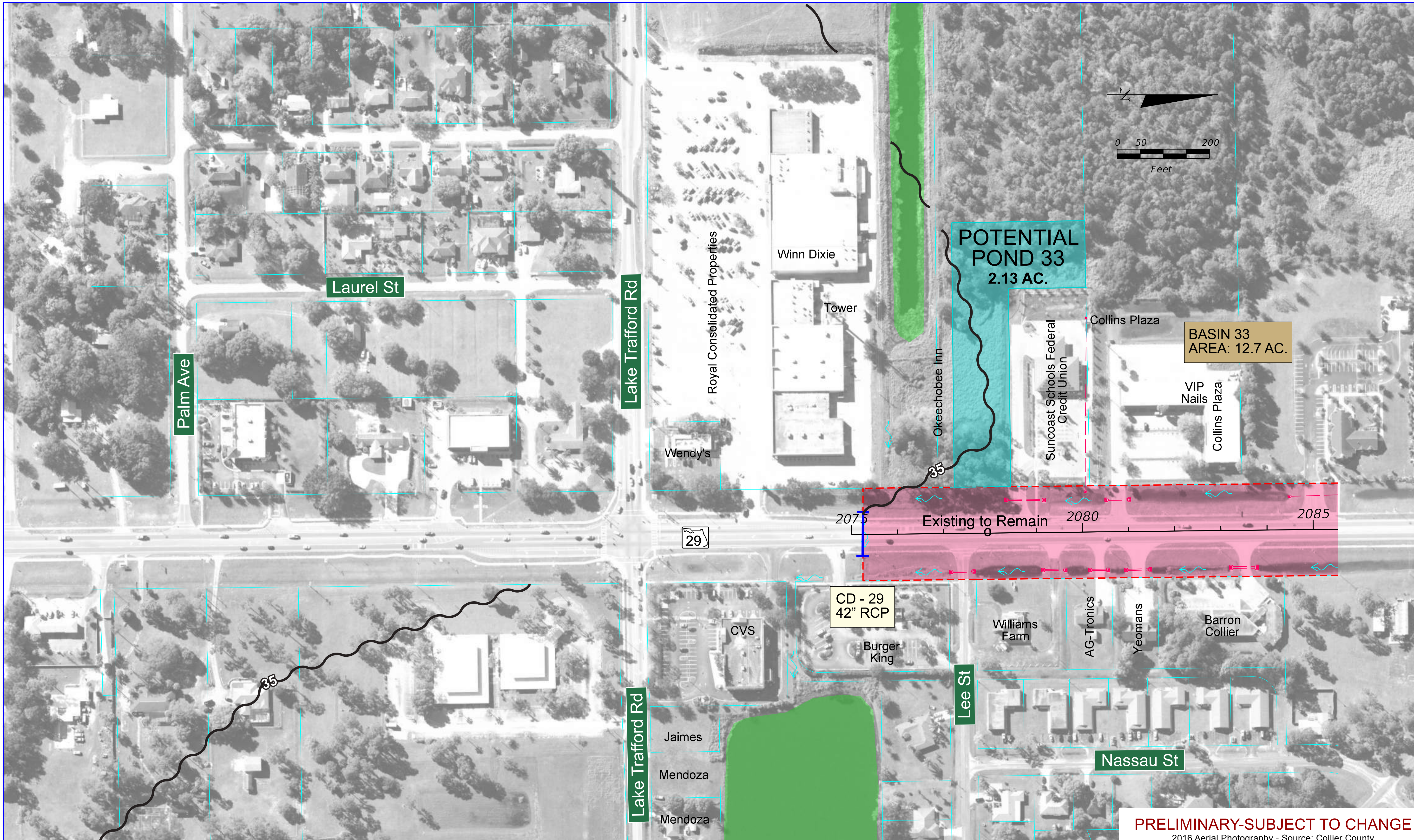
Proposed Drainage Maps Alternative #1 R

Sheet No. C-27



SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3011 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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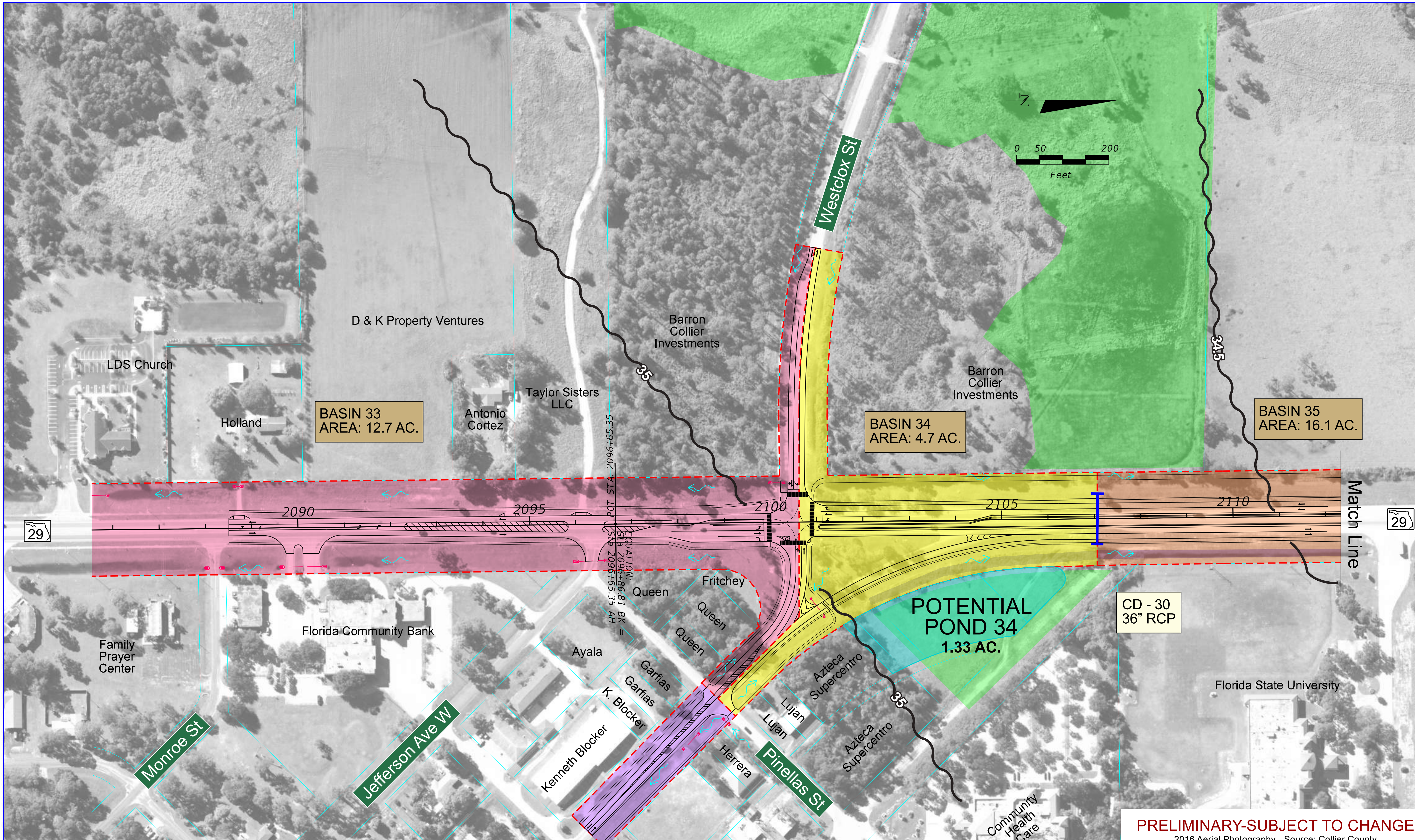
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-28



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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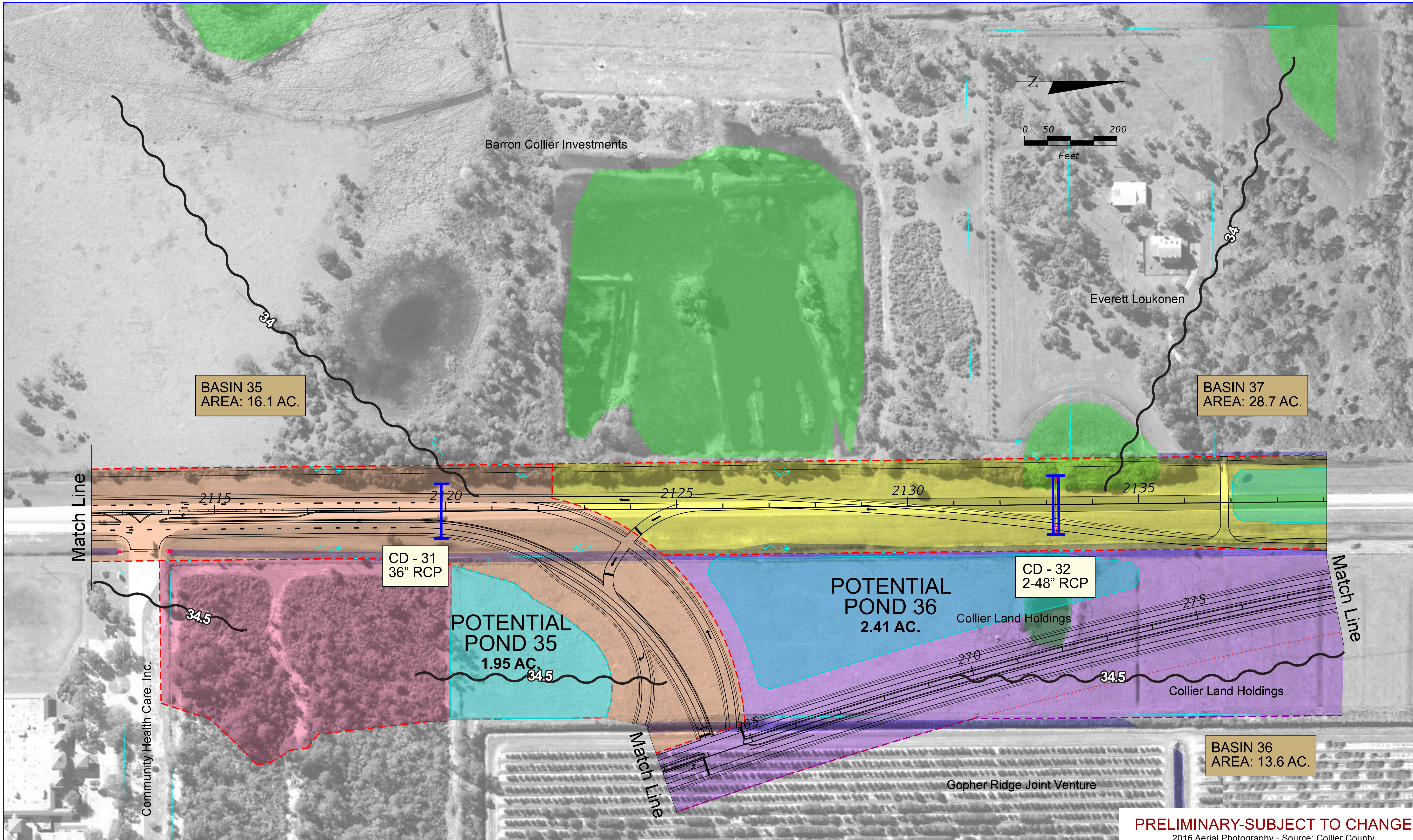
Proposed Drainage Maps Alternative #1 R

Sheet No.
C-29



PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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Proposed Drainage Maps Alternative #1 R

Sheet No.
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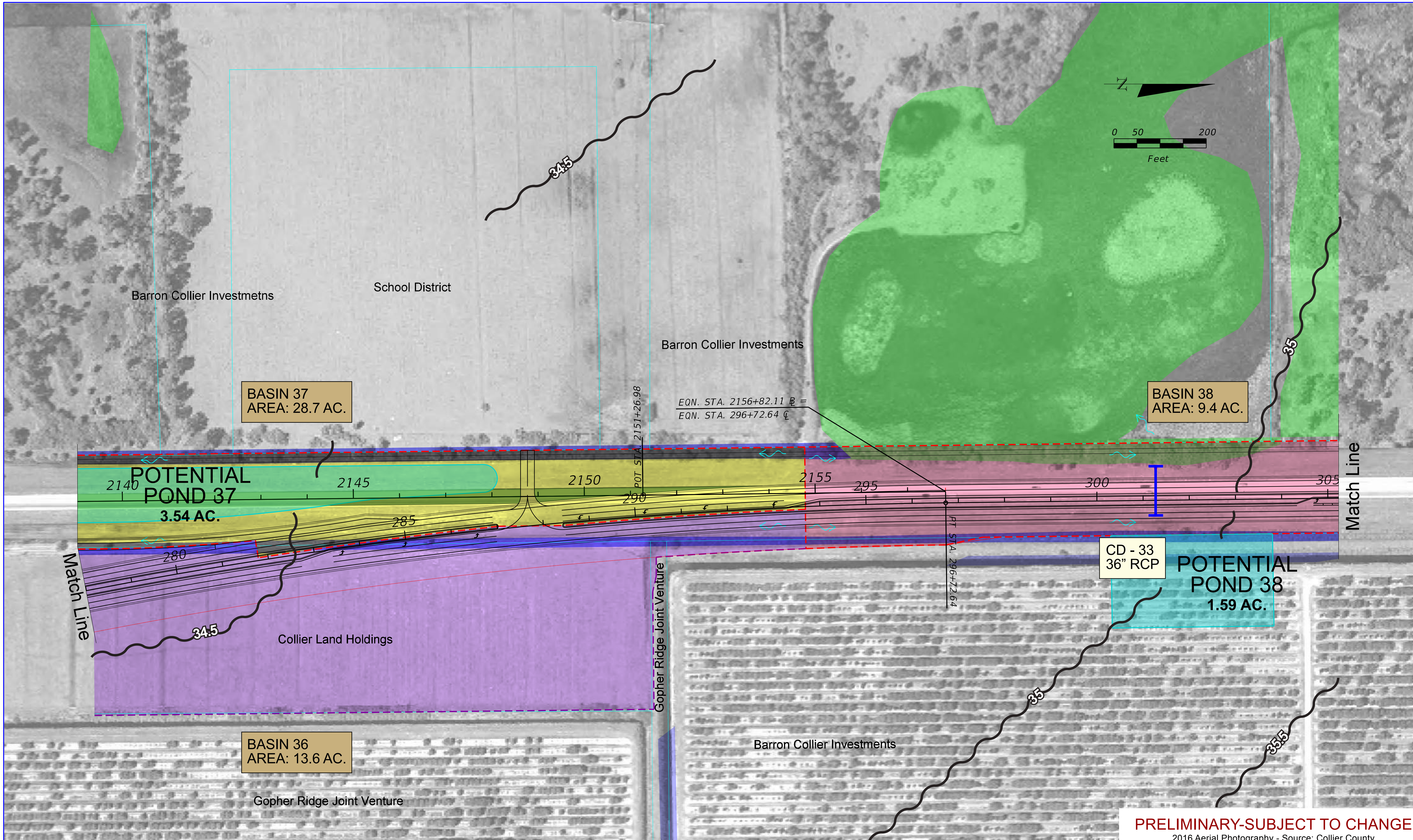

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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Proposed Drainage Maps Alternative #1 R

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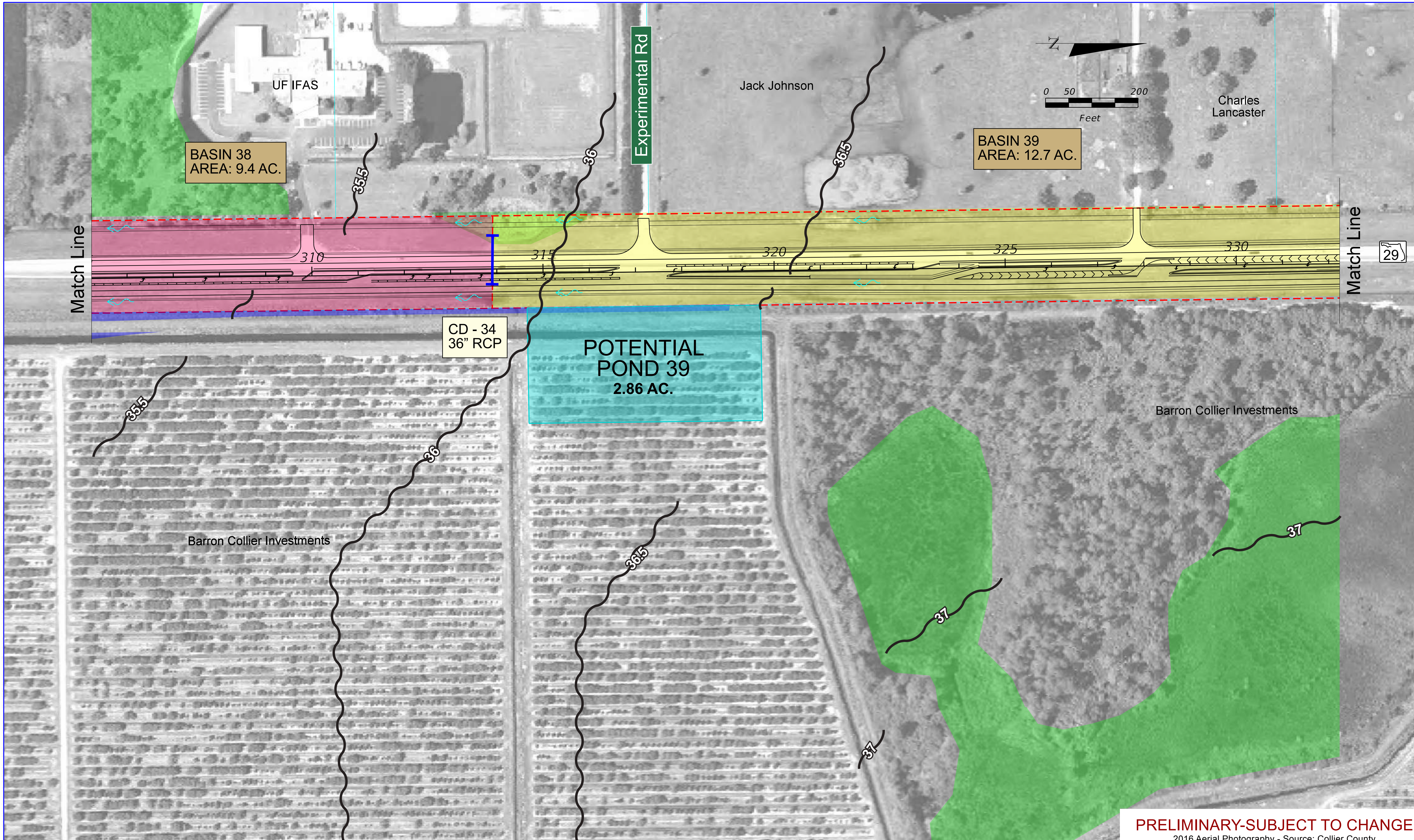

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #1 R

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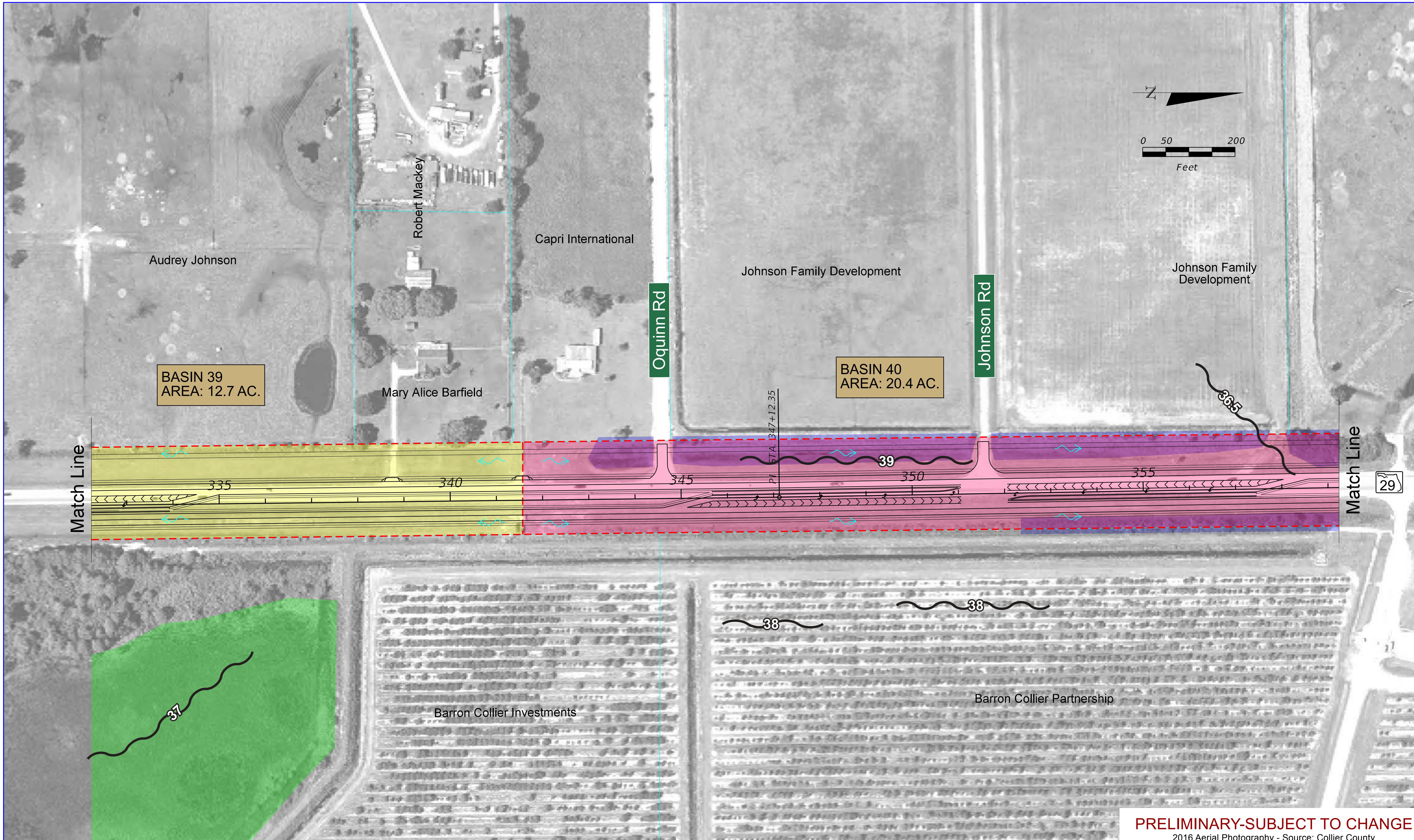

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

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- Cross Drain
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Proposed Drainage Maps Alternative #1 R

Sheet No.

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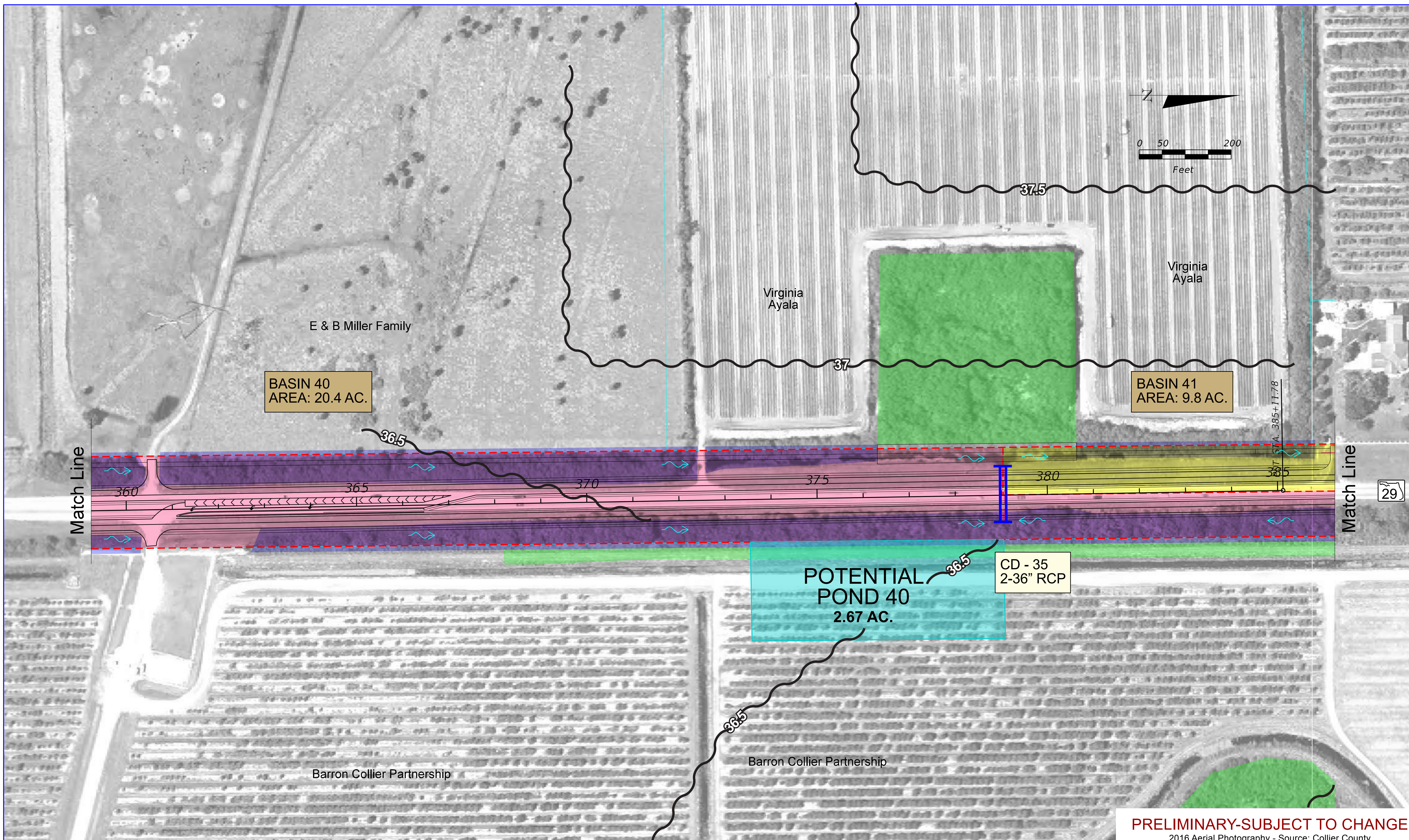

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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- Proposed Right-of-Way
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Proposed Drainage Maps Alternative #1 R

Sheet No.
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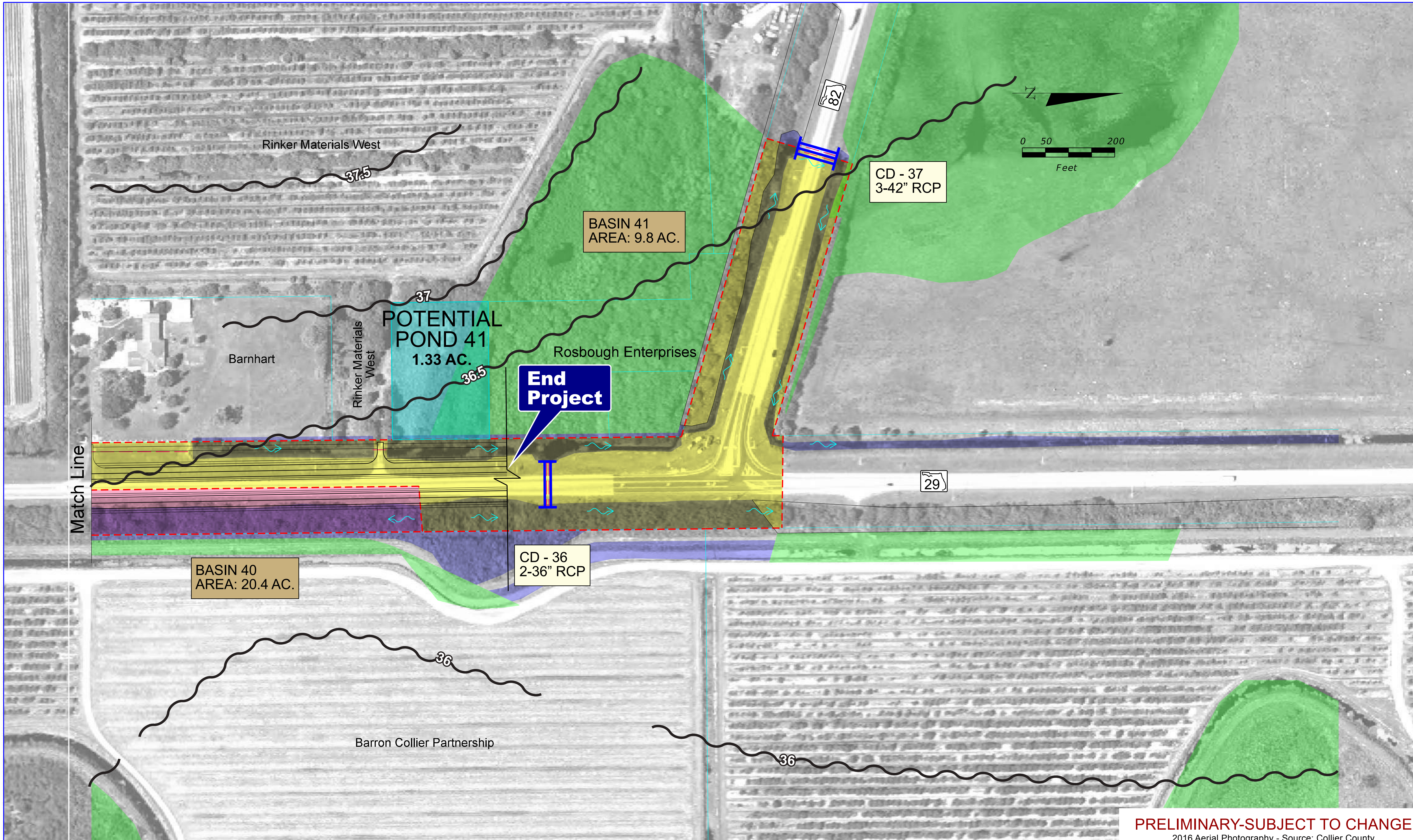

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
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- Proposed Right-of-Way
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- Wetlands
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- Barron Canal
- Base Flood Elevation

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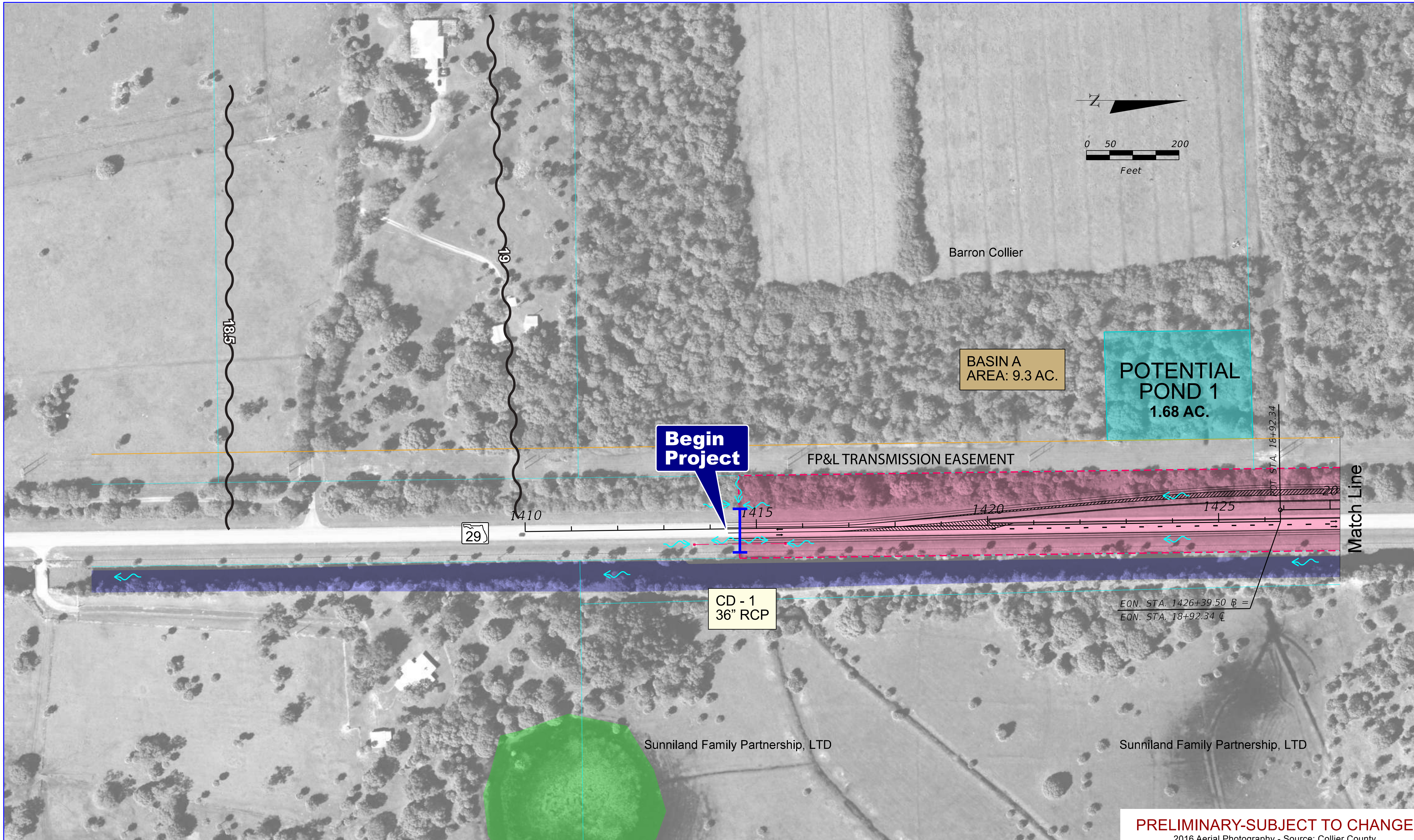
Proposed Drainage Maps Alternative #1 R

Sheet No.

C-35



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

Sheet No.
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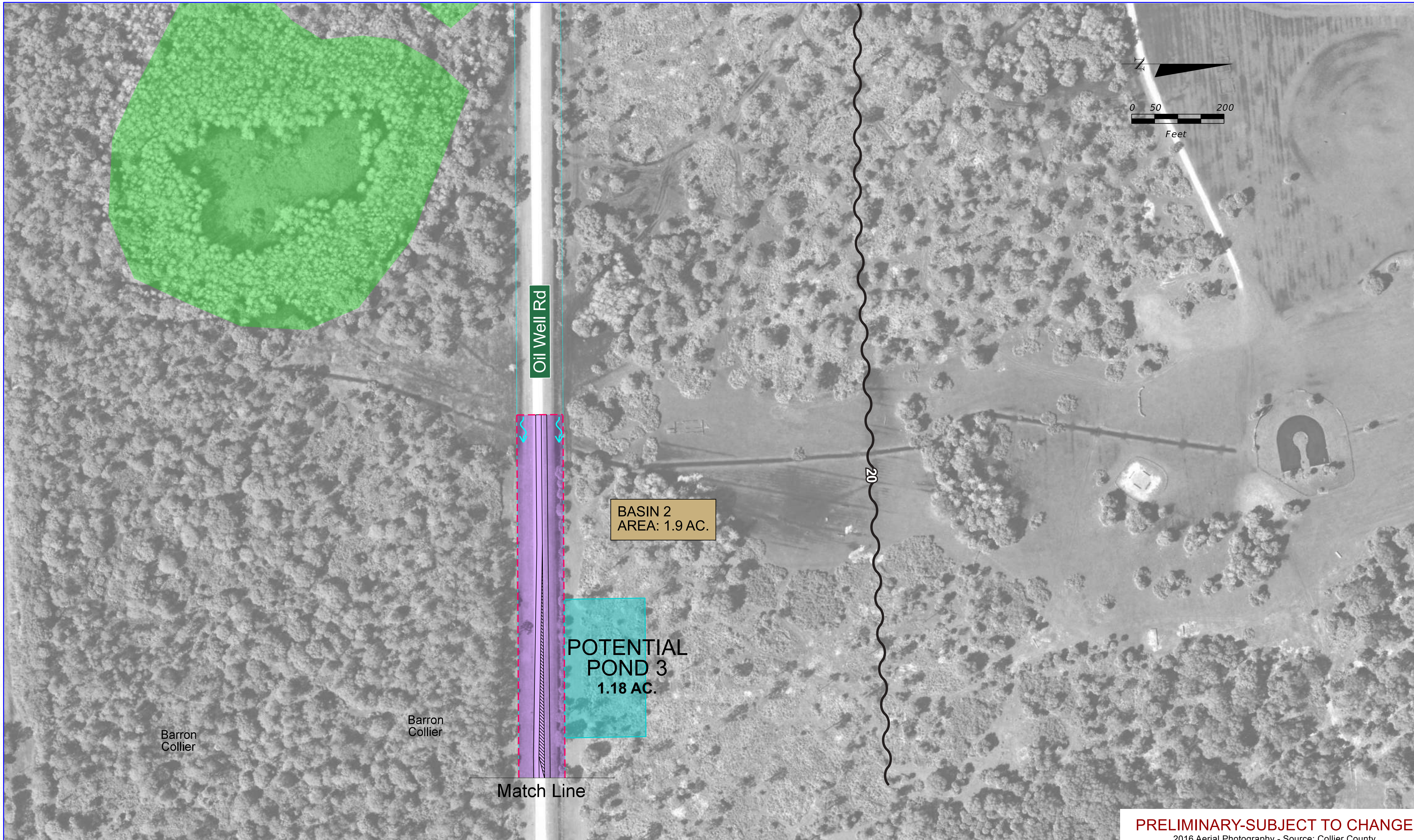

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

Sheet No.
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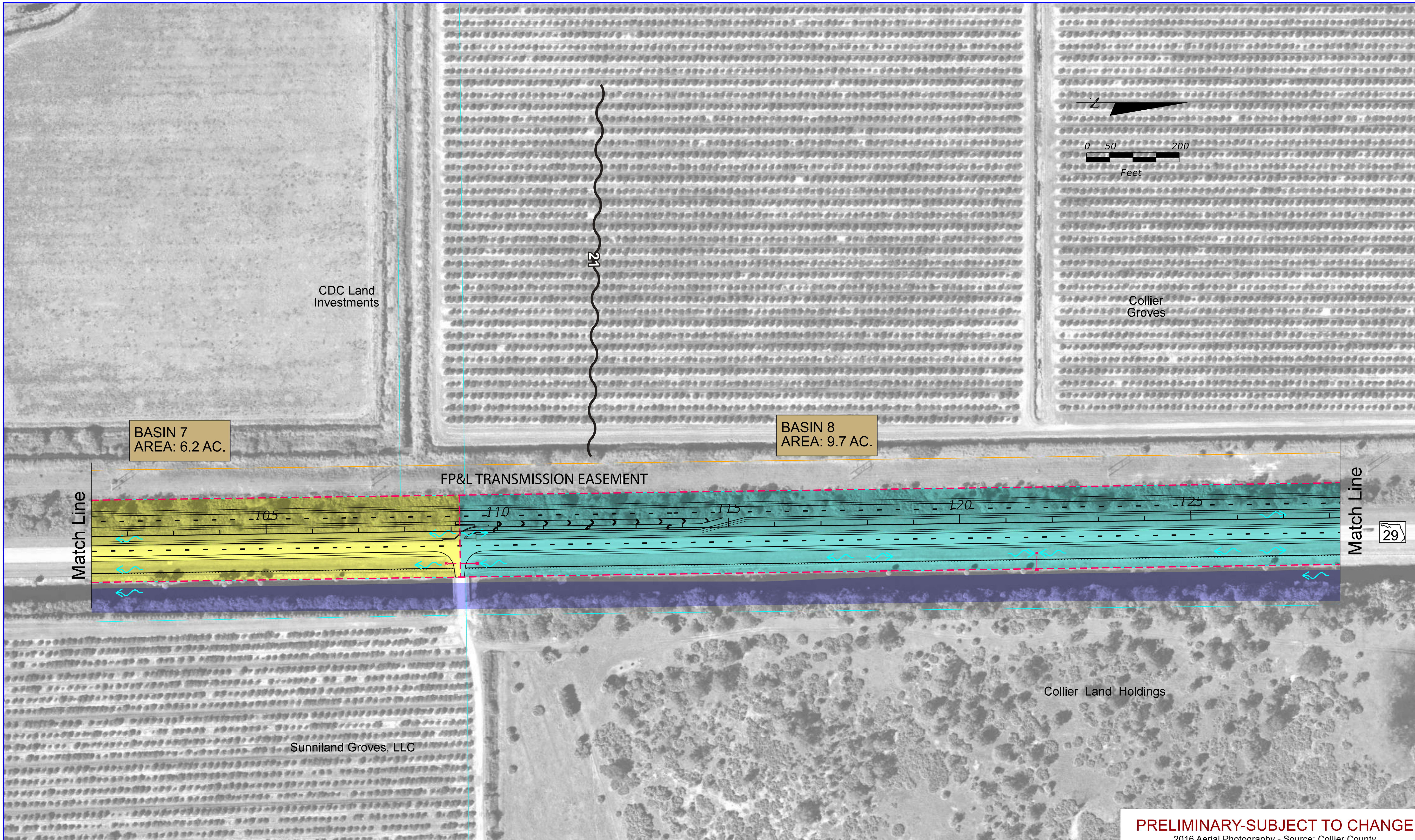

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

Sheet No.
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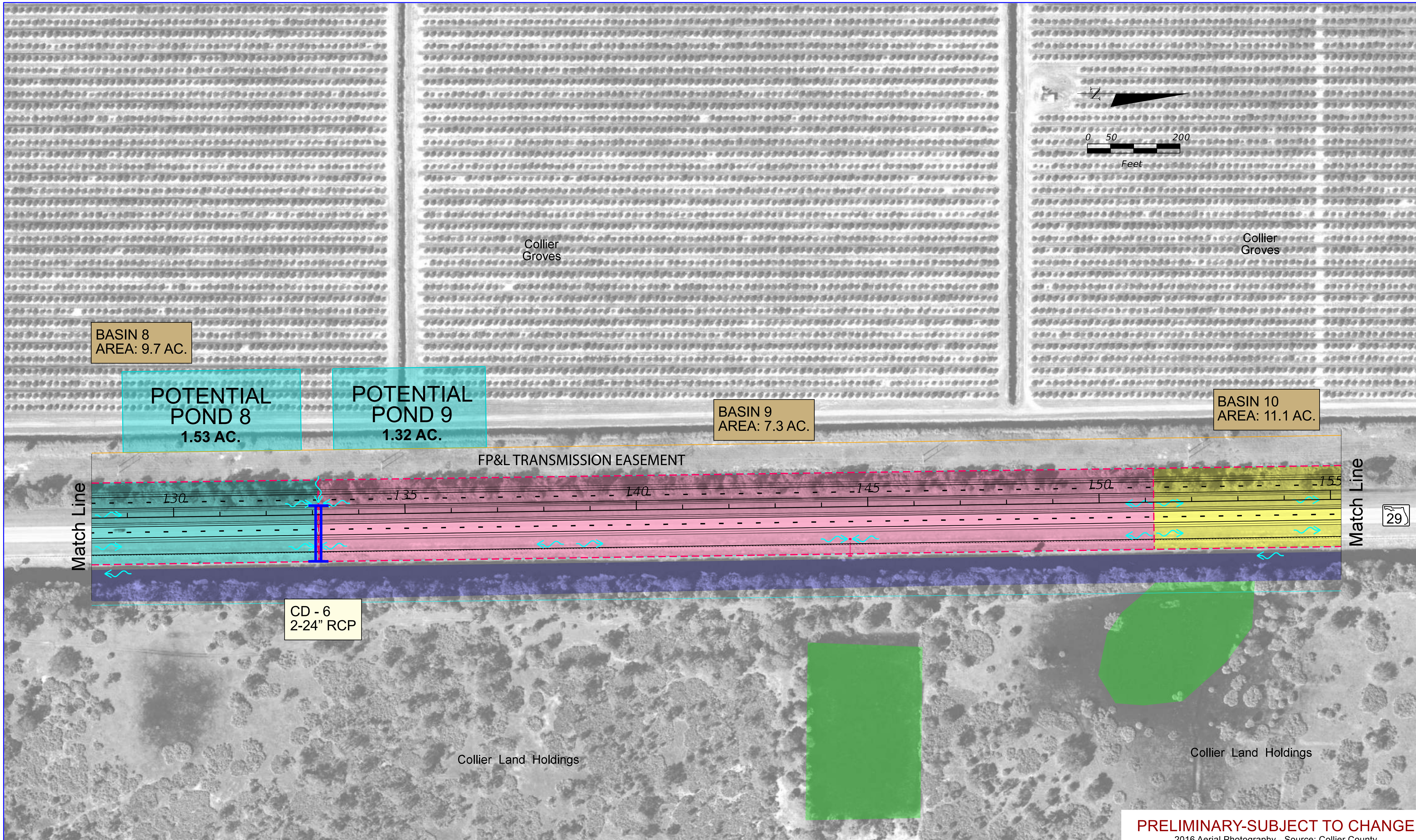

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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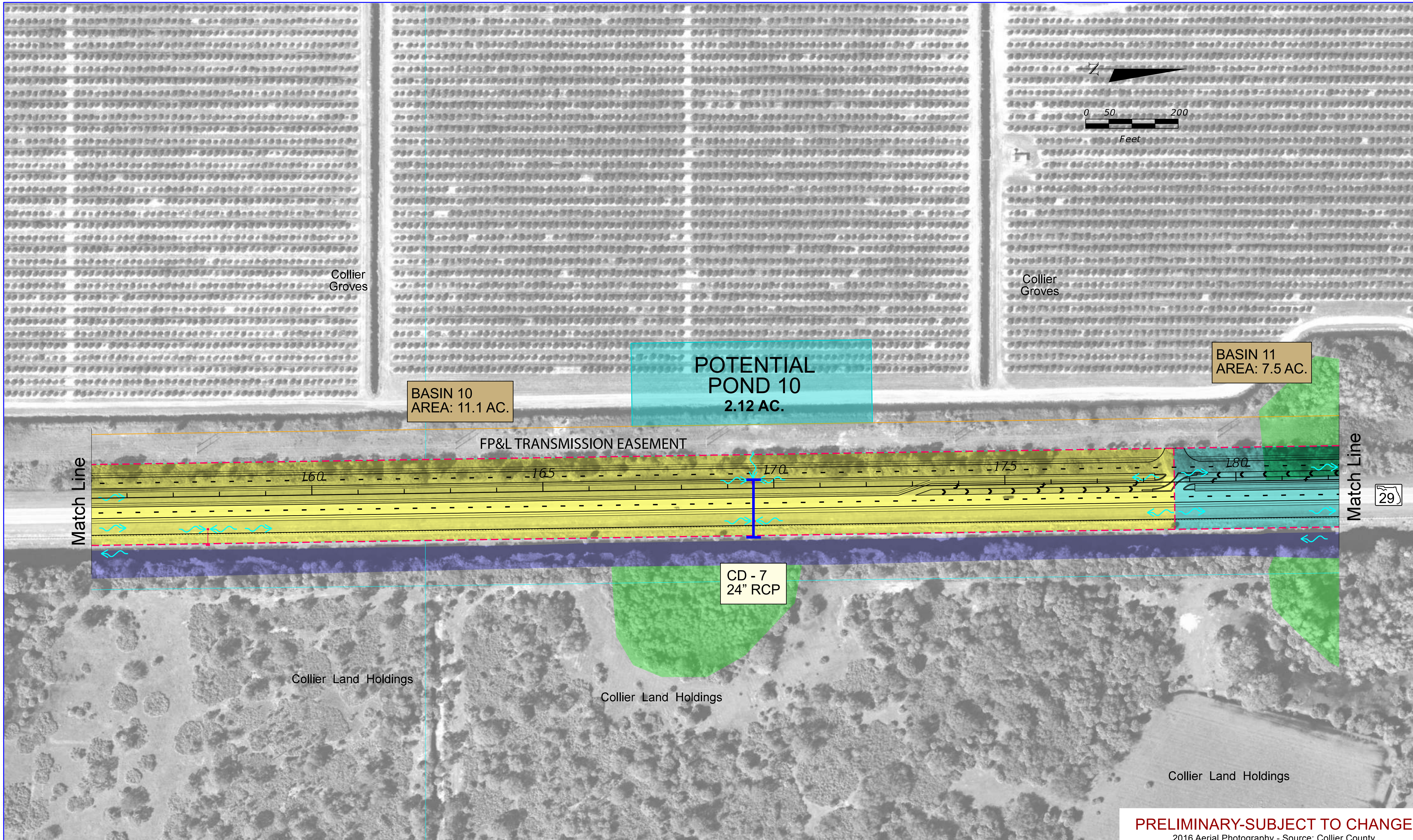
Proposed Drainage Maps Alternative #2

Sheet No. C-42



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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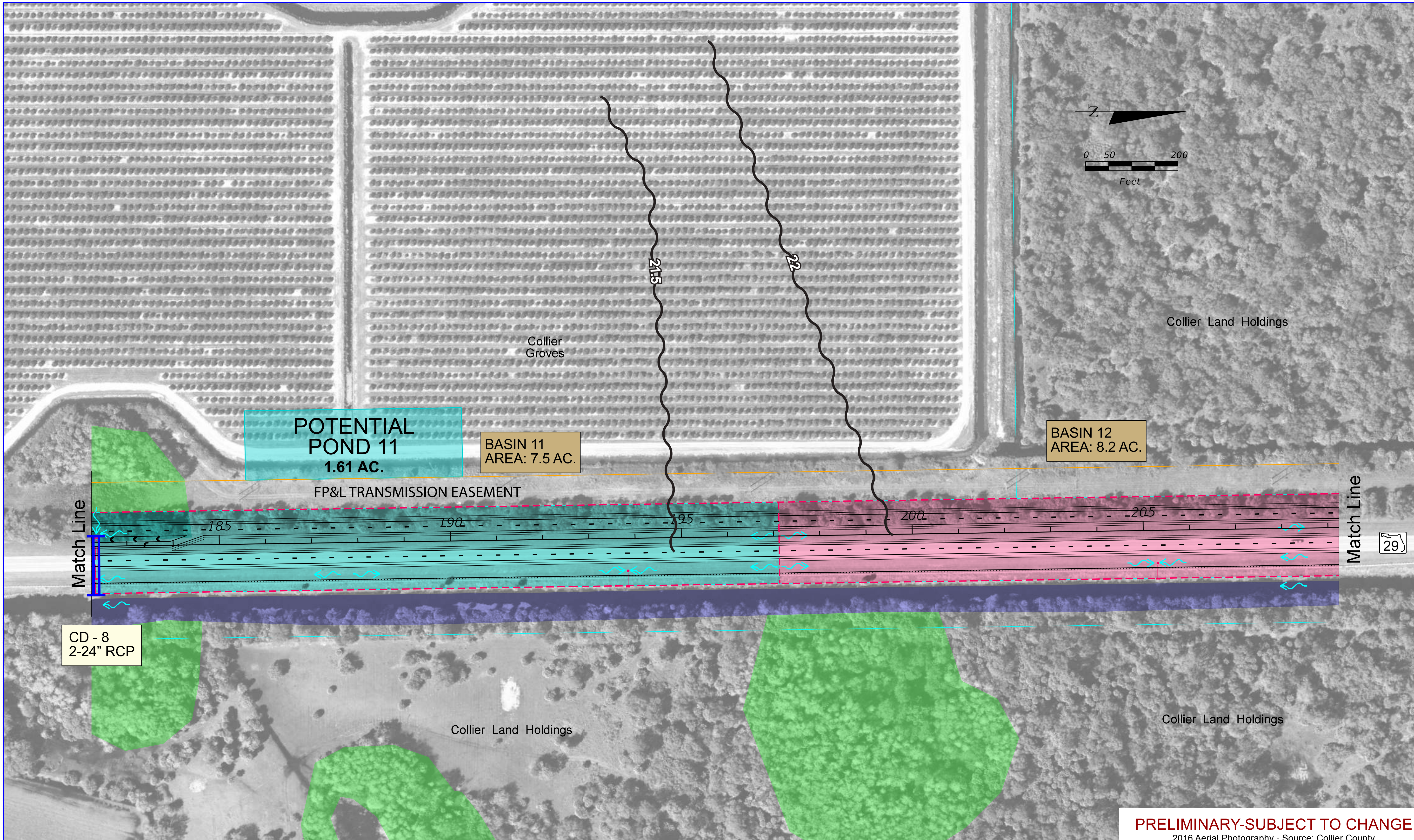

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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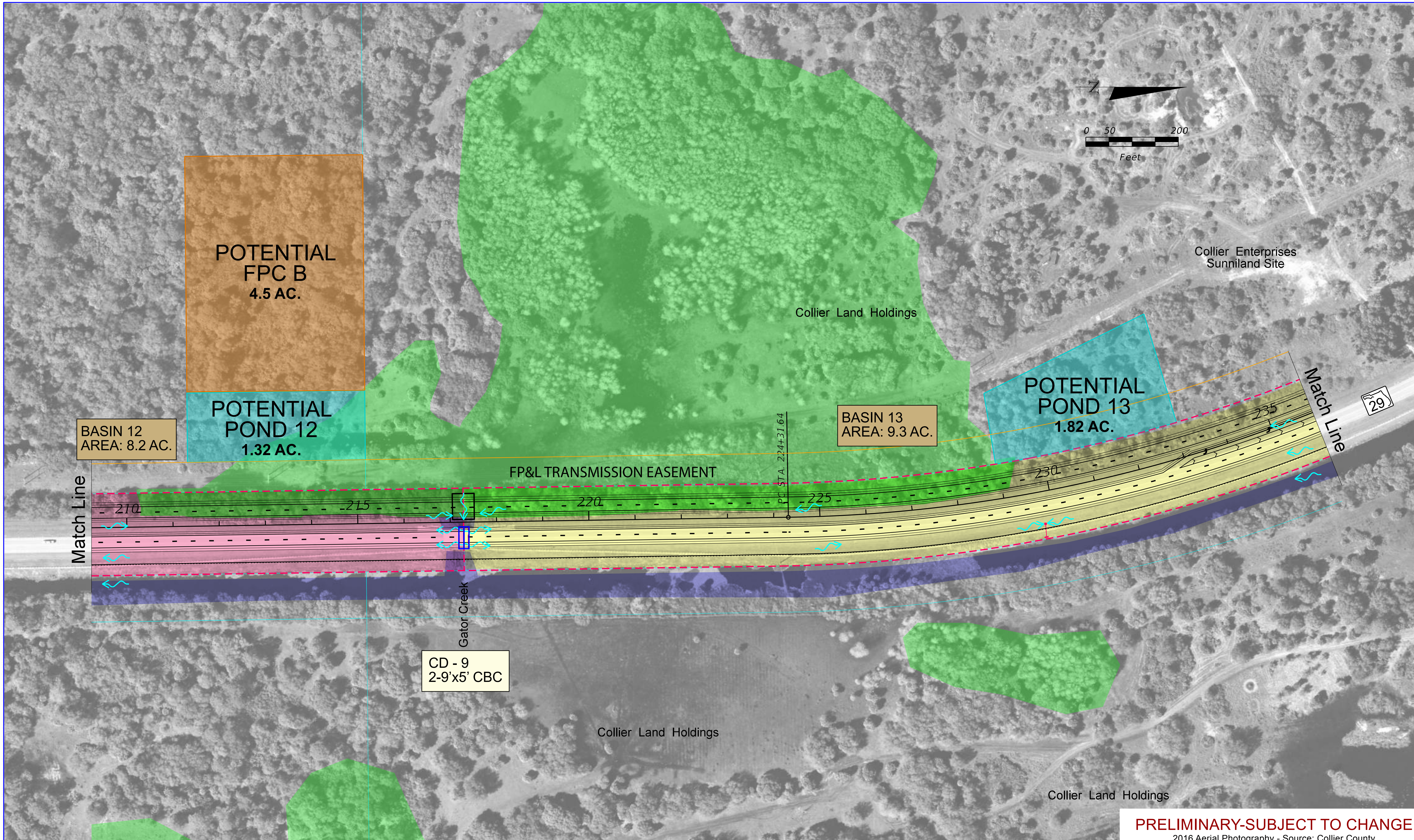
Proposed Drainage Maps Alternative #2

Sheet No. C-44



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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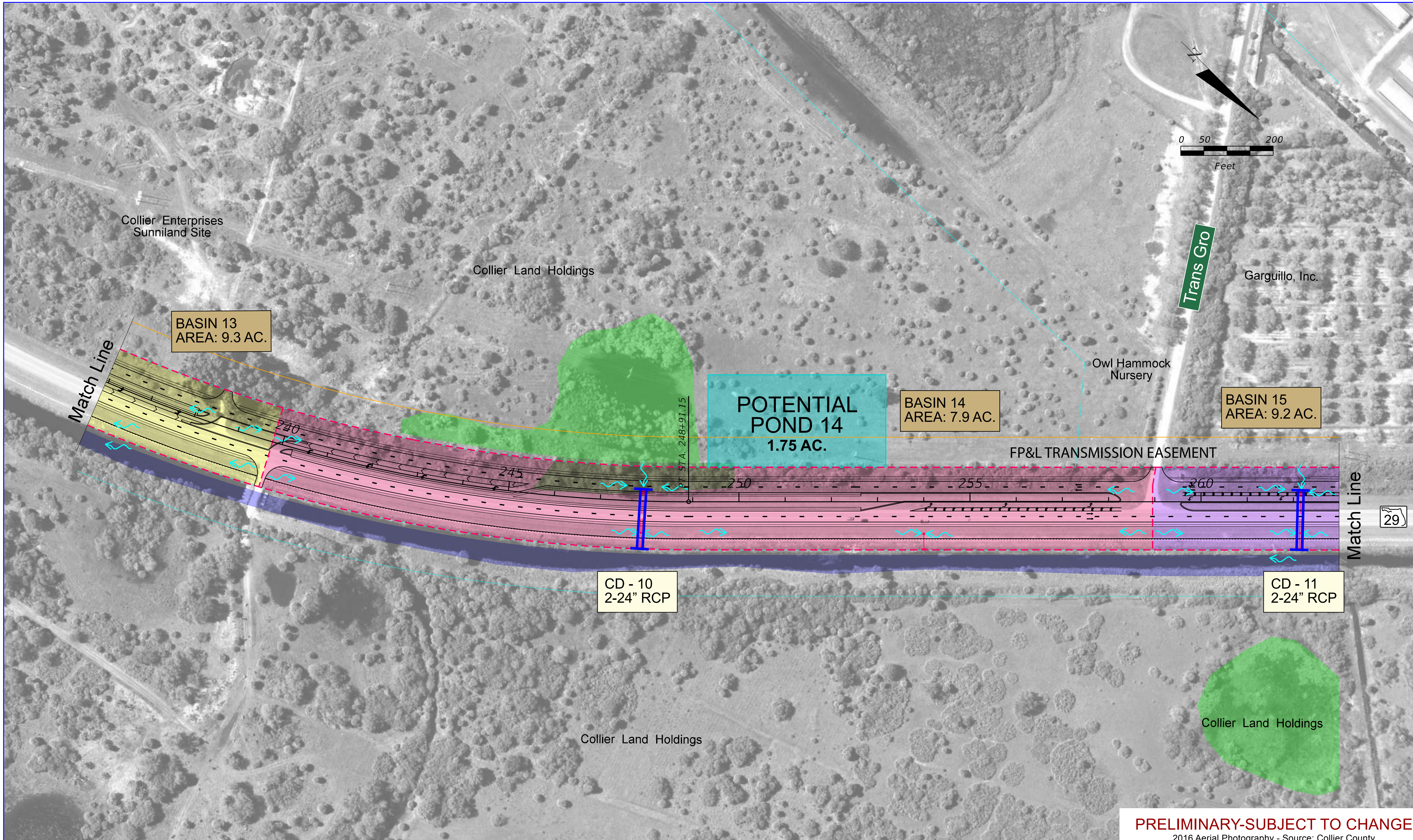
Proposed Drainage Maps Alternative #2

Sheet No. C-45



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	SR 29 Canal
Cross Drain	

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Proposed Drainage Maps Alternative #2

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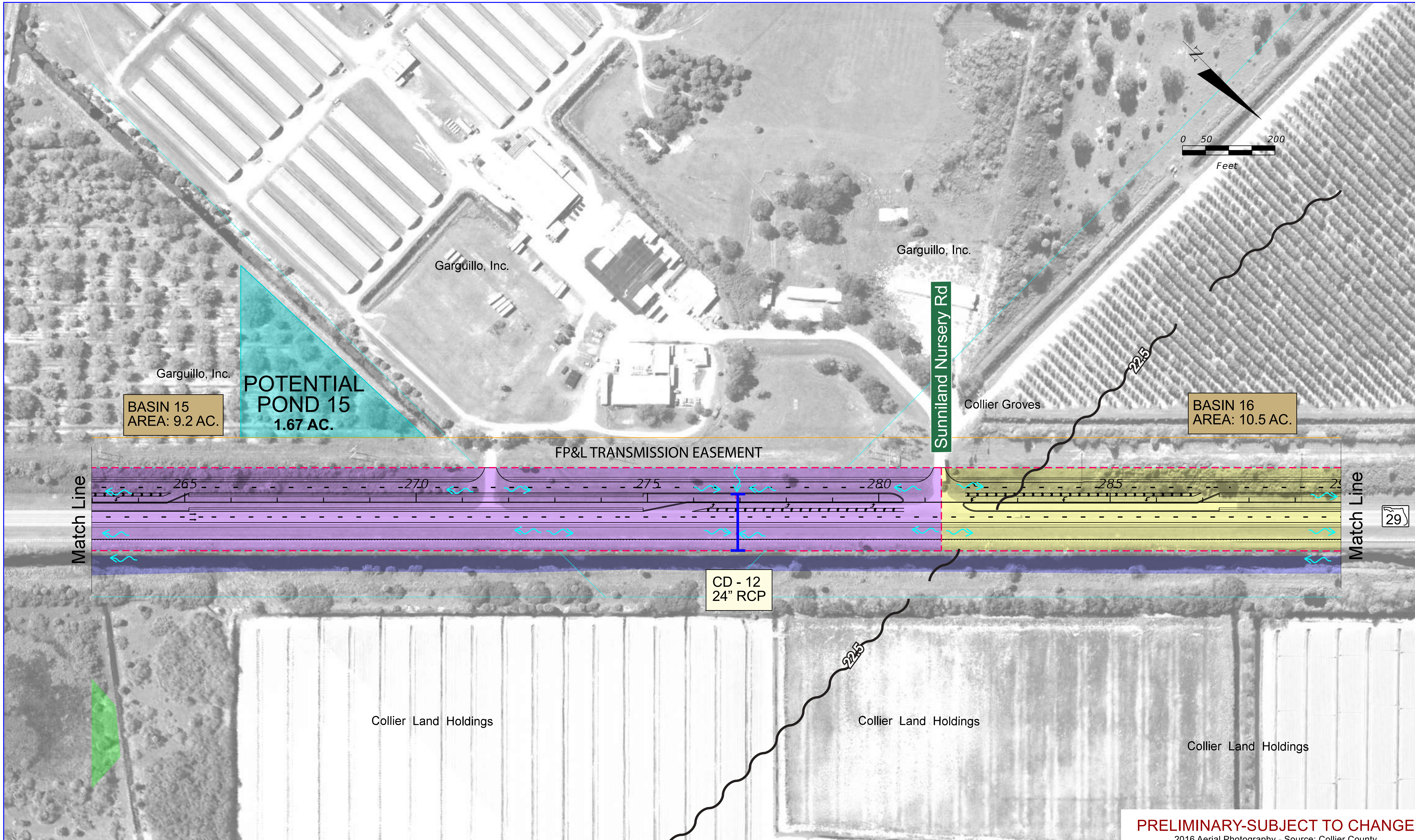

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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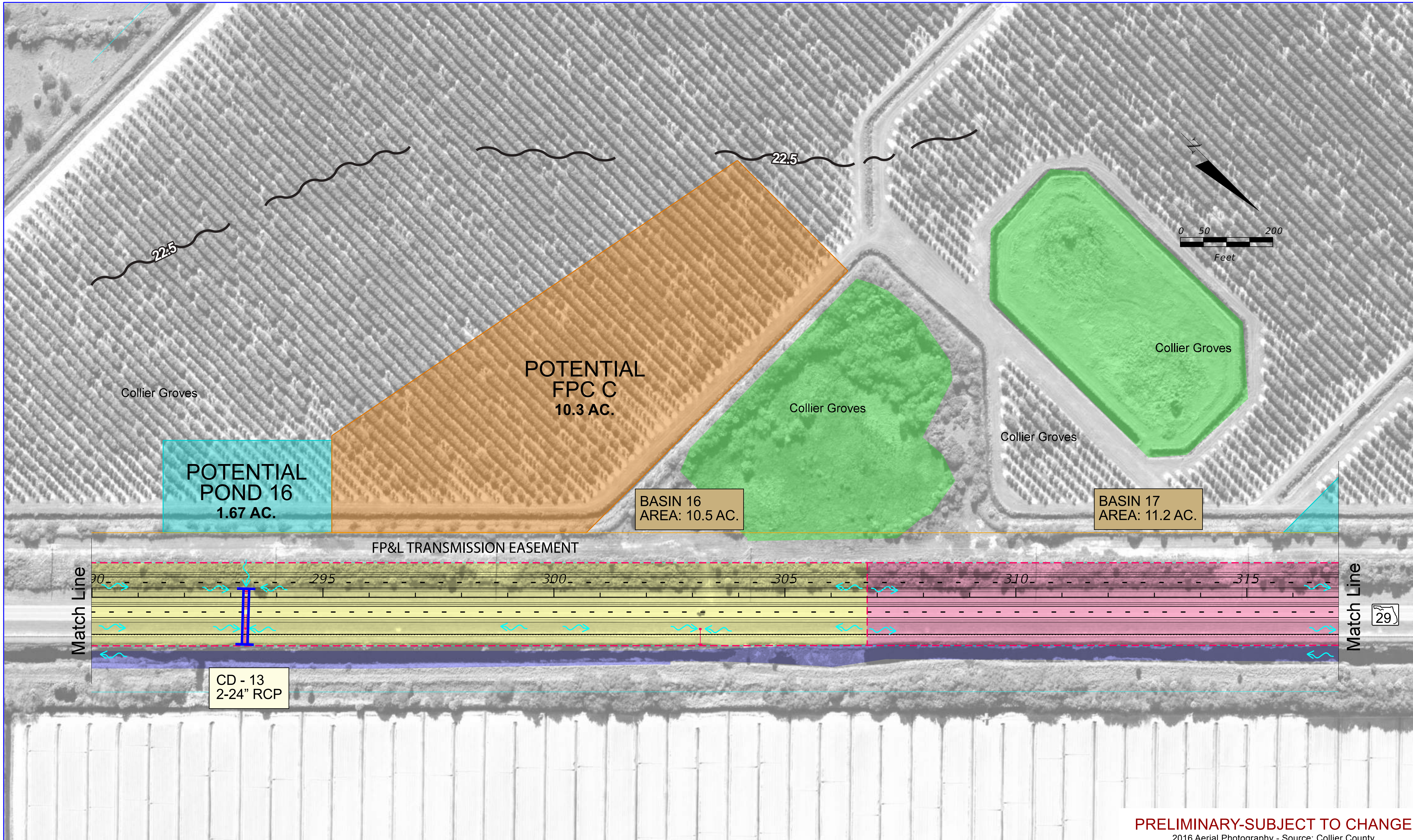

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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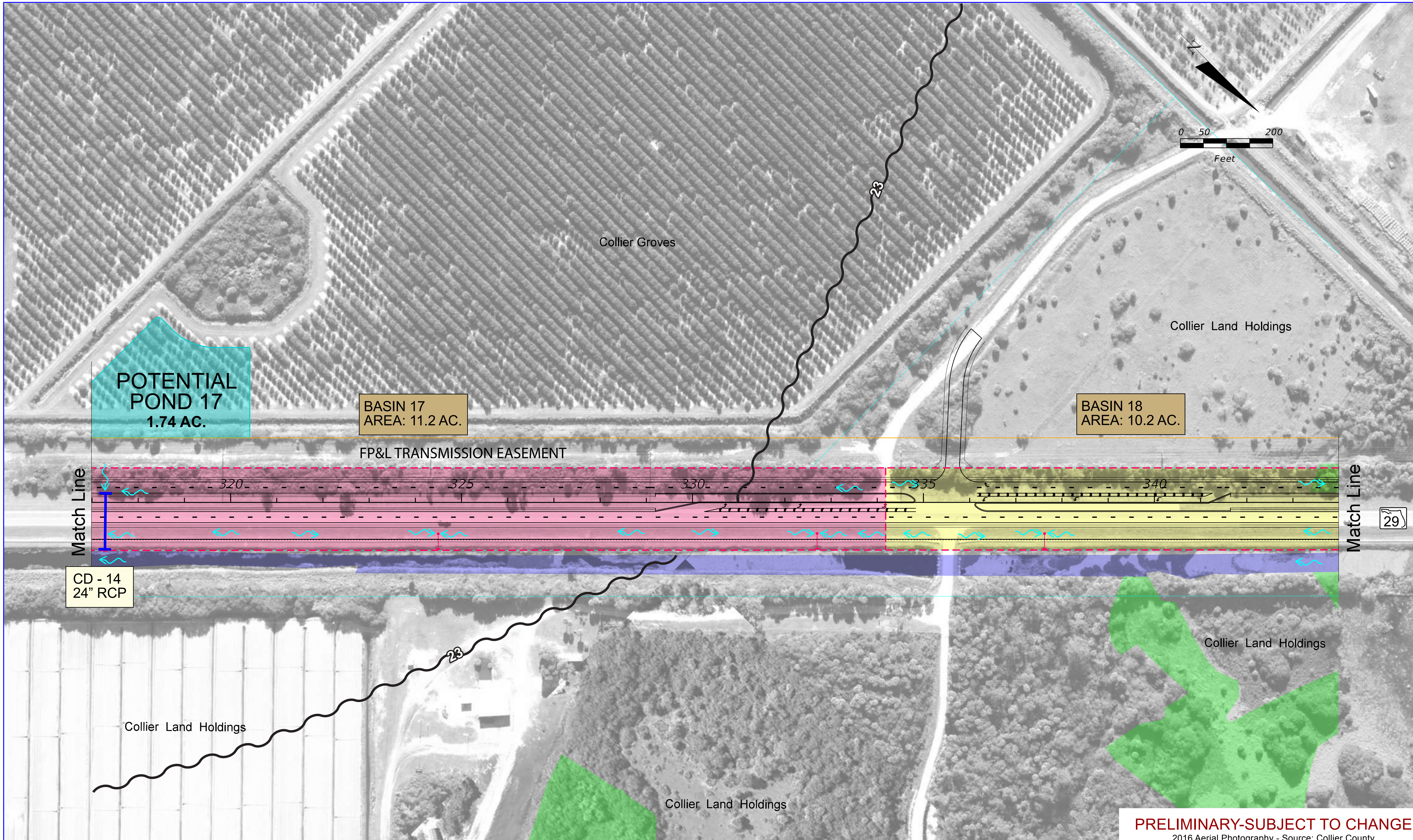

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

Sheet No.
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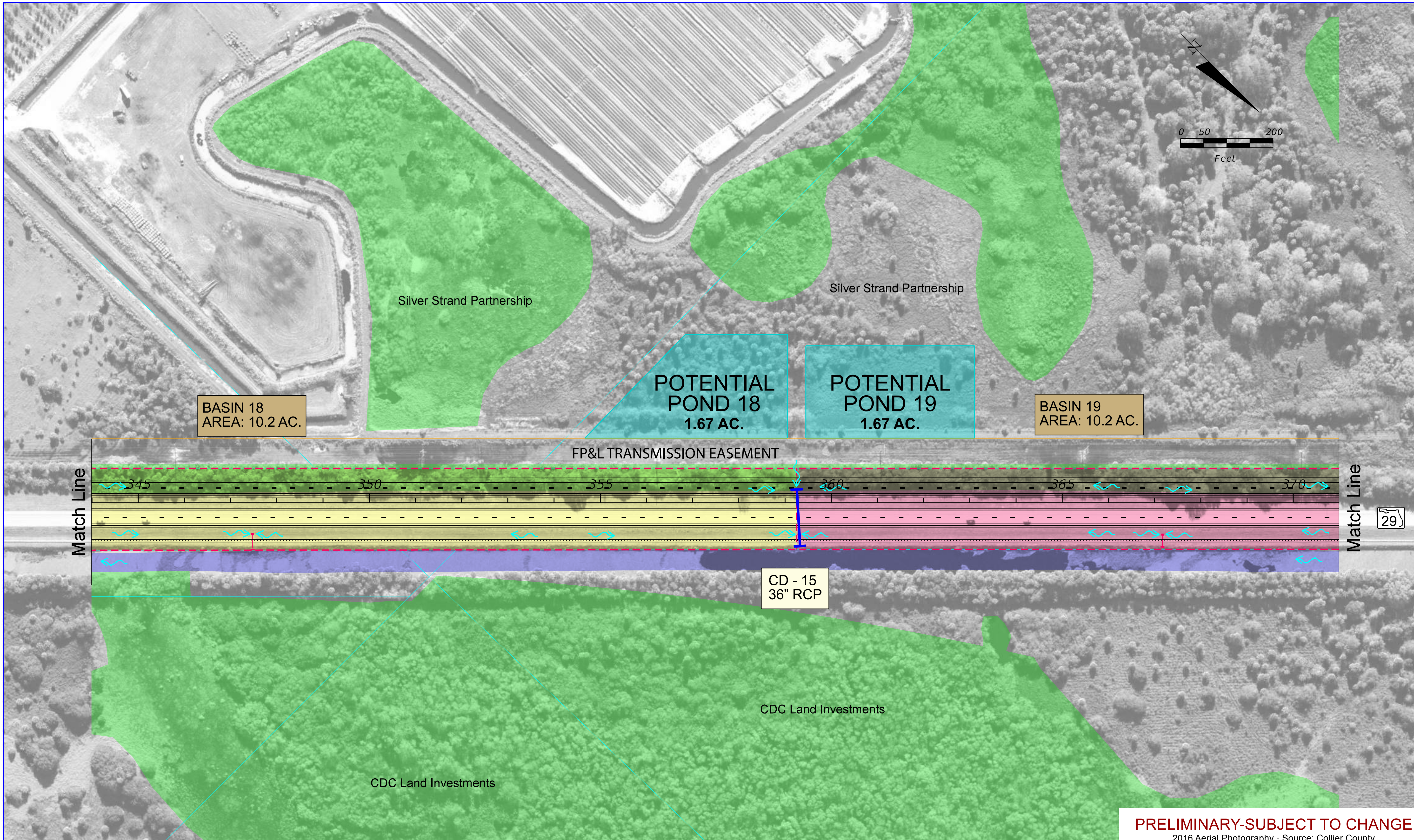

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

Sheet No.
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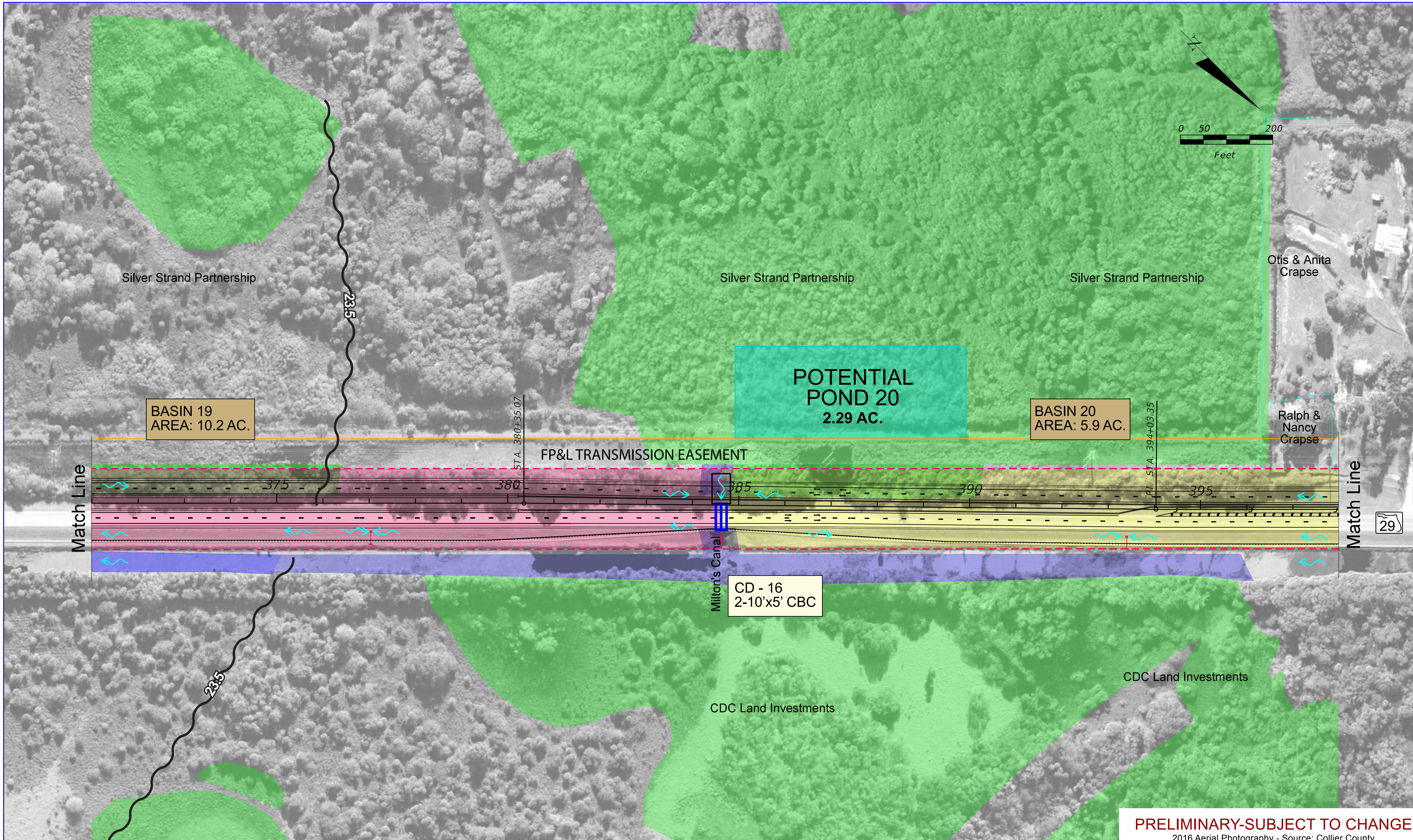

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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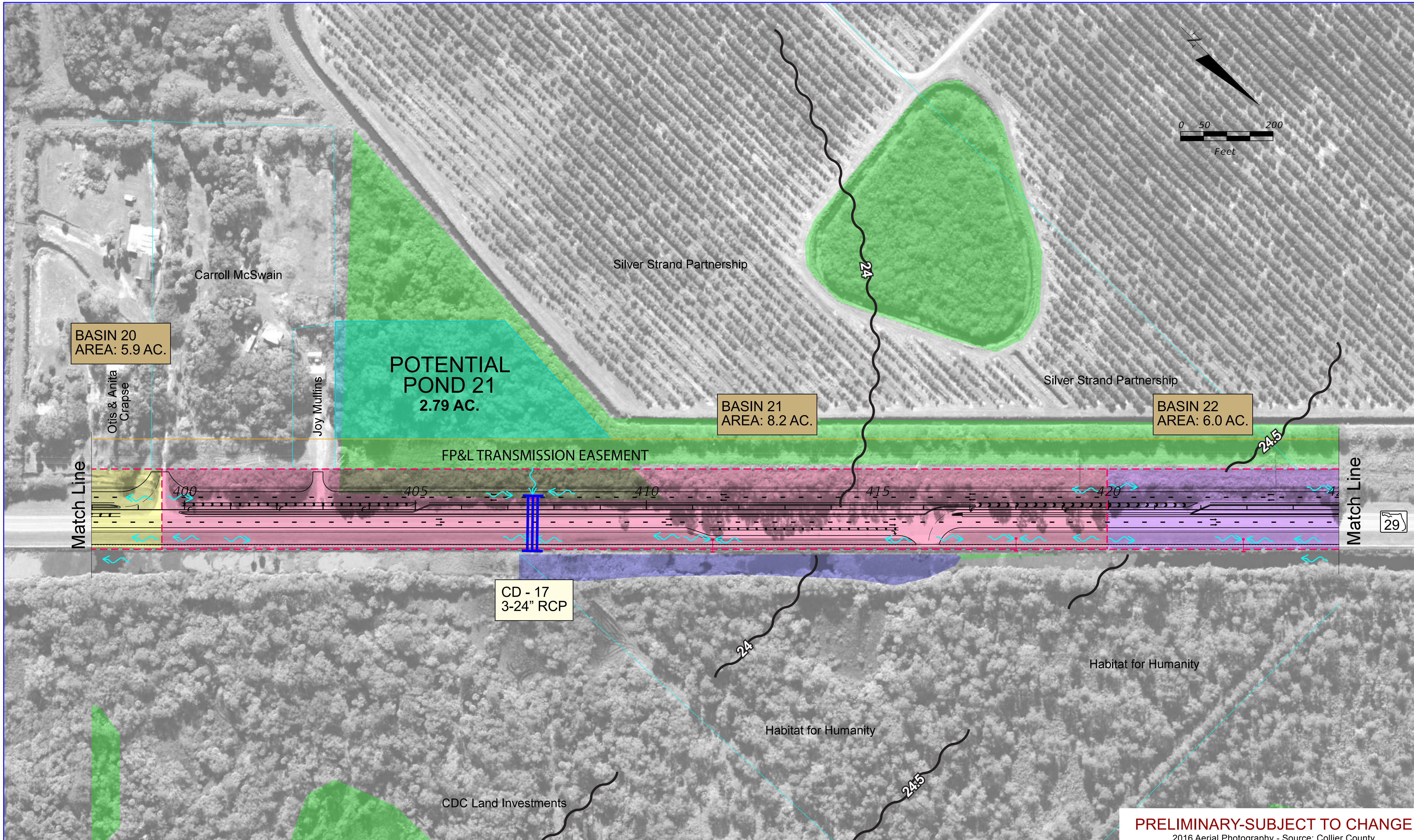

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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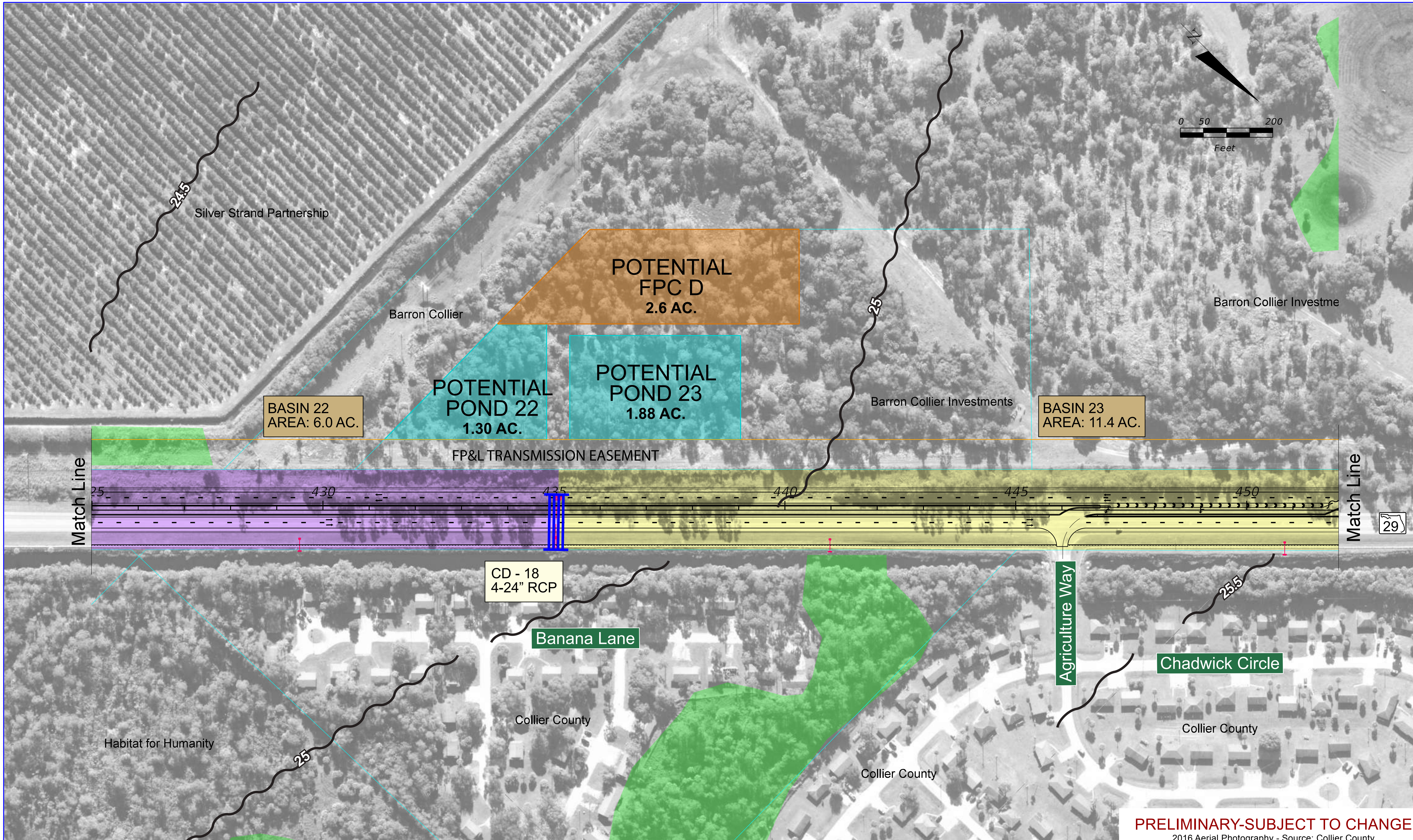

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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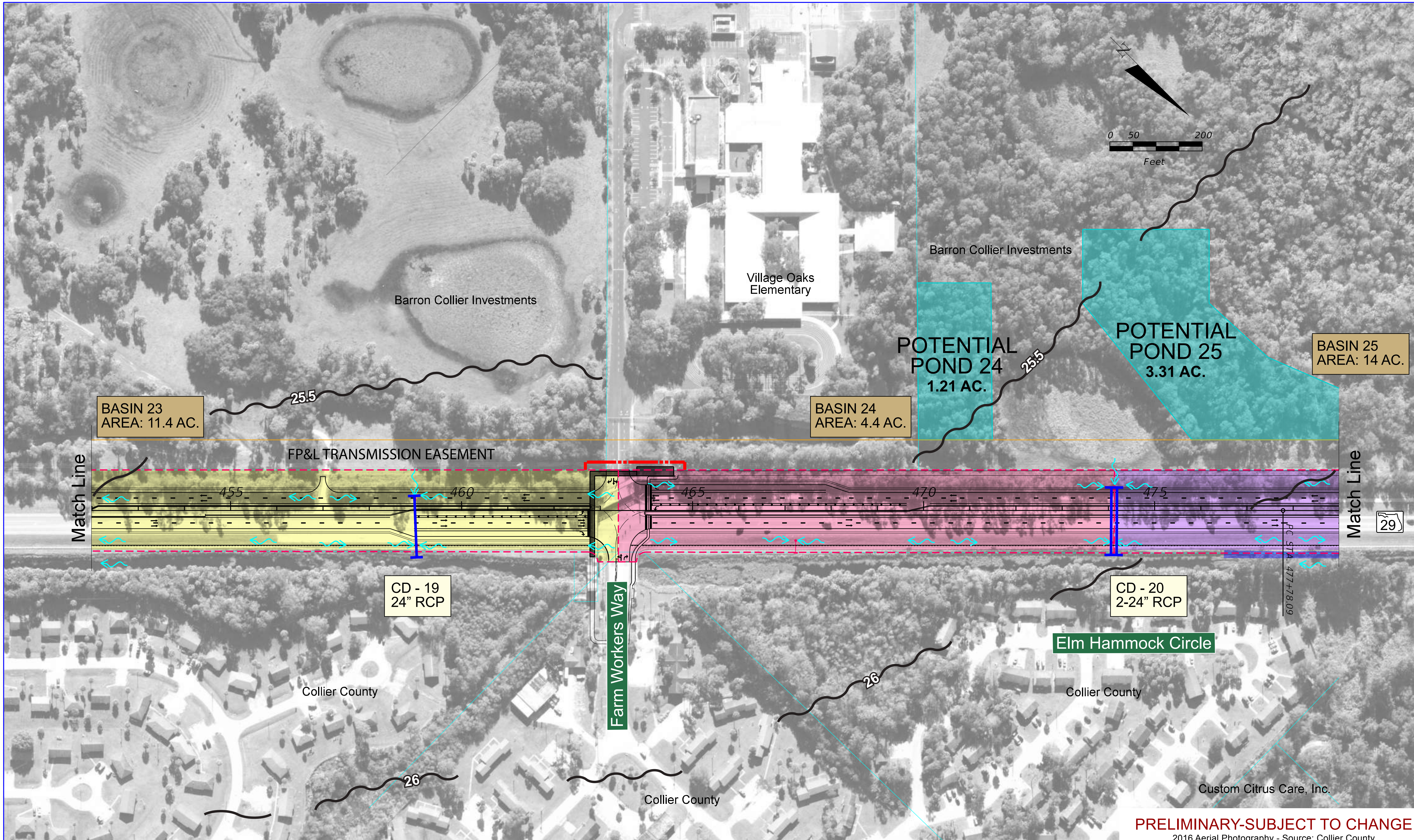
Proposed Drainage Maps Alternative #2

Sheet No. C-53



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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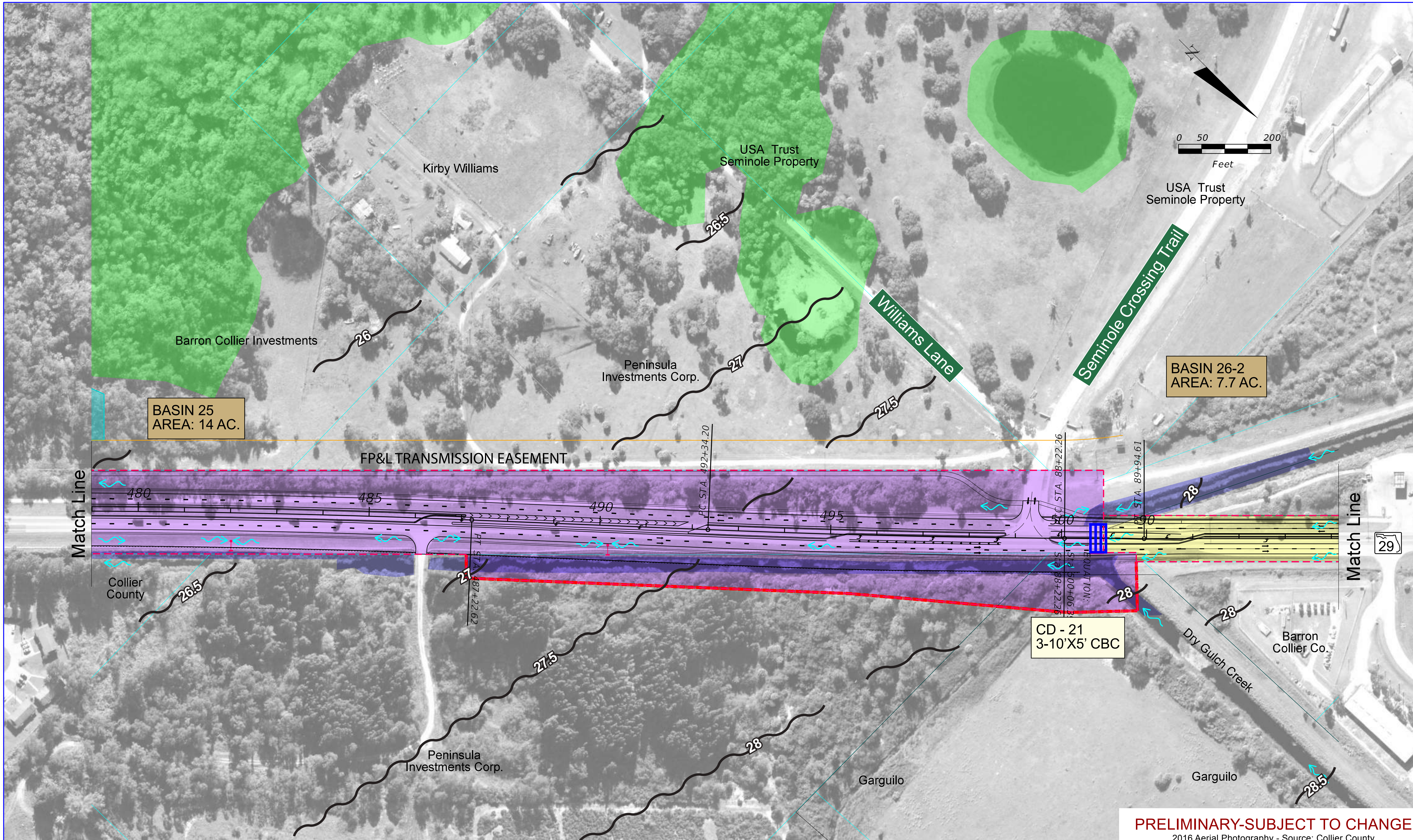

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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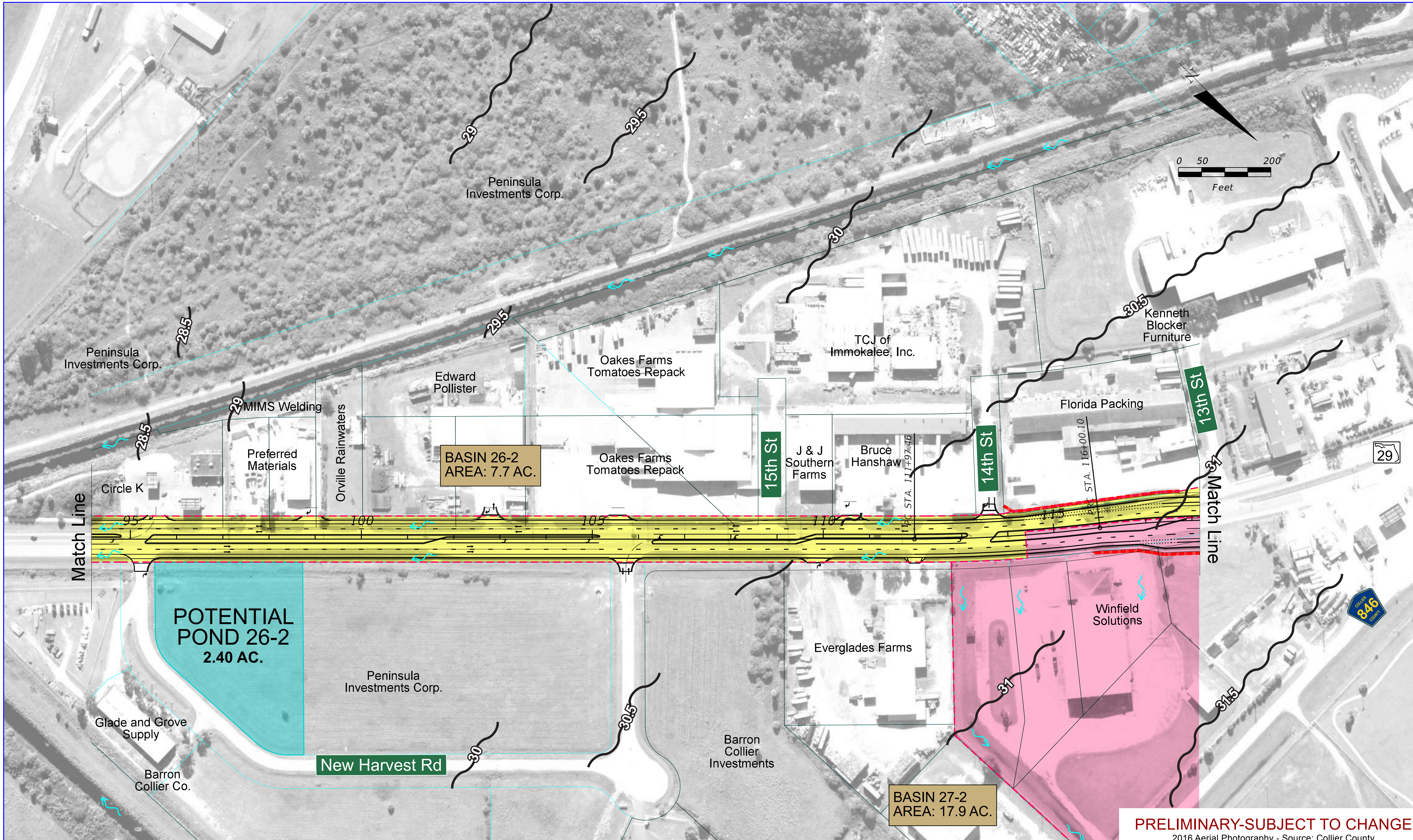

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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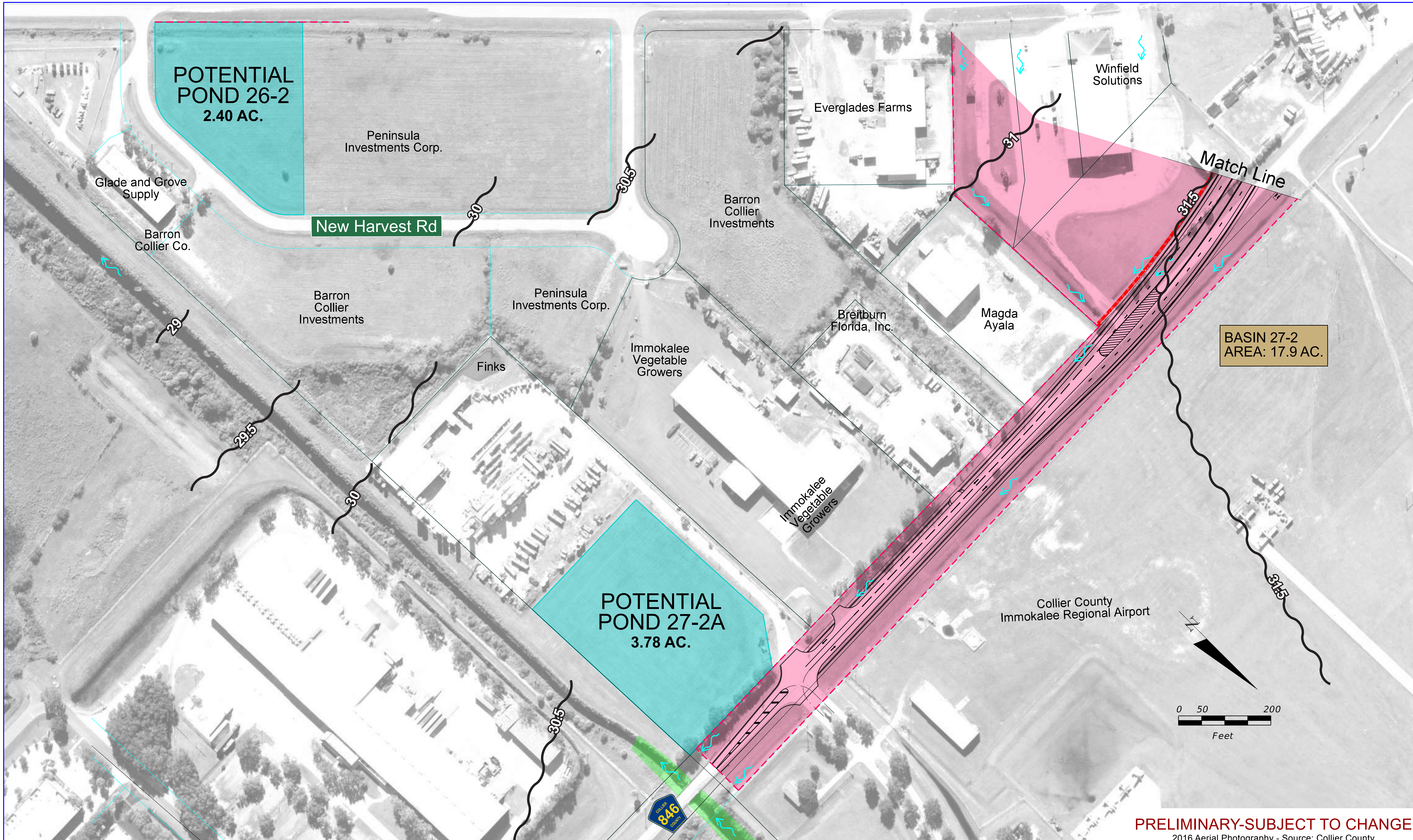

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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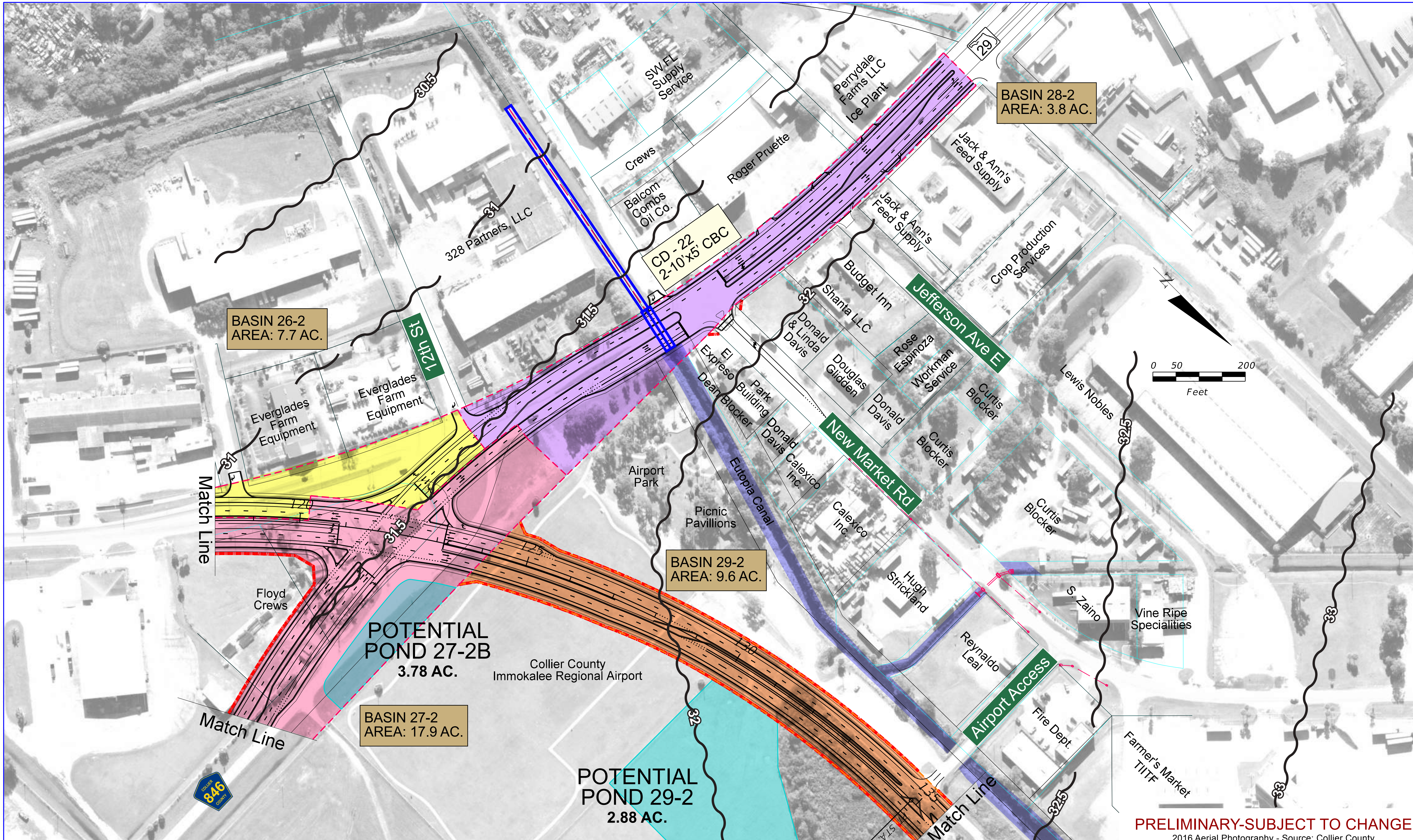

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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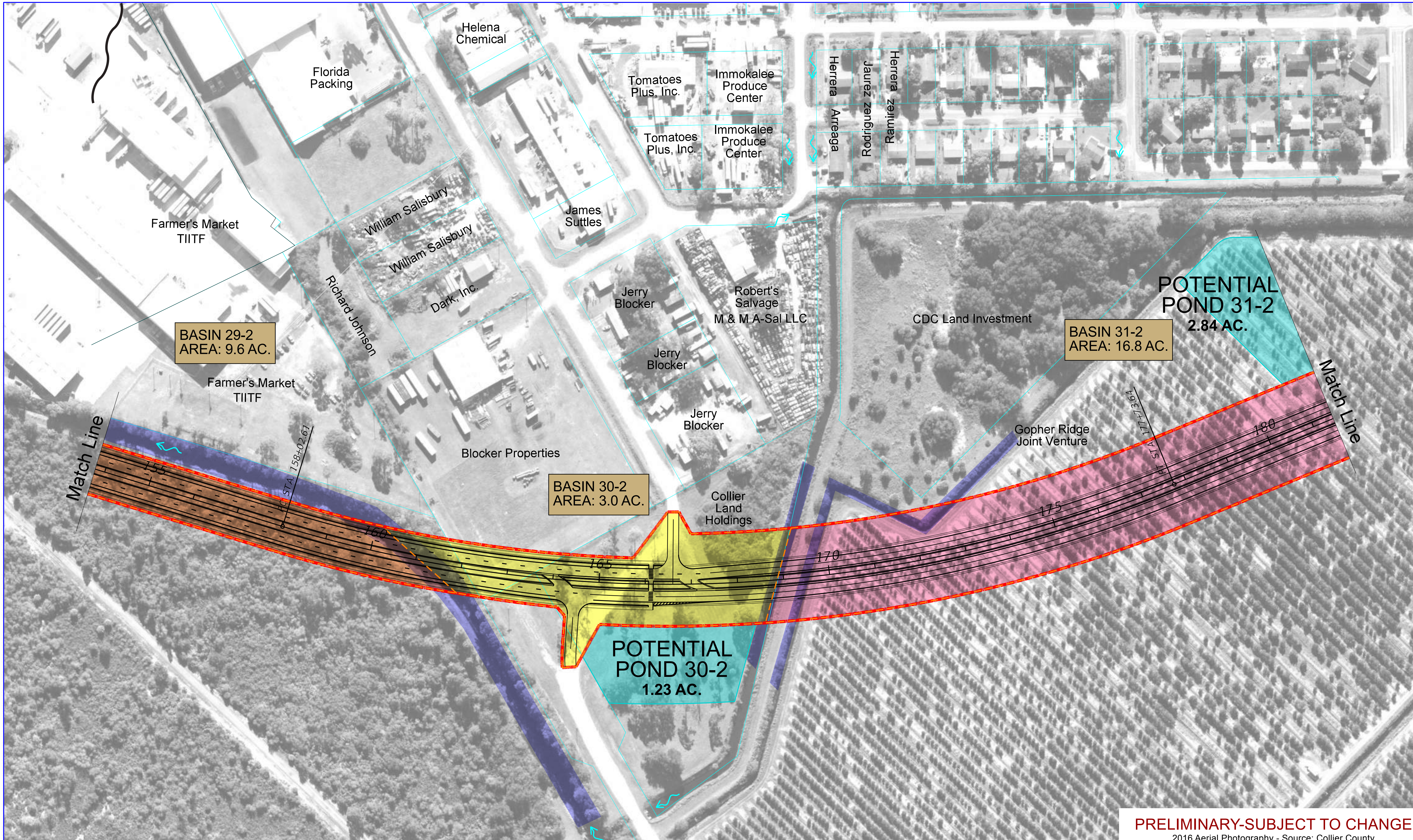

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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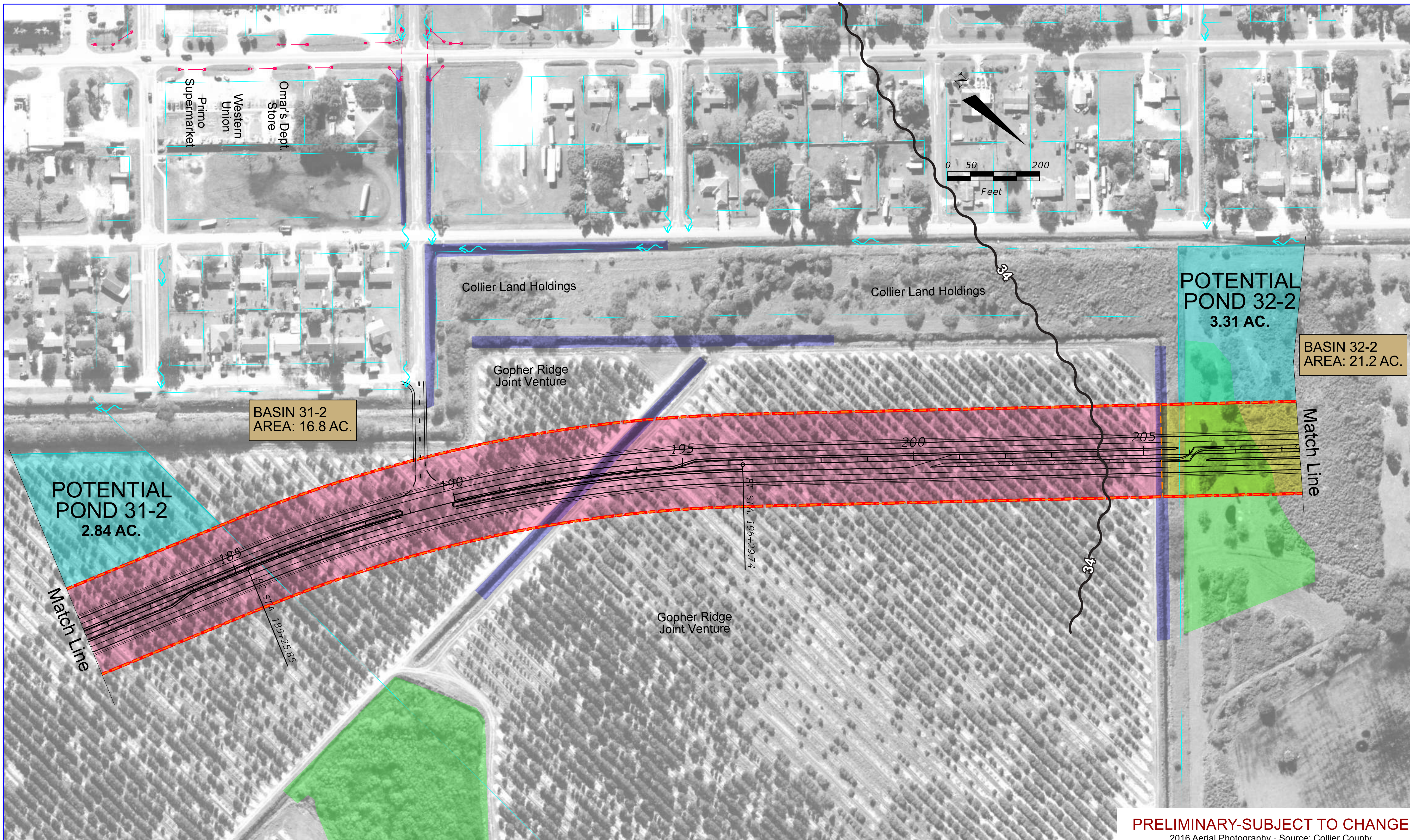

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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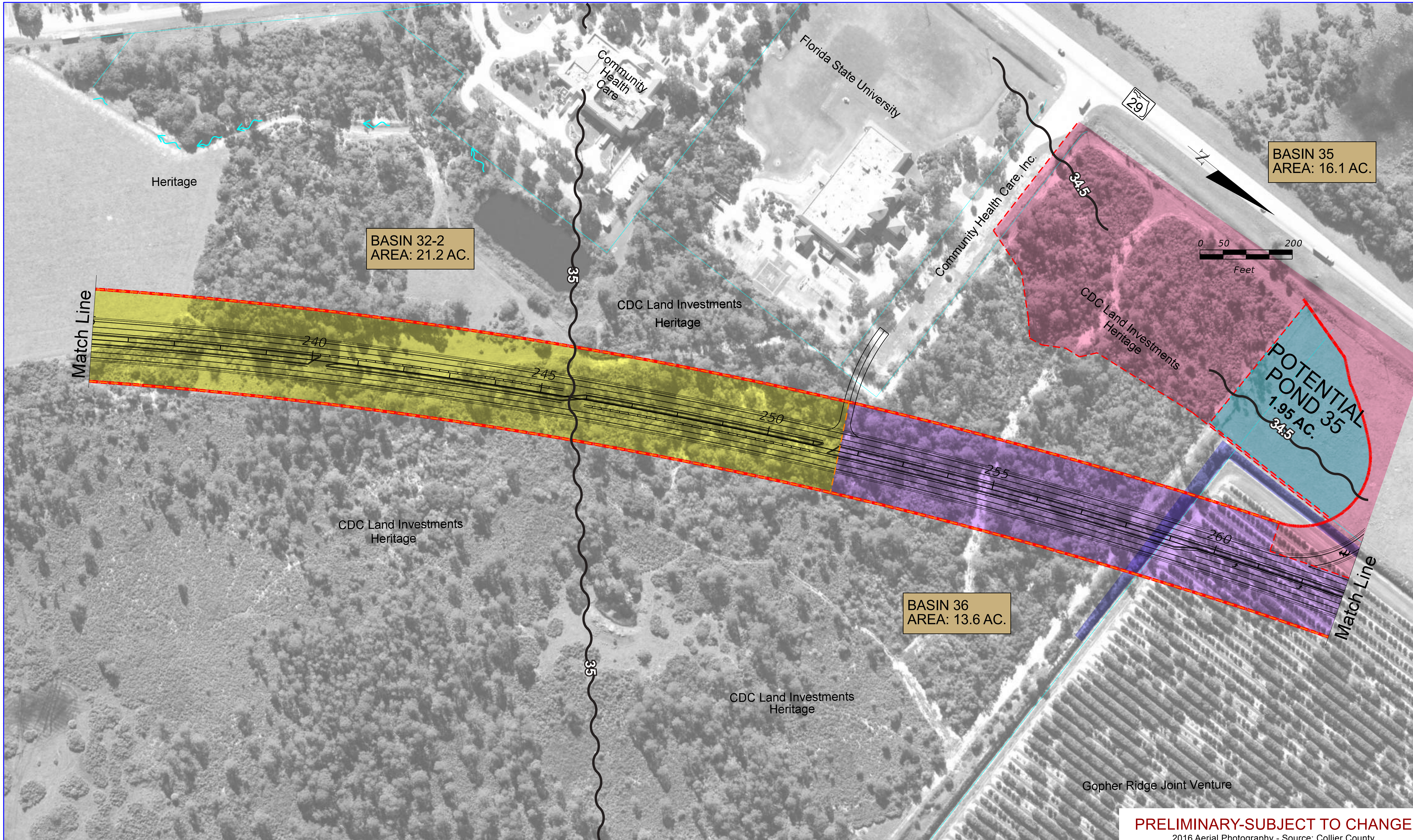

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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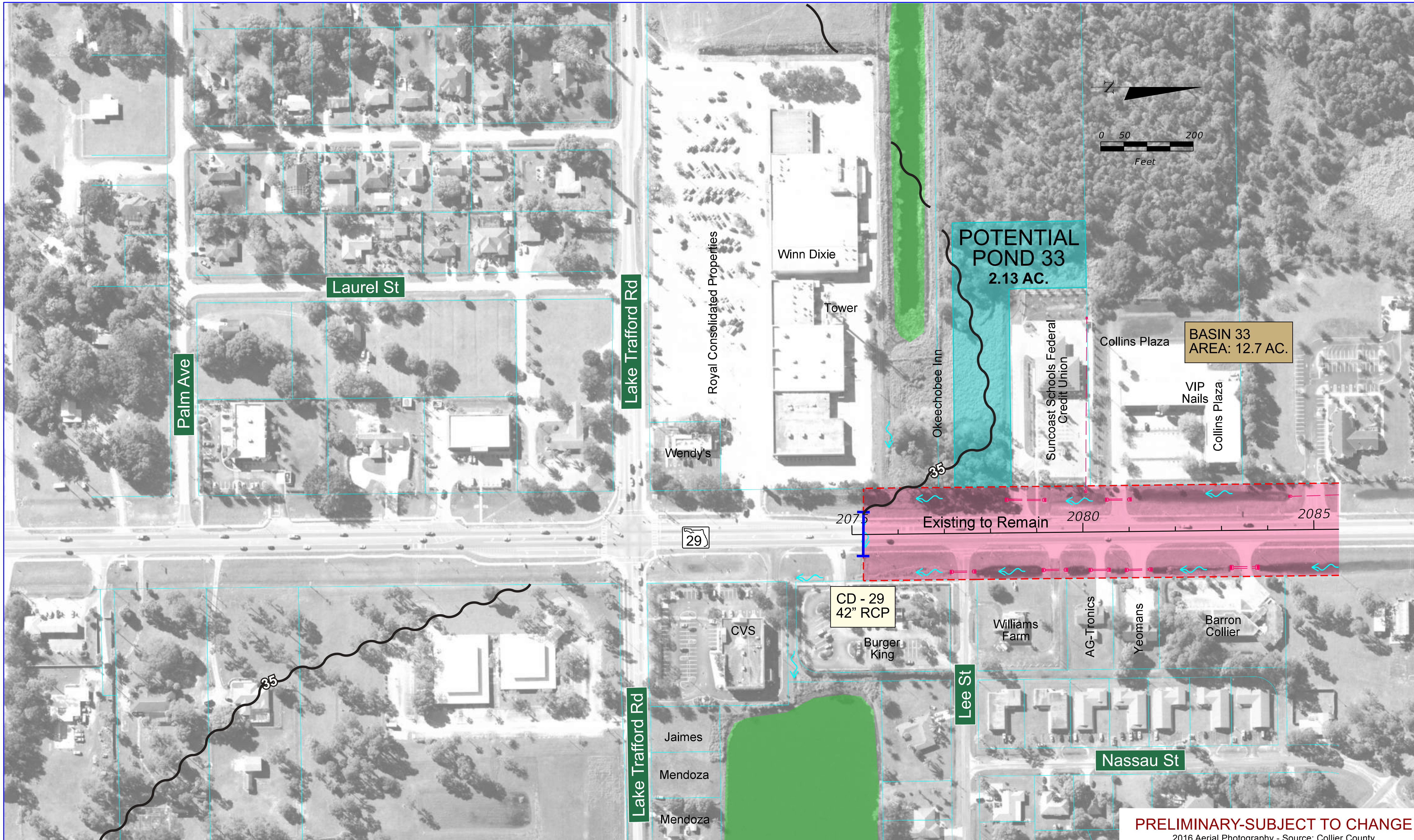

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
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- Wetlands
- Potential Pond
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- Barron Canal
- Base Flood Elevation

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Proposed Drainage Maps Alternative #2

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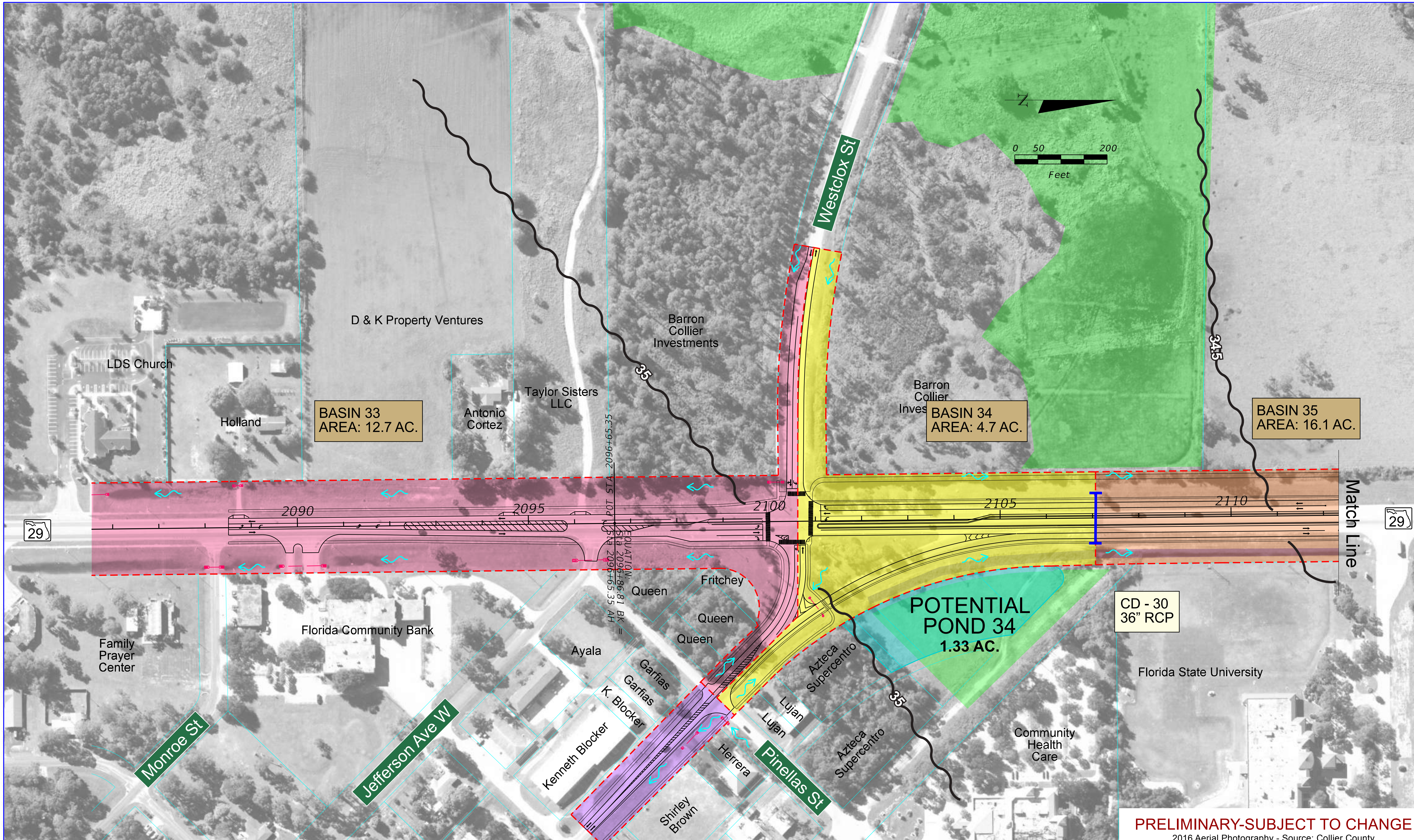

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
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- Barron Canal
- Base Flood Elevation

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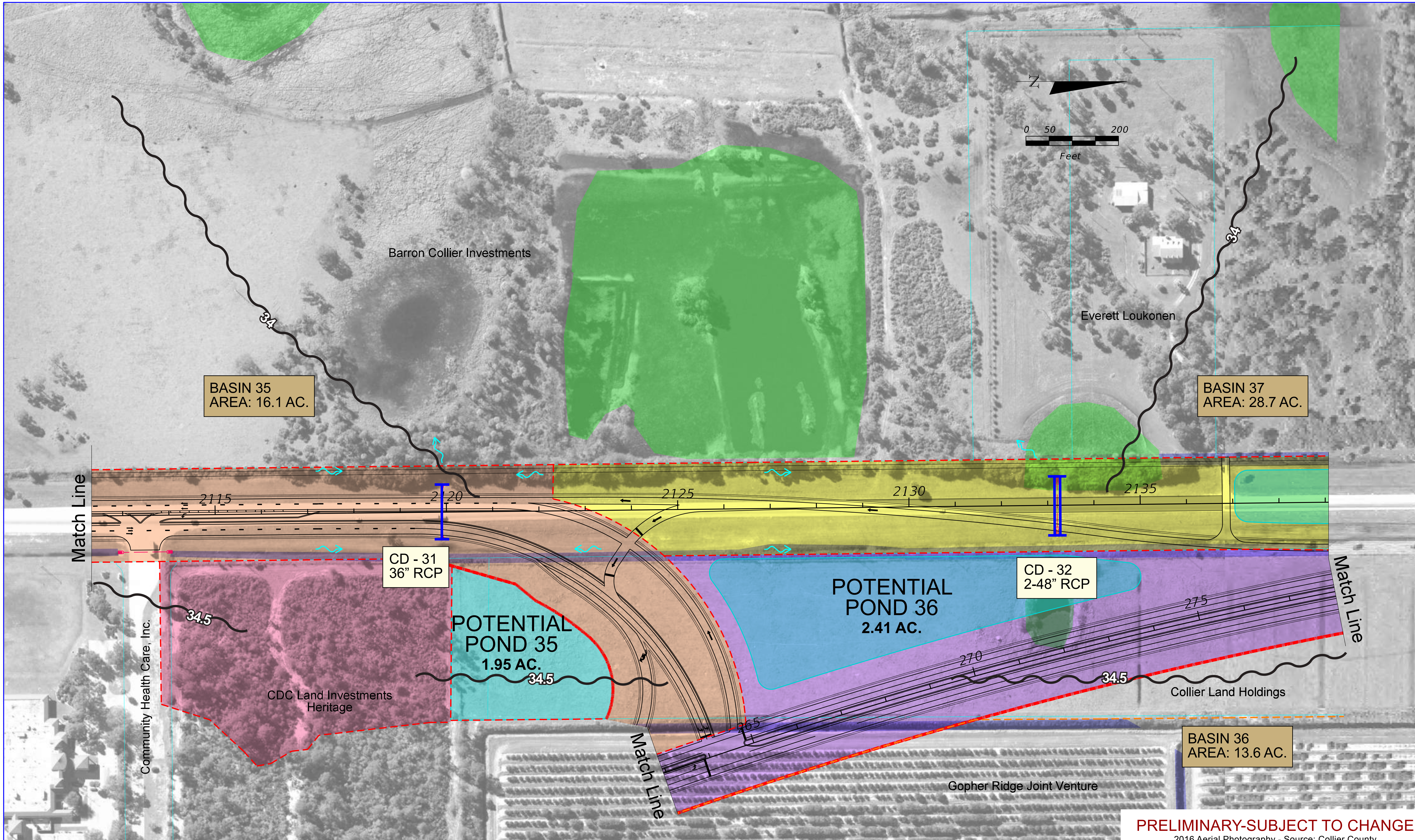
Proposed Drainage Maps Alternative #2

Sheet No. C-64



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

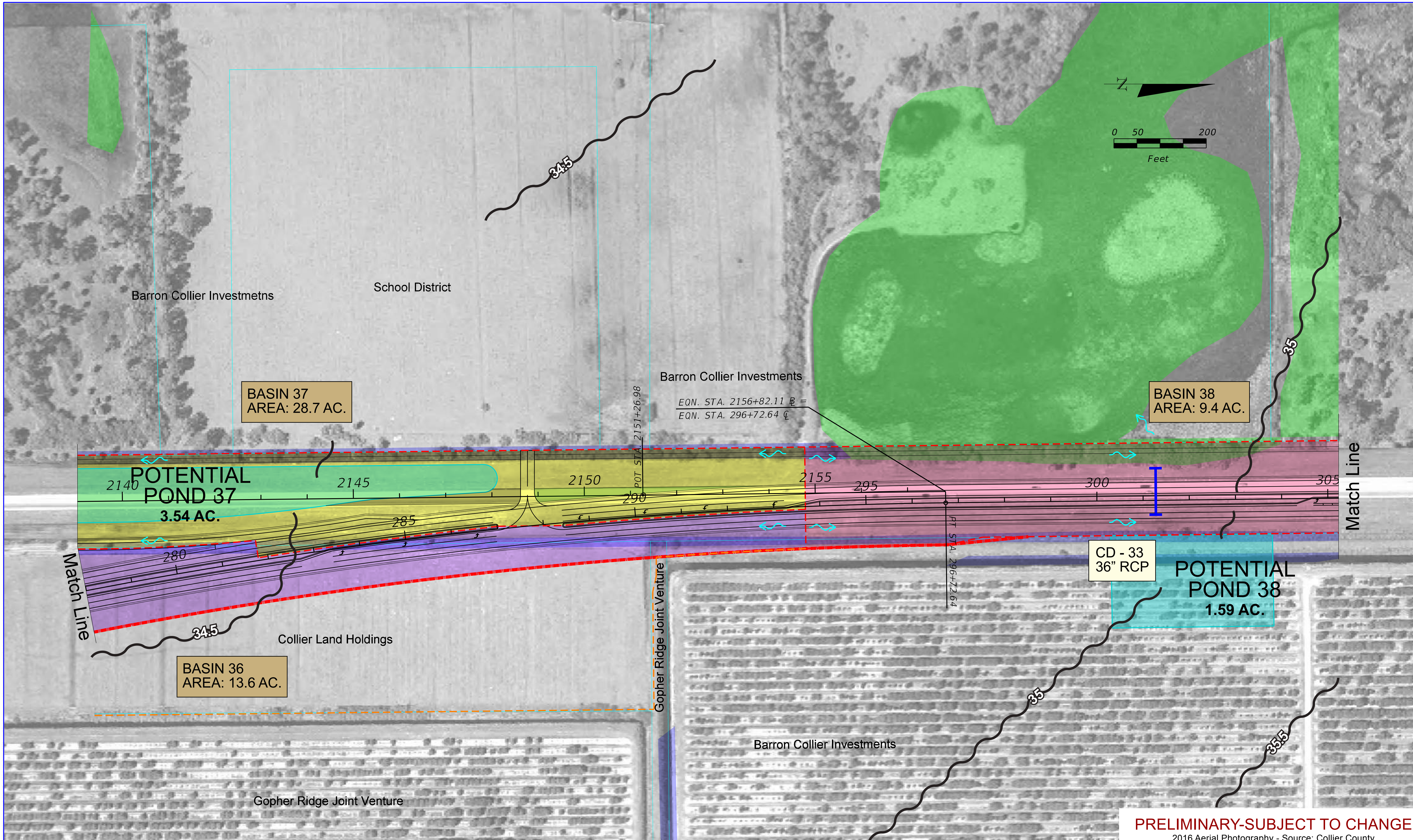
Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

H. W. Lochner, Inc.
4350 W. Cypress St., Suite 800
Tampa, Florida 33607
FBPR Certificate of Auth. #894

Proposed Drainage Maps Alternative #2

Sheet No. C-65



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

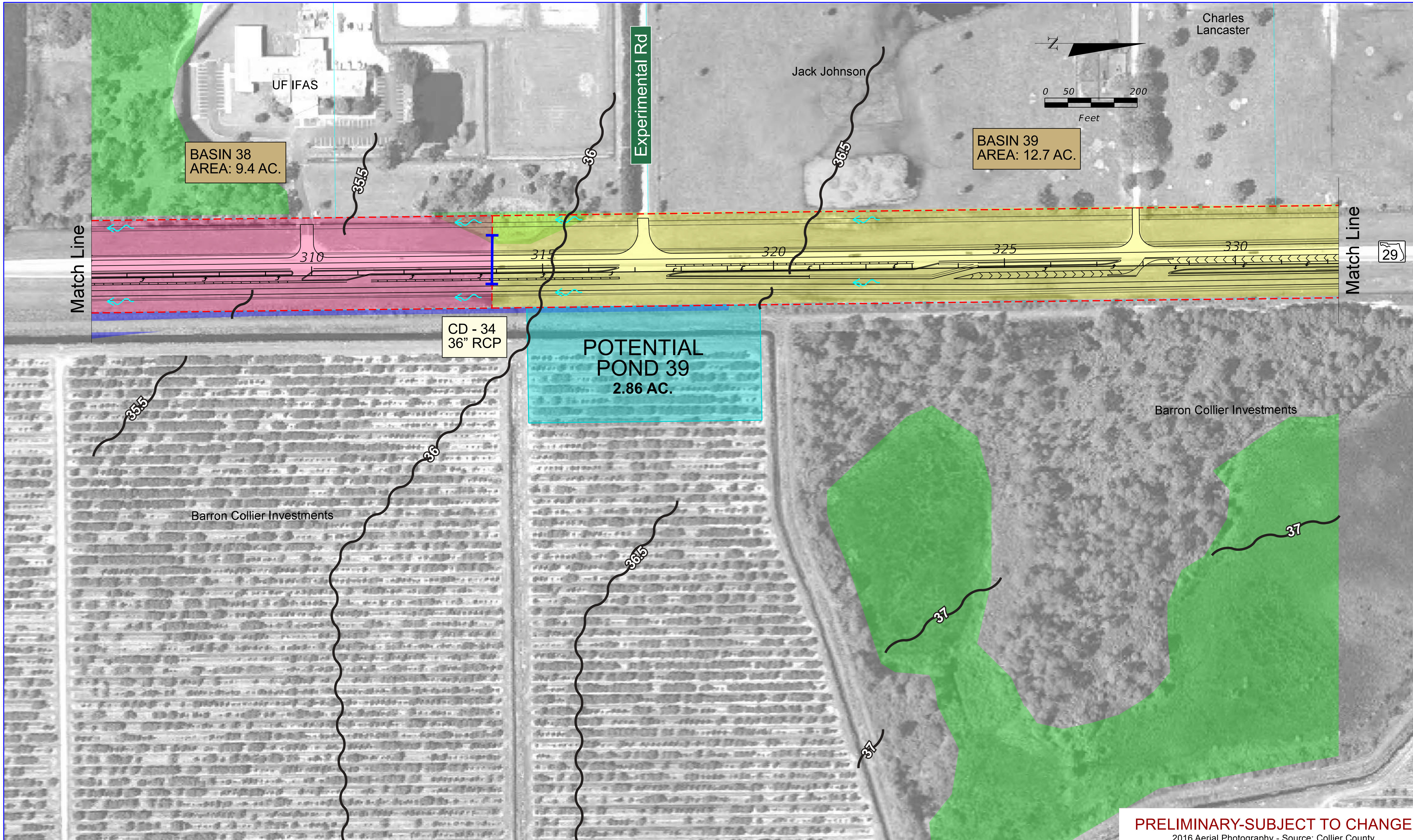
Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

H. W. Lochner, Inc.
4350 W. Cypress St., Suite 800
Tampa, Florida 33607
FBPR Certificate of Auth. #894

Proposed Drainage Maps Alternative #2

Sheet No.
C-66



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

H. W. Lochner, Inc.
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Tampa, Florida 33607
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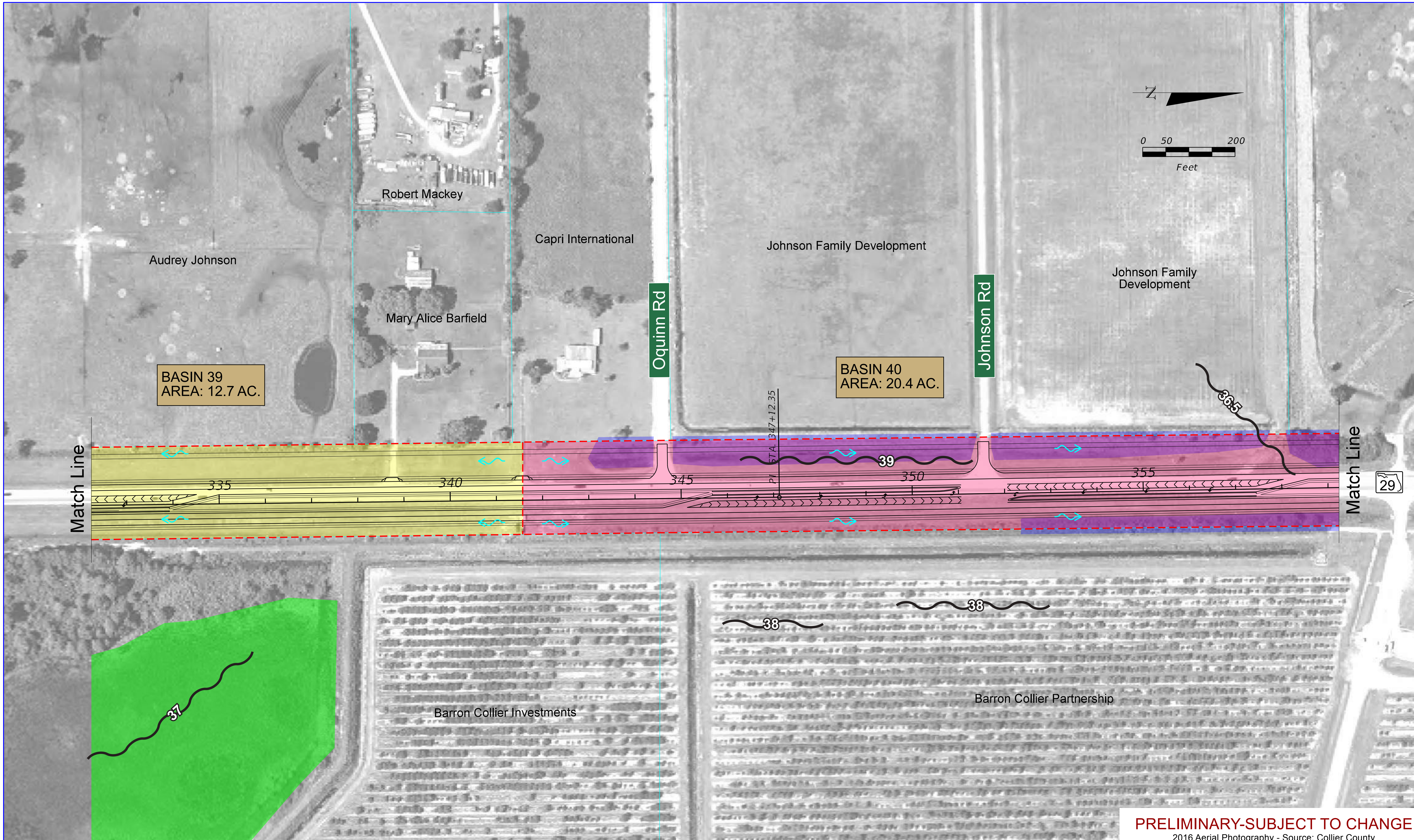
Proposed Drainage Maps Alternative #2

Sheet No.
C-67



PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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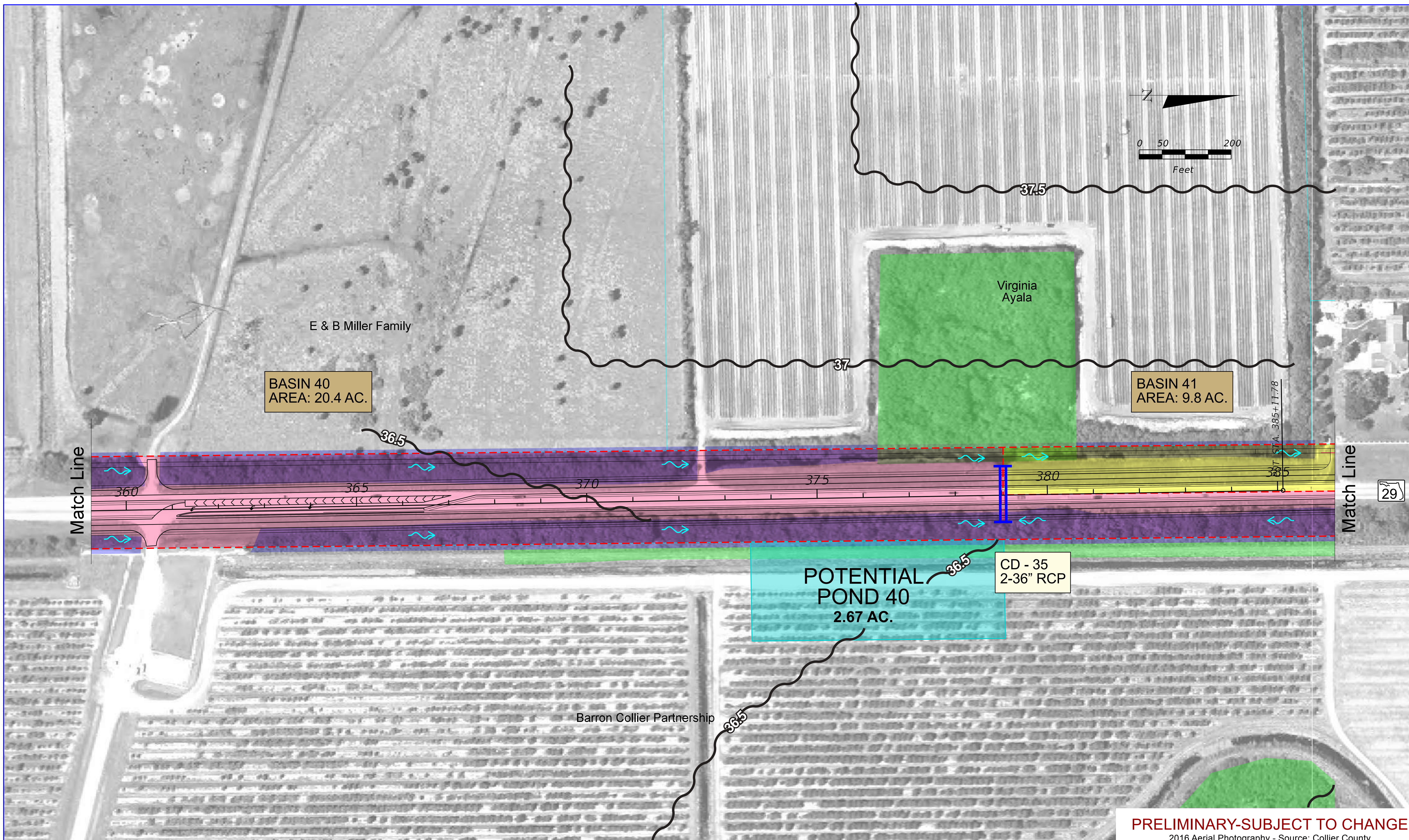
Tampa, Florida 33607
FBPR Certificate of Auth. #894

Proposed Drainage Maps Alternative #2

Sheet No.
C-68



PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study
From Oil Well Road to SR 82
FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Property Lines
- Proposed Right-of-Way
- Flow Arrow
- Cross Drain
- Wetlands
- Potential Pond
- Potential Floodplain
- Barron Canal
- Base Flood Elevation

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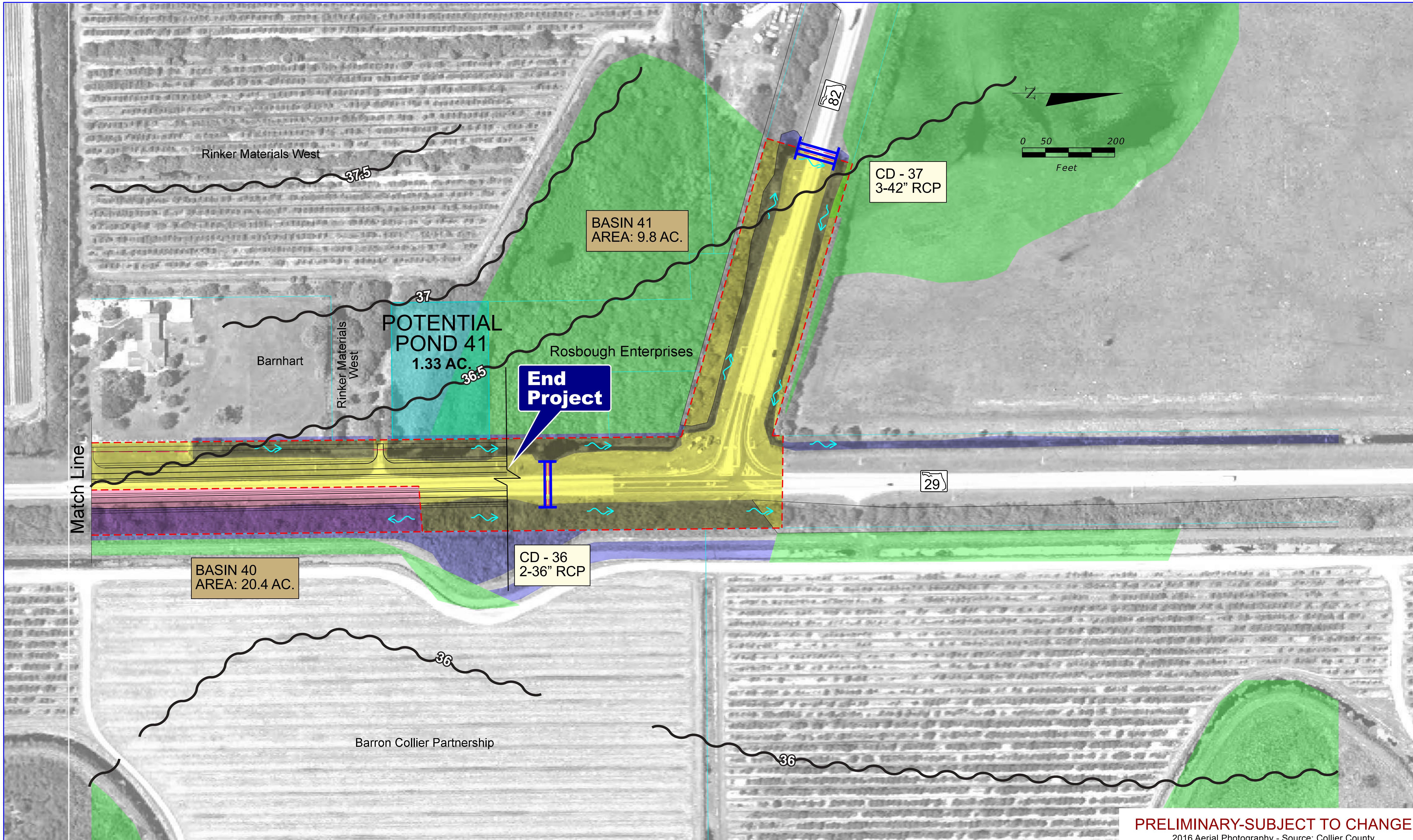
Tampa, Florida 33607
FBPR Certificate of Auth. #894

Proposed Drainage Maps Alternative #2

Sheet No.
C-69



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

Existing Right-of-Way	Wetlands
Property Lines	Potential Pond
Proposed Right-of-Way	Potential Floodplain
Flow Arrow	Barron Canal
Cross Drain	Base Flood Elevation

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Tampa, Florida 33607
FBPR Certificate of Auth. #894

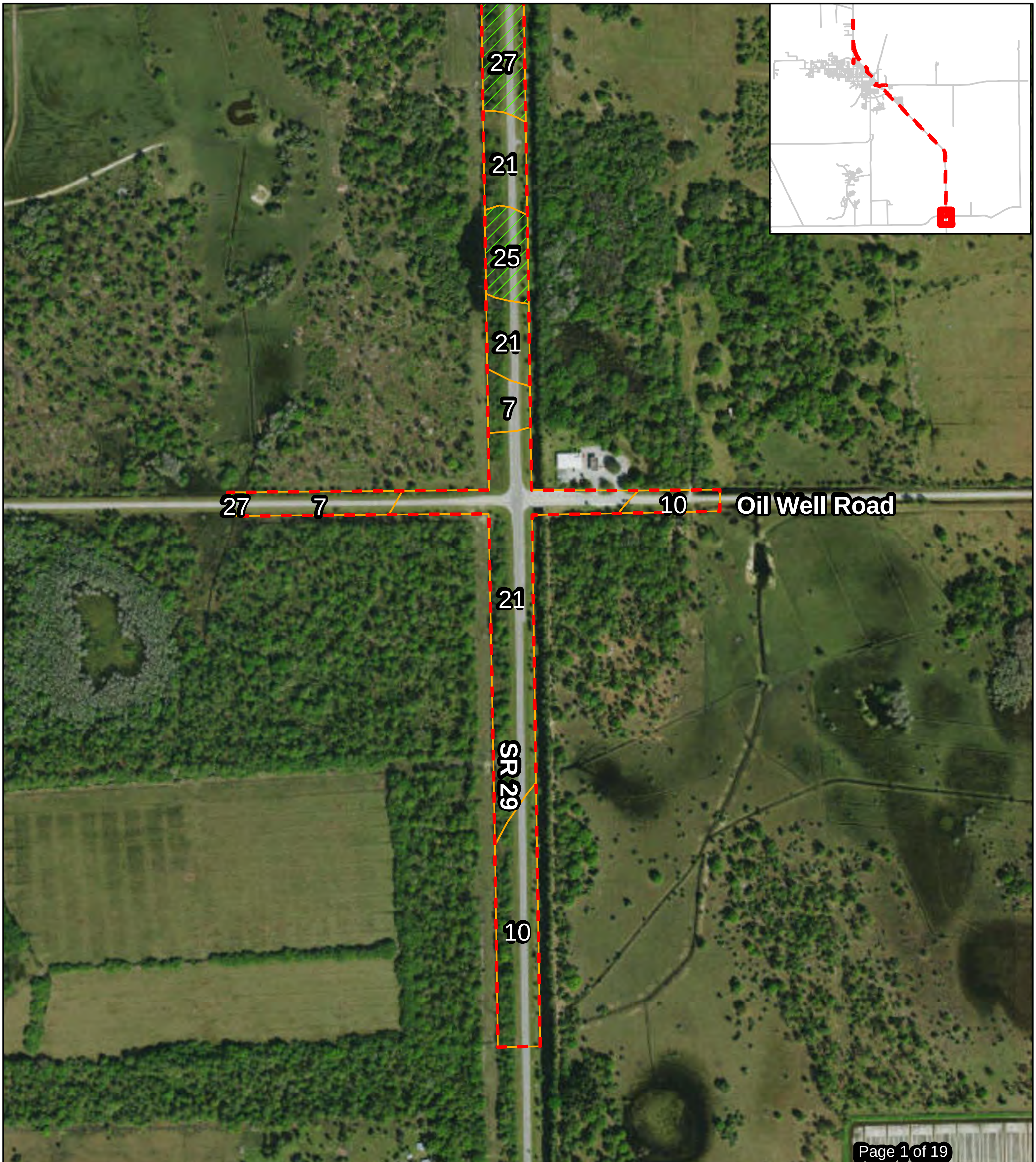
Proposed Drainage Maps Alternative #2

Sheet No.
C-70

Appendix D

Soils Map and Soils Descriptions

APPENDIX D
TABLE OF CONTENTS



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

Central Alternative #1 Revised Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-1

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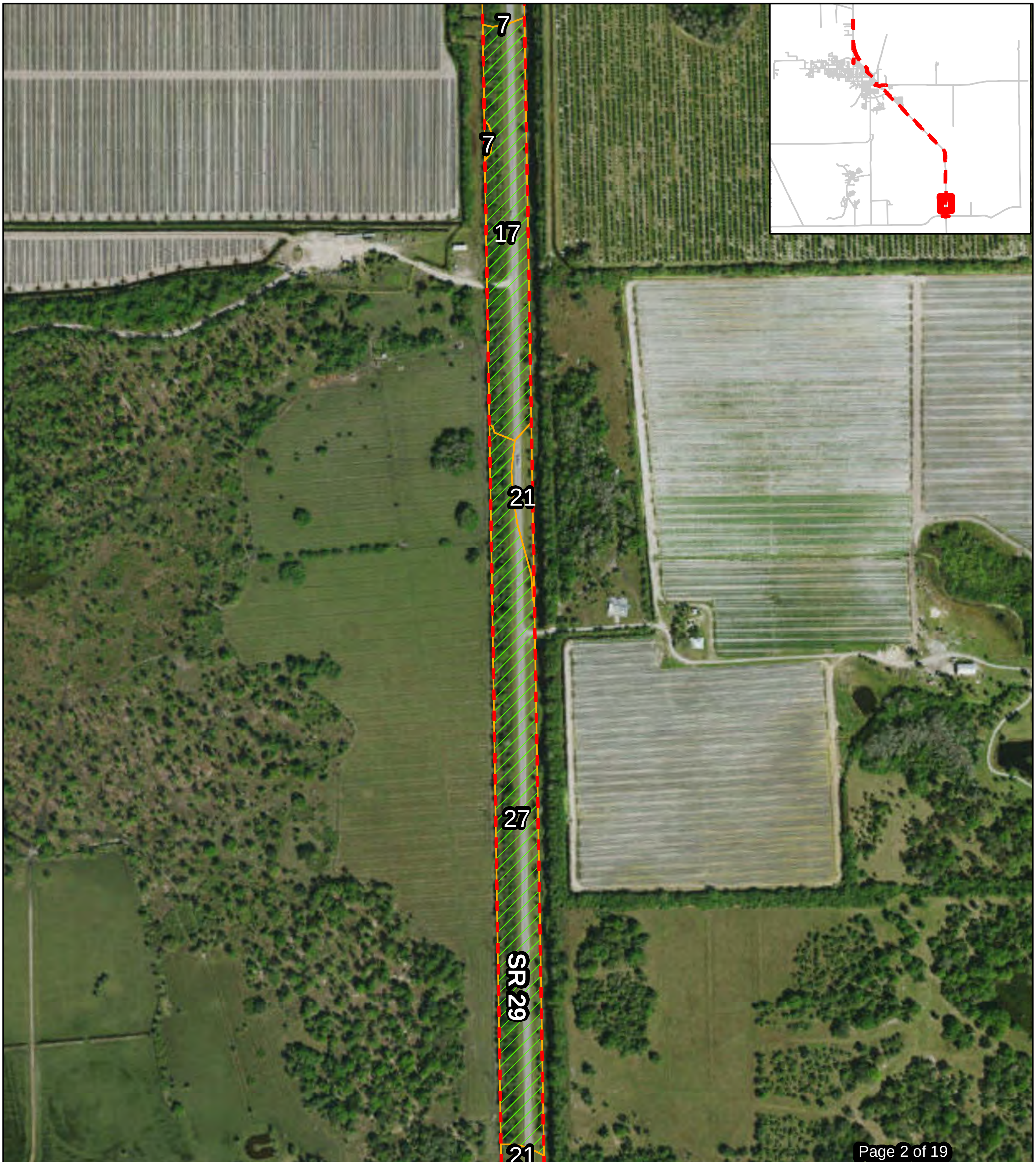

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

Central Alternative #1 Revised Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-2

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W E
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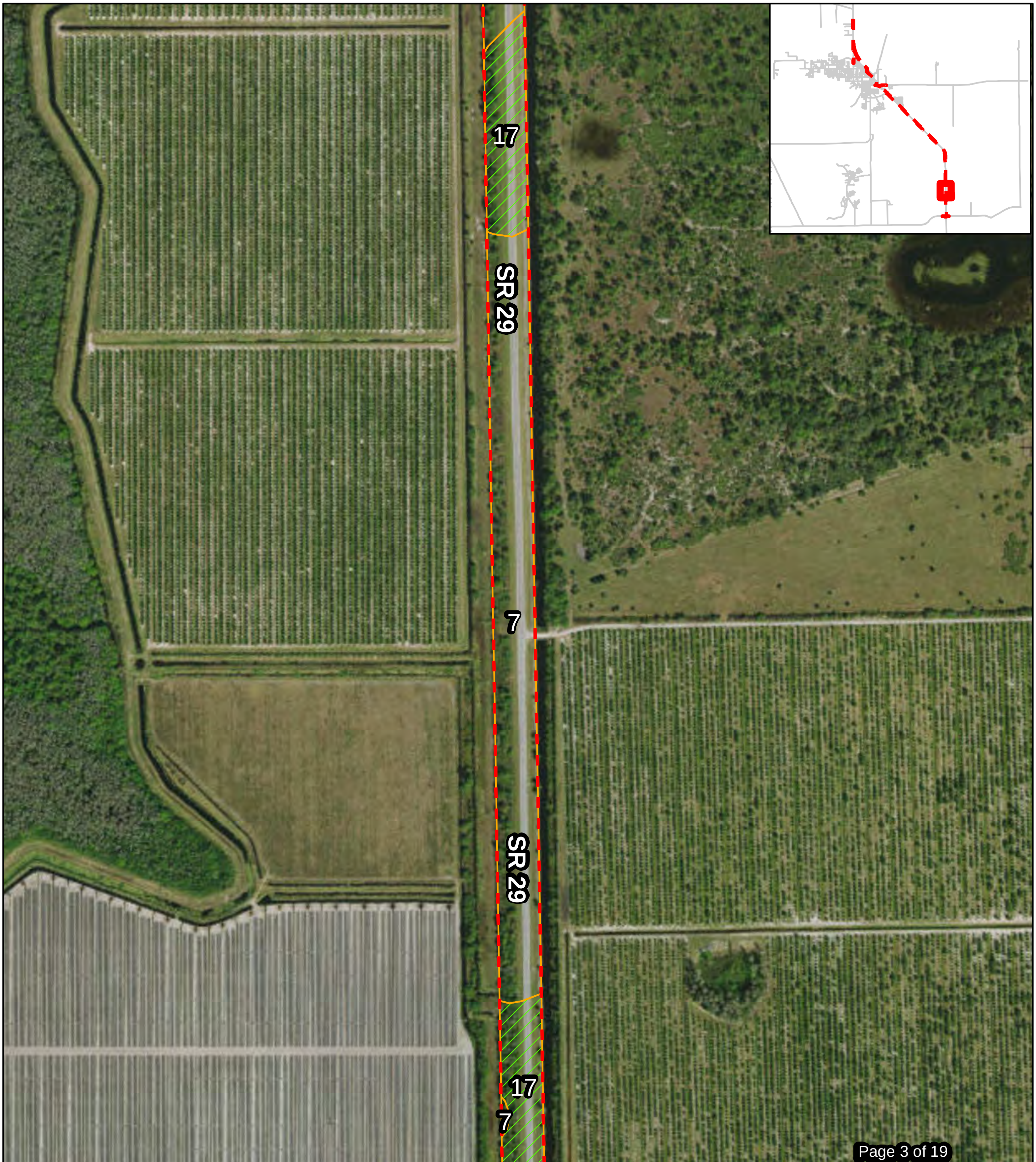
0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

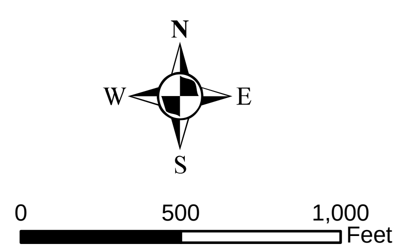
Central Alternative #1 Revised Soils

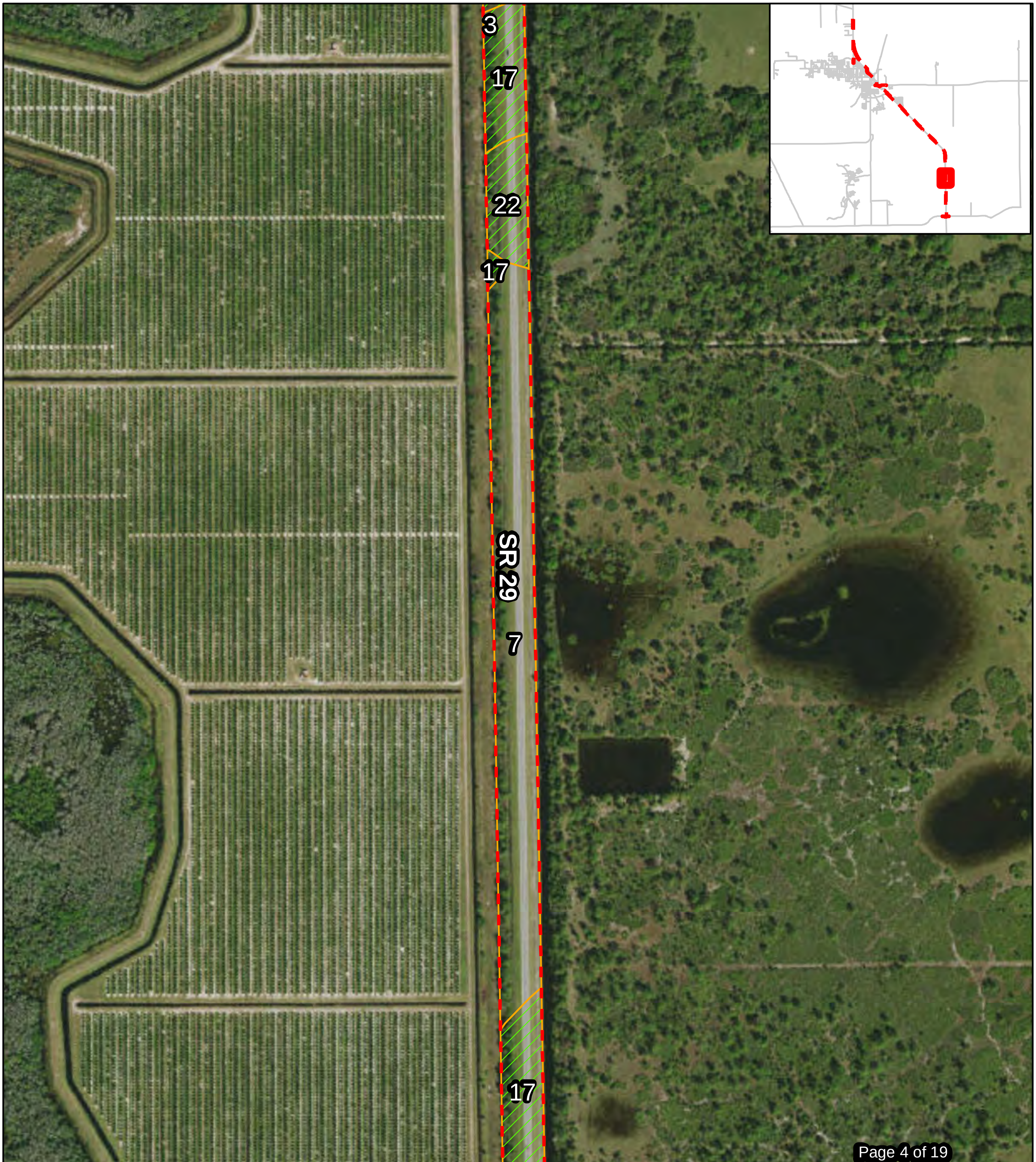
Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-3





S:\Projects_H2O\EnvSci\Environmental\FDOT D1\FDOT D1 - SR 29 Oil Well to SR82\GIS Files\PDFs

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

Central Alternative #1 Revised Soils

Hydric Soils

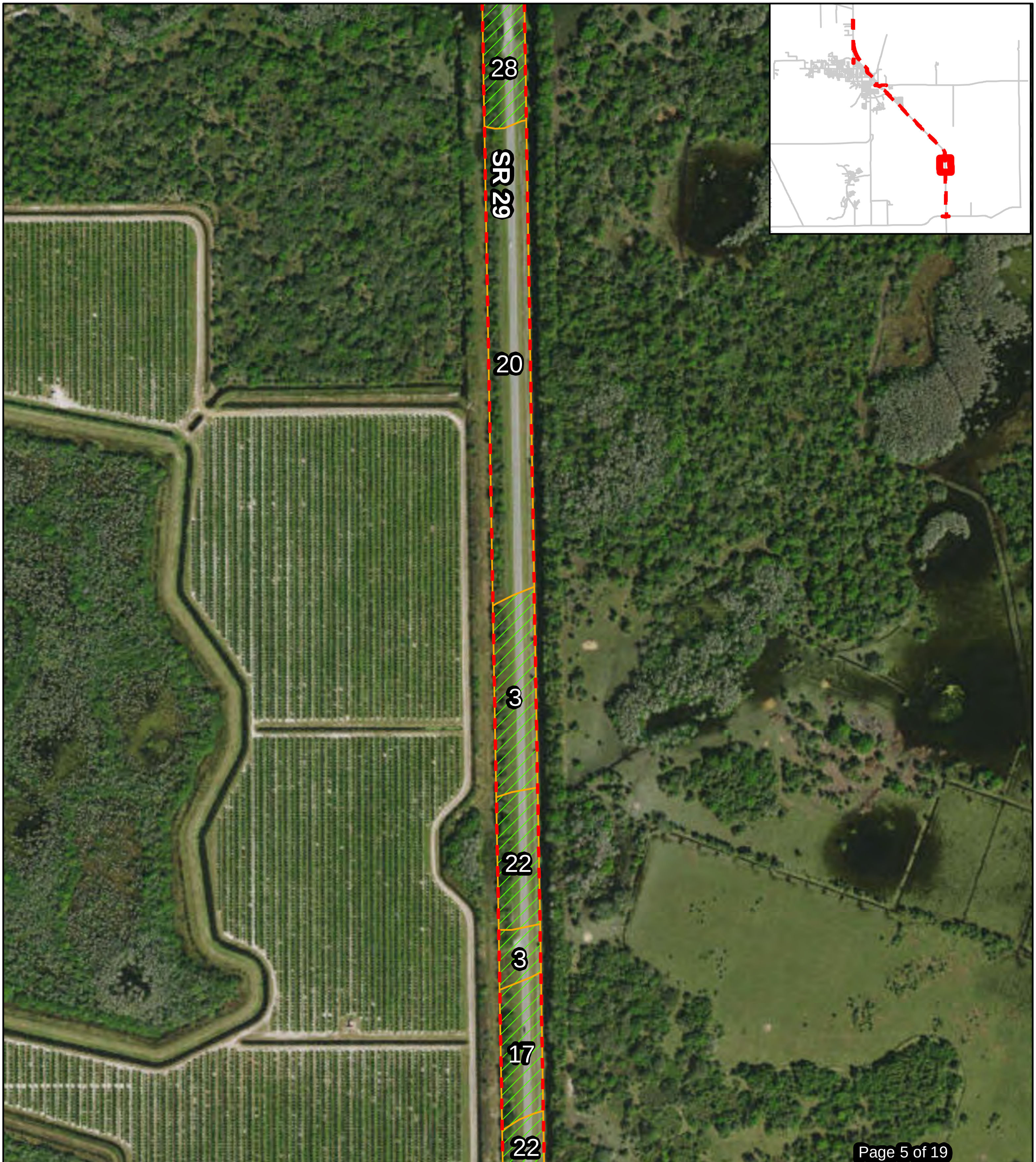
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-4

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

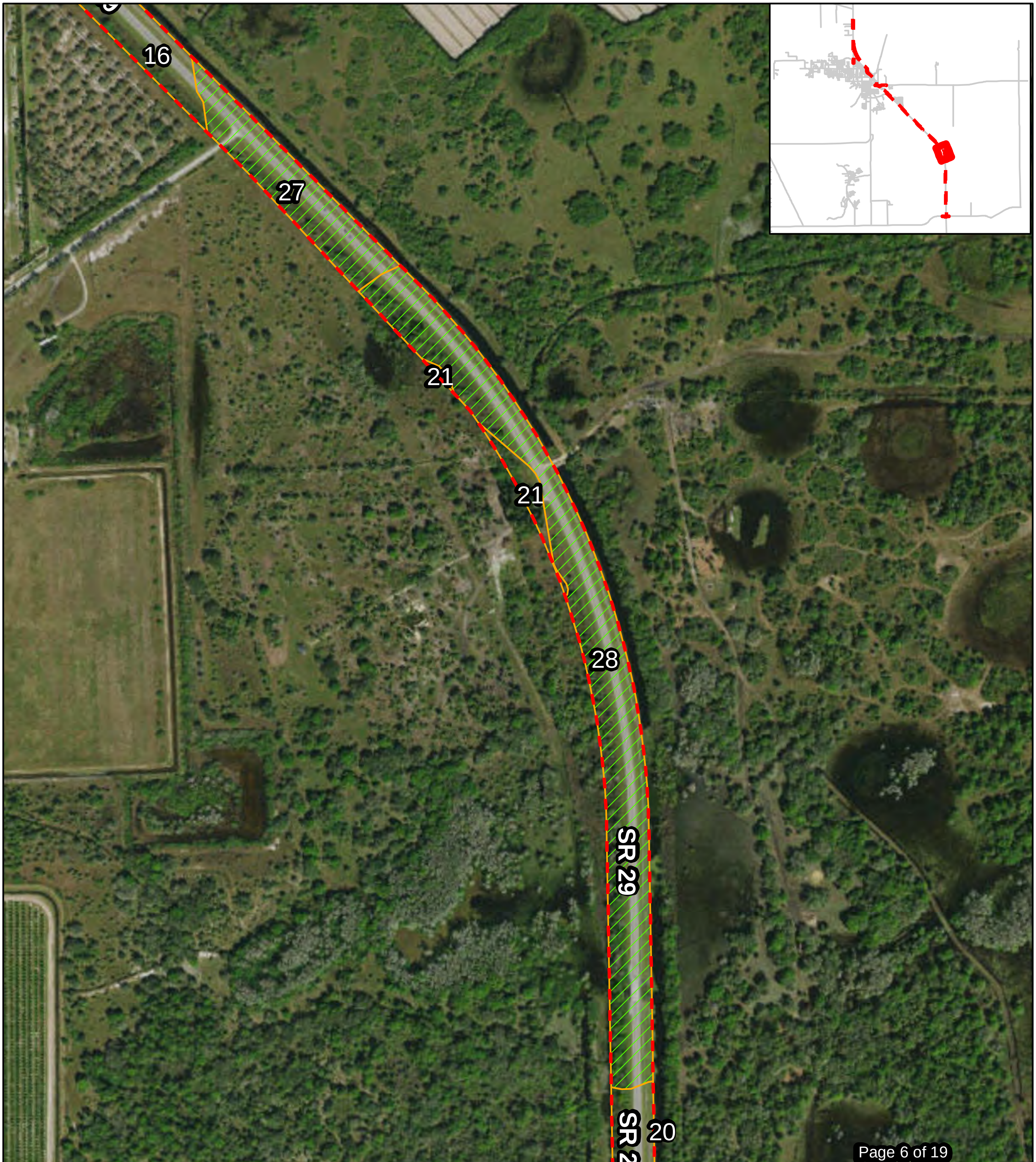
Legend

Central Alternative #1 Revised
Central Alternative #1 Revised Soils
Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-5



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #1 Revised
- Central Alternative #1 Revised Soils
- Hydric Soils

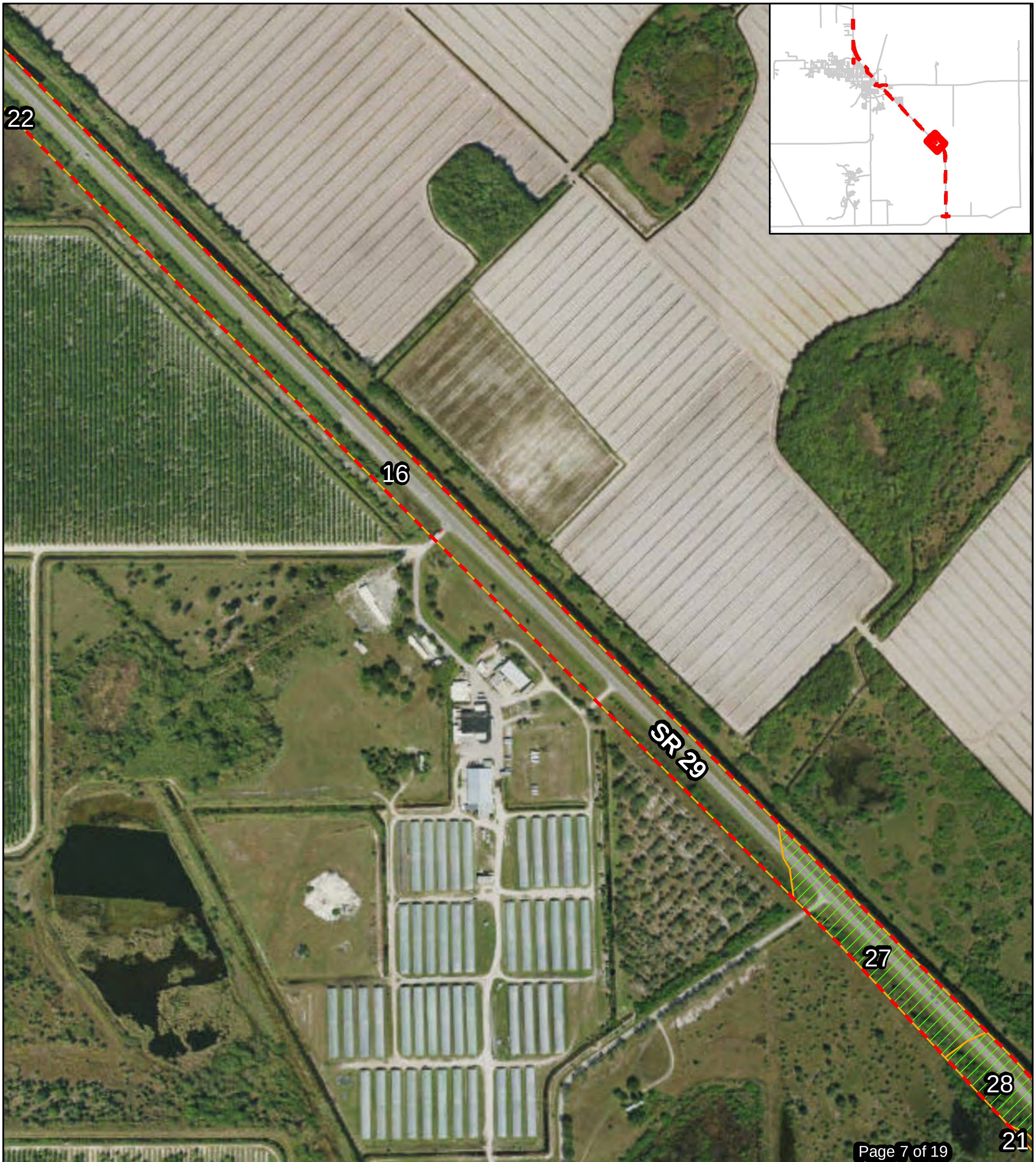
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-6

N
W E
S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

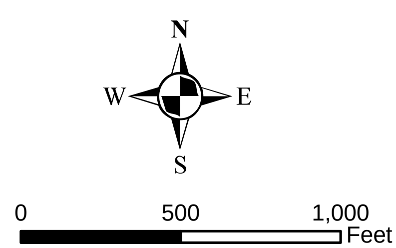
Legend

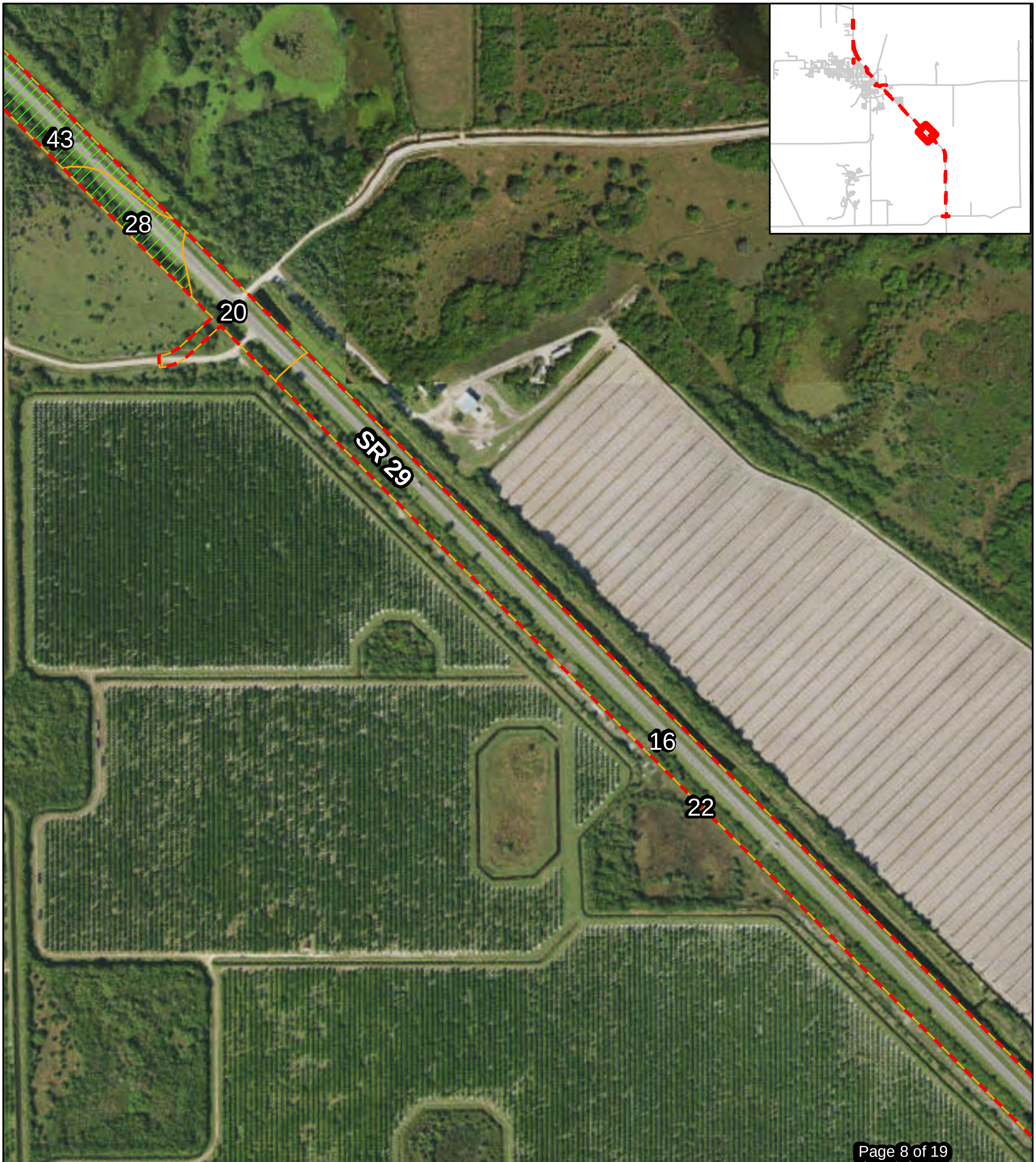
- Central Alternative #1 Revised
- Central Alternative #1 Revised Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-7





MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

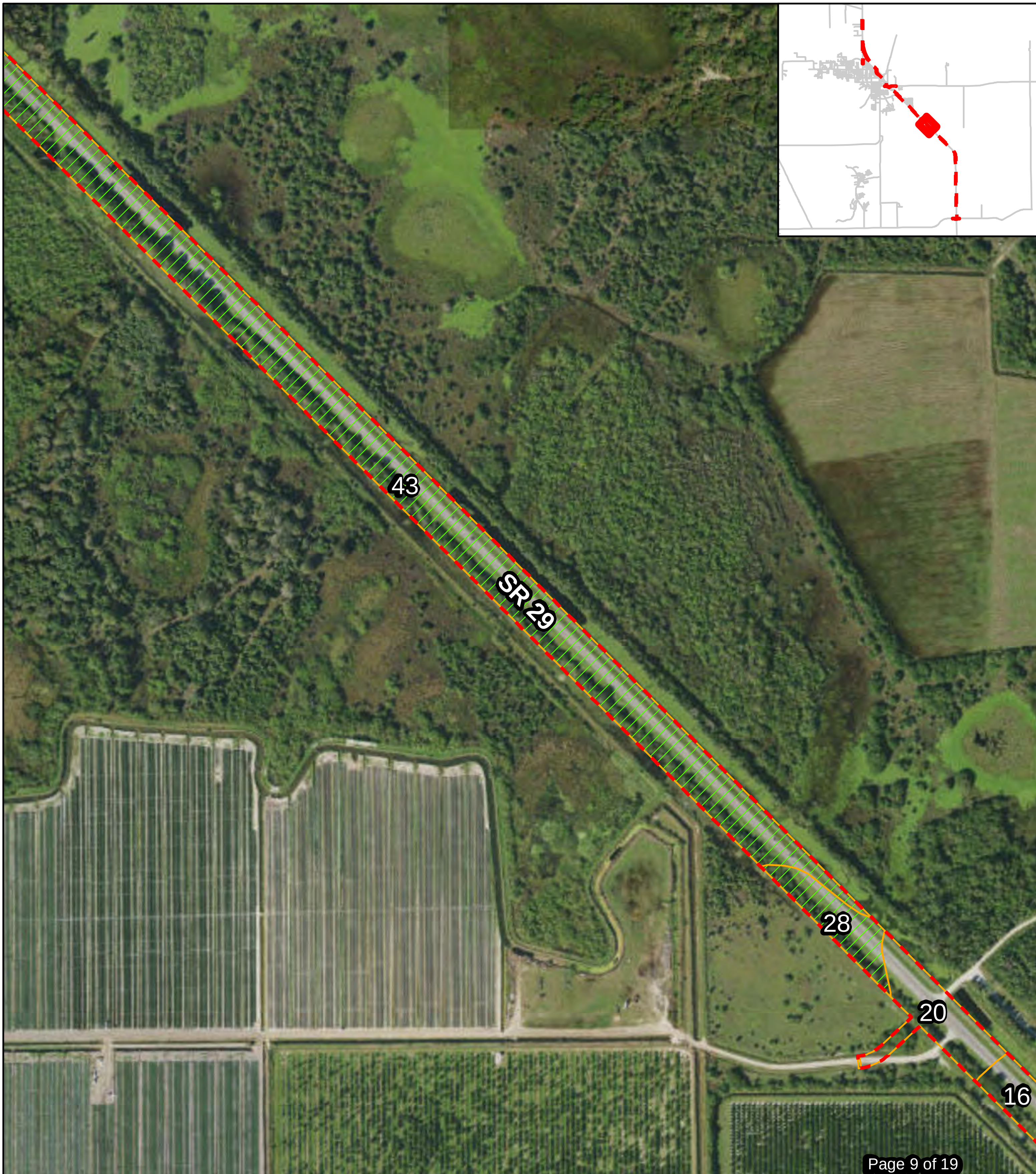
- Central Alternative #1 Revised
- Central Alternative #1 Revised Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018 D-8

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #1 Revised
- Central Alternative #1 Revised Soils
- Hydric Soils

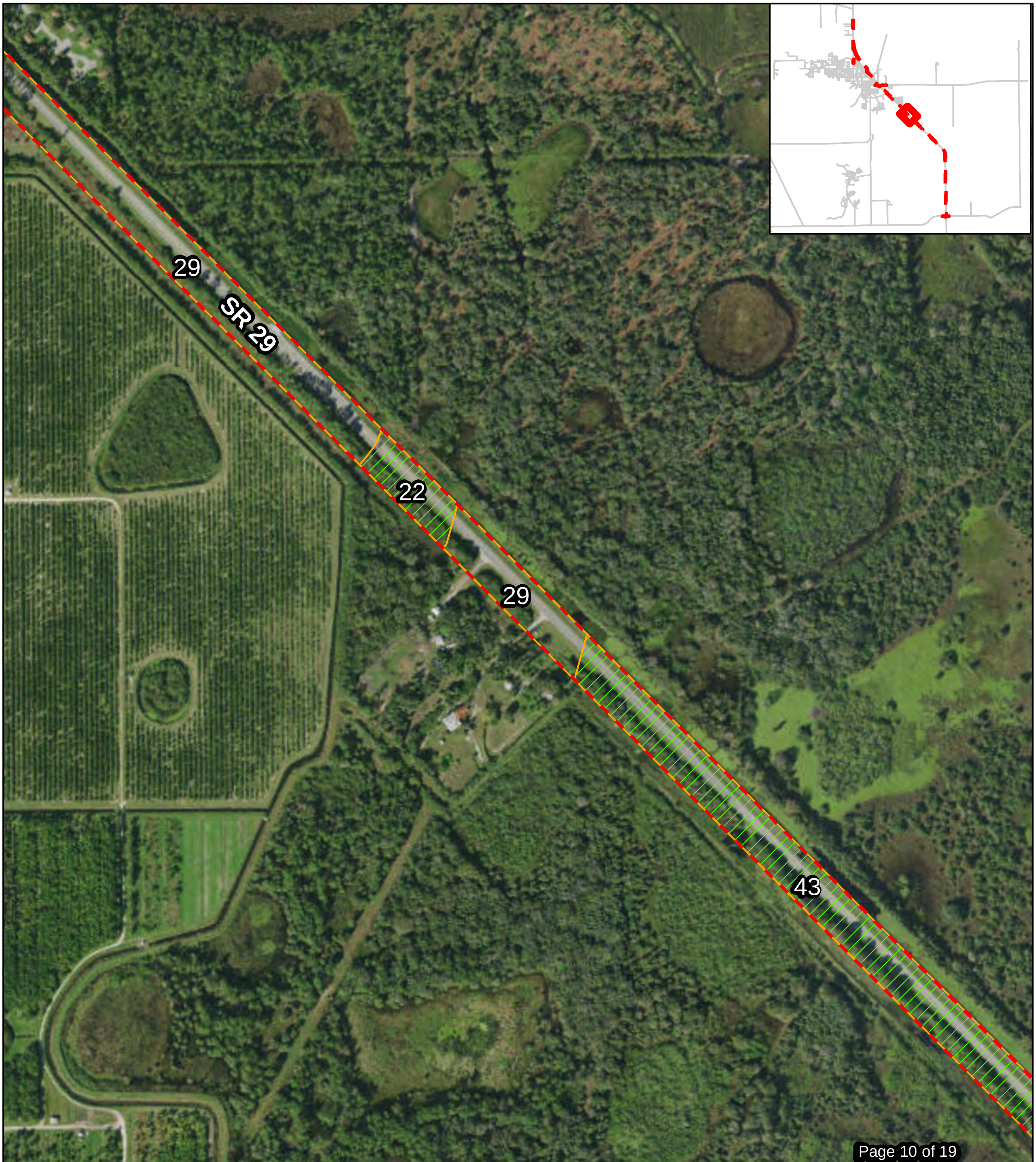
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-9

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

Central Alternative #1 Revised Soils

Hydric Soils

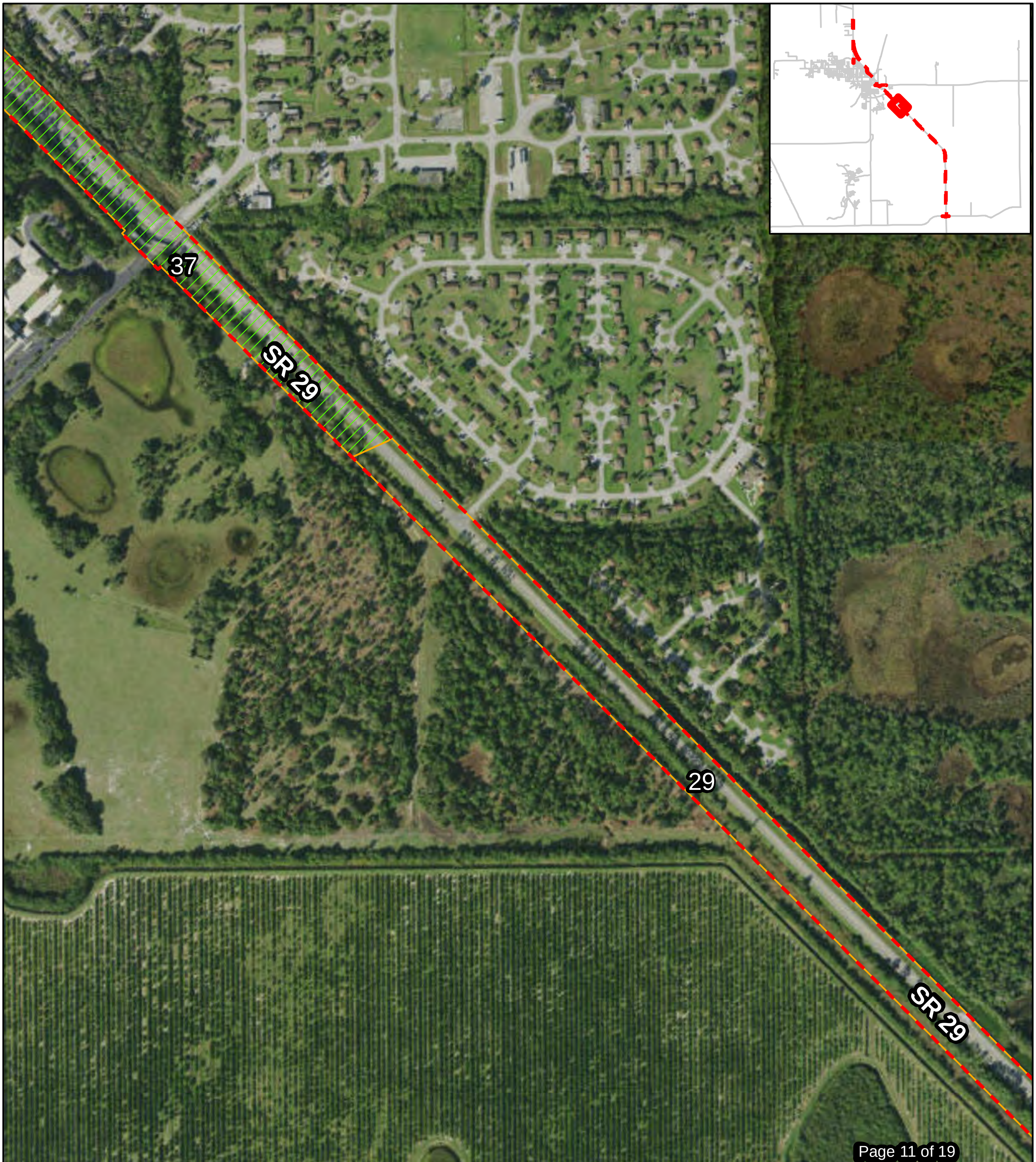
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-10

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

Central Alternative #1 Revised Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-11

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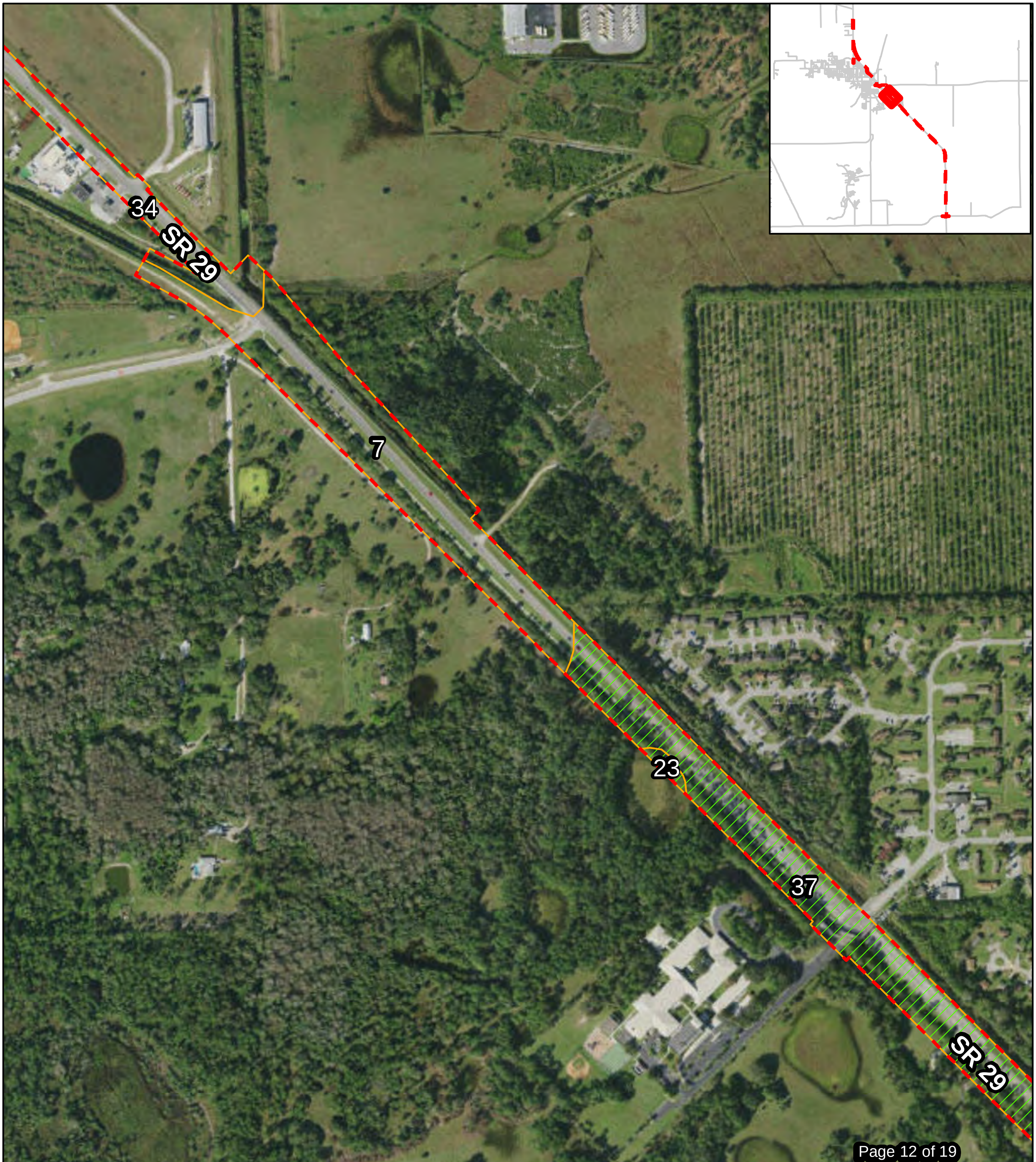


MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

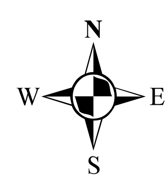
Legend

- Central Alternative #1 Revised
- Central Alternative #1 Revised Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-12



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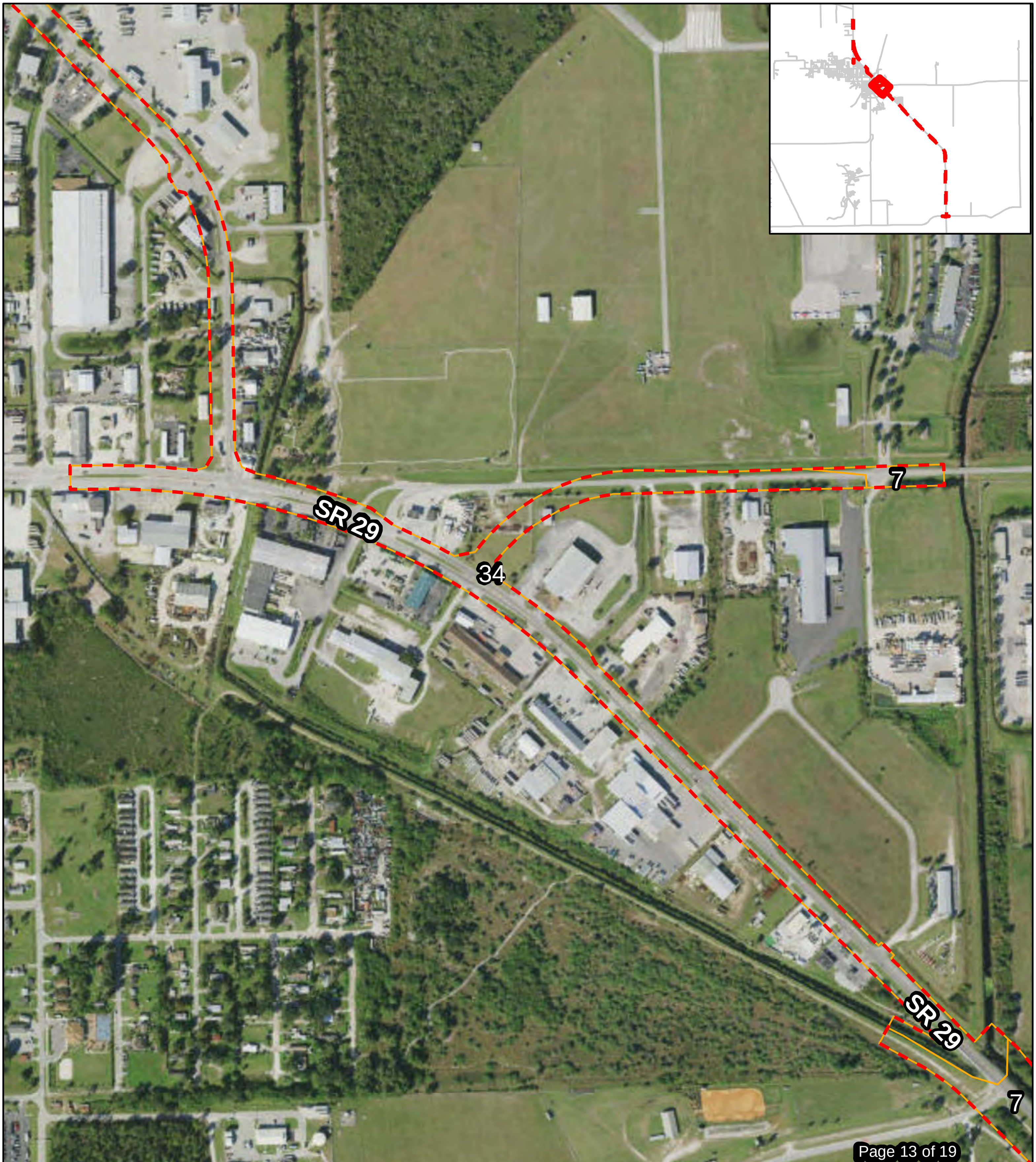

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised
Central Alternative #1 Revised Soils
Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-13

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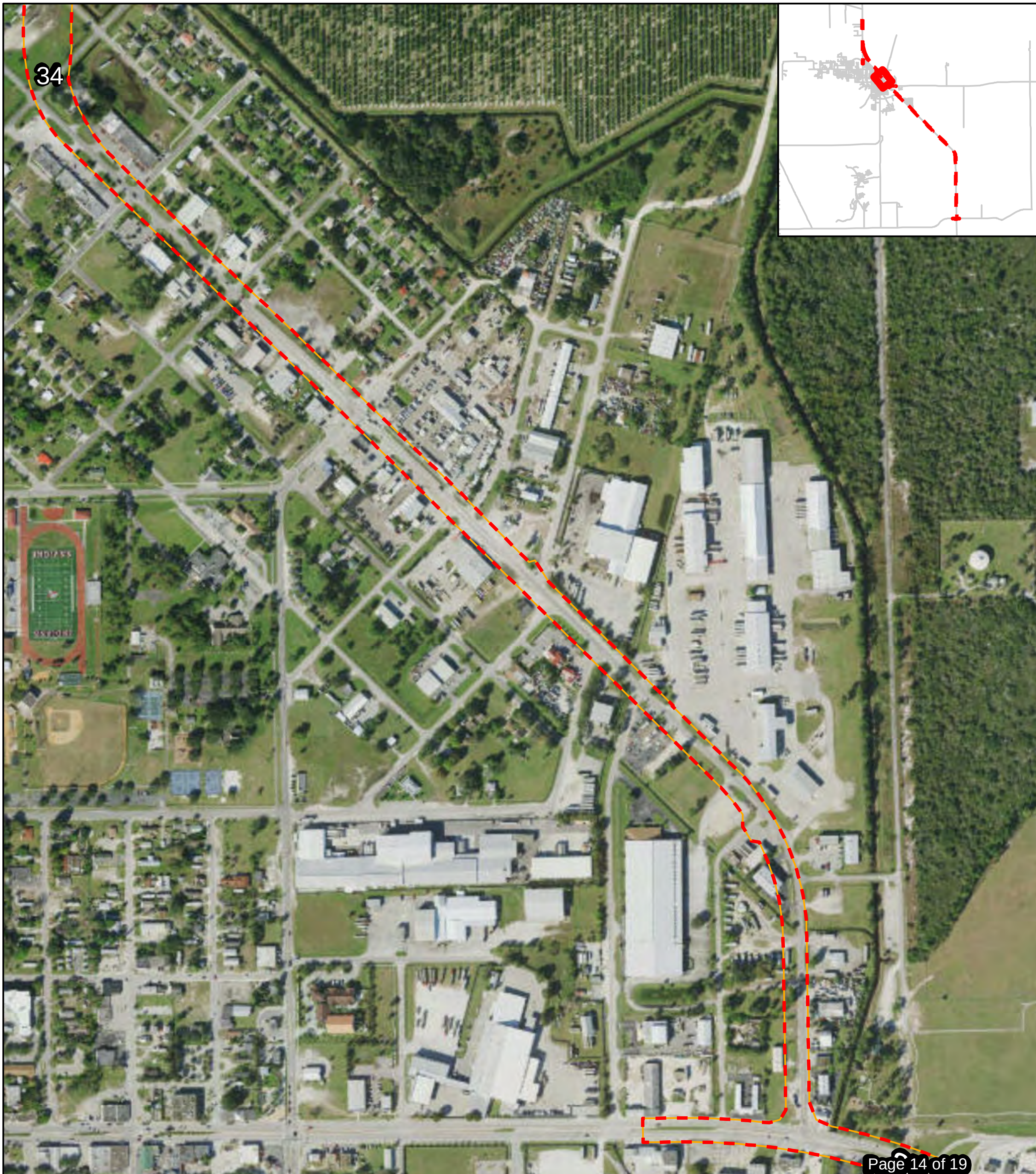


MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

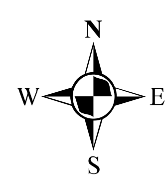
Central Alternative #1 Revised Soils

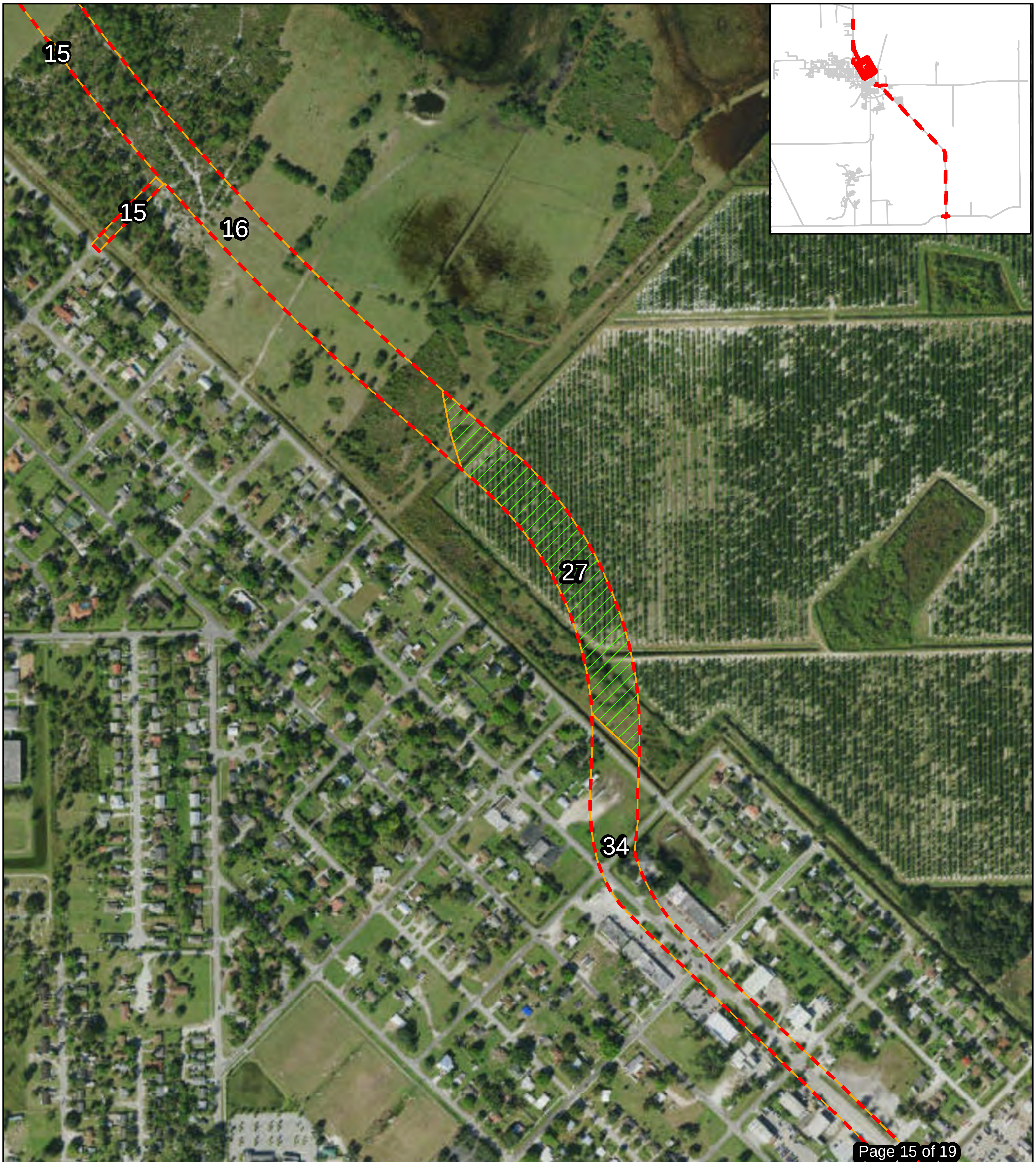
Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-14





MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

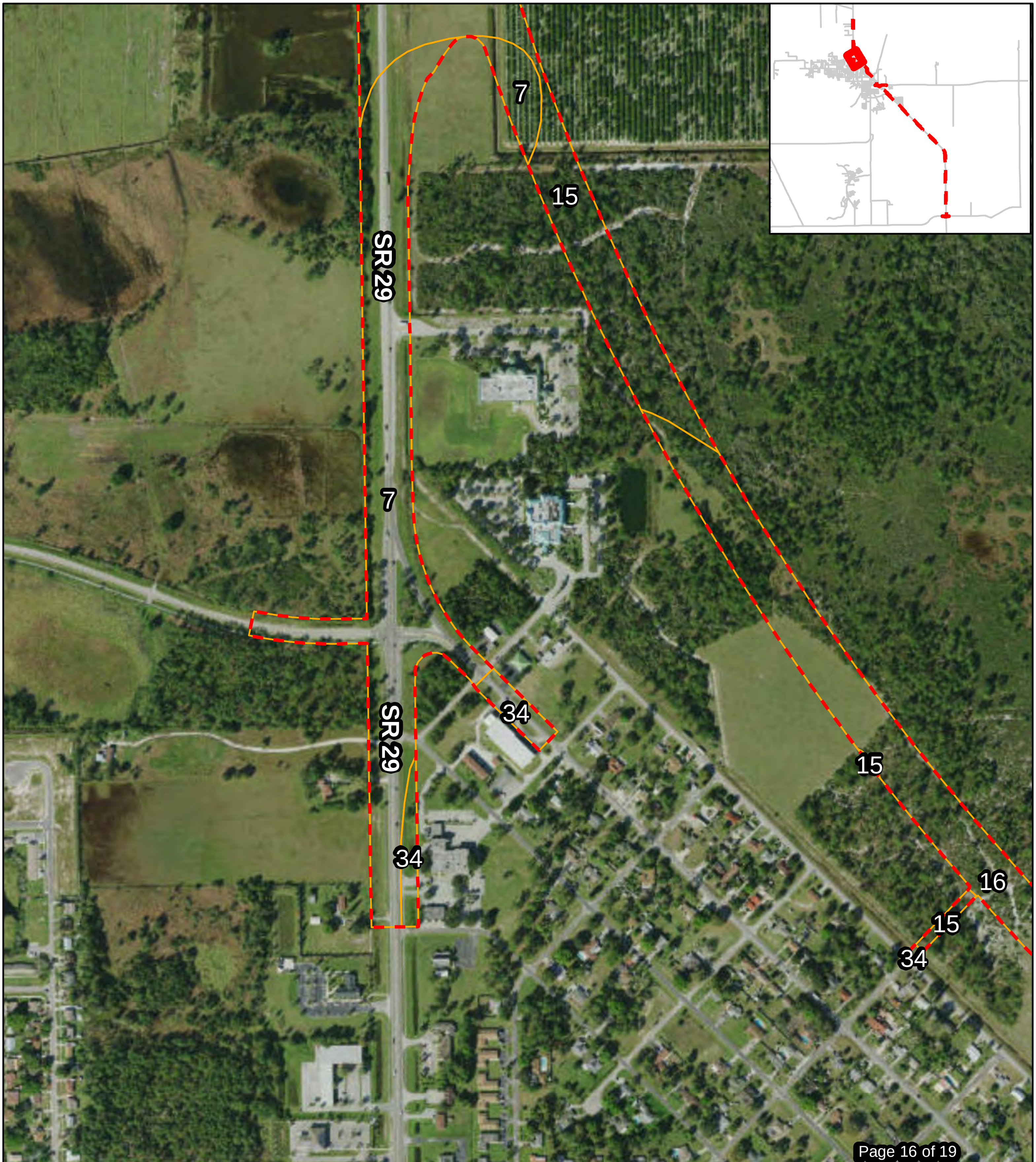
Central Alternative #1 Revised Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-15



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

Central Alternative #1 Revised Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

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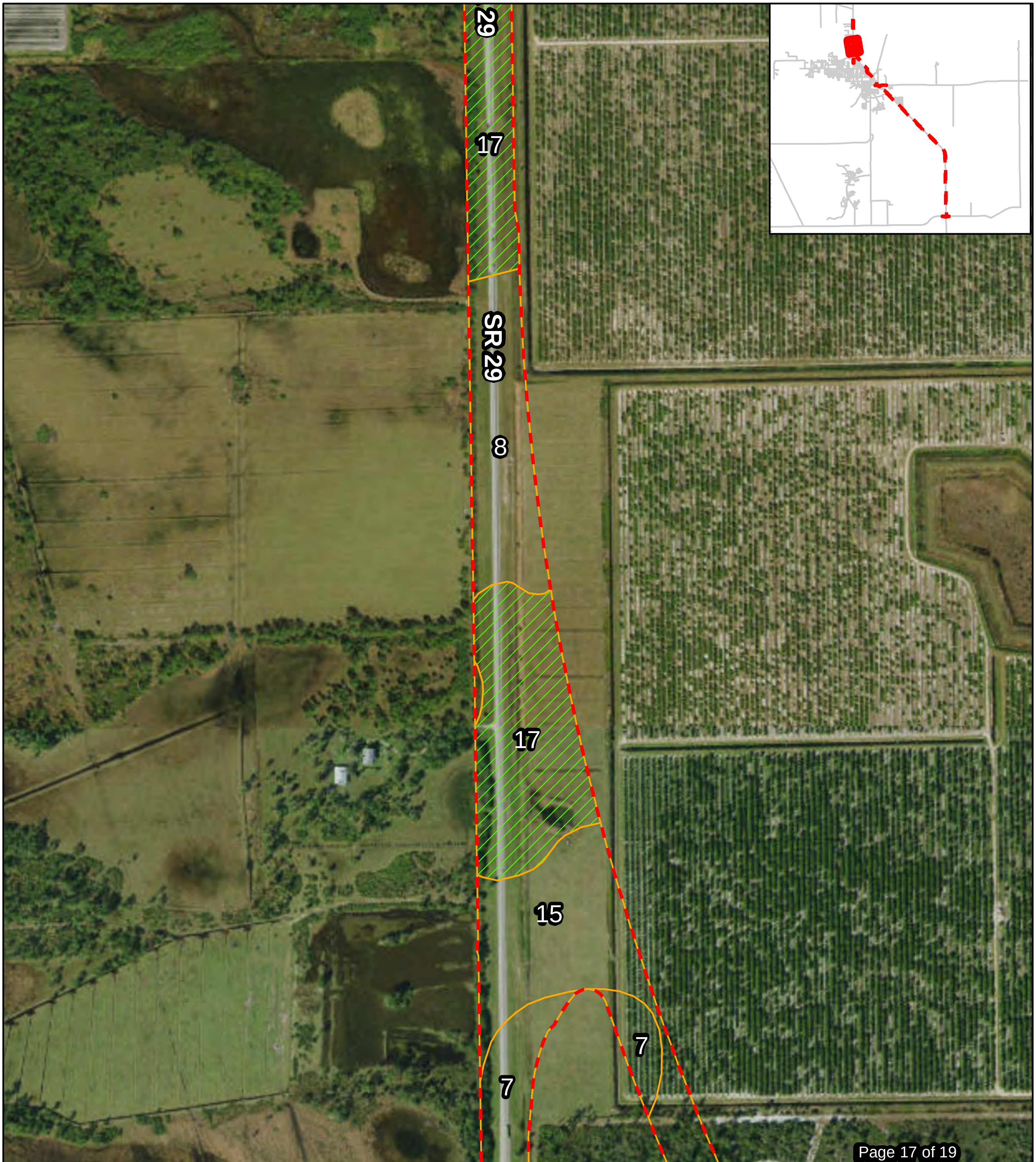

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DATA SOURCE : AECOM 2018

Legend

Central Alternative #1 Revised

Central Alternative #1 Revised Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-17

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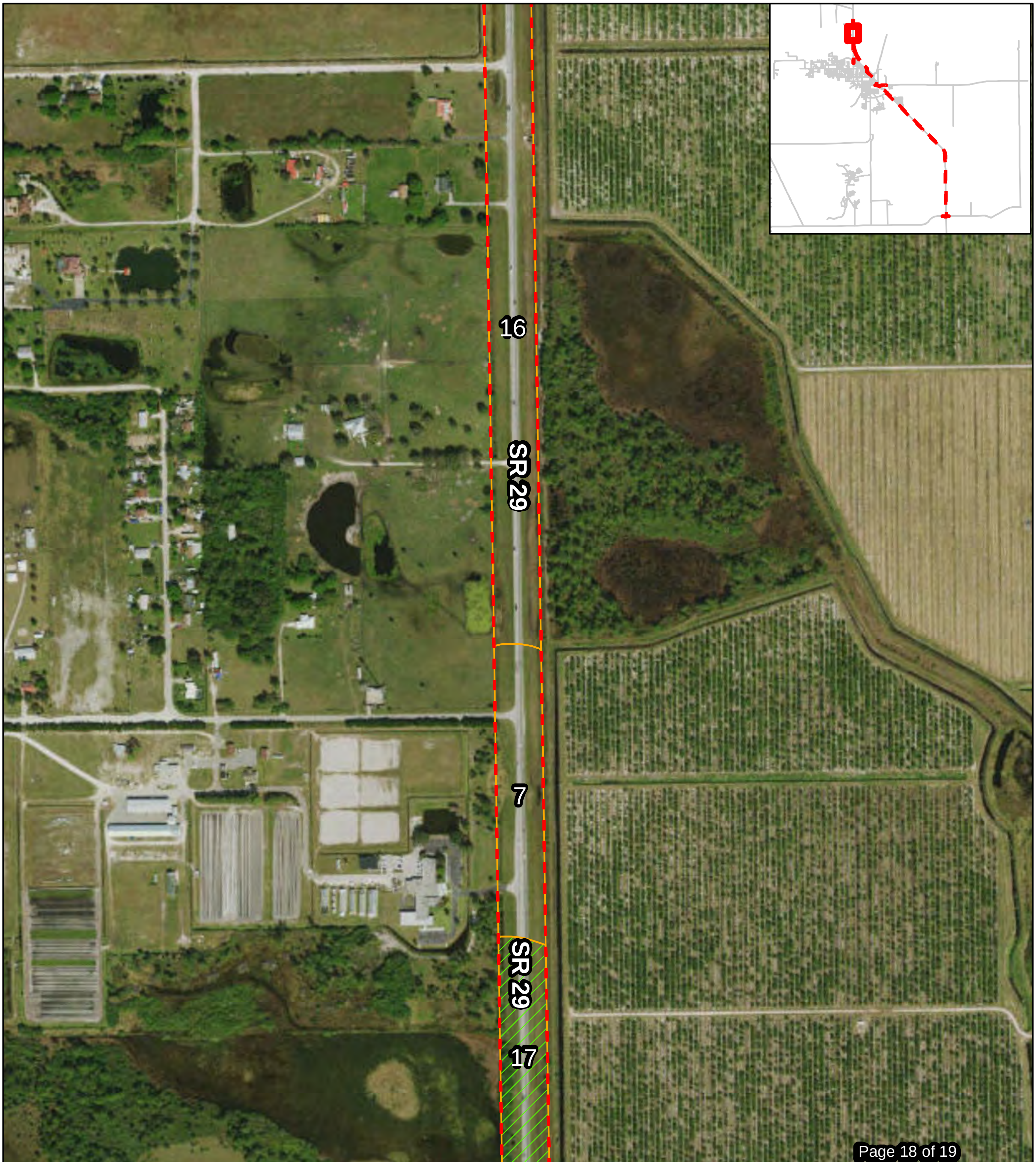

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #1 Revised
- Central Alternative #1 Revised Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-18

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W E
S

0 500 1,000 Feet

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

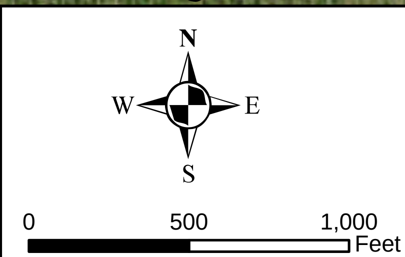
Legend

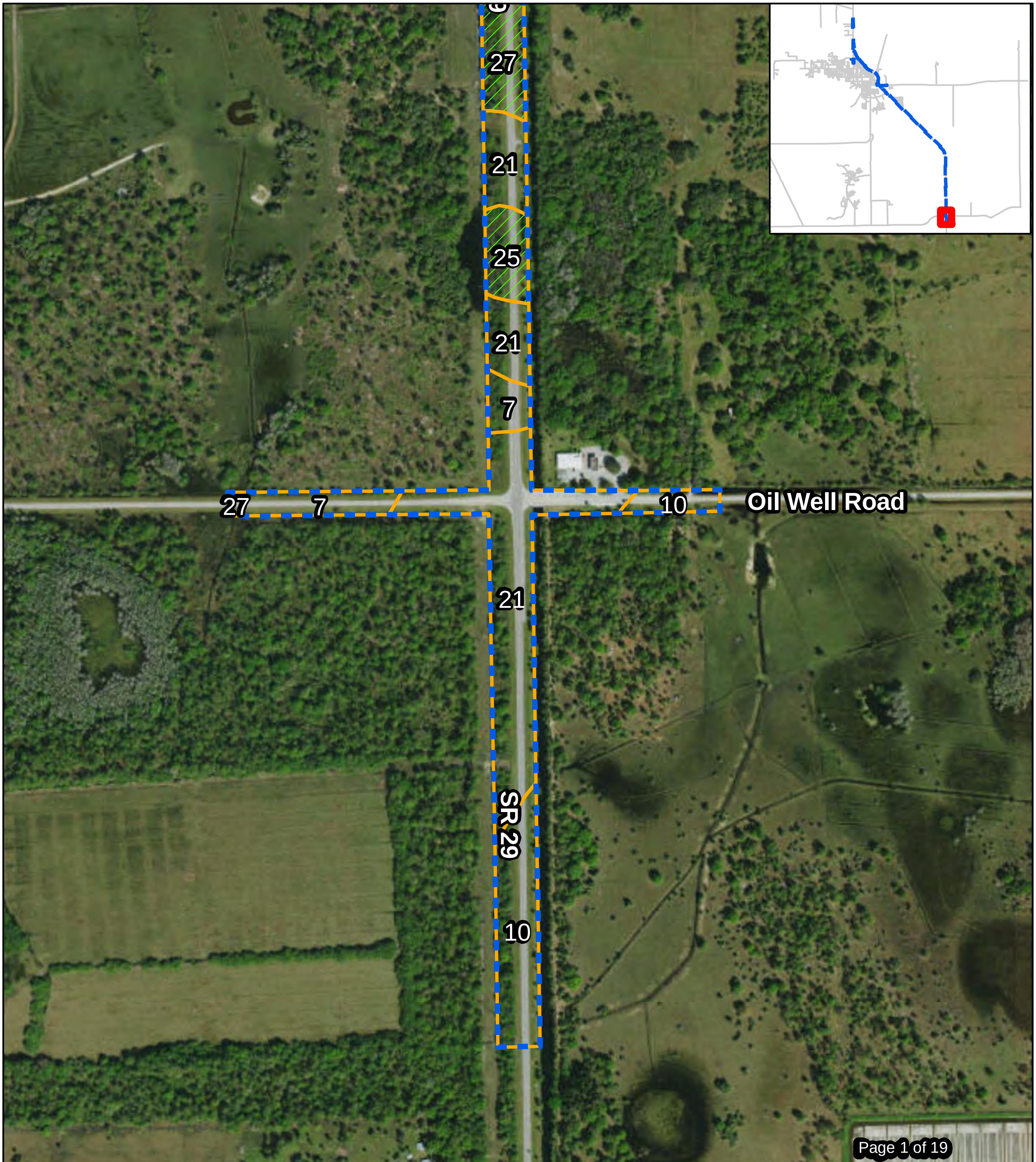
- Central Alternative #1 Revised
- Central Alternative #1 Revised Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #1 Revised

Date: 6/1/2018

D-19





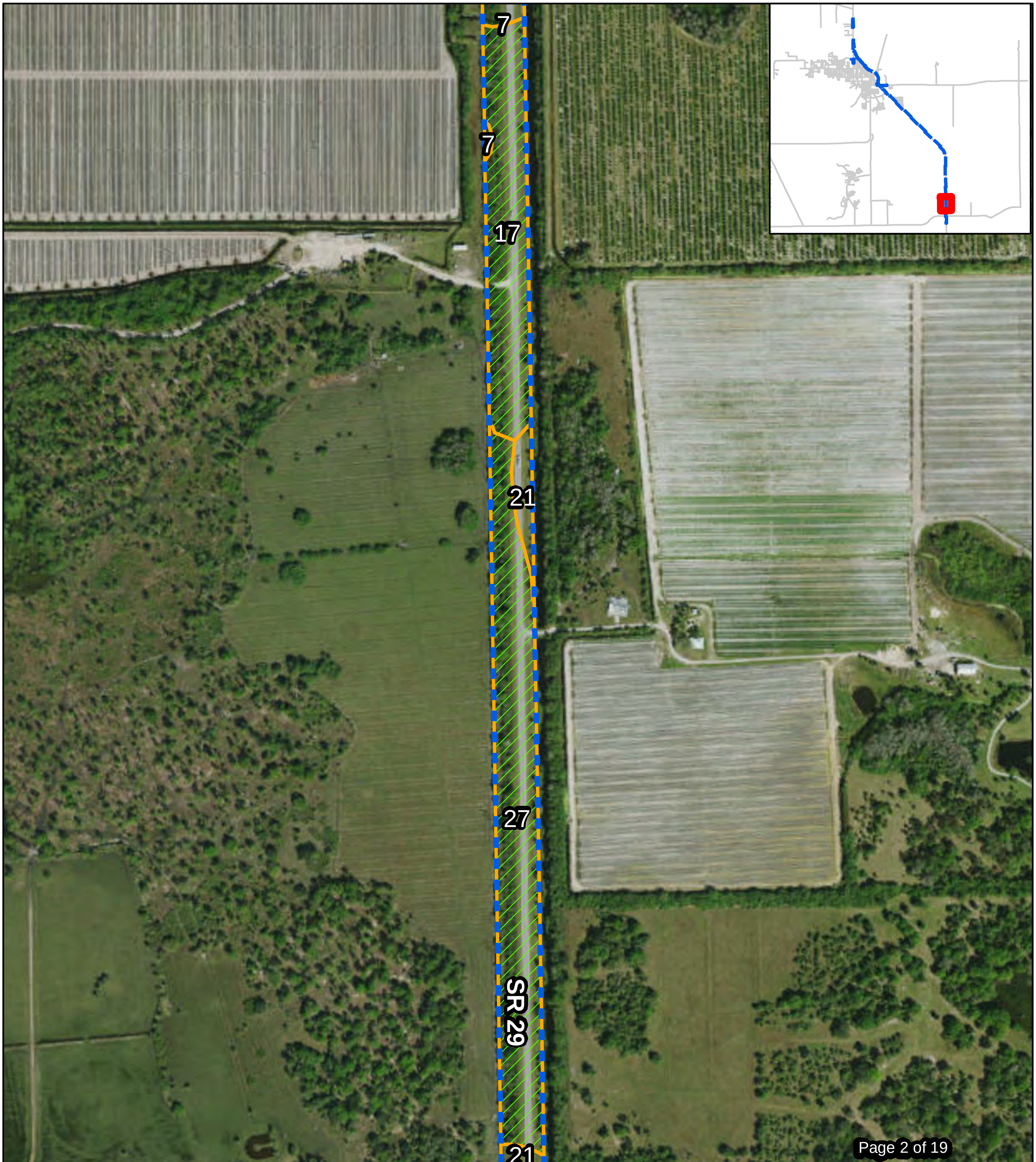
MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #2
Central Alternative #2 Soils
Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-21

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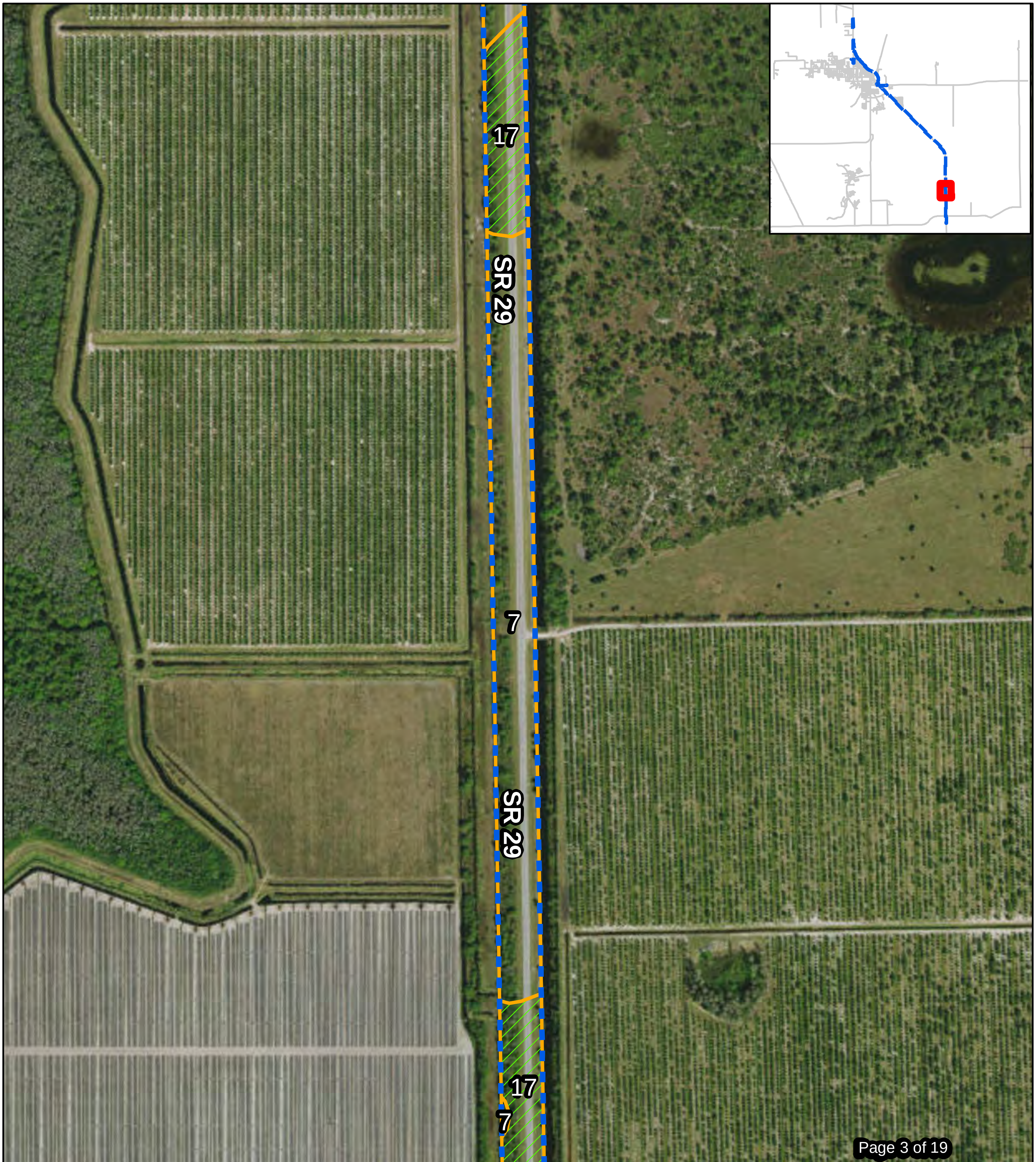

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #2

Central Alternative #2 Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

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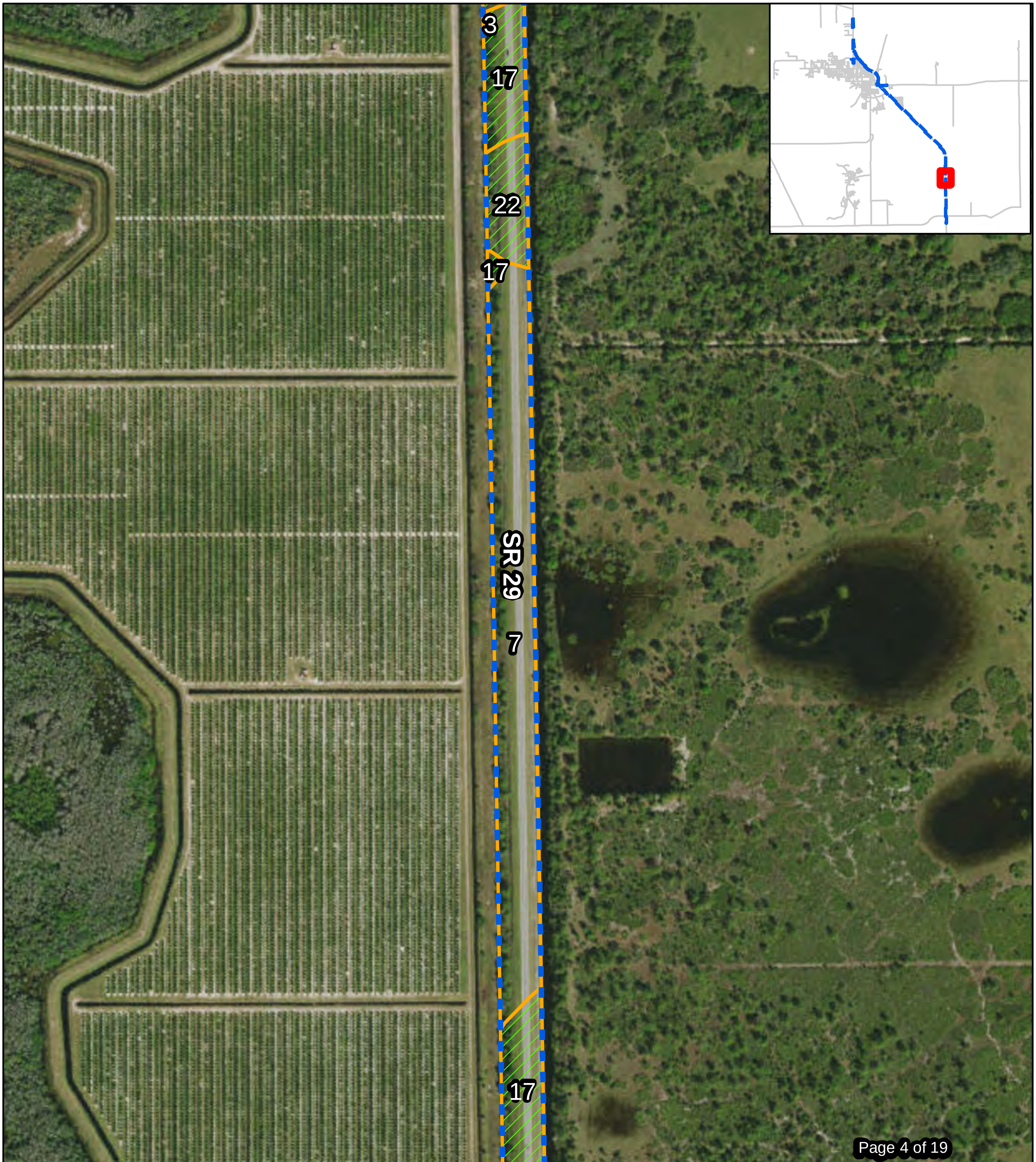

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

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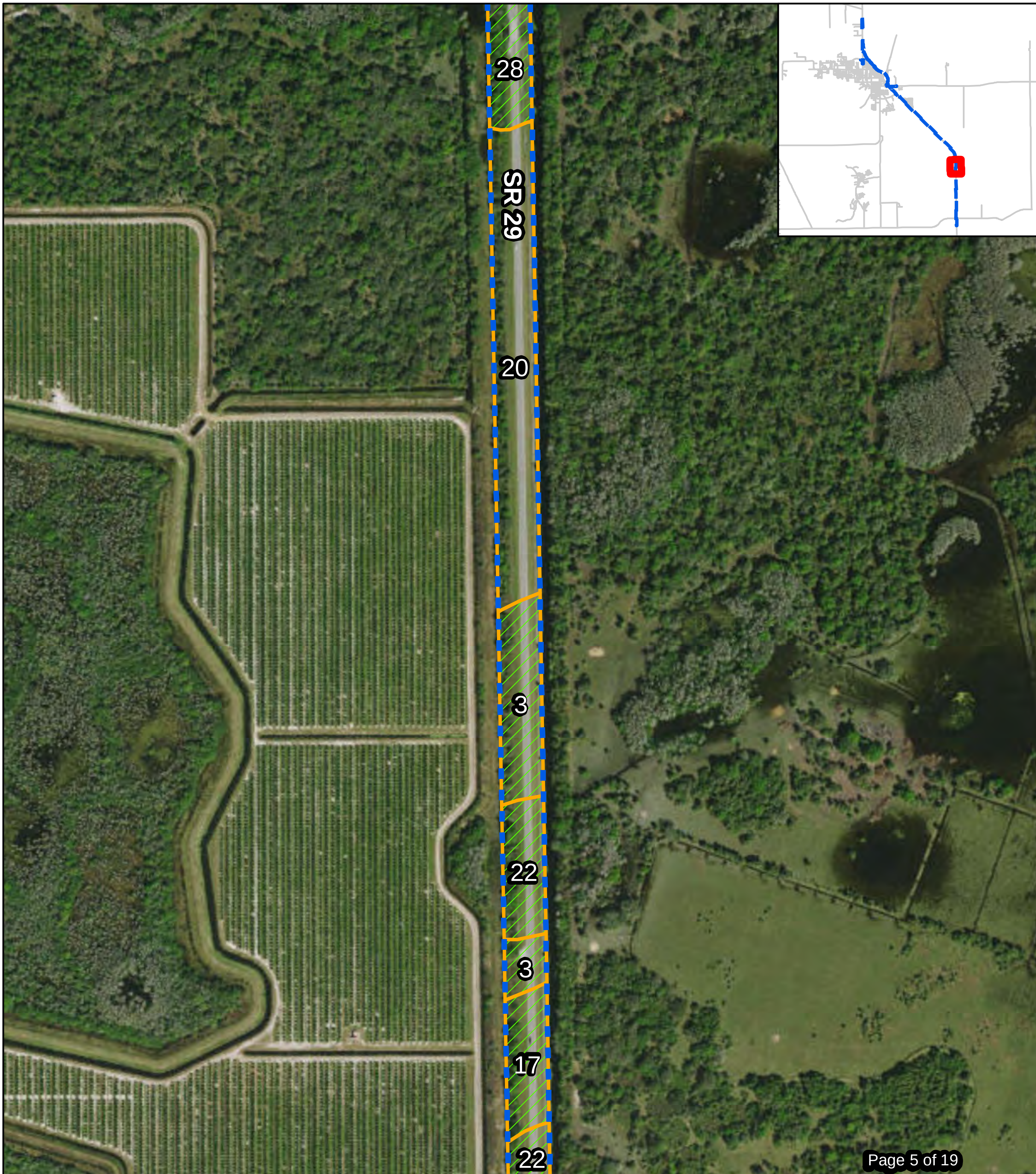

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #2

Central Alternative #2 Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-24

N
W E
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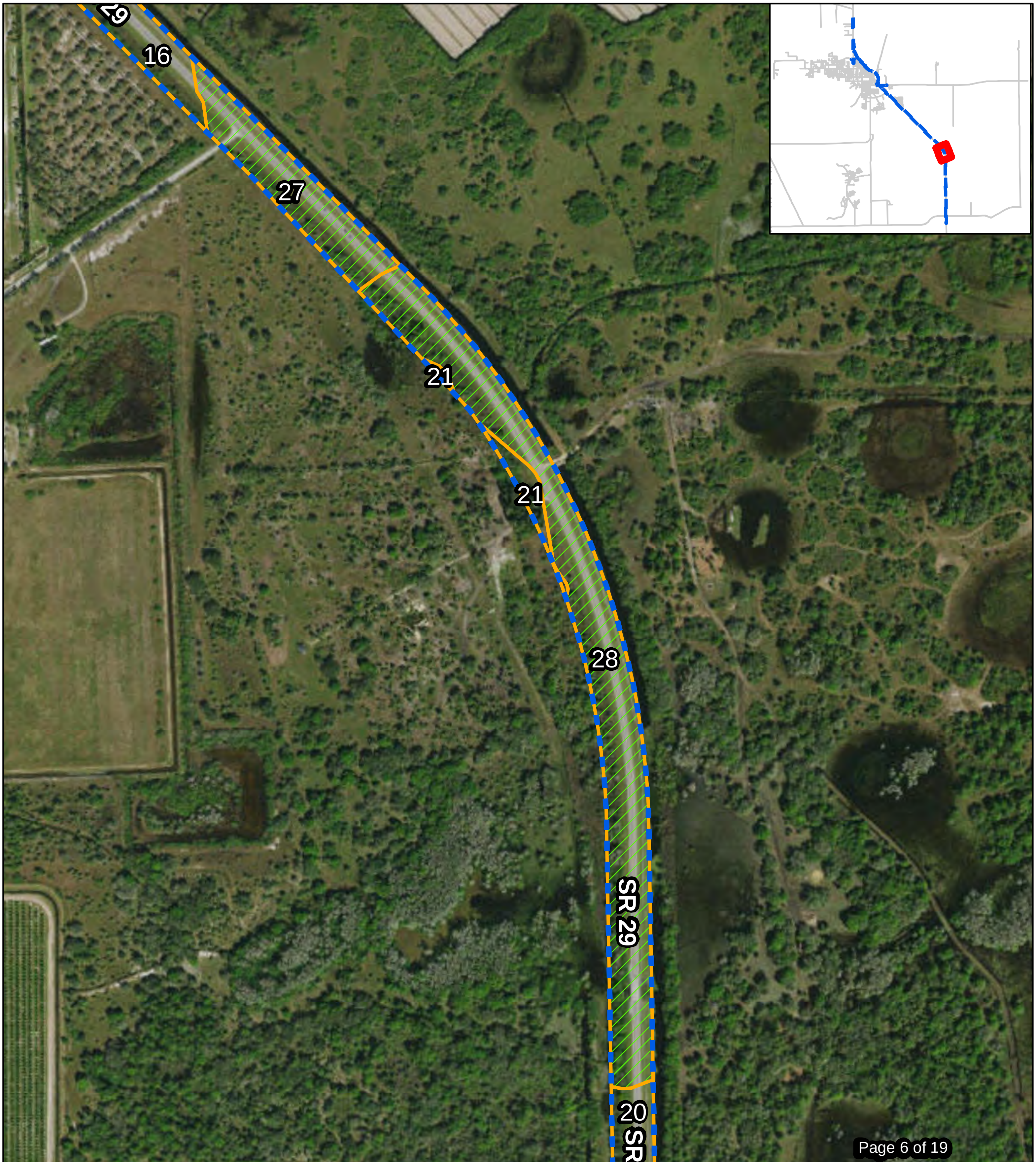
0 500 1,000 Feet



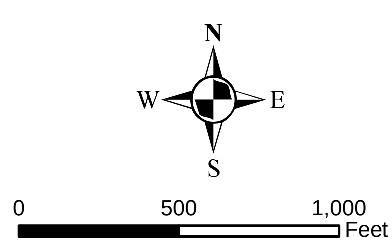
MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

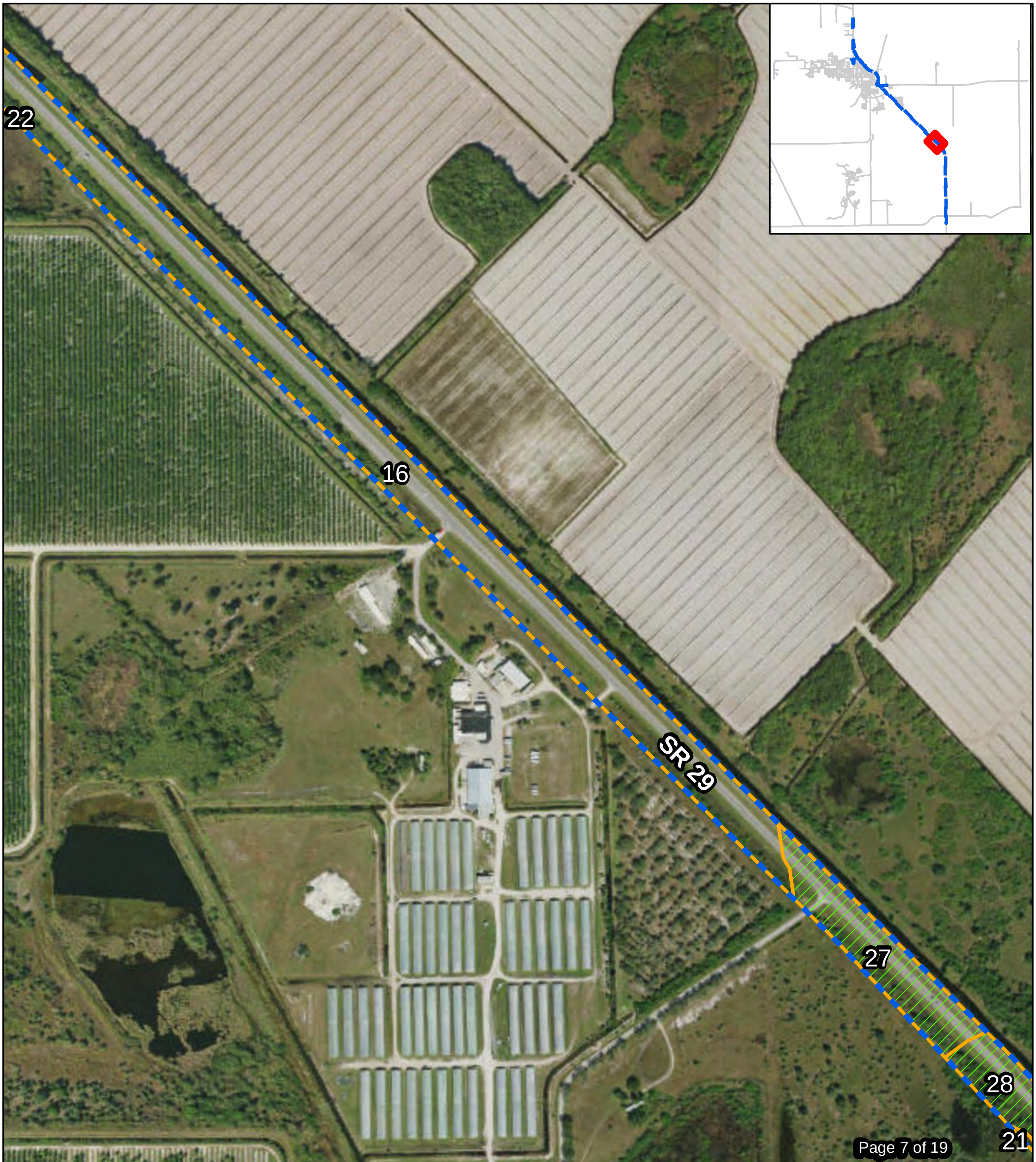
Legend

- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018





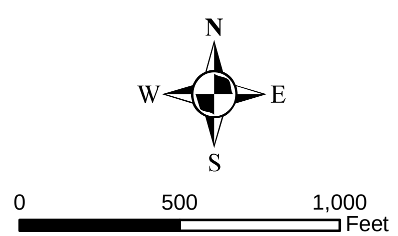
MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

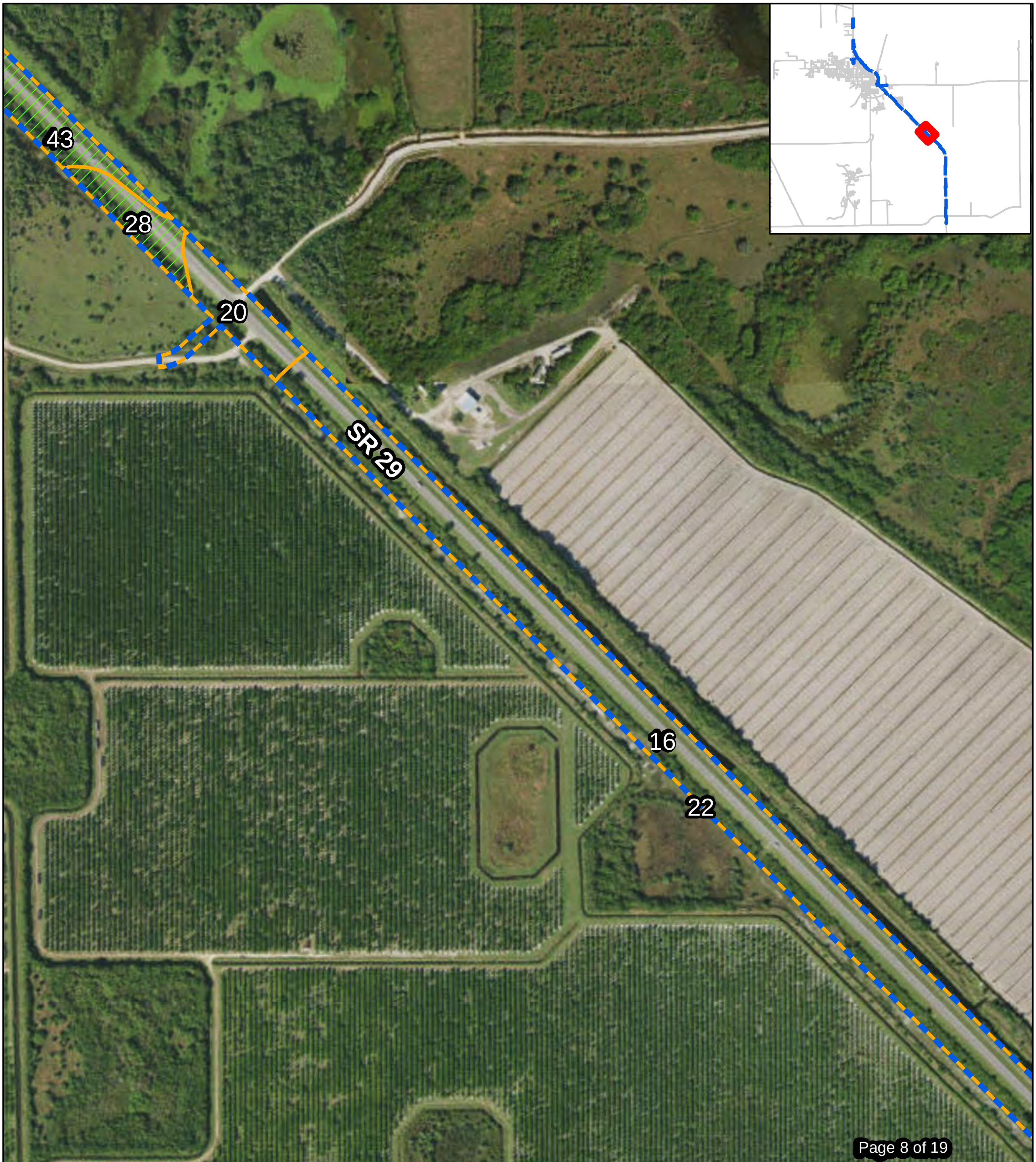
Legend

- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018





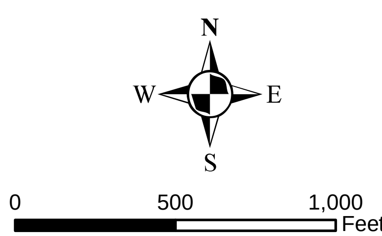
MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

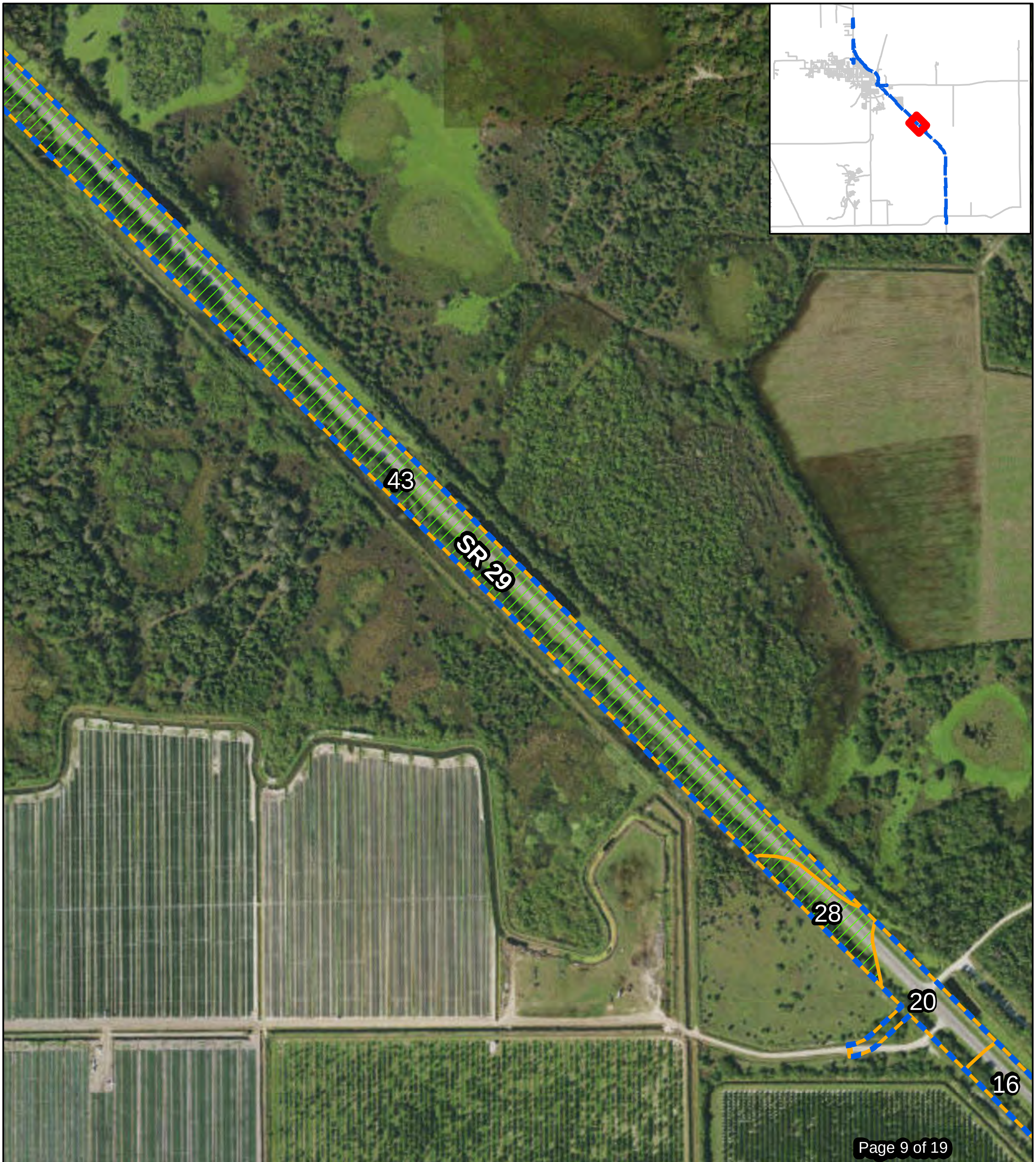
Legend

Central Alternative #2
Central Alternative #2 Soils
Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018





MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

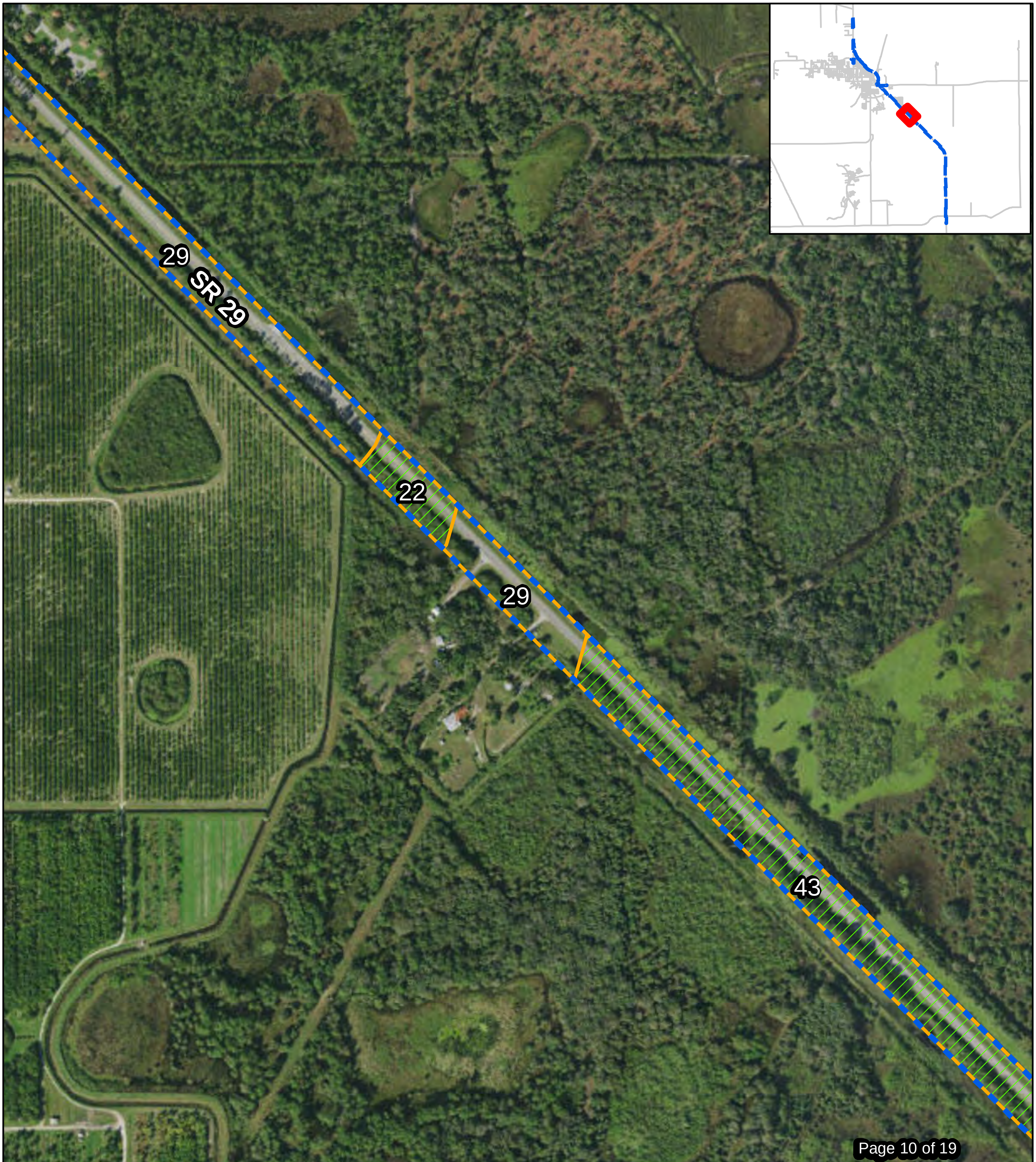
- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

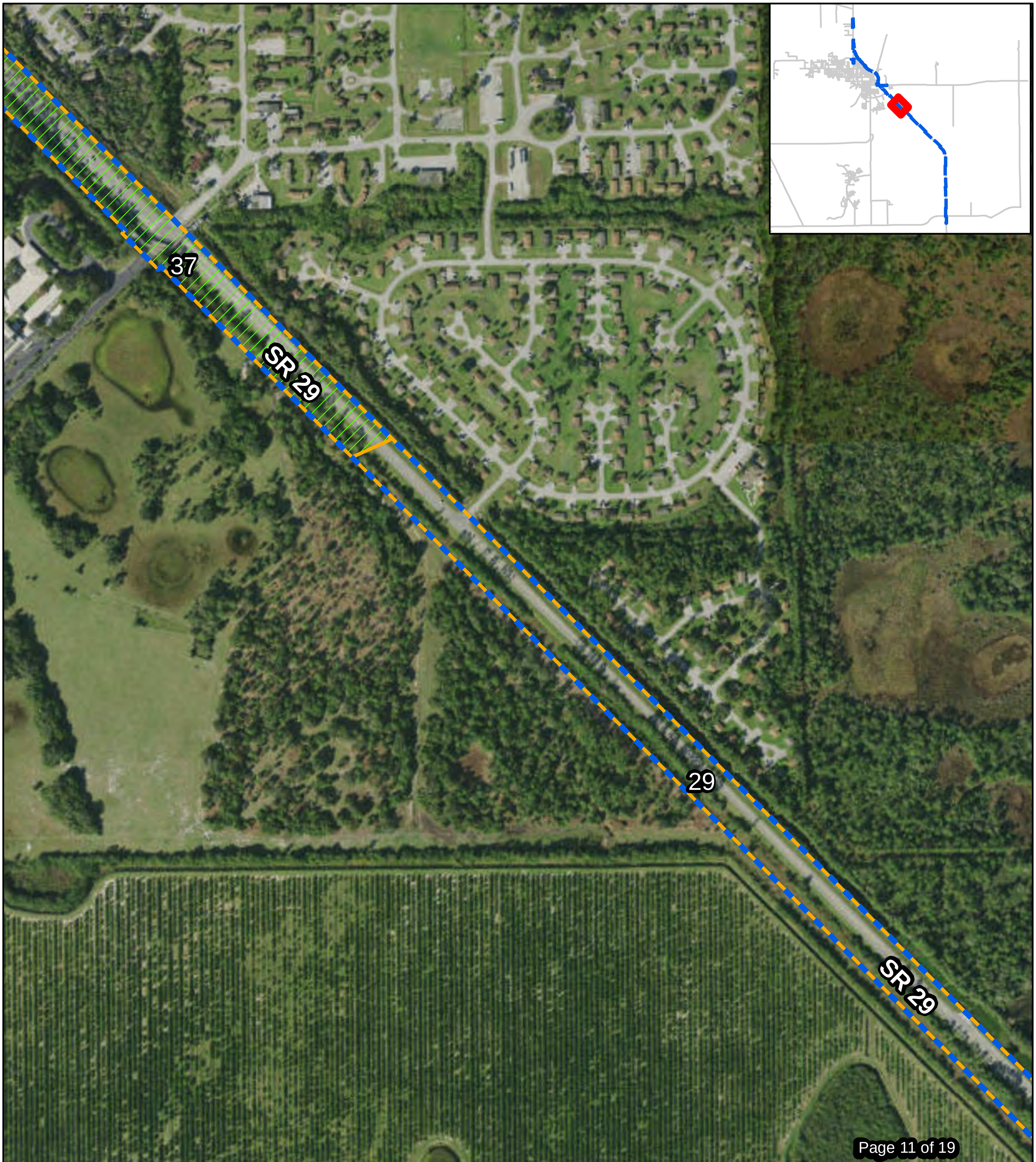
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-29

N
W E
S

0 500 1,000 Feet



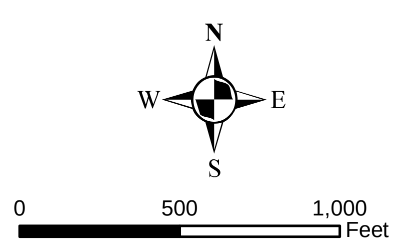
MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

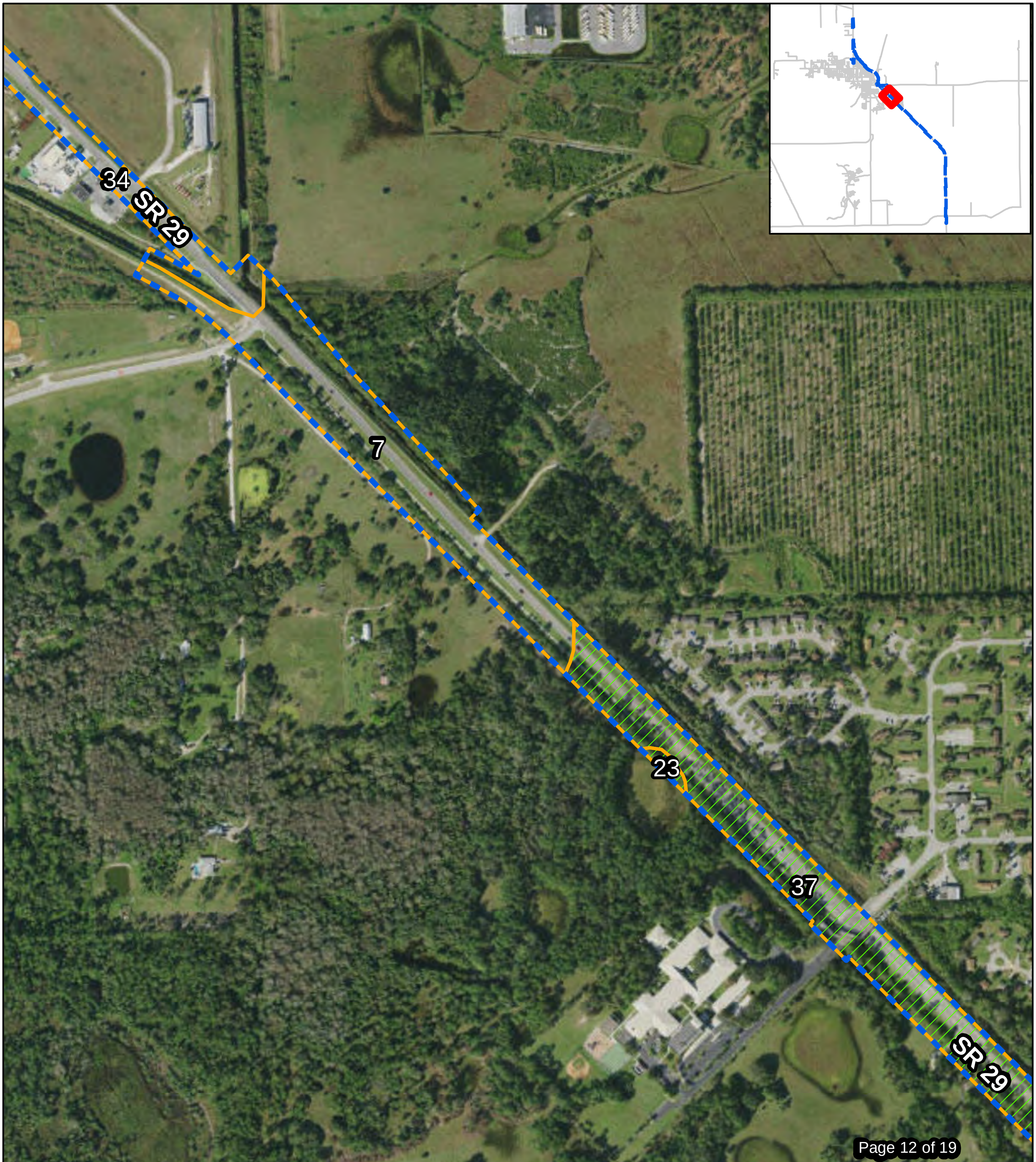
Legend

Central Alternative #2
Central Alternative #2 Soils
Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018





MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

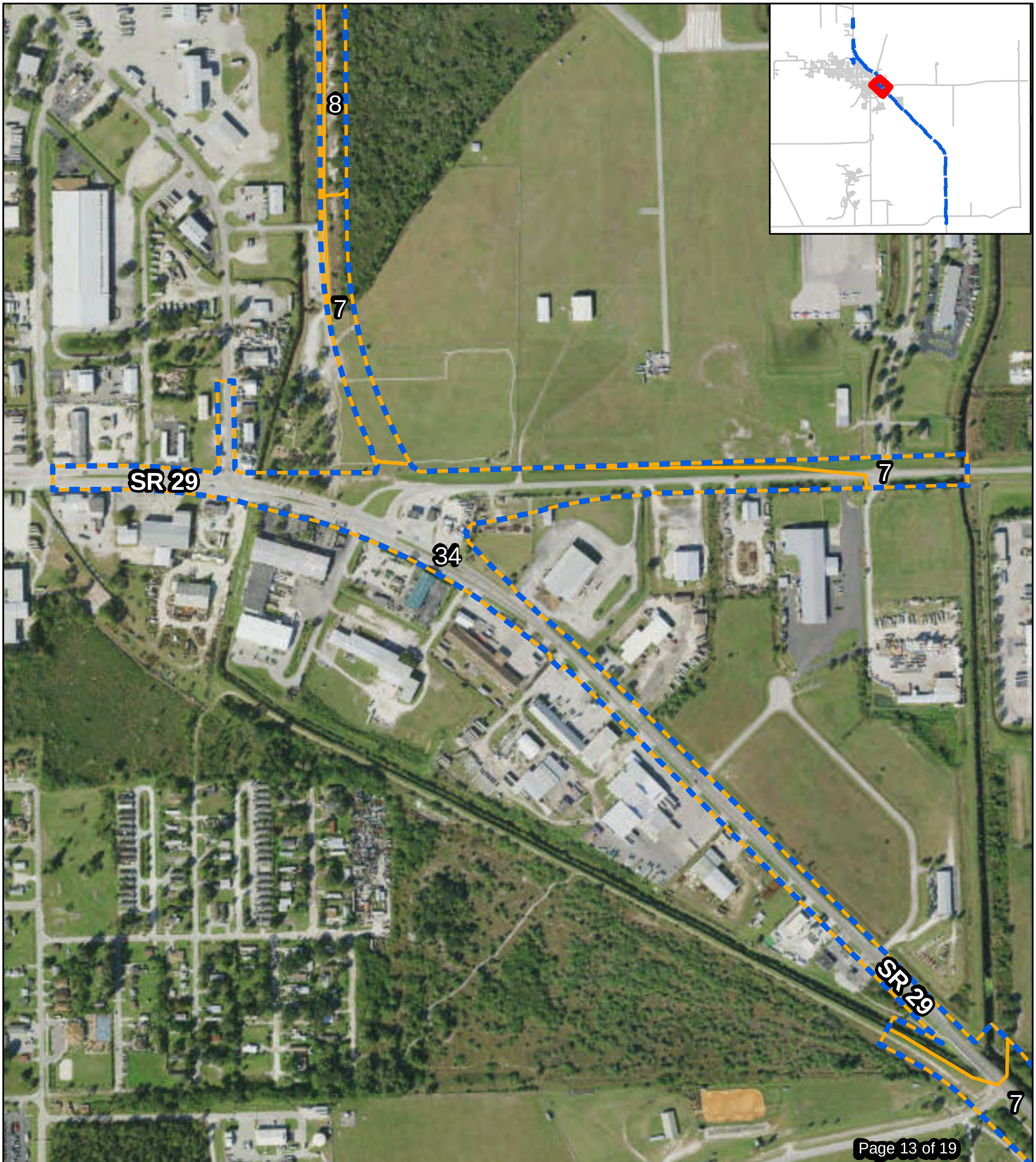
- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #2

Central Alternative #2 Soils

Hydric Soils

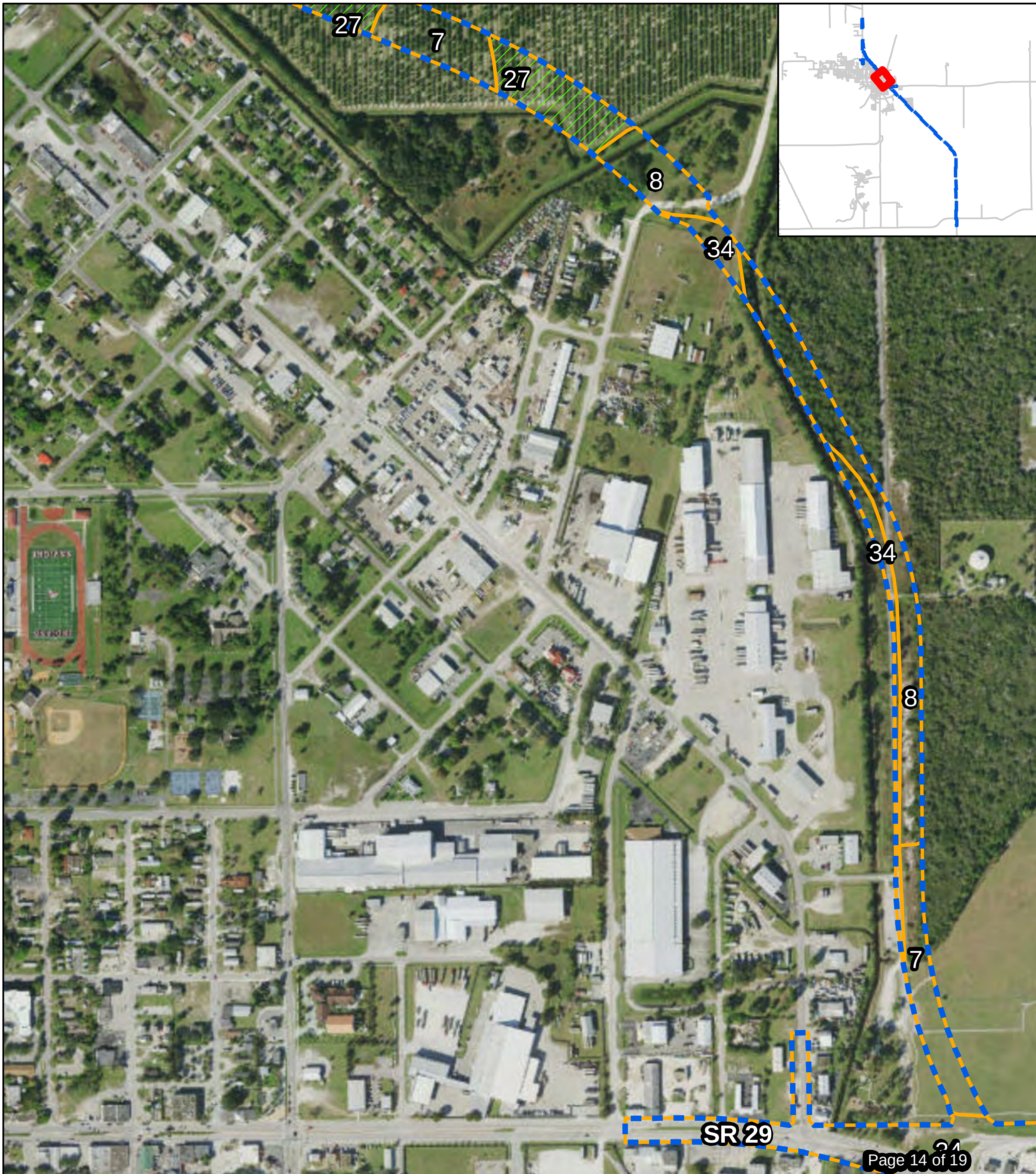
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-32

N
W E
S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #2

Central Alternative #2 Soils

Hydric Soils

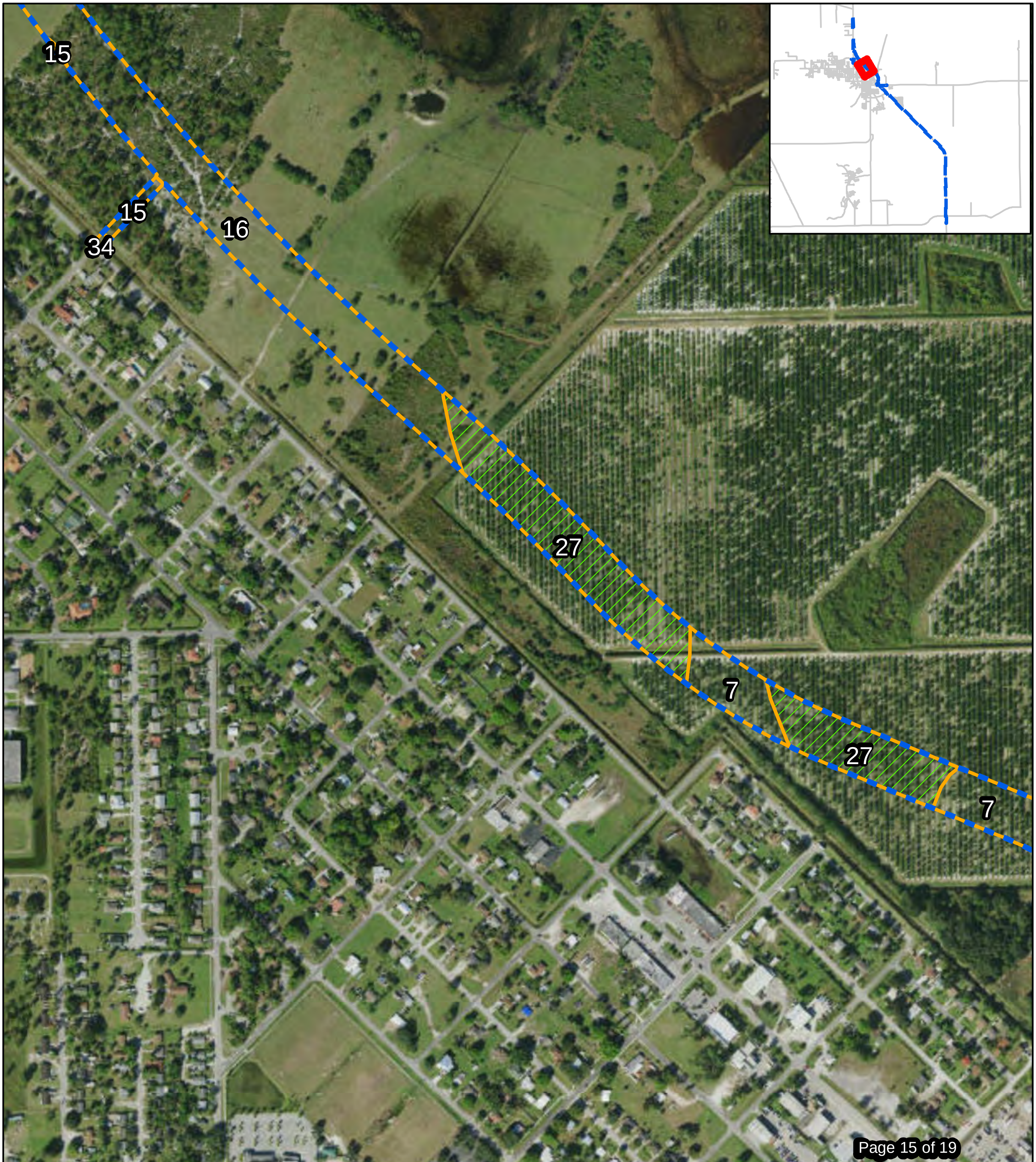
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-33

N
W E
S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

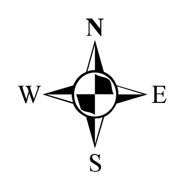
Legend

Central Alternative #2
Central Alternative #2 Soils
Hydric Soils

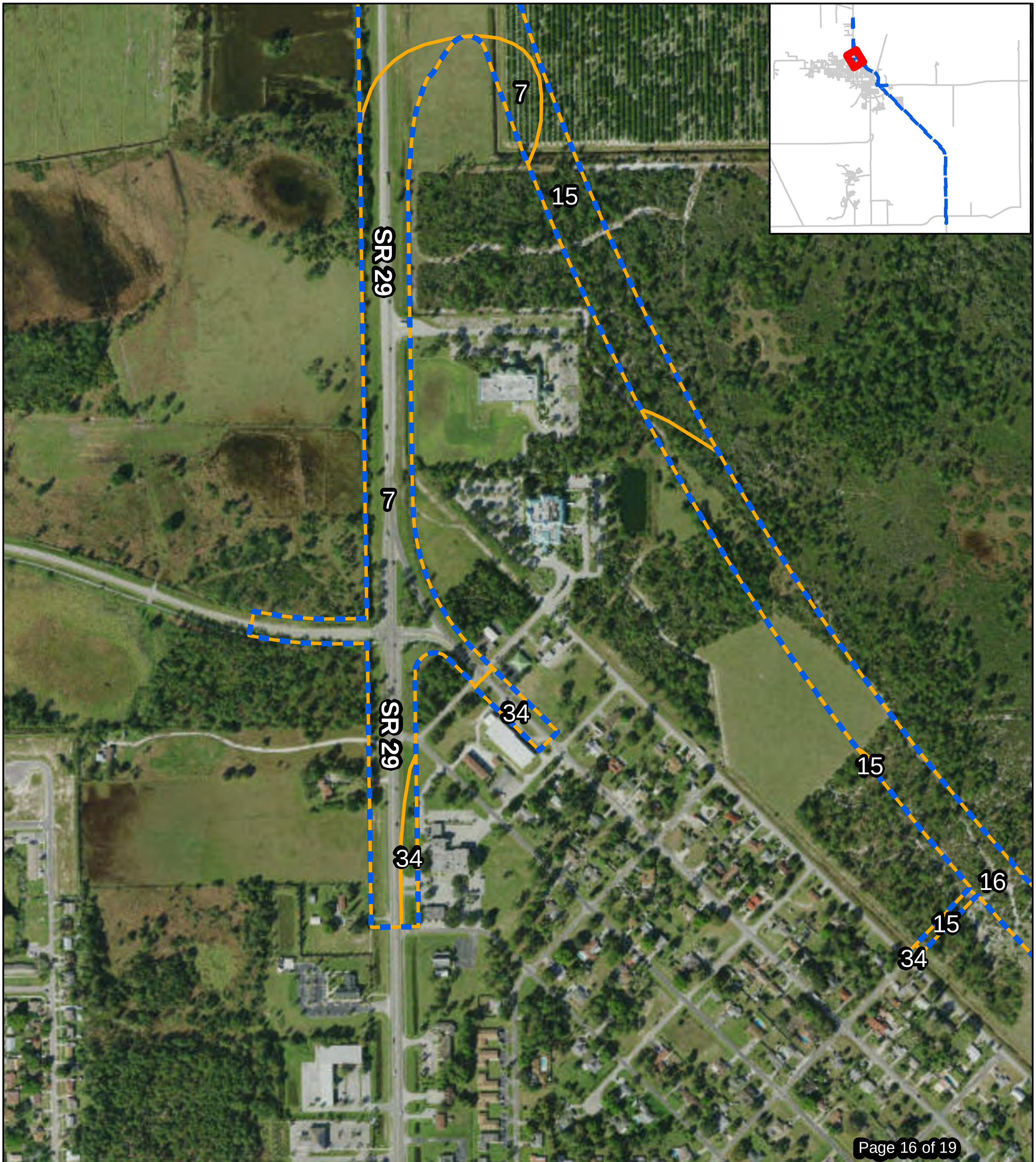
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-34



0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

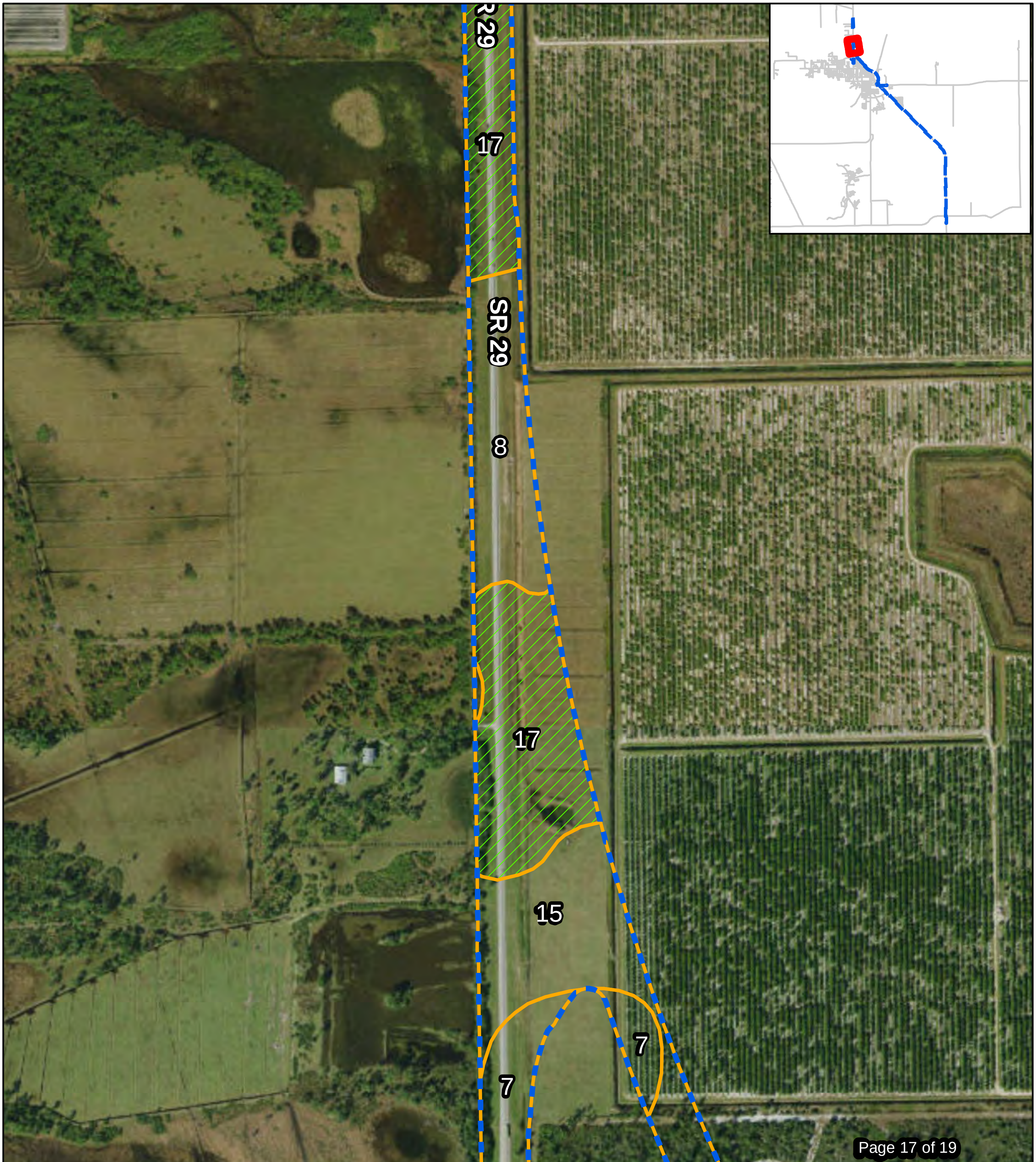
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-35

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #2

Central Alternative #2 Soils

Hydric Soils

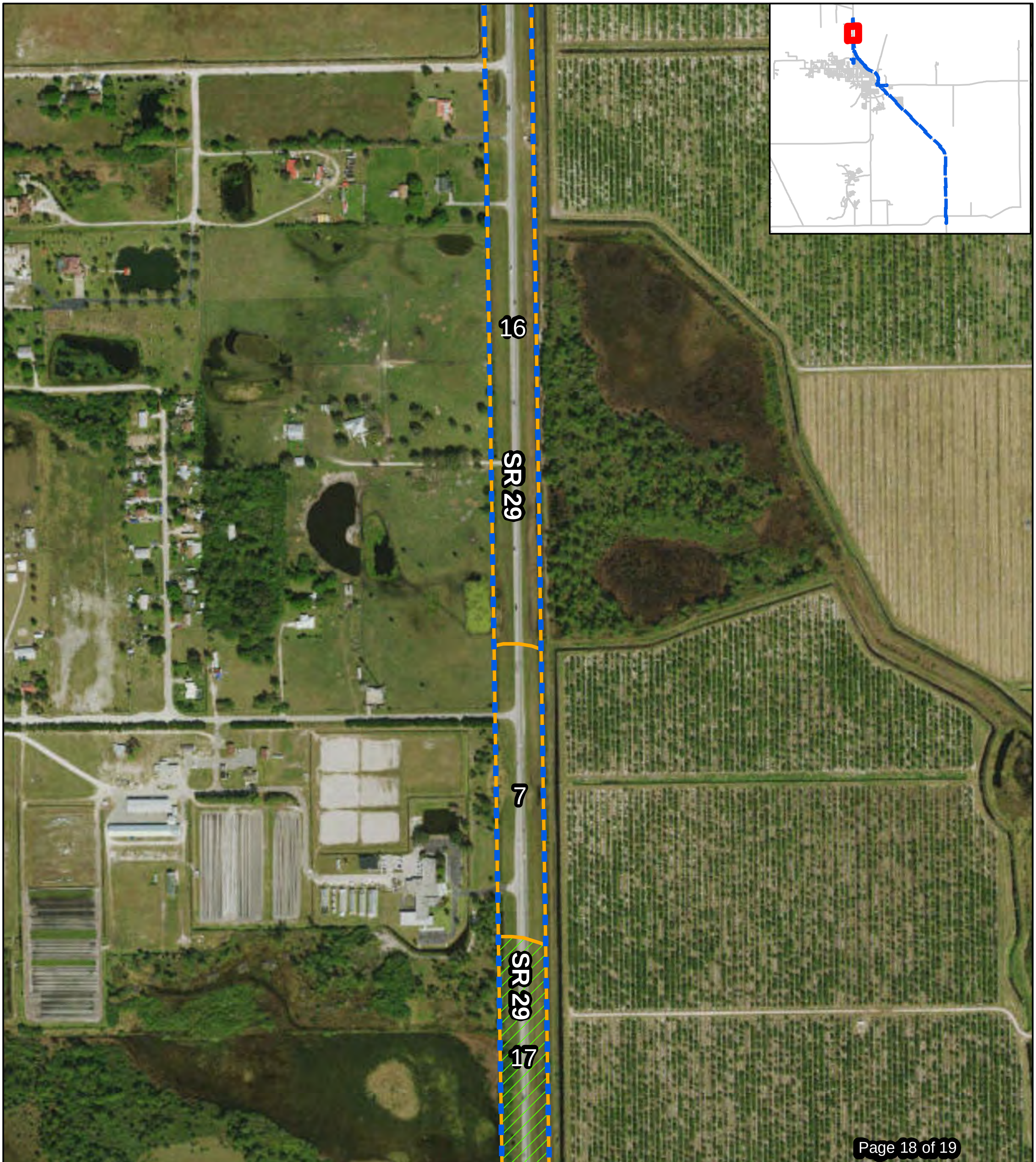
Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

D-36

N W E S

0 500 1,000 Feet



MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

Central Alternative #2

Central Alternative #2 Soils

Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

N
W E
S

0 500 1,000 Feet

MAP SOURCE : ESRI
DATA SOURCE : AECOM 2018

Legend

- Central Alternative #2
- Central Alternative #2 Soils
- Hydric Soils

Soils Map
SR 29 from Oil Well Road to SR 82
PD&E Study
Central Alternative #2

Date: 6/1/2018

N W E S

0 500 1,000 Feet

Appendix D
Soils Descriptions

Map Unit 3 – Malabar fine sand, 0 to 2 percent slopes
This map unit consists of nearly level, poorly drained soils on flatwoods and in sloughs. The permeability of this soil is slow or very slow. The available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 12 inches for 3 to 6 months during most years. Malabar fine sand is classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 4.22 acres (1.14%) of Central Alternative #1 Revised and 4.31 acres (1.13%) of Central Alternative #2.

Map Unit 7 – Immokalee fine sand, 0 to 2 percent slopes
This nearly level, poorly drained soil is on flatwoods. The permeability of this soil is moderate. The available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 6-18 inches for 1 to 6 months during most years. Immokalee fine sand is not classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 69.20 acres (18.78%) of Central Alternative #1 Revised and 75.41 acres (19.73%) of Central Alternative #2.

Map Unit 8 - Myakka fine sand, 0 to 2 percent slopes
This nearly level, poorly drained soil is on flatwoods. The permeability of this soil is moderate. The available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 6-18 inches for 1 to 6 months during most years. Myakka fine sand is not classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 14.11 acres (3.83%) of Central Alternative #1 Revised and 15.38 acres (4.02%) of Central Alternative #2.

Map Unit 10 - Oldsmar fine sand, limestone substratum
This nearly level, poorly drained soil is found on flatwoods. The permeability of this soil is slow, and the available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 6-18 inches for 1 to 6 months during most years. Oldsmar fine sand, limestone substratum is not classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 4.71 acres of the project study area (1.31% of Central Alternative #1 Revised and 1.23% of Central Alternative #2).

Map Unit 15 - Pomello fine sand, 0 to 2 percent slopes
This nearly level, moderately well drained soil is on low ridges on flatwoods. The permeability of this soil is moderately rapid. The available water capacity is low. Under natural conditions, the seasonal high water table is at a depth of 24 to 42 inches for 1 to 5 months during most years. Pomello fine sand is not classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 16.33 acres (4.42%) of Central Alternative #1 Revised and 16.42 acres (4.30%) of Central Alternative #2.

Map Unit 16 - Oldsmar fine sand, 0 to 2 percent slopes
This is a nearly level, poorly drained soil on flatwoods. The permeability of this soil is slow or very slow. The available water capacity is low. Under natural conditions, the seasonal high water table is between depths of 6 to 18 inches for 1 to 6 months during most years. Oldsmar fine sand is not classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 74.12 acres (20.10%) of Central Alternative #1 Revised and 74.42 acres (19.47%) of Central Alternative #2.

Map Unit 17 - Basinger fine sand, 0 to 2 percent slopes
This nearly level, poorly drained soil is found in sloughs and poorly defined drainageways. The permeability of this soil is rapid. The available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 12 inches for 3 to 6 months during most years. Basinger fine sand is classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 30.10 acres of the project study area (8.17% of Central Alternative #1 Revised and 7.87% of Central Alternative #2).

Map Unit 20 – Fort Drum and Malabar high fine sands
These nearly level, poorly drained soils are on ridges along sloughs. The permeability in the Ft. Drum soil is rapid. The permeability in the Malabar soil is slow or very slow. The available water capacity of both soils is low. Under natural conditions, the seasonal high water table is at a depth of 6 to 18 inches for 1 to 6 months during most years. Fort Drum and Malabar high fine sands are not classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 11.01 acres of the project study area (3.01% of Central Alternative #1 Revised and 2.89% of Central Alternative #2).

Map Unit 21 - Boca fine sand, 0 to 2 percent slopes
This nearly level, poorly drained soil is on flatwoods. The permeability of this soil is moderate. The available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 6-18 inches for 1 to 6 months during most years. Boca fine sand is classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 14.22 acres (3.81%) of Central Alternative #1 Revised and 14.37 acres (3.75%) of Central Alternative #2.

Map Unit 22 – Chobee, Winder, and Gator soils, depressional
These are level, very poorly drained soils in depressions and marshes. The permeability in these soils is slow or very slow. The available water capacity is moderate in the Chobee and Winder soils and high in the Gator soil. Under natural conditions, these soils are ponded for 6 months or more each year during most years. Chobee, Winder, and Gator soils, depressional are classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 6.11 acres (1.69%) of Central Alternative #1 Revised and 6.31 acres (1.64%) of Central Alternative #2.

Map Unit 23 - Holopaw and Okeelanta soils, depressional
These are level, very poorly drained soils in depressions and marshes. The permeability in the Holopaw soil is moderate to moderately slow, and the available water capacity is low. The permeability in the Okeelanta soil is slow or very slow, and the available water capacity is high. Under natural conditions, these soils are ponded for 6 months or more each year. Holopaw and Okeelanta soils, depressional are classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 0.30 acres (0.10% of Central Alternative #1 Revised and 0.08% of Central Alternative #2).

Map Unit 25 - Boca, Riviera, limestone substratum and Copeland fine sands, depressional
These are level, very poorly drained soils in depressions, cypress swamps, and marshes. The permeability in the Boca soil is moderate, and the available water capacity is very low. The permeability in the Riviera soil is moderately rapid to moderately slow, and the available water capacity is low. The permeability in the Copeland soil is moderately slow, and the available water capacity is moderate. Under natural conditions, these soils are ponded for 6 months or more each year. Boca, Riviera, limestone substratum and Copeland fine sands, depressional are classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 1.36 acres (0.37%) of Central Alternative #1 Revised and 1.62 acres (0.43%) of Central Alternative #2.

Map Unit 27 - Holopaw fine sand, 0 to 2 percent slopes
This nearly level, poorly drained soil is found in sloughs and poorly defined drainageways. The permeability of this soil is moderate to moderately slow. The available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 12 inches for 3 to 6 months during most years. Holopaw fine sand is classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 21.19 acres (5.67%) of Central Alternative #1 Revised and 31.27 acres (8.18%) of Central Alternative #2.

Map Unit 28 - Pineda and Riviera fine sands
This is a nearly level, poorly drained soil found in sloughs and poorly defined drainageways. The permeability of Pineda and Riviera soils is slow or very slow. The available water capacity for both soils is low. Under natural conditions, the seasonal high water table is within a depth of 12 inches for 3 to 6 months during most years. Pineda and Riviera fine sands are classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 16.51 acres (4.52%) of Central Alternative #1 Revised and 16.70 acres (4.37%) of Central Alternative #2.

Map Unit 29 - Wabasso fine sands, 0 to 2 percent slopes
This nearly level, moderately well drained soil is found on flatwoods. The permeability of this soil is slow or very slow, and the available water capacity is low. Under natural conditions, the seasonal high water table is at a depth of 6 to 18 inches for 1 to 6 months during most years. Wabasso fine sand is not classified as hydric by the *Hydric Soils of*

Florida Handbook (Hurt, 2007). This soil unit comprises 19.12 acres (5.23%) of Central Alternative #1 Revised and 19.12 acres (5.01%) of Central Alternative #2.

Map Unit 34 - Urban land -Immokalee-Oldsmar, limestone substratum complex
These areas of Urban land and nearly level, poorly drained soils are in urban areas. The permeability in the lmmokalee soil is moderate, and the available water capacity is low. The permeability in the Oldsmar soil is moderately slow, and the available water capacity is low. Under natural conditions, the seasonal high water table is at a depth of 6 to 18 inches for 1 to 6 months during most years. Urban land -Immokalee-Oldsmar, limestone substratum complex is unranked. This soil unit comprises 31.66 acres (8.58%) of Central Alternative #1 Revised and 26.34 acres (6.89%) of Central Alternative #2.

Map Unit 37 -Tuscawilla fine sand
This nearly level, poorly drained soil is found in flatwoods and hammocks. The permeability of this soil is moderate to moderately slow. The available water capacity is low. Under natural conditions, the seasonal high water table is within a depth of 6 to 18 inches for 1 to 6 months during most years. Tuscawilla fine sand is classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 12.71 acres (3.40%) of Central Alternative #1 Revised and 12.76 acres (3.33%) of Central Alternative #2.

Map Unit 43 -Winder, Riviera, limestone substratum and Chobee soils, depressional
These are level, very poorly drained soils in marshes. The permeability in the Winder and Chobee soils is slow or very slow. The available water capacity of both soils is moderate. The permeability in the Riviera soil is moderately rapid to moderately slow. The available water capacity is low. Under natural conditions, the soils in this unit are ponded for 6 months or more during most years. Winder, Riviera, limestone substratum and Chobee soils, depressional are classified as hydric by the *Hydric Soils of Florida Handbook* (Hurt, 2007). This soil unit comprises 21.65 acres (5.87%) of Central Alternative #1 Revised and 21.71 acres (5.68%) of Central Alternative #2.

Appendix E

FEMA Flood Insurance Rate Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded half-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Florida State Plane east zone (FIPSZONE 0901). **horizontal datum** was NAD 83, GRS1980 spheroid. Differences in datum, spheroid, projection or state plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

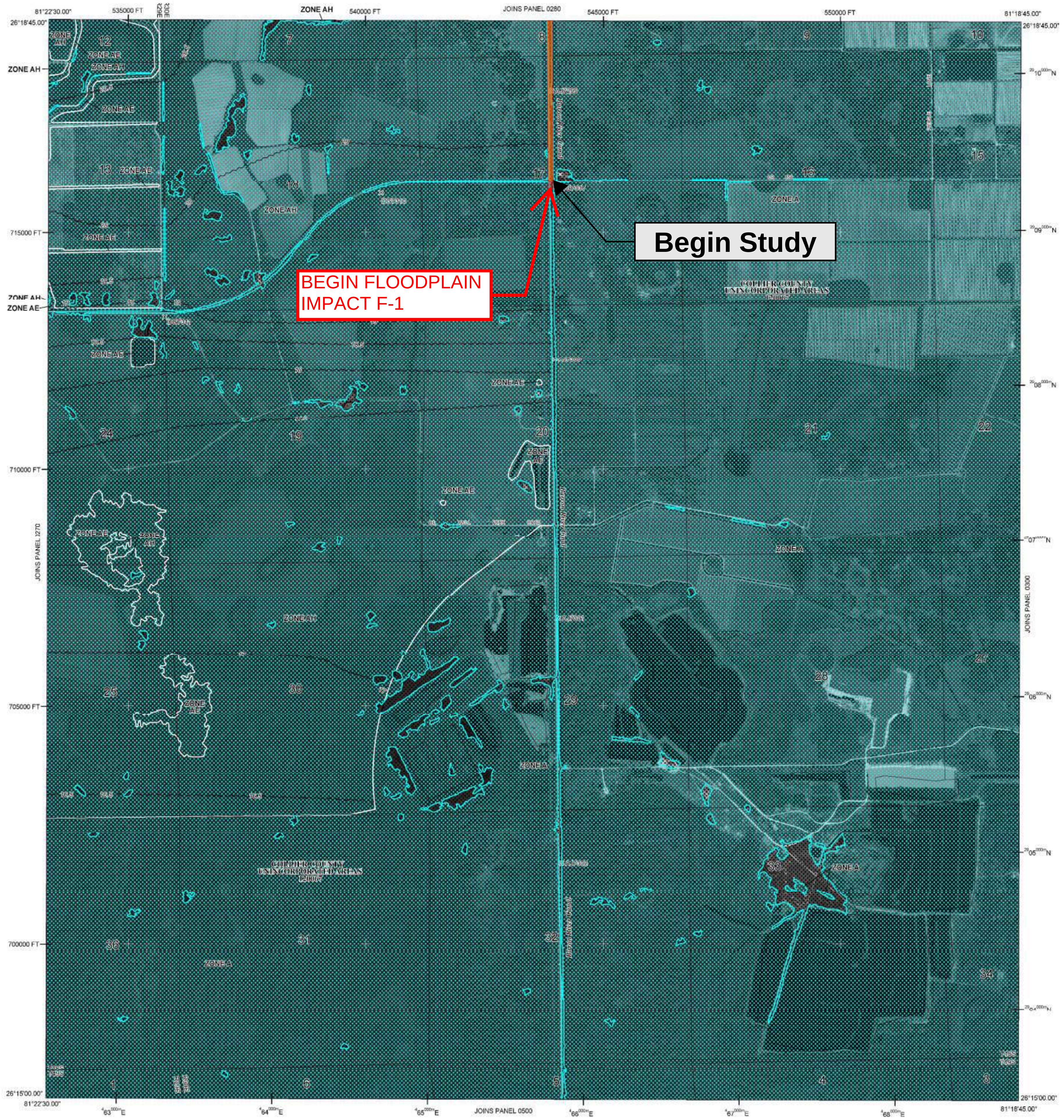
Base map information shown on this FIRM was derived from multiple sources. This information was compiled from Collier County Government (2003, 2008, 2009), U.S. Bureau of Land Management (2005), 3001, Inc. (2004), NOAA-National Geodetic Survey (2006), and U.S. Geological Survey (2009) at a scale of 1:24,000.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Information eXchange at 1-877-FEMA MAP** (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and /or digital versions of this map. The FEMA Map Information eXchange may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE, AE	Base Flood Elevations determined.
ZONE AH, AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)—(A)	Cross section line
(23)- - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid, zone 17
6000000 FT	5000-foot grid : Florida State Plane coordinate system, east zone (FIPSZONE 0901), Lambert Conformal Conic
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
November 17, 2005
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012-to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update roads and road names, to update the effects of wave action, to reflect revised shoreline, to reflect updated topographic information, and to modify Coastal Barrier Resources Areas and Otherwise Protected Areas.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0290H

FIRM
FLOOD INSURANCE RATE MAP
COLLIER COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 290 OF 1225
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLLIER COUNTY	120067	0290	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12021C0290H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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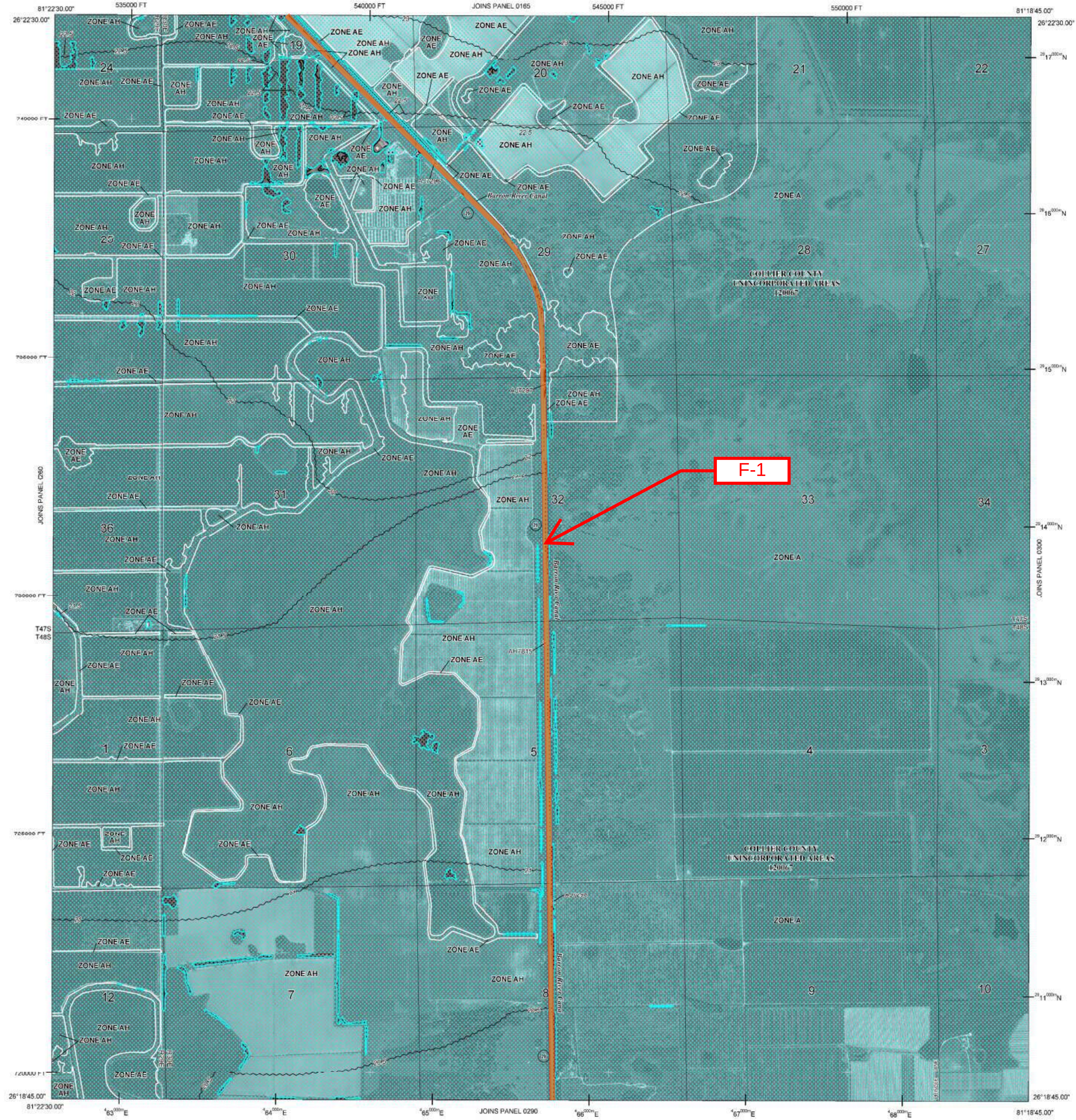

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE, AE	Base Flood Elevations determined.
ZONE AH, AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}75^{000m}$N	1000-meter Universal Transverse Mercator grid value, zone 17
6000000 FT	5000-foot grid value: Florida State Plane coordinate system, east zone (FIPSZONE 0901), Lambert Conformal Conic projection
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
November 17, 2005
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012-to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update roads and road names, to update the effects of wave action, to reflect revised shoreline, to reflect updated topographic information, and to modify Coastal Barrier Resources Areas and Otherwise Protected Areas.

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N

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0280H

FIRM
FLOOD INSURANCE RATE MAP

COLLIER COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 280 OF 1225
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLLIER COUNTY	120067	0280	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12021C0280H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Florida State Plane east zone (FIPSZONE 0901). The **horizontal datum** was NAD 83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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LEGEND

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ZONE AE, AE	Base Flood Elevations determined.
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ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

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- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)———(A)	Cross section line
(23)- - - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid value, zone 17
6000000 FT	5000-foot grid value: Florida State Plane coordinate system, east zone (FIPSZONE 0901), Lambert Conformal Conic projection
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
November 17, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

May 16, 2012 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update roads and road names, to update the effects of wave action, to reflect revised shoreline, to reflect updated topographic information, and to modify Coastal Barrier Resources Areas and Otherwise Protected Areas.

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500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0165H

FIRM
FLOOD INSURANCE RATE MAP

COLLIER COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 165 OF 1225
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

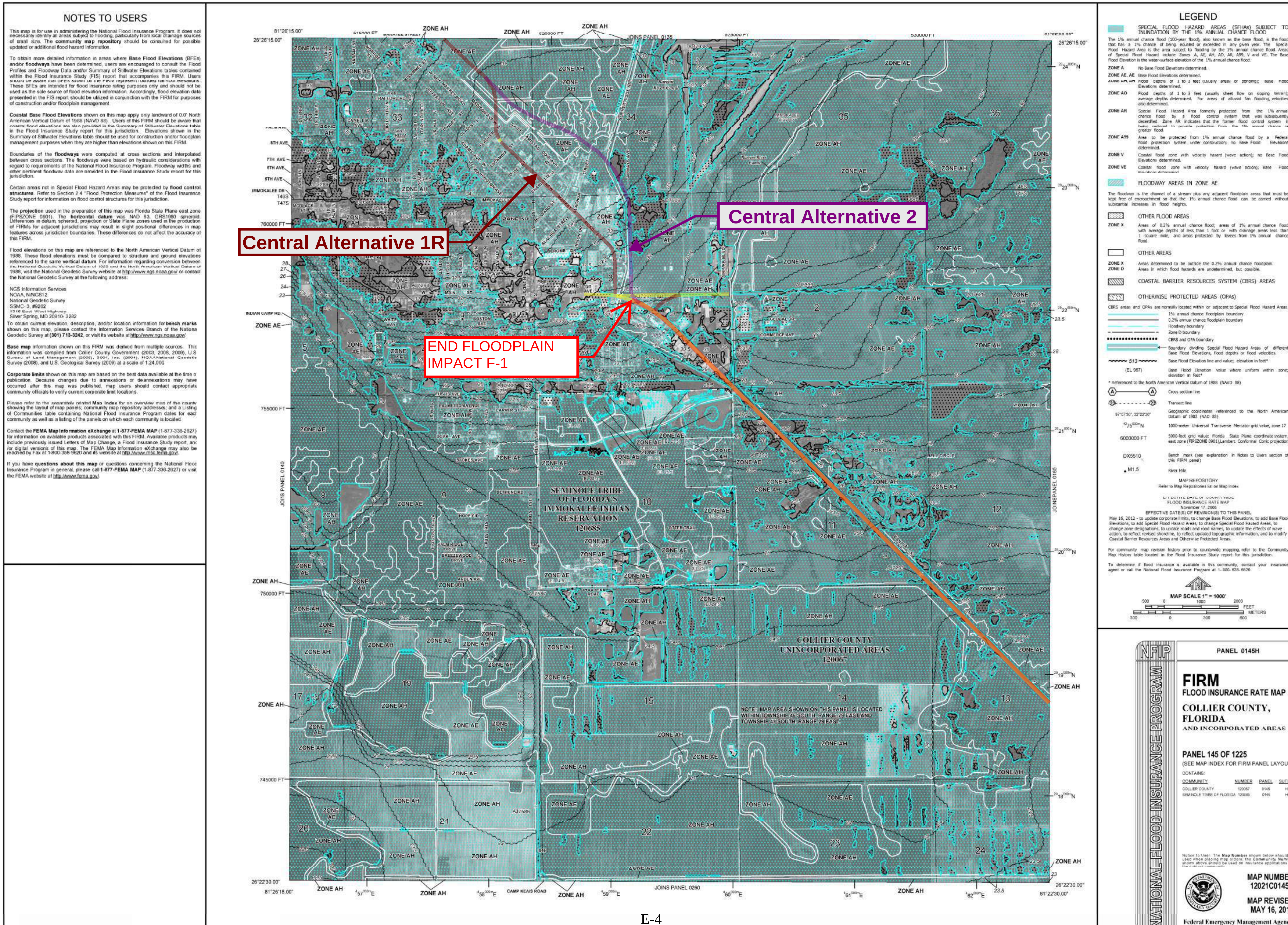
COMMUNITY	NUMBER	PANEL	SUFFIX
COLLIER COUNTY	120067	0165	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12021C0165H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency



NOTES TO USERS
LEGEND
Central Alternative 1R
Central Alternative 2
END FLOODPLAIN IMPACT F-1
SEMINOLE TRIBE OF FLORIDA'S IMMOKALEE INDIAN RESERVATION 120685
COLLIER COUNTY UNINCORPORATED AREAS 120067
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0145H
FIRM
FLOOD INSURANCE RATE MAP
COLLIER COUNTY, FLORIDA
AND INCORPORATED AREAS
PANEL 145 OF 1225
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER 12021C0145H
MAP REVISED MAY 16, 2012
Federal Emergency Management Agency

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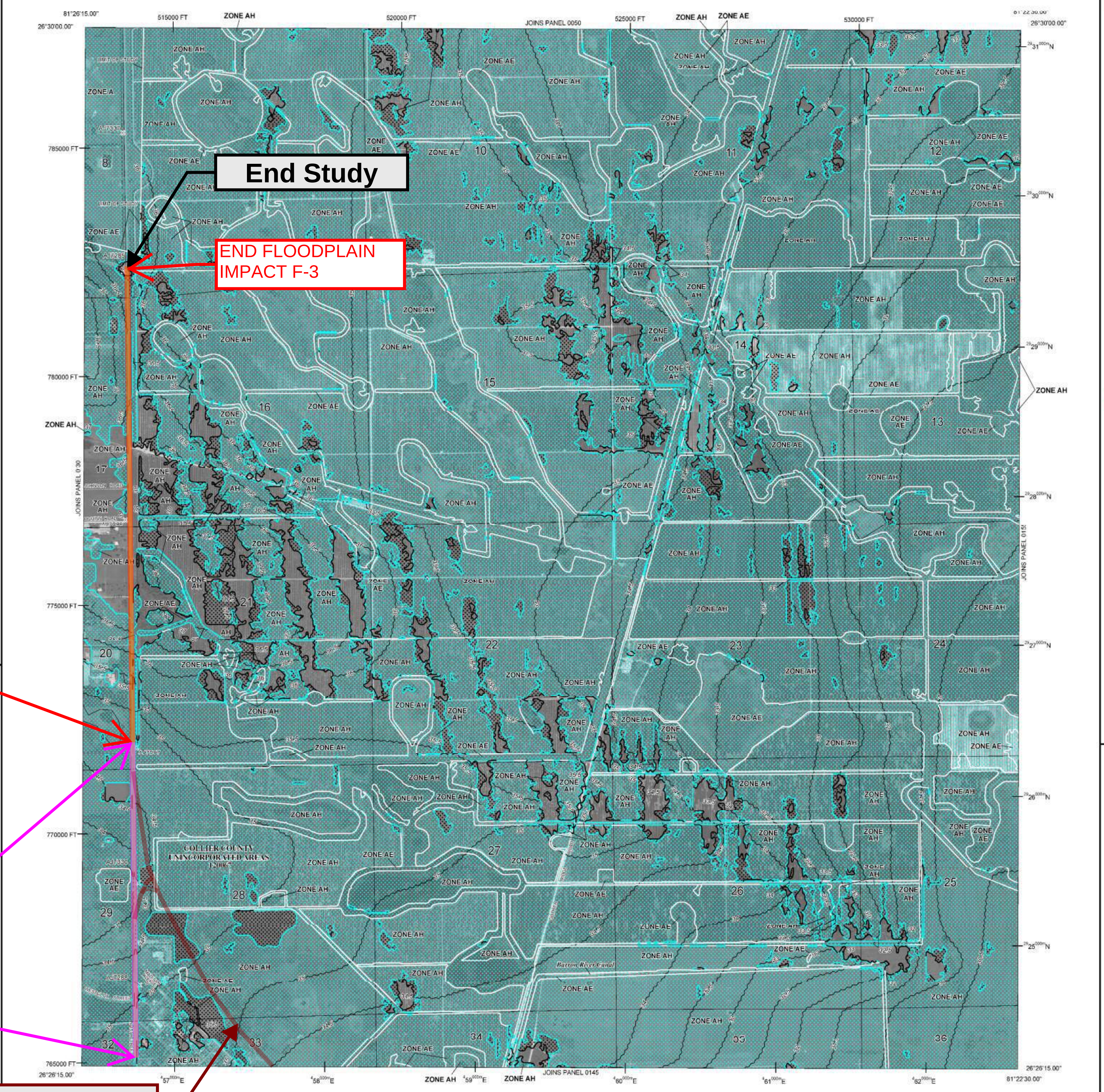

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FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0135H

FIRM
FLOOD INSURANCE RATE MAP
COLLIER COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 135 OF 1225
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLLIER COUNTY	120067	0135	H

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MAP NUMBER 12021C0135H

MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

Appendix F
Stormwater Management Calculations

APPENDIX F
TABLE OF CONTENTS

APPENDIX F
TABLE OF CONTENTS

APPENDIX F
TABLE OF CONTENTS

BASIN 1

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.41	acres	98	138
Shoulders	--	--	0.44	acres	98	43
Driveways	--	--		acres	98	0
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	21	A/D	7.43	acres	80	594
		Totals:	9.28	acres		776

Pre-Condition Composite Curve Number: 83.6

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.6
Drainage Area (A) = 9.28 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.96 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.24 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.60 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.74	acres	98	269
Shoulders	--	--	0.44	acres	98	43
Driveways	--	--		acres	98	0
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	21	A/D	6.10	acres	80	488
		Totals:	9.28	acres		800

Post-Condition Composite Curve Number: 86.2

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.2
Drainage Area (A) = 9.28 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.61 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.56 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 5.85 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.25 AC-FT

BASIN 1

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.33	ACRES
TOTAL BASIN AREA =	9.28	ACRES

TREATMENT VOLUME REQUIRED:

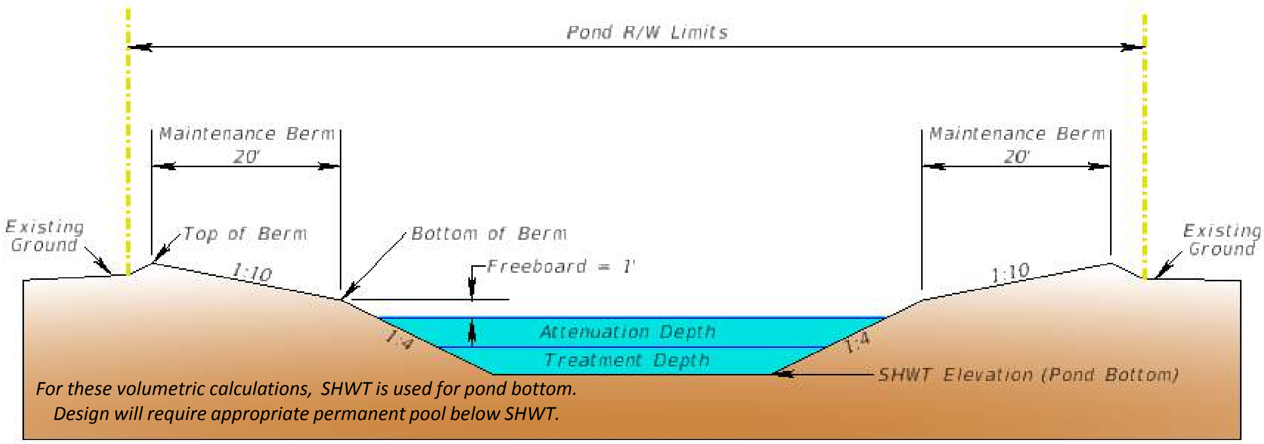
2.5 inches/12 ft	x	1.33 acres =	0.28	AC-FT	
1 inch/12 ft	x	9.28 acres =	**0.77**	**AC-FT**	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND:	21 - Boca Fine Sand	
NRCS HIGH WATER DEPTH:	0.0-1.0 FT	(FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:			
AVERAGE NATURAL GROUND EL =	18.0	FT	
SHWT EL =	17.5	FT	(FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:			
LOW EOP EL =	20.0	FT	



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	12	in	
Attenuation Depth =	4	in	

Approx. low edge of pavement elevation (LEOP) =	20.0	FT
Approx. Proposed Top of Berm elevation =	19.8	FT
Average Ground at Pond Site =	18.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	17.5	FT

BASIN 1

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.20**	**AC-FT**	
Square dimension at bottom of treatment depth	180.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	188.0	FT	
Square dimension at top of attenuation depth	190.7	FT	
Attenuation Volume provided by attenuation depth	**2.47**	**AC-FT**	
Square dimension at top of freeboard	198.7	FT	
Square dimension at top berm	238.7	FT	
Outside pond dimensions (including tie-down)	246.0	FT	

Minimum Total Area Required: **1.68 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 1 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 17.50 ft
Estimated Low Edge of Pavement = 20.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
15.50	29584.0	0.68	0.0	0.0	0.00	
17.50	32400.0	0.74	61984.0	61984.0	1.42	*PPV*
18.50	35344.0	0.81	33872.0	95856.0	2.20	*TV*
18.83	36353.8	0.83	11949.6	107805.6	2.47	*AV*
19.83	39468.4	0.91	37911.1	145716.7	3.35	
19.83	56961.8	1.31	0.0	145716.7	3.35	*Top of Berm*
18.00	73224.4	1.68	--	--	--	

Required Treatment Volume = 0.77 ac-ft
Provided Treatment Volume = 0.78 ac-ft ✓

Required Attenuation Volume = 0.25 ac-ft
Provided Attenuation Volume = 0.27 ac-ft ✓

BASIN 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.46 acres	98	45
Shoulders	--	--	0.14 acres	98	14
Driveways	--	--	0.10 acres	98	10
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	21	A/D	1.18 acres	80	94
		Totals:	1.88 acres		163

Pre-Condition Composite Curve Number: 86.7

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.7
Drainage Area (A) = 1.88 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.53 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.62 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 1.19 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.46 acres	98	45
Shoulders	--	--	0.14 acres	98	14
Driveways	--	--	0.10 acres	98	10
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	21	A/D	1.18 acres	80	94
		Totals:	1.88 acres		163

Post-Condition Composite Curve Number: 86.7

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.7
Drainage Area (A) = 1.88 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.53 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.62 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 1.19 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.00 AC-FT

NO POND REQUIRED

BASIN 3

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	0.64	acres	98	63
Shoulders	--	--	0.01	acres	98	1
Driveways	--	--		acres	98	0
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	21	A/D	2.03	acres	80	162
		Totals:	2.68	acres		226

Pre-Condition Composite Curve Number: 84.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.4
Drainage Area (A) = 2.68 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.85 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.34 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 1.64 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	0.89	acres	98	87
Shoulders	--	--	0.01	acres	98	1
Driveways	--	--		acres	98	0
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	21	A/D	1.78	acres	80	142
		Totals:	2.68	acres		231

Post-Condition Composite Curve Number: 86.0

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.0
Drainage Area (A) = 2.68 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.62 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.54 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 1.68 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.05 AC-FT

BASIN 3

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	0.25	ACRES
TOTAL BASIN AREA =	2.68	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	0.25 acres =	0.05	AC-FT	
1 inch/12 ft	x	2.68 acres =	**0.22**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 21 - Boca Fine Sand

NRCS HIGH WATER DEPTH: 0.0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

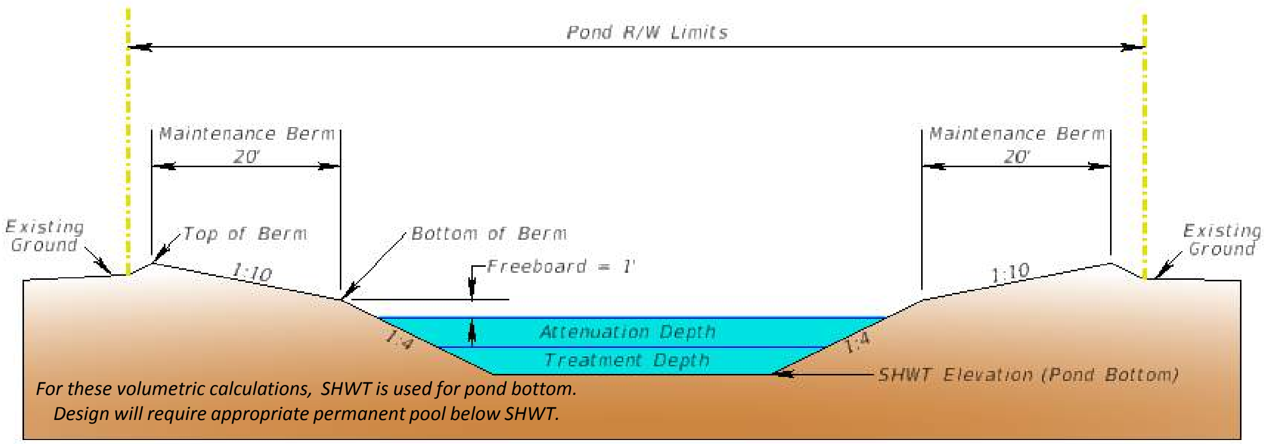
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	18.0	FT	
SHWT EL =	17.5	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	20.0	FT



Conveyance loss to outfall =	0.6	FT	
Available depth for treatment and attenuation =	0.9	FT	= 10.64 in
Treatment Depth =	6	in	
Attenuation Depth =	2	in	

Approx. low edge of pavement elevation (LEOP) =	20.0	FT
Approx. Proposed Top of Berm elevation =	19.2	FT
Average Ground at Pond Site =	18.0	FT
Actual Depth of Treatment and Attenuation =	0.7	FT
Pond Bottom Elevation =	17.5	FT

BASIN 3

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.21**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	152.0	FT	
Square dimension at top of attenuation depth	153.3	FT	
Attenuation Volume provided by attenuation depth	**1.30**	**AC-FT**	
Square dimension at top of freeboard	161.3	FT	
Square dimension at top berm	201.3	FT	
Outside pond dimensions (including tie-down)	206.0	FT	

Minimum Total Area Required: **1.18** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 3 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 17.50 ft
Estimated Low Edge of Pavement = 20.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
15.50	19600.0	0.45	0.0	0.0	0.00	
17.50	21904.0	0.50	41504.0	41504.0	0.95	*PPV*
18.00	23104.0	0.53	11252.0	52756.0	1.21	*TV*
18.17	23511.1	0.54	3884.6	56640.6	1.30	*AV*
19.17	26028.4	0.60	24769.8	81410.4	1.87	
19.17	40535.1	0.93	0.0	81410.4	1.87	*Top of Berm*
18.00	51347.6	1.18	--	--	--	

Required Treatment Volume = 0.22 ac-ft
Provided Treatment Volume = 0.26 ac-ft ✓

Required Attenuation Volume = 0.05 ac-ft
Provided Attenuation Volume = 0.09 ac-ft ✓

BASIN 4

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	0.99	acres	98	97
Shoulders	--	--	0.36	acres	98	35
Driveways	--	--	0.01	acres	98	1
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	21	A/D	4.81	acres	80	385
		Totals:	6.17	acres		518

Pre-Condition Composite Curve Number: 84.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.0
Drainage Area (A) = 6.17 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.91 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.29 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 3.75 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.14	acres	98	210
Shoulders	--	--	0.36	acres	98	35
Driveways	--	--		acres	98	0
Sidewalk	--	--	0.17	acres	98	17
Open Spaces (Sod)	21	A/D	3.50	acres	80	280
		Totals:	6.17	acres		542

Post-Condition Composite Curve Number: 87.8

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.8
Drainage Area (A) = 6.17 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.39 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.76 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 3.99 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.24 AC-FT

BASIN 4

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 1.15 ACRES
TOTAL BASIN AREA = 6.17 ACRES

TREATMENT VOLUME REQUIRED:

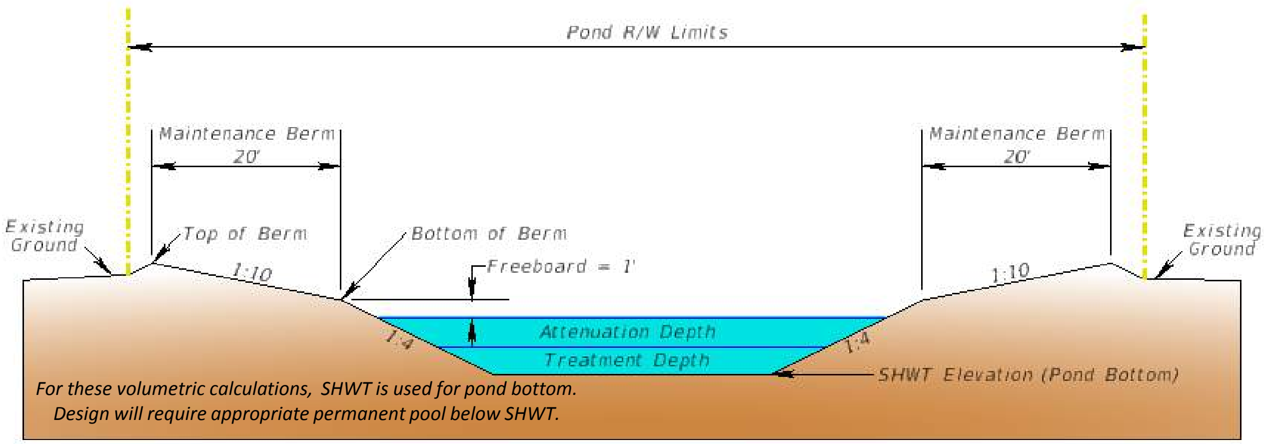
2.5 inches/12 ft	x	1.15 acres =	0.24	AC-FT
1 inch/12 ft	x	6.17 acres =	**0.51**	**AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 21 - Boca Fine Sand
NRCS HIGH WATER DEPTH: 0.0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 20.0 FT
SHWT EL = 19.5 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 22.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	11	in	
Attenuation Depth =	5	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	19.5	FT

BASIN 4

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.54**	**AC-FT**	
Square dimension at bottom of treatment depth	152.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	159.3	FT	
Square dimension at top of attenuation depth	162.7	FT	
Attenuation Volume provided by attenuation depth	**1.79**	**AC-FT**	
Square dimension at top of freeboard	170.7	FT	
Square dimension at top berm	210.7	FT	
Outside pond dimensions (including tie-down)	218.0	FT	

Minimum Total Area Required: **1.32** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 4 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.50 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
17.50	21904.0	0.50	0	0	0	
19.50	23104.0	0.53	45008.0	45008.0	1.03	*PPV*
20.42	25387.1	0.58	22225.1	67233.1	1.54	*TV*
20.83	26460.4	0.61	10801.6	78034.7	1.79	*AV*
21.83	29127.1	0.67	27793.8	105828.4	2.43	
21.83	44380.4	1.02	0.0	105828.4	2.43	*Top of Berm*
20.00	57504.0	1.32	--	--	--	

Required Treatment Volume = 0.51 ac-ft
Provided Treatment Volume = 0.51 ac-ft ✓

Required Attenuation Volume = 0.24 ac-ft
Provided Attenuation Volume = 0.25 ac-ft ✓

BASIN 5

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.26	acres	98	123
Shoulders	--	--	0.52	acres	98	51
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	27	A/D	7.67	acres	80	614
		Totals:	9.47	acres		790

Pre-Condition Composite Curve Number: 83.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.4
Drainage Area (A) = 9.47 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.99 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.22 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.70 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.96	acres	98	290
Shoulders	--	--	0.52	acres	98	51
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--	0.26	acres	98	25
Open Spaces (Sod)	27	A/D	5.71	acres	80	457
		Totals:	9.47	acres		825

Post-Condition Composite Curve Number: 87.1

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.1
Drainage Area (A) = 9.47 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.47 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.68 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.06 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.36 AC-FT

BASIN 5

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.70	ACRES
TOTAL BASIN AREA =	9.47	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.70 acres =	0.35	AC-FT	
1 inch/12 ft	x	9.47 acres =	**0.79**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 27 - Holopaw Fine Sand

NRCS HIGH WATER DEPTH: 0.0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

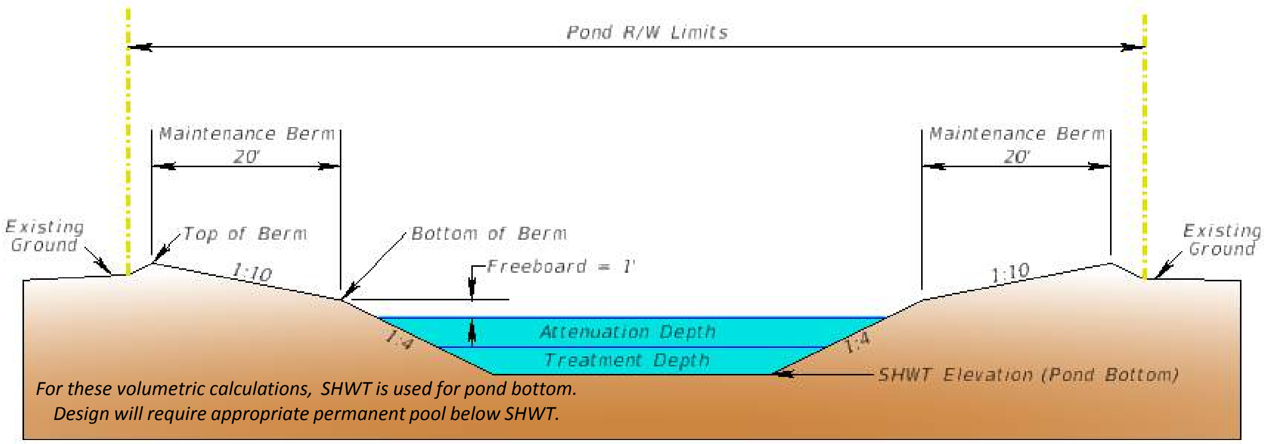
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.5	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	11	in	
Attenuation Depth =	5	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	19.5	FT

BASIN 5

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.38**	**AC-FT**	
Square dimension at bottom of treatment depth	190.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	197.3	FT	
Square dimension at top of attenuation depth	200.7	FT	
Attenuation Volume provided by attenuation depth	**2.76**	**AC-FT**	
Square dimension at top of freeboard	208.7	FT	
Square dimension at top berm	248.7	FT	
Outside pond dimensions (including tie-down)	256.0	FT	
Minimum Total Area Required:	**1.82**	**ACRES**	

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 5 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.50 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
17.50	33124.0	0.76	0.0	0.0	0.00	
19.50	36100.0	0.83	69224.0	69224.0	1.59	*PPV*
20.42	38940.4	0.89	34393.5	103617.5	2.38	*TV*
20.83	40267.1	0.92	16501.6	120119.1	2.76	*AV*
21.83	43541.8	1.00	41904.4	162023.6	3.72	
21.83	61835.1	1.42	0.0	162023.6	3.72	*Top of Berm*
20.00	79298.6	1.82	--	--	--	

Required Treatment Volume =	0.79	ac-ft	
Provided Treatment Volume =	**0.79**	**ac-ft**	✓
Required Attenuation Volume =	0.36	ac-ft	
Provided Attenuation Volume =	**0.38**	**ac-ft**	✓

BASIN 6

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.43	acres	98	140
Shoulders	--	--	0.63	acres	98	62
Driveways	--	--	0.03	acres	98	3
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	17, 27	A/D	8.56	acres	80	685
		Totals:	10.65	acres		890

Pre-Condition Composite Curve Number: 83.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.5
Drainage Area (A) = 10.65 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.97 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.23 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.42 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	3.69	acres	98	362
Shoulders	--	--	0.63	acres	98	62
Driveways	--	--	0.03	acres	98	3
Sidewalk	--	--	0.26	acres	98	25
Open Spaces (Sod)	17, 27	A/D	6.04	acres	80	483
		Totals:	10.65	acres		935

Post-Condition Composite Curve Number: 87.8

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.8
Drainage Area (A) = 10.65 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.39 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.76 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.89 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.47 AC-FT

BASIN 6

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	2.26	ACRES
TOTAL BASIN AREA =	10.65	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	2.26 acres =	0.47	AC-FT	
1 inch/12 ft	x	10.65 acres =	**0.89**	**AC-FT**	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 17 - Basinger Fine Sand

NRCS HIGH WATER DEPTH: 0.3-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

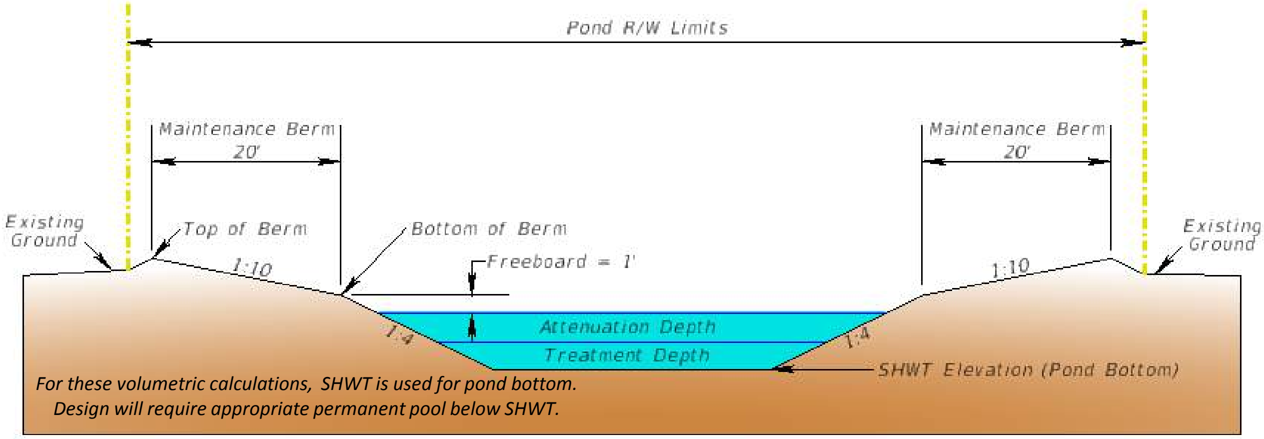
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.1	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.8	FT	= 21.15 in
Treatment Depth =	14	in	
Attenuation Depth =	7	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.9	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	19.1	FT

BASIN 6

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.34**	**AC-FT**	
Square dimension at bottom of treatment depth	180.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	189.3	FT	
Square dimension at top of attenuation depth	194.0	FT	
Attenuation Volume provided by attenuation depth	**2.83**	**AC-FT**	
Square dimension at top of freeboard	202.0	FT	
Square dimension at top berm	242.0	FT	
Outside pond dimensions (including tie-down)	249.4	FT	

Minimum Total Area Required: **1.73 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 6 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.10 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
17.10	29584.0	0.68	0.0	0.0	0.00	
19.10	32400.0	0.74	61984.0	61984.0	1.42	*PPV*
20.27	35847.1	0.82	39810.8	101794.8	2.34	*TV*
20.85	37636.0	0.86	21432.6	123227.4	2.83	*AV*
21.85	40804.0	0.94	39220.0	162447.4	3.73	
21.85	58564.0	1.34	0.0	162447.4	3.73	*Top of Berm*
20.00	75262.4	1.73	--	--	--	

Required Treatment Volume = 0.89 ac-ft
Provided Treatment Volume = 0.92 ac-ft ✓

Required Attenuation Volume = 0.47 ac-ft
Provided Attenuation Volume = 0.49 ac-ft ✓

BASIN 7

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	0.83	acres	98	81
Shoulders	--	--	0.34	acres	98	33
Driveways	--	--	0.01	acres	98	1
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	7	B/D	4.98	acres	80	398
		Totals:	6.16	acres		514

Pre-Condition Composite Curve Number: 83.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.4
Drainage Area (A) = 6.16 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.98 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.22 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 3.71 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.97	acres	98	193
Shoulders	--	--	0.34	acres	98	33
Driveways	--	--	0.01	acres	98	1
Sidewalk	--	--	0.17	acres	98	17
Open Spaces (Sod)	7	B/D	3.67	acres	80	294
		Totals:	6.16	acres		538

Post-Condition Composite Curve Number: 87.3

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.3
Drainage Area (A) = 6.16 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.46 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.69 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 3.95 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.24 AC-FT

BASIN 7

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 1.14 ACRES
TOTAL BASIN AREA = 6.16 ACRES

TREATMENT VOLUME REQUIRED:

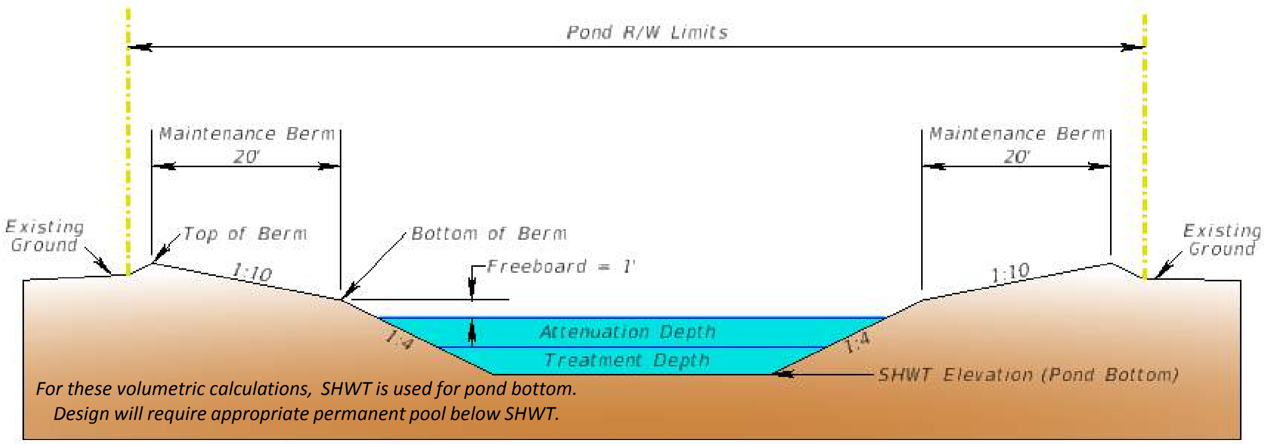
2.5 inches/12 ft x	1.14 acres =	0.24	AC-FT	
1 inch/12 ft x	6.16 acres =	**0.51**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee Fine Sand
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 20.0 FT
SHWT EL = 19.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 22.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	12	in	
Attenuation Depth =	5	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.4	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.4	FT
Pond Bottom Elevation =	19.0	FT

BASIN 7

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.48**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	156.0	FT	
Square dimension at top of attenuation depth	159.3	FT	
Attenuation Volume provided by attenuation depth	**1.72**	**AC-FT**	
Square dimension at top of freeboard	167.3	FT	
Square dimension at top berm	207.3	FT	
Outside pond dimensions (including tie-down)	213.0	FT	

Minimum Total Area Required: **1.26 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 7 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.00 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
17.00	19600.0	0.45	0.0	0.0	0.00	
19.00	21904.0	0.50	41504.0	41504.0	0.95	*PPV*
20.00	24336.0	0.56	23120.0	64624.0	1.48	*TV*
20.42	25387.1	0.58	10359.0	74983.0	1.72	*AV*
21.42	28000.4	0.64	26693.8	101676.8	2.33	
21.42	42987.1	0.99	0.0	101676.8	2.33	*Top of Berm*
20.00	54896.5	1.26	--	--	--	

Required Treatment Volume = 0.51 ac-ft
Provided Treatment Volume = 0.53 ac-ft ✓

Required Attenuation Volume = 0.24 ac-ft
Provided Attenuation Volume = 0.24 ac-ft ✓

BASIN 8

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.32 acres	98	129
Shoulders	--	--	0.54 acres	98	53
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	7	B/D	7.84 acres	80	627
		Totals:	9.72 acres		811

Pre-Condition Composite Curve Number: 83.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.5
Drainage Area (A) = 9.72 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.98 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.23 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.85 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.27 acres	98	320
Shoulders	--	--	0.54 acres	98	53
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	0.27 acres	98	26
Open Spaces (Sod)	7	B/D	5.62 acres	80	450
		Totals:	9.72 acres		851

Post-Condition Composite Curve Number: 87.6

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.6
Drainage Area (A) = 9.72 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.42 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.73 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.26 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.41 AC-FT

BASIN 8

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.95	ACRES
TOTAL BASIN AREA =	9.72	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	1.95 acres =	0.41	AC-FT		
1 inch/12 ft x	9.72 acres =	**0.81**	**AC-FT**	←	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee Fine Sand

NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

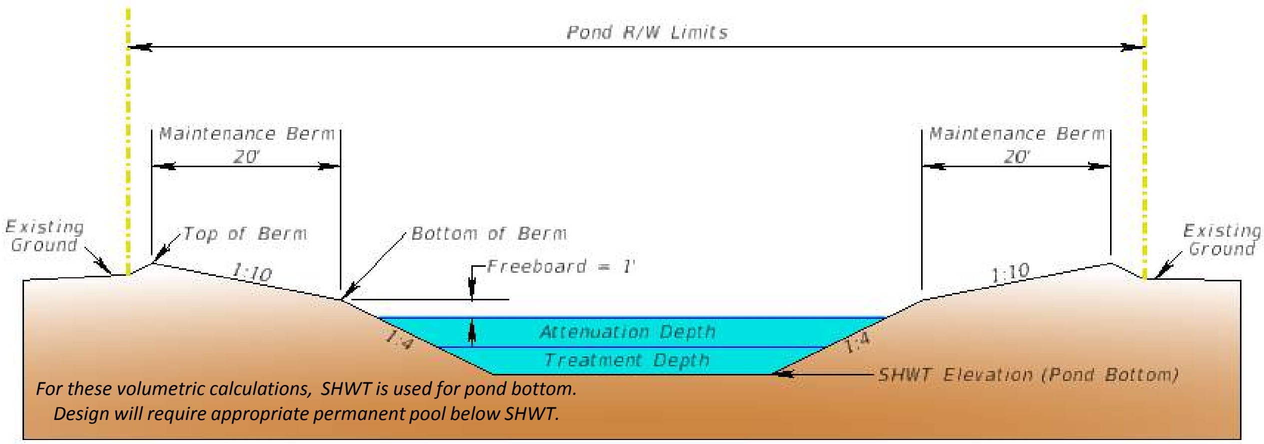
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	15	in	
Attenuation Depth =	7	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	19.0	FT

BASIN 8

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.02**	**AC-FT**	
Square dimension at bottom of treatment depth	165.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	175.0	FT	
Square dimension at top of attenuation depth	179.7	FT	
Attenuation Volume provided by attenuation depth	**2.44**	**AC-FT**	
Square dimension at top of freeboard	187.7	FT	
Square dimension at top berm	227.7	FT	
Outside pond dimensions (including tie-down)	235.0	FT	

Minimum Total Area Required: **1.53 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 8 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.00 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
17.00	24649.0	0.57	0.0	0.0	0.00	
19.00	27225.0	0.63	51874.0	51874.0	1.19	*PPV*
20.25	30625.0	0.70	36156.3	88030.3	2.02	*TV*
20.83	32280.1	0.74	18347.3	106377.6	2.44	*AV*
21.83	35218.8	0.81	33749.4	140127.0	3.22	
21.83	51832.1	1.19	0.0	140127.0	3.22	*Top of Berm*
20.00	66822.3	1.53	--	--	--	

Required Treatment Volume = 0.81 ac-ft
Provided Treatment Volume = 0.83 ac-ft ✓

Required Attenuation Volume = 0.41 ac-ft
Provided Attenuation Volume = 0.42 ac-ft ✓

BASIN 9

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	0.99	acres	98	97
Shoulders	--	--	0.42	acres	98	41
Driveways	--	--		acres	98	0
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	7	B/D	5.88	acres	80	470
		Totals:	7.29	acres		609

Pre-Condition Composite Curve Number: 83.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.5
Drainage Area (A) = 7.29 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.98 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.23 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 4.39 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.32	acres	98	227
Shoulders	--	--	0.42	acres	98	41
Driveways	--	--		acres	98	0
Sidewalk	--	--	0.21	acres	98	21
Open Spaces (Sod)	7	B/D	4.34	acres	80	347
		Totals:	7.29	acres		636

Post-Condition Composite Curve Number: 87.3

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.3
Drainage Area (A) = 7.29 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.46 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.70 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 4.68 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.28 AC-FT

BASIN 9

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.33	ACRES
TOTAL BASIN AREA =	7.29	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.33 acres =	0.28	AC-FT	
1 inch/12 ft	x	7.29 acres =	**0.61**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee Fine Sand
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

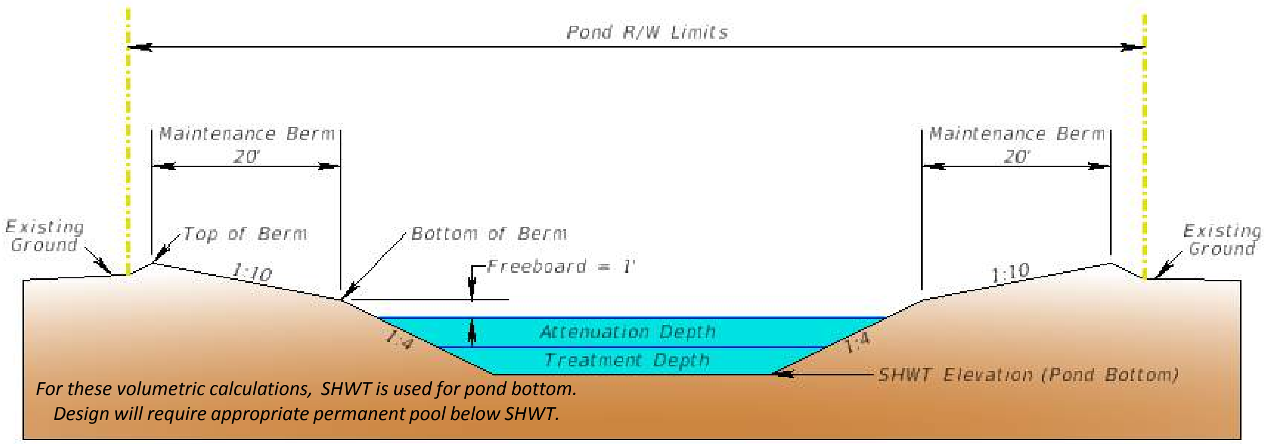
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	15	in	
Attenuation Depth =	7	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	19.0	FT

BASIN 9

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.63**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	158.0	FT	
Square dimension at top of attenuation depth	162.7	FT	
Attenuation Volume provided by attenuation depth	**1.97**	**AC-FT**	
Square dimension at top of freeboard	170.7	FT	
Square dimension at top berm	210.7	FT	
Outside pond dimensions (including tie-down)	218.0	FT	

Minimum Total Area Required: **1.32** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 9 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.00 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
17.00	19600.0	0.45	0.0	0.0	0.00	
19.00	21904.0	0.50	41504.0	41504.0	0.95	*PPV*
20.25	24964.0	0.57	29292.5	70796.5	1.63	*TV*
20.83	26460.4	0.61	14998.8	85795.3	1.97	*AV*
21.83	29127.1	0.67	27793.8	113589.1	2.61	
21.83	44380.4	1.02	0.0	113589.1	2.61	*Top of Berm*
20.00	57504.0	1.32	--	--	--	

Required Treatment Volume = 0.61 ac-ft
Provided Treatment Volume = 0.68 ac-ft ✓

Required Attenuation Volume = 0.28 ac-ft
Provided Attenuation Volume = 0.34 ac-ft ✓

BASIN 10

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.51	acres	98	148
Shoulders	--	--	0.64	acres	98	63
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	7, 17	B/D, A/D	8.90	acres	80	712
		Totals:	11.07	acres		925

Pre-Condition Composite Curve Number: 83.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 83.5

Drainage Area (A) = 11.07 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.97 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.23 IN

Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.67 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	3.66	acres	98	359
Shoulders	--	--	0.64	acres	98	63
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--	0.31	acres	98	30
Open Spaces (Sod)	7, 17	B/D, A/D	6.44	acres	80	515
		Totals:	11.07	acres		969

Post-Condition Composite Curve Number: 87.5

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 87.5

Drainage Area (A) = 11.07 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.42 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.73 IN

Post-Condition Runoff Volume (V_{POST}) = A x Q = 7.13 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.45 AC-FT

BASIN 10

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.15 ACRES
TOTAL BASIN AREA = 11.07 ACRES

TREATMENT VOLUME REQUIRED:

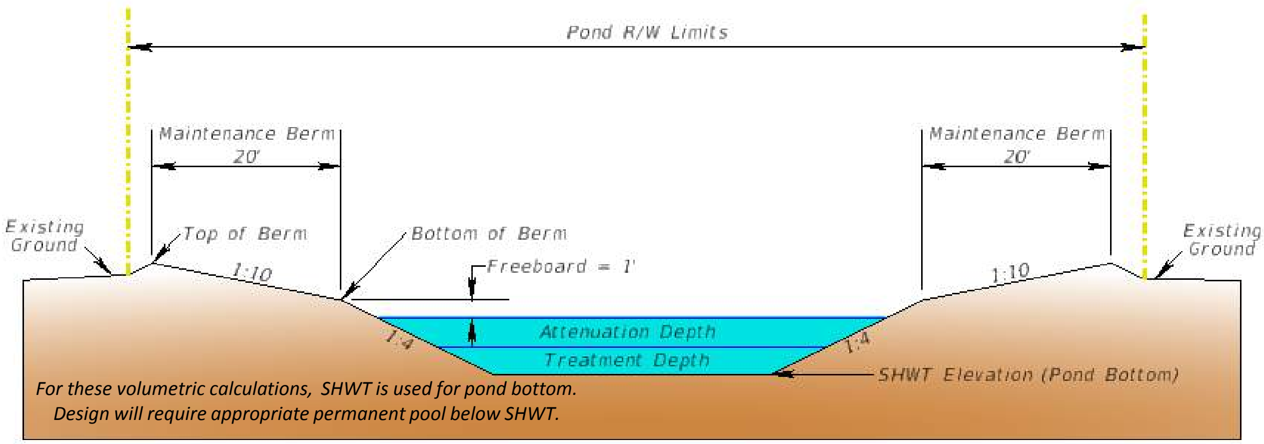
2.5 inches/12 ft x 2.15 acres = 0.45 AC-FT
1 inch/12 ft x 11.07 acres = **0.92** **AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 17 - Basinger Fine Sand
NRCS HIGH WATER DEPTH: 0.3-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 20.0 FT
SHWT EL = 19.5 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 22.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	11	in	
Attenuation Depth =	5	in	
Approx. low edge of pavement elevation (LEOP) =	22.0	FT	
Approx. Proposed Top of Berm elevation =	21.8	FT	
Average Ground at Pond Site =	20.0	FT	
Actual Depth of Treatment and Attenuation =	1.3	FT	
Pond Bottom Elevation =	19.5	FT	

BASIN 10

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.91**	**AC-FT**	
Square dimension at bottom of treatment depth	210.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	217.3	FT	
Square dimension at top of attenuation depth	220.7	FT	
Attenuation Volume provided by attenuation depth	**3.37**	**AC-FT**	
Square dimension at top of freeboard	228.7	FT	
Square dimension at top berm	268.7	FT	
Outside pond dimensions (including tie-down)	276.0	FT	

Minimum Total Area Required: **2.12 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 10 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.50 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
17.50	40804.0	0.94	0.0	0.0	0.00	
19.50	44100.0	1.01	84904.0	84904.0	1.95	*PPV*
20.42	47233.8	1.08	41861.3	126765.3	2.91	*TV*
20.83	48693.8	1.12	19984.9	146750.2	3.37	*AV*
21.83	52288.4	1.20	50491.1	197241.3	4.53	
21.83	72181.8	1.66	0.0	197241.3	4.53	*Top of Berm*
20.00	92173.0	2.12	--	--	--	

Required Treatment Volume = 0.92 ac-ft
Provided Treatment Volume = 0.96 ac-ft ✓

Required Attenuation Volume = 0.45 ac-ft
Provided Attenuation Volume = 0.46 ac-ft ✓

BASIN 11

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.02	acres	98	100
Shoulders	--	--	0.42	acres	98	41
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	3, 22	A/D, C/D	5.99	acres	80	479
		Totals:	7.45	acres		622

Pre-Condition Composite Curve Number: 83.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.5
Drainage Area (A) = 7.45 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.97 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.23 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 4.49 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.52	acres	98	247
Shoulders	--	--	0.42	acres	98	41
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--	0.21	acres	98	21
Open Spaces (Sod)	3, 22	A/D, C/D	4.28	acres	80	342
		Totals:	7.45	acres		653

Post-Condition Composite Curve Number: 87.7

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.7
Drainage Area (A) = 7.45 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.41 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.74 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 4.81 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.32 AC-FT

BASIN 11

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.50	ACRES
TOTAL BASIN AREA =	7.45	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.50 acres =	0.31	AC-FT	
1 inch/12 ft	x	7.45 acres =	**0.62**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 3 - Malabar Fine Sand
NRCS HIGH WATER DEPTH: 0.0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

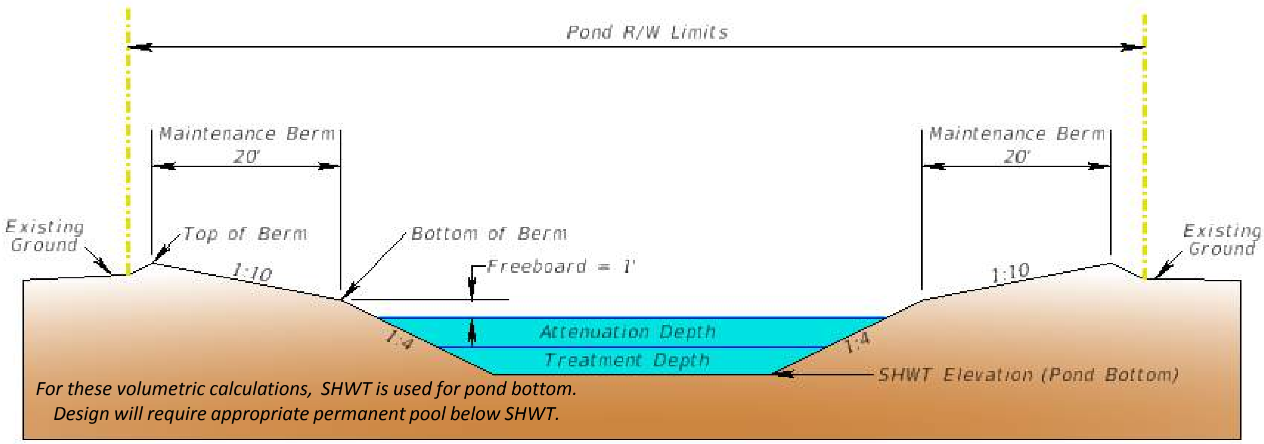
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.5	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	11	in	
Attenuation Depth =	5	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	19.5	FT

BASIN 11

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.02**	**AC-FT**	
Square dimension at bottom of treatment depth	175.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	182.3	FT	
Square dimension at top of attenuation depth	185.7	FT	
Attenuation Volume provided by attenuation depth	**2.34**	**AC-FT**	
Square dimension at top of freeboard	193.7	FT	
Square dimension at top berm	233.7	FT	
Outside pond dimensions (including tie-down)	241.0	FT	

Minimum Total Area Required: **1.61 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 11 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.50 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
17.50	27889.0	0.64	0.0	0.0	0.00	
19.50	30625.0	0.70	58514.0	58514.0	1.34	*PPV*
20.42	33245.4	0.76	29274.0	87788.0	2.02	*TV*
20.83	34472.1	0.79	14107.8	101895.8	2.34	*AV*
21.83	37506.8	0.86	35989.4	137885.2	3.17	
21.83	54600.1	1.25	0.0	137885.2	3.17	*Top of Berm*
20.00	70278.0	1.61	--	--	--	

Required Treatment Volume = 0.62 ac-ft
Provided Treatment Volume = 0.68 ac-ft ✓

Required Attenuation Volume = 0.32 ac-ft
Provided Attenuation Volume = 0.32 ac-ft ✓

BASIN 12

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.11	acres	98	109
Shoulders	--	--	0.46	acres	98	45
Driveways	--	--		acres	98	0
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	20	A/D	6.64	acres	80	531
		Totals:	8.21	acres		685

Pre-Condition Composite Curve Number: 83.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 83.4

Drainage Area (A) = 8.21 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.98 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.22 IN

Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 4.94 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.60	acres	98	255
Shoulders	--	--	0.46	acres	98	45
Driveways	--	--		acres	98	0
Sidewalk	--	--	0.23	acres	98	23
Open Spaces (Sod)	20	A/D	4.92	acres	80	394
		Totals:	8.21	acres		716

Post-Condition Composite Curve Number: 87.2

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 87.2

Drainage Area (A) = 8.21 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.47 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.69 IN

Post-Condition Runoff Volume (V_{POST}) = A x Q = 5.26 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.32 AC-FT

BASIN 12

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.49	ACRES
TOTAL BASIN AREA =	8.21	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.49 acres =	0.31	AC-FT	
1 inch/12 ft	x	8.21 acres =	**0.68**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 20 - Ft. Drum and Malabar Fine Sands
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

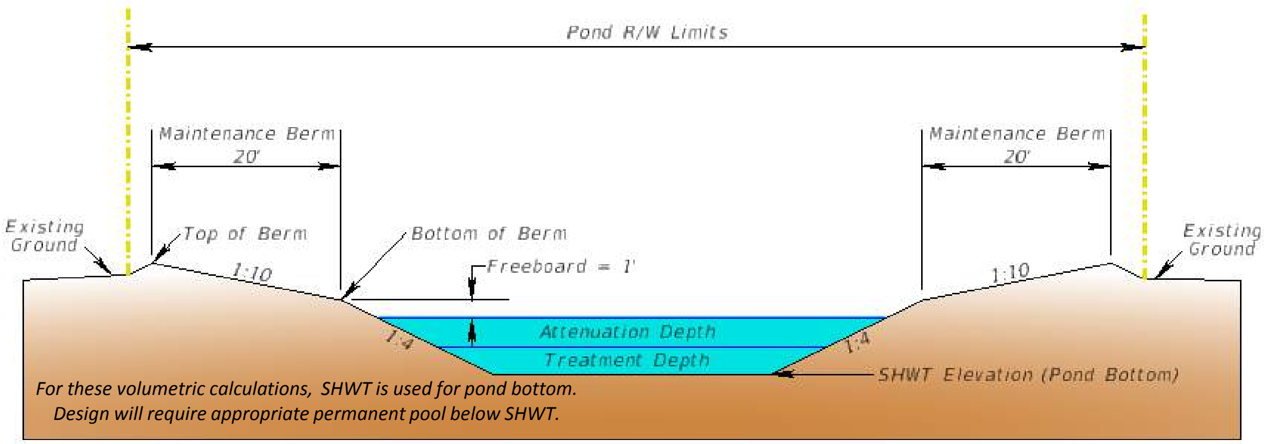
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	15	in	
Attenuation Depth =	7	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	19.0	FT

BASIN 12

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.63**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	158.0	FT	
Square dimension at top of attenuation depth	162.7	FT	
Attenuation Volume provided by attenuation depth	**1.97**	**AC-FT**	
Square dimension at top of freeboard	170.7	FT	
Square dimension at top berm	210.7	FT	
Outside pond dimensions (including tie-down)	218.0	FT	

Minimum Total Area Required: **1.32 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 12 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.00 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
17.00	19600.0	0.45	0.0	0.0	0.00	
19.00	21904.0	0.50	41504.0	41504.0	0.95	*PPV*
20.25	24964.0	0.57	29292.5	70796.5	1.63	*TV*
20.83	26460.4	0.61	14998.8	85795.3	1.97	*AV*
21.83	29127.1	0.67	27793.8	113589.1	2.61	
21.83	44380.4	1.02	0.0	113589.1	2.61	*Top of Berm*
20.00	57504.0	1.32	--	--	--	

Required Treatment Volume = 0.68 ac-ft
Provided Treatment Volume = 0.68 ac-ft ✓

Required Attenuation Volume = 0.32 ac-ft
Provided Attenuation Volume = 0.34 ac-ft ✓

BASIN 13

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.25 acres	98	123
Shoulders	--	--	0.52 acres	98	51
Driveways	--	--	acres	98	0
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	28	C/D	7.49 acres	80	599
		Totals:	9.26 acres		773

Pre-Condition Composite Curve Number: 83.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.4
Drainage Area (A) = 9.26 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.98 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.22 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.57 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.00 acres	98	294
Shoulders	--	--	0.52 acres	98	51
Driveways	--	--	acres	98	0
Sidewalk	--	--	0.24 acres	98	24
Open Spaces (Sod)	28	C/D	5.50 acres	80	440
		Totals:	9.26 acres		808

Post-Condition Composite Curve Number: 87.3

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.3
Drainage Area (A) = 9.26 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.45 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.70 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 5.94 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.37 AC-FT

BASIN 13

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.75	ACRES
TOTAL BASIN AREA =	9.26	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.75 acres =	0.36	AC-FT
1 inch/12 ft	x	9.26 acres =	**0.77**	**AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 28 - Pineda and Riviera Fine Sands
NRCS HIGH WATER DEPTH: 0.0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

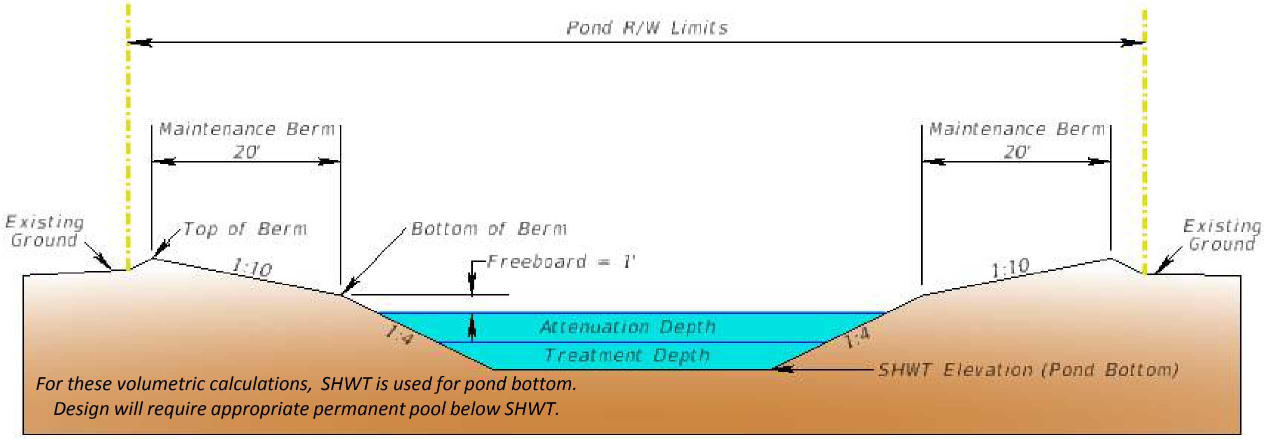
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.5	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.74 in
Treatment Depth =	11	in	
Attenuation Depth =	5	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	19.5	FT

BASIN 13

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.38**	**AC-FT**	
Square dimension at bottom of treatment depth	190.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	197.3	FT	
Square dimension at top of attenuation depth	200.7	FT	
Attenuation Volume provided by attenuation depth	**2.76**	**AC-FT**	
Square dimension at top of freeboard	208.7	FT	
Square dimension at top berm	248.7	FT	
Outside pond dimensions (including tie-down)	256.0	FT	

Minimum Total Area Required: **1.82 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 13 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.50 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
17.50	33124.0	0.76	0.0	0.0	0.00	
19.50	36100.0	0.83	69224.0	69224.0	1.59	*PPV*
20.42	38940.4	0.89	34393.5	103617.5	2.38	*TV*
20.83	40267.1	0.92	16501.6	120119.1	2.76	*AV*
21.83	43541.8	1.00	41904.4	162023.6	3.72	
21.83	61835.1	1.42	0.0	162023.6	3.72	*Top of Berm*
20.00	79298.6	1.82	--	--	--	

Required Treatment Volume = 0.77 ac-ft
Provided Treatment Volume = 0.79 ac-ft ✓

Required Attenuation Volume = 0.37 ac-ft
Provided Attenuation Volume = 0.38 ac-ft ✓

BASIN 14

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.06 acres	98	104
Shoulders	--	--	0.44 acres	98	43
Driveways	--	--	acres	98	0
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	27, 28	C/D, A/D	6.40 acres	80	512
		Totals:	7.90 acres		659

Pre-Condition Composite Curve Number: 83.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.4
Drainage Area (A) = 7.90 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.99 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.22 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 4.75 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.83 acres	98	277
Shoulders	--	--	0.44 acres	98	43
Driveways	--	--	acres	98	0
Sidewalk	--	--	0.22 acres	98	22
Open Spaces (Sod)	27, 28	C/D, A/D	4.41 acres	80	353
		Totals:	7.90 acres		695

Post-Condition Composite Curve Number: 88.0

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 88.0
Drainage Area (A) = 7.90 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.37 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.78 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 5.12 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.37 AC-FT

BASIN 14

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.77	ACRES
TOTAL BASIN AREA =	7.90	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	1.77 acres =	0.37	AC-FT		
1 inch/12 ft x	7.90 acres =	**0.66**	**AC-FT**	←	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 28 - Pineda and Riviera Fine Sands

NRCS HIGH WATER DEPTH: 0.0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

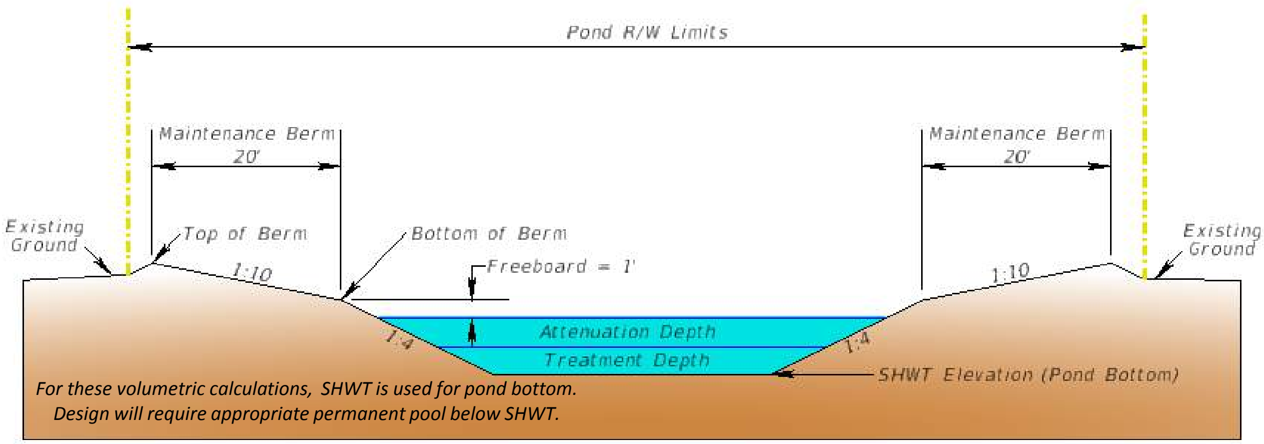
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	20.0	FT	
SHWT EL =	19.5	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	22.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.74 in
Treatment Depth =	10	in	
Attenuation Depth =	6	in	

Approx. low edge of pavement elevation (LEOP) =	22.0	FT
Approx. Proposed Top of Berm elevation =	21.8	FT
Average Ground at Pond Site =	20.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	19.5	FT

BASIN 14

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.18**	**AC-FT**	
Square dimension at bottom of treatment depth	185.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	191.7	FT	
Square dimension at top of attenuation depth	195.7	FT	
Attenuation Volume provided by attenuation depth	**2.61**	**AC-FT**	
Square dimension at top of freeboard	203.7	FT	
Square dimension at top berm	243.7	FT	
Outside pond dimensions (including tie-down)	251.0	FT	

Minimum Total Area Required: **1.75** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 14 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 19.50 ft
Estimated Low Edge of Pavement = 22.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
17.50	31329.0	0.72	0.0	0.0	0.00	
19.50	34225.0	0.79	65554.0	65554.0	1.50	*PPV*
20.33	36736.1	0.84	29567.1	95121.1	2.18	*TV*
20.83	38285.4	0.88	18755.4	113876.5	2.61	*AV*
21.83	41480.1	0.95	39882.8	153759.3	3.53	
21.83	59373.4	1.36	0.0	153759.3	3.53	*Top of Berm*
20.00	76231.2	1.75	--	--	--	

Required Treatment Volume = 0.66 ac-ft
Provided Treatment Volume = 0.68 ac-ft ✓

Required Attenuation Volume = 0.37 ac-ft
Provided Attenuation Volume = 0.43 ac-ft ✓

BASIN 15

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.29 acres	98	126
Shoulders	--	--	0.51 acres	98	50
Driveways	--	--	0.06 acres	98	6
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	16	A/D	7.37 acres	80	590
		Totals:	9.23 acres		772

Pre-Condition Composite Curve Number: 83.6

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.6
Drainage Area (A) = 9.23 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.96 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.25 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.57 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.88 acres	98	380
Shoulders	--	--	0.51 acres	98	50
Driveways	--	--	0.06 acres	98	6
Sidewalk	--	--	0.25 acres	98	25
Open Spaces (Sod)	16	A/D	4.53 acres	80	362
		Totals:	9.23 acres		823

Post-Condition Composite Curve Number: 89.2

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 89.2
Drainage Area (A) = 9.23 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.22 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.93 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.10 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.53 AC-FT

BASIN 15

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.59 ACRES
TOTAL BASIN AREA = 9.23 ACRES

TREATMENT VOLUME REQUIRED:

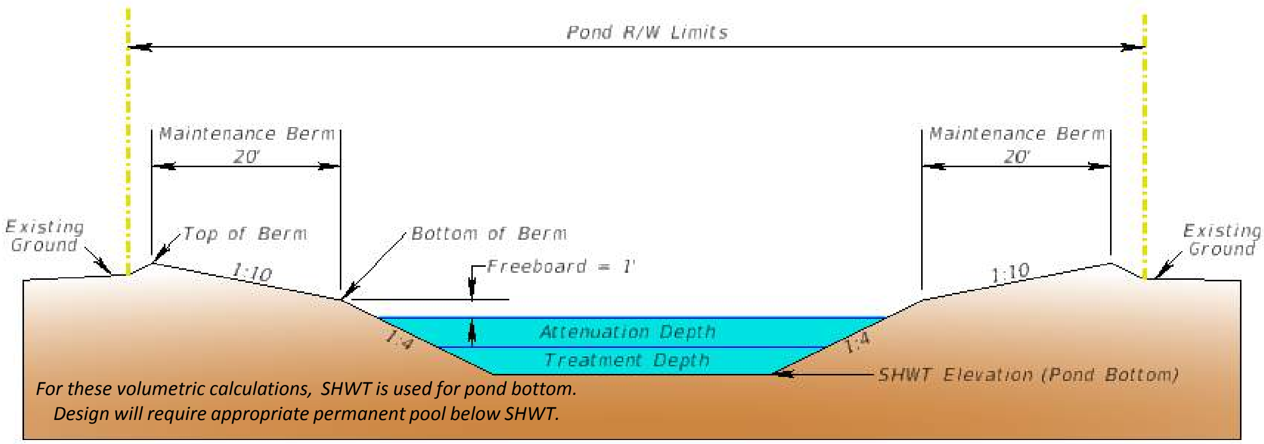
2.5 inches/12 ft x 2.59 acres = 0.54 AC-FT
1 inch/12 ft x 9.23 acres = **0.77** **AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 16 - Oldsmar Fine Sand
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 22.0 FT
SHWT EL = 21.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 24.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	13	in	
Attenuation Depth =	9	in	
Approx. low edge of pavement elevation (LEOP) =	24.0	FT	
Approx. Proposed Top of Berm elevation =	23.8	FT	
Average Ground at Pond Site =	22.0	FT	
Actual Depth of Treatment and Attenuation =	1.8	FT	
Pond Bottom Elevation =	21.0	FT	

BASIN 15

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.14**	**AC-FT**	
Square dimension at bottom of treatment depth	175.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	183.7	FT	
Square dimension at top of attenuation depth	189.7	FT	
Attenuation Volume provided by attenuation depth	**2.74**	**AC-FT**	
Square dimension at top of freeboard	197.7	FT	
Square dimension at top berm	237.7	FT	
Outside pond dimensions (including tie-down)	245.0	FT	

Minimum Total Area Required: **1.67** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 15 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 21.00 ft
Estimated Low Edge of Pavement = 24.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
19.00	27889.0	0.64	0.0	0.0	0.00	
21.00	30625.0	0.70	58514.0	58514.0	1.34	*PPV*
22.08	33733.4	0.77	34860.8	93374.8	2.14	*TV*
22.83	35973.4	0.83	26140.1	119514.9	2.74	*AV*
23.83	39072.1	0.90	37522.8	157037.7	3.61	
23.83	56485.4	1.30	0.0	157037.7	3.61	*Top of Berm*
22.00	72630.3	1.67	--	--	--	

Required Treatment Volume = 0.77 ac-ft
Provided Treatment Volume = 0.80 ac-ft ✓

Required Attenuation Volume = 0.53 ac-ft
Provided Attenuation Volume = 0.60 ac-ft ✓

BASIN 16

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.64 acres	98	161
Shoulders	--	--	0.60 acres	98	59
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	16	A/D	8.23 acres	80	658
		Totals:	10.49 acres		880

Pre-Condition Composite Curve Number: 83.9

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.9
Drainage Area (A) = 10.49 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.92 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.28 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.36 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	4.09 acres	98	401
Shoulders	--	--	0.60 acres	98	59
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	0.29 acres	98	28
Open Spaces (Sod)	16	A/D	5.49 acres	80	439
		Totals:	10.49 acres		929

Post-Condition Composite Curve Number: 88.6

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 88.6
Drainage Area (A) = 10.49 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.29 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.85 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.87 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.51 AC-FT

BASIN 16

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	2.45	ACRES
TOTAL BASIN AREA =	10.49	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	2.45 acres =	0.51	AC-FT	
1 inch/12 ft	x	10.49 acres =	**0.87**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 16 - Oldsmar Fine Sand

NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

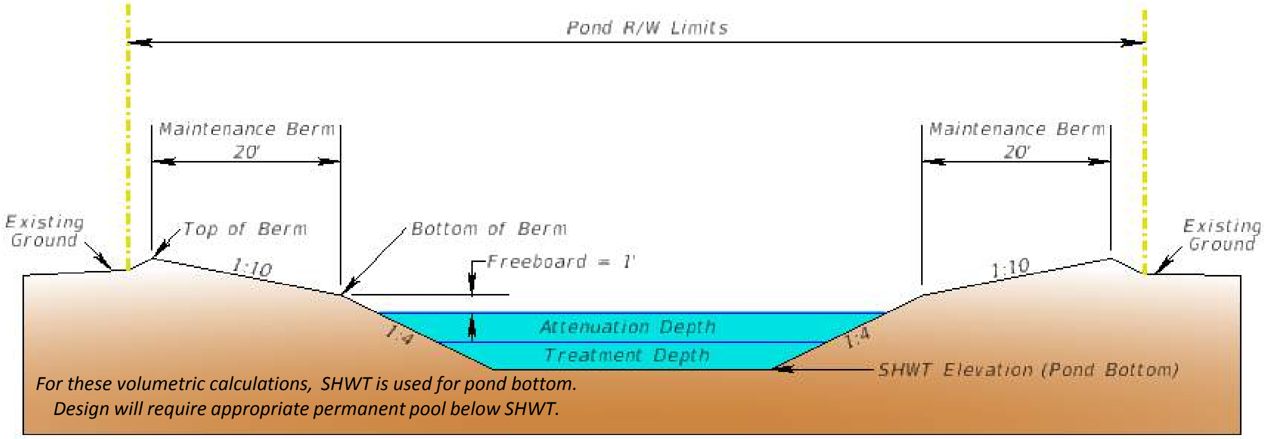
AT POND SITE:

AVERAGE NATURAL GROUND EL = 22.0 FT

SHWT EL = 21.0 FT (FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL = 24.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	14	in	
Attenuation Depth =	8	in	

Approx. low edge of pavement elevation (LEOP) =	24.0	FT
Approx. Proposed Top of Berm elevation =	23.8	FT
Average Ground at Pond Site =	22.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	21.0	FT

BASIN 16

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.21**	**AC-FT**	
Square dimension at bottom of treatment depth	175.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	184.3	FT	
Square dimension at top of attenuation depth	189.7	FT	
Attenuation Volume provided by attenuation depth	**2.74**	**AC-FT**	
Square dimension at top of freeboard	197.7	FT	
Square dimension at top berm	237.7	FT	
Outside pond dimensions (including tie-down)	245.0	FT	

Minimum Total Area Required: **1.67** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 16 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 21.00 ft
Estimated Low Edge of Pavement = 24.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
19.00	27889.0	0.64	0.0	0.0	0.00	
21.00	30625.0	0.70	58514.0	58514.0	1.34	*PPV*
22.17	33978.8	0.78	37685.5	96199.5	2.21	*TV*
22.83	35973.4	0.83	23317.4	119516.9	2.74	*AV*
23.83	39072.1	0.90	37522.8	157039.7	3.61	
23.83	56485.4	1.30	0.0	157039.7	3.61	*Top of Berm*
22.00	72630.3	1.67	--	--	--	

Required Treatment Volume = 0.87 ac-ft
Provided Treatment Volume = 0.87 ac-ft ✓

Required Attenuation Volume = 0.51 ac-ft
Provided Attenuation Volume = 0.53 ac-ft ✓

BASIN 17

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.87	acres	98	183
Shoulders	--	--	0.62	acres	98	61
Driveways	--	--	0.03	acres	98	3
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	16	A/D	8.72	acres	80	698
		Totals:	11.24	acres		945

Pre-Condition Composite Curve Number: 84.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.0
Drainage Area (A) = 11.24 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.90 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.30 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.83 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	4.28	acres	98	419
Shoulders	--	--	0.62	acres	98	61
Driveways	--	--	0.03	acres	98	3
Sidewalk	--	--	0.32	acres	98	31
Open Spaces (Sod)	16	A/D	5.99	acres	80	479
		Totals:	11.24	acres		994

Post-Condition Composite Curve Number: 88.4

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 88.4
Drainage Area (A) = 11.24 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.31 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.83 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 7.34 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.50 AC-FT

BASIN 17

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.41 ACRES
TOTAL BASIN AREA = 11.24 ACRES

TREATMENT VOLUME REQUIRED:

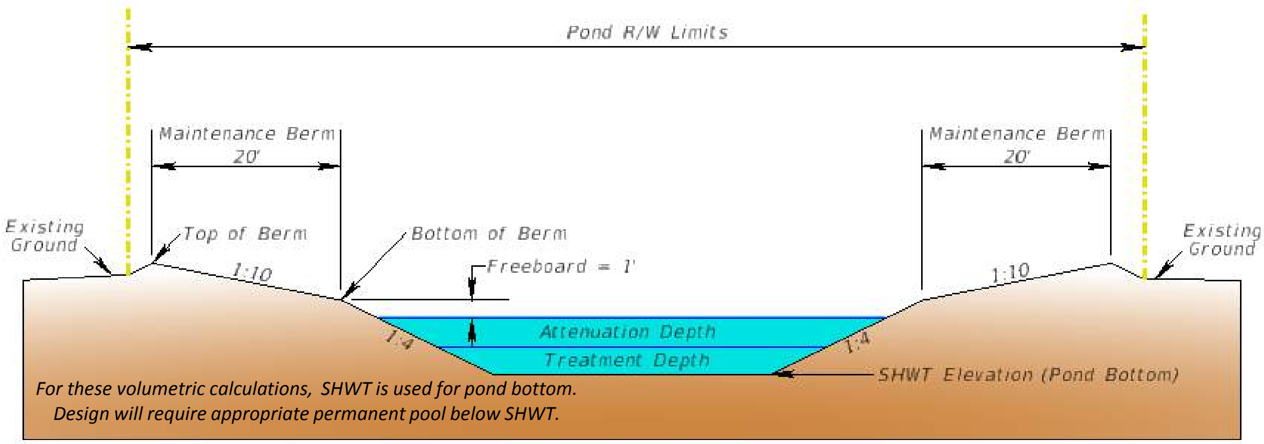
2.5 inches/12 ft x	2.41 acres =	0.50	AC-FT	
1 inch/12 ft x	11.24 acres =	**0.94**	**AC-FT**	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 16 - Oldsmar Fine Sand
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 22.0 FT
SHWT EL = 21.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 24.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	15	in	
Attenuation Depth =	7	in	

Approx. low edge of pavement elevation (LEOP) =	24.0	FT
Approx. Proposed Top of Berm elevation =	23.8	FT
Average Ground at Pond Site =	22.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	21.0	FT

BASIN 17

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.41**	**AC-FT**	
Square dimension at bottom of treatment depth	180.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	190.0	FT	
Square dimension at top of attenuation depth	194.7	FT	
Attenuation Volume provided by attenuation depth	**2.90**	**AC-FT**	
Square dimension at top of freeboard	202.7	FT	
Square dimension at top berm	242.7	FT	
Outside pond dimensions (including tie-down)	250.0	FT	

Minimum Total Area Required: **1.74 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 17 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 21.00 ft
Estimated Low Edge of Pavement = 24.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
19.00	29584.0	0.68	0.0	0.0	0.00	
21.00	32400.0	0.74	61984.0	61984.0	1.42	*PPV*
22.25	36100.0	0.83	42812.5	104796.5	2.41	*TV*
22.83	37895.1	0.87	21581.9	126378.4	2.90	*AV*
23.83	41073.8	0.94	39484.4	165862.9	3.81	
23.83	58887.1	1.35	0.0	165862.9	3.81	*Top of Berm*
22.00	75625.0	1.74	--	--	--	

Required Treatment Volume = 0.94 ac-ft
Provided Treatment Volume = 0.98 ac-ft ✓

Required Attenuation Volume = 0.50 ac-ft
Provided Attenuation Volume = 0.50 ac-ft ✓

BASIN 18

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.57	acres	98	154
Shoulders	--	--	0.58	acres	98	57
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	28	C/D	8.03	acres	80	642
		Totals:	10.20	acres		855

Pre-Condition Composite Curve Number: 83.8

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.8
Drainage Area (A) = 10.20 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.93 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.27 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.18 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	4.14	acres	98	406
Shoulders	--	--	0.58	acres	98	57
Driveways	--	--	0.02	acres	98	2
Sidewalk	--	--	0.28	acres	98	27
Open Spaces (Sod)	28	C/D	5.18	acres	80	414
		Totals:	10.20	acres		906

Post-Condition Composite Curve Number: 88.9

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 88.9
Drainage Area (A) = 10.20 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.25 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.89 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.71 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.53 AC-FT

BASIN 18

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	2.57	ACRES
TOTAL BASIN AREA =	10.20	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	2.57 acres =	0.54	AC-FT		
1 inch/12 ft x	10.20 acres =	**0.85**	**AC-FT**	←	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 28 - Pineda and Riviera Fine Sands
NRCS HIGH WATER DEPTH: 0.0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

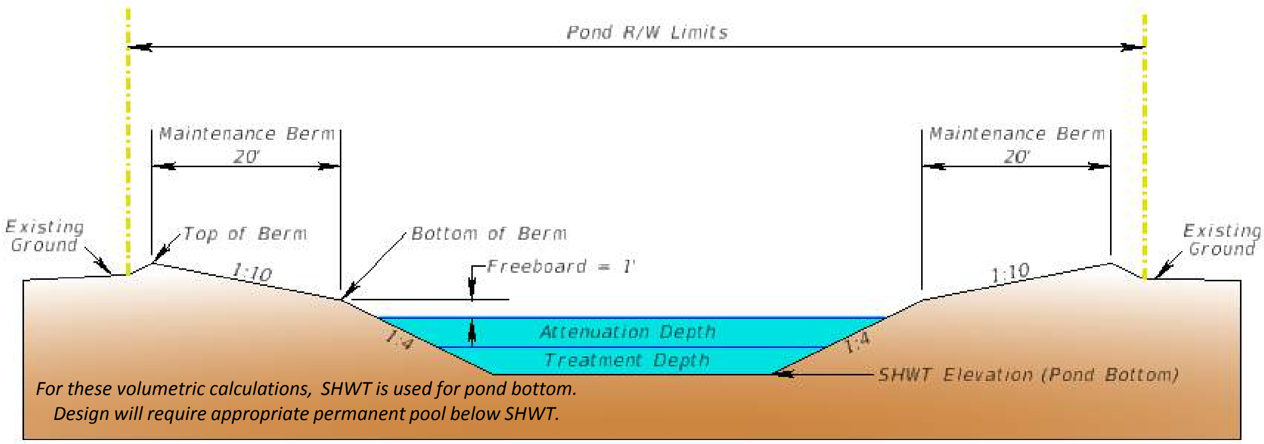
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	22.0	FT	
SHWT EL =	21.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	24.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	14	in	
Attenuation Depth =	8	in	

Approx. low edge of pavement elevation (LEOP) =	24.0	FT
Approx. Proposed Top of Berm elevation =	23.8	FT
Average Ground at Pond Site =	22.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	21.0	FT

BASIN 18

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.21**	**AC-FT**	
Square dimension at bottom of treatment depth	175.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	184.3	FT	
Square dimension at top of attenuation depth	189.7	FT	
Attenuation Volume provided by attenuation depth	**2.74**	**AC-FT**	
Square dimension at top of freeboard	197.7	FT	
Square dimension at top berm	237.7	FT	
Outside pond dimensions (including tie-down)	245.0	FT	

Minimum Total Area Required: **1.67 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 18 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 21.00 ft
Estimated Low Edge of Pavement = 24.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
19.00	27889.0	0.64	0.0	0.0	0.00	
21.00	30625.0	0.70	58514.0	58514.0	1.34	*PPV*
22.17	33978.8	0.78	37685.5	96199.5	2.21	*TV*
22.83	35973.4	0.83	23317.4	119516.9	2.74	*AV*
23.83	39072.1	0.90	37522.8	157039.7	3.61	
23.83	56485.4	1.30	0.0	157039.7	3.61	*Top of Berm*
22.00	72630.3	1.67	--	--	--	

Required Treatment Volume = 0.85 ac-ft
Provided Treatment Volume = 0.87 ac-ft ✓

Required Attenuation Volume = 0.53 ac-ft
Provided Attenuation Volume = 0.53 ac-ft ✓

BASIN 19

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.38 acres	98	135
Shoulders	--	--	0.54 acres	98	53
Driveways	--	--	acres	98	0
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	43	C/D	8.29 acres	80	663
		Totals:	10.21 acres		851

Pre-Condition Composite Curve Number: 83.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.4
Drainage Area (A) = 10.21 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.99 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.22 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.14 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.92 acres	98	384
Shoulders	--	--	0.54 acres	98	53
Driveways	--	--	acres	98	0
Sidewalk	--	--	0.29 acres	98	28
Open Spaces (Sod)	43	C/D	5.46 acres	80	437
		Totals:	10.21 acres		902

Post-Condition Composite Curve Number: 88.4

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 88.4
Drainage Area (A) = 10.21 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.32 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.83 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.66 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.52 AC-FT

BASIN 19

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.54 ACRES
TOTAL BASIN AREA = 10.21 ACRES

TREATMENT VOLUME REQUIRED:

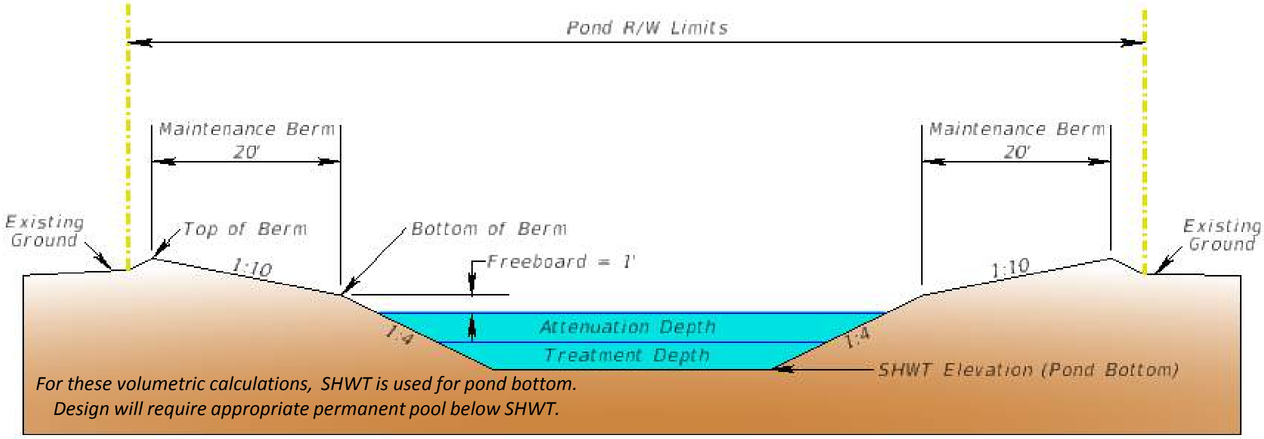
2.5 inches/12 ft x	2.54 acres =	0.53	AC-FT	
1 inch/12 ft x	10.21 acres =	**0.85**	**AC-FT**	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 43 - Winder, Riviera, Limestone Substratum, and Chobee Soils
NRCS HIGH WATER DEPTH: 0.0-0.0 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 21.0 FT
SHWT EL = 20.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 23.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	14	in	
Attenuation Depth =	8	in	

Approx. low edge of pavement elevation (LEOP) =	23.0	FT
Approx. Proposed Top of Berm elevation =	22.8	FT
Average Ground at Pond Site =	21.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	20.0	FT

BASIN 19

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.21**	**AC-FT**	
Square dimension at bottom of treatment depth	175.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	184.3	FT	
Square dimension at top of attenuation depth	189.7	FT	
Attenuation Volume provided by attenuation depth	**2.74**	**AC-FT**	
Square dimension at top of freeboard	197.7	FT	
Square dimension at top berm	237.7	FT	
Outside pond dimensions (including tie-down)	245.0	FT	

Minimum Total Area Required: **1.67 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 19 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 20.00 ft
Estimated Low Edge of Pavement = 23.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
18.00	27889.0	0.64	0.0	0.0	0.00	
20.00	30625.0	0.70	58514.0	58514.0	1.34	*PPV*
21.17	33978.8	0.78	37685.5	96199.5	2.21	*TV*
21.83	35973.4	0.83	23317.4	119516.9	2.74	*AV*
22.83	39072.1	0.90	37522.8	157039.7	3.61	
22.83	56485.4	1.30	0.0	157039.7	3.61	*Top of Berm*
21.00	72630.3	1.67	--	--	--	

Required Treatment Volume = 0.85 ac-ft
Provided Treatment Volume = 0.87 ac-ft ✓

Required Attenuation Volume = 0.52 ac-ft
Provided Attenuation Volume = 0.53 ac-ft ✓

BASIN 20

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.82 acres	98	80
Shoulders	--	--	0.34 acres	98	33
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	acres	98	0
Open Spaces (Sod)	43	C/D	4.76 acres	80	381
		Totals:	5.94 acres		496

Pre-Condition Composite Curve Number: 83.6

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.6
Drainage Area (A) = 5.94 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.97 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.24 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 3.58 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.77 acres	98	271
Shoulders	--	--	0.34 acres	98	33
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	0.17 acres	98	17
Open Spaces (Sod)	43	C/D	2.64 acres	80	211
		Totals:	5.94 acres		535

Post-Condition Composite Curve Number: 90.0

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 90.0
Drainage Area (A) = 5.94 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.11 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.03 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 3.97 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.39 AC-FT

BASIN 20

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.95	ACRES
TOTAL BASIN AREA =	5.94	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.95 acres =	0.41	AC-FT	
1 inch/12 ft	x	5.94 acres =	**0.50**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 43 - Winder, Riviera, Limestone Substratum, and Chobee Soils

NRCS HIGH WATER DEPTH: 0.0-0.0 FT (FROM COLLIER COUTY SOIL SURVEY)

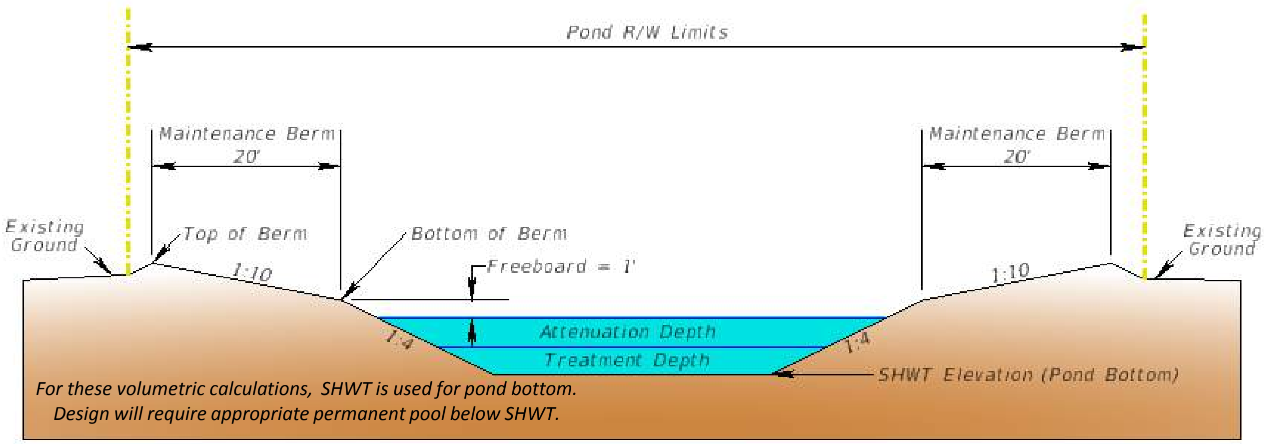
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	22.0	FT	
SHWT EL =	22.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	24.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	0.9	FT	= 10.35 in
Treatment Depth =	6	in	
Attenuation Depth =	4	in	

Approx. low edge of pavement elevation (LEOP) =	24.0	FT
Approx. Proposed Top of Berm elevation =	23.8	FT
Average Ground at Pond Site =	22.0	FT
Actual Depth of Treatment and Attenuation =	0.8	FT
Pond Bottom Elevation =	22.0	FT

BASIN 20

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.83**	**AC-FT**	
Square dimension at bottom of treatment depth	225.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	229.0	FT	
Square dimension at top of attenuation depth	231.7	FT	
Attenuation Volume provided by attenuation depth	**3.24**	**AC-FT**	
Square dimension at top of freeboard	239.7	FT	
Square dimension at top berm	279.7	FT	
Outside pond dimensions (including tie-down)	287.0	FT	

Minimum Total Area Required: **2.29** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 20 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 22.00 ft
Estimated Low Edge of Pavement = 24.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
20.00	47089.0	1.08	0.0	0.0	0.00	
22.00	50625.0	1.16	97714.0	97714.0	2.24	*PPV*
22.50	52441.0	1.20	25766.5	123480.5	2.83	*TV*
22.83	53669.4	1.23	17685.1	141165.6	3.24	*AV*
23.83	57440.1	1.32	55554.8	196720.4	4.52	
23.83	78213.4	1.80	0.0	196720.4	4.52	*Top of Berm*
22.00	99666.5	2.29	--	--	--	

Required Treatment Volume = 0.50 ac-ft
Provided Treatment Volume = 0.59 ac-ft ✓

Required Attenuation Volume = 0.39 ac-ft
Provided Attenuation Volume = 0.41 ac-ft ✓

BASIN 21

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	1.55	acres	98	152
Shoulders	--	--	0.46	acres	98	45
Driveways	--	--	0.07	acres	98	7
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	22	C/D	6.08	acres	80	486
		Totals:	8.16	acres		690

Pre-Condition Composite Curve Number: 84.6

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.6
Drainage Area (A) = 8.16 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.82 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.36 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.01 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	4.04	acres	98	396
Shoulders	--	--	0.46	acres	98	45
Driveways	--	--	0.07	acres	98	7
Sidewalk	--	--	0.27	acres	98	26
Open Spaces (Sod)	22	C/D	3.32	acres	80	266
		Totals:	8.16	acres		740

Post-Condition Composite Curve Number: 90.7

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 90.7
Drainage Area (A) = 8.16 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.03 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.11 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 5.52 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.51 AC-FT

BASIN 21

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.49 ACRES
TOTAL BASIN AREA = 8.16 ACRES

TREATMENT VOLUME REQUIRED:

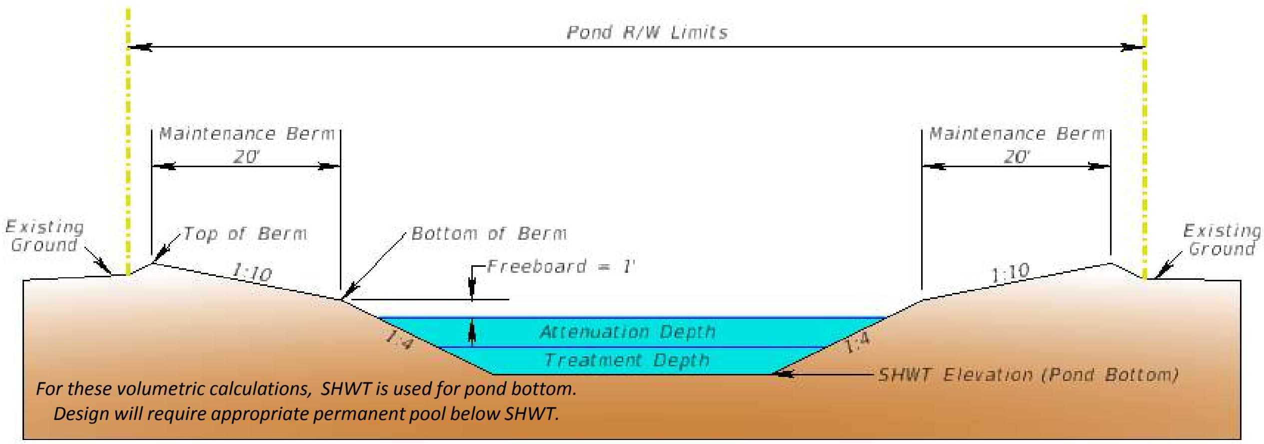
2.5 inches/12 ft x	2.49 acres =	0.52	AC-FT	
1 inch/12 ft x	8.16 acres =	**0.68**	**AC-FT**	**CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 22- Chobee, Winder and Gator Soils
NRCS HIGH WATER DEPTH: 0.0-0.0 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 22.0 FT
SHWT EL = 22.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 24.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	0.9	FT	= 10.35 in
Treatment Depth =	6	in	
Attenuation Depth =	4	in	
Approx. low edge of pavement elevation (LEOP) =	24.0	FT	
Approx. Proposed Top of Berm elevation =	23.8	FT	
Average Ground at Pond Site =	22.0	FT	
Actual Depth of Treatment and Attenuation =	0.8	FT	
Pond Bottom Elevation =	22.0	FT	

BASIN 21

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**3.65**	**AC-FT**	
Square dimension at bottom of treatment depth	255.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	259.0	FT	
Square dimension at top of attenuation depth	261.7	FT	
Attenuation Volume provided by attenuation depth	**4.17**	**AC-FT**	
Square dimension at top of freeboard	269.7	FT	
Square dimension at top berm	309.7	FT	
Outside pond dimensions (including tie-down)	317.0	FT	

Minimum Total Area Required: **2.79** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 21 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 22.00 ft
Estimated Low Edge of Pavement = 24.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
20.00	61009.0	1.40	0.0	0.0	0.00	
22.00	65025.0	1.49	126034.0	126034.0	2.89	*PPV*
22.50	67081.0	1.54	33026.5	159060.5	3.65	*TV*
22.83	68469.4	1.57	22591.7	181652.2	4.17	*AV*
23.83	72720.1	1.67	70594.8	252247.0	5.79	
23.83	95893.4	2.20	0.0	252247.0	5.79	*Top of Berm*
22.00	121591.7	2.79	--	--	--	

Required Treatment Volume = 0.68 ac-ft
Provided Treatment Volume = 0.76 ac-ft ✓

Required Attenuation Volume = 0.51 ac-ft
Provided Attenuation Volume = 0.52 ac-ft ✓

BASIN 22

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	0.93	acres	98	91
Shoulders	--	--	0.35	acres	98	34
Driveways	--	--		acres	98	0
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	29	A/D	4.76	acres	80	381
		Totals:	6.04	acres		506

Pre-Condition Composite Curve Number: 83.8

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.8
Drainage Area (A) = 6.04 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.93 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.27 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 3.66 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.67	acres	98	262
Shoulders	--	--	0.35	acres	98	34
Driveways	--	--		acres	98	0
Sidewalk	--	--	0.21	acres	98	21
Open Spaces (Sod)	29	A/D	2.81	acres	80	225
		Totals:	6.04	acres		541

Post-Condition Composite Curve Number: 89.6

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 89.6
Drainage Area (A) = 6.04 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.16 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.98 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 4.02 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.36 AC-FT

BASIN 22

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.74	ACRES
TOTAL BASIN AREA =	6.04	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.74 acres =	0.36	AC-FT	
1 inch/12 ft	x	6.04 acres =	**0.50**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND:	29 - Wabasso Sand	
NRCS HIGH WATER DEPTH:	0.5-1.5 FT	(FROM COLLIER COUTY SOIL SURVEY)

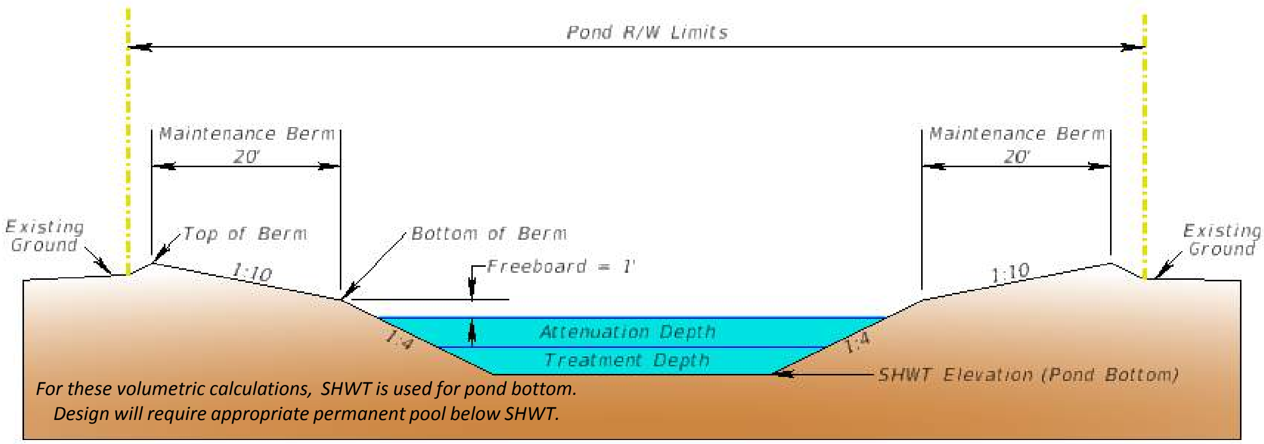
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	24.0	FT	
SHWT EL =	23.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	26.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	12	in	
Attenuation Depth =	8	in	

Approx. low edge of pavement elevation (LEOP) =	26.0	FT
Approx. Proposed Top of Berm elevation =	25.7	FT
Average Ground at Pond Site =	24.0	FT
Actual Depth of Treatment and Attenuation =	1.7	FT
Pond Bottom Elevation =	23.0	FT

BASIN 22

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.48**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	156.0	FT	
Square dimension at top of attenuation depth	161.3	FT	
Attenuation Volume provided by attenuation depth	**1.87**	**AC-FT**	
Square dimension at top of freeboard	169.3	FT	
Square dimension at top berm	209.3	FT	
Outside pond dimensions (including tie-down)	216.0	FT	
Minimum Total Area Required:	**1.30**	**ACRES**	

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 22 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 23.00 ft
Estimated Low Edge of Pavement = 26.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
21.00	19600.0	0.45	0.0	0.0	0.00	
23.00	21904.0	0.50	41504.0	41504.0	0.95	*PPV*
24.00	24336.0	0.56	23120.0	64624.0	1.48	*TV*
24.67	26028.4	0.60	16788.1	81412.1	1.87	*AV*
25.67	28673.8	0.66	27351.1	108763.3	2.50	
25.67	43820.4	1.01	0.0	108763.3	2.50	*Top of Berm*
24.00	56453.8	1.30	--	--	--	

Required Treatment Volume = 0.50 ac-ft
Provided Treatment Volume = 0.53 ac-ft ✓

Required Attenuation Volume = 0.36 ac-ft
Provided Attenuation Volume = 0.39 ac-ft ✓

BASIN 23

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	2.43	acres	98	238
Shoulders	--	--	0.66	acres	98	65
Driveways	--	--	0.05	acres	98	5
Sidewalk	--	--		acres	98	0
Open Spaces (Sod)	29	A/D	8.28	acres	80	662
		Totals:	11.42	acres		970

Pre-Condition Composite Curve Number: 84.9

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.9
Drainage Area (A) = 11.42 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.77 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.41 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 7.05 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area		CN	Product
Impervious Roadway	--	--	5.38	acres	98	527
Shoulders	--	--	0.66	acres	98	65
Driveways	--	--	0.05	acres	98	5
Sidewalk	--	--	0.41	acres	98	40
Open Spaces (Sod)	29	A/D	4.92	acres	80	394
		Totals:	11.42	acres		1031

Post-Condition Composite Curve Number: 90.2

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 90.2
Drainage Area (A) = 11.42 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.08 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.06 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 7.67 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.62 AC-FT

BASIN 23

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.95 ACRES
TOTAL BASIN AREA = 11.42 ACRES

TREATMENT VOLUME REQUIRED:

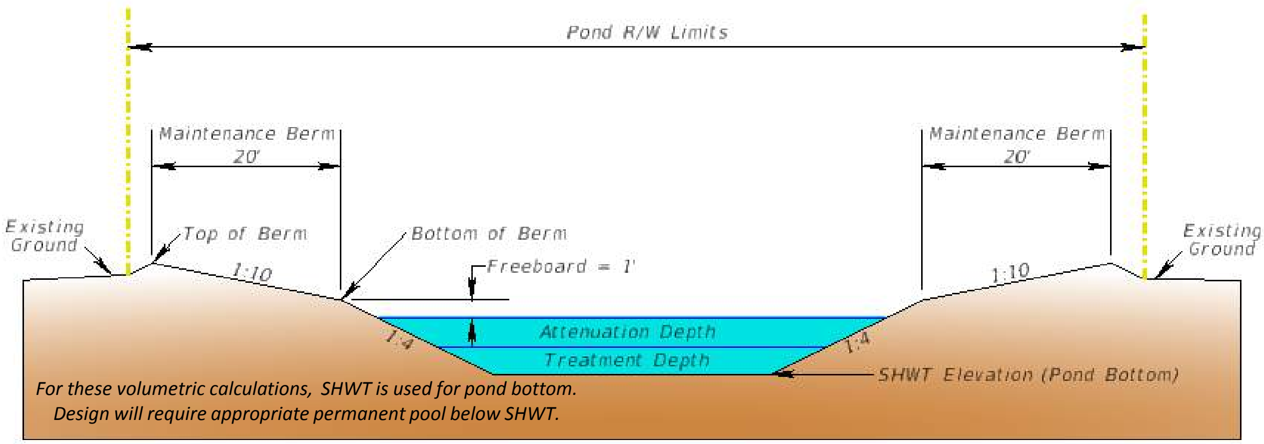
2.5 inches/12 ft x 2.95 acres = 0.61 AC-FT
1 inch/12 ft x 11.42 acres = **0.95** **AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 29 - Wabasso Sand
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 24.0 FT
SHWT EL = 23.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 26.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	14	in	
Attenuation Depth =	8	in	
Approx. low edge of pavement elevation (LEOP) =	26.0	FT	
Approx. Proposed Top of Berm elevation =	25.8	FT	
Average Ground at Pond Site =	24.0	FT	
Actual Depth of Treatment and Attenuation =	1.8	FT	
Pond Bottom Elevation =	23.0	FT	

BASIN 23

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.60**	**AC-FT**	
Square dimension at bottom of treatment depth	190.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	199.3	FT	
Square dimension at top of attenuation depth	204.7	FT	
Attenuation Volume provided by attenuation depth	**3.23**	**AC-FT**	
Square dimension at top of freeboard	212.7	FT	
Square dimension at top berm	252.7	FT	
Outside pond dimensions (including tie-down)	260.0	FT	
Minimum Total Area Required:	**1.88**	**ACRES**	

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 23 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 23.00 ft
Estimated Low Edge of Pavement = 26.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
21.00	33124.0	0.76	0.0	0.0	0.00	
23.00	36100.0	0.83	69224.0	69224.0	1.59	*PPV*
24.17	39733.8	0.91	44236.4	113460.4	2.60	*TV*
24.83	41888.4	0.96	27207.4	140667.8	3.23	*AV*
25.83	45227.1	1.04	43557.8	184225.6	4.23	
25.83	63840.4	1.47	0.0	184225.6	4.23	*Top of Berm*
24.00	81796.0	1.88	--	--	--	

Required Treatment Volume =	0.95	ac-ft	
Provided Treatment Volume =	**1.01**	**ac-ft**	✓
Required Attenuation Volume =	0.62	ac-ft	
Provided Attenuation Volume =	**0.63**	**ac-ft**	✓

BASIN 24

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.32 acres	98	129
Shoulders	--	--	0.24 acres	98	24
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.20 acres	98	20
Open Spaces (Sod)	37	B/D	2.67 acres	80	214
		Totals:	4.43 acres		386

Pre-Condition Composite Curve Number: 87.2

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 87.2

Drainage Area (A) = 4.43 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.47 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.68 IN

Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 2.83 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.70 acres	98	167
Shoulders	--	--	0.63 acres	98	62
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.25 acres	98	25
Open Spaces (Sod)	37	B/D	1.85 acres	80	148
		Totals:	4.43 acres		401

Post-Condition Composite Curve Number: 90.5

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 90.5

Drainage Area (A) = 4.43 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.05 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.09 IN

Post-Condition Runoff Volume (V_{POST}) = A x Q = 2.99 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.16 AC-FT

BASIN 24

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 0.38 ACRES
TOTAL BASIN AREA = 4.43 ACRES

TREATMENT VOLUME REQUIRED:

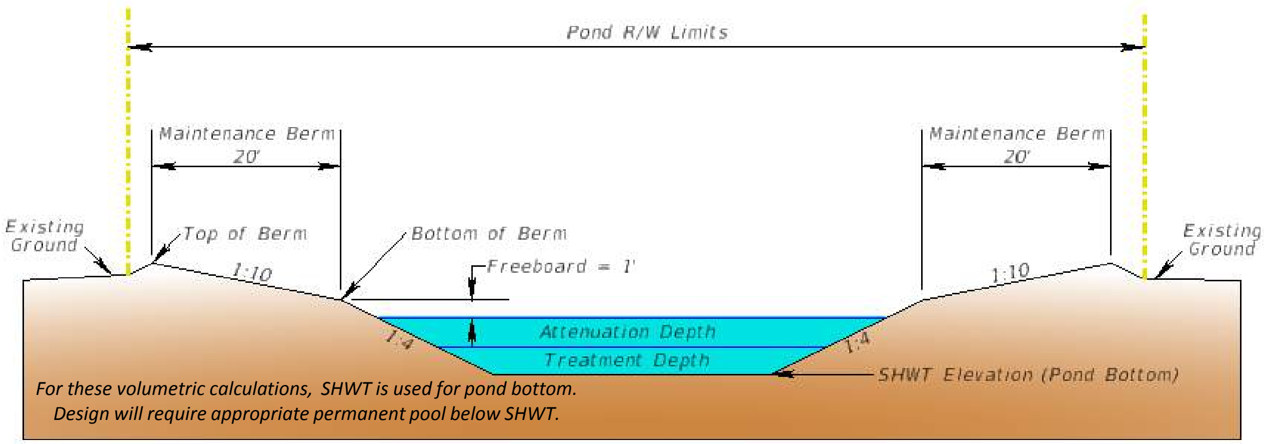
2.5 inches/12 ft x	0.38 acres =	0.08	AC-FT	
1 inch/12 ft x	4.43 acres =	**0.37**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 37 - Tuskawilla Fine Sand
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 24.0 FT
SHWT EL = 23.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 26.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	9	in	
Attenuation Depth =	4	in	
Approx. low edge of pavement elevation (LEOP) =	26.0	FT	
Approx. Proposed Top of Berm elevation =	25.1	FT	
Average Ground at Pond Site =	24.0	FT	
Actual Depth of Treatment and Attenuation =	1.1	FT	
Pond Bottom Elevation =	23.0	FT	

BASIN 24

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.35**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	154.0	FT	
Square dimension at top of attenuation depth	156.7	FT	
Attenuation Volume provided by attenuation depth	**1.53**	**AC-FT**	
Square dimension at top of freeboard	164.7	FT	
Square dimension at top berm	204.7	FT	
Outside pond dimensions (including tie-down)	209.0	FT	

Minimum Total Area Required: **1.21 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 24 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 23.00 ft
Estimated Low Edge of Pavement = 26.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
21.00	19600.0	0.45	0.0	0.0	0.00	
23.00	21904.0	0.50	41504.0	41504.0	0.95	*PPV*
23.75	23716.0	0.54	17107.5	58611.5	1.35	*TV*
24.08	24544.4	0.56	8043.4	66654.9	1.53	*AV*
25.08	27115.1	0.62	25829.8	92484.7	2.12	
25.08	41888.4	0.96	0.0	92484.7	2.12	*Top of Berm*
24.00	52854.0	1.21	--	--	--	

Required Treatment Volume = 0.37 ac-ft
Provided Treatment Volume = 0.40 ac-ft ✓

Required Attenuation Volume = 0.16 ac-ft
Provided Attenuation Volume = 0.18 ac-ft ✓

BASIN 25 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.66 acres	98	163
Shoulders	--	--	0.61 acres	98	60
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.50 acres	98	49
Open Spaces (Sod)	7	B/D	8.36 acres	80	669
		Totals:	11.13 acres		940

Pre-Condition Composite Curve Number: 84.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.5
Drainage Area (A) = 11.13 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.84 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.35 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.82 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.59 acres	98	351
Shoulders	--	--	1.45 acres	98	142
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.61 acres	98	60
Open Spaces (Sod)	7	B/D	8.35 acres	80	668
		Totals:	14.00 acres		1222

Post-Condition Composite Curve Number: 87.3

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.3
Drainage Area (A) = 14.00 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.46 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.69 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 8.98 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 2.16 AC-FT

BASIN 25 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.66 acres	98	163
Shoulders	--	--	0.61 acres	98	60
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.50 acres	98	49
Open Spaces (Sod)	7	B/D	8.36 acres	80	669
		Totals:	11.13 acres		940

Pre-Condition Composite Curve Number: 84.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.5
Drainage Area (A) = 11.13 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.84 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.35 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.82 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.61 acres	98	354
Shoulders	--	--	1.50 acres	98	147
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.66 acres	98	65
Open Spaces (Sod)	7	B/D	8.23 acres	80	658
		Totals:	14.00 acres		1224

Post-Condition Composite Curve Number: 87.4

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.4
Drainage Area (A) = 14.00 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.44 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.71 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 9.00 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 2.18 AC-FT

BASIN 25 - CENTRAL ALIGNMENT 2

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 1.95 ACRES
TOTAL BASIN AREA = 14.00 ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	1.95 acres =	0.41	AC-FT	
1 inch/12 ft x	14.00 acres =	**1.17**	**AC-FT**	← **CONTROLS**

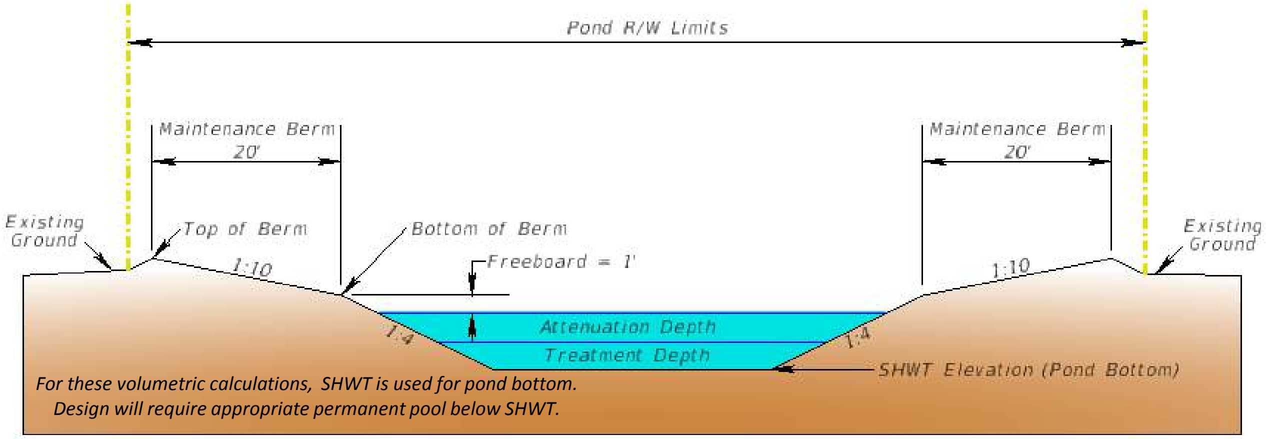
POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee Fine Sands
NRCS HIGH WATER DEPTH: 0.5-1.5 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 26.0 FT
SHWT EL = 25.0 FT (FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:
LOW EOP EL = 28.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	8	in	
Attenuation Depth =	14	in	

Approx. low edge of pavement elevation (LEOP) =	28.0	FT
Approx. Proposed Top of Berm elevation =	27.8	FT
Average Ground at Pond Site =	26.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	25.0	FT

BASIN 25 - CENTRAL ALIGNMENT 2

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**4.60**	**AC-FT**	
Square dimension at bottom of treatment depth	275.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	280.3	FT	
Square dimension at top of attenuation depth	289.7	FT	
Attenuation Volume provided by attenuation depth	**6.78**	**AC-FT**	
Square dimension at top of freeboard	297.7	FT	
Square dimension at top berm	337.7	FT	
Outside pond dimensions (including tie-down)	345.0	FT	
Minimum Total Area Required:	**3.31**	**ACRES**	

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 25 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 25.00 ft
Estimated Low Edge of Pavement = 28.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
23.00	73441.0	1.69	0.0	0.0	0.00	
25.00	75625.0	1.74	149066.0	149066.0	3.42	*PPV*
25.67	78586.8	1.80	51403.9	200469.9	4.60	*TV*
26.83	83906.8	1.93	94787.9	295257.8	6.78	*AV*
27.83	88605.4	2.03	86256.1	381513.9	8.76	
27.83	114018.8	2.62	0.0	381513.9	8.76	*Top of Berm*
26.00	144020.3	3.31	--	--	--	

Required Treatment Volume =	1.17	ac-ft	
Provided Treatment Volume =	**1.18**	**ac-ft**	✓
Required Attenuation Volume =	2.18	ac-ft	
Provided Attenuation Volume =	**2.18**	**ac-ft**	✓

This pond alternative (Pond 25) satisfies the requirements for both Basin 25-1R and Basin 25-2.

BASIN 26 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.72 acres	98	267
Shoulders	--	--	0.93 acres	98	91
Driveways	--	--	0.52 acres	98	51
Sidewalk	--	--	0.59 acres	98	58
Grass	7, 16	A/D, B/D	2.84 acres	80	227
		Totals:	7.60 acres		694

Pre-Condition Composite Curve Number: 91.3

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 91.3
Drainage Area (A) = 7.60 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.96 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.18 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.18 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	4.80 acres	98	470
Shoulders	--	--	1.39 acres	98	136
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	0.76 acres	98	74
Sod	7, 16	A/D, B/D	0.83 acres	80	66
		Totals:	7.80 acres		749

Post-Condition Composite Curve Number: 96.1

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 96.1
Drainage Area (A) = 7.80 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.41 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.77 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 5.70 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.52 AC-FT

BASIN 26 - CENTRAL ALTERNATIVE 1R

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.08 ACRES
TOTAL BASIN AREA = 7.80 ACRES

TREATMENT VOLUME REQUIRED:

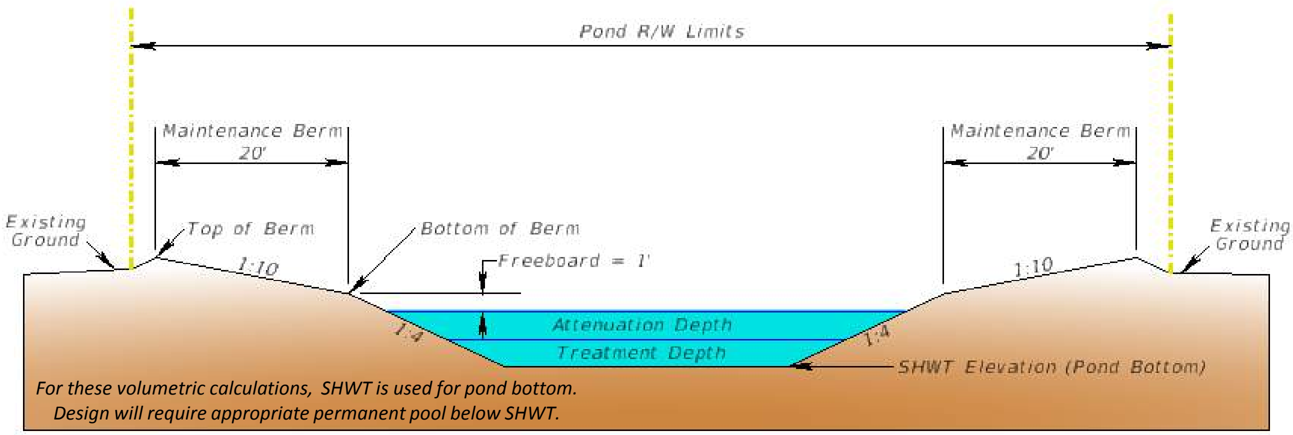
2.5 inches x	2.08 acres =	0.43	AC-FT
1 inch x	7.80 acres =	**0.65**	**AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee
NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 30.0 FT
SHWT EL = 29.5 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 31.5 FT



Conveyance loss to outfall =	0.3	FT	
Available depth for treatment and attenuation =	0.7	FT	= 8.01 in
Treatment Depth =	4	in	
Attenuation Depth =	4	in	
Approx. low edge of pavement elevation (LEOP) =	31.5	FT	
Approx. Proposed Top of Berm elevation =	31.2	FT	
Average Ground at Pond Site =	30.0	FT	
Actual Depth of Treatment and Attenuation =	0.7	FT	
Pond Bottom Elevation =	29.5	FT	

BASIN 26 - CENTRAL ALTERNATIVE 1R

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**4.46**	**AC-FT**	
Square dimension at bottom of treatment depth	290.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	292.7	FT	
Square dimension at top of attenuation depth	295.3	FT	
Attenuation Volume provided by attenuation depth	**5.12**	**AC-FT**	
Square dimension at top of freeboard	303.3	FT	
Square dimension at top berm	343.3	FT	
Outside pond dimensions (including tie-down)	348.0	FT	

Minimum Total Area Required: **3.36 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 26-1R STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 29.50 ft
Estimated Low Edge of Pavement = 31.50 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
27.50	81796.0	1.88	0.0	0.0	0.00	
29.50	84100.0	1.93	165896.0	165896.0	3.81	*PPV*
29.83	85653.8	1.97	28292.3	194188.3	4.46	*TV*
30.17	87221.8	2.00	28812.6	223000.9	5.12	*AV*
31.17	92011.1	2.11	89616.4	312617.3	7.18	
31.17	117877.8	2.71	0.0	312617.3	7.18	*Top of Berm*
30.00	146535.8	3.36	--	--	--	

Required Treatment Volume =	0.65	ac-ft	
Provided Treatment Volume =	**0.65**	**ac-ft**	✓
Required Attenuation Volume =	0.52	ac-ft	
Provided Attenuation Volume =	**0.66**	**ac-ft**	✓

BASIN 26 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.72 acres	98	267
Shoulders	--	--	0.93 acres	98	91
Driveways	--	--	0.52 acres	98	51
Sidewalk	--	--	0.59 acres	98	58
Grass	7, 16	A/D, B/D	2.84 acres	80	227
		Totals:	7.60 acres		694

Pre-Condition Composite Curve Number: 91.3

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 91.3
Drainage Area (A) = 7.60 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.96 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.18 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.18 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	4.29 acres	98	420
Shoulders	--	--	1.26 acres	98	123
Driveways	--	--	0.01 acres	98	1
Sidewalk	--	--	0.73 acres	98	72
Sod	7, 16	A/D, B/D	1.41 acres	80	113
		Totals:	7.70 acres		729

Post-Condition Composite Curve Number: 94.7

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 94.7
Drainage Area (A) = 7.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.56 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.60 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 5.52 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.34 AC-FT

BASIN 26 - CENTRAL ALIGNMENT 2

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.57	ACRES
TOTAL BASIN AREA =	7.70	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches x	1.57 acres =	0.33	AC-FT	
1 inch x	7.70 acres =	**0.64**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee

NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

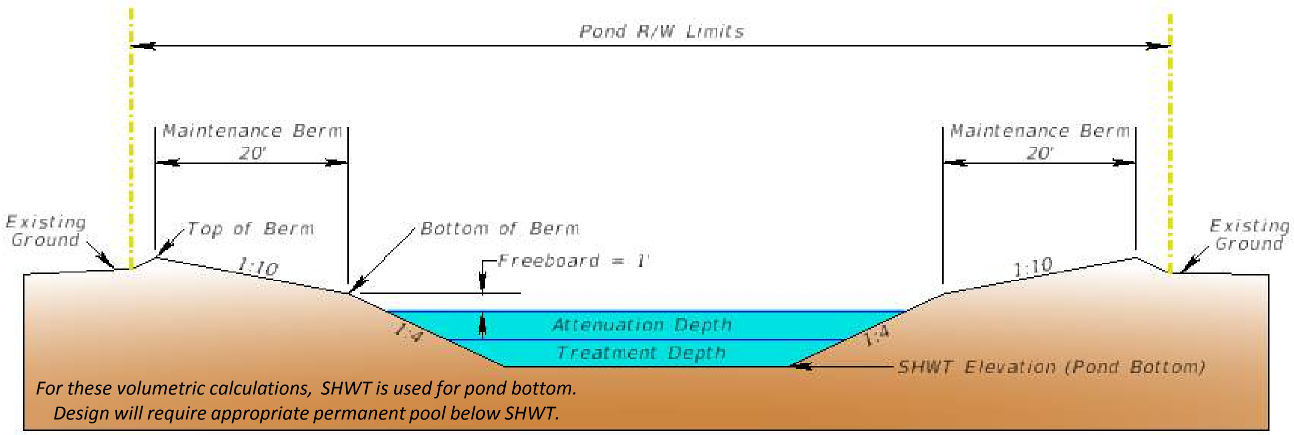
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	30.0	FT	
SHWT EL =	29.5	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	31.5	FT



Conveyance loss to outfall =	0.3	FT	
Available depth for treatment and attenuation =	0.7	FT	= 8.01 in
Treatment Depth =	6	in	
Attenuation Depth =	3	in	
Approx. low edge of pavement elevation (LEOP) =	31.5	FT	
Approx. Proposed Top of Berm elevation =	31.3	FT	
Average Ground at Pond Site =	30.0	FT	
Actual Depth of Treatment and Attenuation =	0.8	FT	
Pond Bottom Elevation =	29.5	FT	

BASIN 26 - CENTRAL ALIGNMENT 2

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**3.14**	**AC-FT**	
Square dimension at bottom of treatment depth	235.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	239.0	FT	
Square dimension at top of attenuation depth	241.0	FT	
Attenuation Volume provided by attenuation depth	**3.47**	**AC-FT**	
Square dimension at top of freeboard	249.0	FT	
Square dimension at top berm	289.0	FT	
Outside pond dimensions (including tie-down)	294.0	FT	
Minimum Total Area Required:	**2.40**	**ACRES**	

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 26-2 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 29.50 ft
Estimated Low Edge of Pavement = 31.50 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
27.50	53361.0	1.23	0.0	0.0	0.00	
29.50	55225.0	1.27	108586.0	108586.0	2.49	*PPV*
30.00	57121.0	1.31	28086.5	136672.5	3.14	*TV*
30.25	58081.0	1.33	14400.3	151072.8	3.47	*AV*
31.25	62001.0	1.42	60041.0	211113.8	4.85	
31.25	83521.0	1.92	0.0	211113.8	4.85	*Top of Berm*
30.00	104587.6	2.40	--	--	--	

Required Treatment Volume = 0.64 ac-ft
Provided Treatment Volume = 0.65 ac-ft ✓

Required Attenuation Volume = 0.34 ac-ft
Provided Attenuation Volume = 0.33 ac-ft ✓

BASIN 27 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.49 acres	98	146
Shoulders	--	--	0.04 acres	98	4
Driveways	--	--	0.18 acres	98	18
Sidewalk	--	--	0.00 acres	98	0
Commercial	7, 34	B/D	10.00 acres	95	950
Grass	7, 34	B/D	5.89 acres	80	471
		Totals:	17.60 acres		1589

Pre-Condition Composite Curve Number: 90.3

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 90.3

Drainage Area (A) = 17.60 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.08 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.06 IN

Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 11.82 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.99 acres	98	293
Shoulders	--	--	0.66 acres	98	65
Driveways	--	--	0.11 acres	98	11
Sidewalk	--	--	0.46 acres	98	45
Commercial	7, 34	B/D	8.25 acres	95	784
Sod	7, 34	B/D	3.73 acres	80	298
		Totals:	16.20 acres		1496

Post-Condition Composite Curve Number: 92.3

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 92.3

Drainage Area (A) = 16.20 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 0.83 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.31 IN

Post-Condition Runoff Volume (V_{POST}) = A x Q = 11.22 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.00 AC-FT

BASIN 27 - CENTRAL ALTERNATIVE 1R

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 1.50 ACRES
TOTAL BASIN AREA = 16.20 ACRES

TREATMENT VOLUME REQUIRED:

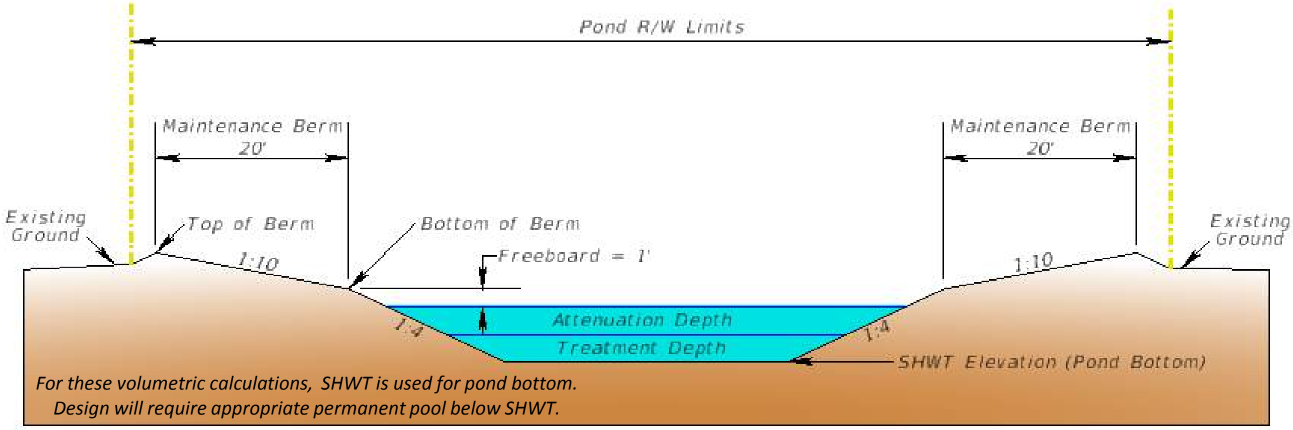
2.5 inches x	1.50 acres =	0.31	AC-FT
1 inch x	16.20 acres =	**1.35**	**AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee
NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 31.0 FT
SHWT EL = 30.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 32.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	0.9	FT	= 11.34 in
Treatment Depth =	11	in	
Attenuation Depth =	0	in	

Approx. low edge of pavement elevation (LEOP) =	32.0	FT
Approx. Proposed Top of Berm elevation =	31.9	FT
Average Ground at Pond Site =	31.0	FT
Actual Depth of Treatment and Attenuation =	0.9	FT
Pond Bottom Elevation =	30.0	FT

BASIN 27 - CENTRAL ALTERNATIVE 1R

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**4.52**	**AC-FT**	
Square dimension at bottom of treatment depth	260.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	267.3	FT	
Square dimension at top of attenuation depth	267.3	FT	
Attenuation Volume provided by attenuation depth	**4.52**	**AC-FT**	
Square dimension at top of freeboard	275.3	FT	
Square dimension at top berm	315.3	FT	
Outside pond dimensions (including tie-down)	319.0	FT	

Minimum Total Area Required: **2.83** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 27-1R STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 30.00 ft
Estimated Low Edge of Pavement = 32.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
28.00	65536.0	1.50	0.0	0.0	0.00	
30.00	67600.0	1.55	133136.0	133136.0	3.06	*PPV*
30.92	71467.1	1.64	63739.1	196875.1	4.52	*TV*
30.92	71467.1	1.64	0.0	196875.1	4.52	*AV*
31.92	75808.4	1.74	73637.8	270512.9	6.21	
31.92	99435.1	2.28	0.0	270512.9	6.21	*Top of Berm*
31.00	123130.8	2.83	--	--	--	

Required Treatment Volume = 1.35 ac-ft
Provided Treatment Volume = 1.46 ac-ft ✓

Required Attenuation Volume = 0.00 ac-ft
Provided Attenuation Volume = 0.00 ac-ft ✓

BASIN 27 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.49 acres	98	146
Shoulders	--	--	0.04 acres	98	4
Driveways	--	--	0.18 acres	98	18
Sidewalk	--	--	0.00 acres	98	0
Commercial	7, 34	B/D	10.00 acres	95	950
Grass	7, 34	B/D	5.89 acres	80	471
		Totals:	17.60 acres		1589

Pre-Condition Composite Curve Number: 90.3

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 90.3

Drainage Area (A) = 17.60 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.08 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.06 IN

Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 11.82 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.92 acres	98	384
Shoulders	--	--	1.07 acres	98	105
Driveways	--	--	0.11 acres	98	11
Sidewalk	--	--	0.66 acres	98	65
Commercial	7, 34	B/D	7.60 acres	95	722
Sod	7, 34	B/D	4.54 acres	80	363
		Totals:	17.90 acres		1650

Post-Condition Composite Curve Number: 92.2

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 92.2

Drainage Area (A) = 17.90 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 0.85 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.29 IN

Post-Condition Runoff Volume (V_{POST}) = A x Q = 12.37 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.55 AC-FT

BASIN 27 - CENTRAL ALIGNMENT 2

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	2.43	ACRES
TOTAL BASIN AREA =	17.90	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches x	2.43 acres =	0.51	AC-FT	
1 inch x	17.90 acres =	**1.49**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee
NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

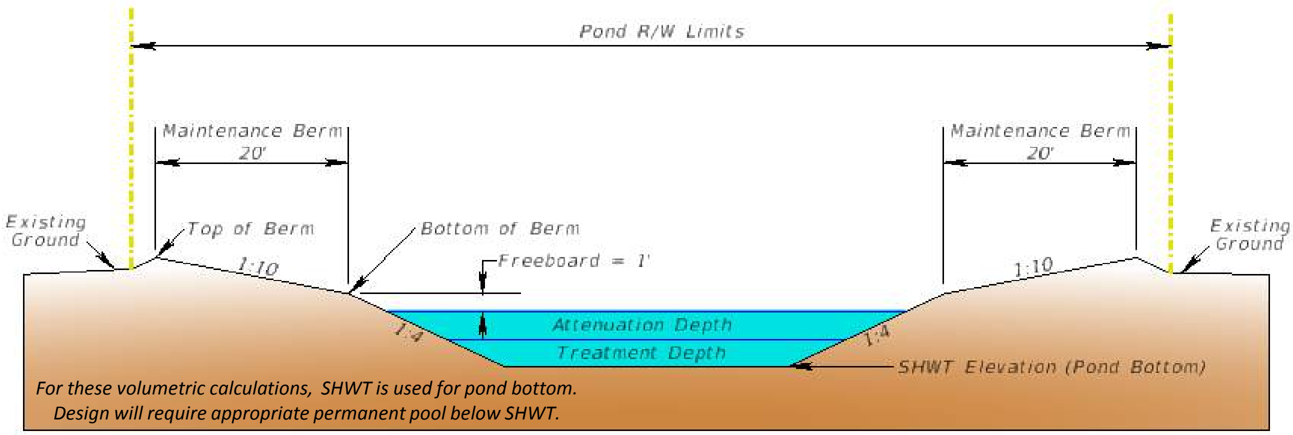
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	31.0	FT	
SHWT EL =	30.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	32.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	0.9	FT	= 11.34 in
Treatment Depth =	8	in	
Attenuation Depth =	3	in	

Approx. low edge of pavement elevation (LEOP) =	32.0	FT
Approx. Proposed Top of Berm elevation =	31.9	FT
Average Ground at Pond Site =	31.0	FT
Actual Depth of Treatment and Attenuation =	0.9	FT
Pond Bottom Elevation =	30.0	FT

BASIN 27 - CENTRAL ALIGNMENT 2

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**5.85**	**AC-FT**	
Square dimension at bottom of treatment depth	310.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	315.3	FT	
Square dimension at top of attenuation depth	317.3	FT	
Attenuation Volume provided by attenuation depth	**6.43**	**AC-FT**	
Square dimension at top of freeboard	325.3	FT	
Square dimension at top berm	365.3	FT	
Outside pond dimensions (including tie-down)	369.0	FT	

Minimum Total Area Required: **3.78 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 27-2 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 30.00 ft
Estimated Low Edge of Pavement = 32.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
28.00	93636.0	2.15	0.0	0.0	0.00	
30.00	96100.0	2.21	189736.0	189736.0	4.36	*PPV*
30.67	99435.1	2.28	65178.4	254914.4	5.85	*TV*
30.92	100700.4	2.31	25016.9	279931.3	6.43	*AV*
31.92	105841.8	2.43	103271.1	383202.4	8.80	
31.92	133468.4	3.06	0.0	383202.4	8.80	*Top of Berm*
31.00	164754.8	3.78	--	--	--	

Required Treatment Volume = 1.49 ac-ft
Provided Treatment Volume = 1.49 ac-ft ✓

Required Attenuation Volume = 0.55 ac-ft
Provided Attenuation Volume = 0.58 ac-ft ✓

BASIN 28 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.10 acres	98	206
Shoulders	--	--	0.64 acres	98	63
Driveways	--	--	0.01 acres	98	1
Sidewalk	--	--	0.29 acres	98	28
Grass	34	B/D	0.96 acres	80	77
		Totals:	4.00 acres		375

Pre-Condition Composite Curve Number: 93.7

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 93.7
Drainage Area (A) = 4.00 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.67 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.48 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 2.83 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.39 acres	98	234
Shoulders	--	--	0.49 acres	98	48
Driveways	--	--	0.05 acres	98	5
Sidewalk	--	--	0.30 acres	98	29
Sod	34	B/D	0.77 acres	80	62
		Totals:	4.00 acres		378

Post-Condition Composite Curve Number: 94.5

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 94.5
Drainage Area (A) = 4.00 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.58 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.58 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 2.86 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.03 AC-FT

BASIN 28 - CENTRAL ALTERNATIVE 1R

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 0.29 ACRES
TOTAL BASIN AREA = 4.00 ACRES

TREATMENT VOLUME REQUIRED:

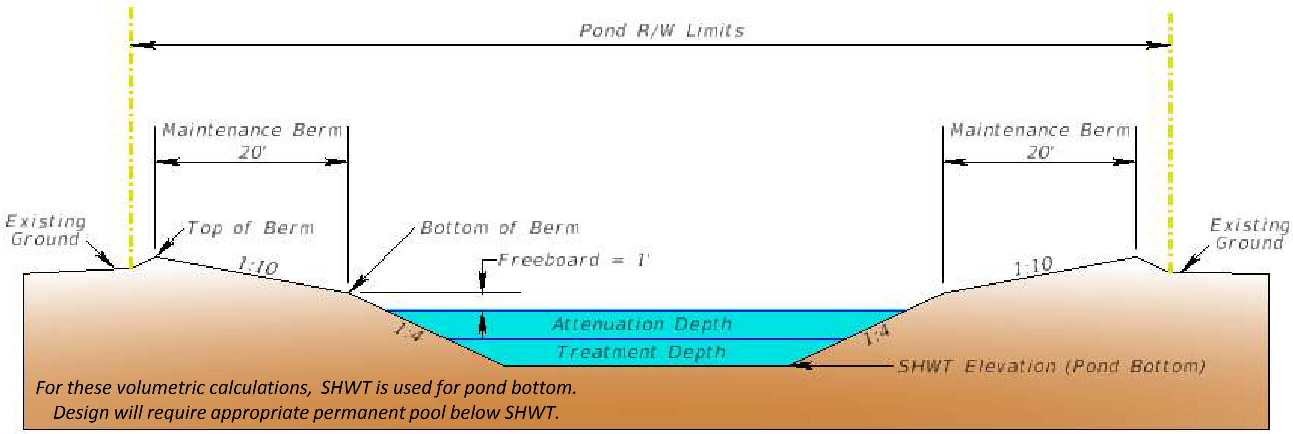
2.5 inches x	0.29 acres =	0.06	AC-FT
1 inch x	4.00 acres =	**0.33**	**AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 34 - Urban Land
NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 30.0 FT
SHWT EL = 29.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 31.0 FT



Conveyance loss to outfall =	0.0	FT	
Available depth for treatment and attenuation =	1.0	FT	= 11.70 in
Treatment Depth =	8	in	
Attenuation Depth =	2	in	
Approx. low edge of pavement elevation (LEOP) =	31.0	FT	
Approx. Proposed Top of Berm elevation =	30.8	FT	
Average Ground at Pond Site =	30.0	FT	
Actual Depth of Treatment and Attenuation =	0.8	FT	
Pond Bottom Elevation =	29.0	FT	

BASIN 28 - CENTRAL ALTERNATIVE 1R

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.33**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	153.3	FT	
Square dimension at top of attenuation depth	154.7	FT	
Attenuation Volume provided by attenuation depth	**1.42**	**AC-FT**	
Square dimension at top of freeboard	162.7	FT	
Square dimension at top berm	202.7	FT	
Outside pond dimensions (including tie-down)	206.0	FT	
Minimum Total Area Required:	**1.18**	**ACRES**	

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 28-1R STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 29.00 ft
Estimated Low Edge of Pavement = 31.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
27.00	20736.0	0.48	0.0	0.0	0.00	
29.00	21904.0	0.50	42640.0	42640.0	0.98	*PPV*
29.67	23511.1	0.54	15138.4	57778.4	1.33	*TV*
29.83	23921.8	0.55	3952.7	61731.1	1.42	*AV*
30.83	26460.4	0.61	25191.1	86922.2	2.00	
30.83	41073.8	0.94	0.0	86922.2	2.00	*Top of Berm*
30.00	51347.6	1.18	--	--	--	

Required Treatment Volume =	0.33	ac-ft	
Provided Treatment Volume =	**0.35**	**ac-ft**	✓
Required Attenuation Volume =	0.03	ac-ft	
Provided Attenuation Volume =	**0.09**	**ac-ft**	✓

BASIN 28 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.10 acres	98	206
Shoulders	--	--	0.64 acres	98	63
Driveways	--	--	0.01 acres	98	1
Sidewalk	--	--	0.29 acres	98	28
Grass	34	B/D	0.96 acres	80	77
		Totals:	4.00 acres		375

Pre-Condition Composite Curve Number: 93.7

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 93.7
Drainage Area (A) = 4.00 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.67 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.48 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 2.83 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.78 acres	98	174
Shoulders	--	--	0.57 acres	98	56
Driveways	--	--	0.06 acres	98	6
Sidewalk	--	--	0.30 acres	98	29
Sod	34	B/D	1.09 acres	80	87
		Totals:	3.80 acres		353

Post-Condition Composite Curve Number: 92.8

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 92.8
Drainage Area (A) = 3.80 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.77 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.37 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 2.65 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.00 AC-FT

NO POND REQUIRED

BASIN 29 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.33 acres	98	130
Sidewalk/Driveways	--	--	1.41 acres	98	138
Open Spaces (Grass)	34	B/D	2.86 acres	80	229
		Totals:	5.60 acres		497

Pre-Condition Composite Curve Number: 88.8

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 88.8
Drainage Area (A) = 5.60 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.26 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.88 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 3.68 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.85 acres	98	279
Shoulders/C&G	--	--	1.23 acres	98	121
Sidewalk	--	--	0.51 acres	98	50
Open Spaces (Sod)	34	B/D	1.01 acres	80	81
		Totals:	5.60 acres		531

Post-Condition Composite Curve Number: 94.8

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 94.8
Drainage Area (A) = 5.60 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.55 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.61 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 4.02 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.34 AC-FT

BASIN 29 - CENTRAL ALTERNATIVE 1R

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 1.52 ACRES
TOTAL BASIN AREA = 2.85 ACRES

TREATMENT VOLUME REQUIRED:

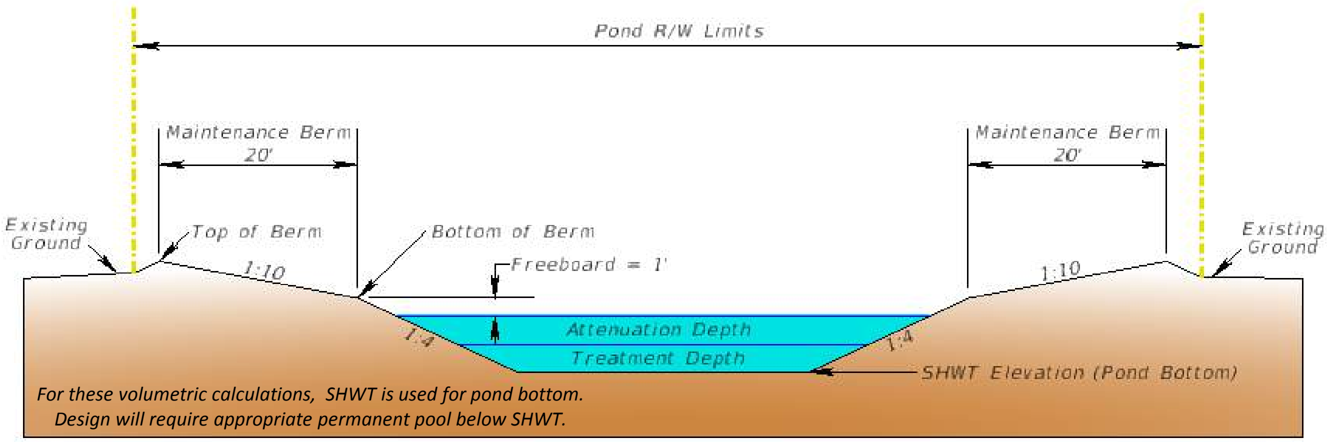
2.5 inches/12 ft x	1.52 acres =	**0.32**	**AC-FT**	← **CONTROLS**
1 inch/12 ft x	2.85 acres =	0.24	AC-FT	

POND SIZE ESTIMATION

NRCS SOILS AT POND: 34 - Urban Land - Immokalee - Oldsmar
NRCS HIGH WATER DEPTH: 0-1.0 (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 31.5 FT
SHWT EL = 30.5 FT (FROM SFWMD PERMIT 11-00999-S)
AT ROADWAY:
LOW EOP EL = 32.0 FT



Conveyance loss to outfall =	0.0	FT	
Available depth for treatment and attenuation =	0.5	FT	= 5.82 in
Treatment Depth =	2.8	in	
Attenuation Depth =	3	in	

Approx. low edge of pavement elevation (LEOP) =	32.0	FT
Approx. Proposed Top of Berm elevation =	32.0	FT
Average Ground at Pond Site =	31.5	FT
Actual Depth of Treatment and Attenuation =	0.5	FT
Pond Bottom Elevation =	30.5	FT

BASIN 29 - CENTRAL ALTERNATIVE 1R

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**3.11**	**AC-FT**	
Square dimension at bottom of treatment depth	248.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	249.9	FT	
Square dimension at top of attenuation depth	251.9	FT	
Attenuation Volume provided by attenuation depth	**3.47**	**AC-FT**	
Square dimension at top of freeboard	259.9	FT	
Square dimension at top berm	299.9	FT	
Outside pond dimensions (including tie-down)	301.8	FT	

Minimum Total Area Required: **2.53** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR

POND 29-1R STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 30.50 ft
Estimated Low Edge of Pavement = 32.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
28.50	59536.0	1.37	0.0	0.0	0.00	
30.50	61504.0	1.41	121040.0	121040.0	2.78	*PPV*
30.73	62433.4	1.43	14459.4	135499.4	3.11	*TV*
30.98	63436.8	1.46	15733.8	151233.1	3.47	*AV*
31.98	67530.7	1.55	65483.8	216716.9	4.98	
31.98	89920.0	2.06	0.0	216716.9	4.98	*Top of Berm*
31.50	110210.7	2.53	--	--	--	

Required Treatment Volume = 0.32 ac-ft
Provided Treatment Volume = 0.33 ac-ft ✓

Required Attenuation Volume = 0.34 ac-ft
Provided Attenuation Volume = 0.36 ac-ft ✓

BASIN 29 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.00 acres	98	0
Sidewalk/Driveways	--	--	0.00 acres	98	0
Open Spaces (Grass)	7, 8	A/D, B/D	9.60 acres	80	768
		Totals:	9.60 acres		768
		Pre-Condition Composite Curve Number:	80.0		

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 80.0
Drainage Area (A) = 9.60 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.50 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 6.80 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.44 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	4.00 acres	98	392
Shoulders/C&G	--	--	2.09 acres	98	205
Sidewalk	--	--	0.54 acres	98	53
Open Spaces (Sod)	7, 8	A/D, B/D	3.07 acres	80	246
		Totals:	9.60 acres		895
		Post-Condition Composite Curve Number:	93.3		

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 93.3
Drainage Area (A) = 9.60 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.72 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.43 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.74 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 1.30 AC-FT

BASIN 29 - CENTRAL ALIGNMENT 2

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	4.00	ACRES
TOTAL BASIN AREA =	9.60	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	4.00 acres =	**0.83**	**AC-FT**	← **CONTROLS**
1 inch/12 ft	x	9.60 acres =	0.80	AC-FT	

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee
NRCS HIGH WATER DEPTH: 0-1.0 (FROM COLLIER COUTY SOIL SURVEY)

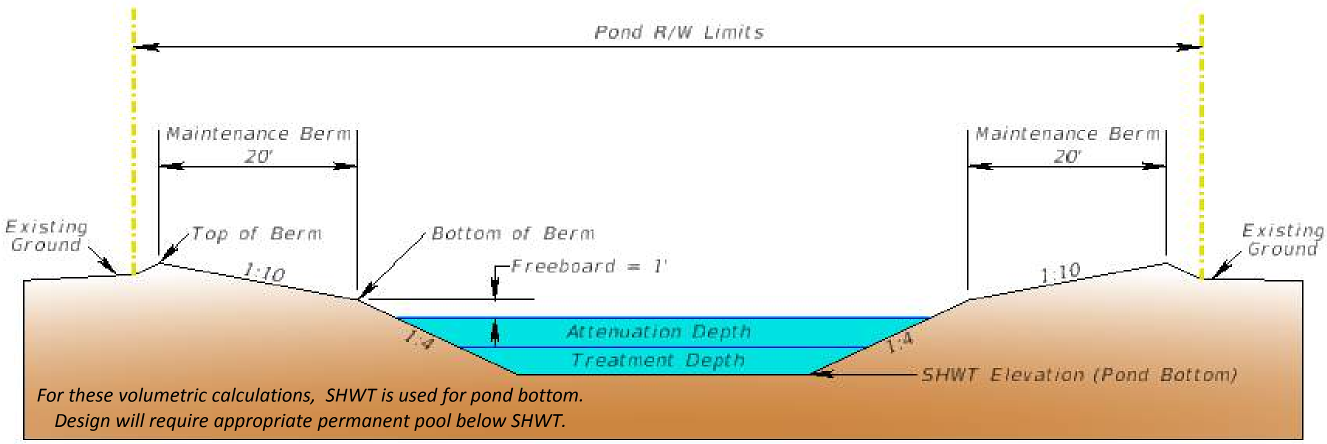
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	32.0	FT	
SHWT EL =	30.5	FT	(FROM SFWMD PERMIT 11-00999-S)

AT ROADWAY:

LOW EOP EL =	33.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	6.5	in	
Attenuation Depth =	9.5	in	

Approx. low edge of pavement elevation (LEOP) =	33.0	FT
Approx. Proposed Top of Berm elevation =	32.8	FT
Average Ground at Pond Site =	32.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	30.5	FT

BASIN 29 - CENTRAL ALIGNMENT 2

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**3.91**	**AC-FT**	
Square dimension at bottom of treatment depth	260.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	264.3	FT	
Square dimension at top of attenuation depth	270.7	FT	
Attenuation Volume provided by attenuation depth	**5.21**	**AC-FT**	
Square dimension at top of freeboard	278.7	FT	
Square dimension at top berm	318.7	FT	
Outside pond dimensions (including tie-down)	322.0	FT	

Minimum Total Area Required: **2.88 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR

POND 29-2 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 30.50 ft
Estimated Low Edge of Pavement = 33.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
28.50	65536.0	1.50	0.0	0.0	0.00	
30.50	67600.0	1.55	133136.0	133136.0	3.06	*PPV*
29.04	69872.1	1.60	37232.0	170368.0	3.91	*TV*
29.83	73260.4	1.68	56656.6	227024.7	5.21	*AV*
30.83	77655.1	1.78	75457.8	302482.4	6.94	
30.83	101548.4	2.33	0.0	302482.4	6.94	*Top of Berm*
32.00	125457.6	2.88	--	--	--	

Required Treatment Volume = 0.83 ac-ft
Provided Treatment Volume = 0.85 ac-ft ✓

Required Attenuation Volume = 1.30 ac-ft
Provided Attenuation Volume = 1.30 ac-ft ✓

BASIN 30 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.45 acres	98	240
Sidewalk/Driveways	--	--	1.86 acres	98	182
Open Spaces (Grass)	34	B/D	6.09 acres	80	487
		Totals:	10.40 acres		910

Pre-Condition Composite Curve Number: 87.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.5
Drainage Area (A) = 10.40 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.43 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.72 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 6.69 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	4.77 acres	98	467
Shoulders/C&G	--	--	2.13 acres	98	209
Sidewalk	--	--	0.95 acres	98	93
Open Spaces (Sod)	15, 16	B/D; C	2.55 acres	80	204
		Totals:	10.40 acres		973

Post-Condition Composite Curve Number: 93.6

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 93.6
Drainage Area (A) = 10.40 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 0.69 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.47 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 7.34 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.65 AC-FT

BASIN 30 - CENTRAL ALTERNATIVE 1R

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 2.32 ACRES
TOTAL BASIN AREA = 4.77 ACRES

TREATMENT VOLUME REQUIRED:

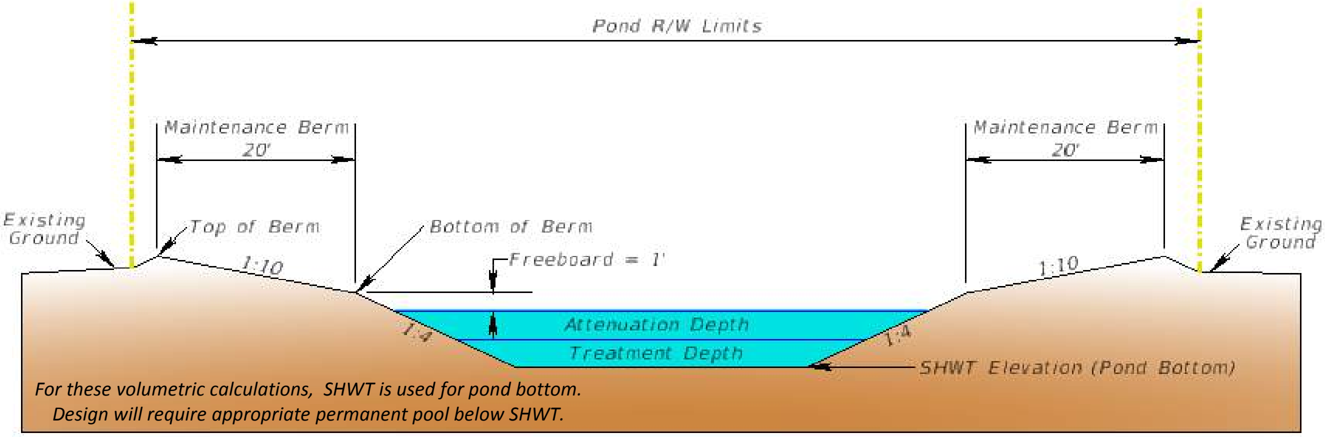
2.5 inches/12 ft x	2.32 acres =	**0.48**	**AC-FT**	← **CONTROLS**
1 inch/12 ft x	4.77 acres =	0.40	AC-FT	

POND SIZE ESTIMATION

NRCS SOILS AT POND: 34 - Urban Land - Immokalee - Oldsmar
NRCS HIGH WATER DEPTH: 0-1.0 (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 32.0 FT
SHWT EL = 31.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 33.5 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	7	in	
Attenuation Depth =	9	in	

Approx. low edge of pavement elevation (LEOP) =	33.5	FT
Approx. Proposed Top of Berm elevation =	33.3	FT
Average Ground at Pond Site =	32.0	FT
Actual Depth of Treatment and Attenuation =	1.3	FT
Pond Bottom Elevation =	31.0	FT

BASIN 30 - CENTRAL ALTERNATIVE 1R

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.07**	**AC-FT**	
Square dimension at bottom of treatment depth	188.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	192.7	FT	
Square dimension at top of attenuation depth	198.7	FT	
Attenuation Volume provided by attenuation depth	**2.73**	**AC-FT**	
Square dimension at top of freeboard	206.7	FT	
Square dimension at top berm	246.7	FT	
Outside pond dimensions (including tie-down)	252.0	FT	

Minimum Total Area Required: **1.76 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 30-1R STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 31.00 ft
Estimated Low Edge of Pavement = 33.50 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
29.00	33856.0	0.78	0.0	0.0	0.00	
31.00	35344.0	0.81	69200.0	69200.0	1.59	*PPV*
31.58	37120.4	0.85	21135.5	90335.5	2.07	*TV*
32.33	39468.4	0.91	28720.8	119056.3	2.73	*AV*
33.33	42711.1	0.98	41089.8	160146.1	3.68	
33.33	60844.4	1.40	0.0	160146.1	3.68	*Top of Berm*
32.00	76839.8	1.76	--	--	--	

Required Treatment Volume = 0.48 ac-ft
Provided Treatment Volume = 0.48 ac-ft ✓

Required Attenuation Volume = 0.65 ac-ft
Provided Attenuation Volume = 0.66 ac-ft ✓

BASIN 30 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.00 acres	98	0
Sidewalk/Driveways	--	--	0.00 acres	98	0
Pasture land, good condition	8, 34	A/D, B/D	3.00 acres	80	240
		Totals:	3.00 acres		240

Pre-Condition Composite Curve Number: 80.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 80.0

Drainage Area (A) = 3.00 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 2.50 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 6.80 IN

Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 1.70 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.14 acres	98	112
Shoulders/C&G	--	--	0.35 acres	98	34
Sidewalk	--	--	0.19 acres	98	19
Open Spaces (Sod)	8, 34	A/D, B/D	1.32 acres	80	106
		Totals:	3.00 acres		270

Post-Condition Composite Curve Number: 90.1

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 90.1

Drainage Area (A) = 3.00 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.10 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 8.04 IN

Post-Condition Runoff Volume (V_{POST}) = A x Q = 2.01 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.31 AC-FT

BASIN 30 - CENTRAL ALIGNMENT 2

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 1.14 ACRES
TOTAL BASIN AREA = 3.00 ACRES

TREATMENT VOLUME REQUIRED:

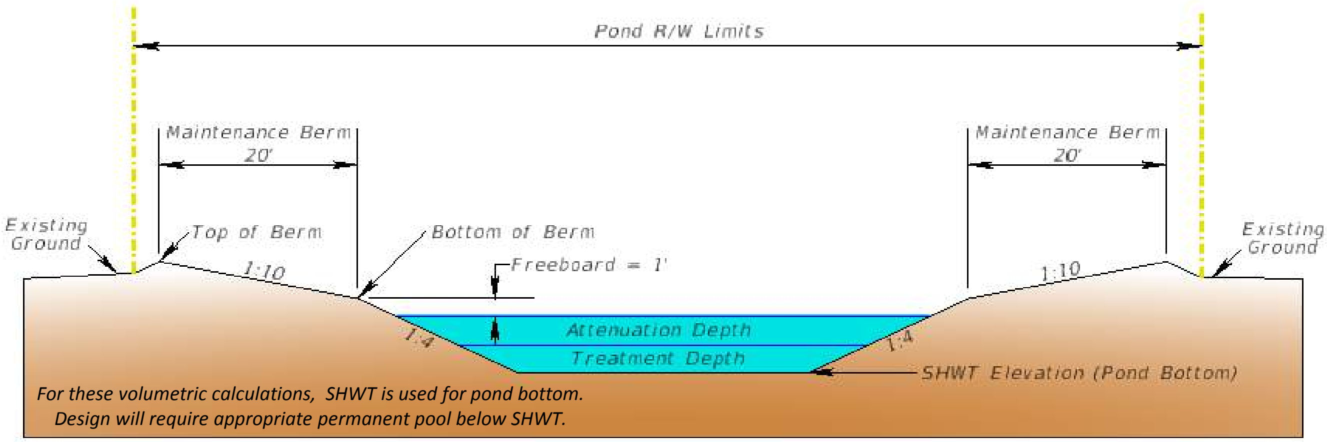
2.5 inches/12 ft x	1.14 acres =	0.24	AC-FT	
1 inch/12 ft x	3.00 acres =	**0.25**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 8 - Myakka Fine Sand
NRCS HIGH WATER DEPTH: 0-1.0 (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 32.0 FT
SHWT EL = 31.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 33.5 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.4	FT	= 16.35 in
Treatment Depth =	7	in	
Attenuation Depth =	7	in	
Approx. low edge of pavement elevation (LEOP) =	33.5	FT	
Approx. Proposed Top of Berm elevation =	33.2	FT	
Average Ground at Pond Site =	32.0	FT	
Actual Depth of Treatment and Attenuation =	1.2	FT	
Pond Bottom Elevation =	31.0	FT	

BASIN 30 - CENTRAL ALIGNMENT 2

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.27**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	152.7	FT	
Square dimension at top of attenuation depth	157.3	FT	
Attenuation Volume provided by attenuation depth	**1.60**	**AC-FT**	
Square dimension at top of freeboard	165.3	FT	
Square dimension at top berm	205.3	FT	
Outside pond dimensions (including tie-down)	210.0	FT	

Minimum Total Area Required: **1.23 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 30-2 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 31.00 ft
Estimated Low Edge of Pavement = 33.50 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
29.00	20736.0	0.48	0.0	0.0	0.00	
31.00	21904.0	0.50	42640.0	42640.0	0.98	*PPV*
29.58	23307.1	0.54	12845.9	55485.9	1.27	*TV*
30.17	24753.8	0.57	14017.8	69503.7	1.60	*AV*
31.17	27335.1	0.63	26044.4	95548.1	2.19	
31.17	42161.8	0.97	0.0	95548.1	2.19	*Top of Berm*
32.00	53361.0	1.23	--	--	--	

Required Treatment Volume = 0.25 ac-ft
Provided Treatment Volume = 0.29 ac-ft ✓

Required Attenuation Volume = 0.31 ac-ft
Provided Attenuation Volume = 0.33 ac-ft ✓

BASIN 31 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.00 acres	98	0
Sidewalk/Driveways	--	--	0.00 acres	98	0
Open Spaces (Grass)	7, 27	A/D, B/D	6.50 acres	80	520
		Totals:	6.50 acres		520
		Pre-Condition Composite Curve Number:	80.0		

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 80.0
Drainage Area (A) = 6.50 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.50 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 6.80 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 3.68 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.59 acres	98	156
Shoulders/C&G	--	--	0.75 acres	98	74
Sidewalk	--	--	0.00 acres	98	0
Open Spaces (Sod)	7, 27	A/D, B/D	4.16 acres	80	333
		Totals:	6.50 acres		562
		Post-Condition Composite Curve Number:	86.5		

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.5
Drainage Area (A) = 6.50 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.56 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.60 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 4.12 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.44 AC-FT

BASIN 31 - CENTRAL ALTERNATIVE 1R

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 1.59 ACRES
TOTAL BASIN AREA = 6.50 ACRES

TREATMENT VOLUME REQUIRED:

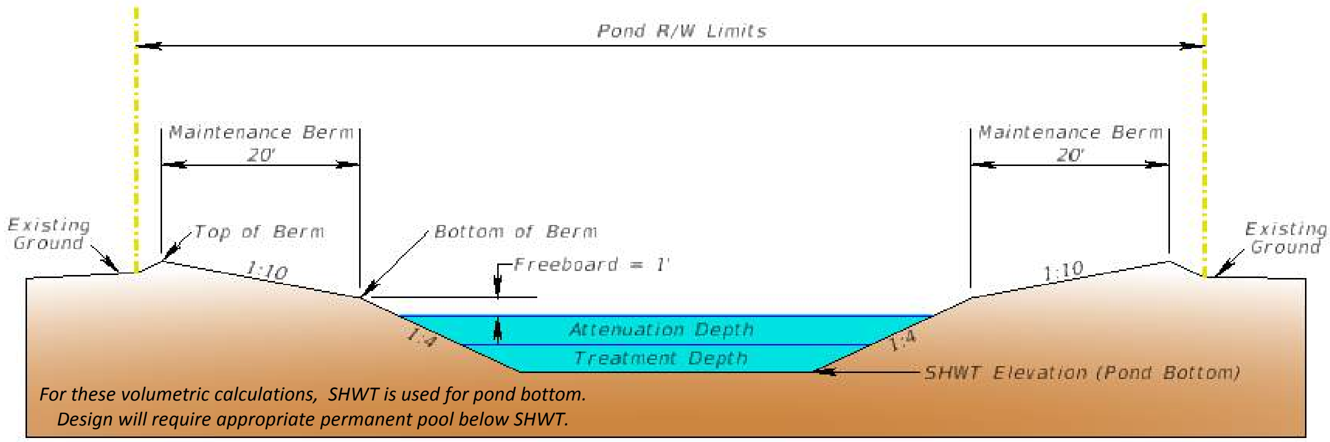
2.5 inches/12 ft x	1.59 acres =	0.33	AC-FT
1 inch/12 ft x	6.50 acres =	**0.54**	**AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 27 - Holopaw
NRCS HIGH WATER DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 32.0 FT
SHWT EL = 31.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 34.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	13	in	
Attenuation Depth =	9	in	
Approx. low edge of pavement elevation (LEOP) =	34.0	FT	
Approx. Proposed Top of Berm elevation =	33.8	FT	
Average Ground at Pond Site =	32.0	FT	
Actual Depth of Treatment and Attenuation =	1.8	FT	
Pond Bottom Elevation =	31.0	FT	

BASIN 31 - CENTRAL ALTERNATIVE 1R

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.56**	**AC-FT**	
Square dimension at bottom of treatment depth	148.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	156.7	FT	
Square dimension at top of attenuation depth	162.7	FT	
Attenuation Volume provided by attenuation depth	**2.00**	**AC-FT**	
Square dimension at top of freeboard	170.7	FT	
Square dimension at top berm	210.7	FT	
Outside pond dimensions (including tie-down)	218.0	FT	

Minimum Total Area Required: **1.32 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 31-1R STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 31.00 ft
Estimated Low Edge of Pavement = 34.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
29.00	20736.0	0.48	0.0	0.0	0.00	
31.00	21904.0	0.50	42640.0	42640.0	0.98	*PPV*
32.08	24544.4	0.56	25159.6	67799.6	1.56	*TV*
32.83	26460.4	0.61	19126.8	86926.4	2.00	*AV*
33.83	29127.1	0.67	27793.8	114720.2	2.63	
33.83	44380.4	1.02	0.0	114720.2	2.63	*Top of Berm*
32.00	57504.0	1.32	--	--	--	

Required Treatment Volume = 0.54 ac-ft
Provided Treatment Volume = 0.58 ac-ft ✓

Required Attenuation Volume = 0.44 ac-ft
Provided Attenuation Volume = 0.44 ac-ft ✓

BASIN 31 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.00 acres	98	0
Sidewalk/Driveways	--	--	0.00 acres	98	0
Open Spaces (Grass)	27, 34	A/D, B/D	16.80 acres	80	1344
		Totals:	16.80 acres		1344

Pre-Condition Composite Curve Number: 80.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 80.0
Drainage Area (A) = 16.80 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.50 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 6.80 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 9.51 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	4.03 acres	98	395
Shoulders/C&G	--	--	1.89 acres	98	185
Sidewalk	--	--	1.16 acres	98	114
Open Spaces (Sod)	27, 34	A/D, B/D	9.72 acres	80	778
		Totals:	16.80 acres		1471

Post-Condition Composite Curve Number: 87.6

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.6
Drainage Area (A) = 16.80 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.42 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.73 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 10.83 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 1.32 AC-FT

BASIN 31 - CENTRAL ALIGNMENT 2

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	4.03	ACRES
TOTAL BASIN AREA =	16.80	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	4.03 acres =	0.84	AC-FT	
1 inch/12 ft	x	16.80 acres =	**1.40**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee; 27 - Holopaw

NRCS HIGH WATER DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

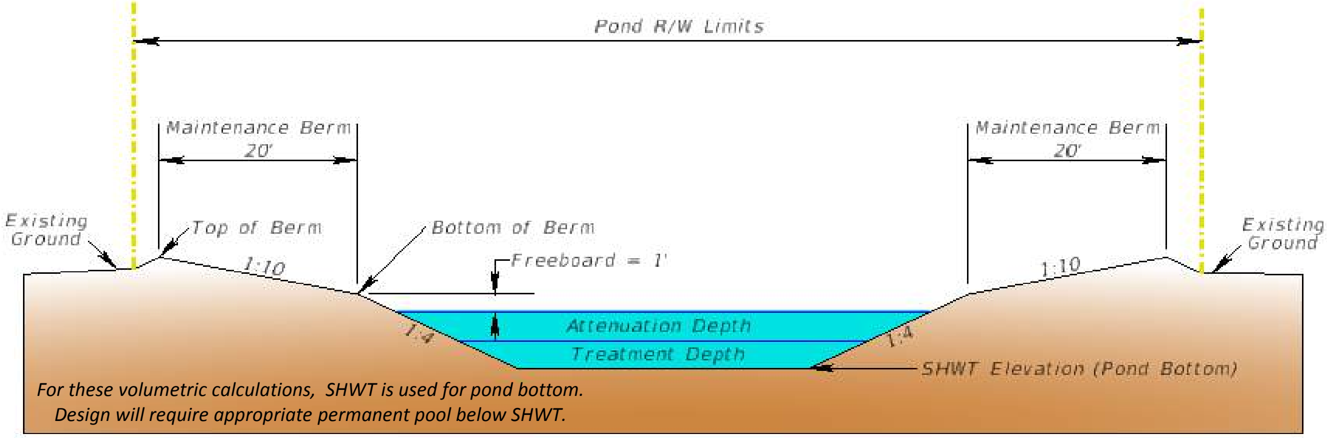
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	32.0	FT	
SHWT EL =	31.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	34.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	11.5	in	
Attenuation Depth =	10.5	in	
Approx. low edge of pavement elevation (LEOP) =	34.0	FT	
Approx. Proposed Top of Berm elevation =	33.8	FT	
Average Ground at Pond Site =	32.0	FT	
Actual Depth of Treatment and Attenuation =	1.8	FT	
Pond Bottom Elevation =	31.0	FT	

BASIN 31 - CENTRAL ALIGNMENT 2

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**4.24**	**AC-FT**	
Square dimension at bottom of treatment depth	250.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	257.7	FT	
Square dimension at top of attenuation depth	264.7	FT	
Attenuation Volume provided by attenuation depth	**5.61**	**AC-FT**	
Square dimension at top of freeboard	272.7	FT	
Square dimension at top berm	312.7	FT	
Outside pond dimensions (including tie-down)	320.0	FT	

Minimum Total Area Required: **2.84 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 31-2 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 31.00 ft
Estimated Low Edge of Pavement = 34.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
29.00	60516.0	1.39	0.0	0.0	0.00	
31.00	62500.0	1.43	123016.0	123016.0	2.82	*PPV*
31.96	66392.1	1.52	61760.8	184776.8	4.24	*TV*
32.83	70048.4	1.61	59692.7	244469.5	5.61	*AV*
33.83	74347.1	1.71	72197.8	316667.3	7.27	
33.83	97760.4	2.24	0.0	316667.3	7.27	*Top of Berm*
32.00	123904.0	2.84	--	--	--	

Required Treatment Volume = 1.40 ac-ft
Provided Treatment Volume = 1.42 ac-ft ✓

Required Attenuation Volume = 1.32 ac-ft
Provided Attenuation Volume = 1.37 ac-ft ✓

BASIN 32 - CENTRAL ALTERNATIVE 1R

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.00 acres	98	0
Pasture land, good condition	15, 16, 27	A, A/D	21.20 acres	80	1696
		Totals:	21.20 acres		1696

Pre-Condition Composite Curve Number: 80.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 80.0
Drainage Area (A) = 21.20 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.50 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 6.80 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 12.01 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	5.15 acres	98	505
Shoulders/C&G	--	--	2.38 acres	98	233
Sidewalk	--	--	0.40 acres	98	39
Open Spaces (Sod)	15, 16, 27	A, A/D	13.27 acres	80	1062
		Totals:	21.20 acres		1839

Post-Condition Composite Curve Number: 86.7

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.7
Drainage Area (A) = 21.20 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.53 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.63 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 13.48 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 1.47 AC-FT

BASIN 32 - CENTRAL ALTERNATIVE 1R

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA = 5.15 ACRES
TOTAL BASIN AREA = 21.20 ACRES

TREATMENT VOLUME REQUIRED:

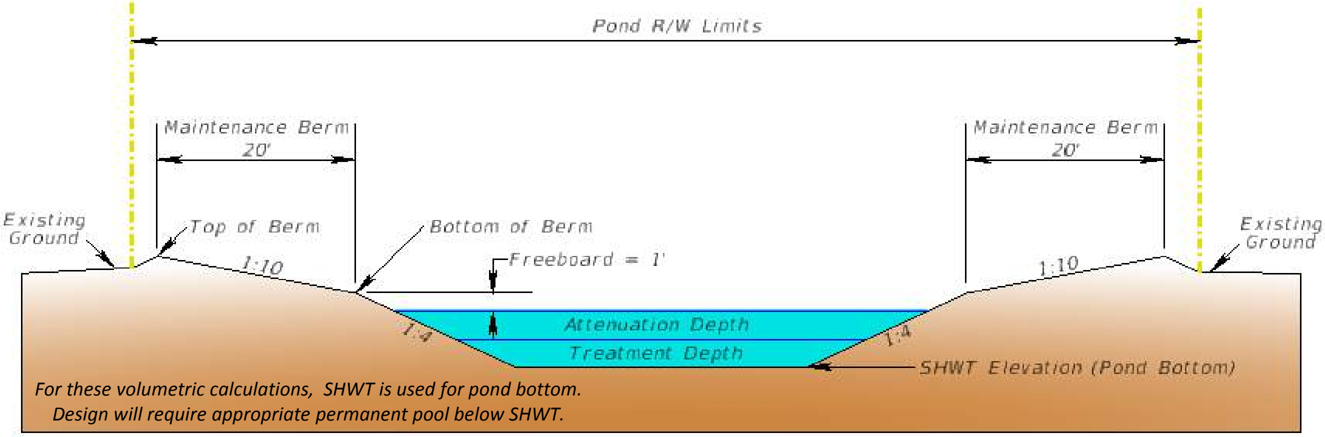
2.5 inches/12 ft x 5.15 acres = 1.07 AC-FT
1 inch/12 ft x 21.20 acres = **1.77** **AC-FT** ← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 16 - Oldsmar
NRCS HIGH WATER DEPTH: 0-1.0 (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:
AVERAGE NATURAL GROUND EL = 34.0 FT
SHWT EL = 33.0 FT (FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:
LOW EOP EL = 36.0 FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	12	in	
Attenuation Depth =	10	in	
Approx. low edge of pavement elevation (LEOP) =	36.0	FT	
Approx. Proposed Top of Berm elevation =	35.8	FT	
Average Ground at Pond Site =	34.0	FT	
Actual Depth of Treatment and Attenuation =	1.8	FT	
Pond Bottom Elevation =	33.0	FT	

BASIN 32 - CENTRAL ALTERNATIVE 1R

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**5.21**	**AC-FT**	
Square dimension at bottom of treatment depth	275.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	283.0	FT	
Square dimension at top of attenuation depth	289.7	FT	
Attenuation Volume provided by attenuation depth	**6.78**	**AC-FT**	
Square dimension at top of freeboard	297.7	FT	
Square dimension at top berm	337.7	FT	
Outside pond dimensions (including tie-down)	345.0	FT	

Minimum Total Area Required: **3.31 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 32-1R STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 33.00 ft
Estimated Low Edge of Pavement = 36.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
31.00	73441.0	1.69	0.0	0.0	0.00	
33.00	75625.0	1.74	149066.0	149066.0	3.42	*PPV*
34.00	80089.0	1.84	77857.0	226923.0	5.21	*TV*
34.83	83906.8	1.93	68331.6	295254.6	6.78	*AV*
35.83	88605.4	2.03	86256.1	381510.7	8.76	
35.83	114018.8	2.62	0.0	381510.7	8.76	*Top of Berm*
34.00	144020.3	3.31	--	--	--	

Required Treatment Volume = 1.77 ac-ft
Provided Treatment Volume = 1.79 ac-ft ✓

Required Attenuation Volume = 1.47 ac-ft
Provided Attenuation Volume = 1.57 ac-ft ✓

BASIN 32 - CENTRAL ALIGNMENT 2

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.00 acres	98	0
Pasture land, good condition	15, 16	A, A/D	21.20 acres	80	1696
		Totals:	21.20 acres		1696

Pre-Condition Composite Curve Number: 80.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 80.0
Drainage Area (A) = 21.20 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.50 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 6.80 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 12.01 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	5.15 acres	98	505
Shoulders/C&G	--	--	2.38 acres	98	233
Sidewalk	--	--	0.40 acres	98	39
Open Spaces (Sod)	15, 16	A, A/D	13.27 acres	80	1062
		Totals:	21.20 acres		1839

Post-Condition Composite Curve Number: 86.7

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.7
Drainage Area (A) = 21.20 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.53 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.63 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 13.48 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 1.47 AC-FT

BASIN 32 - CENTRAL ALIGNMENT 2

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	5.15	ACRES
TOTAL BASIN AREA =	21.20	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	5.15 acres =	1.07	AC-FT	
1 inch/12 ft x	21.20 acres =	**1.77**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 15 - Pomello; 16 - Oldsmar
NRCS HIGH WATER DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

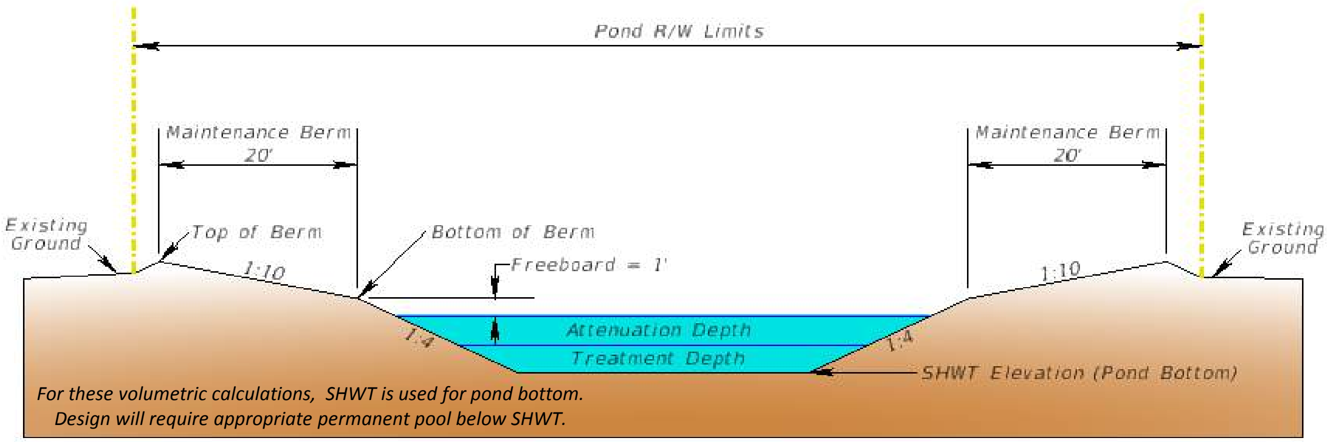
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	34.0	FT	
SHWT EL =	33.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	36.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	12	in	
Attenuation Depth =	10	in	

Approx. low edge of pavement elevation (LEOP) =	36.0	FT
Approx. Proposed Top of Berm elevation =	35.8	FT
Average Ground at Pond Site =	34.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	33.0	FT

BASIN 32 - CENTRAL ALIGNMENT 2

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**5.21**	**AC-FT**	
Square dimension at bottom of treatment depth	275.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	283.0	FT	
Square dimension at top of attenuation depth	289.7	FT	
Attenuation Volume provided by attenuation depth	**6.78**	**AC-FT**	
Square dimension at top of freeboard	297.7	FT	
Square dimension at top berm	337.7	FT	
Outside pond dimensions (including tie-down)	345.0	FT	

Minimum Total Area Required: **3.31 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 32-2 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 33.00 ft
Estimated Low Edge of Pavement = 36.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
31.00	73441.0	1.69	0.0	0.0	0.00	
33.00	75625.0	1.74	149066.0	149066.0	3.42	*PPV*
34.00	80089.0	1.84	77857.0	226923.0	5.21	*TV*
34.83	83906.8	1.93	68331.6	295254.6	6.78	*AV*
35.83	88605.4	2.03	86256.1	381510.7	8.76	
35.83	114018.8	2.62	0.0	381510.7	8.76	*Top of Berm*
34.00	144020.3	3.31	--	--	--	

Required Treatment Volume = 1.77 ac-ft
Provided Treatment Volume = 1.79 ac-ft ✓

Required Attenuation Volume = 1.47 ac-ft
Provided Attenuation Volume = 1.57 ac-ft ✓

BASIN 33

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.24 acres	98	318
Shoulders	--	--	0.45 acres	98	44
Driveways	--	--	0.54 acres	98	53
Sidewalk	--	--	0.58 acres	98	57
Grass	7	B/D	7.89 acres	80	631
		Totals:	12.70 acres		1103

Pre-Condition Composite Curve Number: 86.8

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.8
Drainage Area (A) = 12.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.52 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.64 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 8.08 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.34 acres	98	327
Shoulders	--	--	0.35 acres	98	34
Driveways	--	--	0.45 acres	98	44
Sidewalk	--	--	0.63 acres	98	62
Sod	7	B/D	7.93 acres	80	634
		Totals:	12.70 acres		1102

Post-Condition Composite Curve Number: 86.8

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 86.8
Drainage Area (A) = 12.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.53 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.63 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 8.08 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.00 AC-FT

BASIN 33

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	0.10	ACRES
TOTAL BASIN AREA =	12.70	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	0.10 acres =	0.02	AC-FT	
1 inch/12 ft	x	12.70 acres =	**1.06**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee

NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

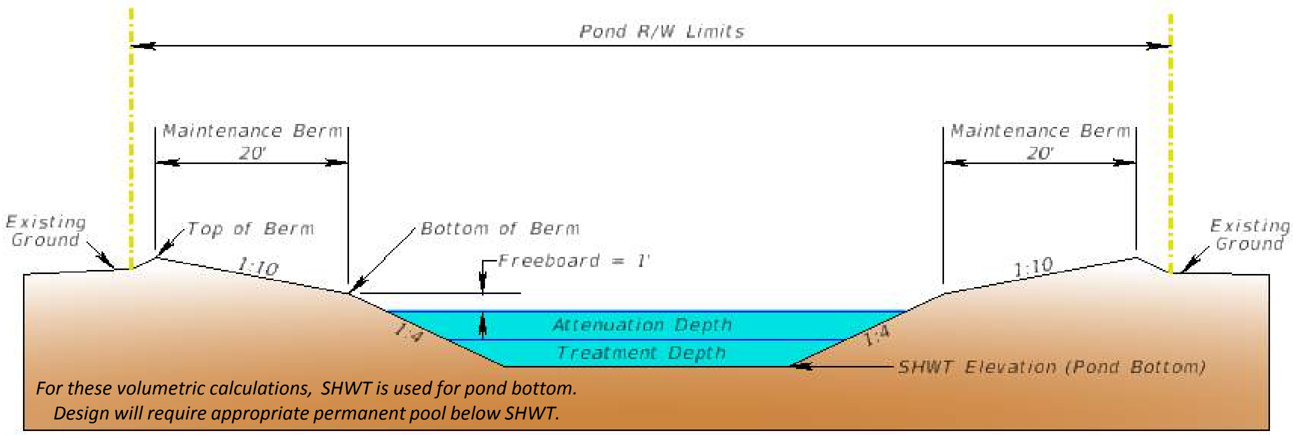
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	34.0	FT	
SHWT EL =	33.0	FT	(FROM SFWMD ERP 11-03470-P)

AT ROADWAY:

LOW EOP EL =	35.5	FT



Conveyance loss to outfall =	0.3	FT	
Available depth for treatment and attenuation =	1.2	FT	= 14.40 in
Treatment Depth =	12	in	
Attenuation Depth =	2	in	

Approx. low edge of pavement elevation (LEOP) =	35.5	FT
Approx. Proposed Top of Berm elevation =	35.2	FT
Average Ground at Pond Site =	34.0	FT
Actual Depth of Treatment and Attenuation =	1.2	FT
Pond Bottom Elevation =	33.0	FT

BASIN 33

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**3.18**	**AC-FT**	
Square dimension at bottom of treatment depth	215.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	223.0	FT	
Square dimension at top of attenuation depth	224.3	FT	
Attenuation Volume provided by attenuation depth	**3.38**	**AC-FT**	
Square dimension at top of freeboard	232.3	FT	
Square dimension at top berm	272.3	FT	
Outside pond dimensions (including tie-down)	277.0	FT	

Minimum Total Area Required: **2.13** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 33 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 33.00 ft
Estimated Low Edge of Pavement = 35.50 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
31.00	44521.0	1.02	0.0	0.0	0.00	
33.00	46225.0	1.06	90746.0	90746.0	2.08	*PPV*
34.00	49729.0	1.14	47977.0	138723.0	3.18	*TV*
34.17	50325.4	1.16	8337.9	147060.9	3.38	*AV*
35.17	53978.8	1.24	52152.1	199213.0	4.57	
35.17	74165.4	1.70	0.0	199213.0	4.57	*Top of Berm*
34.00	92842.1	2.13	--	--	--	

Required Treatment Volume = 1.06 ac-ft
Provided Treatment Volume = 1.10 ac-ft ✓

Required Attenuation Volume = 0.00 ac-ft
Provided Attenuation Volume = 0.20 ac-ft ✓

BASIN 34

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.21 acres	98	119
Shoulders	--	--	0.18 acres	98	18
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	0.00 acres	98	0
Grass	7	B/D	3.29 acres	80	263
		Totals:	4.70 acres		401

Pre-Condition Composite Curve Number: 85.4

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 85.4
Drainage Area (A) = 4.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.71 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.46 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 2.92 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.81 acres	98	177
Shoulders	--	--	0.49 acres	98	48
Driveways	--	--	0.02 acres	98	2
Sidewalk	--	--	0.15 acres	98	15
Sod	7	B/D	2.23 acres	80	178
		Totals:	4.70 acres		420

Post-Condition Composite Curve Number: 89.5

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 89.5
Drainage Area (A) = 4.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.18 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.96 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 3.12 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.20 AC-FT

BASIN 34

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	0.60	ACRES
TOTAL BASIN AREA =	4.70	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	0.60 acres =	0.13	AC-FT	
1 inch/12 ft	x	4.70 acres =	**0.39**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee
NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

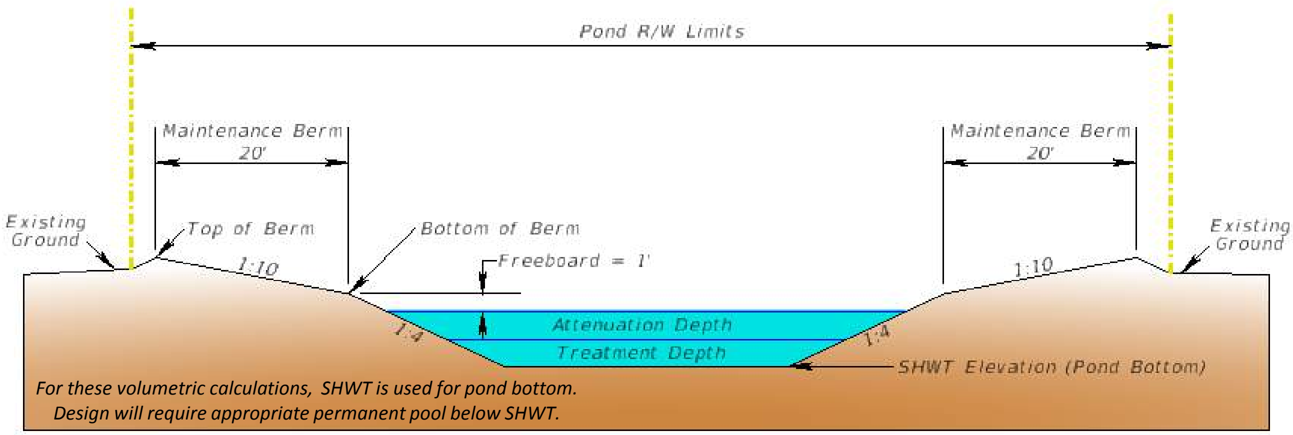
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	34.0	FT	
SHWT EL =	32.7	FT	(FROM SFWMD ERP 11-00805-S)

AT ROADWAY:

LOW EOP EL =	35.5	FT



Conveyance loss to outfall =	0.8	FT	
Available depth for treatment and attenuation =	1.0	FT	= 12.24 in
Treatment Depth =	8	in	
Attenuation Depth =	4	in	

Approx. low edge of pavement elevation (LEOP) =	35.5	FT
Approx. Proposed Top of Berm elevation =	34.7	FT
Average Ground at Pond Site =	34.0	FT
Actual Depth of Treatment and Attenuation =	1.0	FT
Pond Bottom Elevation =	32.7	FT

BASIN 34

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**0.41**	**AC-FT**	
Square dimension at bottom of treatment depth	160.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	165.3	FT	
Square dimension at top of attenuation depth	168.0	FT	
Attenuation Volume provided by attenuation depth	**0.62**	**AC-FT**	
Square dimension at top of freeboard	176.0	FT	
Square dimension at top berm	216.0	FT	
Outside pond dimensions (including tie-down)	218.9	FT	

Minimum Total Area Required: **1.33 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 34 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 32.73 ft
Estimated Low Edge of Pavement = 35.50 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
32.73	25600.0	0.59	0.0	0.0	0.00	
33.40	27335.1	0.63	17645.0	17645.0	0.41	*TV*
33.73	28224.0	0.65	9259.9	26904.9	0.62	*AV*
34.73	30976.0	0.71	29600.0	56504.9	1.30	
34.73	46656.0	1.07	0.0	56504.9	1.30	*Top of Berm*
34.00	57990.4	1.33	--	--	--	

Required Treatment Volume = 0.39 ac-ft
Provided Treatment Volume = 0.41 ac-ft ✓

Required Attenuation Volume = 0.20 ac-ft
Provided Attenuation Volume = 0.21 ac-ft ✓

BASIN 35

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.71 acres	98	168
Shoulders	--	--	0.41 acres	98	40
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.00 acres	98	0
Grass (Offsite)	7	B/D	10.75 acres	80	860
Grass	7	B/D	6.88 acres	80	550
		Totals:	19.75 acres		1618

Pre-Condition Composite Curve Number: 81.9

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 81.9

Drainage Area (A) = 19.75 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 2.21 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.04 IN

Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 11.58 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.75 acres	98	270
Shoulders	--	--	1.02 acres	98	100
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.35 acres	98	34
Grass (Offsite)	7	B/D	5.50 acres	80	440
Sod	7	B/D	6.48 acres	80	518
		Totals:	16.10 acres		1362

Post-Condition Composite Curve Number: 84.6

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN

CN = 84.6

Drainage Area (A) = 16.10 AC

Potential maximum retention after runoff begins (S) and S is:

(S) = 1000/CN-10 = 1.82 IN

Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.37 IN

Post-Condition Runoff Volume (V_{POST}) = A x Q = 9.88 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.00 AC-FT

BASIN 35

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	1.04	ACRES
TOTAL BASIN AREA =	16.10	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	1.04 acres =	0.22	AC-FT	
1 inch/12 ft	x	16.10 acres =	**1.34**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee

NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

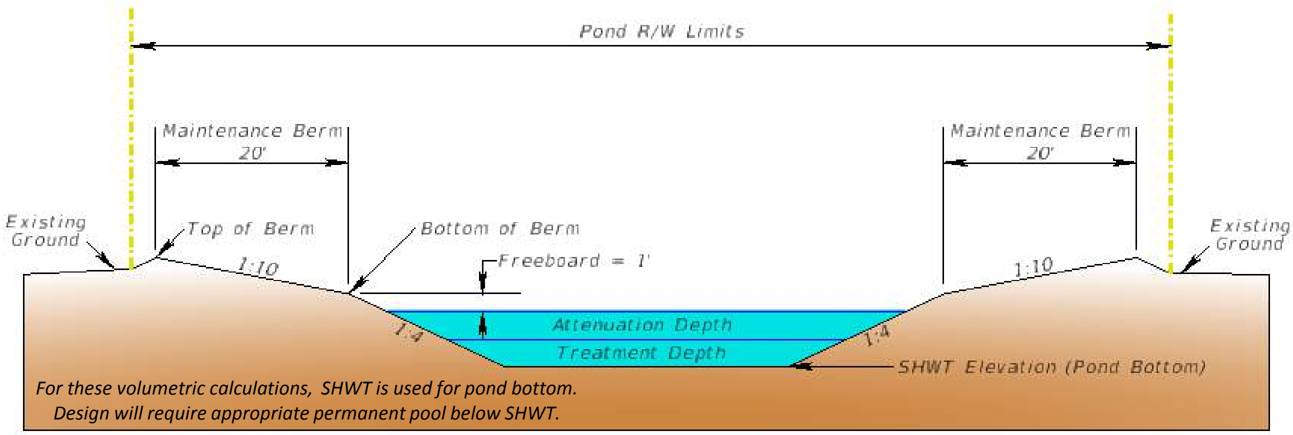
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	34.0	FT	
SHWT EL =	32.7	FT	(FROM SFWMD ERP 11-00805-S)

AT ROADWAY:

LOW EOP EL =	35.5	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.6	FT	= 19.59 in
Treatment Depth =	18	in	
Attenuation Depth =	0	in	

Approx. low edge of pavement elevation (LEOP) =	35.5	FT
Approx. Proposed Top of Berm elevation =	35.2	FT
Average Ground at Pond Site =	34.0	FT
Actual Depth of Treatment and Attenuation =	1.5	FT
Pond Bottom Elevation =	32.7	FT

BASIN 35

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**3.26**	**AC-FT**	
Square dimension at bottom of treatment depth	200.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	212.0	FT	
Square dimension at top of attenuation depth	212.0	FT	
Attenuation Volume provided by attenuation depth	**3.26**	**AC-FT**	
Square dimension at top of freeboard	220.0	FT	
Square dimension at top berm	260.0	FT	
Outside pond dimensions (including tie-down)	264.9	FT	
Minimum Total Area Required:	**1.95**	**ACRES**	

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 35 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 32.73 ft
Estimated Low Edge of Pavement = 35.50 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
30.73	38416.0	0.88	0.0	0.0	0.00	
32.73	40000.0	0.92	78416.0	78416.0	1.80	*PPV*
34.23	44944.0	1.03	63708.0	142124.0	3.26	*TV*
34.23	44944.0	1.03	0.0	142124.0	3.26	*AV*
35.23	48400.0	1.11	46672.0	188796.0	4.33	
35.23	67600.0	1.55	0.0	188796.0	4.33	*Top of Berm*
34.00	84921.0	1.95	--	--	--	

Required Treatment Volume = 1.34 ac-ft
Provided Treatment Volume = 1.46 ac-ft ✓

Required Attenuation Volume = 0.00 ac-ft
Provided Attenuation Volume = 0.00 ac-ft ✓

BASIN 36

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.55 acres	98	152
Shoulders	--	--	0.52 acres	98	51
Driveways	--	--	0.03 acres	98	3
Sidewalk	--	--	0.00 acres	98	0
Grass	8, 15, 17	A, A/D	10.80 acres	80	864
		Totals:	12.90 acres		1070

Pre-Condition Composite Curve Number: 82.9

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 82.9
Drainage Area (A) = 12.90 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.06 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.16 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 7.70 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.76 acres	98	172
Shoulders	--	--	0.51 acres	98	50
Driveways	--	--	0.08 acres	98	8
Sidewalk	--	--	0.74 acres	98	73
Pond	--	--	2.41 acres	100	241
Sod	8, 15, 17	A, A/D	8.10 acres	80	648
		Totals:	13.60 acres		1192

Post-Condition Composite Curve Number: 87.6

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.6
Drainage Area (A) = 13.60 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.41 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.74 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 8.77 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 1.07 AC-FT

BASIN 36

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	0.21	ACRES
TOTAL BASIN AREA =	13.60	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	0.21 acres =	0.04	AC-FT	
1 inch/12 ft	x	13.60 acres =	**1.13**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 17 - Basinger

NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

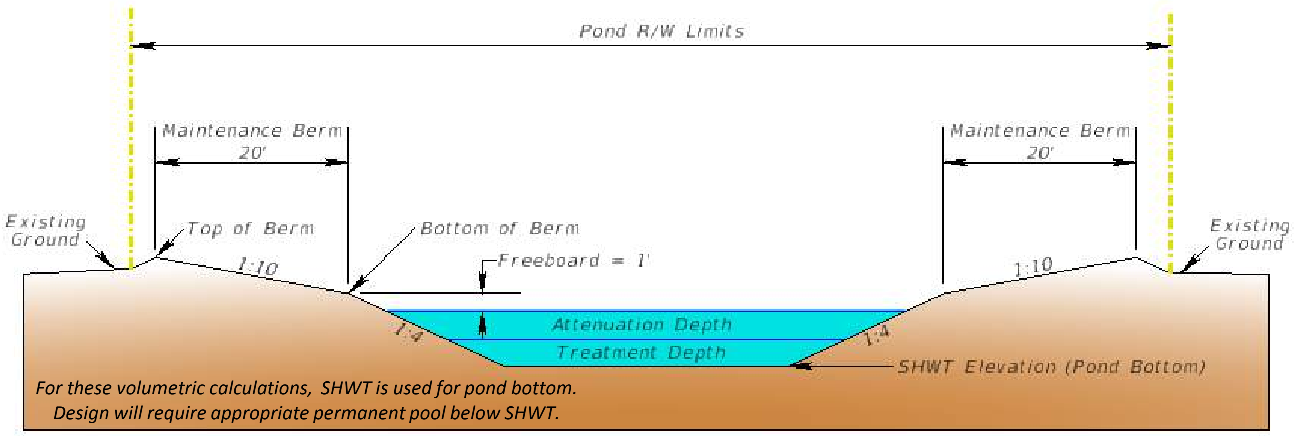
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	34.0	FT	
SHWT EL =	33.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	36.0	FT



Conveyance loss to outfall =	0.2	FT	
Available depth for treatment and attenuation =	1.8	FT	= 21.57 in
Treatment Depth =	11.5	in	
Attenuation Depth =	10	in	

Approx. low edge of pavement elevation (LEOP) =	36.0	FT
Approx. Proposed Top of Berm elevation =	35.8	FT
Average Ground at Pond Site =	34.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	33.0	FT

BASIN 36

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**3.44**	**AC-FT**	
Square dimension at bottom of treatment depth	225.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	232.7	FT	
Square dimension at top of attenuation depth	239.3	FT	
Attenuation Volume provided by attenuation depth	**4.50**	**AC-FT**	
Square dimension at top of freeboard	247.3	FT	
Square dimension at top berm	287.3	FT	
Outside pond dimensions (including tie-down)	294.5	FT	

Minimum Total Area Required: **2.41** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 36 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 33.00 ft
Estimated Low Edge of Pavement = 36.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
31.00	48841.0	1.12	0.0	0.0	0.00	
33.00	50625.0	1.16	99466.0	99466.0	2.28	*PPV*
33.96	54133.8	1.24	50196.9	149662.9	3.44	*TV*
34.79	57280.4	1.31	46422.6	196085.5	4.50	*AV*
35.79	61173.8	1.40	59227.1	255312.6	5.86	
35.79	82560.4	1.90	0.0	255312.6	5.86	*Top of Berm*
34.00	104943.6	2.41	--	--	--	

Required Treatment Volume = 1.13 ac-ft
Provided Treatment Volume = 1.15 ac-ft ✓

Required Attenuation Volume = 1.07 ac-ft
Provided Attenuation Volume = 1.07 ac-ft ✓

BASIN 37

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	0.00 acres	98	0
Pasture land, good condition	7, 15, 17	B/D, A, A/D	28.70 acres	80	2296
		Totals:	28.70 acres		2296

Pre-Condition Composite Curve Number: 80.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 80.0
Drainage Area (A) = 28.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.50 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 6.80 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 16.25 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	5.22 acres	98	512
Shoulders	--	--	2.03 acres	98	199
Sidewalk	--	--	0.00 acres	98	0
Pond	--	--	3.60 acres	100	360
Open Spaces (Sod)	7, 15, 16	B/D, A, A/D	17.85 acres	80	1428
		Totals:	28.70 acres		2499

Post-Condition Composite Curve Number: 87.1

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.1
Drainage Area (A) = 28.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.49 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.67 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 18.34 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 2.09 AC-FT

BASIN 37

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	5.22	ACRES
TOTAL BASIN AREA =	28.70	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	5.22 acres =	1.09	AC-FT	
1 inch/12 ft x	28.70 acres =	**2.39**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 15 - Pomello

NRCS HIGH WATER DEPTH: 2.0-3.5 FT (FROM COLLIER COUTY SOIL SURVEY)

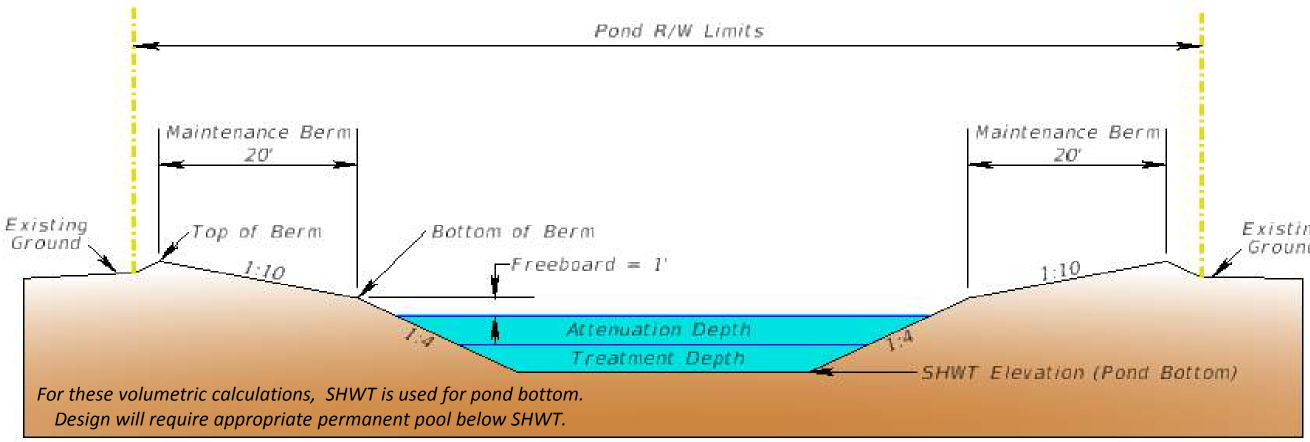
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	34.0	FT	
SHWT EL =	32.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	36.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	2.9	FT	= 34.35 in
Treatment Depth =	15	in	
Attenuation Depth =	13	in	
Approx. low edge of pavement elevation (LEOP) =	36.0	FT	
Approx. Proposed Top of Berm elevation =	35.3	FT	
Average Ground at Pond Site =	34.0	FT	
Actual Depth of Treatment and Attenuation =	2.3	FT	
Pond Bottom Elevation =	32.0	FT	

BASIN 37

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**6.09**	**AC-FT**	
Square dimension at bottom of treatment depth	285.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	295.0	FT	
Square dimension at top of attenuation depth	303.7	FT	
Attenuation Volume provided by attenuation depth	**8.32**	**AC-FT**	
Square dimension at top of freeboard	311.7	FT	
Square dimension at top berm	351.7	FT	
Outside pond dimensions (including tie-down)	357.0	FT	

Minimum Total Area Required: **3.54 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 37 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 32.00 ft
Estimated Low Edge of Pavement = 36.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
30.00	78961.0	1.81	0.0	0.0	0.00	
32.00	81225.0	1.86	160186.0	160186.0	3.68	*PPV*
33.25	87025.0	2.00	105156.3	265342.3	6.09	*TV*
34.33	92213.4	2.12	97087.5	362429.7	8.32	*AV*
35.33	97136.1	2.23	94674.8	457104.5	10.49	
35.33	123669.4	2.84	0.0	457104.5	10.49	*Top of Berm*
34.00	154213.3	3.54	--	--	--	

Required Treatment Volume = 2.39 ac-ft
Provided Treatment Volume = 2.41 ac-ft ✓

Required Attenuation Volume = 2.09 ac-ft
Provided Attenuation Volume = 2.23 ac-ft ✓

BASIN 38

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.50 acres	98	147
Shoulders	--	--	0.33 acres	98	32
Driveways	--	--	0.00 acres	98	0
Sidewalk	--	--	0.00 acres	98	0
Grass	7, 17	A/D, B/D	7.57 acres	80	606
		Totals:	9.40 acres		785

Pre-Condition Composite Curve Number: 83.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.5
Drainage Area (A) = 9.40 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.98 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.23 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.66 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.43 acres	98	238
Shoulders	--	--	1.15 acres	98	113
Driveways	--	--	0.06 acres	98	6
Sidewalk	--	--	0.46 acres	98	45
Sod	7, 17	A/D, B/D	5.30 acres	80	424
		Totals:	9.40 acres		826

Post-Condition Composite Curve Number: 87.9

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.9
Drainage Area (A) = 9.40 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.38 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.77 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.08 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.42 AC-FT

BASIN 38

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	0.93	ACRES
TOTAL BASIN AREA =	9.40	ACRES

TREATMENT VOLUME REQUIRED:

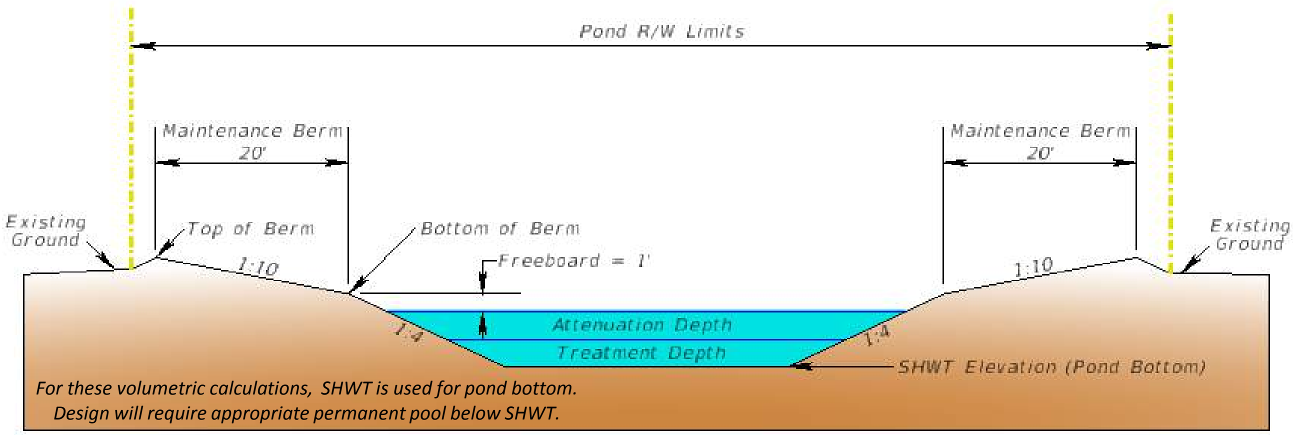
2.5 inches/12 ft	x	0.93 acres =	0.19	AC-FT	
1 inch/12 ft	x	9.40 acres =	**0.78**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND:	17 - Basinger	
NRCS HIGH WATER TABLE DEPTH:	0-1.0	FT (FROM COLLIER COUTY SOIL SURVEY)

VERTICAL LIMITATIONS:

AT POND SITE:			
AVERAGE NATURAL GROUND EL =	34.0	FT	
SHWT EL =	33.0	FT	(FROM COLLIER COUTY SOIL SURVEY)
AT ROADWAY:			
LOW EOP EL =	36.0	FT	



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	14	in	
Attenuation Depth =	7	in	

Approx. low edge of pavement elevation (LEOP) =	36.0	FT
Approx. Proposed Top of Berm elevation =	35.8	FT
Average Ground at Pond Site =	34.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	33.0	FT

BASIN 38

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**2.11**	**AC-FT**	
Square dimension at bottom of treatment depth	170.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	179.3	FT	
Square dimension at top of attenuation depth	184.0	FT	
Attenuation Volume provided by attenuation depth	**2.56**	**AC-FT**	
Square dimension at top of freeboard	192.0	FT	
Square dimension at top berm	232.0	FT	
Outside pond dimensions (including tie-down)	239.0	FT	

Minimum Total Area Required: **1.59 ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 38 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 33.00 ft
Estimated Low Edge of Pavement = 36.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
31.00	27556.0	0.63	0.0	0.0	0.00	
33.00	28900.0	0.66	56456.0	56456.0	1.30	*PPV*
34.17	32160.4	0.74	35618.6	92074.6	2.11	*TV*
34.75	33856.0	0.78	19254.8	111329.4	2.56	*AV*
35.75	36864.0	0.85	35360.0	146689.4	3.37	
35.75	53824.0	1.24	0.0	146689.4	3.37	*Top of Berm*
34.00	69116.4	1.59	--	--	--	

Required Treatment Volume = 0.78 ac-ft
Provided Treatment Volume = 0.81 ac-ft ✓

Required Attenuation Volume = 0.42 ac-ft
Provided Attenuation Volume = 0.45 ac-ft ✓

BASIN 39

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.64 acres	98	161
Shoulders	--	--	0.49 acres	98	48
Driveways	--	--	0.04 acres	98	4
Sidewalk	--	--	0.00 acres	98	0
Grass	7, 16	A/D, B/D	10.53 acres	80	842
		Totals:	12.70 acres		1055

Pre-Condition Composite Curve Number: 83.1

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.1
Drainage Area (A) = 12.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 2.04 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.18 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 7.60 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.98 acres	98	390
Shoulders	--	--	1.16 acres	98	114
Driveways	--	--	0.05 acres	98	5
Sidewalk	--	--	0.62 acres	98	61
Sod	7, 16	A/D, B/D	6.89 acres	80	551
		Totals:	12.70 acres		1121

Post-Condition Composite Curve Number: 88.2

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 88.2
Drainage Area (A) = 12.70 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.33 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.81 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 8.27 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.67 AC-FT

BASIN 39

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	2.34	ACRES
TOTAL BASIN AREA =	12.70	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	2.34 acres =	0.49	AC-FT	
1 inch/12 ft x	12.70 acres =	**1.06**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 7 - Immokalee

NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

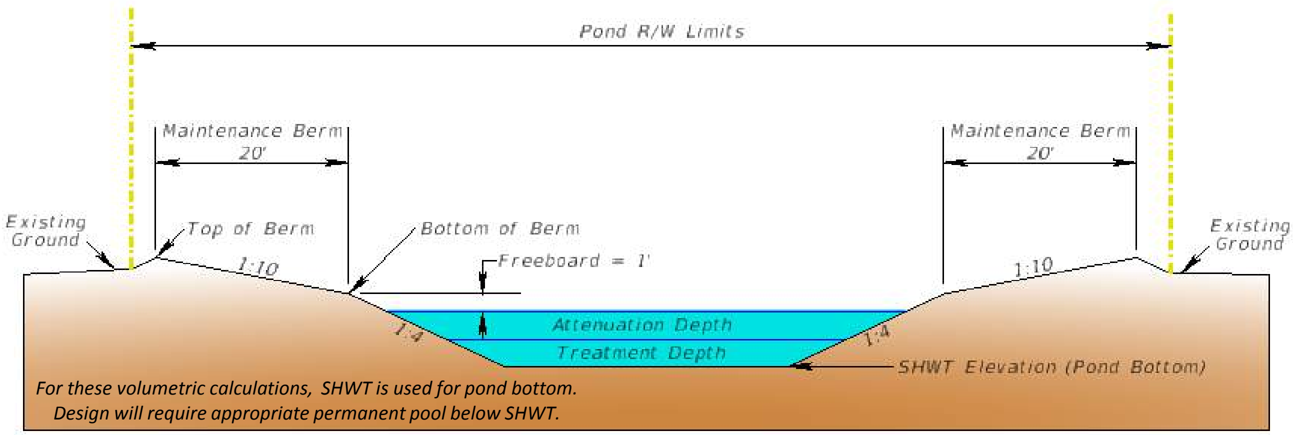
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	35.0	FT	
SHWT EL =	34.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	36.5	FT



Conveyance loss to outfall =	0.3	FT	
Available depth for treatment and attenuation =	1.2	FT	= 14.40 in
Treatment Depth =	8	in	
Attenuation Depth =	5	in	

Approx. low edge of pavement elevation (LEOP) =	36.5	FT
Approx. Proposed Top of Berm elevation =	36.1	FT
Average Ground at Pond Site =	35.0	FT
Actual Depth of Treatment and Attenuation =	1.1	FT
Pond Bottom Elevation =	34.0	FT

BASIN 39

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**4.11**	**AC-FT**	
Square dimension at bottom of treatment depth	260.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	265.3	FT	
Square dimension at top of attenuation depth	268.7	FT	
Attenuation Volume provided by attenuation depth	**4.79**	**AC-FT**	
Square dimension at top of freeboard	276.7	FT	
Square dimension at top berm	316.7	FT	
Outside pond dimensions (including tie-down)	321.0	FT	

Minimum Total Area Required: **2.86** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 39 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 34.00 ft
Estimated Low Edge of Pavement = 36.50 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
32.00	65536.0	1.50	0.0	0.0	0.00	
34.00	67600.0	1.55	133136.0	133136.0	3.06	*PPV*
34.67	70401.8	1.62	46000.6	179136.6	4.11	*TV*
35.08	72181.8	1.66	29704.9	208841.5	4.79	*AV*
36.08	76544.4	1.76	74363.1	283204.6	6.50	
36.08	100277.8	2.30	0.0	283204.6	6.50	*Top of Berm*
35.00	124679.6	2.86	--	--	--	

Required Treatment Volume = 1.06 ac-ft
Provided Treatment Volume = 1.06 ac-ft ✓

Required Attenuation Volume = 0.67 ac-ft
Provided Attenuation Volume = 0.68 ac-ft ✓

BASIN 40

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	3.10 acres	98	304
Shoulders	--	--	0.79 acres	98	77
Driveways	--	--	0.08 acres	98	8
Sidewalk	--	--	0.00 acres	98	0
Grass	16, 22, 27	A/D, C/D	16.43 acres	80	1314
		Totals:	20.40 acres		1703

Pre-Condition Composite Curve Number: 83.5

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 83.5
Drainage Area (A) = 20.40 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.98 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.23 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 12.29 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	5.93 acres	98	581
Shoulders	--	--	1.81 acres	98	177
Driveways	--	--	0.04 acres	98	4
Sidewalk	--	--	0.72 acres	98	71
Sod	16, 22, 27	A/D, C/D	11.90 acres	80	952
		Totals:	20.40 acres		1785

Post-Condition Composite Curve Number: 87.5

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 87.5
Drainage Area (A) = 20.40 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.43 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.72 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 13.13 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.84 AC-FT

BASIN 40

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	2.83	ACRES
TOTAL BASIN AREA =	20.40	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft x	2.83 acres =	0.59	AC-FT	
1 inch/12 ft x	20.40 acres =	**1.70**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND:	16 - Oldsmar	
NRCS HIGH WATER TABLE DEPTH:	0-1.0	FT (FROM COLLIER COUTY SOIL SURVEY)

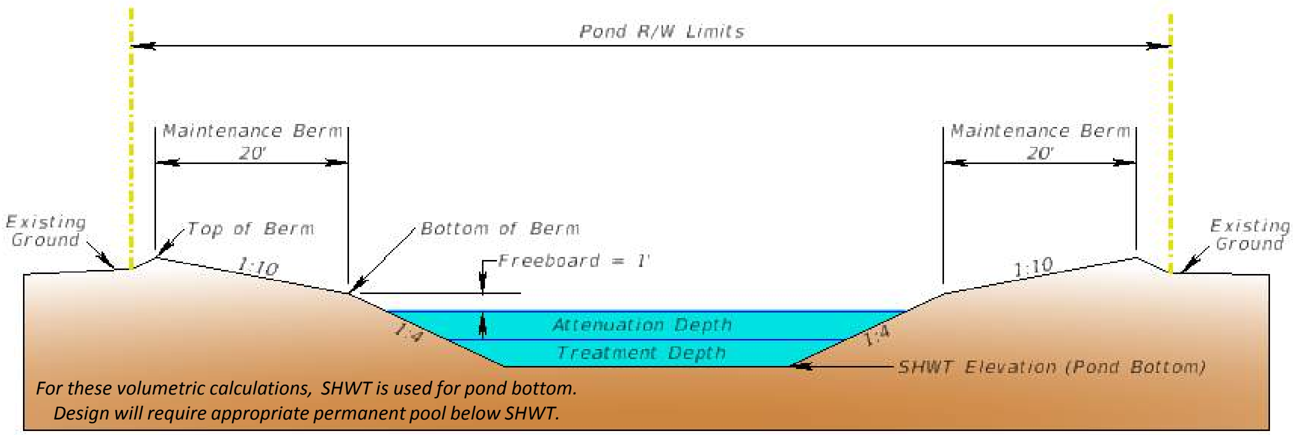
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	36.0	FT	
SHWT EL =	35.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	38.0	FT



Conveyance loss to outfall =	0.1	FT	
Available depth for treatment and attenuation =	1.9	FT	= 22.35 in
Treatment Depth =	15	in	
Attenuation Depth =	7	in	

Approx. low edge of pavement elevation (LEOP) =	38.0	FT
Approx. Proposed Top of Berm elevation =	37.8	FT
Average Ground at Pond Site =	36.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	35.0	FT

BASIN 40

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**4.32**	**AC-FT**	
Square dimension at bottom of treatment depth	240.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	250.0	FT	
Square dimension at top of attenuation depth	254.7	FT	
Attenuation Volume provided by attenuation depth	**5.18**	**AC-FT**	
Square dimension at top of freeboard	262.7	FT	
Square dimension at top berm	302.7	FT	
Outside pond dimensions (including tie-down)	310.0	FT	

Minimum Total Area Required: **2.67** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 40 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 35.00 ft
Estimated Low Edge of Pavement = 38.00 ft

Elevation	Area	Area	Acumulated Volume	Total Volume	Total Volume	REMARKS
(ft)	(sf)	(ac)	(cf)	(cf)	(ac-ft)	
33.00	55696.0	1.28	0.0	0.0	0.00	
35.00	57600.0	1.32	113296.0	113296.0	2.60	*PPV*
36.25	62500.0	1.43	75062.5	188358.5	4.32	*TV*
36.83	64855.1	1.49	37145.2	225503.7	5.18	*AV*
37.83	68993.8	1.58	66924.4	292428.2	6.71	
37.83	91607.1	2.10	0.0	292428.2	6.71	*Top of Berm*
36.00	116281.0	2.67	--	--	--	

Required Treatment Volume = 1.70 ac-ft
Provided Treatment Volume = 1.72 ac-ft ✓

Required Attenuation Volume = 0.84 ac-ft
Provided Attenuation Volume = 0.86 ac-ft ✓

BASIN 41

Curve Number and Runoff Volume Calculation (SFWMD 25YR/3DAY)

Pre-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	1.61 acres	98	158
Shoulders	--	--	0.48 acres	98	47
Driveways	--	--	0.07 acres	98	7
Sidewalk	--	--	0.00 acres	98	0
Grass	16, 22	A/D, C/D	7.64 acres	80	611
		Totals:	9.80 acres		823

Pre-Condition Composite Curve Number: 84.0

Pre-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 84.0
Drainage Area (A) = 9.80 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.91 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.29 IN
Pre-Condition Runoff Volume (V_{PRE}) = A x Q = 5.95 AC-FT

Post-Condition Curve Number Calculation

Land Use Description	Soil Map Unit	Hydrologic Group	Area	CN	Product
Impervious Roadway	--	--	2.23 acres	98	219
Shoulders	--	--	0.50 acres	98	49
Driveways	--	--	0.05 acres	98	5
Sidewalk	--	--	0.00 acres	98	0
Sod	16, 22	A/D, C/D	7.02 acres	80	562
		Totals:	9.80 acres		834

Post-Condition Composite Curve Number: 85.1

Post-Condition Runoff Volume Calculation

25-yr/3-day Rainfall Depth (P) = 9.24 IN
CN = 85.1
Drainage Area (A) = 9.80 AC
Potential maximum retention after runoff begins (S) and S is:
(S) = 1000/CN-10 = 1.75 IN
Runoff Depth (Q) = (P-0.2S)^2/(P+0.8S) = 7.43 IN
Post-Condition Runoff Volume (V_{POST}) = A x Q = 6.07 AC-FT

Required Attenuation Volume = V_{POST} - V_{PRE} = 0.12 AC-FT

BASIN 41

TREATMENT VOLUME CALCULATION

NEW ROADWAY IMPERVIOUS AREA =	0.62	ACRES
TOTAL BASIN AREA =	9.80	ACRES

TREATMENT VOLUME REQUIRED:

2.5 inches/12 ft	x	0.62 acres =	0.13	AC-FT	
1 inch/12 ft	x	9.80 acres =	**0.82**	**AC-FT**	← **CONTROLS**

POND SIZE ESTIMATION

NRCS SOILS AT POND: 17 - Basinger

NRCS HIGH WATER TABLE DEPTH: 0-1.0 FT (FROM COLLIER COUTY SOIL SURVEY)

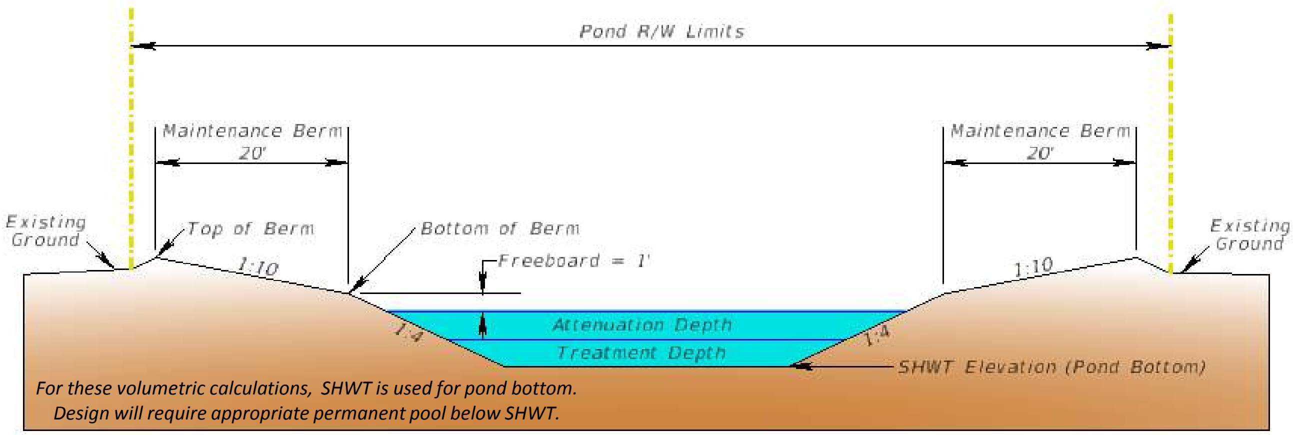
VERTICAL LIMITATIONS:

AT POND SITE:

AVERAGE NATURAL GROUND EL =	36.0	FT	
SHWT EL =	35.0	FT	(FROM COLLIER COUTY SOIL SURVEY)

AT ROADWAY:

LOW EOP EL =	38.0	FT



Conveyance loss to outfall =	0.2	FT	
Available depth for treatment and attenuation =	1.8	FT	= 21.78 in
Treatment Depth =	18	in	
Attenuation Depth =	3	in	

Approx. low edge of pavement elevation (LEOP) =	38.0	FT
Approx. Proposed Top of Berm elevation =	37.8	FT
Average Ground at Pond Site =	36.0	FT
Actual Depth of Treatment and Attenuation =	1.8	FT
Pond Bottom Elevation =	35.0	FT

BASIN 41

POND SIZE ESTIMATION (CONTIN.)

Treatment Volume provided by treatment depth	**1.85**	**AC-FT**	
Square dimension at bottom of treatment depth	150.0	FT	(minimum 148' to achieve 0.5 acre)
Square dimension at top of treatment depth	162.0	FT	
Square dimension at top of attenuation depth	164.0	FT	
Attenuation Volume provided by attenuation depth	**2.00**	**AC-FT**	
Square dimension at top of freeboard	172.0	FT	
Square dimension at top berm	212.0	FT	
Outside pond dimensions (including tie-down)	219.0	FT	

Minimum Total Area Required: **1.33** **ACRES**

THE POND SIZE INCLUDES A 10% SAFETY FACTOR FOR BOTH LENGTH & WIDTH

POND 41 STAGE-STORAGE CALCULATIONS

Estimated Seasonal High Water Table (SHWT) = 35.00 ft
Estimated Low Edge of Pavement = 38.00 ft

Elevation (ft)	Area (sf)	Area (ac)	Acumulated Volume (cf)	Total Volume (cf)	Total Volume (ac-ft)	REMARKS
33.00	21316.0	0.49	0.0	0.0	0.00	
35.00	22500.0	0.52	43816.0	43816.0	1.01	*PPV*
36.50	26244.0	0.60	36558.0	80374.0	1.85	*TV*
36.75	26896.0	0.62	6642.5	87016.5	2.00	*AV*
37.75	29584.0	0.68	28240.0	115256.5	2.65	
37.75	44944.0	1.03	0.0	115256.5	2.65	*Top of Berm*
36.00	58032.8	1.33	--	--	--	

Required Treatment Volume = 0.82 ac-ft
Provided Treatment Volume = 0.84 ac-ft ✓

Required Attenuation Volume = 0.12 ac-ft
Provided Attenuation Volume = 0.15 ac-ft ✓

GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 1

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:

Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data	Red Numbers = Calculated	LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION: A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

COMINGLING | MULTI-LAND USE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs] | max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 1

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	9.280	AC
Total post-development catchment or for BMP analysis:	10.960	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	15.19	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	29.53	%
Estimated BMP Area (No loading from this area)	1.680	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	10.191	ac-ft/year
Average annual post runoff volume (note no BMP area):	14.494	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	14.956	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.948	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	21.271	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.771	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018	V 8.6	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 1

GO TO STORMWATER TREATMENT ANALYSIS

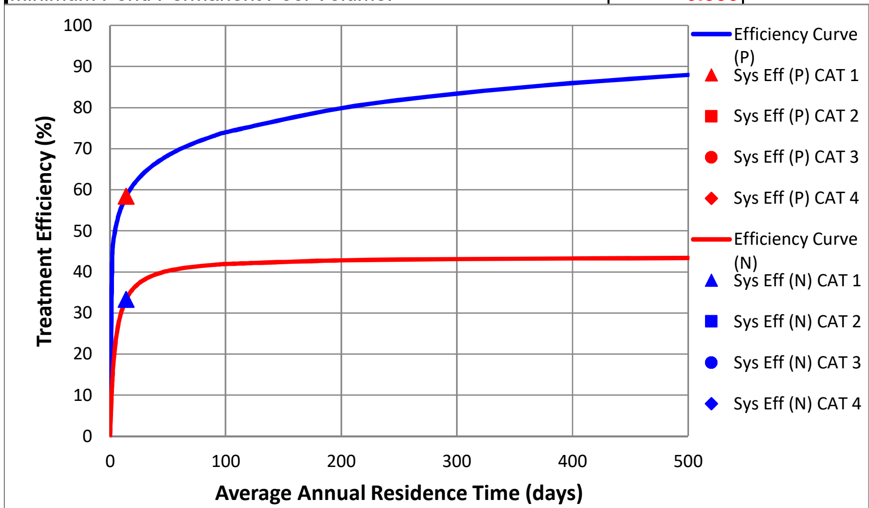
	Pond 1	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	9.280	0.000	0.000	0.000	ac
Total post-development catchment area:	9.280	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	29.689				%
Total **Phosphorus** removal required:	29.689				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorus** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	14.494				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

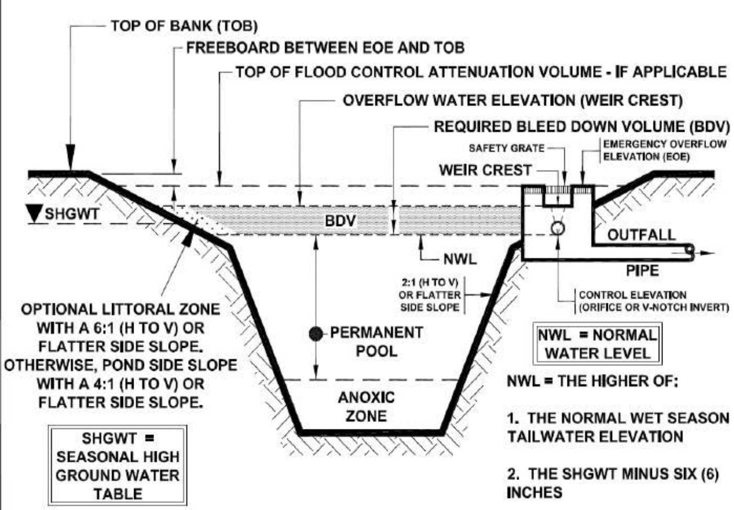
	Pond 1	Catchment 2	Catchment 3	Catchment 4	
Minimum Pond Permanent Pool Volume:	0.556				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 1	Optional Identification		
	Pond 1	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	
Nitrogen Pre Load (kg/yr)	14.96	
Phosphorus Pre Load (kg/yr)	1.95	
Nitrogen Post Load (kg/yr)	21.27	
Phosphorus Post Load (kg/yr)	2.77	
Target Load Reduction (N) %	30	
Target Load Reduction (P) %	30	
Target Discharge Load, N (kg/yr)	14.89	
Target Discharge Load, P (kg/yr)	1.94	
Provided Overall Efficiency, N (%):	33	
Provided Overall Efficiency, P (%):	58	
Discharged Load, N (kg/yr & lb/yr):	14.18	31.24
Discharged Load, P (kg/yr & lb/yr):	1.15	2.54
Load Removed, N (kg/yr & lb/yr):	7.09	15.61
Load Removed, P (kg/yr & lb/yr):	1.62	3.57

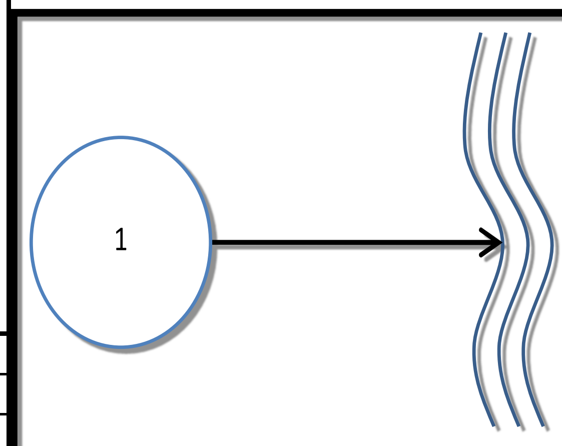
Treatment Objectives or Target for

TN MET

TP MET

5/16/2018

BMPTRAINS MODEL



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 3

HELP Rainfall

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

GO TO WATERSHED CHARACTERISTICS

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
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Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 3

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	2.680	AC
Total post-development catchment or for BMP analysis:	3.860	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	23.88	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	33.21	%
Estimated BMP Area (No loading from this area)	1.180	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	3.692	ac-ft/year
Average annual post runoff volume (note no BMP area):	4.500	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	5.418	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.706	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	6.604	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	0.860	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 3 | GO TO STORMWATER TREATMENT ANALYSIS

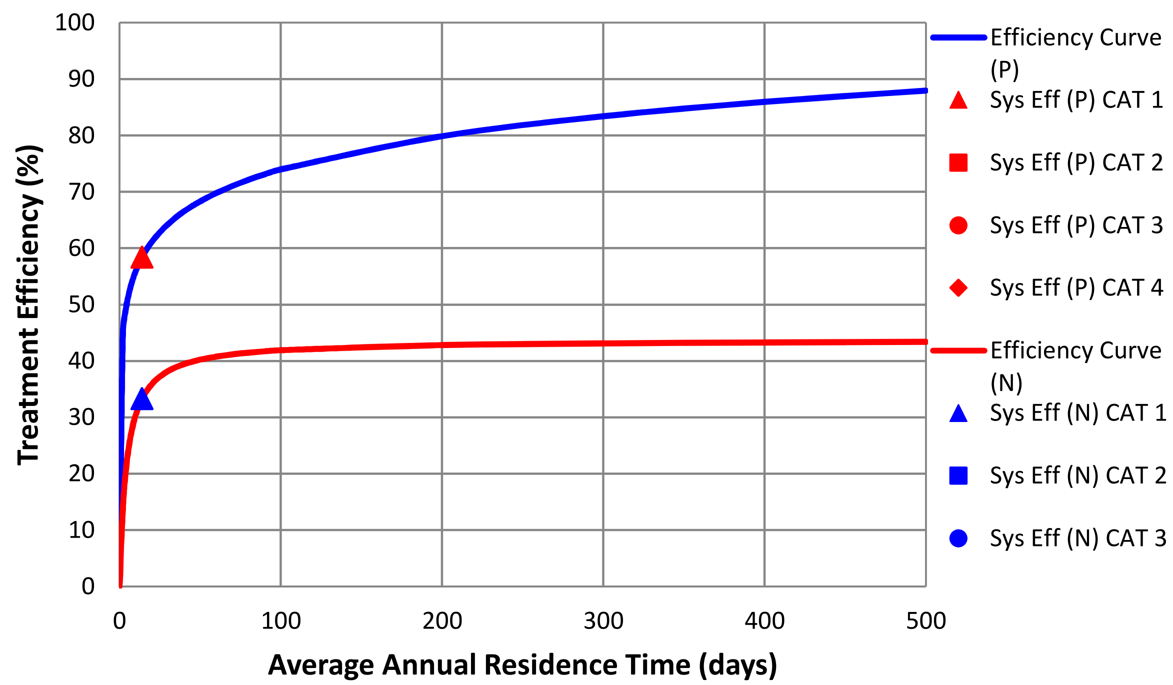
	Pond 3	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	2.680	0.000	0.000	0.000	ac
Total post-development catchment area:	2.680	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	17.969				%
Total **Phosphorus** removal required:	17.969				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	4.500				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

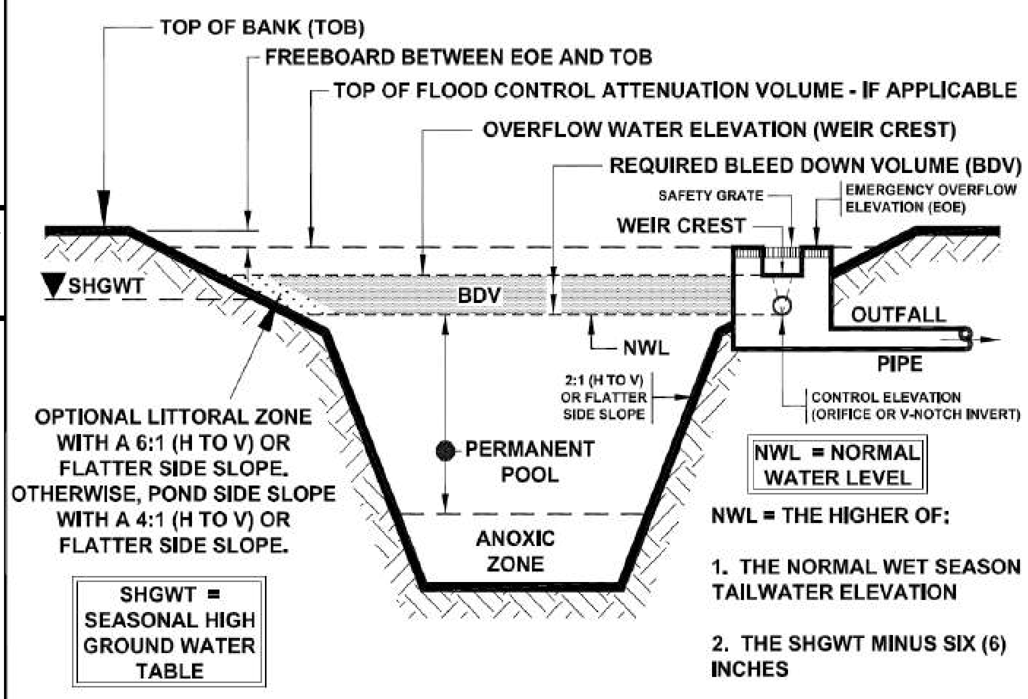
Minimum Pond Permanent Pool Volume:	0.173				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY	V 8.6

CALCULATION METHODS:

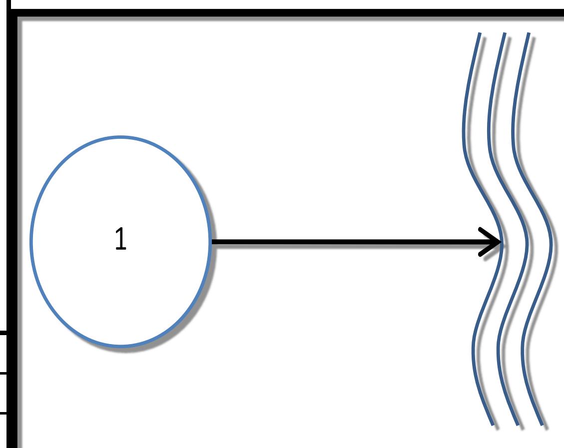
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 3	Optional Identification	

	Pond 3	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	5.42	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	0.71	TN MET	
Nitrogen Post Load (kg/yr)	6.60	TP MET	
Phosphorus Post Load (kg/yr)	0.86		
Target Load Reduction (N) %	18		
Target Load Reduction (P) %	18		
Target Discharge Load, N (kg/yr)	5.42		
Target Discharge Load, P (kg/yr)	0.71		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	4.40	9.70	
Discharged Load, P (kg/yr & lb/yr):	0.36	0.79	
Load Removed, N (kg/yr & lb/yr):	2.20	4.85	
Load Removed, P (kg/yr & lb/yr):	0.50	1.11	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover
Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis	NAME OF PROJECT SR 29 PD&E - Basin 4		HELP Rainfall

VIEW ZONE MAP

	CLICK ON CELL BELOW TO SELECT	
Meteorological Zone (Please use zone map):	Zone 4	
Mean Annual Rainfall (Please use rainfall map):	56.00	Inches
	CLICK ON CELL BELOW TO SELECT	
Type of analysis:	Net improvement	
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):		%

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
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Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 4

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	6.170	AC
Total post-development catchment or for BMP analysis:	7.490	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	16.05	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	34.68	%
Estimated BMP Area (No loading from this area)	1.320	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	6.942	ac-ft/year
Average annual post runoff volume (note no BMP area):	10.649	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	10.188	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.327	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	15.629	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.036	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | **SR 29 PD&E - Basin 4**

GO TO STORMWATER TREATMENT ANALYSIS

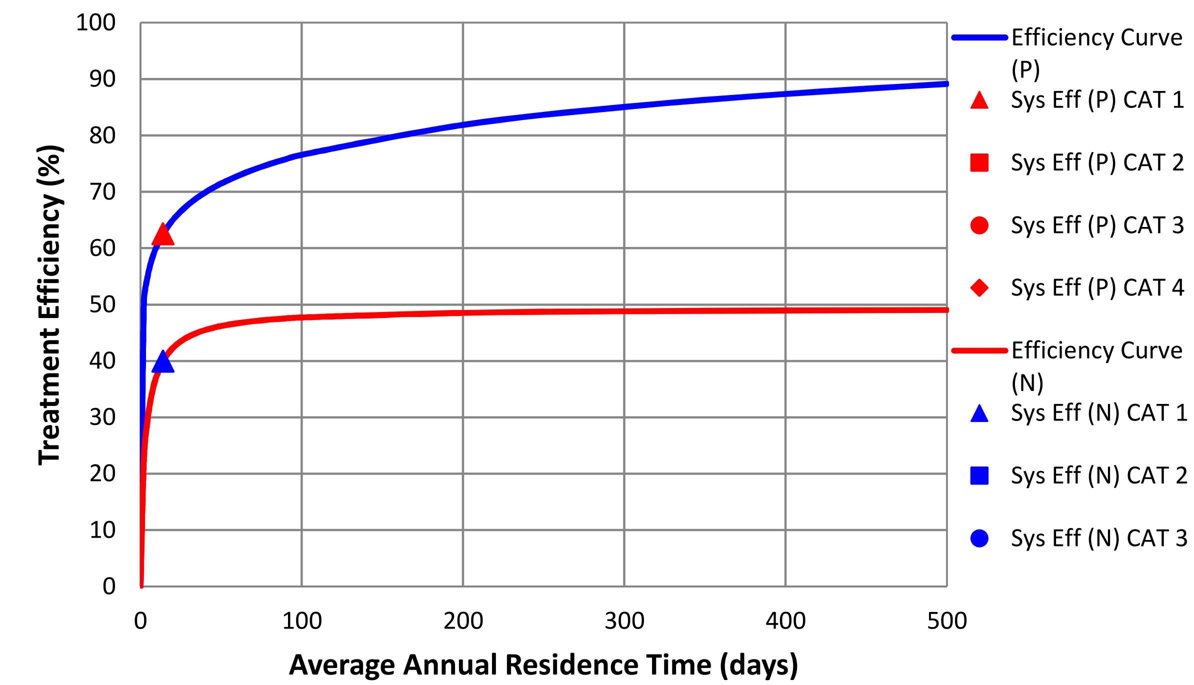
	Pond 4	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	6.170	0.000	0.000	0.000	ac
Total post-development catchment area:	6.170	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	34.809				%
Total **Phosphorus** removal required:	34.809				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	10.649				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

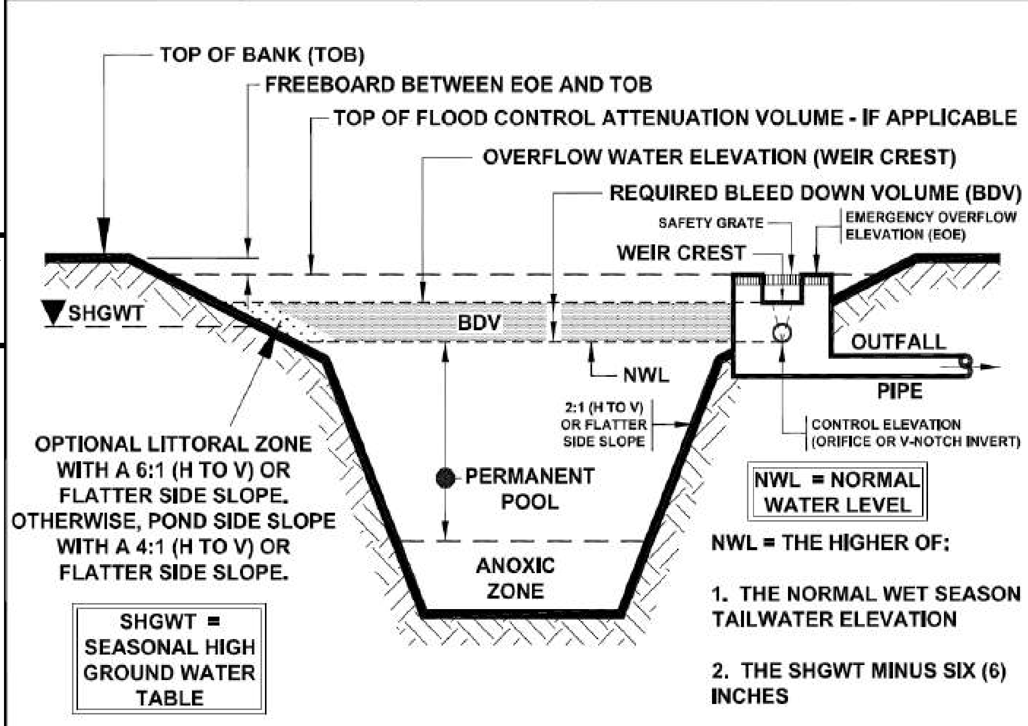
Minimum Pond Permanent Pool Volume:	0.408				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

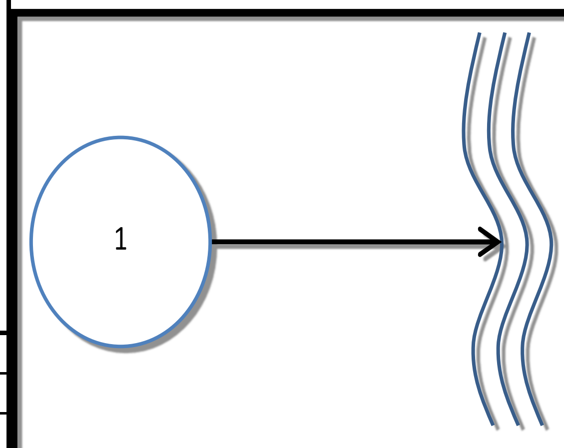
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 4	Optional Identification		
	Pond 4	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	10.19	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	1.33	TN MET	
Nitrogen Post Load (kg/yr)	15.63	TP MET	
Phosphorus Post Load (kg/yr)	2.04		
Target Load Reduction (N) %	35		
Target Load Reduction (P) %	35		
Target Discharge Load, N (kg/yr)	10.16		
Target Discharge Load, P (kg/yr)	1.32		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	9.38	20.66	
Discharged Load, P (kg/yr & lb/yr):	0.76	1.68	
Load Removed, N (kg/yr & lb/yr):	6.25	13.77	
Load Removed, P (kg/yr & lb/yr):	1.27	2.81	



GENERAL SITE INFORMATION: V 8.6

GO TO INTRODUCTION PAGE

5/16/2018

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 5

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 5

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	9.470	AC
Total post-development catchment or for BMP analysis:	11.290	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.31	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	31.26	%
Estimated BMP Area (No loading from this area)	1.820	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	9.817	ac-ft/year
Average annual post runoff volume (note no BMP area):	15.315	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	14.407	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.877	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	22.476	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.928	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS: 5/16/2018 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:

SR 29 PD&E - Basin 5

GO TO STORMWATER TREATMENT ANALYSIS

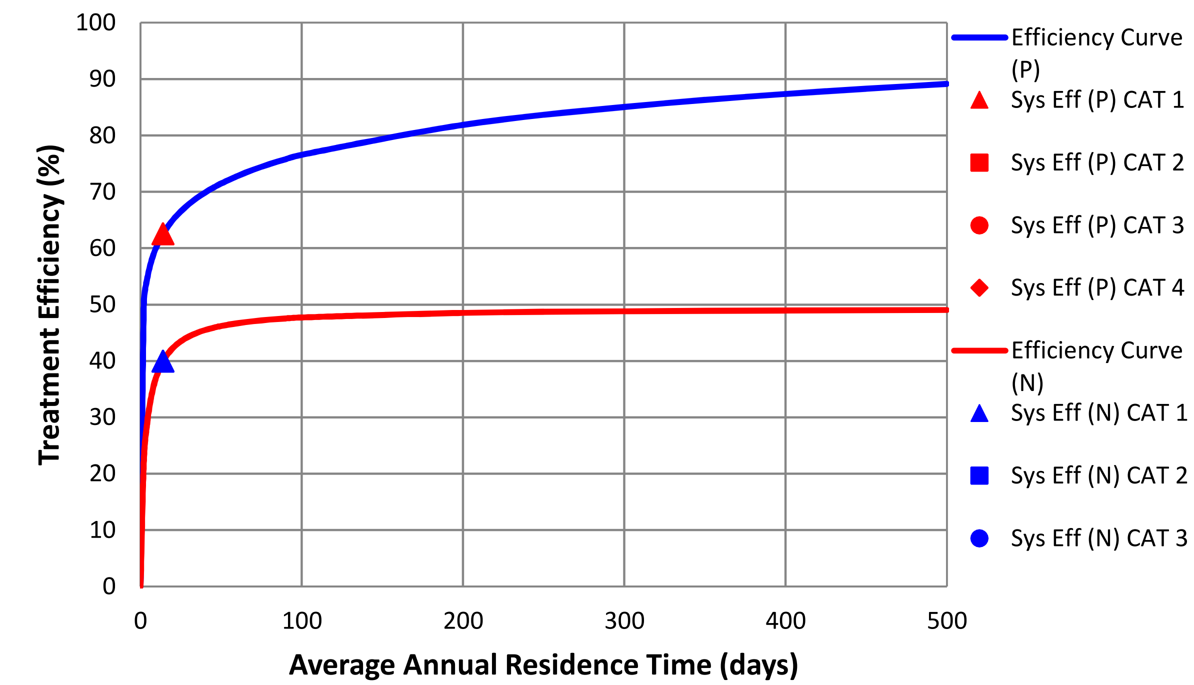
	Pond 5	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	9.470	0.000	0.000	0.000	ac
Total post-development catchment area:	9.470	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	35.900				%
Total **Phosphorus** removal required:	35.900				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	15.315				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

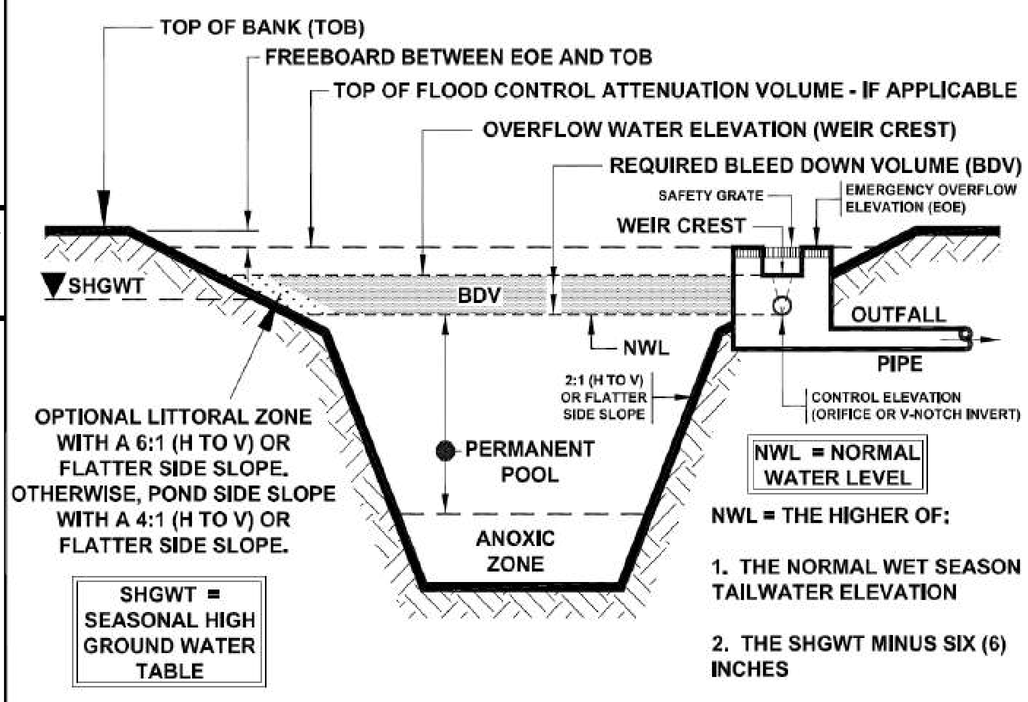
Minimum Pond Permanent Pool Volume:	0.587				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

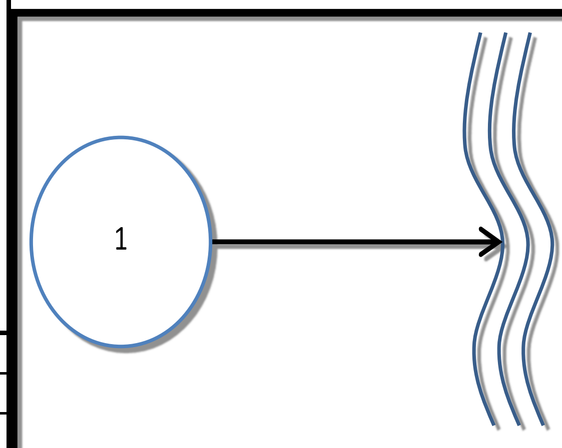
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 5	Optional Identification		
	Pond 5	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for	5/16/2018
Nitrogen Pre Load (kg/yr)	14.41		BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.88		
Nitrogen Post Load (kg/yr)	22.48		
Phosphorus Post Load (kg/yr)	2.93		
Target Load Reduction (N) %	36	TN MET	
Target Load Reduction (P) %	36		
Target Discharge Load, N (kg/yr)	14.38		
Target Discharge Load, P (kg/yr)	1.87	TP MET	
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	13.49	29.71	
Discharged Load, P (kg/yr & lb/yr):	1.10	2.41	
Load Removed, N (kg/yr & lb/yr):	8.99	19.80	
Load Removed, P (kg/yr & lb/yr):	1.83	4.04	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 6

VIEW ZONE MAP

Meteorological Zone (Please use zone map): CLICK ON CELL BELOW TO SELECT — Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

Type of analysis: CLICK ON CELL BELOW TO SELECT — Net improvement

GO TO WATERSHED CHARACTERISTICS

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

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Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

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METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs]

max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 6

	CLICK ON CELL BELOW TO SELECT
Pre-development land use:	Highway: TN=1.520 TP=0.200
with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use:	Highway: TN=1.520 TP=0.200
with default EMCs	

Total pre-development catchment area:	10.650	AC
Total post-development catchment or for BMP analysis:	12.380	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.43	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	34.65	%
Estimated BMP Area (No loading from this area)	1.730	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	11.083	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.369	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	16.265	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.119	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	26.959	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.511	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use:	
with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use:	
with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use:	
with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use:	
with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use:	
with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use:	
with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 6

GO TO STORMWATER TREATMENT ANALYSIS

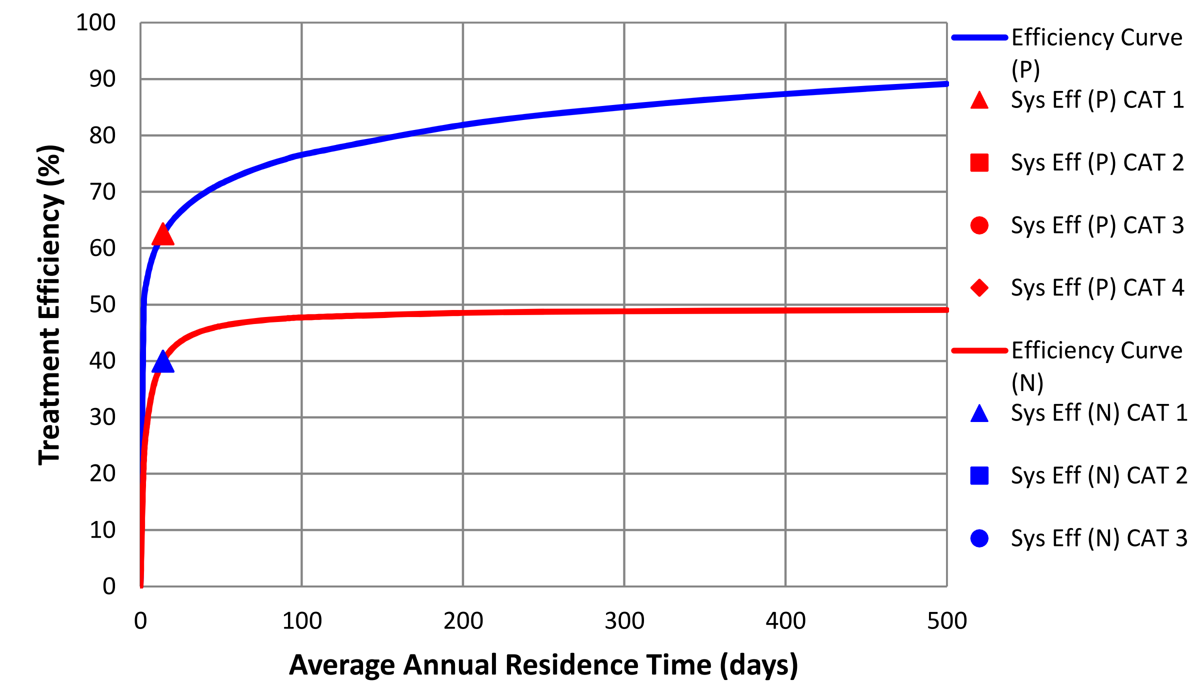
	Pond 6	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	10.650	0.000	0.000	0.000	ac
Total post-development catchment area:	10.650	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	39.668				%
Total **Phosphorus** removal required:	39.668				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	18.369				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

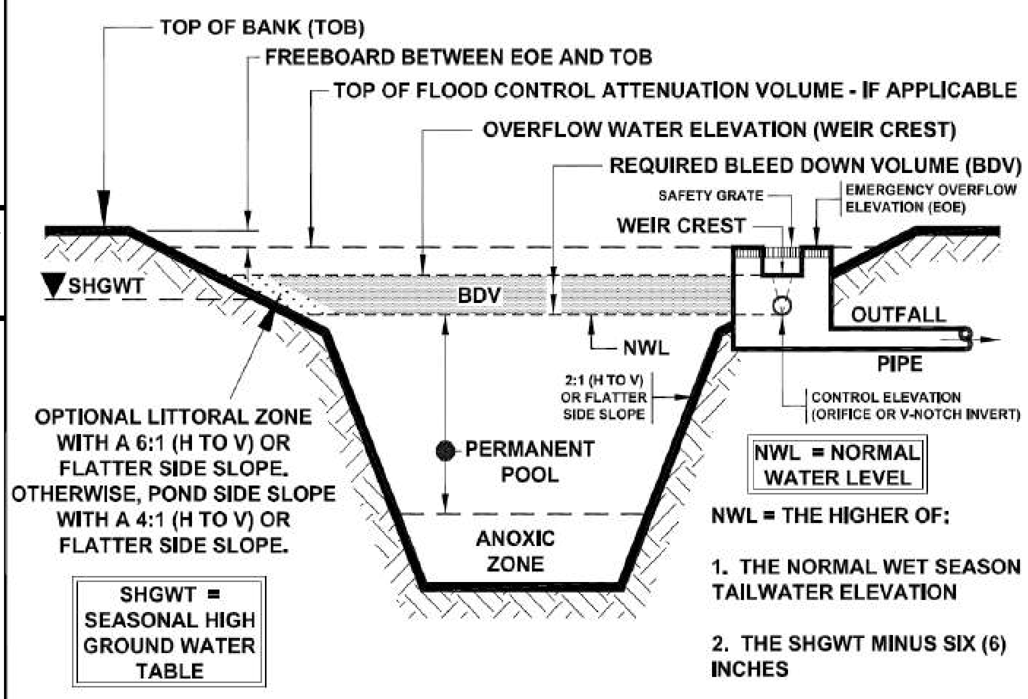
Minimum Pond Permanent Pool Volume:	0.705				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 6	Optional Identification		
	Pond 6	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		
Nitrogen Pre Load (kg/yr)	16.26		
Phosphorus Pre Load (kg/yr)	2.12		
Nitrogen Post Load (kg/yr)	26.96		
Phosphorus Post Load (kg/yr)	3.51		
Target Load Reduction (N) %	40		
Target Load Reduction (P) %	40		
Target Discharge Load, N (kg/yr)	16.18		
Target Discharge Load, P (kg/yr)	2.11		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	16.18	35.63	
Discharged Load, P (kg/yr & lb/yr):	1.31	2.89	
Load Removed, N (kg/yr & lb/yr):	10.78	23.75	
Load Removed, P (kg/yr & lb/yr):	2.20	4.84	

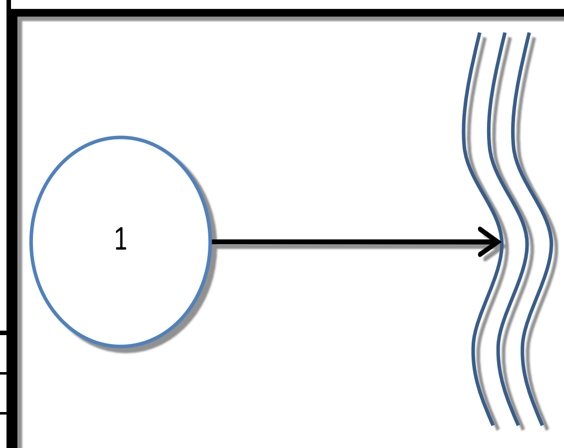
Treatment Objectives or Target for

TN MET

TP MET

5/16/2018

BMPTRAINS MODEL



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 7

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT	
Meteorological Zone (Please use zone map):	Zone 4	
Mean Annual Rainfall (Please use rainfall map):	56.00	Inches
	CLICK ON CELL BELOW TO SELECT	
Type of analysis:	Net improvement	
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):		%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs]

max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 7

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200

Total pre-development catchment area:	6.160	AC
Total post-development catchment or for BMP analysis:	7.420	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.47	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	31.98	%
Estimated BMP Area (No loading from this area)	1.260	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	6.420	ac-ft/year
Average annual post runoff volume (note no BMP area):	10.104	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	9.421	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.227	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	14.828	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	1.931	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:	SR 29 PD&E - Basin 7	GO TO STORMWATER TREATMENT ANALYSIS

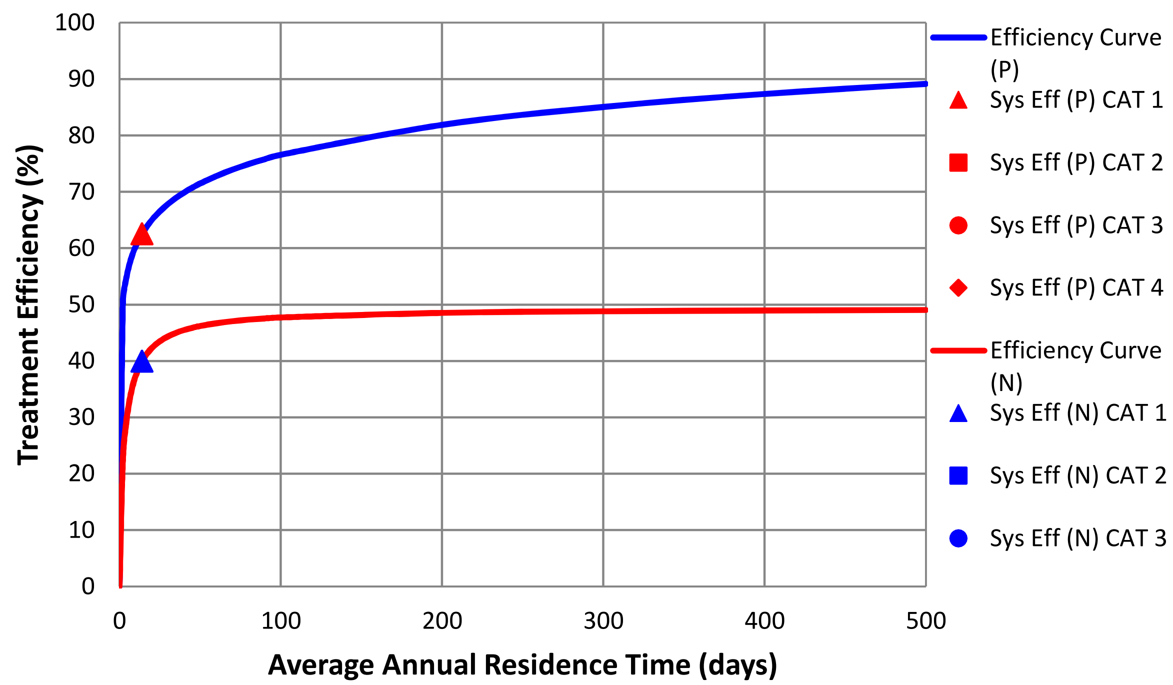
	Pond 7	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	6.160	0.000	0.000	0.000	ac
Total post-development catchment area:	6.160	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	36.461				%
Total **Phosphorus** removal required:	36.461				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	10.104				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

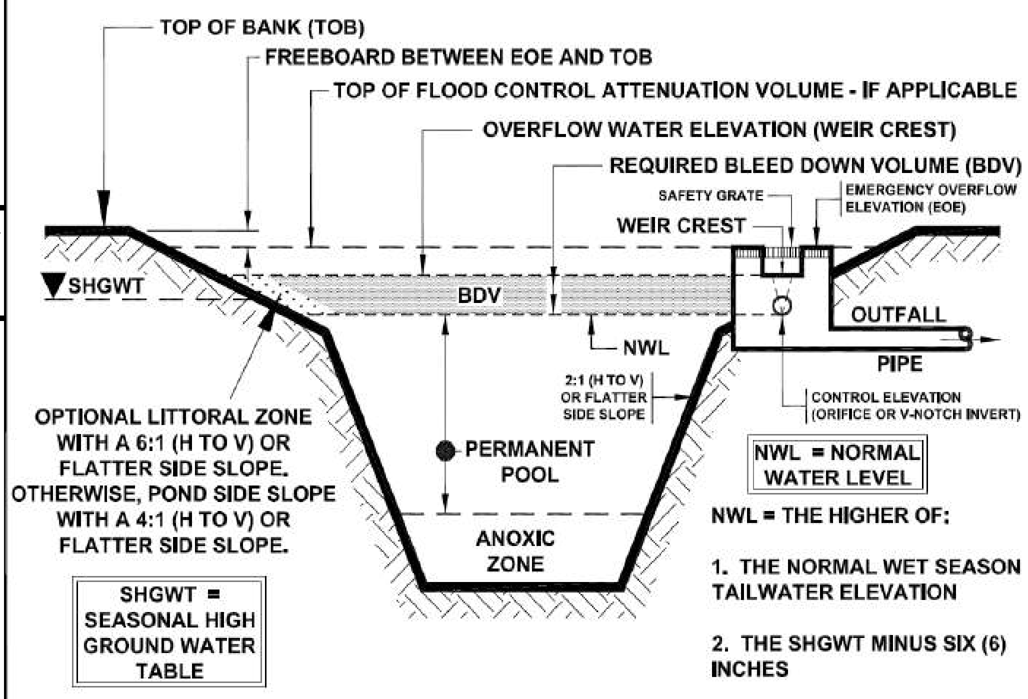
Minimum Pond Permanent Pool Volume:	0.388				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

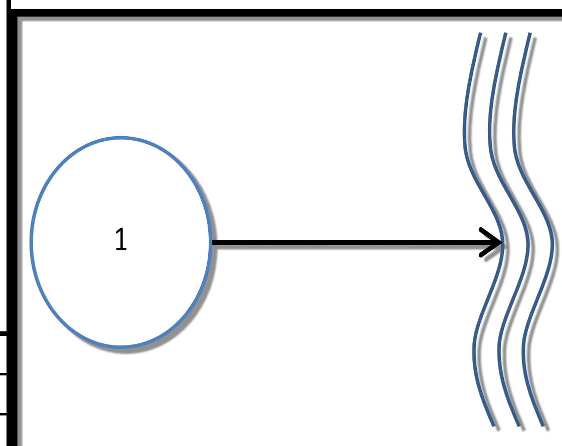
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 7	Optional Identification		
	Pond 7	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	9.42	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.23	TN MET	
Nitrogen Post Load (kg/yr)	14.83	TP MET	
Phosphorus Post Load (kg/yr)	1.93		
Target Load Reduction (N) %	36		
Target Load Reduction (P) %	36		
Target Discharge Load, N (kg/yr)	9.49		
Target Discharge Load, P (kg/yr)	1.24		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	8.90	19.60	
Discharged Load, P (kg/yr & lb/yr):	0.72	1.59	
Load Removed, N (kg/yr & lb/yr):	5.93	13.06	
Load Removed, P (kg/yr & lb/yr):	1.21	2.66	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 8

HELP Rainfall

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 8

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	9.720	AC
Total post-development catchment or for BMP analysis:	11.250	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.58	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	33.64	%
Estimated BMP Area (No loading from this area)	1.530	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	10.163	ac-ft/year
Average annual post runoff volume (note no BMP area):	16.455	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	14.916	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.943	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	24.149	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.145	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | **SR 29 PD&E - Basin 8**

GO TO STORMWATER TREATMENT ANALYSIS

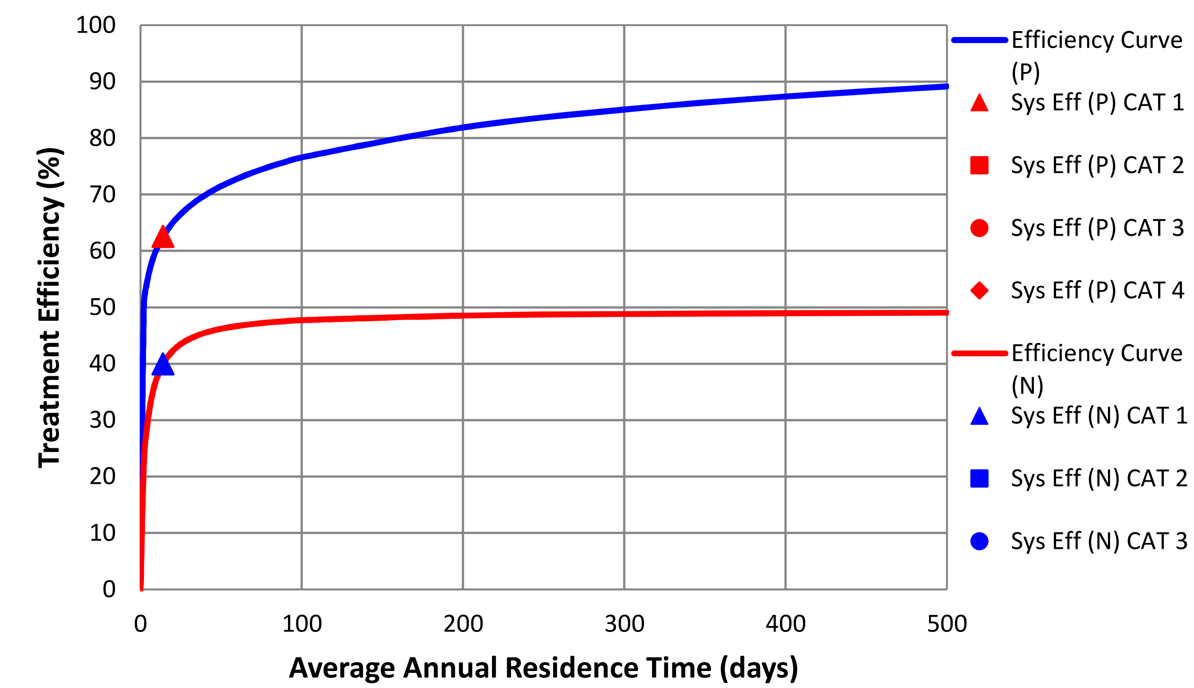
	Pond 8	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	9.720	0.000	0.000	0.000	ac
Total post-development catchment area:	9.720	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	38.235				%
Total **Phosphorus** removal required:	38.235				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	16.455				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

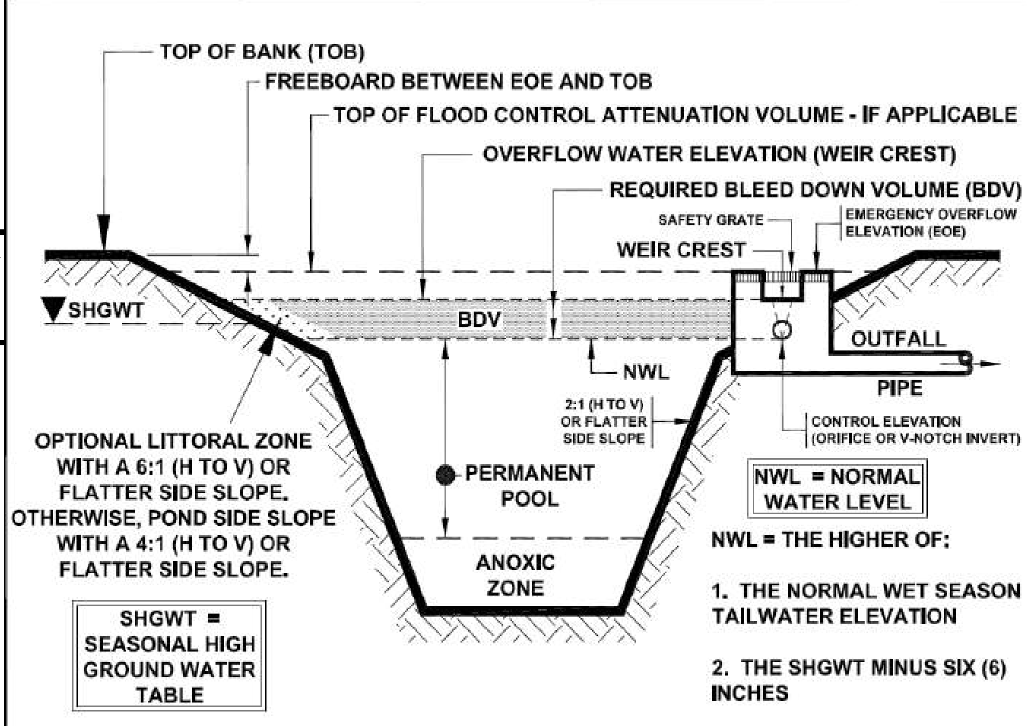
Minimum Pond Permanent Pool Volume:	0.631				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY	V 8.6

CALCULATION METHODS:

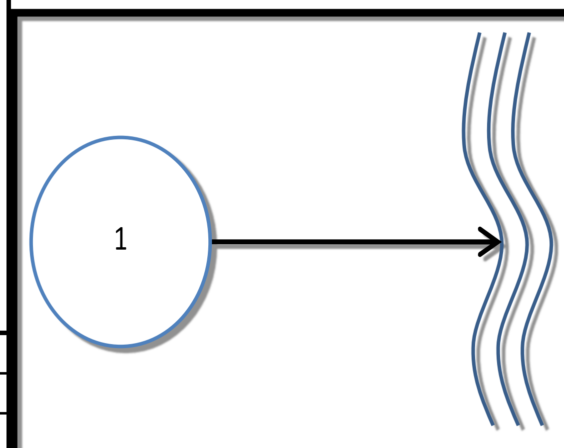
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 8	Optional Identification	

	Pond 8	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for TN MET TP MET	5/16/2018 BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	14.92		
Phosphorus Pre Load (kg/yr)	1.94		
Nitrogen Post Load (kg/yr)	24.15		
Phosphorus Post Load (kg/yr)	3.15		
Target Load Reduction (N) %	38		
Target Load Reduction (P) %	38		
Target Discharge Load, N (kg/yr)	14.97		
Target Discharge Load, P (kg/yr)	1.95		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	14.49	31.92	
Discharged Load, P (kg/yr & lb/yr):	1.18	2.59	
Load Removed, N (kg/yr & lb/yr):	9.66	21.27	
Load Removed, P (kg/yr & lb/yr):	1.97	4.34	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 9

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT	
Meteorological Zone (Please use zone map):	Zone 4	
Mean Annual Rainfall (Please use rainfall map):	56.00	Inches
	CLICK ON CELL BELOW TO SELECT	
Type of analysis:	Net improvement	
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):		%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs]

max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 9

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200

Total pre-development catchment area:	7.290	AC
Total post-development catchment or for BMP analysis:	8.610	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.58	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	31.82	%
Estimated BMP Area (No loading from this area)	1.320	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	7.623	ac-ft/year
Average annual post runoff volume (note no BMP area):	11.921	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	11.187	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.457	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	17.495	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.279	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 9

GO TO STORMWATER TREATMENT ANALYSIS

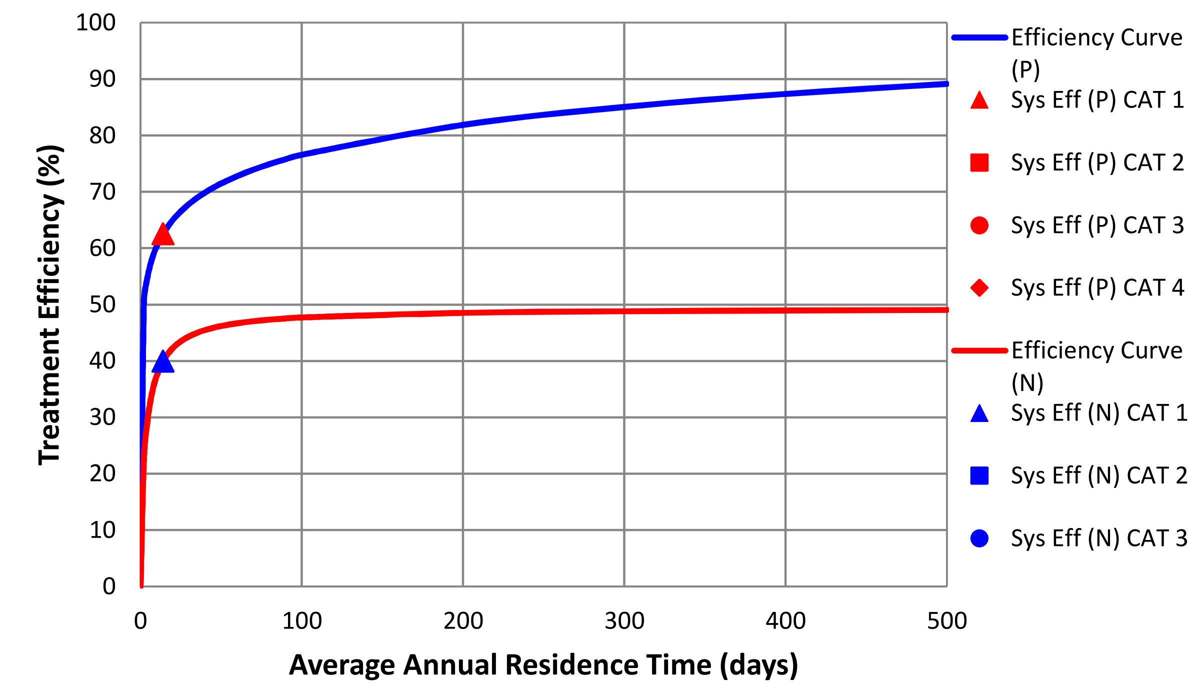
	Pond 9	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	7.290	0.000	0.000	0.000	ac
Total post-development catchment area:	7.290	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	36.057				%
Total **Phosphorus** removal required:	36.057				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	11.921				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

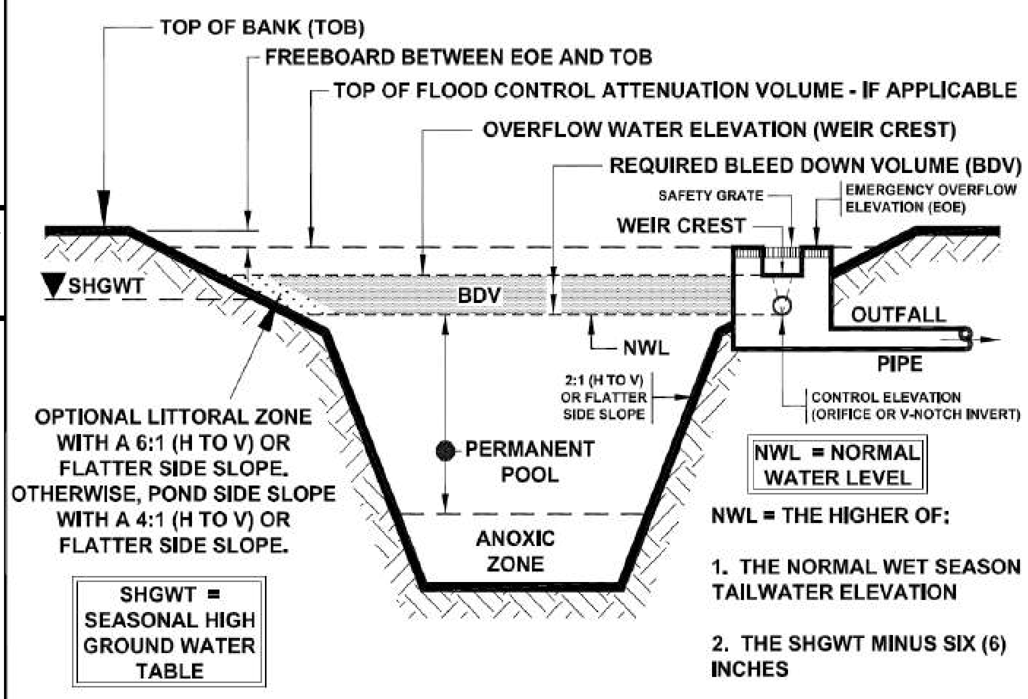
Minimum Pond Permanent Pool Volume:	0.457				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

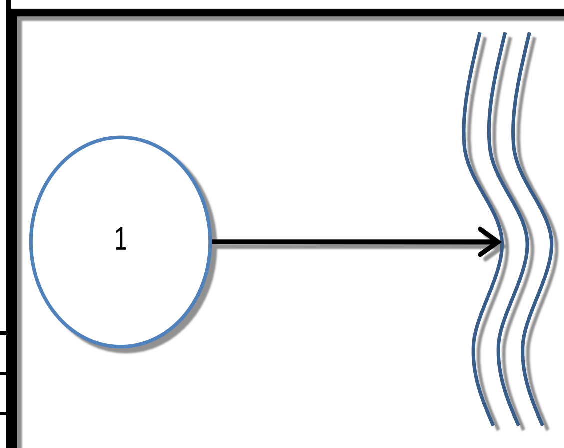
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 9	Optional Identification		
	Pond 9	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	11.19	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.46		
Nitrogen Post Load (kg/yr)	17.49		
Phosphorus Post Load (kg/yr)	2.28		
Target Load Reduction (N) %	36	TN MET	
Target Load Reduction (P) %	36		
Target Discharge Load, N (kg/yr)	11.20	TP MET	
Target Discharge Load, P (kg/yr)	1.46		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	10.50	23.12	
Discharged Load, P (kg/yr & lb/yr):	0.85	1.88	
Load Removed, N (kg/yr & lb/yr):	7.00	15.41	
Load Removed, P (kg/yr & lb/yr):	1.43	3.14	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 10

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches

	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs] | CATCHMENT NO.1 NAME: Pond 10

max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 10

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	11.070	AC
Total post-development catchment or for BMP analysis:	13.190	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.64	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	33.06	%
Estimated BMP Area (No loading from this area)	2.120	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	11.597	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.537	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	17.019	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.217	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	27.204	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.543	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:	SR 29 PD&E - Basin 10	GO TO STORMWATER TREATMENT ANALYSIS

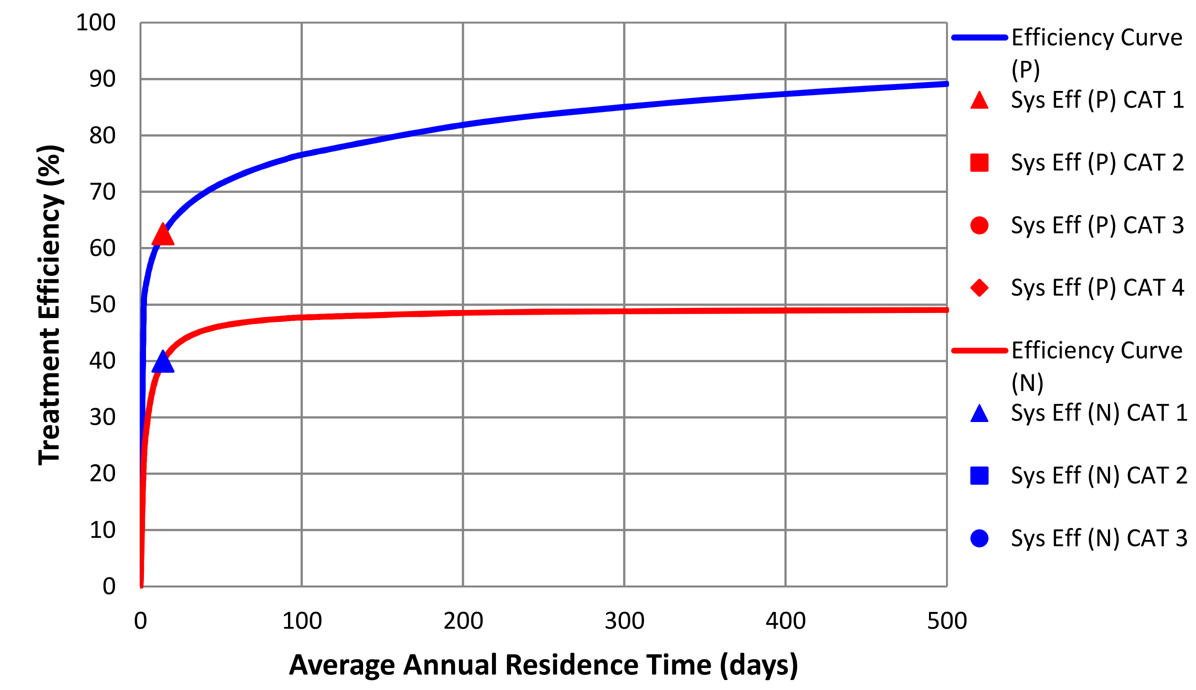
	Pond 10	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	11.070	0.000	0.000	0.000	ac
Total post-development catchment area:	11.070	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	37.439				%
Total **Phosphorus** removal required:	37.439				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	18.537				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

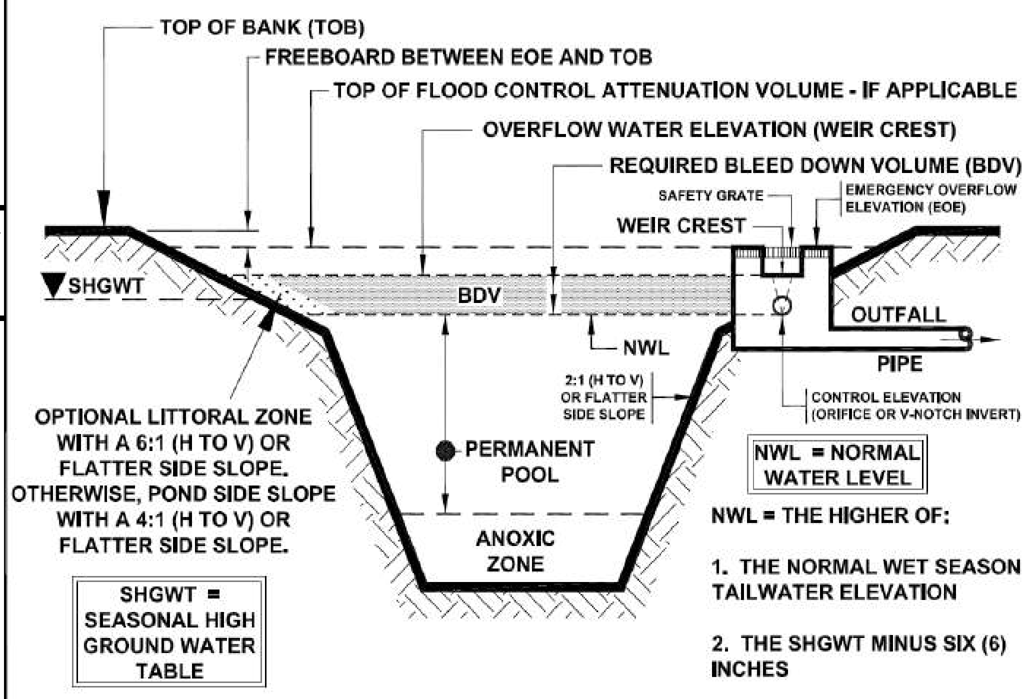
Minimum Pond Permanent Pool Volume:	0.711				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY				V 8.6

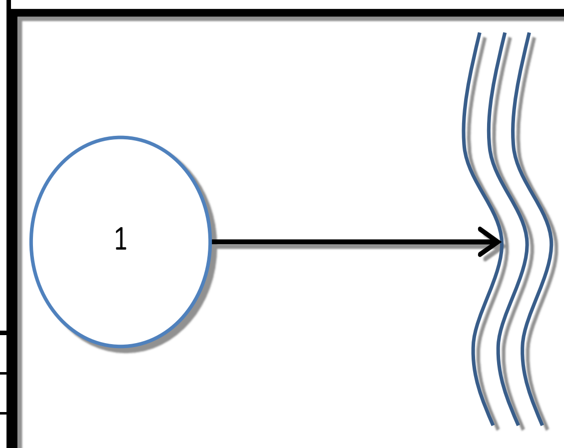
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 10	Optional Identification		
	Pond 10	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	17.02	Treatment Objectives or Target for TN MET TP MET	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	2.22		
Nitrogen Post Load (kg/yr)	27.20		
Phosphorus Post Load (kg/yr)	3.54		
Target Load Reduction (N) %	37		
Target Load Reduction (P) %	37		
Target Discharge Load, N (kg/yr)	17.14		
Target Discharge Load, P (kg/yr)	2.23		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	16.32	35.96	
Discharged Load, P (kg/yr & lb/yr):	1.33	2.92	
Load Removed, N (kg/yr & lb/yr):	10.88	23.96	
Load Removed, P (kg/yr & lb/yr):	2.22	4.88	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 11

VIEW ZONE MAP

Meteorological Zone (Please use zone map): CLICK ON CELL BELOW TO SELECT — Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

Type of analysis: CLICK ON CELL BELOW TO SELECT — Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:

Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data	LAND USES/EMC
SELECT CATCHMENT CONFIGURATION 5/16/2018	CLICK ON CELL BELOW TO SELECT CONFIGURATION: A - Single Catchment	Red Numbers = Calculated	VIEW CATCHMENT CONFIGURATION
For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain	COMINGLING / MULTI-LAND USE		GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 11

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	7.450	AC
Total post-development catchment or for BMP analysis:	9.060	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.69	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	33.83	%
Estimated BMP Area (No loading from this area)	1.610	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	7.817	ac-ft/year
Average annual post runoff volume (note no BMP area):	12.656	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	11.472	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.494	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	18.573	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.419	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 11

GO TO STORMWATER TREATMENT ANALYSIS

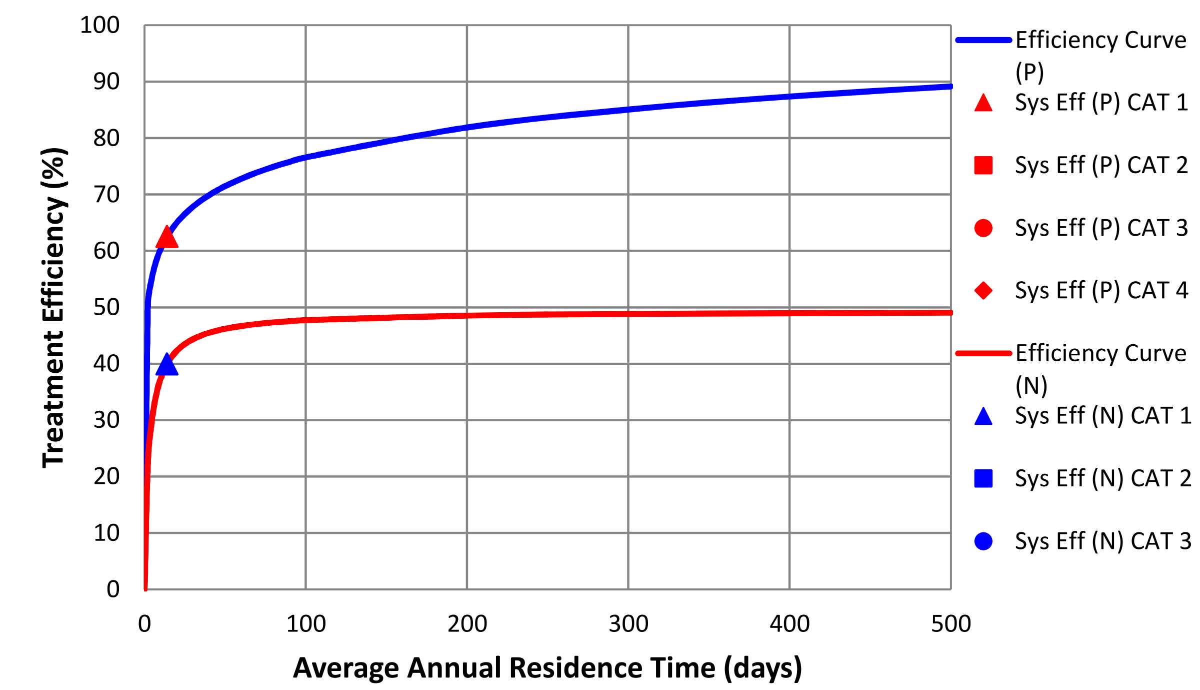
	Pond 11	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	7.450	0.000	0.000	0.000	ac
Total post-development catchment area:	7.450	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	38.233				%
Total **Phosphorus** removal required:	38.233				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	12.656				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

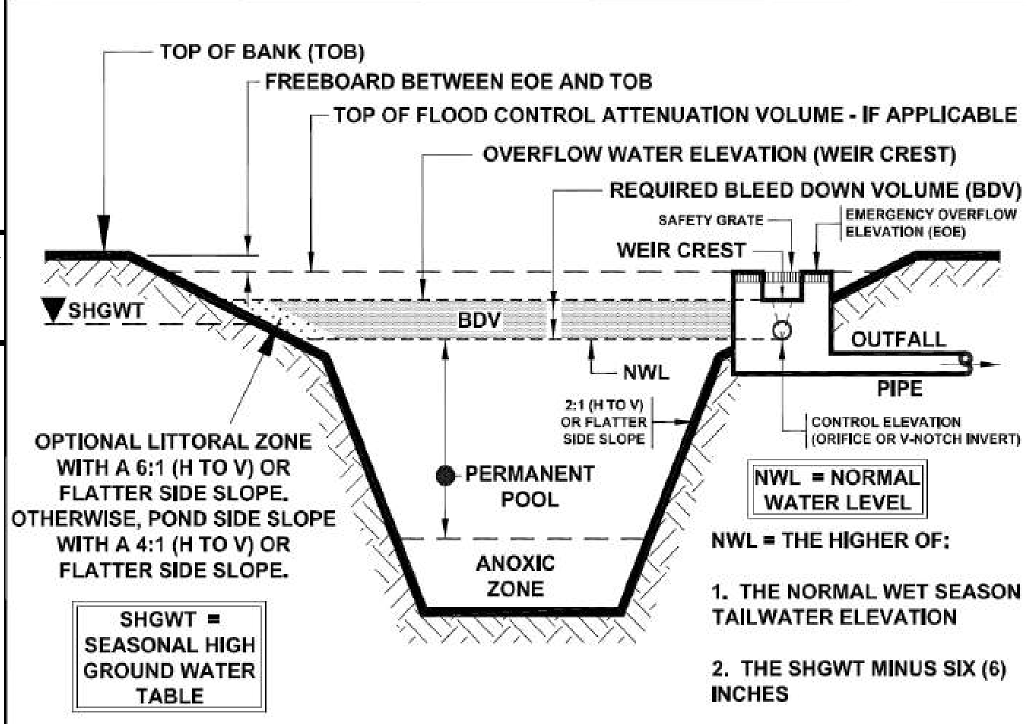
Minimum Pond Permanent Pool Volume:	0.485				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

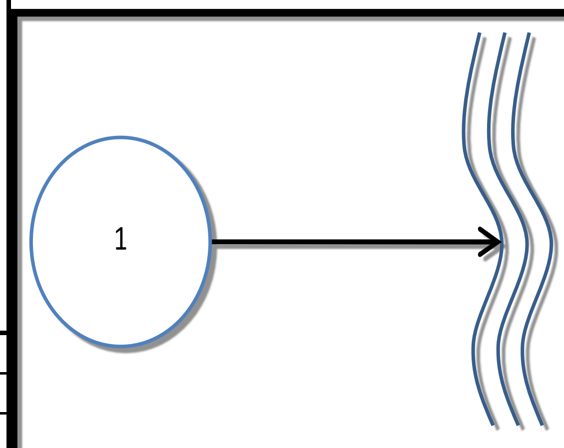
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 11	Optional Identification		
	Pond 11	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for TN MET TP MET	5/16/2018
Nitrogen Pre Load (kg/yr)	11.47		BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.49		
Nitrogen Post Load (kg/yr)	18.57		
Phosphorus Post Load (kg/yr)	2.42		
Target Load Reduction (N) %	38		
Target Load Reduction (P) %	38		
Target Discharge Load, N (kg/yr)	11.52		
Target Discharge Load, P (kg/yr)	1.50		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	11.15	24.55	
Discharged Load, P (kg/yr & lb/yr):	0.91	1.99	
Load Removed, N (kg/yr & lb/yr):	7.43	16.36	
Load Removed, P (kg/yr & lb/yr):	1.51	3.33	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 12

VIEW ZONE MAP

Meteorological Zone (Please use zone map): CLICK ON CELL BELOW TO SELECT — Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

Type of analysis: CLICK ON CELL BELOW TO SELECT — Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 12

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	8.210	AC
Total post-development catchment or for BMP analysis:	9.520	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.52	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	31.67	%
Estimated BMP Area (No loading from this area)	1.310	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	8.568	ac-ft/year
Average annual post runoff volume (note no BMP area):	13.385	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	12.575	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.638	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	19.644	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.559	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 12

GO TO STORMWATER TREATMENT ANALYSIS

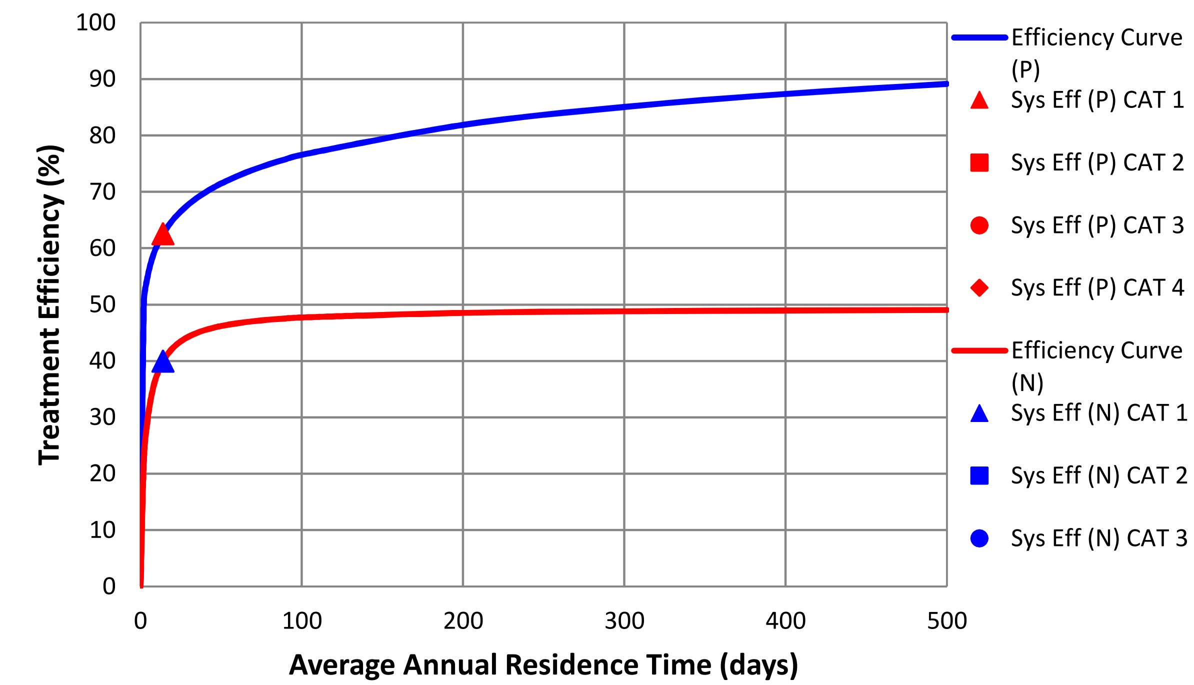
	Pond 12	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	8.210	0.000	0.000	0.000	ac
Total post-development catchment area:	8.210	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	35.985				%
Total **Phosphorus** removal required:	35.985				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	13.385				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

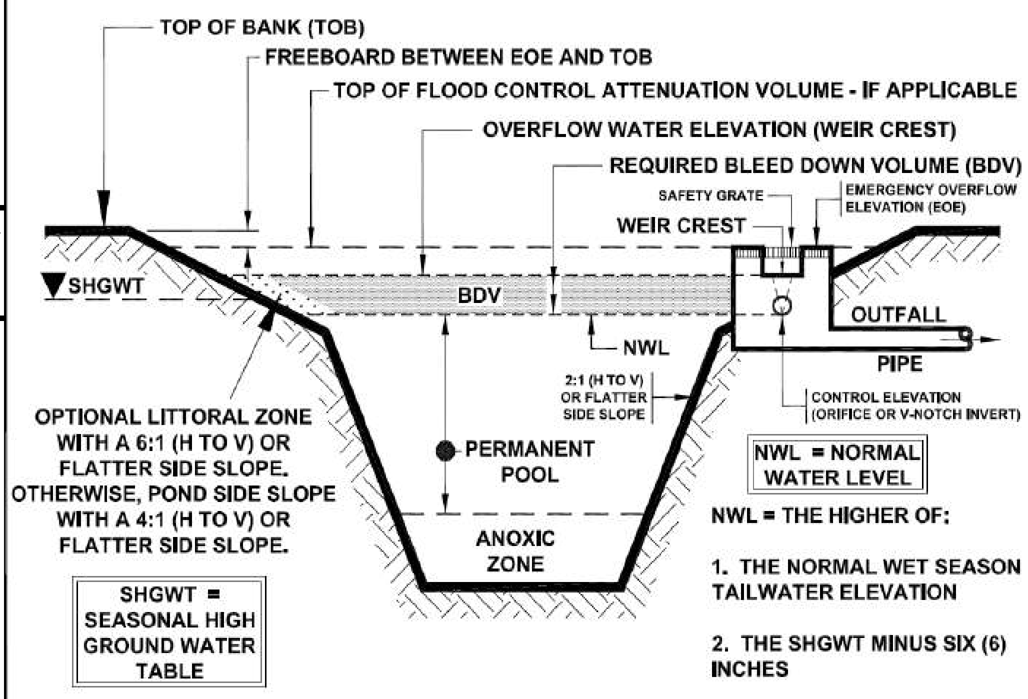
Minimum Pond Permanent Pool Volume:	0.513				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY — V 8.6

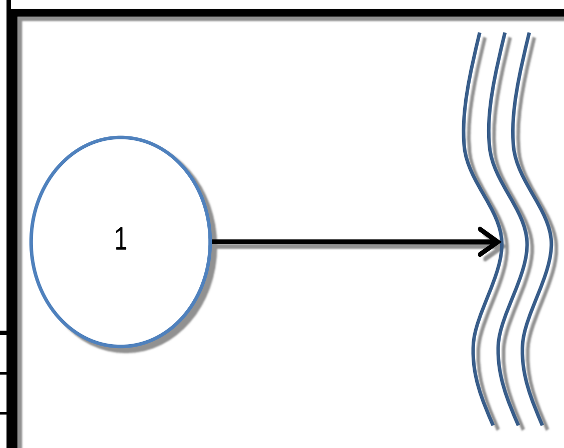
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 12	Optional Identification		
	Pond 12	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for	5/16/2018
Nitrogen Pre Load (kg/yr)	12.57		BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.64		
Nitrogen Post Load (kg/yr)	19.64		
Phosphorus Post Load (kg/yr)	2.56		
Target Load Reduction (N) %	36	TN MET	
Target Load Reduction (P) %	36		
Target Discharge Load, N (kg/yr)	12.57		
Target Discharge Load, P (kg/yr)	1.64	TP MET	
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	11.79	25.96	
Discharged Load, P (kg/yr & lb/yr):	0.96	2.11	
Load Removed, N (kg/yr & lb/yr):	7.86	17.30	
Load Removed, P (kg/yr & lb/yr):	1.60	3.53	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 13

VIEW ZONE MAP

Meteorological Zone (Please use zone map): CLICK ON CELL BELOW TO SELECT — Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

Type of analysis: CLICK ON CELL BELOW TO SELECT — Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

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Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
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Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 13

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	9.260	AC
Total post-development catchment or for BMP analysis:	11.080	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.50	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	32.40	%
Estimated BMP Area (No loading from this area)	1.820	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	9.658	ac-ft/year
Average annual post runoff volume (note no BMP area):	15.311	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	14.174	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.846	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	22.470	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.927	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:	SR 29 PD&E - Basin 13	GO TO STORMWATER TREATMENT ANALYSIS

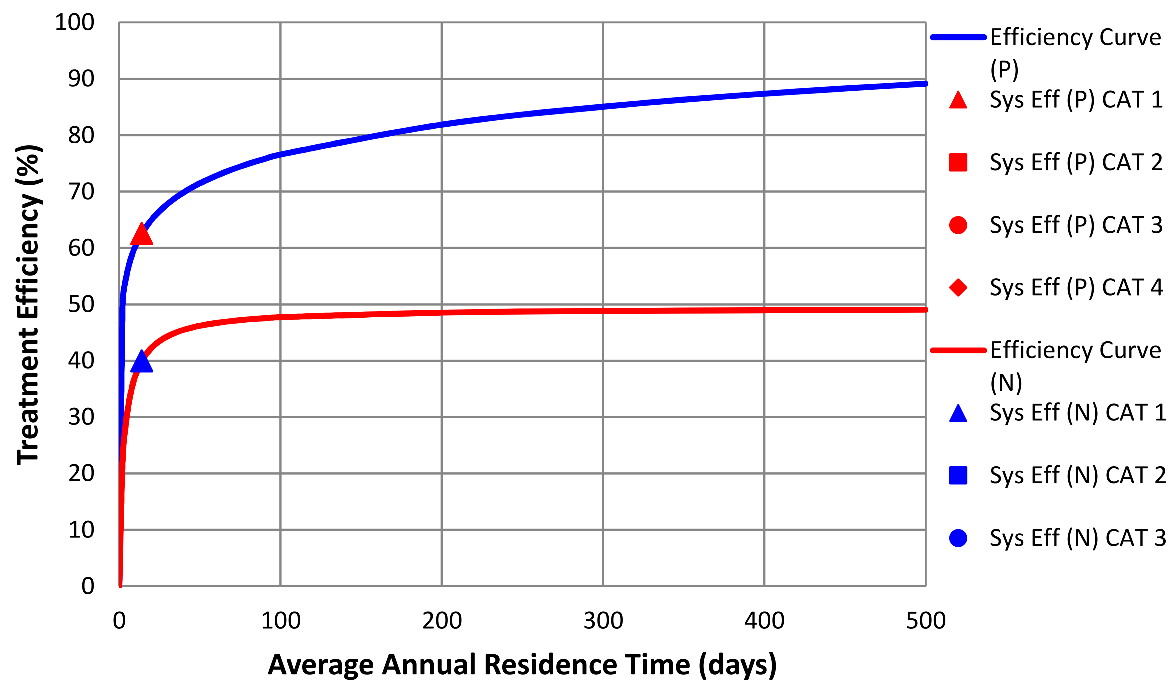
	Pond 13	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	9.260	0.000	0.000	0.000	ac
Total post-development catchment area:	9.260	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	36.920				%
Total **Phosphorus** removal required:	36.920				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	15.311				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

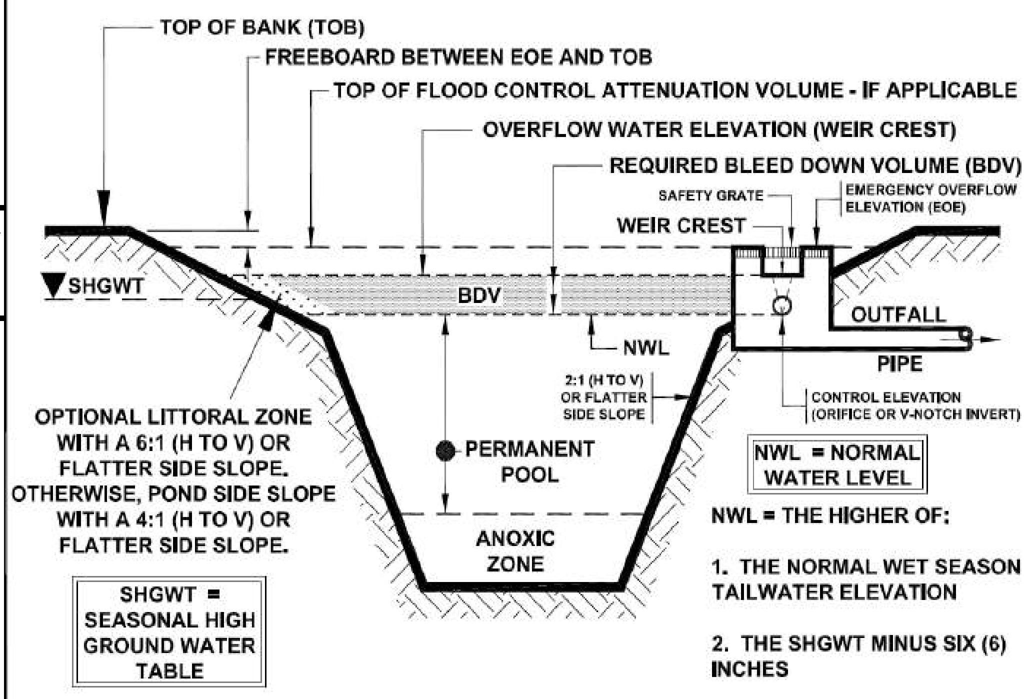
Minimum Pond Permanent Pool Volume:	0.587				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

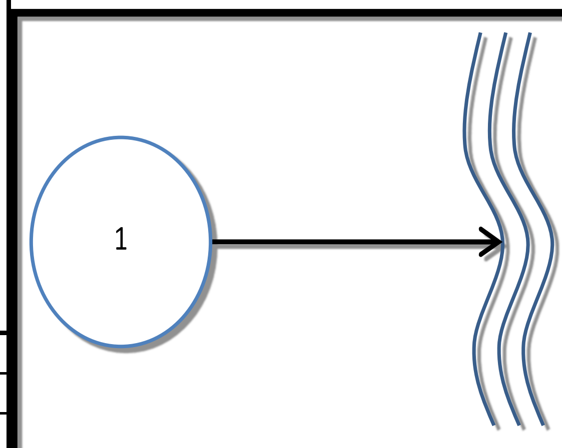
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 13	Optional Identification		
	Pond 13	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	14.17	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.85		
Nitrogen Post Load (kg/yr)	22.47		
Phosphorus Post Load (kg/yr)	2.93		
Target Load Reduction (N) %	37		
Target Load Reduction (P) %	37	TN MET	
Target Discharge Load, N (kg/yr)	14.16		
Target Discharge Load, P (kg/yr)	1.84	TP MET	
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	13.48	29.70	
Discharged Load, P (kg/yr & lb/yr):	1.09	2.41	
Load Removed, N (kg/yr & lb/yr):	8.99	19.79	
Load Removed, P (kg/yr & lb/yr):	1.83	4.03	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 14

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map): CLICK ON CELL BELOW TO SELECT — Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

Type of analysis: CLICK ON CELL BELOW TO SELECT — Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 14

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	7.900	AC
Total post-development catchment or for BMP analysis:	9.210	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.42	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	35.82	%
Estimated BMP Area (No loading from this area)	1.310	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	8.219	ac-ft/year
Average annual post runoff volume (note no BMP area):	13.926	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	12.062	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.571	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	20.438	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.662	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | **SR 29 PD&E - Basin 14**

GO TO STORMWATER TREATMENT ANALYSIS

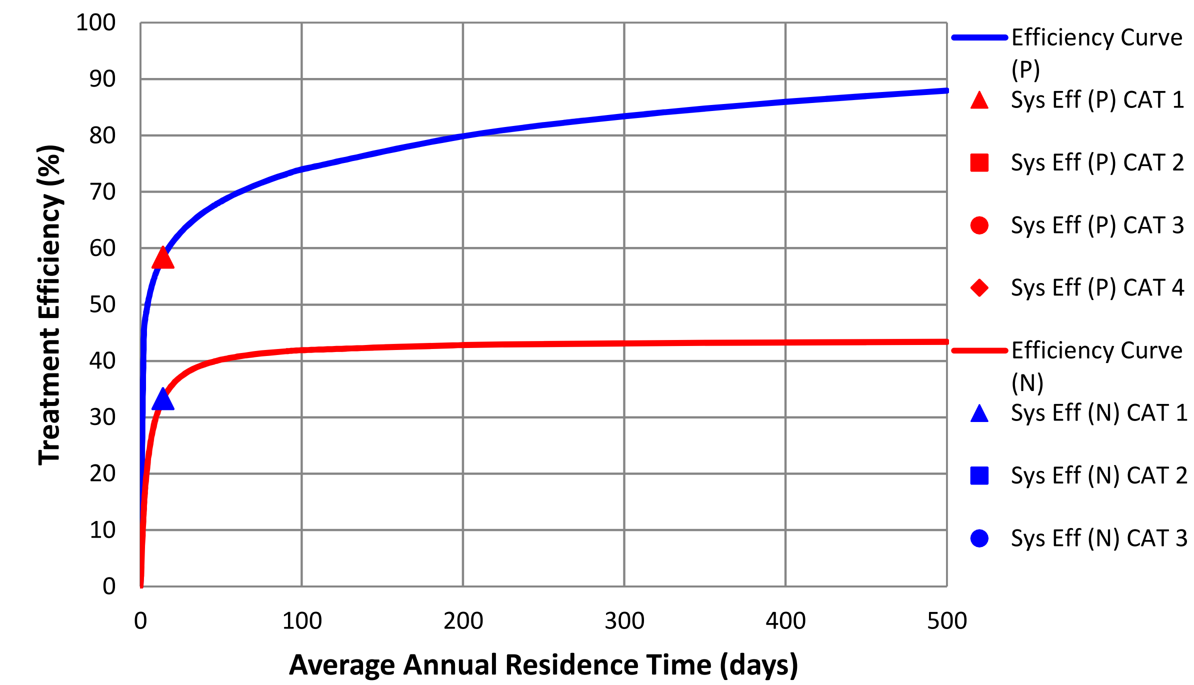
	Pond 14	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	7.900	0.000	0.000	0.000	ac
Total post-development catchment area:	7.900	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	40.981				%
Total **Phosphorus** removal required:	40.981				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	13.926				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

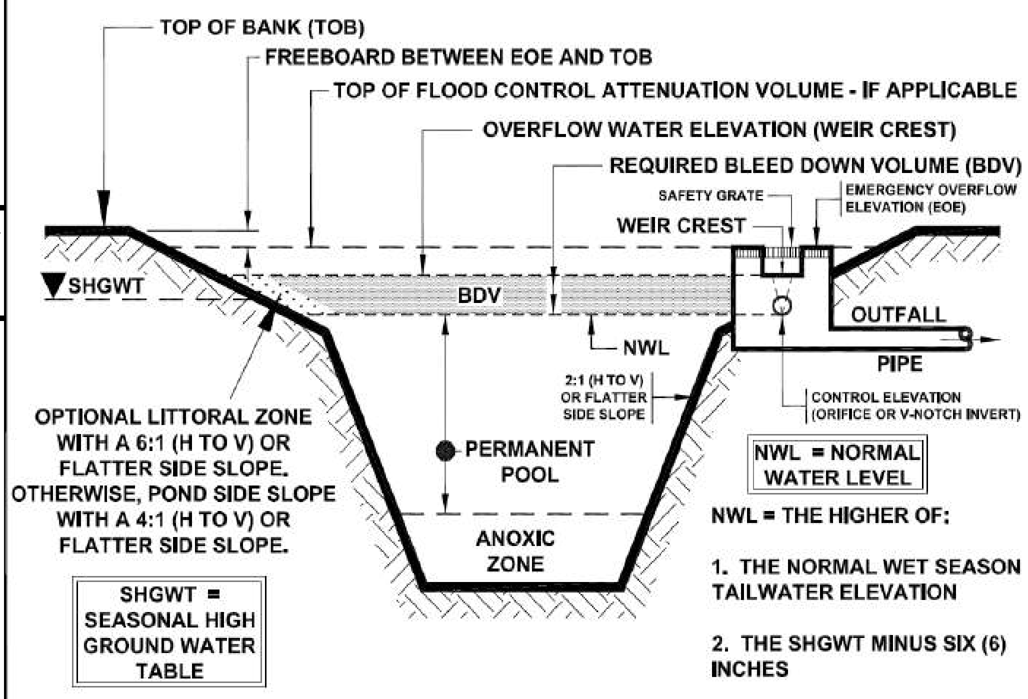
Minimum Pond Permanent Pool Volume:	0.534				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:			5/16/2018	V 8.6

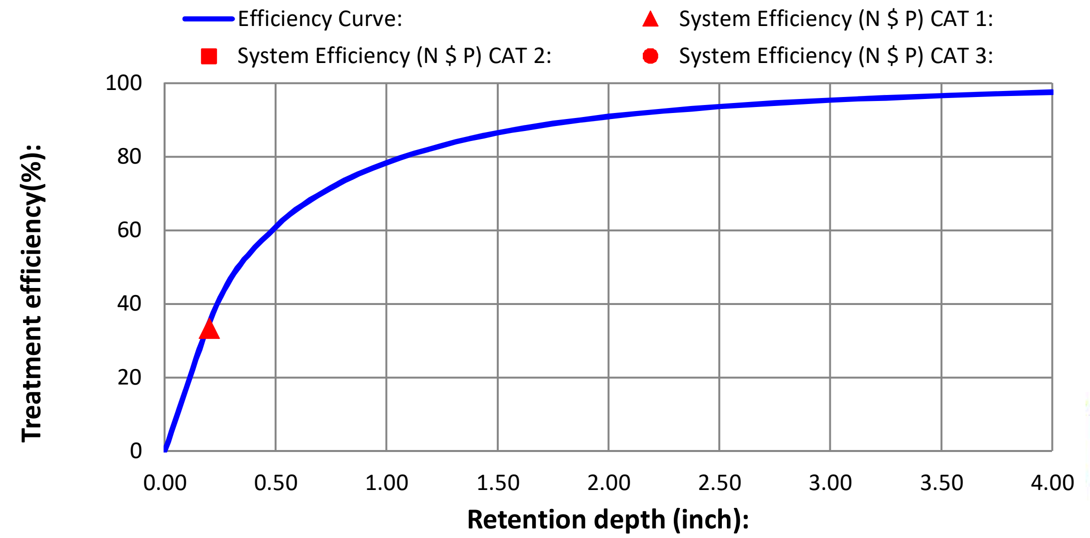
Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING:	SR 29 PD&E - Basin 14				
Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 14	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	7.900	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	40.981				%
Required Treatment Eff (**Phosphorus**):	40.981				%
Required retention depth over the watershed to meet required efficiency:	0.246	0.000	0.000	0.000	in
Required water quality retention volume:	0.162	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.132	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.200				in
Provided treatment efficiency (**Nitrogen**):	33.364	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	33.364	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	11.430				%
Remaining treatment efficiency (**Phosphorus**):	11.430				%
Remaining retention depth needed:	0.046	0.000	0.000	0.000	in

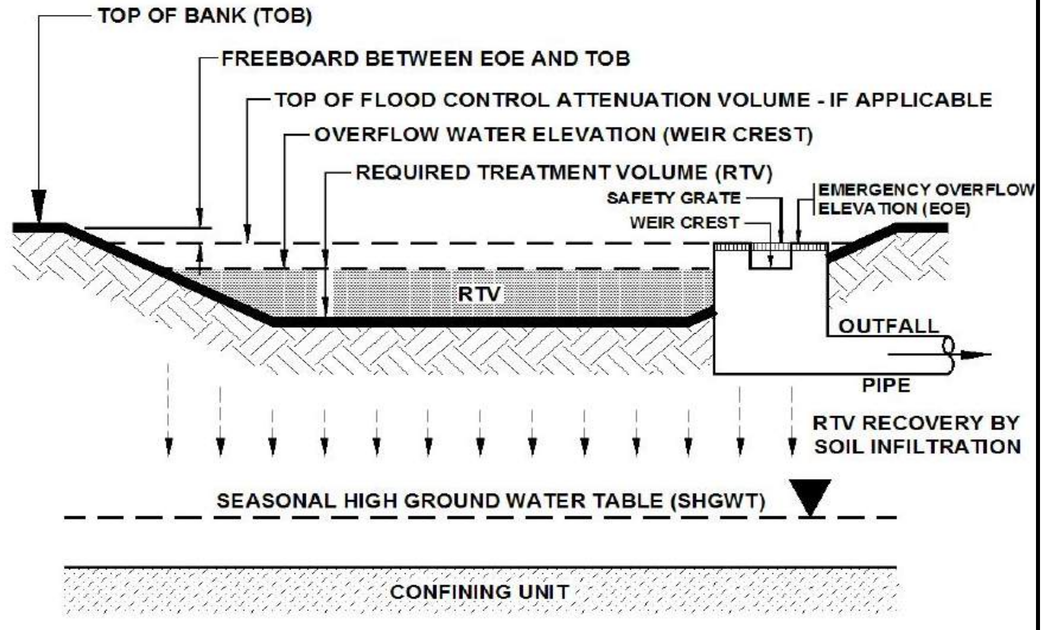


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY	V 8.6

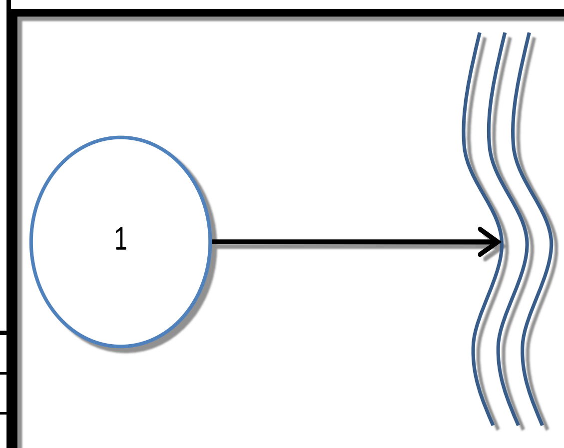
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 14	Optional Identification		
	Pond 14	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for TN MET TP MET	5/16/2018 BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	12.06		
Phosphorus Pre Load (kg/yr)	1.57		
Nitrogen Post Load (kg/yr)	20.44		
Phosphorus Post Load (kg/yr)	2.66		
Target Load Reduction (N) %	41		
Target Load Reduction (P) %	41		
Target Discharge Load, N (kg/yr)	12.06		
Target Discharge Load, P (kg/yr)	1.57		
Provided Overall Efficiency, N (%):	41		
Provided Overall Efficiency, P (%):	69		
Discharged Load, N (kg/yr & lb/yr):	12.08	26.60	
Discharged Load, P (kg/yr & lb/yr):	0.82	1.81	
Load Removed, N (kg/yr & lb/yr):	8.36	18.42	
Load Removed, P (kg/yr & lb/yr):	1.84	4.05	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 15

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data	LAND USES/EMC
SELECT CATCHMENT CONFIGURATION 5/16/2018	CLICK ON CELL BELOW TO SELECT CONFIGURATION: A - Single Catchment	Red Numbers = Calculated	VIEW CATCHMENT CONFIGURATION
For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain	COMINGLING / MULTI-LAND USE		GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs]: | max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 15

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	9.230	AC
Total post-development catchment or for BMP analysis:	10.900	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.98	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	42.04	%
Estimated BMP Area (No loading from this area)	1.670	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	9.770	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.145	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	14.339	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.868	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	26.629	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.469	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | **SR 29 PD&E - Basin 15**

GO TO STORMWATER TREATMENT ANALYSIS

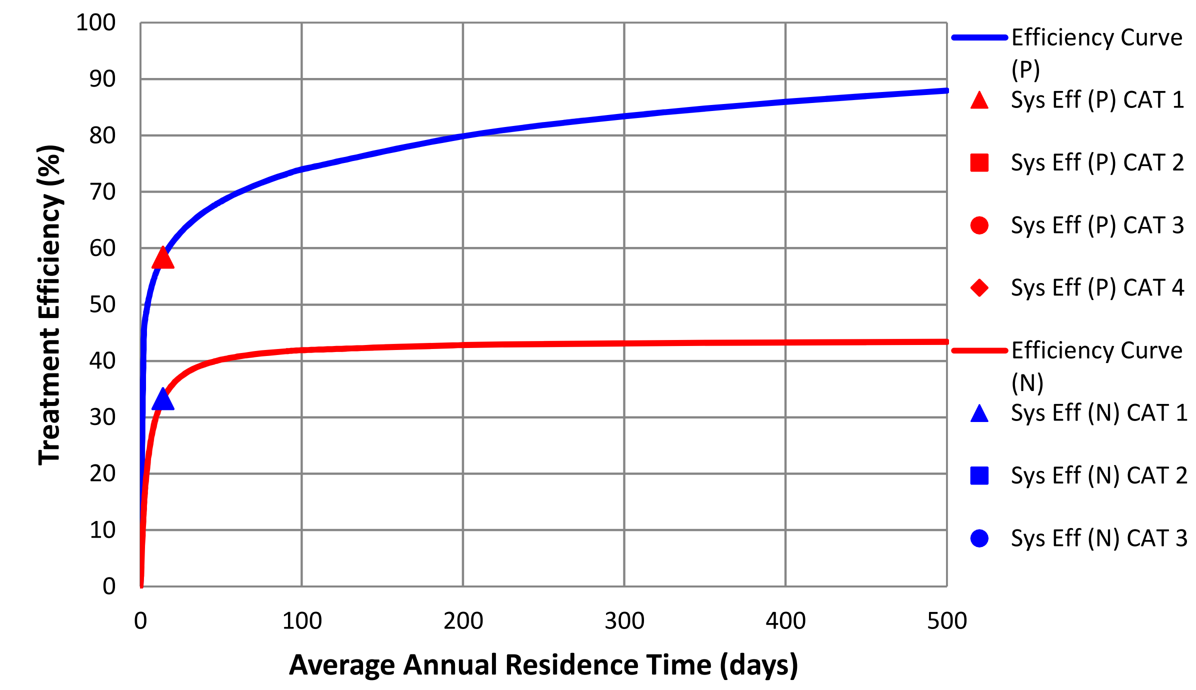
	Pond 15	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	9.230	0.000	0.000	0.000	ac
Total post-development catchment area:	9.230	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	46.153				%
Total **Phosphorus** removal required:	46.153				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	18.145				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

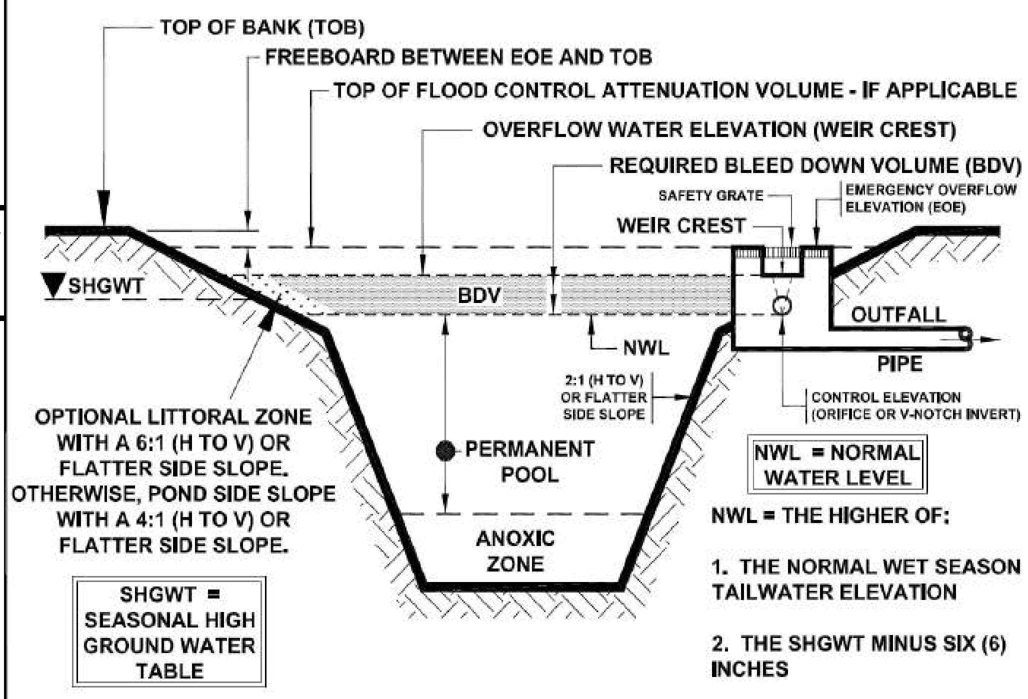
Minimum Pond Permanent Pool Volume:	0.696				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

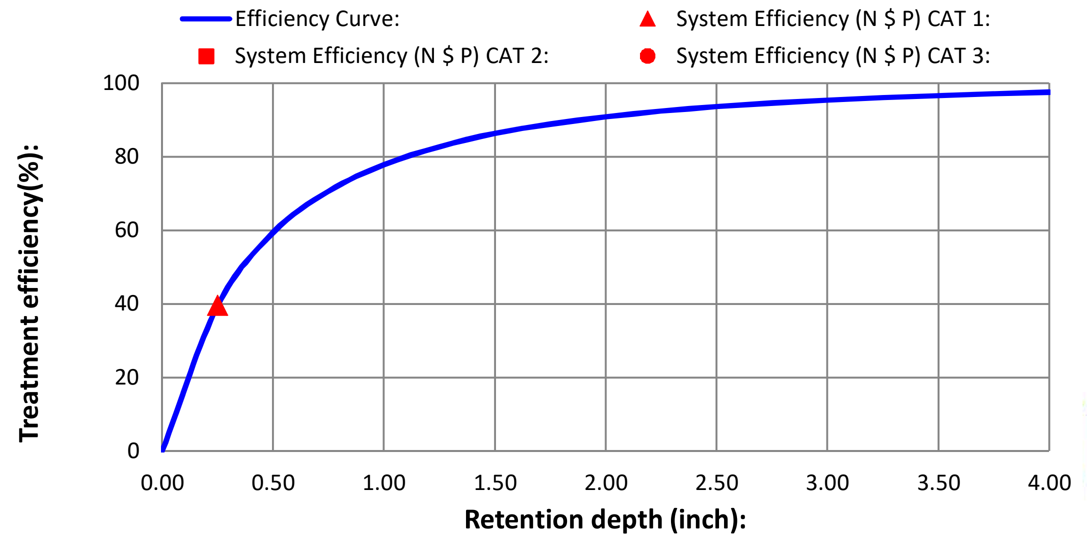
RETENTION BASIN:	5/16/2018	V 8.6	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING:	SR 29 PD&E - Basin 15				
Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 15	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	9.230	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	46.153				%
Required Treatment Eff (**Phosphorus**):	46.153				%
Required retention depth over the watershed to meet required efficiency:	0.334	0.000	0.000	0.000	in
Required water quality retention volume:	0.257	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.192	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.250				in
Provided treatment efficiency (**Nitrogen**):	39.507	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	39.507	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	10.986				%
Remaining treatment efficiency (**Phosphorus**):	10.986				%
Remaining retention depth needed:	0.084	0.000	0.000	0.000	in

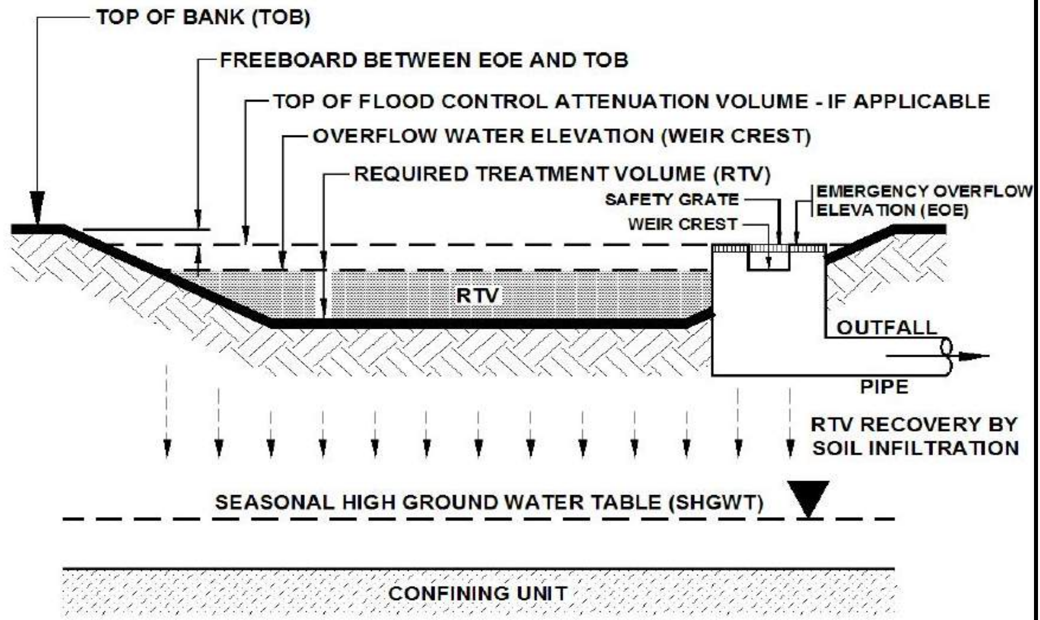


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

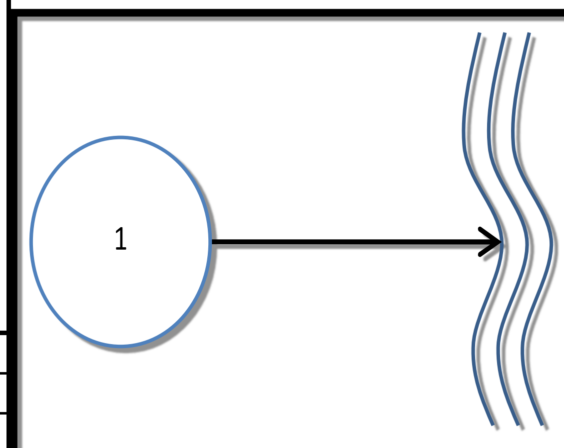
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 15	Optional Identification		
	Pond 15	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	14.34	Treatment Objectives or Target for TN MET TP MET	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.87		
Nitrogen Post Load (kg/yr)	26.63		
Phosphorus Post Load (kg/yr)	3.47		
Target Load Reduction (N) %	46		
Target Load Reduction (P) %	46		
Target Discharge Load, N (kg/yr)	14.38		
Target Discharge Load, P (kg/yr)	1.87		
Provided Overall Efficiency, N (%):	46		
Provided Overall Efficiency, P (%):	71		
Discharged Load, N (kg/yr & lb/yr):	14.28	31.46	
Discharged Load, P (kg/yr & lb/yr):	0.99	2.18	
Load Removed, N (kg/yr & lb/yr):	12.34	27.19	
Load Removed, P (kg/yr & lb/yr):	2.48	5.46	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 16

HELP Rainfall

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 16

Delay [hrs]

max delay = 15 hrs.

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200

Total pre-development catchment area:	10.490	AC
Total post-development catchment or for BMP analysis:	12.160	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	15.63	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	38.99	%
Estimated BMP Area (No loading from this area)	1.670	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	11.666	ac-ft/year
Average annual post runoff volume (note no BMP area):	19.578	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	17.121	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.230	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	28.732	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.742	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 16

GO TO STORMWATER TREATMENT ANALYSIS

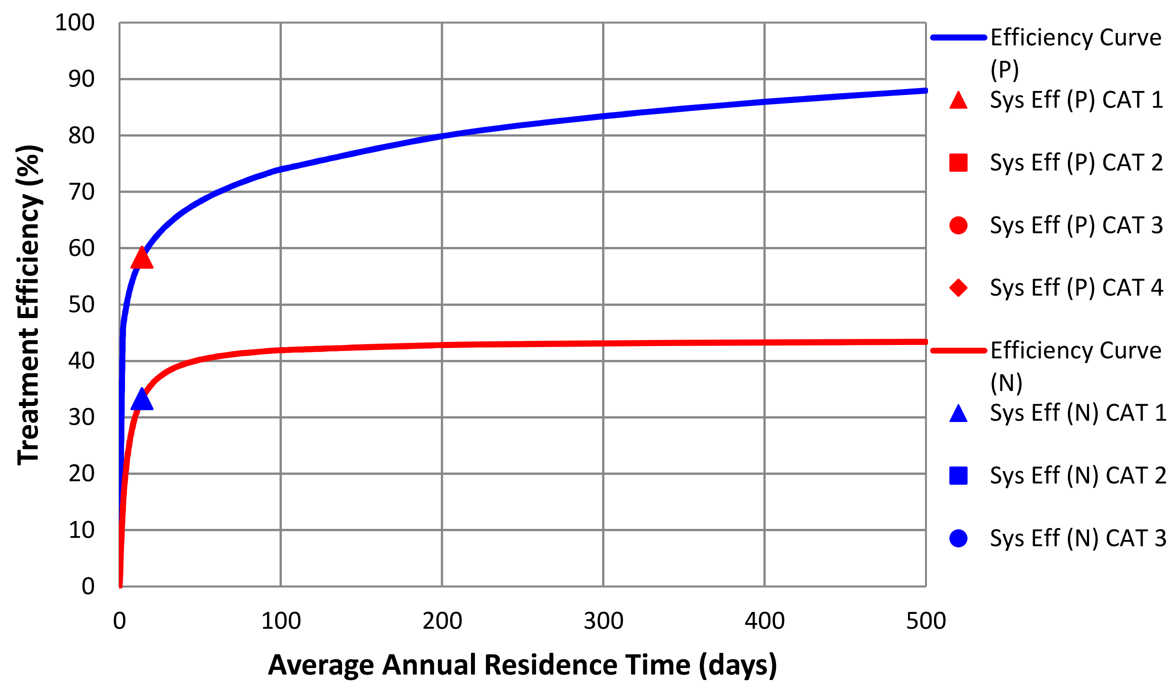
	Pond 16	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	10.490	0.000	0.000	0.000	ac
Total post-development catchment area:	10.490	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	40.411				%
Total **Phosphorus** removal required:	40.411				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	19.578				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

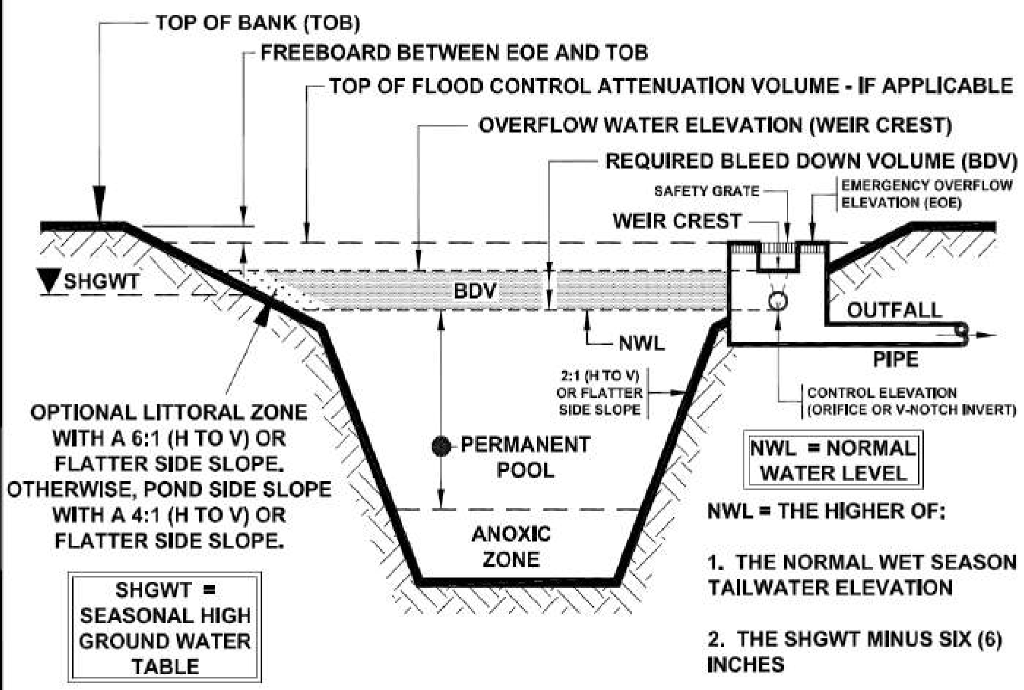
Minimum Pond Permanent Pool Volume:	0.751				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:		5/16/2018	V 8.6		
RETENTION BASIN SERVING:	SR 29 PD&E - Basin 16				

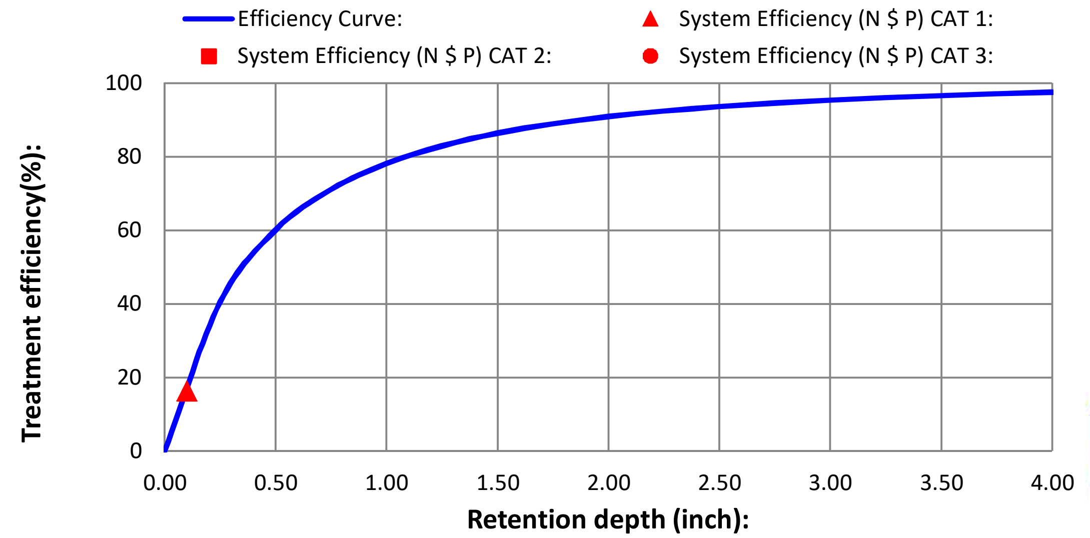
Blue Numbers = Input data
Red Numbers = Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 16	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	10.490	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	40.411				%
Required Treatment Eff (**Phosphorus**):	40.411				%
Required retention depth over the watershed to meet required efficiency:	0.249	0.000	0.000	0.000	in
Required water quality retention volume:	0.218	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.087	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.100				in
Provided treatment efficiency (**Nitrogen**):	16.226	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	16.226	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	28.870				%
Remaining treatment efficiency (**Phosphorus**):	28.870				%
Remaining retention depth needed:	0.149	0.000	0.000	0.000	in

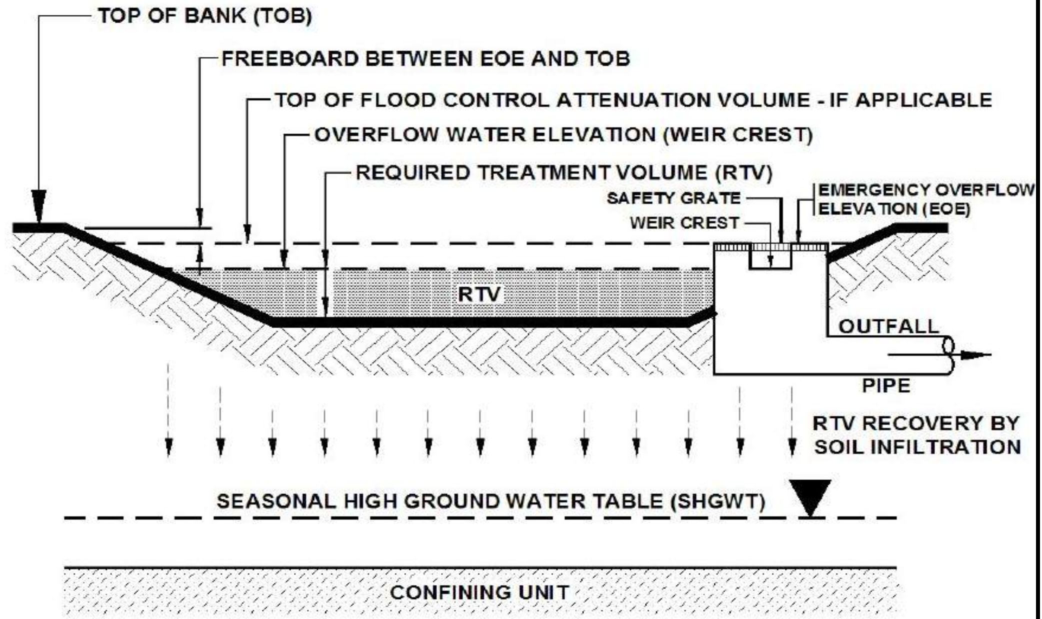


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

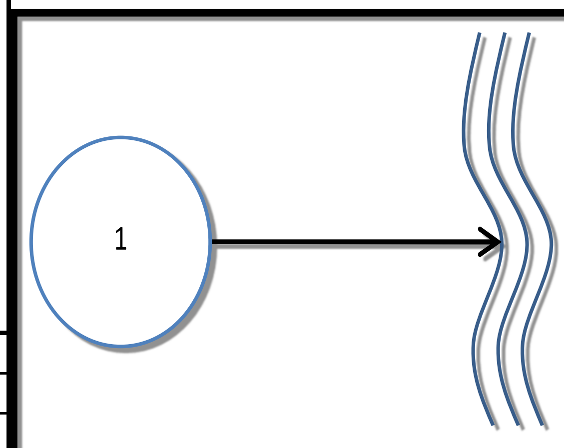
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 16	Optional Identification		
	Pond 16	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	17.12	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	2.23		
Nitrogen Post Load (kg/yr)	28.73		
Phosphorus Post Load (kg/yr)	3.74		
Target Load Reduction (N) %	40	TN MET	
Target Load Reduction (P) %	40		
Target Discharge Load, N (kg/yr)	17.24		
Target Discharge Load, P (kg/yr)	2.25	TP MET	
Provided Overall Efficiency, N (%):	42		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	16.61	36.58	
Discharged Load, P (kg/yr & lb/yr):	1.38	3.03	
Load Removed, N (kg/yr & lb/yr):	12.13	26.71	
Load Removed, P (kg/yr & lb/yr):	2.37	5.21	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 17

HELP Rainfall

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 17

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	11.240	AC
Total post-development catchment or for BMP analysis:	12.980	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	16.64	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	38.08	%
Estimated BMP Area (No loading from this area)	1.740	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	12.858	ac-ft/year
Average annual post runoff volume (note no BMP area):	20.643	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	18.870	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.458	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	30.295	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.946	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 17

GO TO STORMWATER TREATMENT ANALYSIS

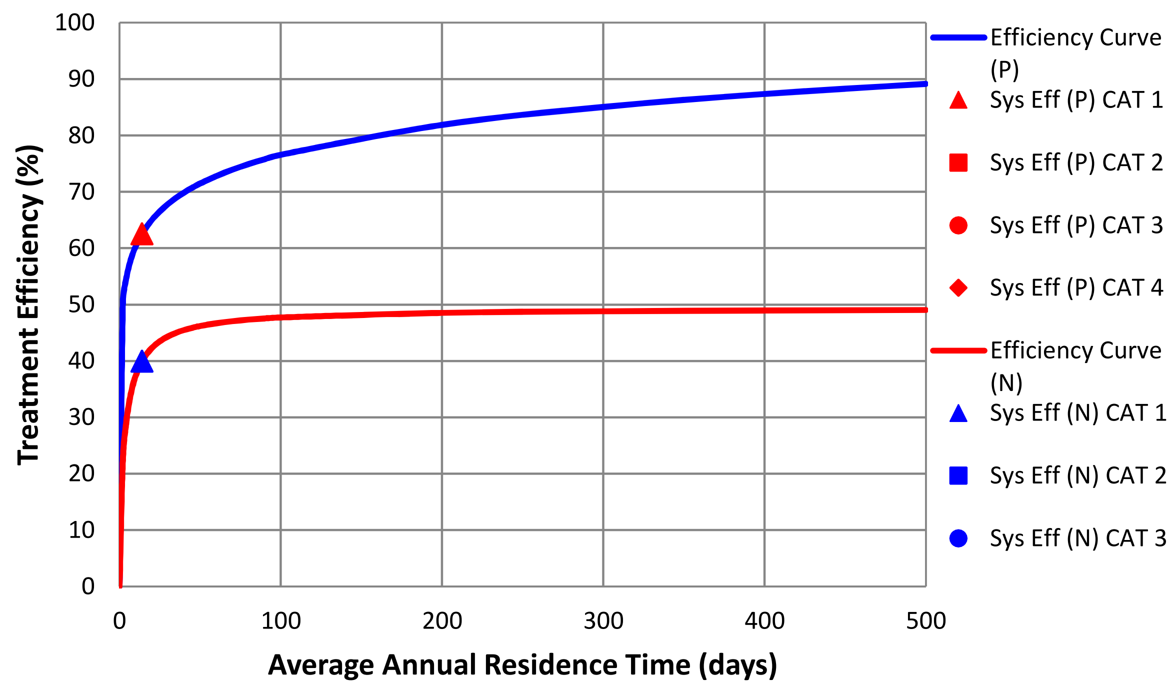
REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.

	Pond 17	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	11.240	0.000	0.000	0.000	ac
Total post-development catchment area:	11.240	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	37.712				%
Total **Phosphorus** removal required:	37.712				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	20.643				ac-ft/yr

* pond coverage must follow Regulatory Requirements

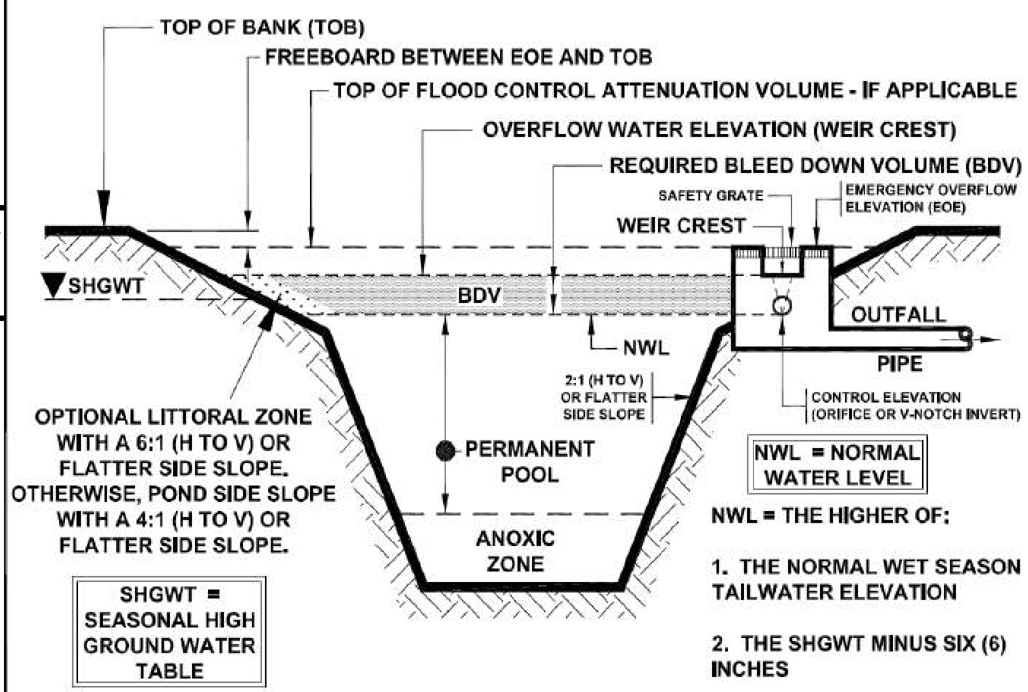
Wet Detention Pond Characteristic:

Minimum Pond Permanent Pool Volume:	0.792				ac-ft



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

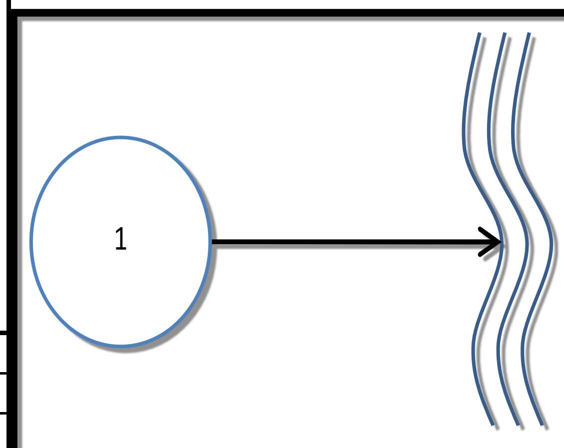
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 17	Optional Identification	

	Pond 17	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	18.87	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	2.46		
Nitrogen Post Load (kg/yr)	30.30		
Phosphorus Post Load (kg/yr)	3.95		
Target Load Reduction (N) %	38	TN MET	
Target Load Reduction (P) %	38		
Target Discharge Load, N (kg/yr)	18.78	TP MET	
Target Discharge Load, P (kg/yr)	2.45		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	18.18	40.04	
Discharged Load, P (kg/yr & lb/yr):	1.48	3.25	
Load Removed, N (kg/yr & lb/yr):	12.12	26.69	
Load Removed, P (kg/yr & lb/yr):	2.47	5.44	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 18

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 18

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	10.200	AC
Total post-development catchment or for BMP analysis:	11.870	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	15.39	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	40.59	%
Estimated BMP Area (No loading from this area)	1.670	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	11.265	ac-ft/year
Average annual post runoff volume (note no BMP area):	19.569	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	16.533	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.153	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	28.719	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.741	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:	SR 29 PD&E - Basin 18	GO TO STORMWATER TREATMENT ANALYSIS

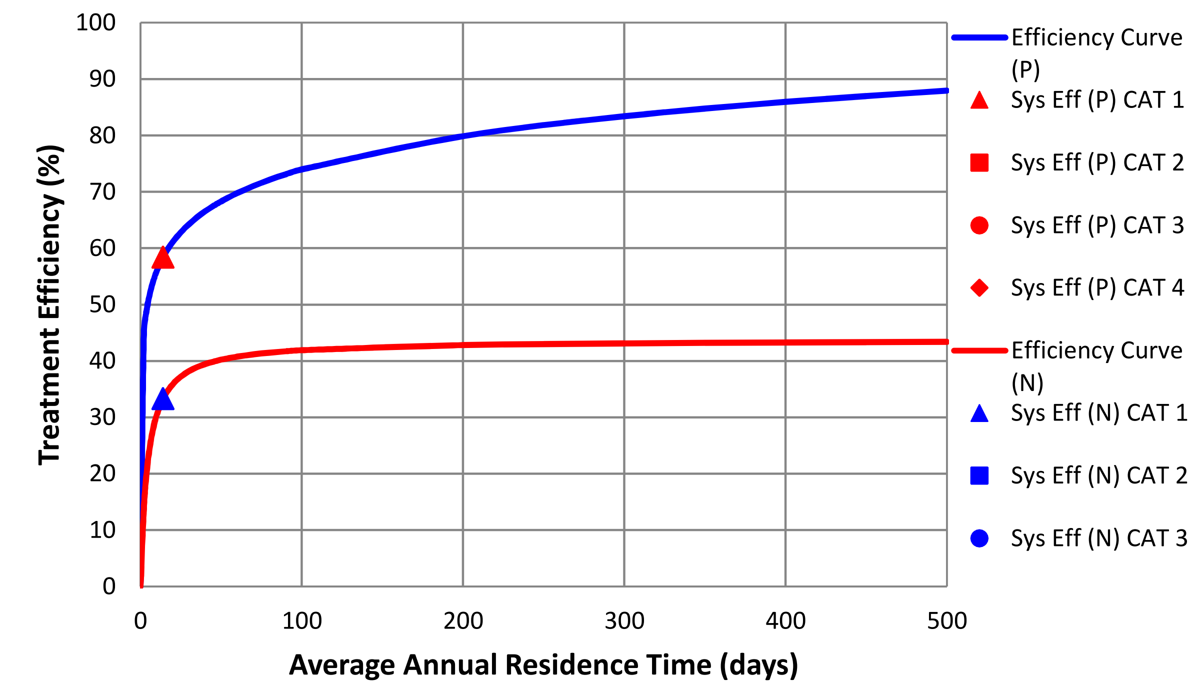
	Pond 18	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	10.200	0.000	0.000	0.000	ac
Total post-development catchment area:	10.200	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	42.433				%
Total **Phosphorus** removal required:	42.433				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	19.569				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

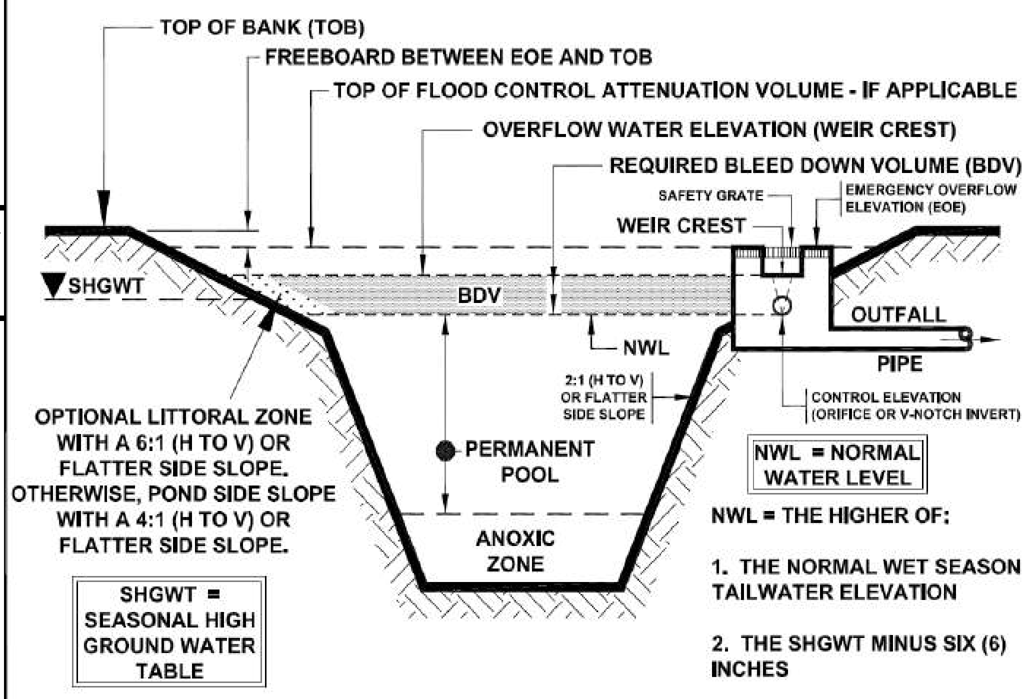
Minimum Pond Permanent Pool Volume:	0.751				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

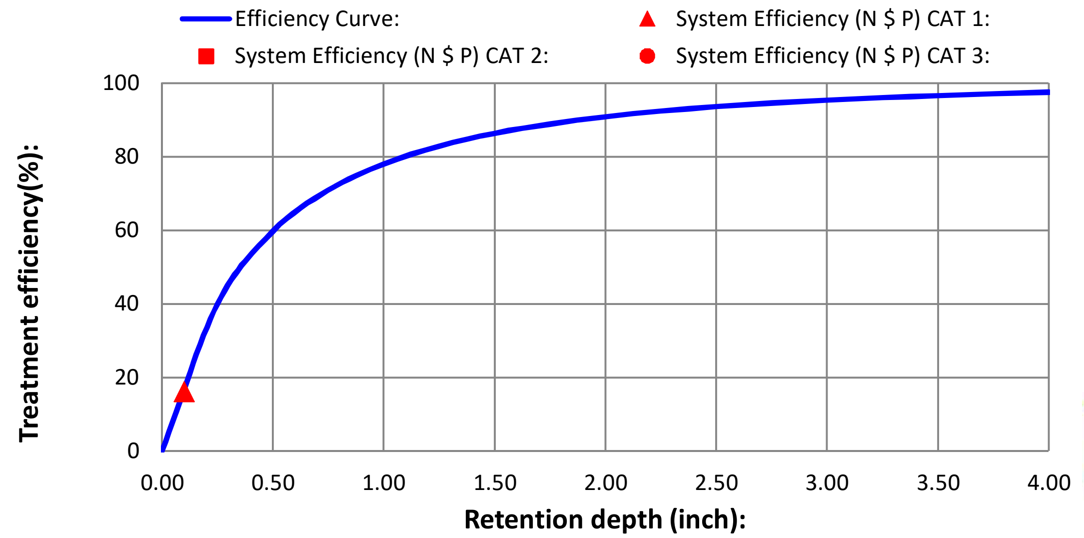
RETENTION BASIN:	5/16/2018	V 8.6	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING:	SR 29 PD&E - Basin 18				
Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 18	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	10.200	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	42.433				%
Required Treatment Eff (**Phosphorus**):	42.433				%
Required retention depth over the watershed to meet required efficiency:	0.281	0.000	0.000	0.000	in
Required water quality retention volume:	0.239	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.085	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.100				in
Provided treatment efficiency (**Nitrogen**):	16.000	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	16.000	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	31.468				%
Remaining treatment efficiency (**Phosphorus**):	31.468				%
Remaining retention depth needed:	0.181	0.000	0.000	0.000	in

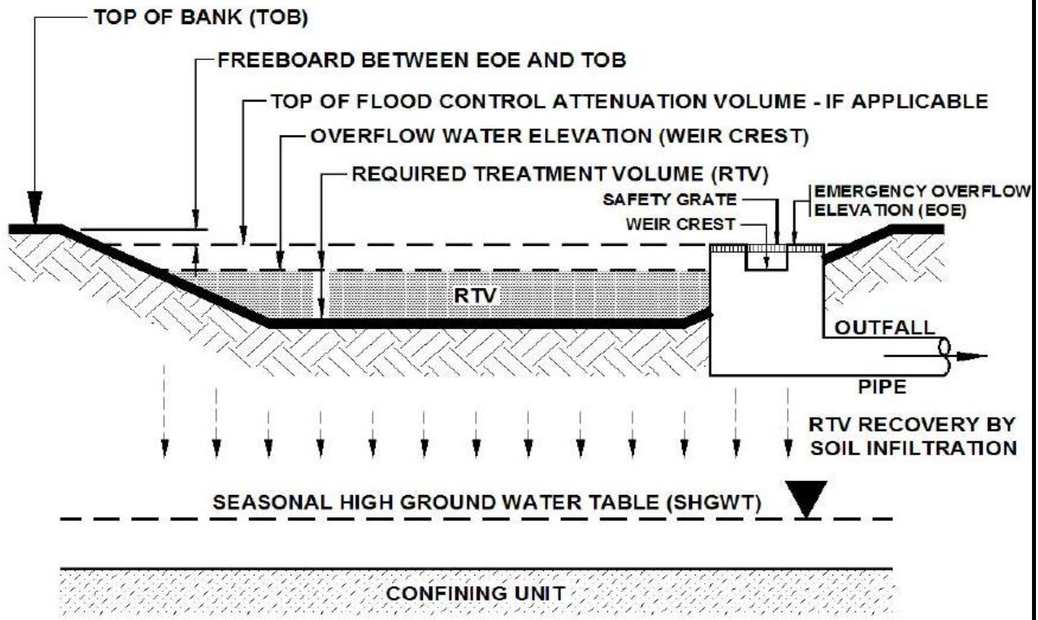


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

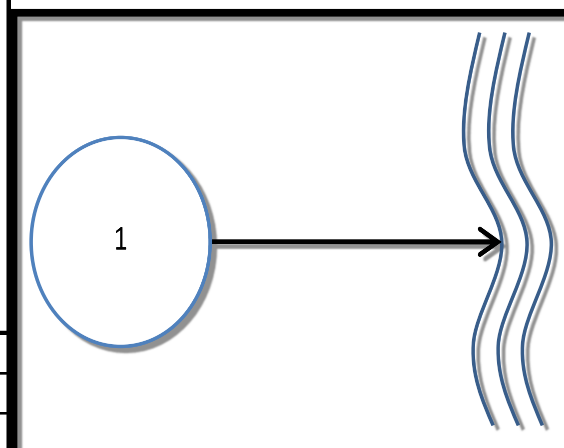
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 18	Optional Identification		
	Pond 18	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	16.53	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	2.15		
Nitrogen Post Load (kg/yr)	28.72		
Phosphorus Post Load (kg/yr)	3.74		
Target Load Reduction (N) %	42	TN MET	
Target Load Reduction (P) %	42		
Target Discharge Load, N (kg/yr)	16.66	TP MET	
Target Discharge Load, P (kg/yr)	2.17		
Provided Overall Efficiency, N (%):	42		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	16.64	36.64	
Discharged Load, P (kg/yr & lb/yr):	1.38	3.04	
Load Removed, N (kg/yr & lb/yr):	12.08	26.61	
Load Removed, P (kg/yr & lb/yr):	2.36	5.20	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 19

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

COMINGLING MULTI-LAND USE

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 19

Delay [hrs]

max delay = 15 hrs.

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200

Total pre-development catchment area:	10.210	AC
Total post-development catchment or for BMP analysis:	11.880	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.52	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	38.39	%
Estimated BMP Area (No loading from this area)	1.670	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	10.654	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.856	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	15.636	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.037	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	27.673	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.605	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | **SR 29 PD&E - Basin 19**

GO TO STORMWATER TREATMENT ANALYSIS

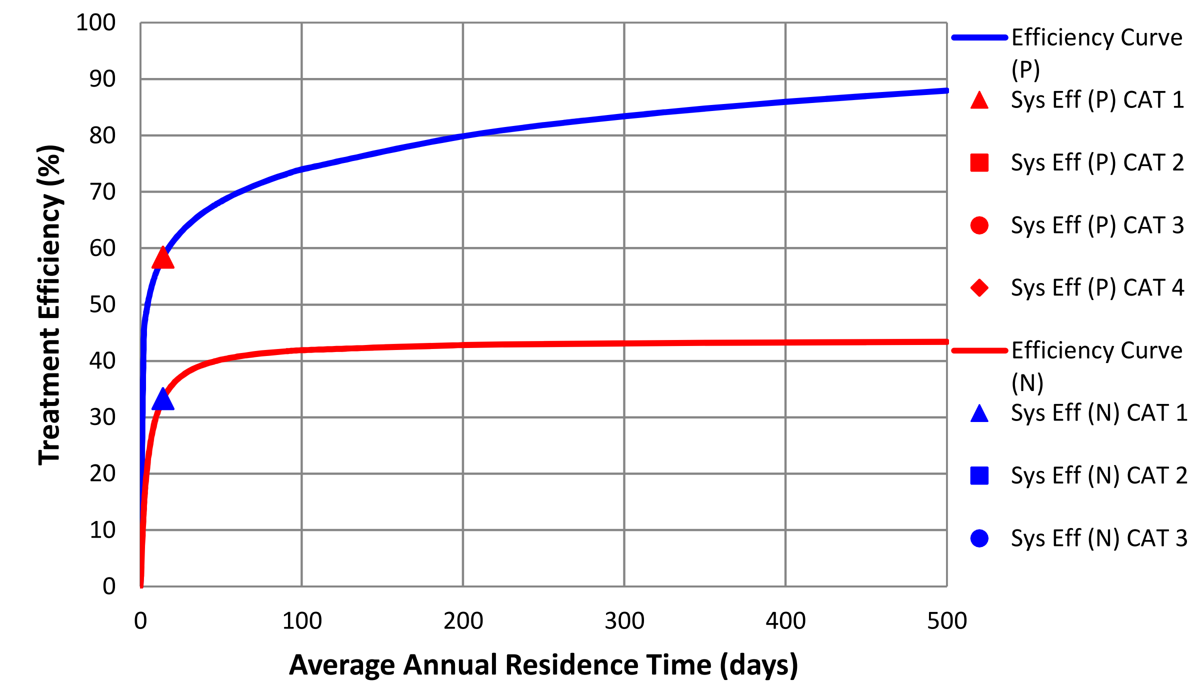
	Pond 19	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	10.210	0.000	0.000	0.000	ac
Total post-development catchment area:	10.210	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	43.497				%
Total **Phosphorus** removal required:	43.497				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	18.856				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

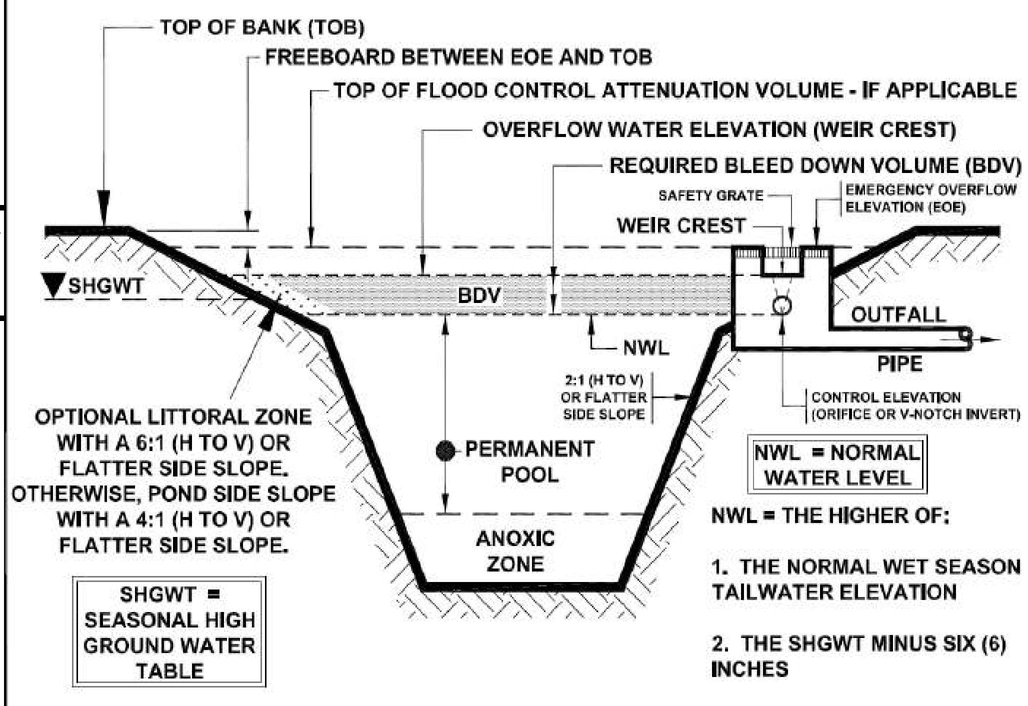
Minimum Pond Permanent Pool Volume:	0.723				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:		5/16/2018	V 8.6

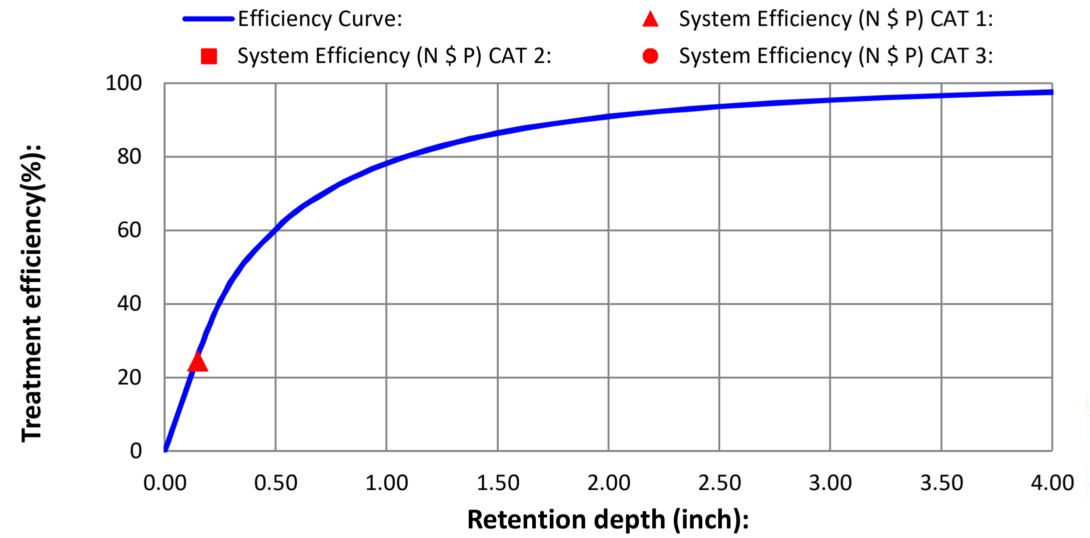
Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING:	SR 29 PD&E - Basin 19				
Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 19	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	10.210	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	43.497				%
Required Treatment Eff (**Phosphorus**):	43.497				%
Required retention depth over the watershed to meet required efficiency:	0.285	0.000	0.000	0.000	in
Required water quality retention volume:	0.242	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.128	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.150				in
Provided treatment efficiency (**Nitrogen**):	24.467	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	24.467	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	25.195				%
Remaining treatment efficiency (**Phosphorus**):	25.195				%
Remaining retention depth needed:	0.135	0.000	0.000	0.000	in

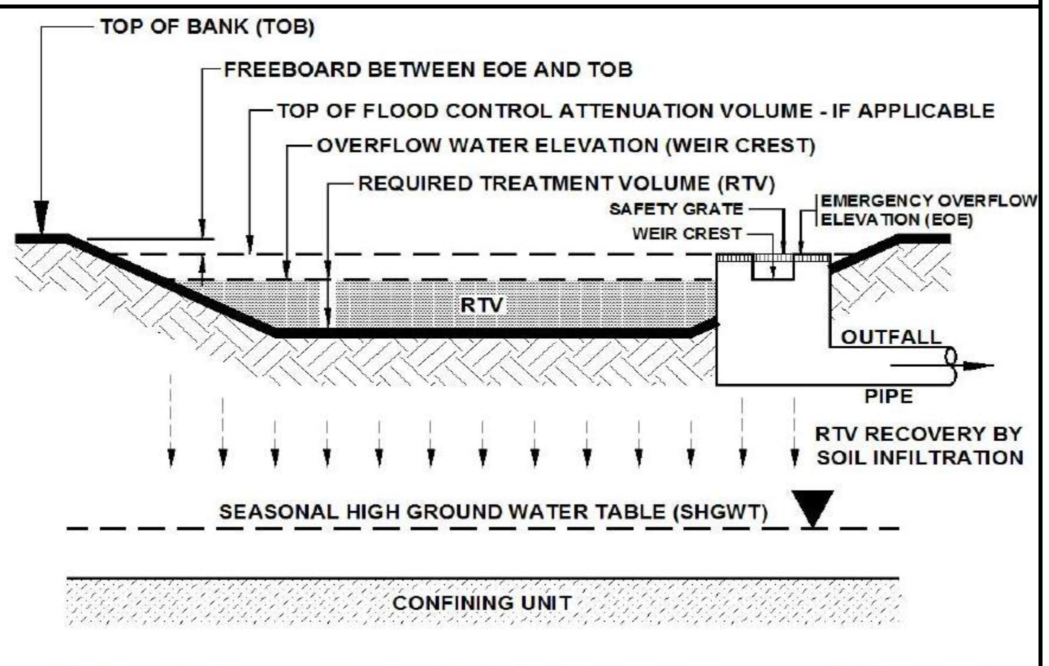


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

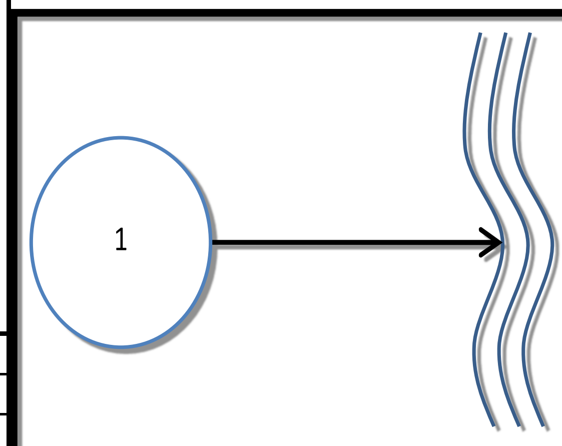
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 19	Optional Identification		
	Pond 19	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	15.64	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	2.04	TN MET	
Nitrogen Post Load (kg/yr)	27.67	TP MET	
Phosphorus Post Load (kg/yr)	3.60		
Target Load Reduction (N) %	43		
Target Load Reduction (P) %	43		
Target Discharge Load, N (kg/yr)	15.77		
Target Discharge Load, P (kg/yr)	2.05		
Provided Overall Efficiency, N (%):	47		
Provided Overall Efficiency, P (%):	66		
Discharged Load, N (kg/yr & lb/yr):	14.67	32.31	
Discharged Load, P (kg/yr & lb/yr):	1.23	2.70	
Load Removed, N (kg/yr & lb/yr):	13.01	28.65	
Load Removed, P (kg/yr & lb/yr):	2.38	5.24	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 20

HELP Rainfall

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data Red Numbers = Calculated	LAND USES/EMC
SELECT CATCHMENT CONFIGURATION 5/16/2018	CLICK ON CELL BELOW TO SELECT CONFIGURATION A - Single Catchment	VIEW CATCHMENT CONFIGURATION	
For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain	COMINGLING / MULTI-LAND USE	GO TO GENERAL SITE INFORMATION PAGE	

Delay [hrs] | CATCHMENT NO.1 NAME: Pond 20

max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	5.940	AC
Total post-development catchment or for BMP analysis:	8.230	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	13.80	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	46.63	%
Estimated BMP Area (No loading from this area)	2.290	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	6.255	ac-ft/year
Average annual post runoff volume (note no BMP area):	12.560	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	9.179	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.196	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	18.433	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.401	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 20

GO TO STORMWATER TREATMENT ANALYSIS

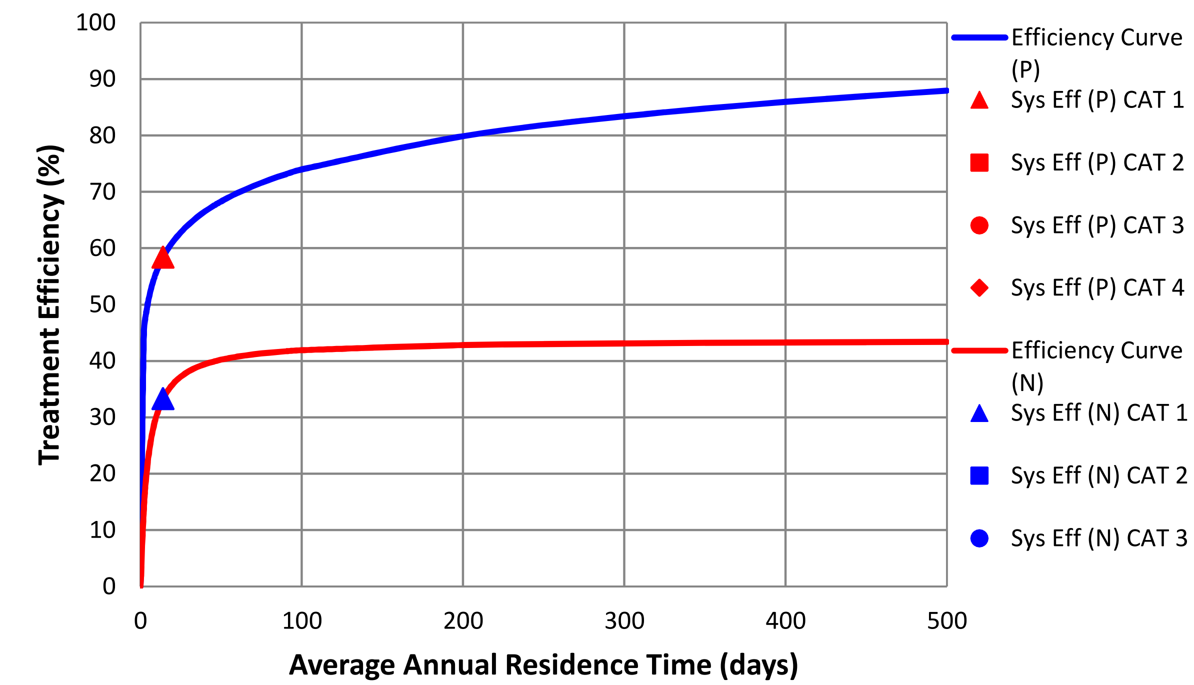
	Pond 20	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	5.940	0.000	0.000	0.000	ac
Total post-development catchment area:	5.940	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	50.203				%
Total **Phosphorus** removal required:	50.203				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	12.560				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

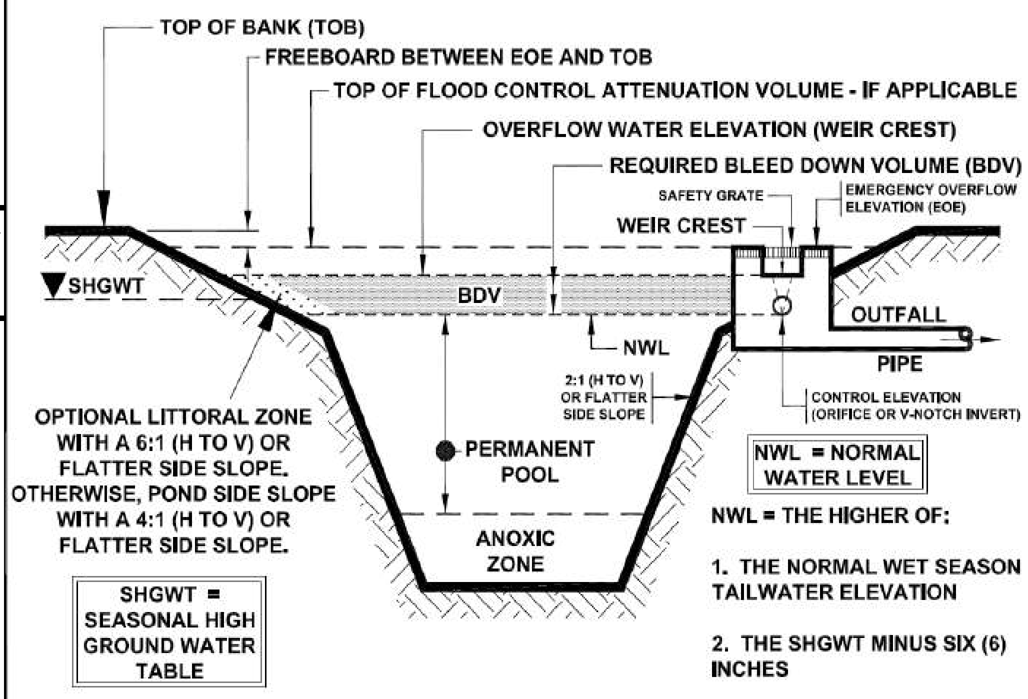
Minimum Pond Permanent Pool Volume:	0.482				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:			5/16/2018	V 8.6

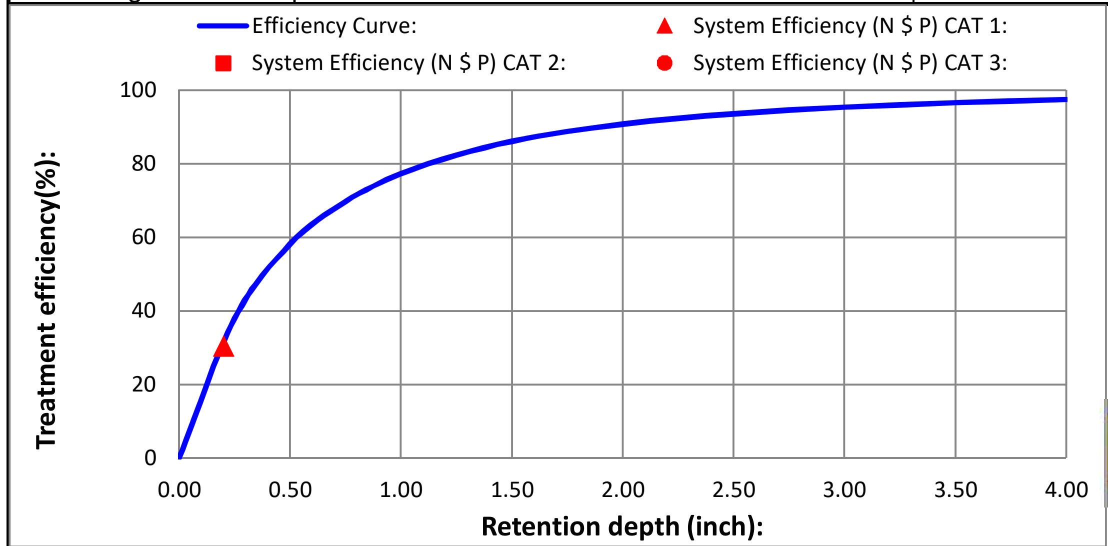
Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

GO TO STORMWATER TREATMENT ANALYSIS

RETENTION BASIN SERVING:	SR 29 PD&E - Basin 20				
Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 20	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	5.940	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	50.203				%
Required Treatment Eff (**Phosphorus**):	50.203				%
Required retention depth over the watershed to meet required efficiency:	0.402	0.000	0.000	0.000	in
Required water quality retention volume:	0.199	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.099	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.200				in
Provided treatment efficiency (**Nitrogen**):	30.356	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	30.356	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	28.498				%
Remaining treatment efficiency (**Phosphorus**):	28.498				%
Remaining retention depth needed:	0.202	0.000	0.000	0.000	in

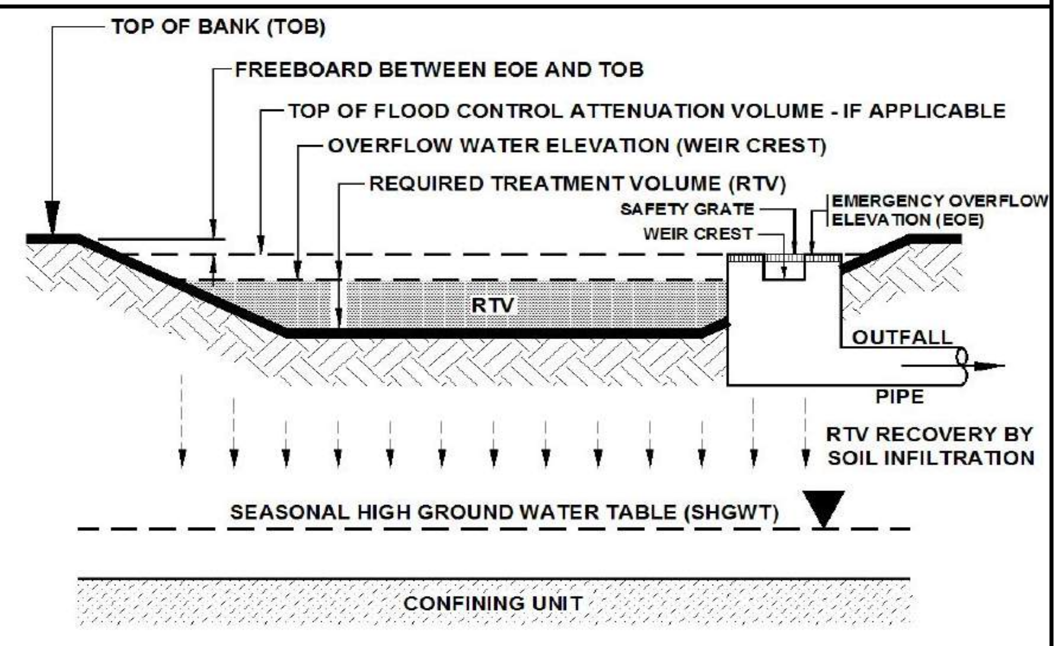


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY   V 8.6

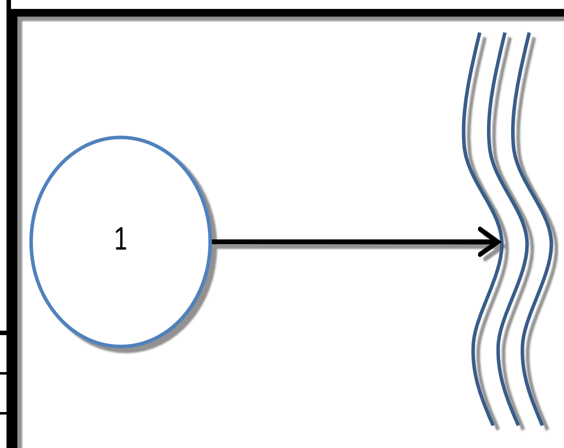
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 20	Optional Identification		
	Pond 20	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	9.18	Treatment Objectives or Target for TN MET TP MET	
Phosphorus Pre Load (kg/yr)	1.20		
Nitrogen Post Load (kg/yr)	18.43		
Phosphorus Post Load (kg/yr)	2.40		
Target Load Reduction (N) %	50		
Target Load Reduction (P) %	50		
Target Discharge Load, N (kg/yr)	9.22		
Target Discharge Load, P (kg/yr)	1.20		
Provided Overall Efficiency, N (%):	51		
Provided Overall Efficiency, P (%):	68		
Discharged Load, N (kg/yr & lb/yr):	9.12	20.08	
Discharged Load, P (kg/yr & lb/yr):	0.77	1.69	
Load Removed, N (kg/yr & lb/yr):	9.32	20.52	
Load Removed, P (kg/yr & lb/yr):	1.63	3.60	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 21

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map): CLICK ON CELL BELOW TO SELECT — Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

Type of analysis: CLICK ON CELL BELOW TO SELECT — Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 21

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	8.160	AC
Total post-development catchment or for BMP analysis:	10.950	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	19.00	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	49.51	%
Estimated BMP Area (No loading from this area)	2.790	AC

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	9.945	ac-ft/year
Average annual post runoff volume (note no BMP area):	17.999	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	14.595	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.901	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	26.415	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.441	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 21

GO TO STORMWATER TREATMENT ANALYSIS

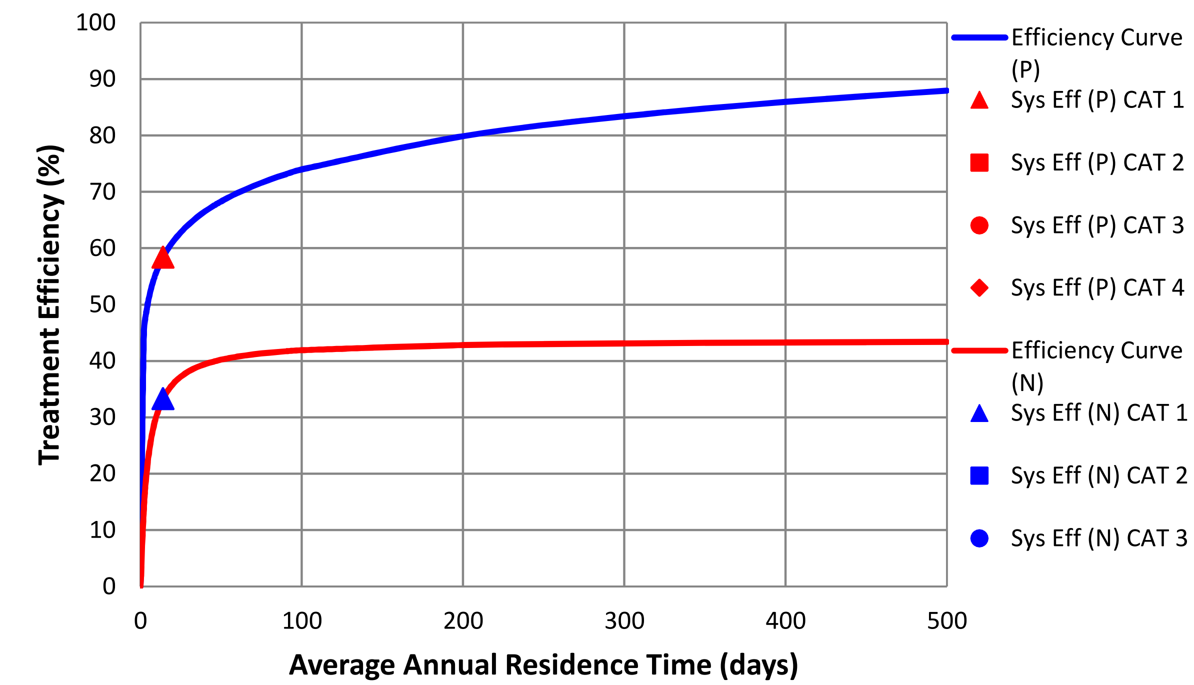
	Pond 21	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	8.160	0.000	0.000	0.000	ac
Total post-development catchment area:	8.160	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	44.746				%
Total **Phosphorus** removal required:	44.746				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	17.999				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

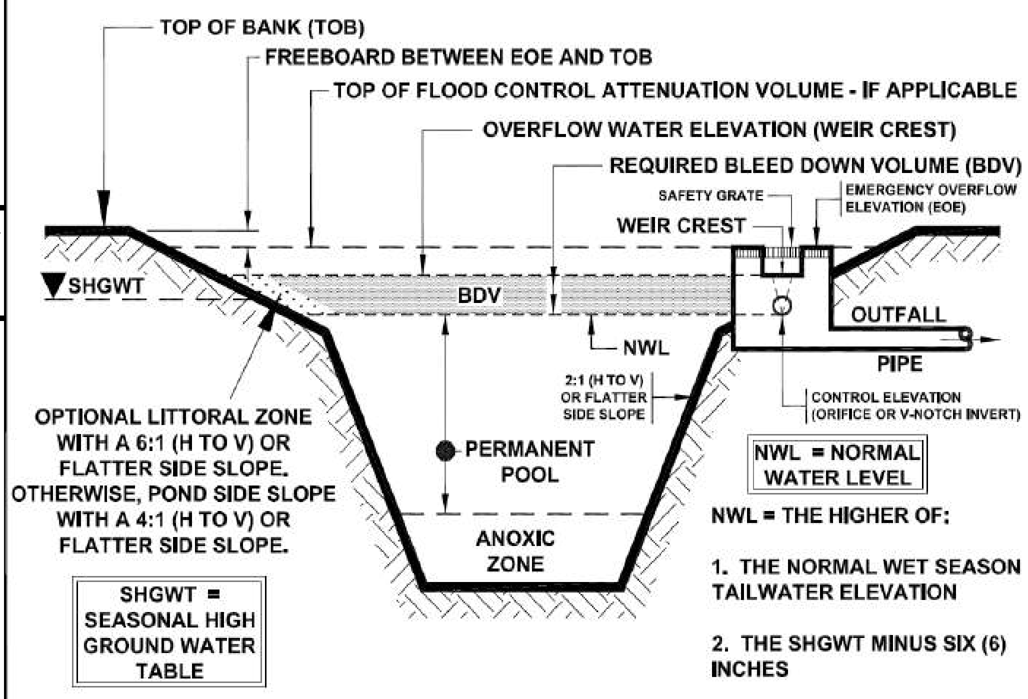
Minimum Pond Permanent Pool Volume:	0.690				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:		5/16/2018	V 8.6		Blue Numbers =	Input data
					Red Numbers =	Calculated or Carryover

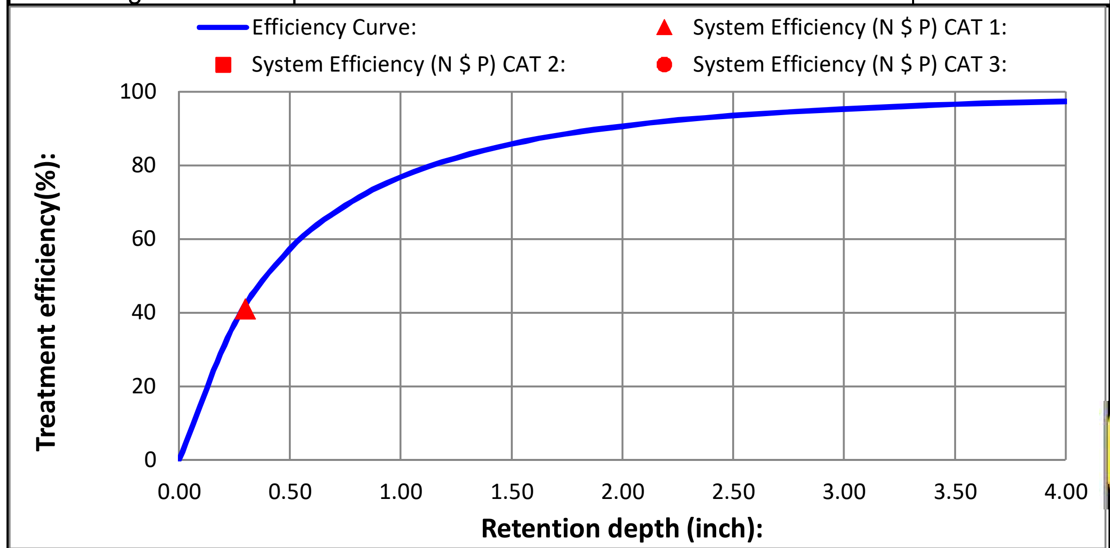
RETENTION BASIN SERVING: SR 29 PD&E - Basin 21

GO TO STORMWATER TREATMENT ANALYSIS

Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 21	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	8.160	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	44.746				%
Required Treatment Eff (**Phosphorus**):	44.746				%
Required retention depth over the watershed to meet required efficiency:	0.346	0.000	0.000	0.000	in
Required water quality retention volume:	0.235	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.204	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.300				in
Provided treatment efficiency (**Nitrogen**):	41.023	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	41.023	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	6.313				%
Remaining treatment efficiency (**Phosphorus**):	6.313				%
Remaining retention depth needed:	0.046	0.000	0.000	0.000	in

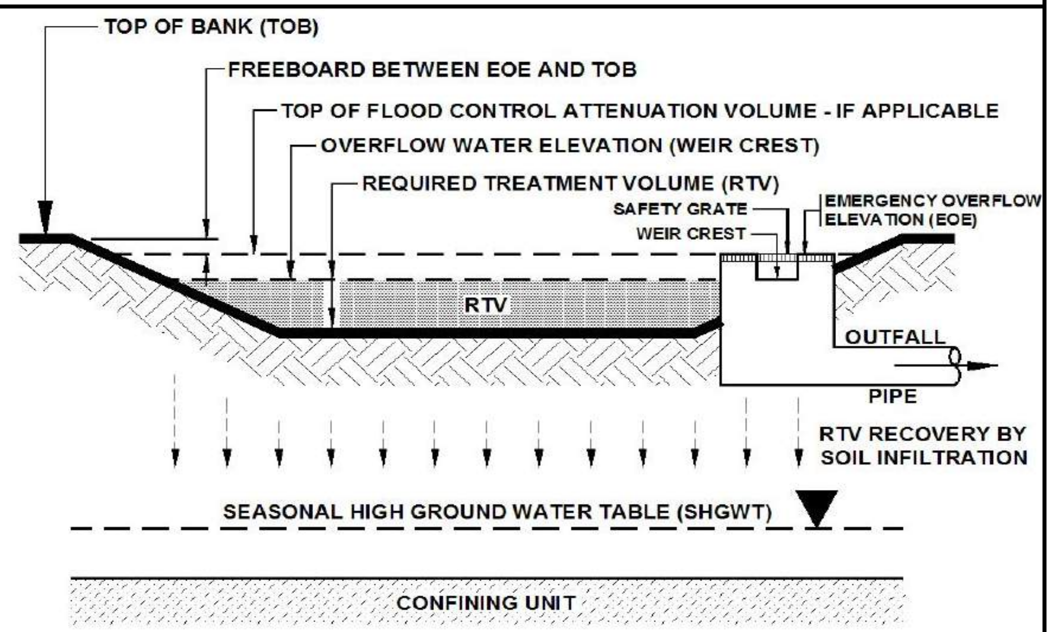


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

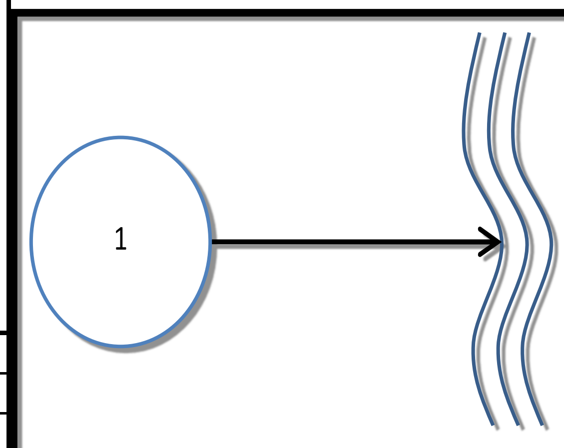
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 21	Optional Identification		
	Pond 21	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	14.60	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	1.90		
Nitrogen Post Load (kg/yr)	26.42		
Phosphorus Post Load (kg/yr)	3.44		
Target Load Reduction (N) %	45	TN MET	
Target Load Reduction (P) %	45		
Target Discharge Load, N (kg/yr)	14.53	TP MET	
Target Discharge Load, P (kg/yr)	1.89		
Provided Overall Efficiency, N (%):	48		
Provided Overall Efficiency, P (%):	72		
Discharged Load, N (kg/yr & lb/yr):	13.81	30.43	
Discharged Load, P (kg/yr & lb/yr):	0.96	2.12	
Load Removed, N (kg/yr & lb/yr):	12.60	27.75	
Load Removed, P (kg/yr & lb/yr):	2.48	5.46	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 22

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map):	CLICK ON CELL BELOW TO SELECT Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
Type of analysis:	CLICK ON CELL BELOW TO SELECT Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data Red Numbers = Calculated	LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 22

Delay [hrs]

max delay = 15 hrs.

Pre-development land use:	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200	
with default EMCs		
Post-development land use:	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200	
with default EMCs		
Total pre-development catchment area:	6.040	AC
Total post-development catchment or for BMP analysis:	7.340	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	15.40	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	44.21	%
Estimated BMP Area (No loading from this area)	1.300	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	6.672	ac-ft/year
Average annual post runoff volume (note no BMP area):	12.302	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	9.791	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.275	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	18.054	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.352	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use:	CLICK ON CELL BELOW TO SELECT	
with default EMCs		
Post-development land use:	CLICK ON CELL BELOW TO SELECT	
with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use:	CLICK ON CELL BELOW TO SELECT	
with default EMCs		
Post-development land use:	CLICK ON CELL BELOW TO SELECT	
with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use:	CLICK ON CELL BELOW TO SELECT	
with default EMCs		
Post-development land use:	CLICK ON CELL BELOW TO SELECT	
with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 22

GO TO STORMWATER TREATMENT ANALYSIS

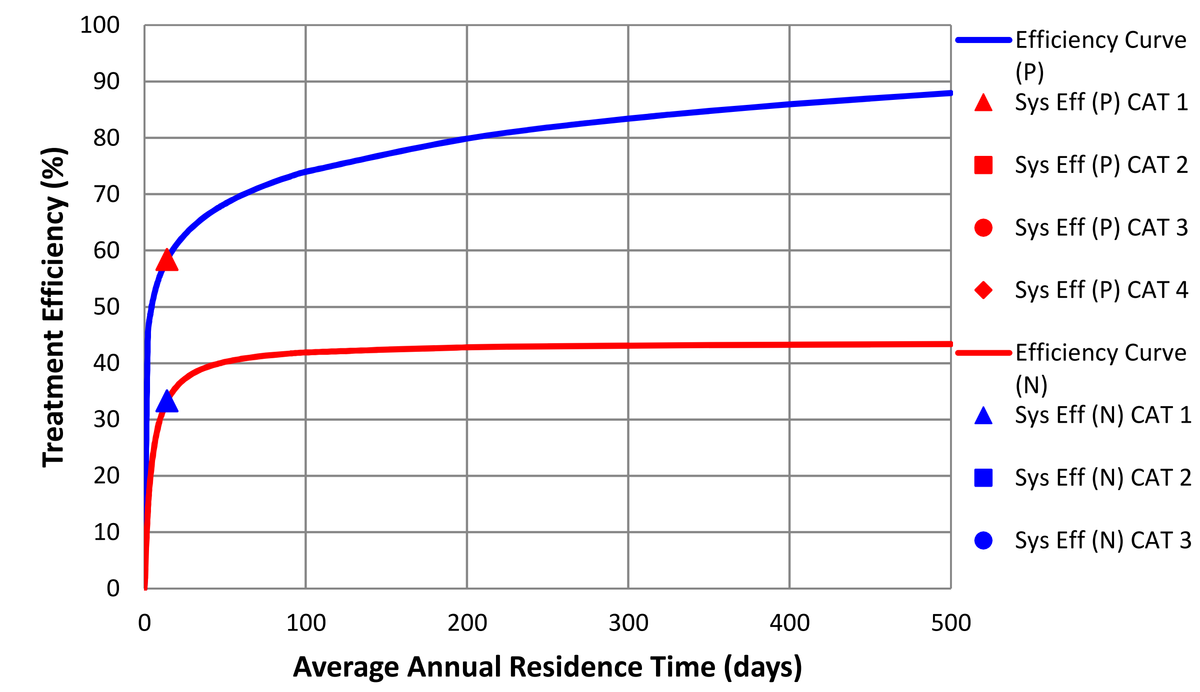
	Pond 22	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	6.040	0.000	0.000	0.000	ac
Total post-development catchment area:	6.040	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	45.765				%
Total **Phosphorus** removal required:	45.765				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	12.302				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

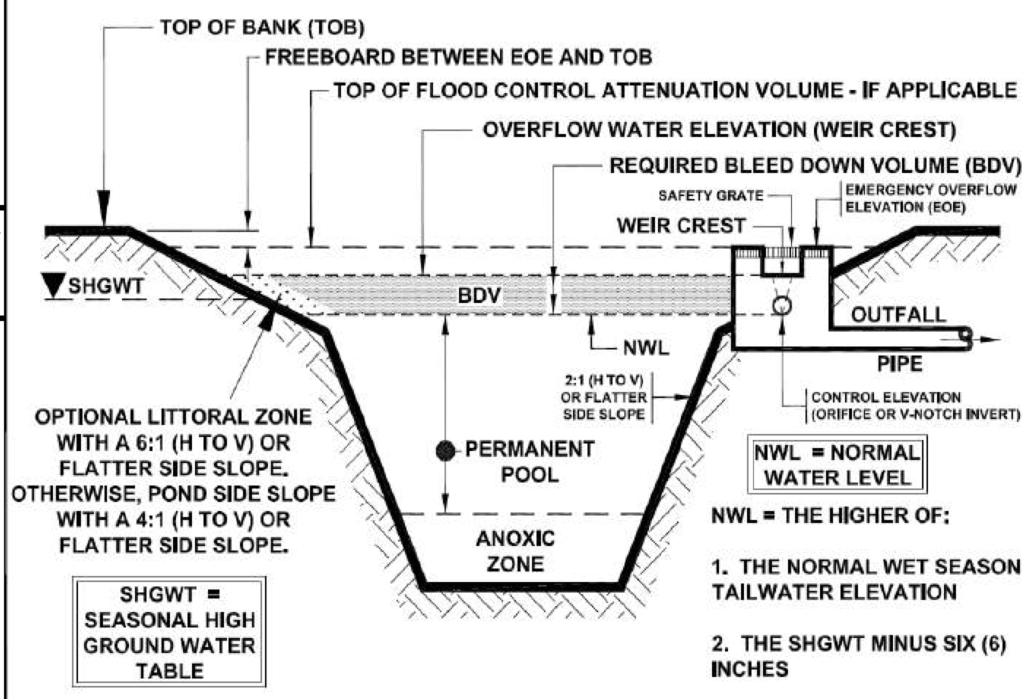
Minimum Pond Permanent Pool Volume:	0.472				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:			5/16/2018	V 8.6

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

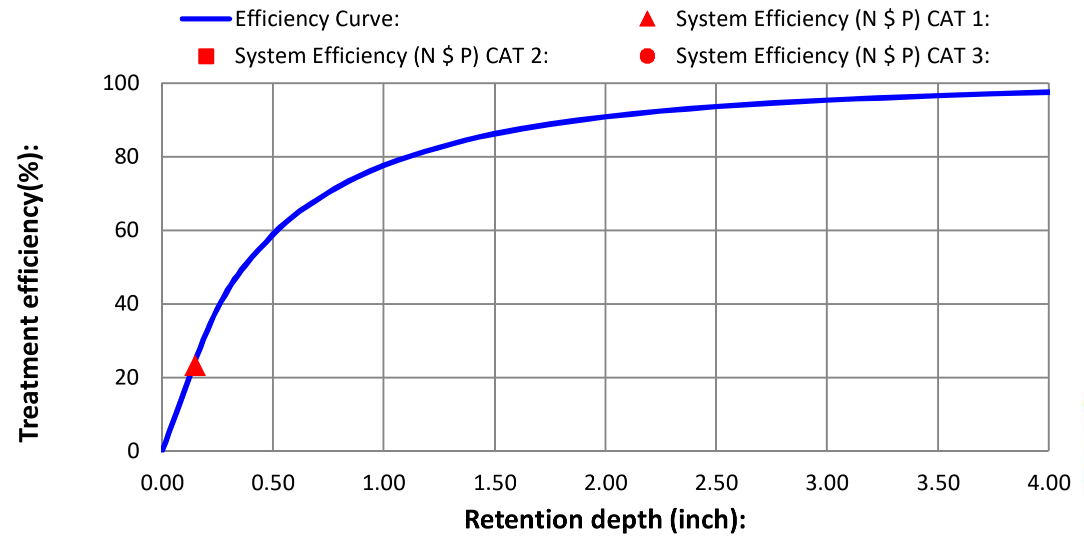
RETENTION BASIN SERVING: SR 29 PD&E - Basin 22

GO TO STORMWATER TREATMENT ANALYSIS

Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 22	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	6.040	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	45.765				%
Required Treatment Eff (**Phosphorus**):	45.765				%
Required retention depth over the watershed to meet required efficiency:	0.337	0.000	0.000	0.000	in
Required water quality retention volume:	0.170	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.076	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	0.150				in
Provided treatment efficiency (**Nitrogen**):	23.262	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	23.262	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	29.324				%
Remaining treatment efficiency (**Phosphorus**):	29.324				%
Remaining retention depth needed:	0.187	0.000	0.000	0.000	in

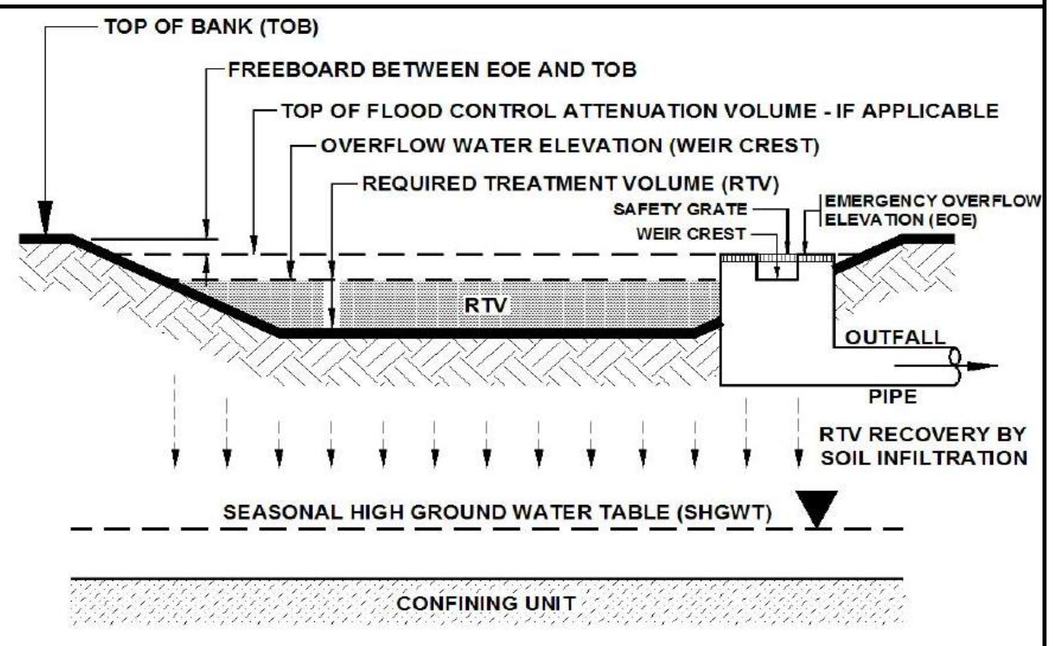


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

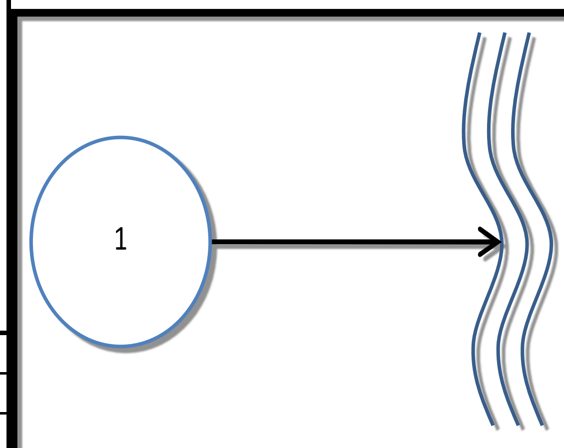
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 22	Optional Identification		
	Pond 22	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	9.79	**Treatment Objectives or Target for**	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.28		
Nitrogen Post Load (kg/yr)	18.05		
Phosphorus Post Load (kg/yr)	2.35		
Target Load Reduction (N) %	46	**TN MET**	
Target Load Reduction (P) %	46		
Target Discharge Load, N (kg/yr)	9.75		
Target Discharge Load, P (kg/yr)	1.27	**TP MET**	
Provided Overall Efficiency, N (%):	46		
Provided Overall Efficiency, P (%):	66		
Discharged Load, N (kg/yr & lb/yr):	9.70	21.36	
Discharged Load, P (kg/yr & lb/yr):	0.81	1.78	
Load Removed, N (kg/yr & lb/yr):	8.36	18.41	
Load Removed, P (kg/yr & lb/yr):	1.54	3.40	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 23

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map):	CLICK ON CELL BELOW TO SELECT Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
Type of analysis:	CLICK ON CELL BELOW TO SELECT Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs] | CATCHMENT NO.1 NAME: Pond 23

max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	11.420	AC
Total post-development catchment or for BMP analysis:	13.300	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	21.28	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	47.11	%
Estimated BMP Area (No loading from this area)	1.880	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	14.760	ac-ft/year
Average annual post runoff volume (note no BMP area):	24.320	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	21.661	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.821	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	35.692	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	4.649	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS: 5/16/2018 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: SR 29 PD&E - Basin 23

GO TO STORMWATER TREATMENT ANALYSIS

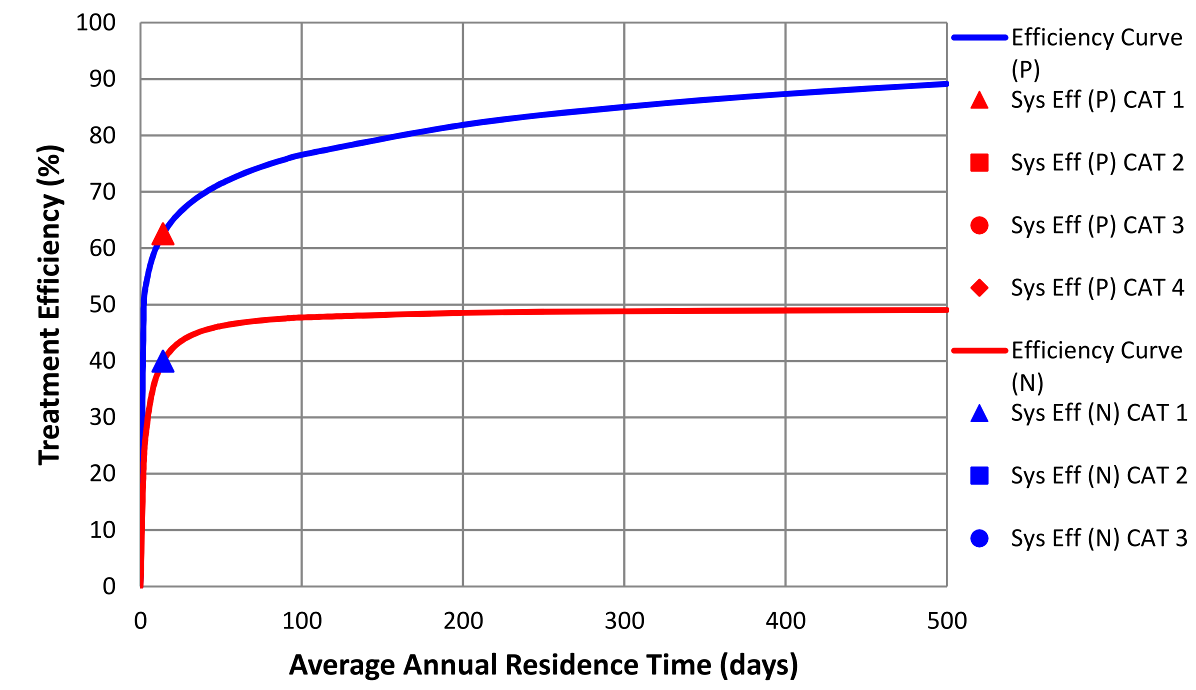
	Pond 23	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	11.420	0.000	0.000	0.000	ac
Total post-development catchment area:	11.420	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	39.312				%
Total **Phosphorus** removal required:	39.312				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	24.320				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

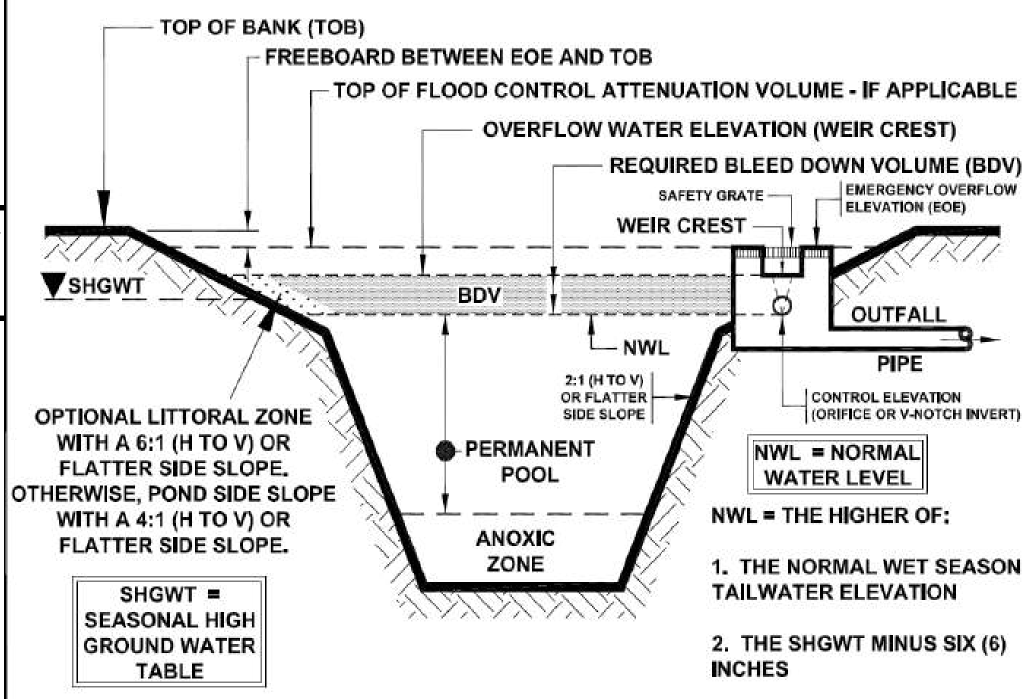
Minimum Pond Permanent Pool Volume:	0.933				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

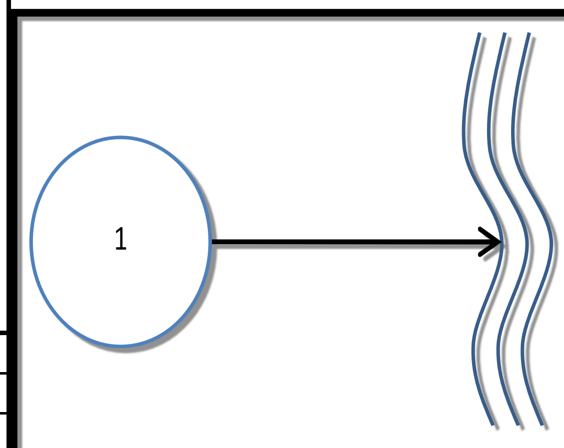
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 23	Optional Identification		
	Pond 23	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for TN MET TP MET	5/16/2018 BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	21.66		
Phosphorus Pre Load (kg/yr)	2.82		
Nitrogen Post Load (kg/yr)	35.69		
Phosphorus Post Load (kg/yr)	4.65		
Target Load Reduction (N) %	39		
Target Load Reduction (P) %	39		
Target Discharge Load, N (kg/yr)	21.77		
Target Discharge Load, P (kg/yr)	2.84		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	21.42	47.18	
Discharged Load, P (kg/yr & lb/yr):	1.74	3.83	
Load Removed, N (kg/yr & lb/yr):	14.27	31.44	
Load Removed, P (kg/yr & lb/yr):	2.91	6.41	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 24

HELP Rainfall

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data Red Numbers = Calculated	LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 24

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	4.430	AC
Total post-development catchment or for BMP analysis:	5.640	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	29.80	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	38.37	%
Estimated BMP Area (No loading from this area)	1.210	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	6.958	ac-ft/year
Average annual post runoff volume (note no BMP area):	8.179	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	10.212	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.330	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	12.003	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	1.563	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 24

GO TO STORMWATER TREATMENT ANALYSIS

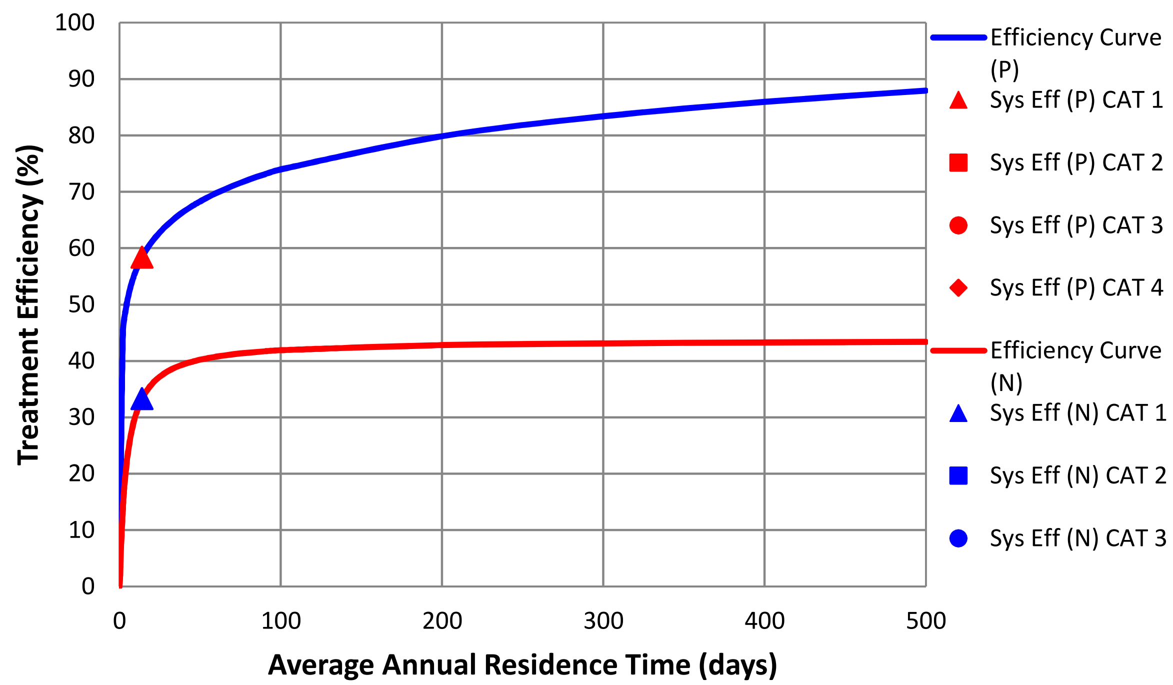
	Pond 24	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	4.430	0.000	0.000	0.000	ac
Total post-development catchment area:	4.430	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	14.925				%
Total **Phosphorus** removal required:	14.925				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	8.179				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

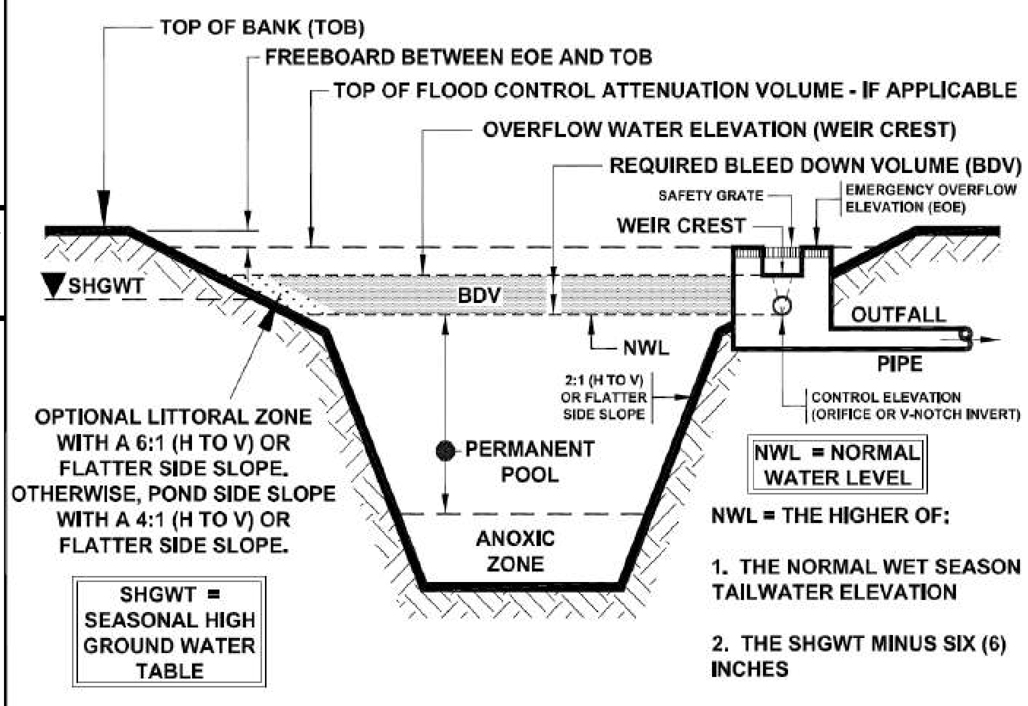
Minimum Pond Permanent Pool Volume:	0.314				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

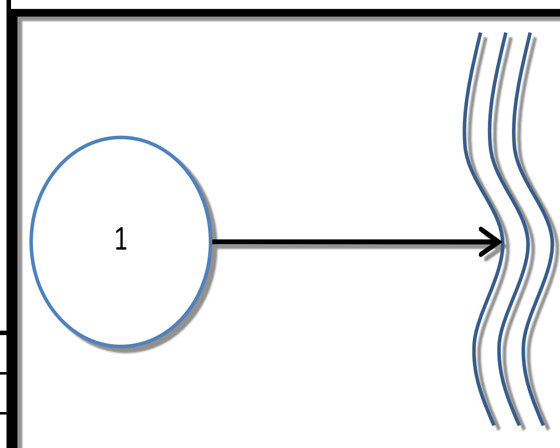
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 24	Optional Identification		
	Pond 24	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	10.21	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	1.33	TN MET	
Nitrogen Post Load (kg/yr)	12.00	TP MET	
Phosphorus Post Load (kg/yr)	1.56		
Target Load Reduction (N) %	15		
Target Load Reduction (P) %	15		
Target Discharge Load, N (kg/yr)	10.20		
Target Discharge Load, P (kg/yr)	1.33		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	8.00	17.63	
Discharged Load, P (kg/yr & lb/yr):	0.65	1.43	
Load Removed, N (kg/yr & lb/yr):	4.00	8.81	
Load Removed, P (kg/yr & lb/yr):	0.91	2.01	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 25

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 25

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	11.130	AC
Total post-development catchment or for BMP analysis:	14.440	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	14.91	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	32.43	%
Estimated BMP Area (No loading from this area)	3.310	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	12.123	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.416	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	17.791	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.317	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	27.027	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.520	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:	SR 29 PD&E - Basin 25

GO TO STORMWATER TREATMENT ANALYSIS

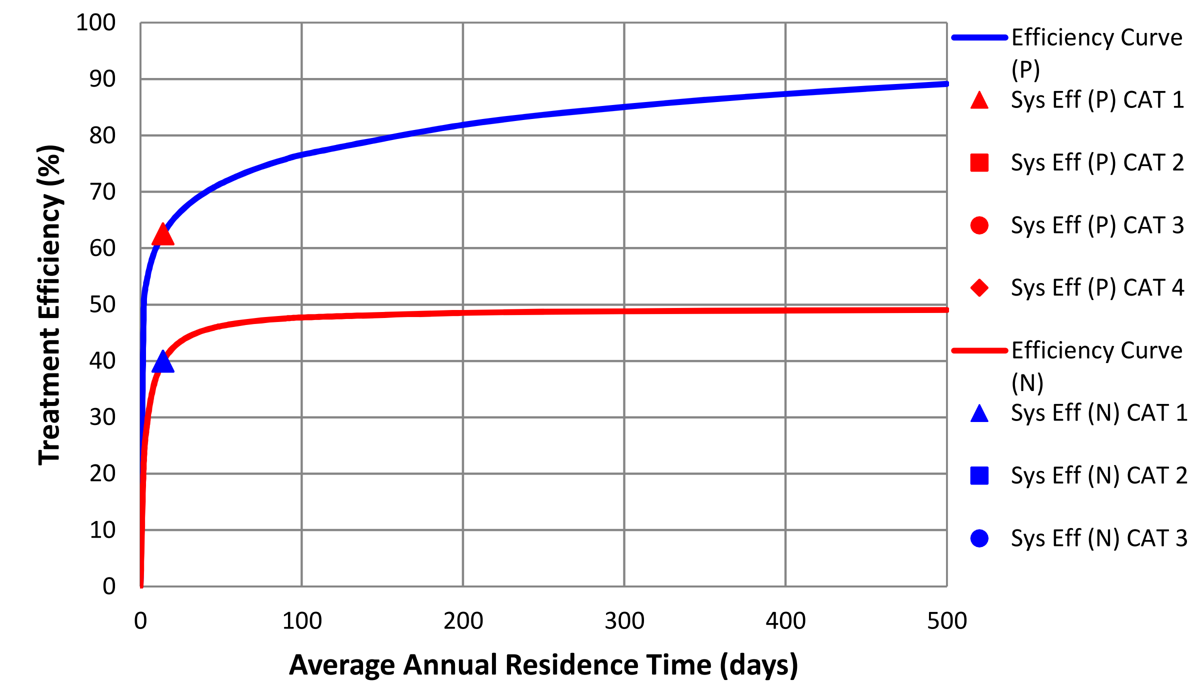
	Pond 25	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	11.130	0.000	0.000	0.000	ac
Total post-development catchment area:	11.130	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	34.171				%
Total **Phosphorus** removal required:	34.171				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	18.416				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

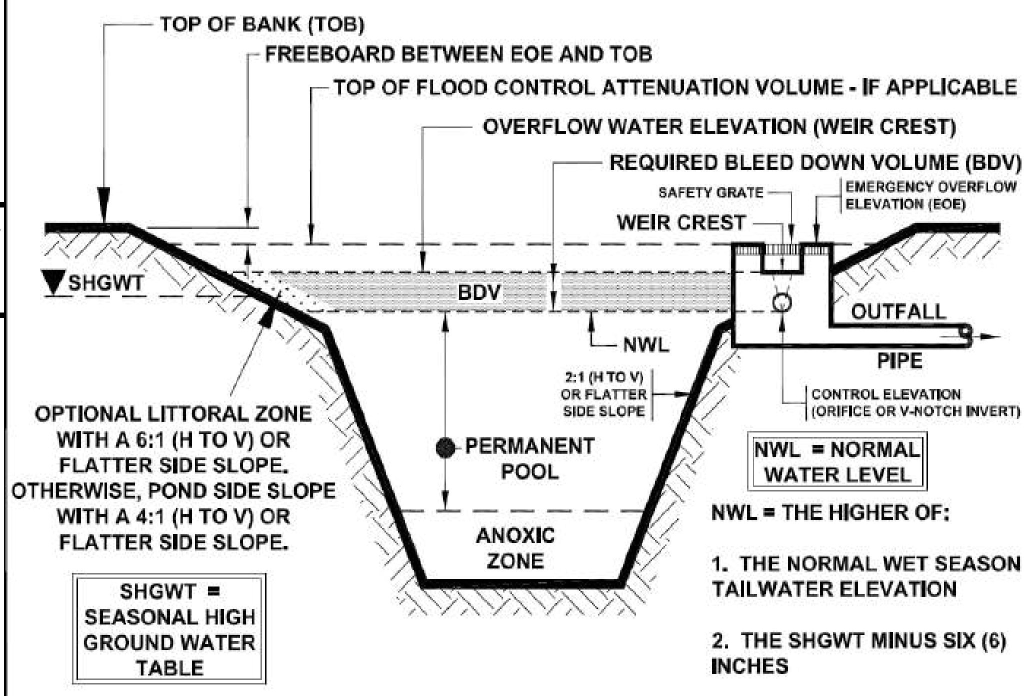
Minimum Pond Permanent Pool Volume:	0.706				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY				V 8.6

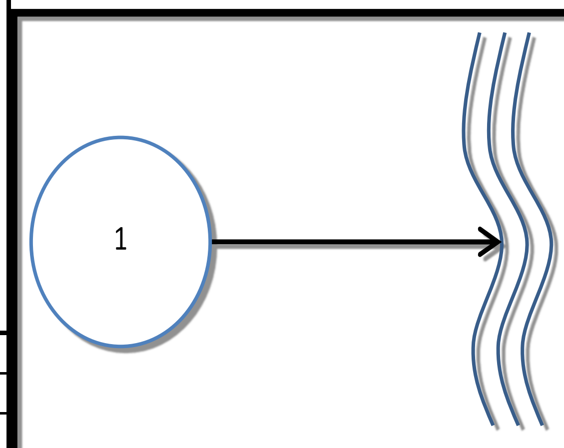
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 25	Optional Identification		
	Pond 25	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	17.79	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	2.32		
Nitrogen Post Load (kg/yr)	27.03		
Phosphorus Post Load (kg/yr)	3.52		
Target Load Reduction (N) %	34	TN MET	
Target Load Reduction (P) %	34		
Target Discharge Load, N (kg/yr)	17.84	TP MET	
Target Discharge Load, P (kg/yr)	2.32		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	16.22	35.72	
Discharged Load, P (kg/yr & lb/yr):	1.32	2.90	
Load Removed, N (kg/yr & lb/yr):	10.81	23.81	
Load Removed, P (kg/yr & lb/yr):	2.20	4.85	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 26-1R

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 26-1R

Delay [hrs]

max delay = 15 hrs.

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	7.600	AC
Total post-development catchment or for BMP analysis:	10.960	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	35.79	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	63.16	%
Estimated BMP Area (No loading from this area)	3.360	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	13.390	ac-ft/year
Average annual post runoff volume (note no BMP area):	20.126	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	19.650	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.559	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	29.537	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.847	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:

SR 29 PD&E - Basin 26-1R

GO TO STORMWATER TREATMENT ANALYSIS

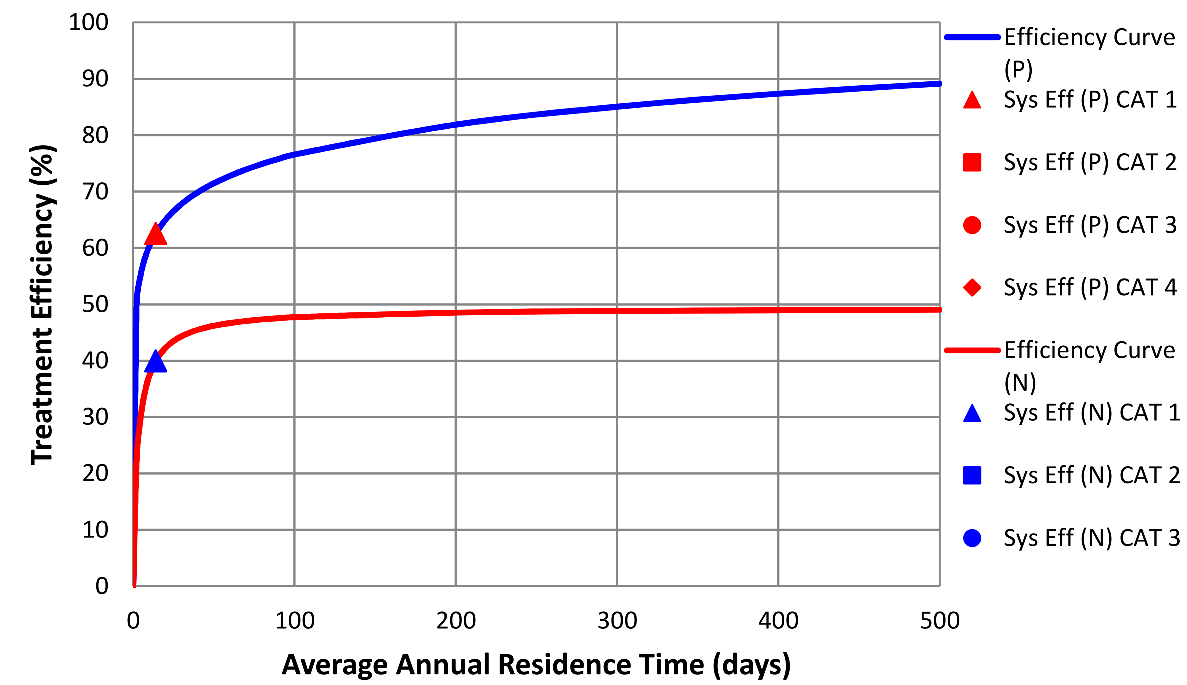
	Pond 26-1R	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	7.600	0.000	0.000	0.000	ac
Total post-development catchment area:	7.600	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	33.472				%
Total **Phosphorus** removal required:	33.472				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	20.126				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

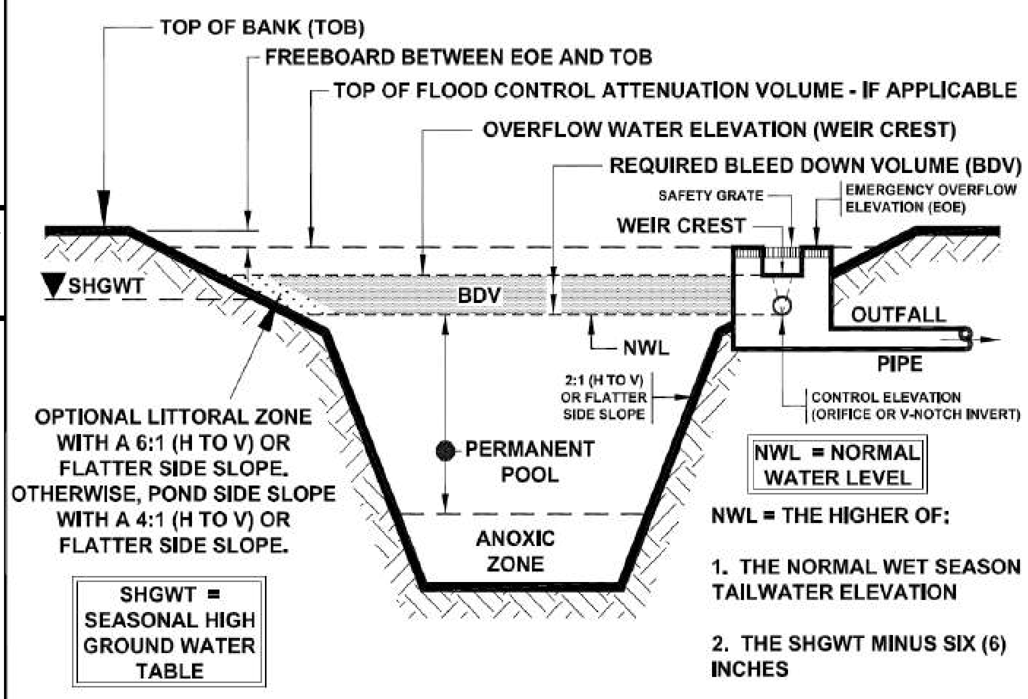
Minimum Pond Permanent Pool Volume:	0.772				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

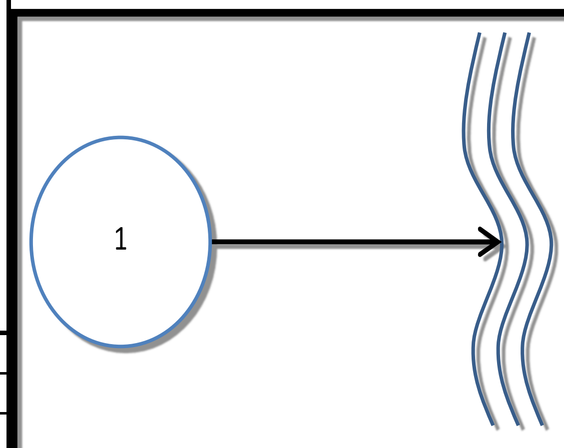
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 26-1R	Optional Identification		
	Pond 26-1R	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	19.65	Treatment Objectives or Target for TN MET TP MET	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	2.56		
Nitrogen Post Load (kg/yr)	29.54		
Phosphorus Post Load (kg/yr)	3.85		
Target Load Reduction (N) %	33		
Target Load Reduction (P) %	33		
Target Discharge Load, N (kg/yr)	19.79		
Target Discharge Load, P (kg/yr)	2.58		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	17.72	39.04	
Discharged Load, P (kg/yr & lb/yr):	1.44	3.17	
Load Removed, N (kg/yr & lb/yr):	11.81	26.02	
Load Removed, P (kg/yr & lb/yr):	2.41	5.30	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 26-2

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches

	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 26-2

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	7.600	AC
Total post-development catchment or for BMP analysis:	10.000	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	35.79	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	56.45	%
Estimated BMP Area (No loading from this area)	2.400	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	13.390	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.483	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	19.650	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.559	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	27.125	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.533	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 26-2

GO TO STORMWATER TREATMENT ANALYSIS

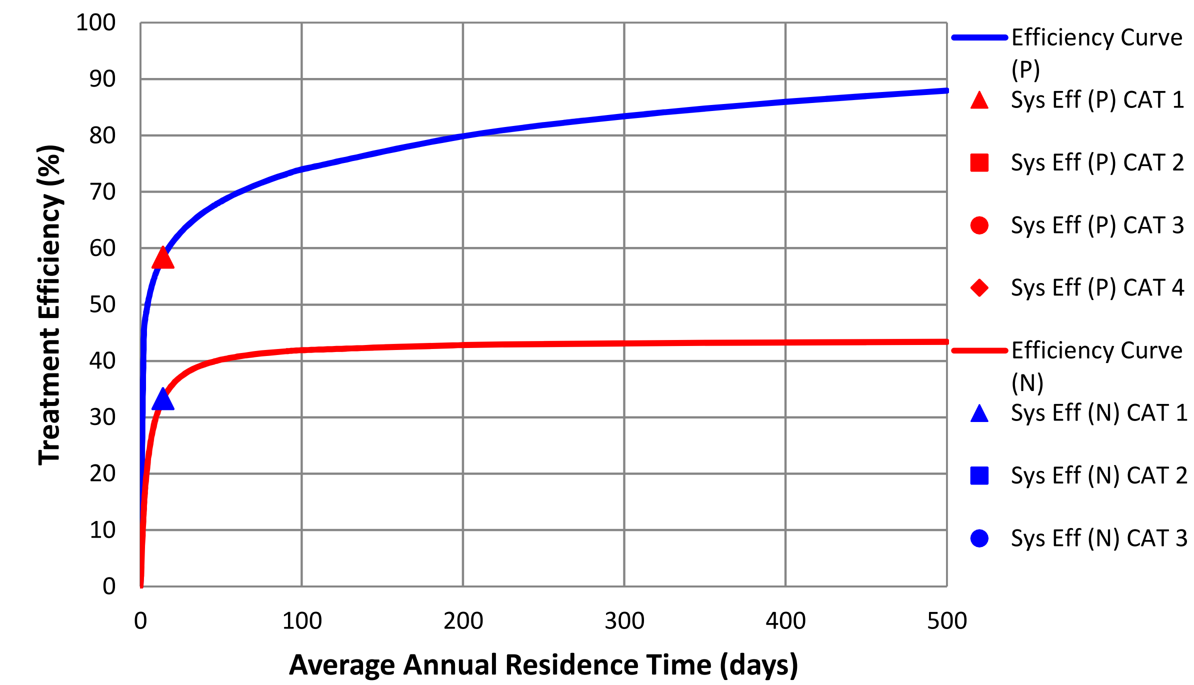
	Pond 26-2	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	7.600	0.000	0.000	0.000	ac
Total post-development catchment area:	7.600	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	27.556				%
Total **Phosphorus** removal required:	27.556				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	18.483				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

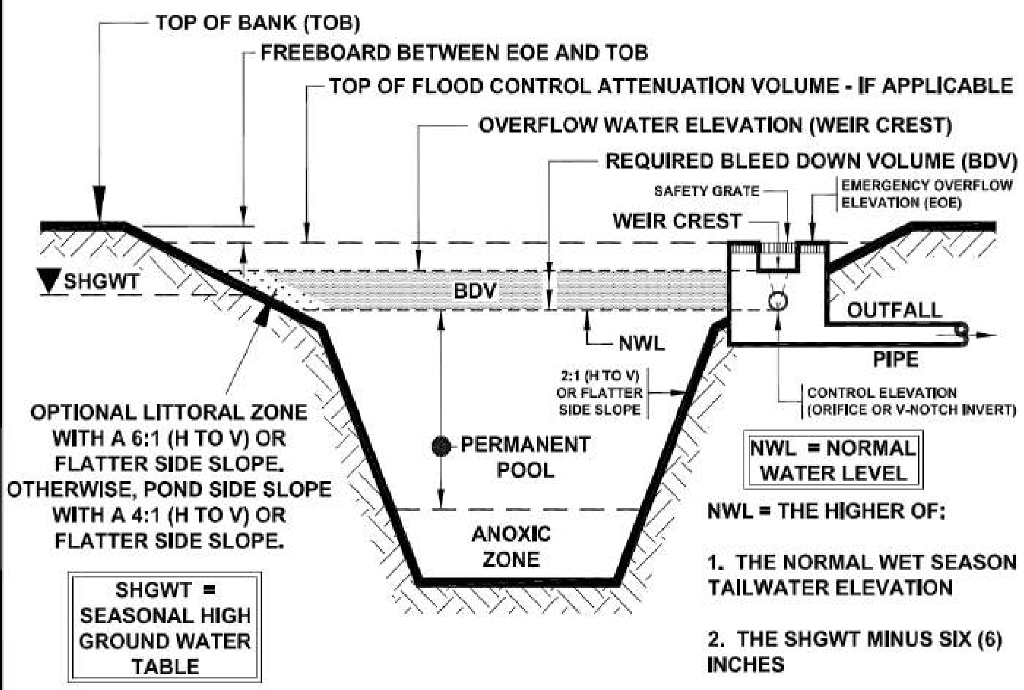
Minimum Pond Permanent Pool Volume:	0.709				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

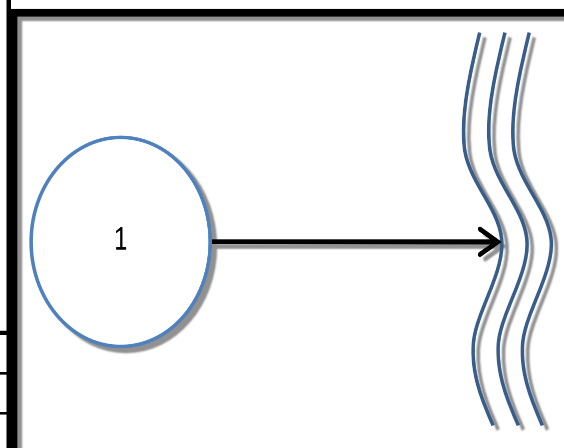
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 26-2	Optional Identification		
	Pond 26-2	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	19.65	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	2.56	TN MET	
Nitrogen Post Load (kg/yr)	27.13		
Phosphorus Post Load (kg/yr)	3.53	TP MET	
Target Load Reduction (N) %	28		
Target Load Reduction (P) %	28		
Target Discharge Load, N (kg/yr)	19.53		
Target Discharge Load, P (kg/yr)	2.54		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	18.09	39.84	
Discharged Load, P (kg/yr & lb/yr):	1.47	3.24	
Load Removed, N (kg/yr & lb/yr):	9.04	19.91	
Load Removed, P (kg/yr & lb/yr):	2.06	4.55	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 27-1R

HELP Rainfall

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

VIEW MEAN ANNUAL RAINFALL MAP

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

GO TO WATERSHED CHARACTERISTICS

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 27-1R

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	17.600	AC
Total post-development catchment or for BMP analysis:	20.430	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	8.47	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	16.99	%
Estimated BMP Area (No loading from this area)	2.830	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	15.488	ac-ft/year
Average annual post runoff volume (note no BMP area):	20.330	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	22.730	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.961	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	29.836	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.886	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 27-1R

GO TO STORMWATER TREATMENT ANALYSIS

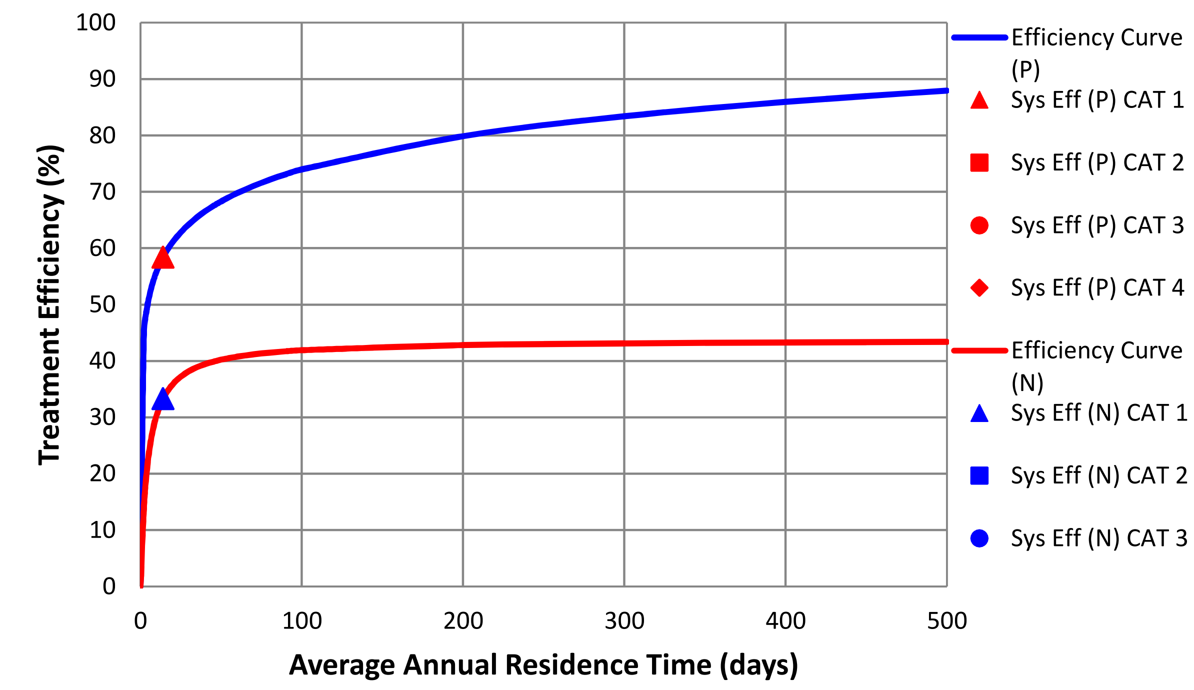
	Pond 27-1R	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	17.600	0.000	0.000	0.000	ac
Total post-development catchment area:	17.600	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	23.818				%
Total **Phosphorus** removal required:	23.818				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	20.330				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

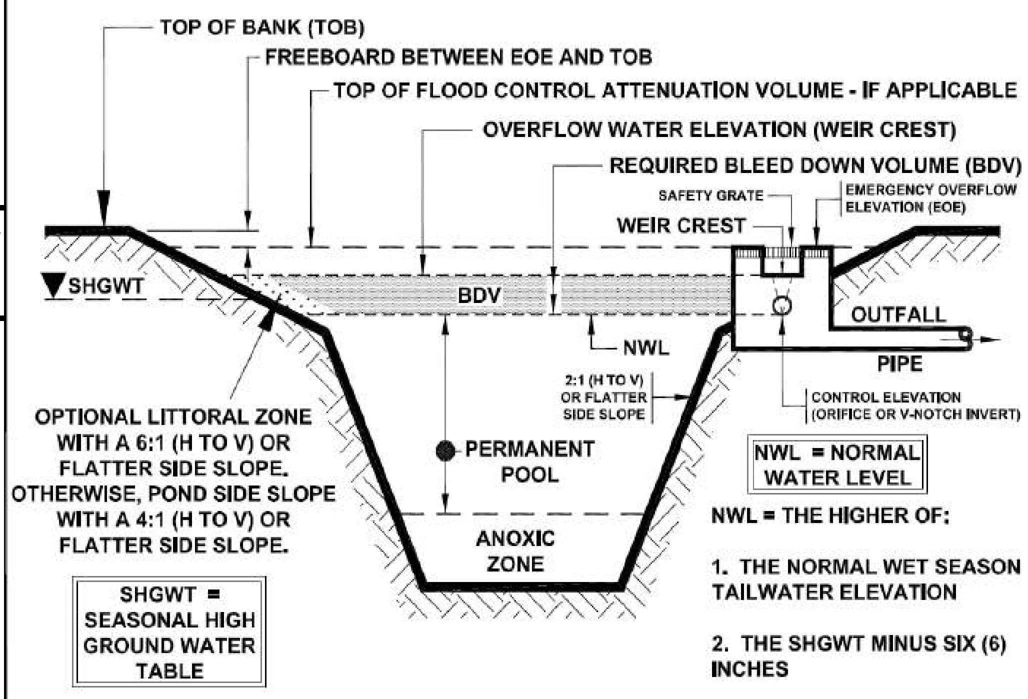
Minimum Pond Permanent Pool Volume:	0.780				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

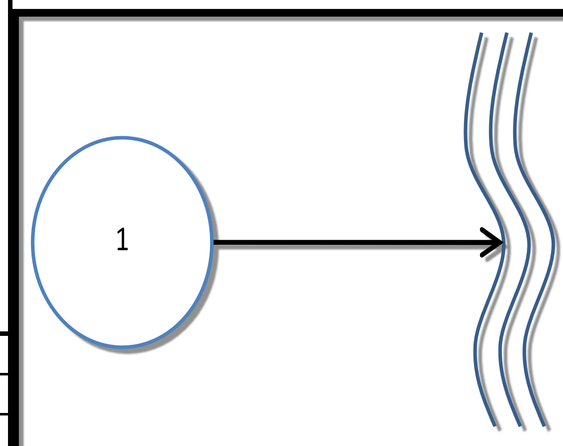
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 27-1R	Optional Identification		
	Pond 27-1R	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	22.73	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	2.96		
Nitrogen Post Load (kg/yr)	29.84		
Phosphorus Post Load (kg/yr)	3.89		
Target Load Reduction (N) %	24	TN MET	
Target Load Reduction (P) %	24		
Target Discharge Load, N (kg/yr)	22.68	TP MET	
Target Discharge Load, P (kg/yr)	2.95		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	19.89	43.82	
Discharged Load, P (kg/yr & lb/yr):	1.62	3.56	
Load Removed, N (kg/yr & lb/yr):	9.94	21.90	
Load Removed, P (kg/yr & lb/yr):	2.27	5.00	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	6/13/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 27-2

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
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Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

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RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 6/13/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs] | max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 27-2

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	17.600	AC
Total post-development catchment or for BMP analysis:	21.380	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	8.47	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	22.27	%
Estimated BMP Area (No loading from this area)	3.780	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	15.488	ac-ft/year
Average annual post runoff volume (note no BMP area):	23.318	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	22.730	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.961	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	34.222	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	4.457	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	6/13/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 27-2

GO TO STORMWATER TREATMENT ANALYSIS

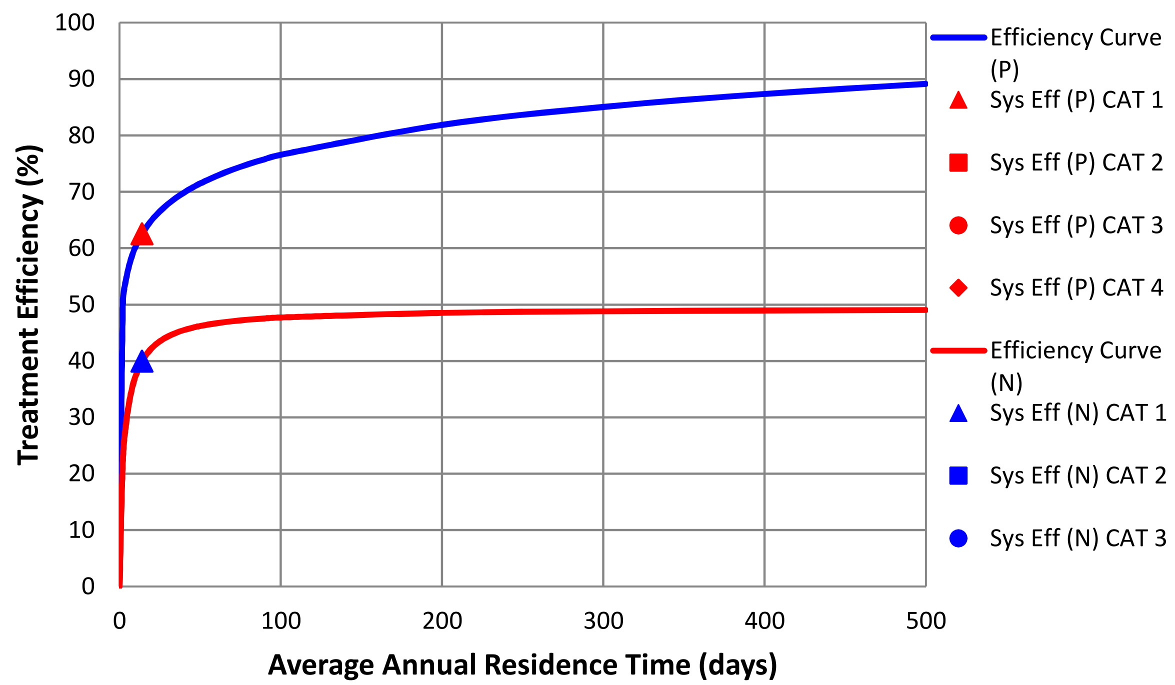
	Pond 27-2	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	17.600	0.000	0.000	0.000	ac
Total post-development catchment area:	17.600	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	33.581				%
Total **Phosphorus** removal required:	33.581				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	23.318				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

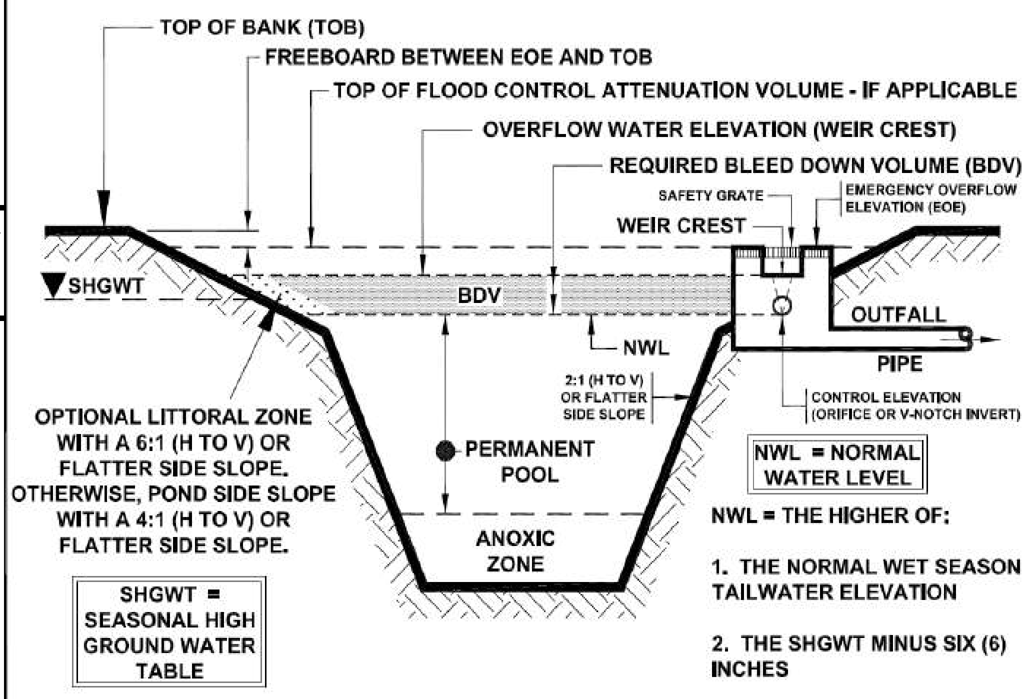
Minimum Pond Permanent Pool Volume:	0.894				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

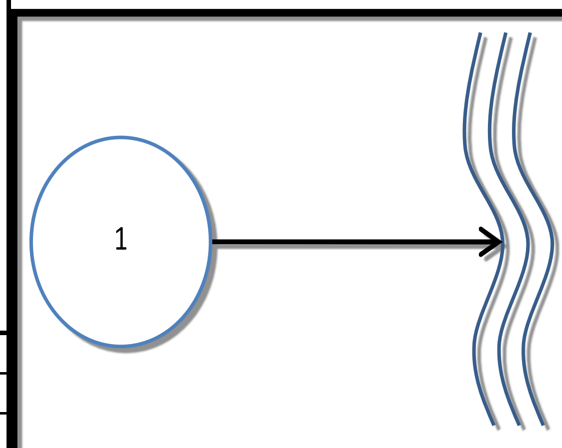
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 27-2	Optional Identification		
	Pond 27-2	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for	6/13/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	22.73		
Phosphorus Pre Load (kg/yr)	2.96		
Nitrogen Post Load (kg/yr)	34.22		
Phosphorus Post Load (kg/yr)	4.46		
Target Load Reduction (N) %	34	TN MET	
Target Load Reduction (P) %	34		
Target Discharge Load, N (kg/yr)	22.59	TP MET	
Target Discharge Load, P (kg/yr)	2.94		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	20.54	45.23	
Discharged Load, P (kg/yr & lb/yr):	1.67	3.67	
Load Removed, N (kg/yr & lb/yr):	13.69	30.14	
Load Removed, P (kg/yr & lb/yr):	2.79	6.14	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	6/14/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 28-1R

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

VIEW MEAN ANNUAL RAINFALL MAP

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

GO TO WATERSHED CHARACTERISTICS

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data	Red Numbers = Calculated	LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 6/14/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION: A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 28-1R

Delay [hrs]:

max delay = 15 hrs.

Pre-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	4.000	AC
Total post-development catchment or for BMP analysis:	5.180	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	52.50	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	59.75	%
Estimated BMP Area (No loading from this area)	1.180	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	9.212	ac-ft/year
Average annual post runoff volume (note no BMP area):	10.159	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	13.519	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.761	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	14.910	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	1.942	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	6/14/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 28-1R

GO TO STORMWATER TREATMENT ANALYSIS

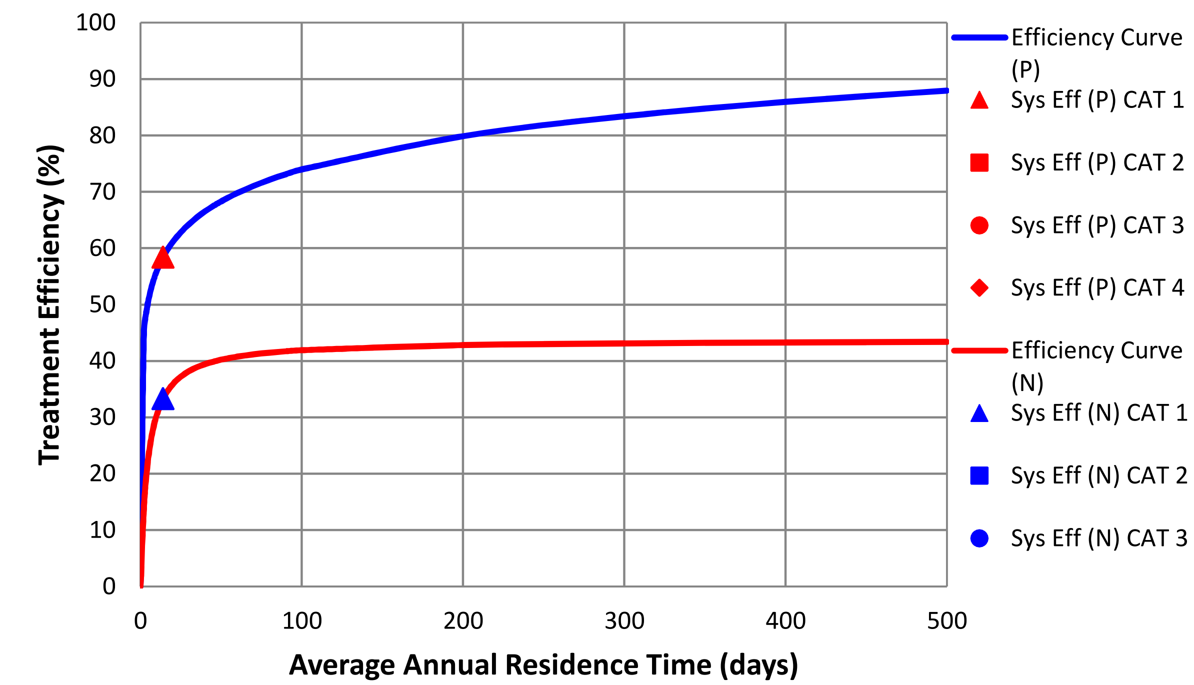
	Pond 28-1R	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	4.000	0.000	0.000	0.000	ac
Total post-development catchment area:	4.000	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	9.325				%
Total **Phosphorus** removal required:	9.325				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	10.159				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

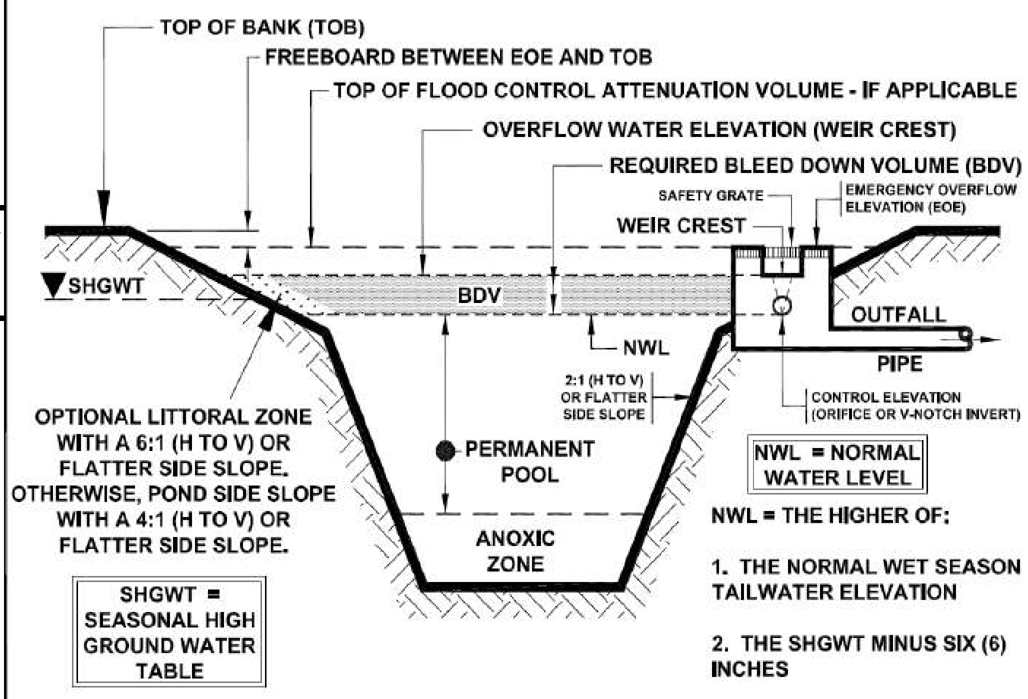
Minimum Pond Permanent Pool Volume:	0.390				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 28-1R	Optional Identification	

	Pond 28-1R	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	
Nitrogen Pre Load (kg/yr)	13.52	
Phosphorus Pre Load (kg/yr)	1.76	
Nitrogen Post Load (kg/yr)	14.91	
Phosphorus Post Load (kg/yr)	1.94	
Target Load Reduction (N) %	9	
Target Load Reduction (P) %	9	
Target Discharge Load, N (kg/yr)	13.57	
Target Discharge Load, P (kg/yr)	1.77	
Provided Overall Efficiency, N (%):	33	
Provided Overall Efficiency, P (%):	58	
Discharged Load, N (kg/yr & lb/yr):	9.94	21.90
Discharged Load, P (kg/yr & lb/yr):	0.81	1.78
Load Removed, N (kg/yr & lb/yr):	4.97	10.94
Load Removed, P (kg/yr & lb/yr):	1.13	2.50

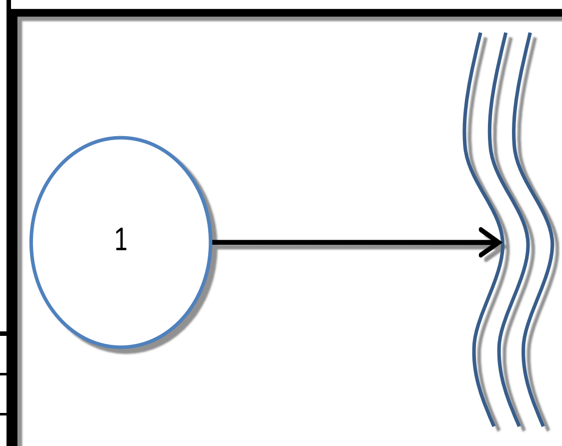
Treatment Objectives or Target for

TN MET

TP MET

6/14/2018

BMPTRAINS MODEL



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 29-1R

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:

Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data Red Numbers = Calculated	LAND USES/EMC
SELECT CATCHMENT CONFIGURATION 5/16/2018	CLICK ON CELL BELOW TO SELECT CONFIGURATION A - Single Catchment	VIEW CATCHMENT CONFIGURATION	
For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain	COMINGLING / MULTI-LAND USE	GO TO GENERAL SITE INFORMATION PAGE	

CATCHMENT NO.1 NAME: Pond 29-1R

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Agricultural - Citrus: TN=2.240 TP=0.183	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	5.600	AC
Total post-development catchment or for BMP analysis:	8.130	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	23.75	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	50.89	%
Estimated BMP Area (No loading from this area)	2.530	AC

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	7.690	ac-ft/year
Average annual post runoff volume (note no BMP area):	12.602	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	11.285	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	1.470	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	18.495	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.409	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 29-1R

GO TO STORMWATER TREATMENT ANALYSIS

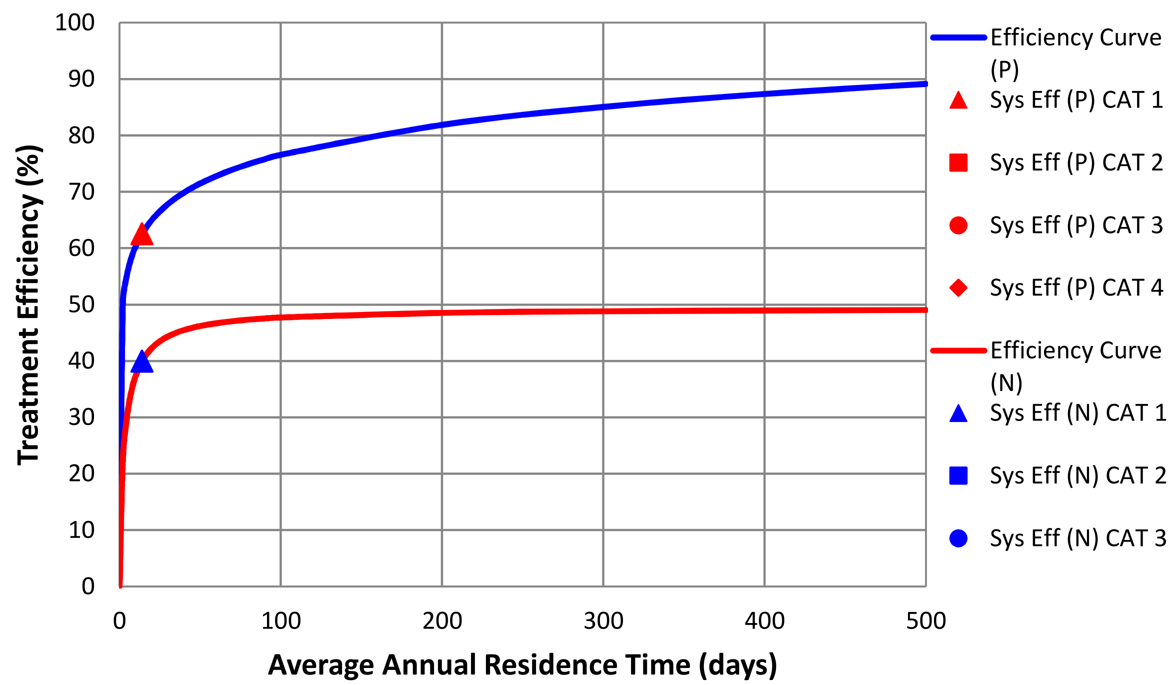
	Pond 29-1R	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	5.600	0.000	0.000	0.000	ac
Total post-development catchment area:	5.600	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	38.981				%
Total **Phosphorus** removal required:	38.981				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	12.602				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

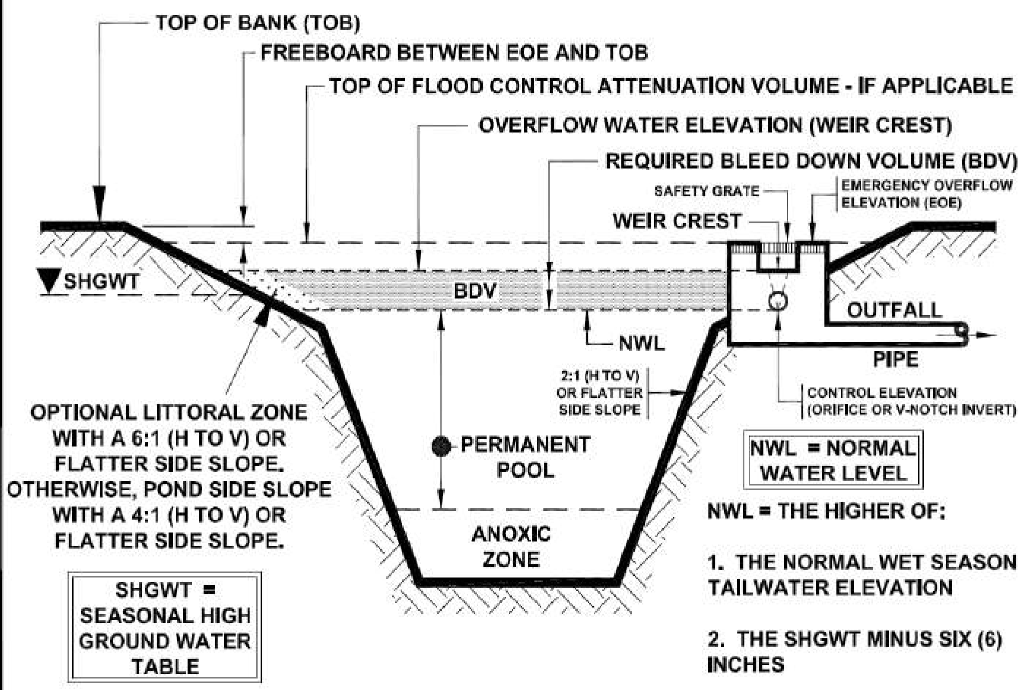
Minimum Pond Permanent Pool Volume:	0.483				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

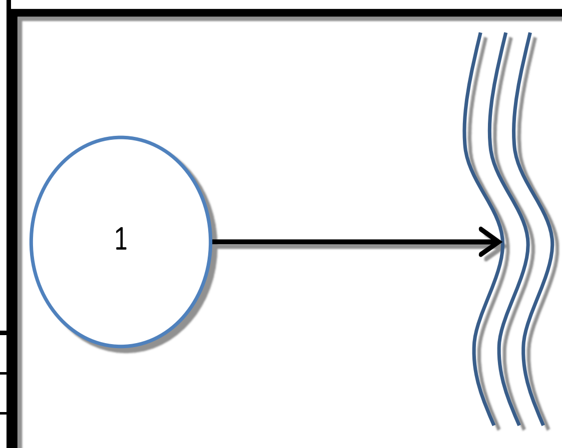
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 29-1R	Optional Identification		
	Pond 29-1R	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	11.29	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	1.47		
Nitrogen Post Load (kg/yr)	18.49		
Phosphorus Post Load (kg/yr)	2.41		
Target Load Reduction (N) %	39	TN MET	
Target Load Reduction (P) %	39		
Target Discharge Load, N (kg/yr)	11.28	TP MET	
Target Discharge Load, P (kg/yr)	1.47		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	11.10	24.45	
Discharged Load, P (kg/yr & lb/yr):	0.90	1.99	
Load Removed, N (kg/yr & lb/yr):	7.40	16.29	
Load Removed, P (kg/yr & lb/yr):	1.51	3.32	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 29-2

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 29-2

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	Rangeland/Parkland: TN=1.150 TP=0.055
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.150	mg/L	1.190	mg/L
EMC(P):	0.055	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	9.700	AC
Total post-development catchment or for BMP analysis:	11.990	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	41.24	%
Estimated BMP Area (No loading from this area)	2.290	AC

Average annual pre runoff volume:	5.885	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.816	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	8.346	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.399	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	27.615	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.597	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT
Pre-development land use: with default EMCs	
	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS: 5/16/2018 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | **SR 29 PD&E - Basin 29-2**

GO TO STORMWATER TREATMENT ANALYSIS

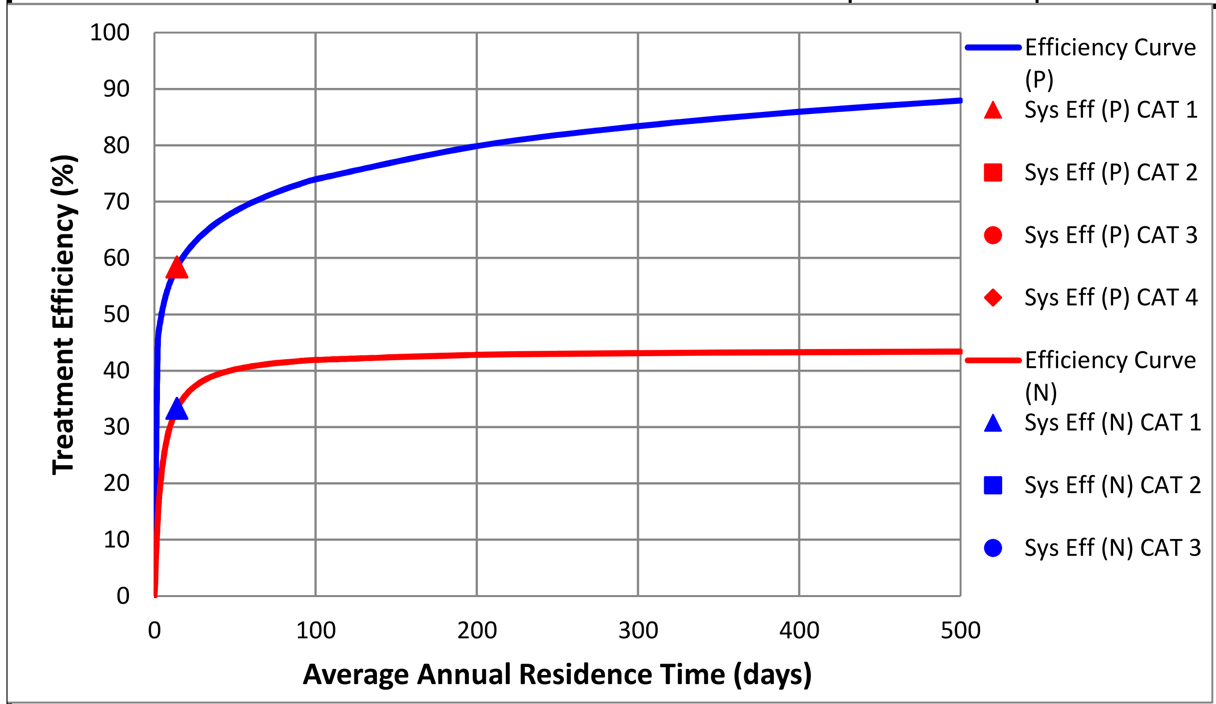
REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.

	Pond 29-2	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	9.700	0.000	0.000	0.000	ac
Total post-development catchment area:	9.700	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	69.777				%
Total **Phosphorus** removal required:	88.903				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	18.816				ac-ft/yr

* pond coverage must follow Regulatory Requirements

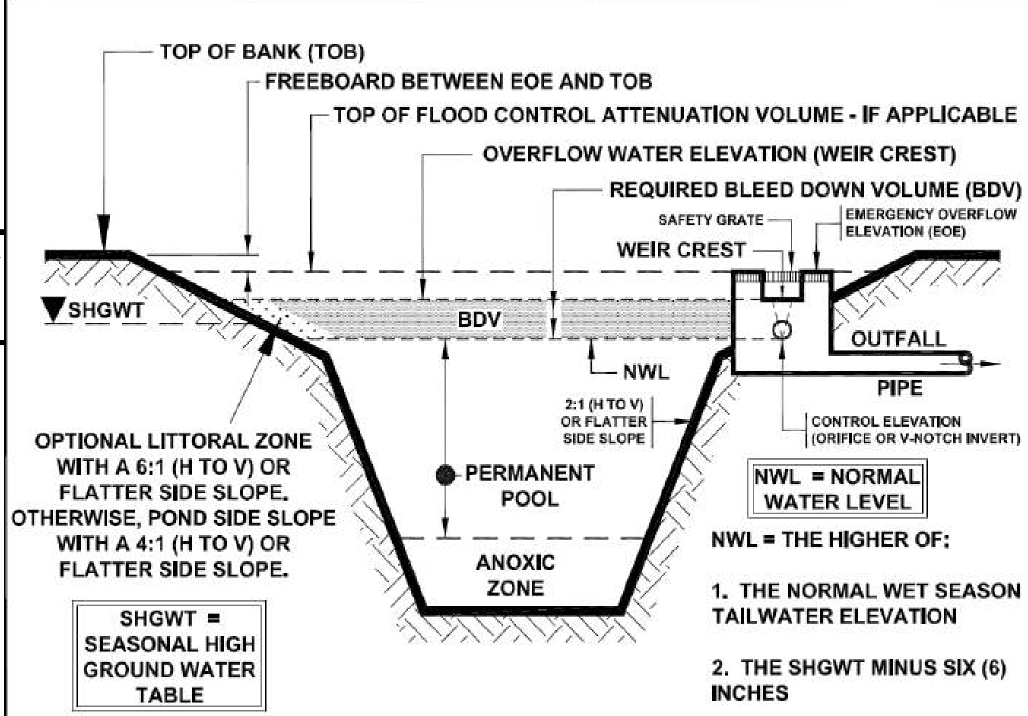
Wet Detention Pond Characteristic:

Minimum Pond Permanent Pool Volume:	0.722				ac-ft



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:	5/16/2018	V 8.6	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

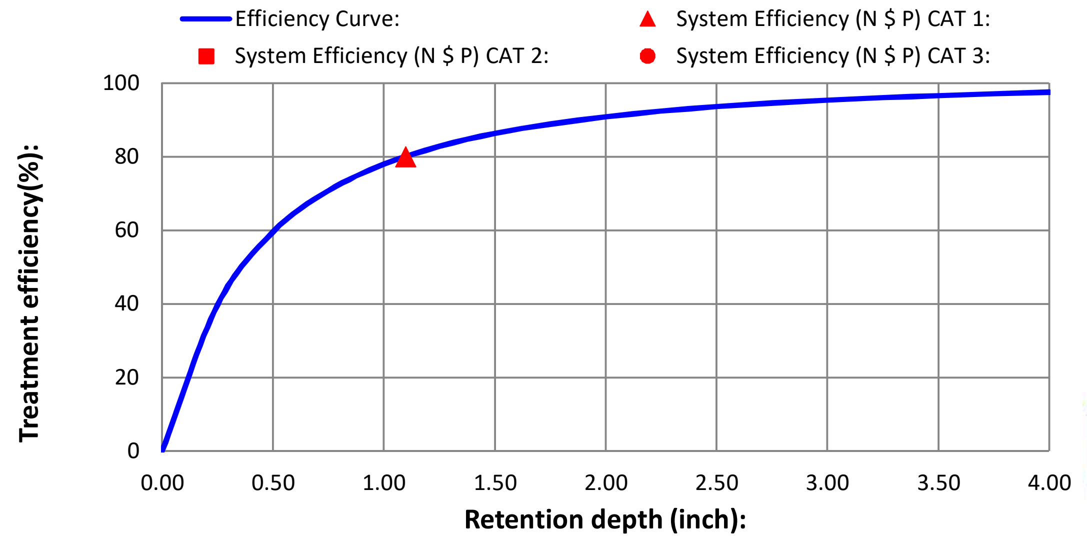
RETENTION BASIN SERVING: SR 29 PD&E - Basin 29-2

GO TO STORMWATER TREATMENT ANALYSIS

Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 29-2	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	9.700	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	69.777				%
Required Treatment Eff (**Phosphorus**):	88.903				%
Required retention depth over the watershed to meet required efficiency:	1.753	0.000	0.000	0.000	in
Required water quality retention volume:	1.417	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.889	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	1.100				in
Provided treatment efficiency (**Nitrogen**):	79.891	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	79.891	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	0.000				%
Remaining treatment efficiency (**Phosphorus**):	44.814				%
Remaining retention depth needed:	0.653	0.000	0.000	0.000	in

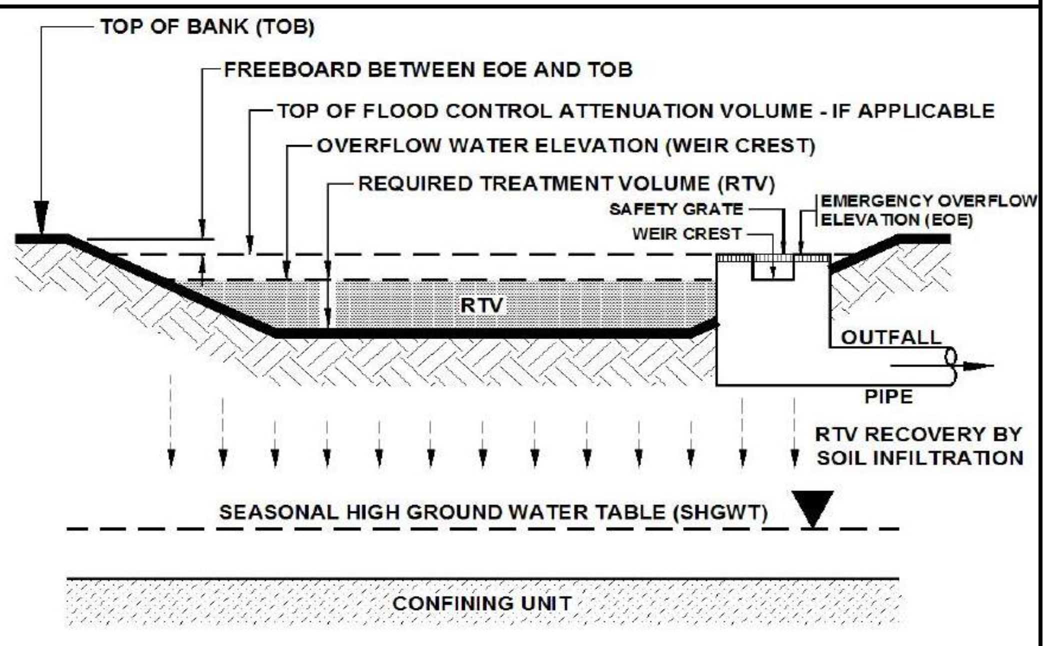


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 29-2	Optional Identification	

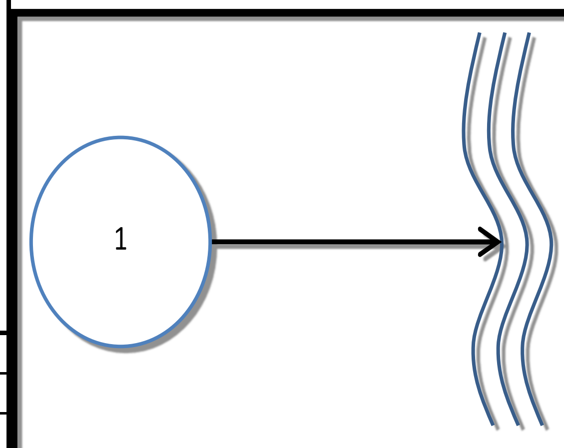
	Pond 29-2	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for
Nitrogen Pre Load (kg/yr)	8.35	TN MET
Phosphorus Pre Load (kg/yr)	0.40	TP MET
Nitrogen Post Load (kg/yr)	27.61	
Phosphorus Post Load (kg/yr)	3.60	
Target Load Reduction (N) %	70	
Target Load Reduction (P) %	89	
Target Discharge Load, N (kg/yr)	8.28	
Target Discharge Load, P (kg/yr)	0.40	
Provided Overall Efficiency, N (%):	82	
Provided Overall Efficiency, P (%):	89	
Discharged Load, N (kg/yr & lb/yr):	4.92	10.85
Discharged Load, P (kg/yr & lb/yr):	0.39	0.85
Load Removed, N (kg/yr & lb/yr):	22.69	49.98
Load Removed, P (kg/yr & lb/yr):	3.21	7.07

5/16/2018

BMPTRAINS MODEL



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 30-1R

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data	LAND USES/EMC
		Red Numbers = Calculated	
SELECT CATCHMENT CONFIGURATION 5/16/2018	CLICK ON CELL BELOW TO SELECT CONFIGURATION	VIEW CATCHMENT CONFIGURATION	
	A - Single Catchment		
For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain	COMINGLING / MULTI-LAND USE	GO TO GENERAL SITE INFORMATION PAGE	

Delay [hrs] | max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 30-1R

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Agricultural - Citrus: TN=2.240 TP=0.183	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	10.400	AC
Total post-development catchment or for BMP analysis:	12.160	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	23.56	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	45.87	%
Estimated BMP Area (No loading from this area)	1.760	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	14.216	ac-ft/year
Average annual post runoff volume (note no BMP area):	21.737	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	20.864	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.718	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	31.901	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	4.155	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers = Input data	Red Numbers = Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 30-1R

GO TO STORMWATER TREATMENT ANALYSIS

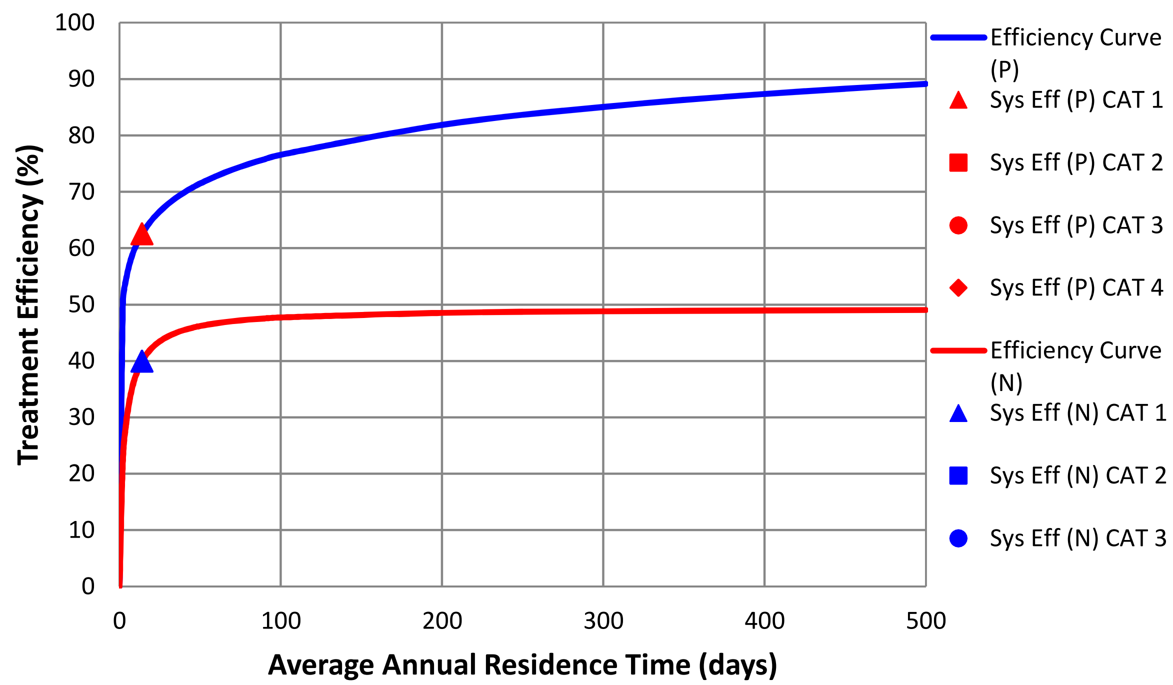
	Pond 30-1R	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	10.400	0.000	0.000	0.000	ac
Total post-development catchment area:	10.400	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	YES				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	34.599				%
Total **Phosphorus** removal required:	34.599				%
Total **Nitrogen** removal efficiency:	39.992	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	62.587	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	21.737				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

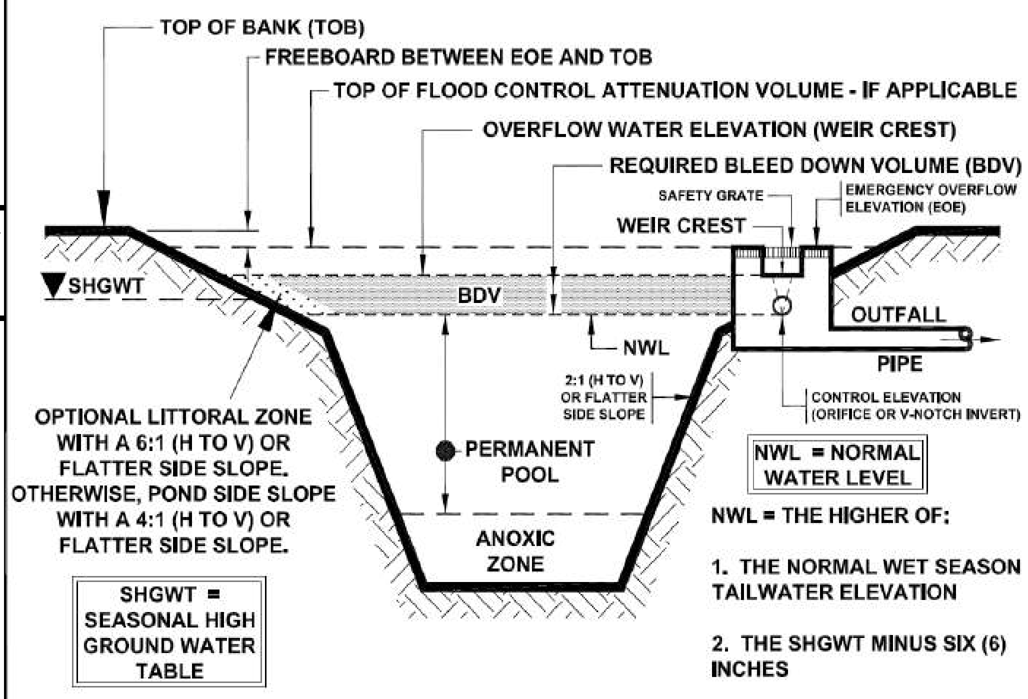
Minimum Pond Permanent Pool Volume:	0.834				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 30-1R	Optional Identification		
	Pond 30-1R	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		
Nitrogen Pre Load (kg/yr)	20.86		
Phosphorus Pre Load (kg/yr)	2.72		
Nitrogen Post Load (kg/yr)	31.90		
Phosphorus Post Load (kg/yr)	4.16		
Target Load Reduction (N) %	35		
Target Load Reduction (P) %	35		
Target Discharge Load, N (kg/yr)	20.74		
Target Discharge Load, P (kg/yr)	2.70		
Provided Overall Efficiency, N (%):	40		
Provided Overall Efficiency, P (%):	63		
Discharged Load, N (kg/yr & lb/yr):	19.14	42.17	
Discharged Load, P (kg/yr & lb/yr):	1.55	3.42	
Load Removed, N (kg/yr & lb/yr):	12.76	28.10	
Load Removed, P (kg/yr & lb/yr):	2.60	5.73	

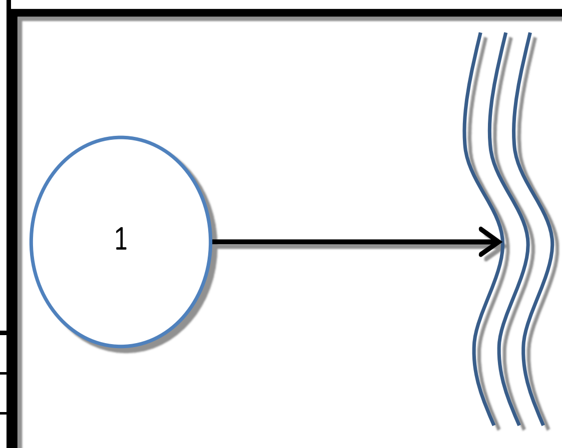
Treatment Objectives or Target for

TN MET

TP MET

5/16/2018

BMPTRAINS MODEL



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 30-2

VIEW ZONE MAP

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): | | | %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data	LAND USES/EMC
		Red Numbers = Calculated	

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

COMINGLING | MULTI-LAND USE

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 30-2

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Rangeland/Parkland: TN=1.150 TP=0.055	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	3.000	AC
Total post-development catchment or for BMP analysis:	4.230	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	38.00	%
Estimated BMP Area (No loading from this area)	1.230	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.150	mg/L	1.190	mg/L
EMC(P):	0.055	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	1.820	ac-ft/year
Average annual post runoff volume (note no BMP area):	5.502	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	2.581	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.123	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	8.075	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	1.052	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS: 5/16/2018 V 8.6

Blue Numbers =	Input data
Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | **SR 29 PD&E - Basin 30-2**

GO TO STORMWATER TREATMENT ANALYSIS

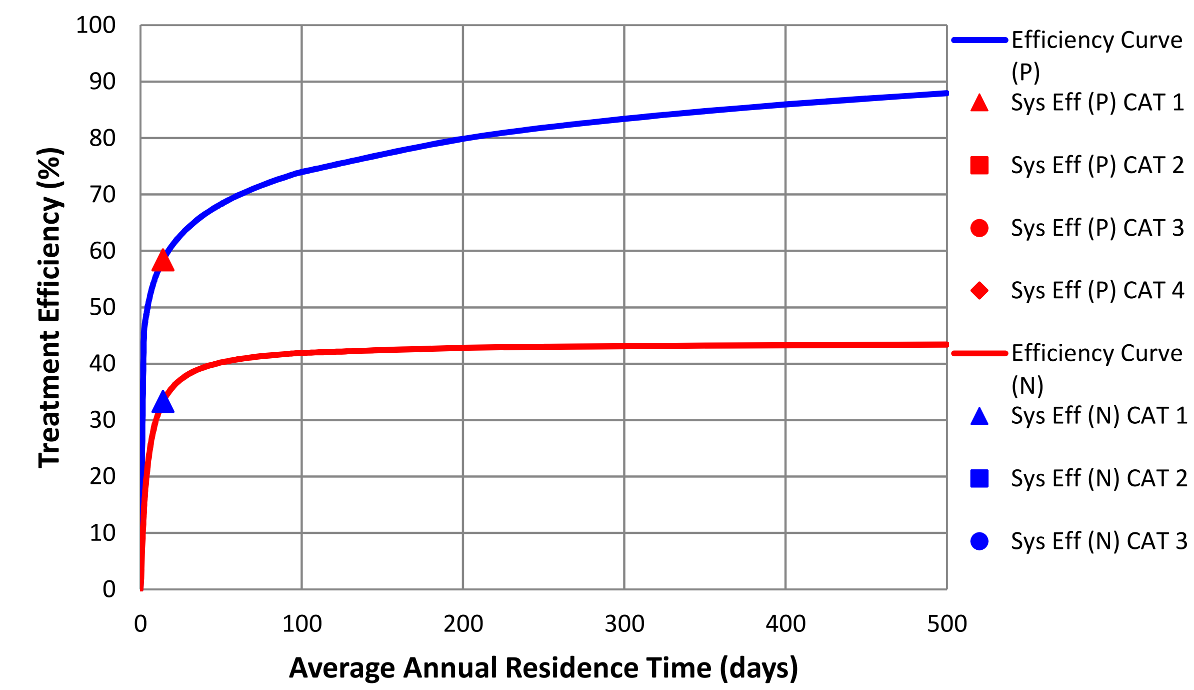
	Pond 30-2	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	3.000	0.000	0.000	0.000	ac
Total post-development catchment area:	3.000	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	68.033				%
Total **Phosphorus** removal required:	88.262				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	NO				
Average annual runoff volume:	5.502				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

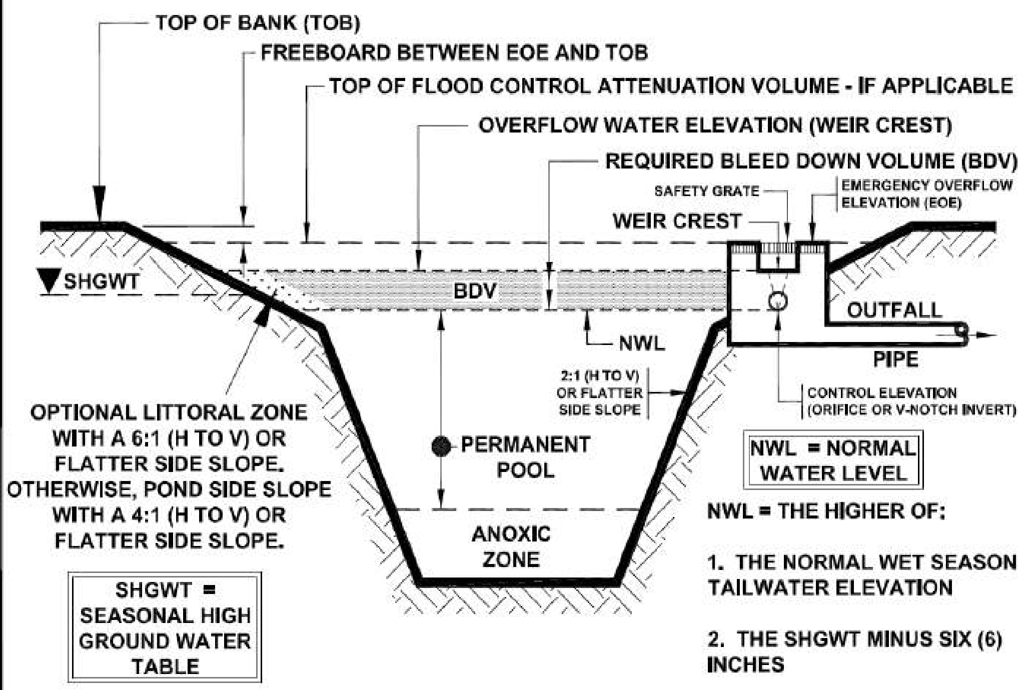
Minimum Pond Permanent Pool Volume:	0.211				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

RETENTION BASIN:		6/14/2018	V 8.6

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

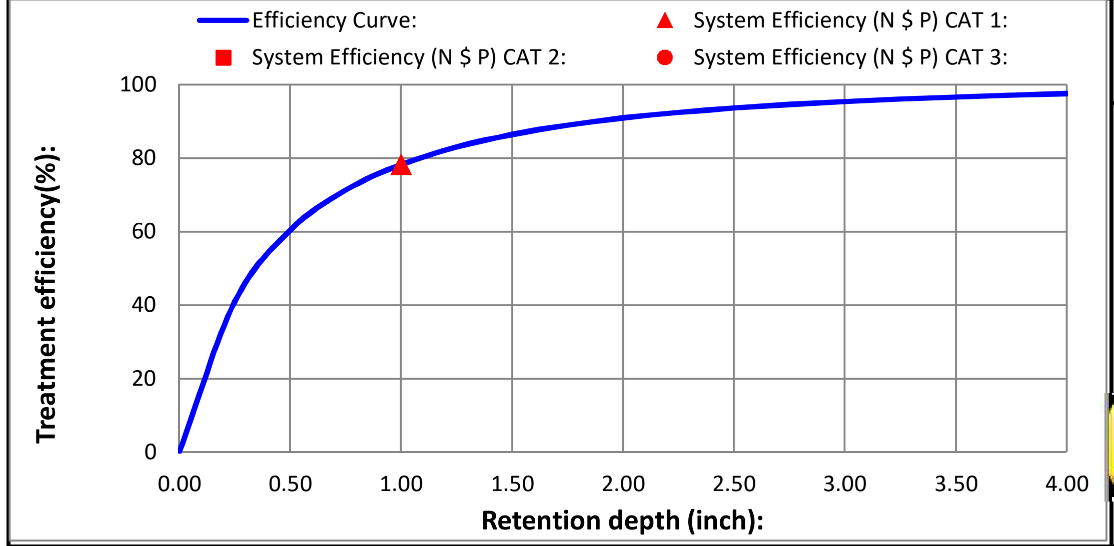
RETENTION BASIN SERVING: SR 29 PD&E - Basin 30-2

GO TO STORMWATER TREATMENT ANALYSIS

Loadings from BMP area are contained by the BMP, thus no BMP area load.	Pond 30-2	Catchment 2	Catchment 3	Catchment 4	
Watershed area cotributing to basin:	3.000	0.000	0.000	0.000	ac
Required Treatment Eff (**Nitrogen**):	68.033				%
Required Treatment Eff (**Phosphorus**):	88.262				%
Required retention depth over the watershed to meet required efficiency:	1.682	0.000	0.000	0.000	in
Required water quality retention volume:	0.421	0.000	0.000	0.000	ac-ft

RETENTION BASIN FOR MULTIPLE TREATMENT SYSTEMS (if there is a need for additional removal efficiencies in a series of BMPs):

Retention volume based on retention depth and Total area - BMP area	0.250	0.000	0.000	0.000	ac-ft
Provided retention depth (0.1-3.99 inches over the watershed)	1.000				in
Provided treatment efficiency (**Nitrogen**):	78.220	0.000	0.000	0.000	%
Provided treatment efficiency (**Phosphorus**):	78.220	0.000	0.000	0.000	%
Remaining treatment efficiency (**Nitrogen**):	0.000				%
Remaining treatment efficiency (**Phosphorus**):	46.108				%
Remaining retention depth needed:	0.682	0.000	0.000	0.000	in

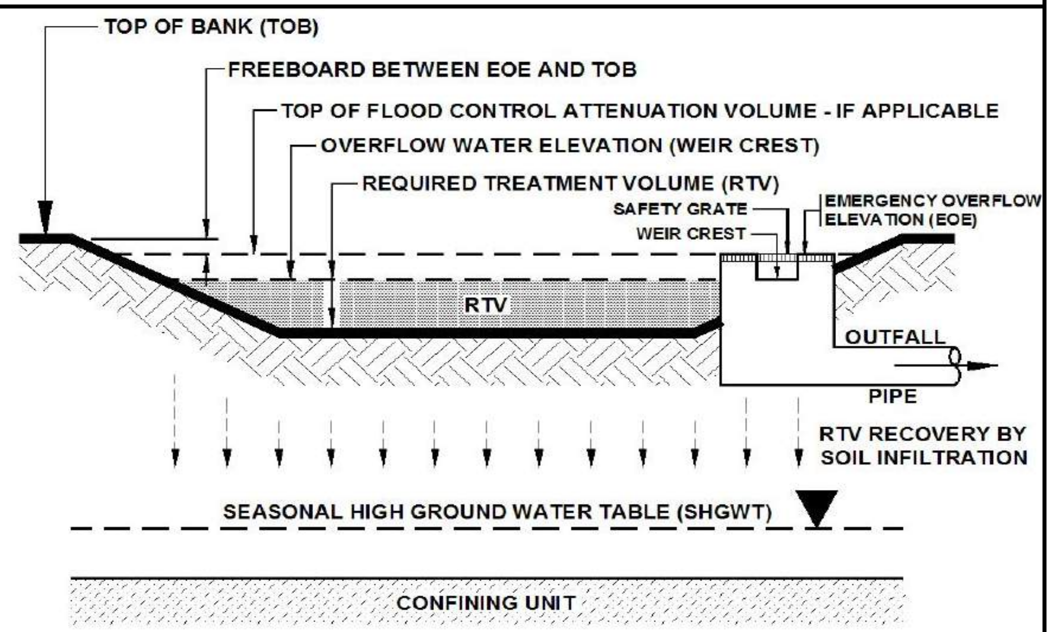


NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of this graph is to help illustrate the treatment efficiency of the retention system as the function of retention depth **for a single BMP and in a single catchment**. The graph illustrates that there is a diminished return as the retention depth is increased. Thus evaluations of other alternatives in "treatment trains" and compensatory treatment should be considered. **NOTE:** the retention volume can not exceed 3.99 inches to be within the range of data used to determine effectiveness.

HELP - EXAMPLE PROBLEM 3

View Media Mixes



TYPICAL CROSS SECTION OF A "DRY" RETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010.

Estimate of groundwater impacts	Catchment 1	Catchment 2	Catchment 3	Catchment 4
Use only down flow media mix before water enters the ground, specify type				
Nitrogen mass reduction in groundwater discharge (%)				
Phosphorus mass reduction in groundwater discharge (%)				

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

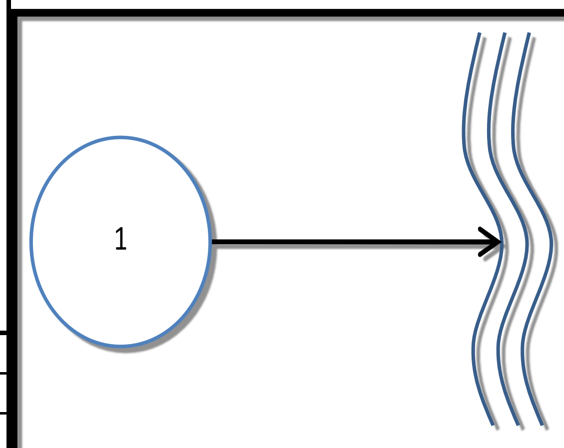
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 30-2	Optional Identification		
	Pond 30-2	Catchment 2	Catchment 3	Catchment 4
BMP Name	Retention Basin			
BMP Name	Wet Detention/ MAPs			
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for TN MET TP MET	5/16/2018
Nitrogen Pre Load (kg/yr)	2.58		BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	0.12		
Nitrogen Post Load (kg/yr)	8.07		
Phosphorus Post Load (kg/yr)	1.05		
Target Load Reduction (N) %	68		
Target Load Reduction (P) %	88		
Target Discharge Load, N (kg/yr)	2.58		
Target Discharge Load, P (kg/yr)	0.13		
Provided Overall Efficiency, N (%):	81		
Provided Overall Efficiency, P (%):	88		
Discharged Load, N (kg/yr & lb/yr):	1.56	3.43	
Discharged Load, P (kg/yr & lb/yr):	0.12	0.27	
Load Removed, N (kg/yr & lb/yr):	6.52	14.35	
Load Removed, P (kg/yr & lb/yr):	0.93	2.05	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis	NAME OF PROJECT
	SR 29 PD&E - Basin 31-1R

VIEW ZONE MAP

	CLICK ON CELL BELOW TO SELECT
Meteorological Zone (Please use zone map):	Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
	CLICK ON CELL BELOW TO SELECT
Type of analysis:	Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers = Input data
Red Numbers = Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION
A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs] | CATCHMENT NO.1 NAME: Pond 31-1R

max delay = 15 hrs.

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Agricultural - Citrus: TN=2.240 TP=0.183	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	6.500	AC
Total post-development catchment or for BMP analysis:	7.820	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	24.46	%
Estimated BMP Area (No loading from this area)	1.320	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	2.240	mg/L	1.190	mg/L
EMC(P):	0.183	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	3.943	ac-ft/year
Average annual post runoff volume (note no BMP area):	9.077	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	10.893	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	0.890	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	13.321	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	1.735	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6

Blue Numbers = Input data
Red Numbers = Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 31-1R

GO TO STORMWATER TREATMENT ANALYSIS

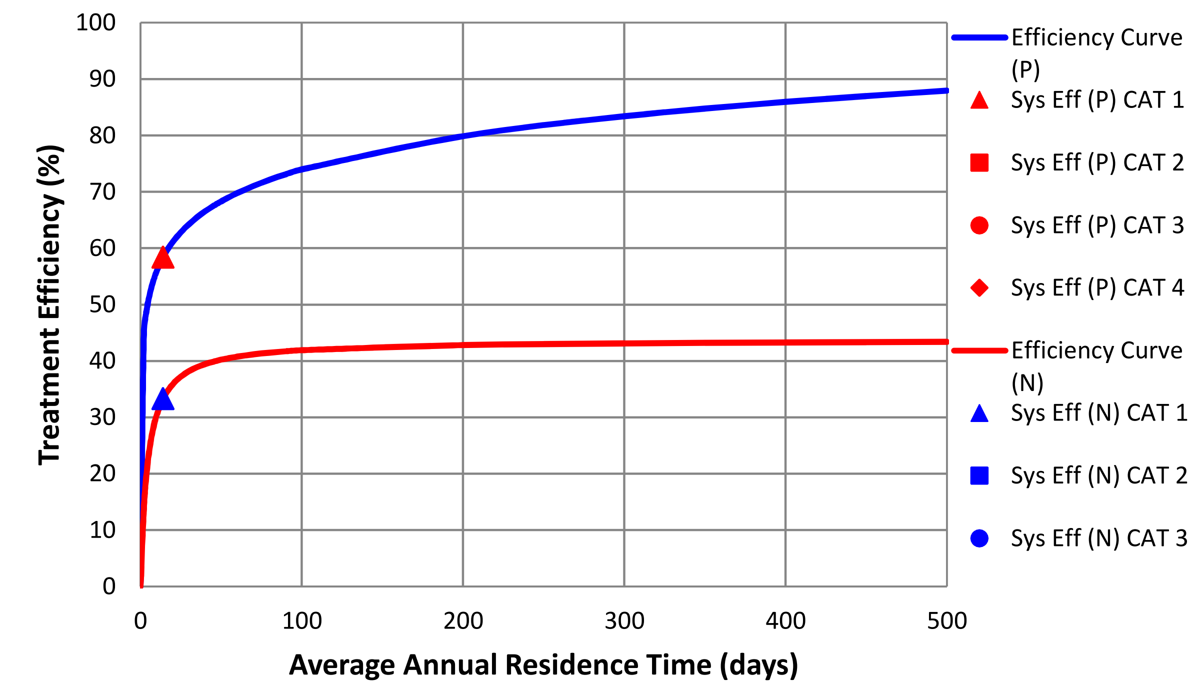
	Pond 31-1R	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	6.500	0.000	0.000	0.000	ac
Total post-development catchment area:	6.500	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	18.222				%
Total **Phosphorus** removal required:	48.707				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	9.077				ac-ft/yr

* pond coverage must follow Regulatory Requirements

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.

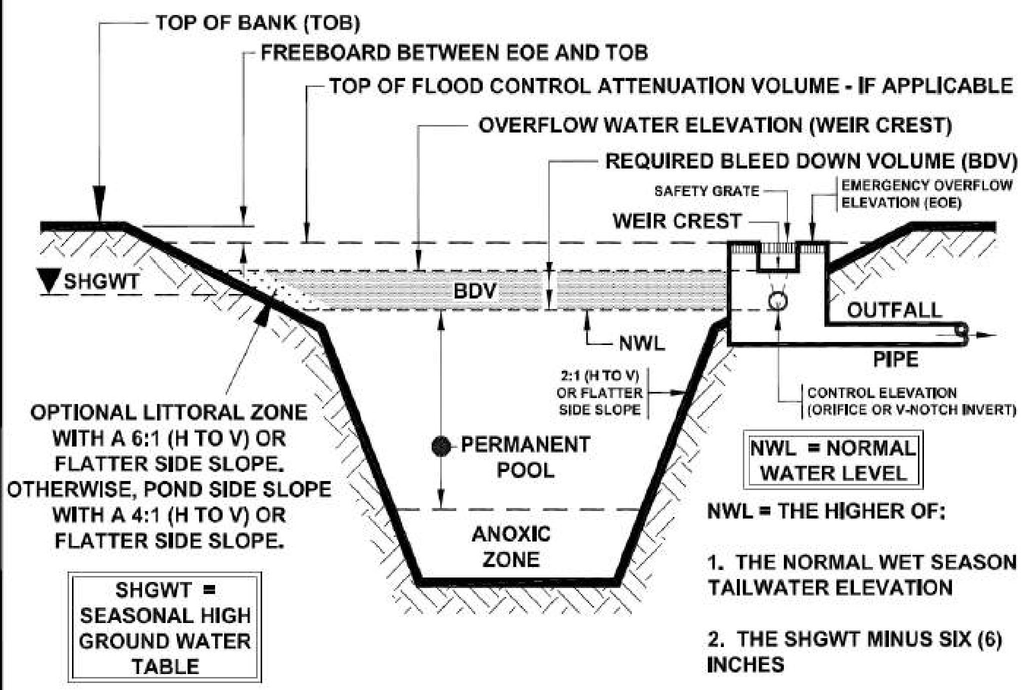
Wet Detention Pond Characteristic:

	Pond 31-1R	Catchment 2	Catchment 3	Catchment 4	
Minimum Pond Permanent Pool Volume:	0.348				ac-ft



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY				V 8.6

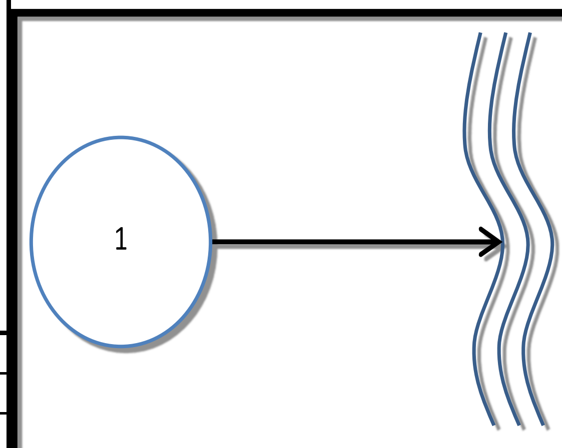
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 31-1R	Optional Identification		
	Pond 31-1R	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	10.89	Treatment Objectives or Target for TN MET TP MET	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	0.89		
Nitrogen Post Load (kg/yr)	13.32		
Phosphorus Post Load (kg/yr)	1.74		
Target Load Reduction (N) %	18		
Target Load Reduction (P) %	49		
Target Discharge Load, N (kg/yr)	10.92		
Target Discharge Load, P (kg/yr)	0.88		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	8.88	19.56	
Discharged Load, P (kg/yr & lb/yr):	0.72	1.59	
Load Removed, N (kg/yr & lb/yr):	4.44	9.78	
Load Removed, P (kg/yr & lb/yr):	1.01	2.23	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 31-2

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

COMINGLING MULTI-LAND USE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 31-2

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Agricultural - Citrus: TN=2.240 TP=0.183	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	16.800	AC
Total post-development catchment or for BMP analysis:	19.640	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	23.99	%
Estimated BMP Area (No loading from this area)	2.840	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	2.240	mg/L	1.190	mg/L
EMC(P):	0.183	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	10.192	ac-ft/year
Average annual post runoff volume (note no BMP area):	23.201	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	28.155	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.300	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	34.049	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	4.435	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 31-2 | GO TO STORMWATER TREATMENT ANALYSIS

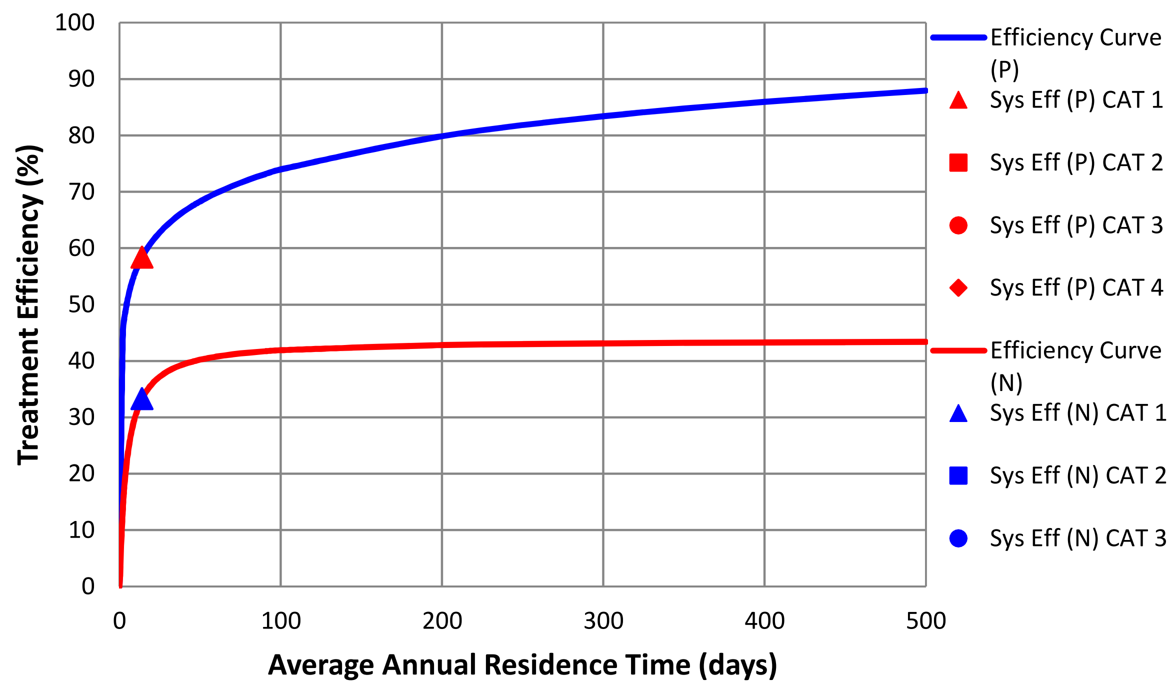
	Pond 31-2	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	16.800	0.000	0.000	0.000	ac
Total post-development catchment area:	16.800	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	17.310				%
Total **Phosphorus** removal required:	48.135				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	23.201				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

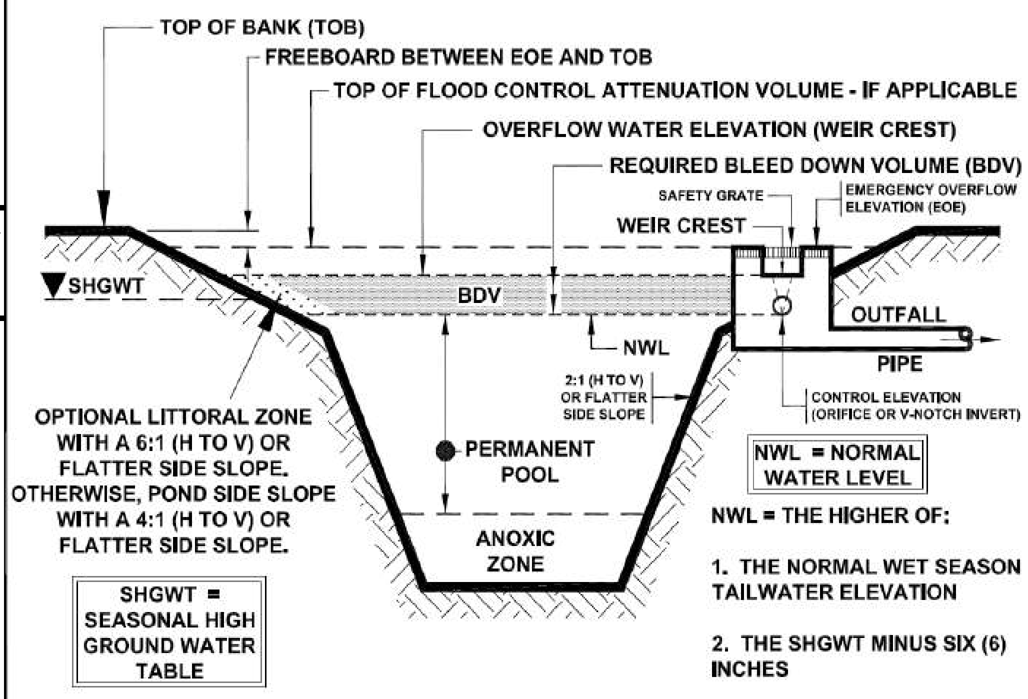
Minimum Pond Permanent Pool Volume:	0.890				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

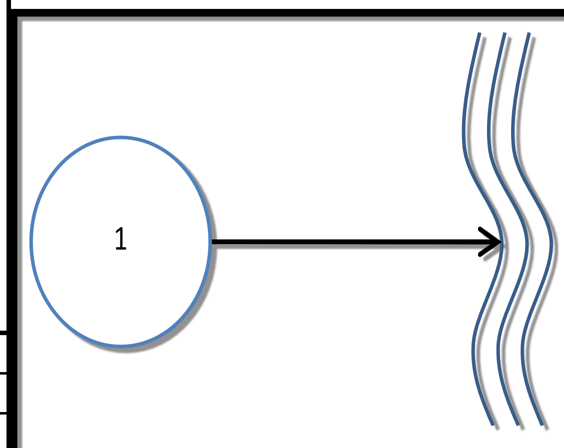
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 31-2	Optional Identification	

	Pond 31-2	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	28.16	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	2.30	TN MET	
Nitrogen Post Load (kg/yr)	34.05	TP MET	
Phosphorus Post Load (kg/yr)	4.43		
Target Load Reduction (N) %	17		
Target Load Reduction (P) %	48		
Target Discharge Load, N (kg/yr)	28.26		
Target Discharge Load, P (kg/yr)	2.31		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	22.70	50.00	
Discharged Load, P (kg/yr & lb/yr):	1.84	4.06	
Load Removed, N (kg/yr & lb/yr):	11.35	24.99	
Load Removed, P (kg/yr & lb/yr):	2.59	5.71	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 32-1R

VIEW ZONE MAP

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

VIEW MEAN ANNUAL RAINFALL MAP

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

GO TO WATERSHED CHARACTERISTICS

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING | MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

CATCHMENT NO.1 NAME: Pond 32-1R

Delay [hrs]

max delay = 15 hrs.

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Agricultural - Citrus: TN=2.240 TP=0.183	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	21.200	AC
Total post-development catchment or for BMP analysis:	24.510	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	24.29	%
Estimated BMP Area (No loading from this area)	3.310	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	2.240	mg/L	1.190	mg/L
EMC(P):	0.183	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	12.861	ac-ft/year
Average annual post runoff volume (note no BMP area):	29.487	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	35.530	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.903	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	43.274	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	5.637	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond:	SR 29 PD&E - Basin 32-1R	GO TO STORMWATER TREATMENT ANALYSIS

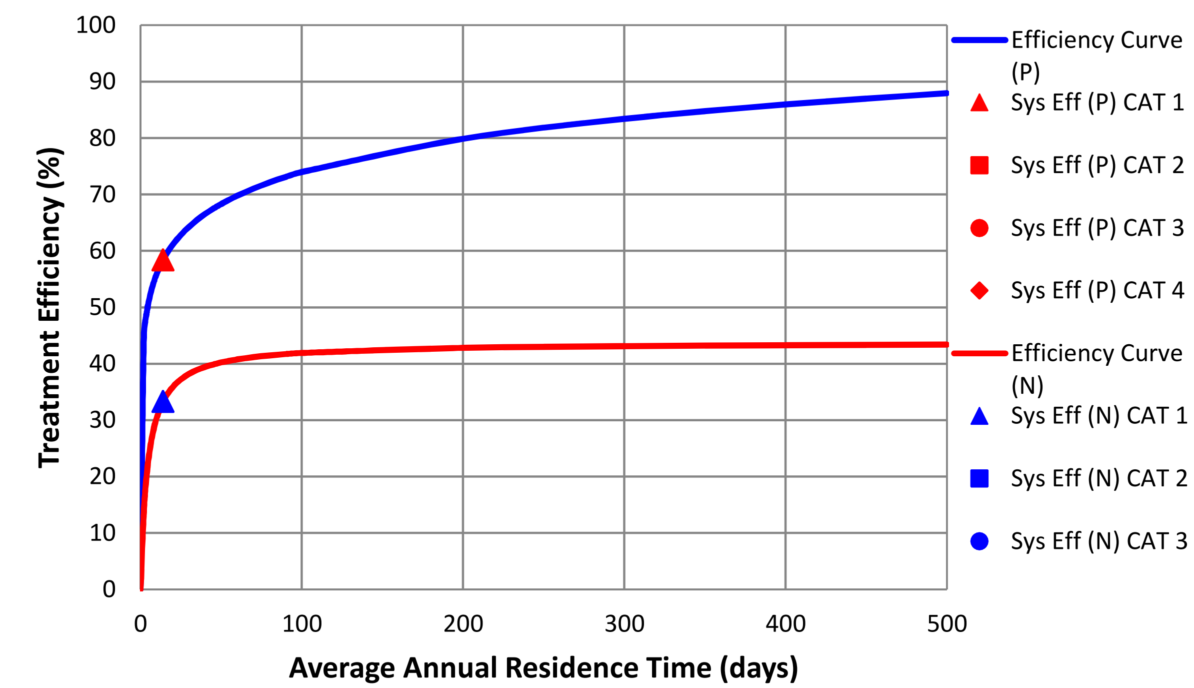
	Pond 32-1R	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	21.200	0.000	0.000	0.000	ac
Total post-development catchment area:	21.200	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	17.897				%
Total **Phosphorus** removal required:	48.503				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	29.487				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

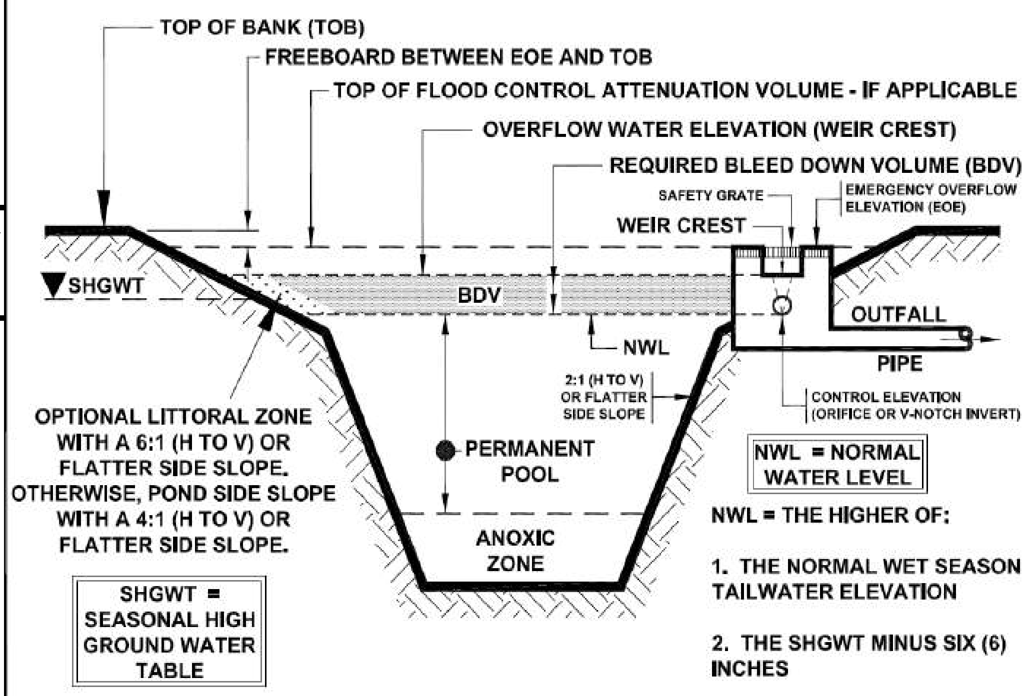
Minimum Pond Permanent Pool Volume:	1.131				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY — V 8.6

CALCULATION METHODS:

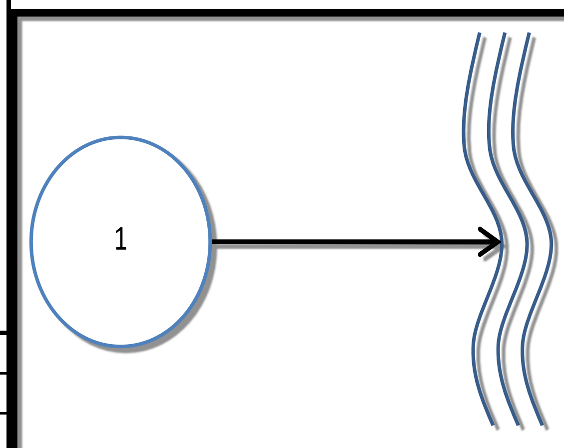
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 32-1R	Optional Identification	

	Pond 32-1R	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		
Nitrogen Pre Load (kg/yr)	35.53	Treatment Objectives or Target for	5/16/2018
Phosphorus Pre Load (kg/yr)	2.90		BMPTRAINS MODEL
Nitrogen Post Load (kg/yr)	43.27		
Phosphorus Post Load (kg/yr)	5.64		
Target Load Reduction (N) %	18	TN MET	
Target Load Reduction (P) %	49		
Target Discharge Load, N (kg/yr)	35.48	TP MET	
Target Discharge Load, P (kg/yr)	2.87		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	28.85	63.55	
Discharged Load, P (kg/yr & lb/yr):	2.34	5.16	
Load Removed, N (kg/yr & lb/yr):	14.42	31.76	
Load Removed, P (kg/yr & lb/yr):	3.29	7.25	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT
SR 29 PD&E - Basin 32-2

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

	CLICK ON CELL BELOW TO SELECT	
Meteorological Zone (Please use zone map):	Zone 4	
Mean Annual Rainfall (Please use rainfall map):	56.00	Inches
	CLICK ON CELL BELOW TO SELECT	
Type of analysis:	Net improvement	
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):		%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

GO TO GENERAL SITE INFORMATION PAGE

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 32-2

CLICK ON CELL BELOW TO SELECT

Pre-development land use: Agricultural - Citrus: TN=2.240 TP=0.183
with default EMCs

CLICK ON CELL BELOW TO SELECT

Post-development land use: Highway: TN=1.520 TP=0.200
with default EMCs

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	2.240	mg/L	1.190	mg/L
EMC(P):	0.183	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Total pre-development catchment area:	21.200	AC
Total post-development catchment or for BMP analysis:	24.510	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	0.00	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	24.29	%
Estimated BMP Area (No loading from this area)	3.310	AC

Average annual pre runoff volume:	12.861	ac-ft/year
Average annual post runoff volume (note no BMP area):	29.487	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	35.530	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.903	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	43.274	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	5.637	kg/year

CATCHMENT NO.2 NAME:

CLICK ON CELL BELOW TO SELECT

Pre-development land use:
with default EMCs

CLICK ON CELL BELOW TO SELECT

Post-development land use:
with default EMCs

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

CLICK ON CELL BELOW TO SELECT

Pre-development land use:
with default EMCs

CLICK ON CELL BELOW TO SELECT

Post-development land use:
with default EMCs

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

CLICK ON CELL BELOW TO SELECT

Pre-development land use:
with default EMCs

CLICK ON CELL BELOW TO SELECT

Post-development land use:
with default EMCs

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

Blue Numbers =	Input data			
Red Numbers =	Calculated or Carryover			

WET DETENTION / MANAGED AQUATIC PLANTS: 5/16/2018 V 8.6

Also called: FLOATING ISLANDS and includes a wet detention pond: **SR 29 PD&E - Basin 32-2**

GO TO STORMWATER TREATMENT ANALYSIS

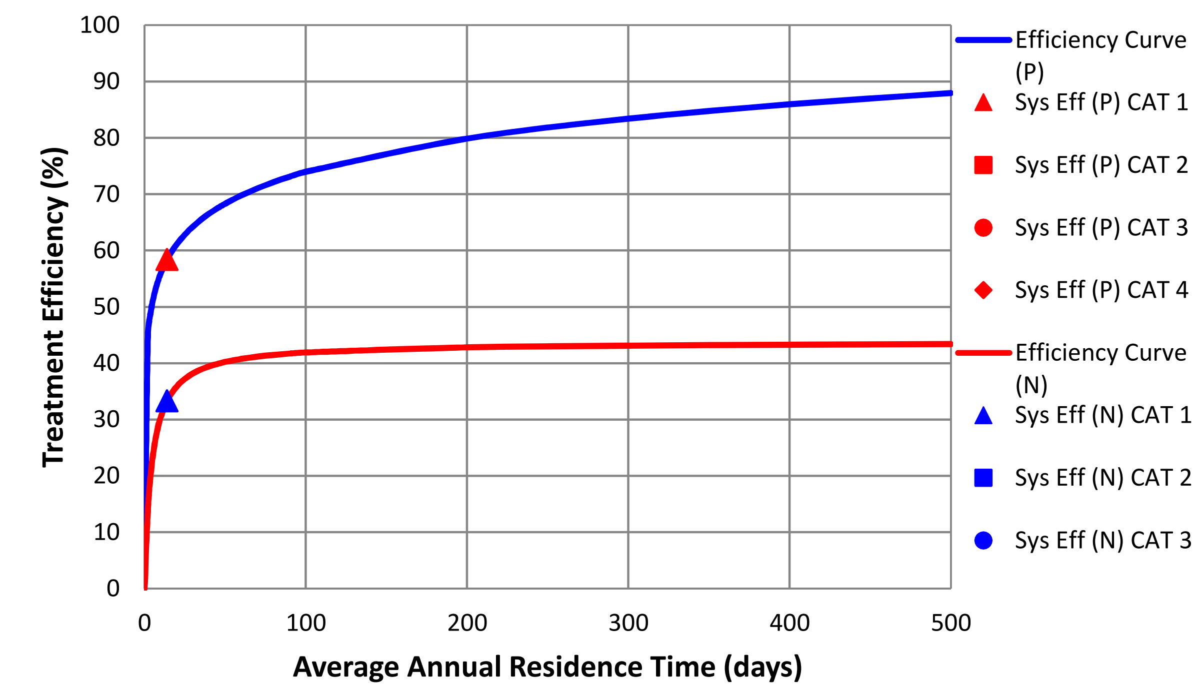
	Pond 32-2	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	21.200	0.000	0.000	0.000	ac
Total post-development catchment area:	21.200	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:					%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	17.897				%
Total **Phosphorus** removal required:	48.503				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	29.487				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

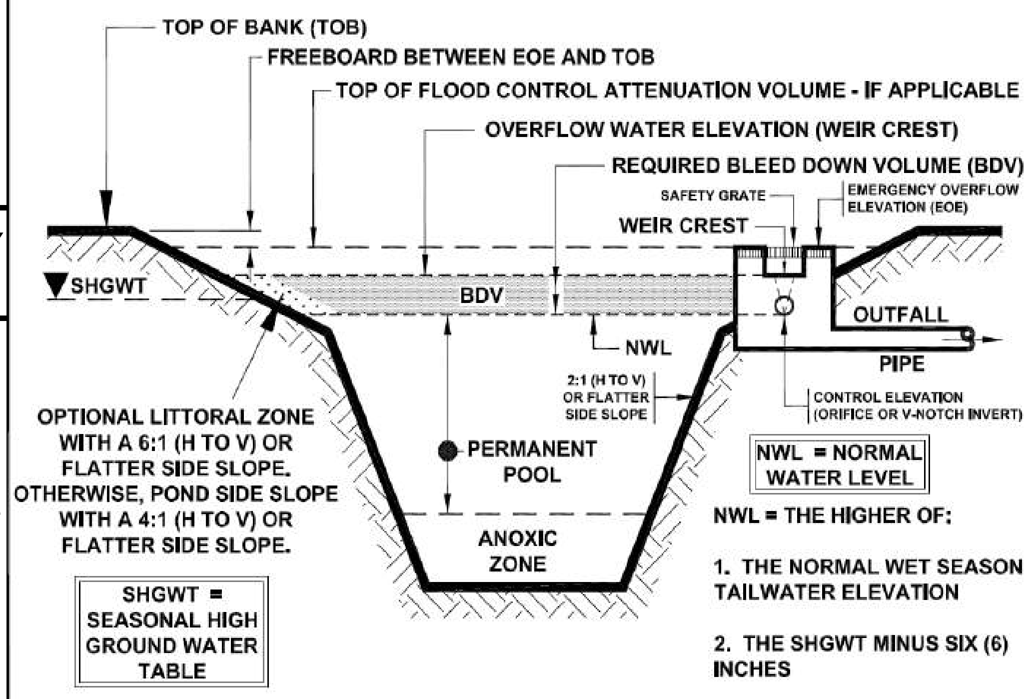
Minimum Pond Permanent Pool Volume:	1.131				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

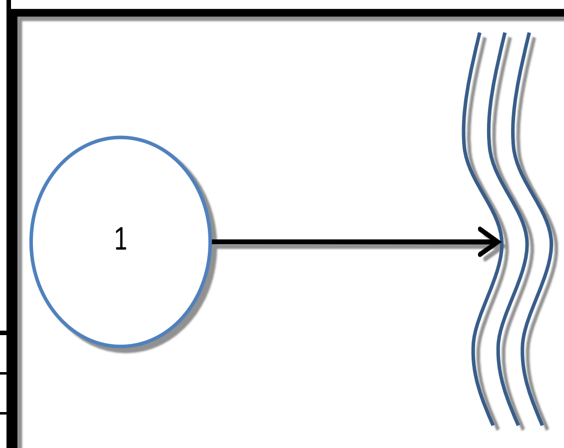
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 32-2	Optional Identification		
	Pond 32-2	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		
			5/16/2018
			BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	35.53	Treatment Objectives or Target for	
Phosphorus Pre Load (kg/yr)	2.90		
Nitrogen Post Load (kg/yr)	43.27		
Phosphorus Post Load (kg/yr)	5.64	TN MET	
Target Load Reduction (N) %	18		
Target Load Reduction (P) %	49	TP MET	
Target Discharge Load, N (kg/yr)	35.48		
Target Discharge Load, P (kg/yr)	2.87		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	28.85	63.55	
Discharged Load, P (kg/yr & lb/yr):	2.34	5.16	
Load Removed, N (kg/yr & lb/yr):	14.42	31.76	
Load Removed, P (kg/yr & lb/yr):	3.29	7.25	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 33

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

CLICK ON CELL BELOW TO SELECT

Meteorological Zone (Please use zone map): Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

CLICK ON CELL BELOW TO SELECT

Type of analysis: Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

COMINGLING MULTI-LAND USE

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs]

max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 33

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Agricultural - Citrus: TN=2.240 TP=0.183	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	12.700	AC
Total post-development catchment or for BMP analysis:	14.830	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	25.51	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	26.30	%
Estimated BMP Area (No loading from this area)	2.130	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	18.170	ac-ft/year
Average annual post runoff volume (note no BMP area):	18.497	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	26.666	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	3.473	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	27.146	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	3.536	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT	
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 33

GO TO STORMWATER TREATMENT ANALYSIS

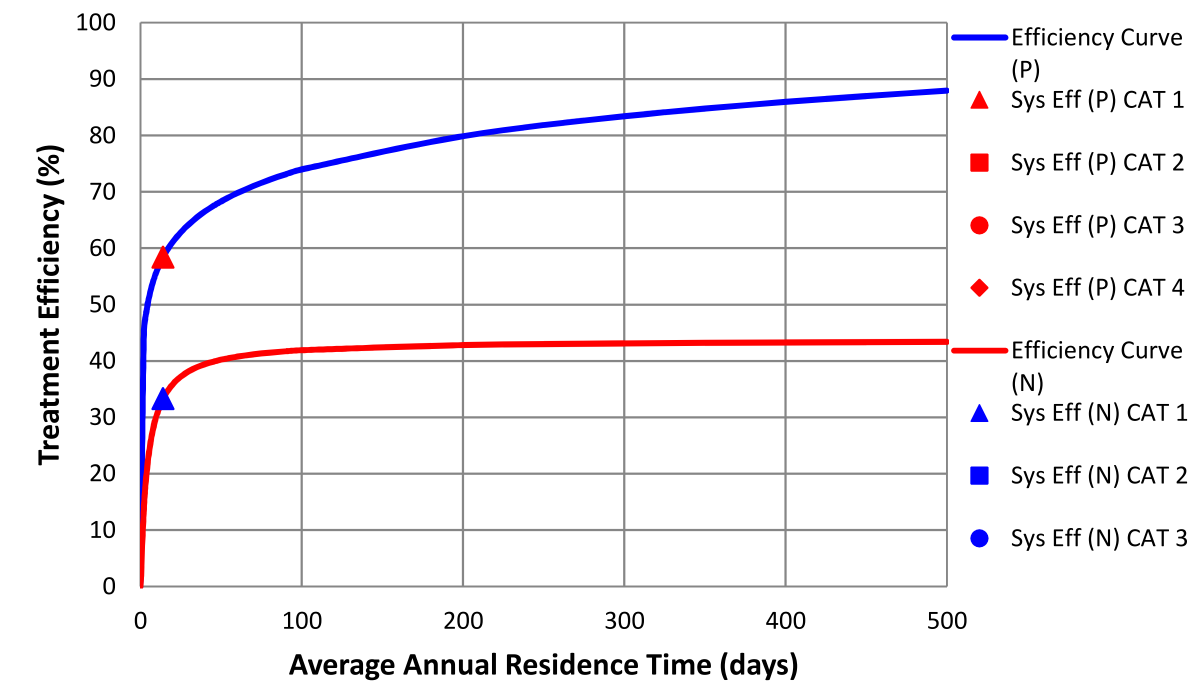
	Pond 33	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	12.700	0.000	0.000	0.000	ac
Total post-development catchment area:	12.700	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	1.766				%
Total **Phosphorus** removal required:	1.766				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	18.497				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

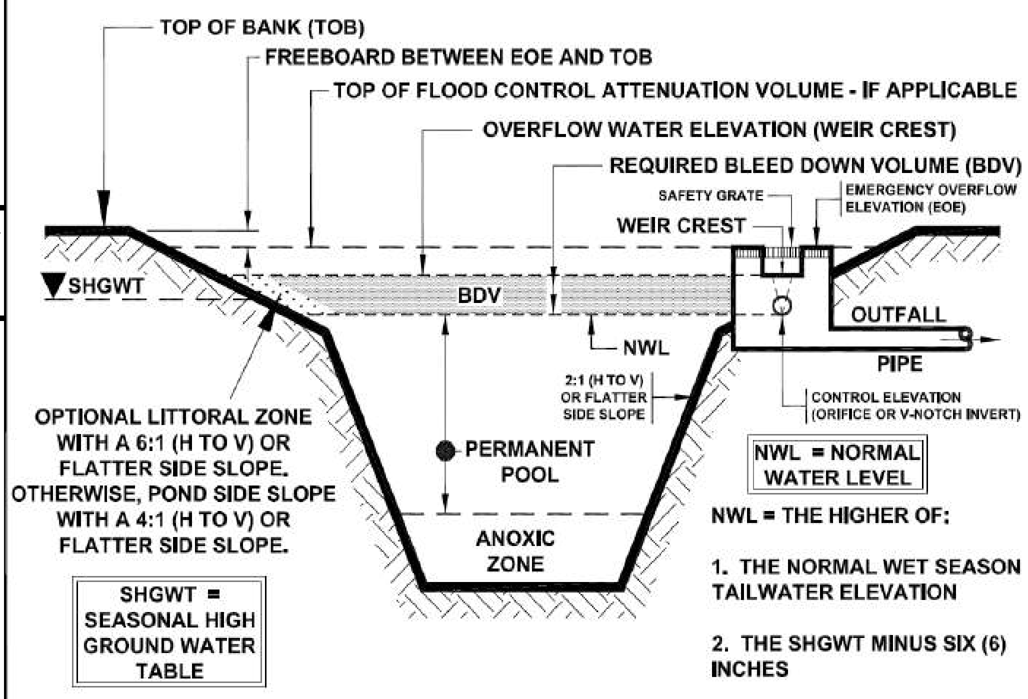
Minimum Pond Permanent Pool Volume:	0.709				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

CALCULATION METHODS:

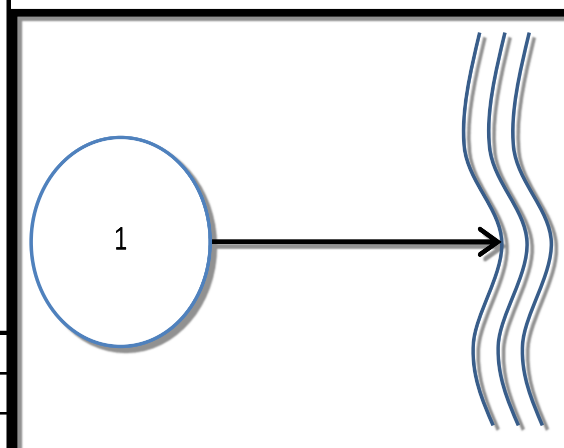
1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 33	Optional Identification	

	Pond 33	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	26.67	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	3.47		
Nitrogen Post Load (kg/yr)	27.15		
Phosphorus Post Load (kg/yr)	3.54		
Target Load Reduction (N) %	2	TN MET	
Target Load Reduction (P) %	2		
Target Discharge Load, N (kg/yr)	26.60		
Target Discharge Load, P (kg/yr)	3.47	TP MET	
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	18.10	39.87	
Discharged Load, P (kg/yr & lb/yr):	1.47	3.24	
Load Removed, N (kg/yr & lb/yr):	9.05	19.92	
Load Removed, P (kg/yr & lb/yr):	2.07	4.55	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers = Input data Red Numbers = Calculated or Carryover

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT: SR 29 PD&E - Basin 40

HELP Rainfall

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map):	CLICK ON CELL BELOW TO SELECT Zone 4
Mean Annual Rainfall (Please use rainfall map):	56.00 Inches
Type of analysis:	CLICK ON CELL BELOW TO SELECT Net improvement
Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**):	%

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

STORMWATER TREATMENT ANALYSIS

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

Model documentation and example problems.

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6	GO TO STORMWATER TREATMENT ANALYSIS	Blue Numbers = Input data	LAND USES/EMC
		Red Numbers = Calculated	

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION: A - Single Catchment

COMINGLING | MULTI-LAND USE

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs] | CATCHMENT NO.1 NAME: Pond 40

max delay = 15 hrs.

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs	Agricultural - Citrus: TN=2.240 TP=0.183	
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs	Highway: TN=1.520 TP=0.200	
Total pre-development catchment area:	20.400	AC
Total post-development catchment or for BMP analysis:	23.070	AC
Pre-development Non DCIA CN:	80.00	
Pre-development DCIA percentage:	15.20	%
Post-development Non DCIA CN:	80.00	
Post-development DCIA percentage:	29.07	%
Estimated BMP Area (No loading from this area)	2.670	AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:		POST:	
EMC(N):	1.190	mg/L	1.190	mg/L
EMC(P):	0.155	mg/L	0.155	mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	22.404	ac-ft/year
Average annual post runoff volume (note no BMP area):	31.557	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	32.879	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	4.283	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	46.312	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	6.032	kg/year

CATCHMENT NO.2 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (No loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

	CLICK ON CELL BELOW TO SELECT	
Pre-development land use: with default EMCs		
	CLICK ON CELL BELOW TO SELECT	
Post-development land use: with default EMCs		
Total pre-development catchment area:		AC
Total post-development catchment or BMP analysis area:		AC
Pre-development Non DCIA CN:		
Pre-development DCIA percentage:		%
Post-development Non DCIA CN:		
Post-development DCIA percentage:		%
Estimated BMP Area (no loading from this area)		AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:		POST:	
EMC(N):		mg/L		mg/L
EMC(P):		mg/L		mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 40

GO TO STORMWATER TREATMENT ANALYSIS

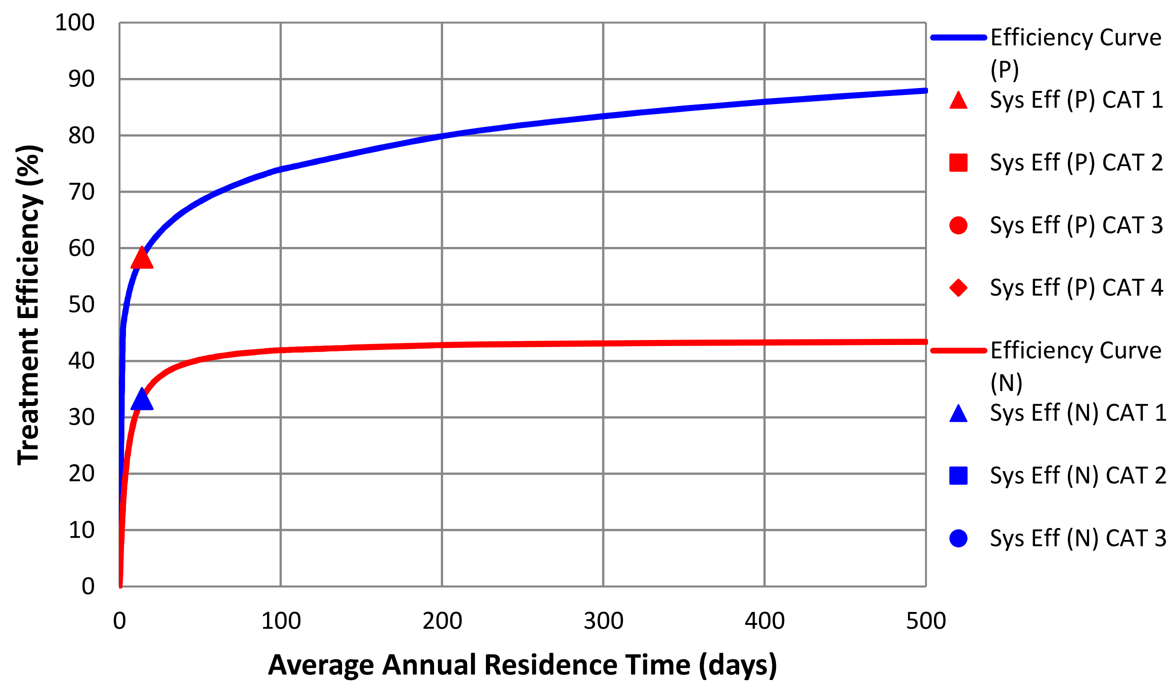
	Pond 40	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	20.400	0.000	0.000	0.000	ac
Total post-development catchment area:	20.400	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	29.005				%
Total **Phosphorus** removal required:	29.005				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	31.557				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

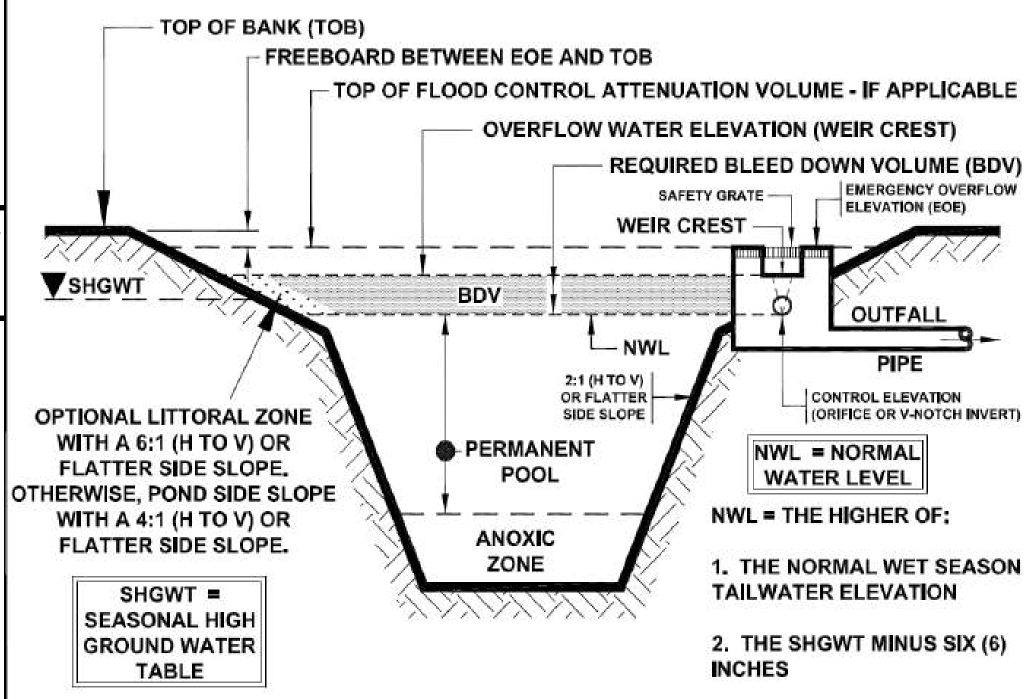
Minimum Pond Permanent Pool Volume:	1.210				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY V 8.6

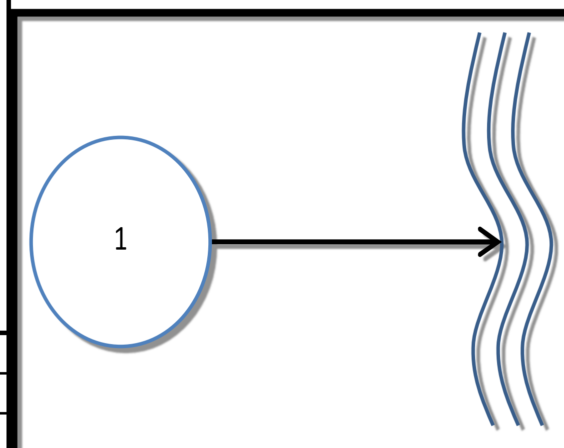
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 40	Optional Identification		
	Pond 40	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment		5/16/2018
Nitrogen Pre Load (kg/yr)	32.88	Treatment Objectives or Target for	BMPTRAINS MODEL
Phosphorus Pre Load (kg/yr)	4.28		
Nitrogen Post Load (kg/yr)	46.31		
Phosphorus Post Load (kg/yr)	6.03		
Target Load Reduction (N) %	29	TN MET	
Target Load Reduction (P) %	29		
Target Discharge Load, N (kg/yr)	32.88	TP MET	
Target Discharge Load, P (kg/yr)	4.28		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	30.88	68.01	
Discharged Load, P (kg/yr & lb/yr):	2.51	5.52	
Load Removed, N (kg/yr & lb/yr):	15.43	33.99	
Load Removed, P (kg/yr & lb/yr):	3.52	7.76	



GENERAL SITE INFORMATION: V 8.6	GO TO INTRODUCTION PAGE	5/16/2018	Blue Numbers =	Input data
			Red Numbers =	Calculated or Carryover

HELP Rainfall

Select the appropriate Meteorological Zone, input the appropriate Mean Annual Rainfall amount and select the type of analysis

NAME OF PROJECT

SR 29 PD&E - Basin 41

VIEW ZONE MAP

VIEW MEAN ANNUAL RAINFALL MAP

GO TO WATERSHED CHARACTERISTICS

Meteorological Zone (Please use zone map): CLICK ON CELL BELOW TO SELECT — Zone 4

Mean Annual Rainfall (Please use rainfall map): 56.00 Inches

Type of analysis: CLICK ON CELL BELOW TO SELECT — Net improvement

Treatment efficiency (N, P) (ex 80 70 (no decimal points) **use only for specified removal efficiency**): %

Select the STORMWATER TREATMENT ANALYSIS Button below to begin analyzing the effectiveness of Best Management Practices.

Model documentation and example problems.

STORMWATER TREATMENT ANALYSIS

There is a user's manual for the BMPTRAINS model. It can be downloaded from www.stormwater.ucf.edu. The results from the example problems shown in the manual however may not reflect current model results due to ongoing updates of the model.

Systems available for analysis:
Retention Basin with option for calculating effluent concentration
Wet Detention
Exfiltration Trench
Pervious Pavement
Stormwater Harvesting
Biofiltration
Greenroof
Rainwater Harvesting
Managed Aquatic Plants Detention
Vegetated Natural Buffer
Vegetated Filter Strip
Swale
Rain Garden
Tree Well
Lined reuse pond
User Defined BMP

RESET INPUT FOR STORMWATER TREATMENT ANALYSIS

METHODOLOGY FOR CALCULATING REQUIRED TREATMENT EFFICIENCY

METHODOLOGY FOR RETENTION SYSTEMS

METHODOLOGY FOR WET DETENTION SYSTEMS

METHODOLOGY FOR GREENROOF SYSTEMS

METHODOLOGY FOR WATER HARVESTING SYSTEMS

WATERSHED CHARACTERISTICS V 8.6

GO TO STORMWATER TREATMENT ANALYSIS

Blue Numbers =	Input data
Red Numbers =	Calculated

LAND USES/EMC

SELECT CATCHMENT CONFIGURATION 5/16/2018

CLICK ON CELL BELOW TO SELECT CONFIGURATION

A - Single Catchment

VIEW CATCHMENT CONFIGURATION

GO TO GENERAL SITE INFORMATION PAGE

For comingling, the off-site catchment must be upstream. The delay is only for retention BMPs and must be used in hours as measured by the time of concentration at a one inch/hour rain

COMINGLING MULTI-LAND USE

VIEW AVERAGE ANNUAL RUNOFF "C" Factor

VIEW EMC & FLUCCS

GO TO GIS LANDUSE DATA

Delay [hrs] max delay = 15 hrs.

CATCHMENT NO.1 NAME: Pond 41

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Agricultural - Citrus: TN=2.240 TP=0.183
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT: Highway: TN=1.520 TP=0.200
Total pre-development catchment area:	9.800 AC
Total post-development catchment or for BMP analysis:	11.130 AC
Pre-development Non DCIA CN:	80.00
Pre-development DCIA percentage:	16.43 %
Post-development Non DCIA CN:	80.00
Post-development DCIA percentage:	22.76 %
Estimated BMP Area (No loading from this area)	1.330 AC

OVERWRITE DEFAULT CONCENTRATIONS USING:

	PRE:	POST:
EMC(N):	1.190 mg/L	1.190 mg/L
EMC(P):	0.155 mg/L	0.155 mg/L

OVERWRITE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:	11.146	ac-ft/year
Average annual post runoff volume (note no BMP area):	13.139	ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**	16.357	kg/year
Pre-development Annual Mass Loading - **Phosphorus:**	2.131	kg/year
Post-development Annual Mass Loading - **Nitrogen:**	19.282	kg/year
Post-development Annual Mass Loading - **Phosphorus:**	2.512	kg/year

CATCHMENT NO.2 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Total pre-development catchment area:	AC
Total post-development catchment or BMP analysis area:	AC
Pre-development Non DCIA CN:	
Pre-development DCIA percentage:	%
Post-development Non DCIA CN:	
Post-development DCIA percentage:	%
Estimated BMP Area (No loading from this area)	AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.3 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Total pre-development catchment area:	AC
Total post-development catchment or BMP analysis area:	AC
Pre-development Non DCIA CN:	
Pre-development DCIA percentage:	%
Post-development Non DCIA CN:	
Post-development DCIA percentage:	%
Estimated BMP Area (no loading from this area)	AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

CATCHMENT NO.4 NAME:

Pre-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Post-development land use: with default EMCs	CLICK ON CELL BELOW TO SELECT
Total pre-development catchment area:	AC
Total post-development catchment or BMP analysis area:	AC
Pre-development Non DCIA CN:	
Pre-development DCIA percentage:	%
Post-development Non DCIA CN:	
Post-development DCIA percentage:	%
Estimated BMP Area (no loading from this area)	AC

OVERWRITE DEFAULT CONCENTRATIONS:

	PRE:	POST:
EMC(N):	mg/L	mg/L
EMC(P):	mg/L	mg/L

USE DEFAULT CONCENTRATIONS

Average annual pre runoff volume:		ac-ft/year
Average annual post runoff volume (note no BMP area):		ac-ft/year
Pre-development Annual Mass Loading - **Nitrogen:**		kg/year
Pre-development Annual Mass Loading - **Phosphorus:**		kg/year
Post-development Annual Mass Loading - **Nitrogen:**		kg/year
Post-development Annual Mass Loading - **Phosphorus:**		kg/year

WET DETENTION / MANAGED AQUATIC PLANTS:	5/16/2018 V 8.6	Blue Numbers =	Input data
		Red Numbers =	Calculated or Carryover

Also called: FLOATING ISLANDS and includes a wet detention pond: | SR 29 PD&E - Basin 41

GO TO STORMWATER TREATMENT ANALYSIS

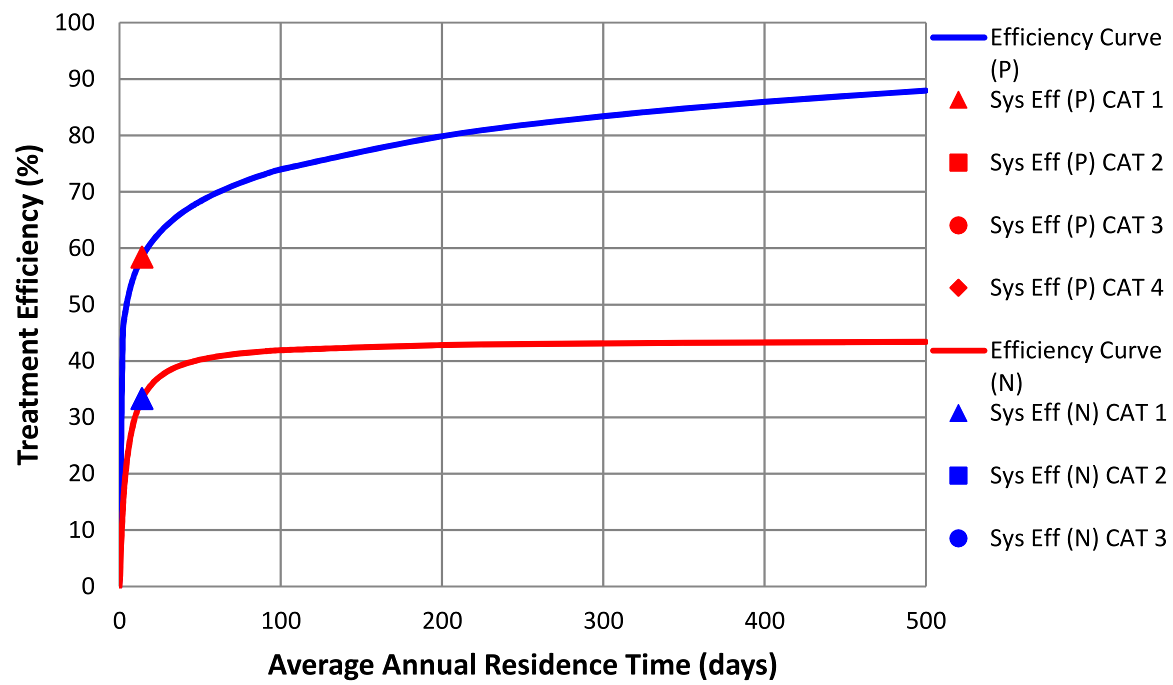
	Pond 41	Catchment 2	Catchment 3	Catchment 4	
Total pre-development catchment area:	9.800	0.000	0.000	0.000	ac
Total post-development catchment area:	9.800	0.000	0.000	0.000	ac
Average annual residence time (between 1 and 500 days)	14.00				days
Littoral Zone or other improvements used?*	NO				
Littoral Zone or other improvement efficiency credit:	10.00				%
Floating Wetland or Mats used in the design:					
Floating Wetland or Mats credit:					%
Total **Nitrogen** removal required:	15.167				%
Total **Phosphorus** removal required:	15.167				%
Total **Nitrogen** removal efficiency:	33.324	0.000	0.000	0.000	%
Total **Phosphorous** removal efficiency:	58.430	0.000	0.000	0.000	%
Is the wet detention sufficient:	YES				
Average annual runoff volume:	13.139				ac-ft/yr

* pond coverage must follow Regulatory Requirements

Wet Detention Pond Characteristic:

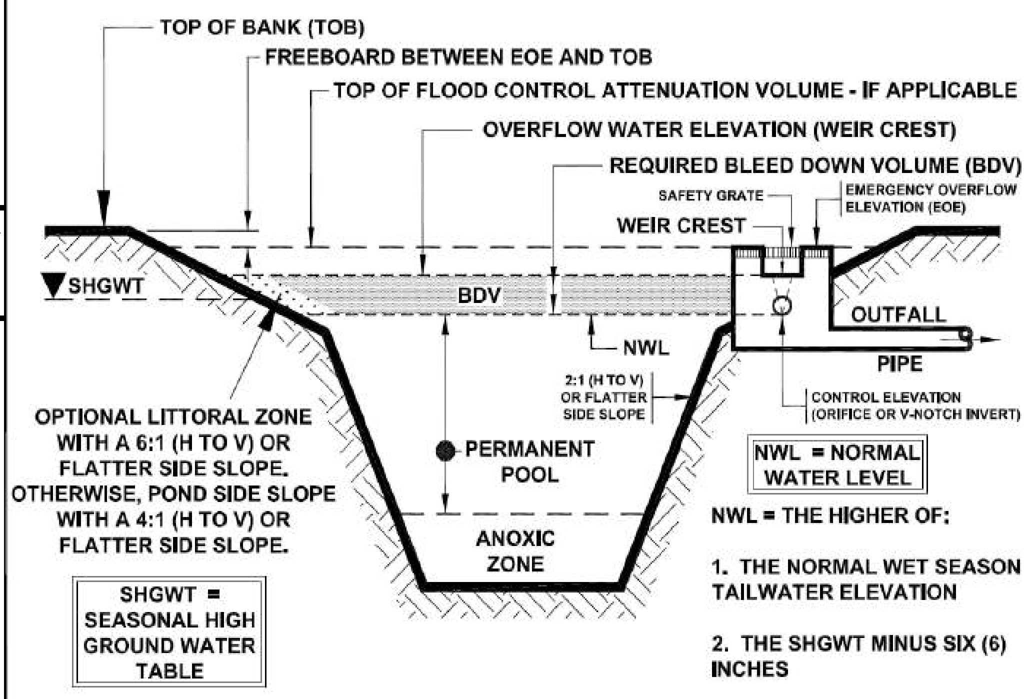
Minimum Pond Permanent Pool Volume:	0.504				ac-ft

REQUIRED REMAINING TREATMENT EFFICIENCIES OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION. USE FOR SIZING OF TREATMENT SYSTEM IN SERIES WITH FLOATING ISLANDS WITH WET DETENTION.



NOTE FOR TREATMENT EFFICIENCY GRAPH:

The purpose of the treatment efficiency graphs is to help illustrate the treatment efficiency of the wet detention system as the function of average annual residence time (and permanent pool volume). The graph illustrates that there is a point of diminished return as the permanent pool volume is substantially increased. Therefore, to provide the most economical BMP treatment system, other alternatives such as "treatment trains" and compensatory treatment should be considered.



TYPICAL X-SECTION OF A WET DETENTION SYSTEM

Source of Graphic: draft **STORMWATER QUALITY APPLICANT'S HANDBOOK** dated March 2010, by the Department of Environmental Protection, available at: http://www.dep.state.fl.us/water/wetlands/erp/rules/stormwater, March 2010

CATCHMENTS AND TREATMENT SURFACE DISCHARGE SUMMARY				V 8.6

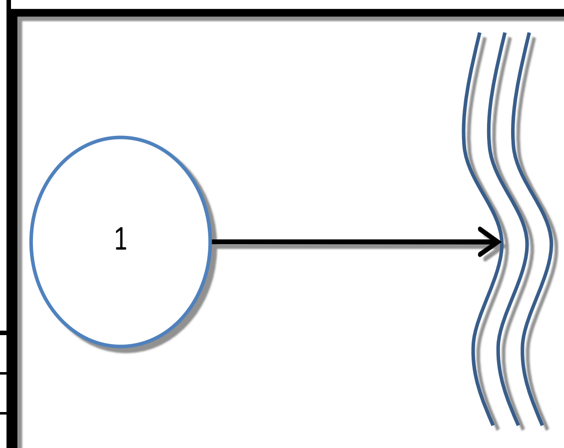
CALCULATION METHODS:

1. The effectiveness of each BMP in a single catchment is converted to an equivalent capture volume.
2. Certain BMP treatment train combinations have not been evaluated and in practice they are at this time not used, an example is a greenroof following a tree well.
3. Wet detention is last when used in a single catchment with other BMPs, except when followed by filtration

PROJECT TITLE	SR 29 PD&E - Basin 41	Optional Identification		
	Pond 41	Catchment 2	Catchment 3	Catchment 4
BMP Name	Wet Detention/ MAPs			
BMP Name				
BMP Name				

Surface Water Discharge Summary Performance of Entire Watershed

Catchment Configuration	A - Single Catchment	Treatment Objectives or Target for TN MET TP MET	5/16/2018 BMPTRAINS MODEL
Nitrogen Pre Load (kg/yr)	16.36		
Phosphorus Pre Load (kg/yr)	2.13		
Nitrogen Post Load (kg/yr)	19.28		
Phosphorus Post Load (kg/yr)	2.51		
Target Load Reduction (N) %	15		
Target Load Reduction (P) %	15		
Target Discharge Load, N (kg/yr)	16.39		
Target Discharge Load, P (kg/yr)	2.13		
Provided Overall Efficiency, N (%):	33		
Provided Overall Efficiency, P (%):	58		
Discharged Load, N (kg/yr & lb/yr):	12.86	28.32	
Discharged Load, P (kg/yr & lb/yr):	1.04	2.30	
Load Removed, N (kg/yr & lb/yr):	6.43	14.15	
Load Removed, P (kg/yr & lb/yr):	1.47	3.23	



Appendix G
Correspondence & Design Aids

APPENDIX G

TABLE OF CONTENTS

H.W. Lochner, Inc.
440 Sawgrass Corporation Parkway
Suite 206
Sunrise, FL 33325
T 954.846.0009
F 954.846.1090

hwlochner.com

MEETING MINUTES

February 13th, 2009

Regulatory Meeting for SR-29 at SFWMD Naples Office

Attendees:

Tim Howard	Special Engineering Assistant	SFWMD
Mark Kuntz	Senior Drainage Engineer	HWLOCHNER
Anata Nath	Chief Engineer	SFWMD
Satish Vijjapu	Project Engineer	HWLOCHNER
Clarence Tears, Jr.	Director	BIG CYPRESS BASIN

Distribution:

Bill Howell	Project Manager	HWLOCHNER
John Kenty	Project Manager	HWLOCHNER
Mark Kuntz	Senior Drainage Engineer	HWLOCHNER
Jesus Mustafa	Vice President	HWLOCHNER
Satish Vijjapu	Project Engineer	HWLOCHNER

On Friday, February 13th 2009, a permit coordination meeting was held at the Naples Office of the South Florida Water Management District. The meeting was requested by H.W.Lochner to introduce the project to the District so that their concerns could be identified.

Mark Kuntz introduced the project and explained that four general alternatives: east, west, SR-29, and SR-29A were being considered. Mr. Kuntz explained that the preferred alternatives were those that utilized the existing SR-29 corridor as much as possible. These two alternatives included SR-29 and SR-29A.

Tim Howard explained that there was a DRI (Development of Regional Impact) for the Immokalee Airport in the works. It was moving forward, albeit slowly because of the economic situation. He requested that HWLochner consider the existence of this DRI when evaluating potential alternatives.

He stated that the expected expansion to the airport would, more than likely occur to the east of the airport, posing possible conflicts with any alternative east of the airport. In addition, he also stated that there are a myriad of environmental issues associated with an eastern alternative. These issues include wetland, habitat, etc. He suggested that HWLOCHNER try to avoid this area if possible.

He explained that the District thought that most feasible (since it was the most desirable to the public) alternative would be one which lies east of 29A and west of the airport, next to the existing rail corridor which lies between. Such an alternative would be considered a hybrid between the eastern and central corridor alternatives. This alternative would place SR-29 near the existing businesses located near the airport. This would be of benefit since they are the businesses most likely in need of using this route.

Mark Kuntz suggested that this alternative would have additional merit if the existing rail corridor, which was now abandoned, could be used, since utilization of the existing corridor in this fashion might result in significant reductions in impacts associated with the project.

District staff expressed that this might be a good idea. Mr. Kuntz asked about obtaining information of the abandoned corridor. Tim Howard mentioned that the corridor was probably owned by the Barr Collier Corp. Mr. Kuntz was directed to contact either of their engineers, Bob Roth or Ray March.

The District expressed that the development of the western alternative would involve several challenges. These challenges include coordination with the Seminoles (since it impacts Seminole Lands), and impacts to an existing slough. The District referred Lochner to see Metcalf & Eddy's website for more information about an existing report detailing environmental concerns for this area. Metcalf & Eddy participated in a study which includes much of southwest Florida.

The District suggested that Lochner contact Tim Lieberman at extension 7799. Tim is expecting updated Lidar data of the corridor. The data should be available after February 18^{th}. This data is being obtained as part of the Coastal Lidar Initiative. It should include good information around Owl Hammock Curve including inlets, outfalls, and the centerline of the SR-29 Borrow Canal.

SFWMD confirmed that the airport canal and Madison Avenue Ditch drain to the SR-29 Canal.

Tim Howard also mentioned that there was a high level of uncertainty regarding the existing drainage patterns located below the bell (which is located to the west and at the south end of Immokalee). All drainage studies for this area had difficulty assessing the natural drainage pattern for this area.

Mr. Tears also emphasized that the vast majority of folks within Immokalee (including the mayor) wish to see a proposed corridor that has an eastern alignment.

Mr. Tears also stated that the existing runway will need to be lengthened to 7000 ft. (more than likely to the east).

In addition, Lake Trafford has been classified as an impaired water body. As such, the design of any proposed alignment to the west of Immokalee will need to consider measures related to this classification.

Mr. Kuntz expressed his concern that the current flood plain maps for the areas surrounding Immokalee did not give specific flood plain elevations. Mr. Kuntz asked if there was better data available regarding this determination.

Mr. Kuntz was directed to contract Mr. Robert Wiley with FEMA. Mr. Wiley is currently involved in an effort to improve flood plain elevation determination. He used to work for Collier County, but now works for FEMA. His phone number is (239) 213-5858.

SFWMD extended to LOCHNER staff the opportunity to come look at their files regarding this area at any time.

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Memorandum

Date: January 18, 2018

Subject: Telephone Conversation with Robert Wiley

Contact was made with **Robert Wiley** Principal Project Manager at FEMA and Floodplain Section in Collier County. As per Robert Wiley, new Floodplain maps are currently in production and would take a minimum 1 year to complete. His suggestion was to use the current maps available at FEMA Map Service center on the website http://msc.fema.gov/ .

Robert Wiley's contact number & email:
239-252-5858
RobertWiley@colliergov.net

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TELEPHONE MEETING
MEMORANDUM

Date: July 31, 2018

Prepared By: Tracy Ellison, PE

Attendees: Fidel Herrera, Maintenance Manager/Field Operations – Ferrovial Services
Tracy Ellison, PE - Lochner

Subject: FPID 417540-1-22-01, SR 29 from Oil Well Road to SR 82 PD&E
Existing Drainage/Flooding Concerns

Fidel Herrera, Maintenance Manager/Field Operations for Ferrovial Services (FDOT Asset Management Consultant) and Tracy Ellison (Lochner) discussed the SR 29 PD&E project from Oil Well Road to SR 82. Tracy described the project objectives and asked if there were any known existing drainage concerns or flooding issues within the project limits. Mr. Herrera stated that there were no issues with the existing drainage structures or function of the drainage system. In addition, aside from occasional nuisance ponding, there are no known flooding problems within the project limits.

Florida Department of Transportation

RICK SCOTT
GOVERNOR

801 North Broadway Avenue
Bartow, FL 33830

ANANTH PRASAD
SECRETARY

MEMORANDUM

Date:	July 7, 2011
To:	FDOT District One Design Consultants
From:	Brent Setchell, P.E. FDOT District One Environmental Permits Engineer
Subject:	**Nutrient Loading Calculations for FDOT Projects**

This memo provides guidance for nutrient loading calculations for Florida Department of Transportation (FDOT) District One projects. For projects that discharge to impaired water bodies, South Florida Water Management District (SFWMD) and Southwest Florida Water Management District (SWFWMD) require nutrient loading calculations that demonstrate no net increase in total nitrogen (TN) and total phosphorus (TP).

SFWMD and SWFWMD currently recognize the data in the March 2010 draft of the *Stormwater Quality Applicant's Handbook (SQAH)* published by the Florida Department of Environmental Protection (FDEP) as the best available information. The SQAH is based on the methodology of the *Evaluation of Current Stormwater Design Criteria within the State of Florida* (2007 Harper Report). When performing nutrient loading calculations for FDOT projects, designers should use the 2010 SQAH data and adhere to the following assumptions and criteria:

- The "Pre" condition shall be defined as the existing condition of the project area, not the "Pre-Indian" or "natural" condition.
- Use the rainfall distribution data in the 2010 SQAH instead of the rainfall distribution from the 2007 Harper Report.
- Use the Phosphorus Removal Efficiency equation from the 2010 SQAH in lieu of the equation listed in the 2007 Harper Report.

In addition FDOT submitted a Memo dated April 25, 2011 to each of the Water Management District offices within District One indicating FDOT will begin utilizing Event Mean Concentration (EMC) values with better scientific supporting data. The Memo dated April 25, 2011 is attached to this memo for your reference. The EMC values were established by the 2010 ATM Report, which is also attached to this memo. District One is requesting consultants utilize the following EMC Values on all current projects that haven't submitted for permits and all future projects:

Highway EMC Values	TN (mg/L)	TP (mg/L)
Lee, Charlotte, Collier and Hendry Counties	1.16	0.157
All Other Locations within FDOT District One	1.19	0.155

Instructions for determining if your project is located within Impaired Waters are also attached for your reference. It is District One's position that only those WBIDs listed for nutrients would require pollutant loading calculations. Impairments for fecal coliform or mercury in fish are not considered contributing pollutants by District One. Therefore, nutrient loading calculations are not required for these impairments.

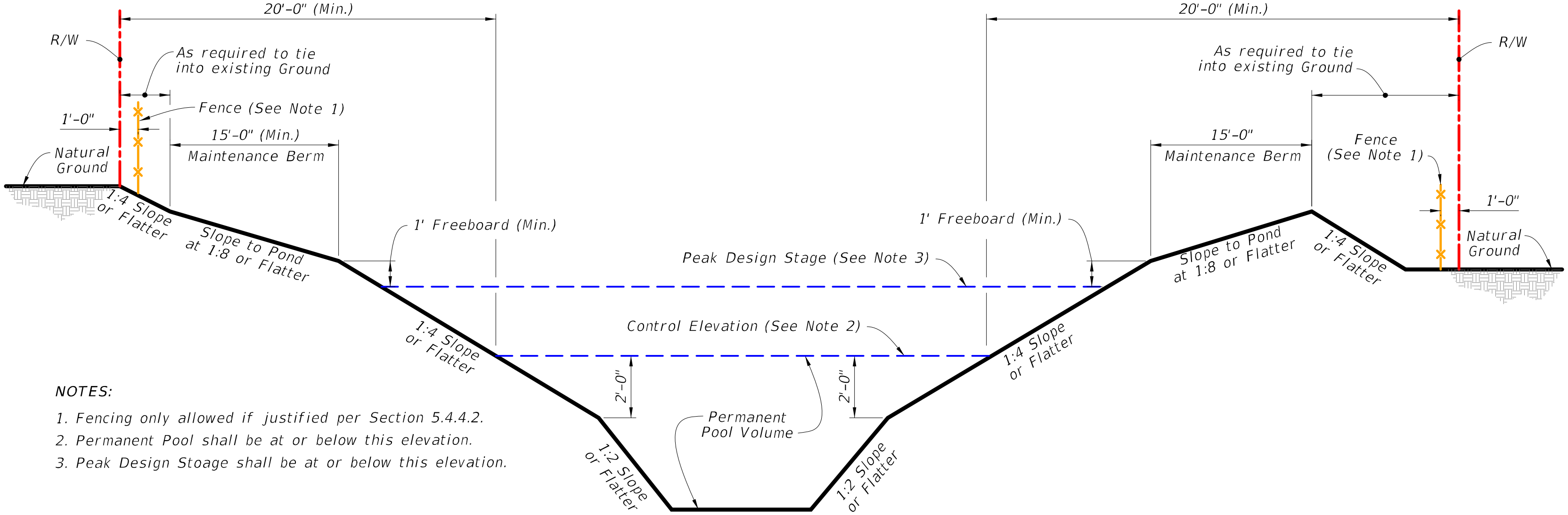

Figure 5-1: Minimum Clearance Retention-Detention Ponds

Table T-7
SCS Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Land Use

Land Use Description		Hydrologic Soil Group A	B	C	D
Cultivated Land[a]:					
Without conservation treatment		72	81	88	91
With conservation treatment		62	71	78	81
Pasture or range land:					
Poor condition		68	79	86	89
Good condition		39	61	74	80
Meadow: good condition		30	58	71	78
Wood or Forest Land:					
Thin stand, poor cover, no mulch		45	66	77	83
Good cover [b]		25	55	70	77
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries:					
Good condition: grass cover on 75% or more of the area		39	61	74	80
Fair condition: grass cover on 50% to 75% of the area		49	69	79	84
Poor condition: grass cover on 50% or less of the area		68	79	86	89
Commercial and Business Areas (85% impervious)		89	92	94	95
Industrial Districts (72% impervious)		81	88	91	93
Residential [c]					
Average lot size	Average % Impervious [d]				
1/8 acre or less	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
Paved Parking Lots, Roofs, Driveways [e]:		98	98	98	98
Streets and Roads:					
Paved with curbs and storm sewers [e]		98	98	98	98
Gravel		76	85	89	91
Dirt		72	82	87	89
Paved with open ditches		83	89	92	93
Newly graded area (no vegetation established)[f]		77	86	91	94

[a] For a more detailed description of agricultural land use curve numbers, refer to Table T-8. .
[b] Good cover is protected from grazing and litter and brush cover soil.
[c] Curve numbers are computed assuming the runoff from the house and driveway is directed toward the street with a minimum of roof water directed to lawns where additional infiltration could occur, which depends on the depth and degree of the permeability of the underlying strata.
[d] The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.
[e] In some warmer climates of the country, a curve number of 96 may be used.
[f] Use for temporary conditions during grading and construction.
Note: These values are for Antecedent Moisture Condition II, and $I_a = 0.2S$.

Reference: USDA, SCS, TR-55 (1984).

Appendix H
Environmental Screenings

APPENDIX H
TABLE OF CONTENTS

APPENDIX K

SUMMARY OF ALTERNATIVE POND AND FLOODPLAIN COMPENSATION SITES

A total of thirty-eight (38) alternative pond site locations and five (5) potential floodplain compensation (FPC) sites were identified for each Build Alternative to be further reviewed as part of this PD&E Study. Nearly all of the potential pond locations and FPC sites included in this evaluation are common to both Build Alternatives as they occur along the existing SR 29 corridor. However, the Build Alternatives both contain five (5) pond site locations not shared by the other Build Alternative. The individual locations of potential pond and FPC sites within the two Build Alternatives are depicted on the attached aerial photographs, and general descriptions are provided in the following paragraphs. The below table summarizes the alternative pond and FPC sites by acreage, corresponding Build Alternative(s), and FLUCFCS designations, based on review of SFWMD 2008 GIS land use data. Pond and FPC sites with similar land uses and habitat types are discussed collectively for general assessment purposes.

Table Appendix K-1
Summary of Alternative Pond and Floodplain Compensation Sites

Corresponding Alternative	Pond/FPC Site ID	FLUCFCS Categories	FLUCFCS Acreages	Total Size (acres)
Common to both Build Alternatives	FPC A	211	1.50	4.39
		434	2.89	
	FPC B	434	4.51	4.51
		641	0.001	
	FPC C	221	10.33	10.33
	FPC D	434	2.60	2.60
	FPC E	221	11.96	11.96
	Pond 1	320	0.09	1.70
		420	1.61	
	Pond 3	411	1.14	1.21
		814	0.07	
	Pond 4	411	1.15	1.38
		434	0.23	
	Pond 5	211	1.83	1.83
	Pond 6	214	1.75	1.75
	Pond 7	214	1.22	1.29
		320	0.07	
	Pond 8	221	1.09	1.54
		320	0.45	
	Pond 9	221	0.89	1.32
		320	0.43	
	Pond 10	221	1.49	2.15
		320	0.66	
	Pond 11	221	1.10	1.62
		320	0.52	
	Pond 12	434	0.88	1.32
		641	0.44	
	Pond 13	320	0.07	1.82
		330	1.74	
		630	0.01	

Table Appendix K-1 (Continued)
Summary of Alternative Pond and Floodplain Compensation Sites

Corresponding Alternative	Pond/FPC Site ID	FLUCFCS Categories	FLUCFCS Acreages	Total Size (acres)
Common to both Build Alternatives	Pond 14	320	0.07	1.77
		330	1.69	
		641	0.01	
	Pond 15	243	1.71	1.71
	Pond 16	221	1.68	1.68
	Pond 17	221	1.76	1.76
	Pond 18	330	1.70	1.70
	Pond 19	330	1.68	1.68
	Pond 20	617	2.30	2.30
	Pond 21	112	0.11	2.82
		617	2.71	
	Pond 22	434	1.31	1.31
	Pond 23	434	1.91	1.91
	Pond 24	411	1.25	1.25
	Pond 25	411	3.33	3.33
	Pond 26-2 / Pond 26-1R	155	2.34	2.42
		814	0.08	
Within Central Alternative #1 Revised Only	Pond 28-1R	814	1.20	1.20
	Pond 27-1R	814	2.84	2.84
	Pond 29-1R	155	2.54	2.54
	Pond 30-1R	155	1.78	1.78
	Pond 31-1R	212	1.33	1.33
Within Central Alternative #2 Only	Pond 27-2A	155	3.38	3.44
		814	0.06	
	Pond 27-2B	155	0.09	0.64
		811	0.55	
	Pond 29-2	811	2.89	2.89
	Pond 30-2	212	1.26	1.26
	Pond 31-2	212	0.01	2.90
		221	2.89	
Common to both Build Alternatives	Pond 32-2 / Pond 32-1R	121	0.01	3.31
		212	3.01	
		641	0.29	
	Pond 33	411	2.14	2.16
		814	0.02	
	Pond 34	411	0.20	1.34
		643	1.01	
		814	0.13	
	Pond 35	211	1.72	2.02
		411	0.30	
	Pond 36	211	3.37	3.62
		510	0.09	
		534	0.16	
	Pond 37	814	2.42	2.42
	Pond 38	221	1.32	1.61
		510	0.29	
	Pond 39	221	2.77	2.90
		320	0.02	
		510	0.11	
	Pond 40	221	2.23	2.71
		510	0.14	
		617	0.34	
	Pond 41	221	0.91	1.42
		510	0.04	
		617	0.47	

Each alternative pond and FPC site was reviewed for potential occurrences of federal and state-listed plant and animal species in accordance with Section 7 of the Endangered Species Act of 1973, as amended, the Fish and Wildlife Conservation Act, the Migratory Bird Treaty Act, Part 2 – Chapter 16 of the PD&E Manual, and Chapters 5B-40 and 68A-27 FAC. The sites were also evaluated for the occurrence of federally-designated Critical Habitat as defined by Congress in 50 CFR 17. Based on this evaluation, it was determined that no federally-designated Critical Habitat is present within or adjacent to any of the alternative pond or FPC sites.

These sites occur within the FWS Consultation Areas for the eastern indigo snake, Audubon's crested caracara, Florida scrub jay, Florida panther, Florida bonneted bat, snail kite, wood stork, and Florida grasshopper sparrow; and many are also located within either Primary or Secondary Habitat Zone for the Florida panther. Florida scrub jays have also been previously documented along the project corridor and were observed by project biologists during various field evaluations. The project study area falls within the core foraging area (CFA) of seven (7) active nesting wood stork colonies.

The alternative pond and FPC sites were also evaluated for the presence of wetlands in accordance with Presidential Executive Order 11990 entitled "Protection of Wetlands", United States Department of Transportation Order 5660.1A, "Preservation of the Nation's Wetlands", and Part 2, Chapter 9 of the FDOT PD&E Manual. Potential pond and FPC sites were designed outside of wetlands to the best extent feasible. However, wetland impact resulting from the proposed surface water management system may be unavoidable and will depend on the final roadway design. The purpose of this alternative pond and FPC site evaluation is for early identification of potential wetland and/or protected species issues so that avoidance and minimization measures can be incorporated into the project design to greatest extent practicable.

<u>FPC Sites A, B, and D - Pond Sites 1, 3, 4, 22, 23, 24, and 25</u>

These 10 sites are discussed collectively due to similar land use classifications and quality of suitable wildlife habitat currently available for nesting and/or foraging. Pond Sites 1, 3, and 4 occur within close proximity of one another, near the south project terminus. Pond Sites 22, 23, and FPC Site D are located immediately adjacent to each other, and Pond Sites 24 and 25 are also positioned very close in proximity. These sites all occur primarily within undeveloped forested uplands. A minimal amount of freshwater marsh habitat (0.001 acre) is reported within FPC Site B; however this acreage is negligible when compared to the overall parcel size (4.51 acres). No wetlands or surface waters are documented within the remaining sites.

These 10 sites contain suitable habitat for Florida scrub jay, Florida panther, Florida bonneted bat, eastern indigo snake, Florida black bear, gopher tortoise, and Big Cypress fox squirrel; therefore seasonal surveys for one or more of these species may be required during the design and permitting phase as part of Section 7 consultation with FWS. A Panther Habitat Unit (PHU) assessment would also be required for impacts to suitable panther habitat within these sites as they occur within FWS Primary and Secondary Panther Habitat Zones.

FPC Sites C and E - Pond Sites 8, 9, 10, 11, 16, 17, 31-2, 38, 39, 40, and 41

These 13 sites are located intermittently throughout the SR 29 corridor and occur primarily over active citrus groves fringed with disturbed upland shrub and brush habitat. Ponds 38, 39, and 40 contain upland-cut agricultural ditches that may provide suitable wood stork foraging habitat. Pond 41 also contains 0.47 acre of mixed wetland hardwoods, which would require compensatory mitigation if impacted by the project. If deemed suitable, a wood stork prey analysis may be required for ditch impacts on these sites as part of Section 7 consultation with the FWS, and any wetland mitigation credits used for compensatory mitigation may need to include a wood stork component.

These 13 sites also contain suitable habitat for the Florida scrub jay, Florida panther, American alligator, eastern indigo snake, snail kite, gopher tortoise, Florida black bear, little blue heron, tricolored heron, roseate spoonbill, Florida sandhill crane, and Florida burrowing owl; therefore seasonal surveys for one or more of these species may be required during the design and permitting phase as part of Section 7 consultation with FWS. A PHU assessment would also be required for impacts to suitable panther habitat in these sites as they occur within FWS Primary and Secondary Panther Habitat Zones.

Pond Sites 5, 30-2, 32-2, 31-1R, 32-1R, 35, and 36

These 7 alternative pond sites are concentrated primarily in the northern region of the project corridor (the exception is Pond 5, located near the south terminus). These sites are comprised primarily of improved and unimproved pastures with active cattle grazing. Ponds 32-1R and 32-2, which share the same footprint, does contain 0.29 acre of freshwater marsh habitat, which would require compensatory mitigation if adversely impacted. Pond 36 also includes a total of 0.25 acre of OSWs (0.09 acre of ditches and 0.16 acre of reservoirs). If the impacted OSW features are determined to provide suitable wood stork foraging habitat, a wood stork prey analysis may be required, and compensatory wetland mitigation may be necessary to offset impacts to suitable wood stork foraging habitat.

These 7 sites also provide suitable habitat for the Florida scrub jay, Florida panther, American alligator, eastern indigo snake, snail kite, crested caracara, gopher tortoise, Florida black bear, little blue heron, tricolored heron, roseate spoonbill, Florida sandhill crane, and Florida burrowing owl; therefore seasonal surveys for one or more of these species may be required during the design and permitting phase as part of Section 7 consultation with FWS. A PHU assessment would also be required for impacts to suitable panther habitat in these sites as they occur within FWS Primary and Secondary Panther Habitat Zones.

Pond Sites 6, 7, and 15

These 3 alternative pond sites are discussed collectively due to the similarity of current land uses within these sites and marginal quality of suitable habitat available for wildlife utilization. Ponds 6 and 7 are used for active row crop production, and Pond 15 occurs entirely over a field used for cultivation of landscape plants for the adjacent nursery facility. None of these 3 alternative pond site locations contain suitable habitat for any state or federally listed species, and no wetlands or OSWs occur within these sites. Pond 7 does contain 0.07 acre of upland shrub and brushland along its outer fringe; however this habitat has been severely fragmented by the nursery and existing roadway and contains an infestation of nuisance/exotic vegetation.

Pond Sites 13, 14, 18, and 19

These 4 alternative pond sites are comprised of mixed rangeland interspersed with upland shrub and brushland and occur within the center region of the project corridor. Ponds 13 and 14 are positioned within close proximity to one another, and Pond 18 is located adjacent to the south boundary of Pond 19. Very minor wetland acreage (0.01 acre) is reported within Ponds 18 and 19, and Ponds 13 and 14 occur entirely within uplands.

These 4 sites may provide suitable habitat for the Florida scrub jay, Florida panther, eastern indigo snake, gopher tortoise, Florida black bear, Florida sandhill crane, and Florida burrowing owl; therefore seasonal surveys for one or more of these species may be required during the design and permitting phase as part of Section 7 consultation with FWS. A PHU assessment would also be required for impacts to suitable panther habitat in these sites as they occur within FWS Primary and Secondary Panther Habitat Zones.

Pond Sites 26-1R, 27-1R, 28-1R, 29-1R, 30-1R, 26-2, 27-2A, 27-2B, and 29-2

These 9 alternative pond sites are discussed collectively due to the industrial nature of land uses within the proposed pond site locations and the proximity of surrounding commercial development. Ponds 26-1R, 29-1R, 30-1R, 26-2, and 27-2A are positioned within open, regularly maintained grounds at industrial manufacturing facilities. Ponds 27-1R, 28-1R, 27-2B and 29-2 are each located within regularly maintained developed parcels associated with the Immokalee Airport. All 9 alternative pond site locations have previously been altered by development and therefore do not provide suitable habitat for any state or federally listed species. Additionally, no wetlands or OSWs occur within any of these sites. A PHU assessment would not be necessary for potential land alterations associated with these 9 sites as they all occur outside of the FWS Primary and Secondary Panther Habitat Zones.

Pond Sites 20 and 21

Pond 20 is located entirely within forested wetlands, and Pond 21 occurs almost entirely within forested wetlands with the exception of an 0.11-acre portion of the site designated as a mobile home unit within a low-density residential area. Selection of either alternative pond site for future utilization in the project's stormwater management system would result in similar impacts to a currently undeveloped 'mixed wetland hardwoods' habitat; Pond 20 would impact 2.30 acres of this wetland, and Pond 21 would result in 2.71 acres of wetland impact. Compensatory mitigation would be required to offset any adverse wetland impacts resulting from pond installations at these sites.

Both sites contain suitable wood stork foraging habitat. As such, a wood stork prey analysis may be required, and compensatory wetland mitigation that includes a wood stork component may be necessary to offset adverse impacts to suitable wood stork foraging habitat.

These 2 alternative pond sites also provide suitable habitat for the Florida panther, American alligator, eastern indigo snake, snail kite, Florida black bear, little blue heron, tricolored heron, roseate spoonbill, and Florida sandhill crane; therefore seasonal surveys for one or more of these species may be required during the design and permitting phase as part of Section 7 consultation with FWS. A PHU assessment would also be required for impacts to suitable panther habitat within these sites as they both occur within FWS Primary Panther Habitat Zone.

Section 8.0
POND SITING EVALUATION

As part of the CSER, 47 proposed pond locations and five Flood Plain Compensation (FPC) areas were evaluated. Common to Central Alternative #1 Revised and Central Alternative #2 are 33 of the proposed ponds (Pond 1, Ponds 3 through 25 and Ponds 33 through 41) and all of the FPC areas (FPC-A through E). Additional ponds for Central Alternative #1 Revised include Ponds 26-C1R through 32-C1R. Additional ponds for Central Alternative #2 include Ponds 26-C2, 27A-C2, 27B-C2, and Ponds 29-C2 through 32-C2.

Of the 52 evaluated locations, five proposed pond locations (Pond 27-C1R, Pond 27A-C2, Pond 27B-C2, Pond 28-C2, Pond 29-C1R) were given a "Medium" potential for impacts from sites identified through the CSER.

Pond 27-C1R and Pond 27A-C2 were given a "Medium" potential for impacts from Site No. 19 (Liquid Plant Inc.). This site is an existing fertilizer plant located adjacent to and south of Pond 27-C1R and Pond 27A-C2. A staging area containing various ASTs, tots, and trailer mounted tanks is adjacent to the proposed pond locations. A 10,000-gallon diesel AST is located approximately 180 feet south of proposed ponds. Evaluation of the soils and/or groundwater in these pond areas is suggested using laboratory analyses for pesticides (EPA Method 8081), herbicides (EPA Method 8051), EDB (EPA Method 504.1), ammonia, and metals (lead, iron and zinc). Additional evaluation is recommended if contaminants are discovered above action levels.

Pond 27B-C2 and Pond 28-C2 were given a "Medium" potential for impacts from Site No. 28. Pond 27B-C2 also has a potential for impacts from Site No. 38C. Site No. 28 is an existing filling station (Sunoco) that is located adjacent to and south of Pond 27B-C2 and Pond 28-C2. Site No. 38C is an existing filling station that is located adjacent to and north of Pond 27B-C2. See **Section 8.0 Results and Recommendations** for proposed evaluations of Sites No. 28 and No. 38C.

Pond 29-C1R was given a "Medium" potential for impacts from Site No. 35 and Site No. 37. Site No. 35 (Immokalee Auto General Repair) is an existing automotive repair facility. Site No. 37 (Strickland Property) is an existing automotive repair facility and historical filling station (Former Shell-Stricks). See Section 8.0 Results and Recommendations for proposed evaluations of Sites No. 35 and No. 37.

Of the 52 evaluated locations, 15 are within or partly within existing citrus groves. These include Ponds 6, 7, 8, 9, 10, 11, 15, 16, 17, 31-C2, 38, 39 and 40, and FPC areas C and E. Surface and subsurface soils likely contain application levels of pesticides and herbicides. Evaluation of these ponds and FPC areas is suggested using laboratory analyses for pesticides (EPA Method 8081), herbicides (EPA Method 8051), and EDB (EPA Method 504.1). Additional evaluation is recommended if contaminants are discovered above action levels.

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

Memo

To: Bill Howell, PE, Senior Transportation Engineer, Lochner
From: Kathleen Hoffman and Cristina Echazabal, Janus Research
Date: June 6, 2018
Re: Cultural Resources Desktop Analysis of Proposed Ponds and Floodplain Compensation Sites Associated with the Central Alternative #1 Revised and Central Alternative #2 of the SR 29 Immokalee PD&E Study from Oil Well Road (CR 858) to SR 82 in Collier County, Florida

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At the request of the Florida Department of Transportation (FDOT), District 1, Janus Research conducted a cultural resources desktop analysis of proposed ponds and floodplain compensation (FPC) sites associated the State Road (SR) 29 Project Development and Environment (PD&E) Study from Oil Well Road (County Road [CR] 858) to SR 82 in Collier County, Florida (Figure 1). The cultural resource assessment survey (CRAS) for the SR 29 PD&E Study was conducted between 2010 and 2018 and included two project alternatives: Central Alternative #1 Revised and Central Alternative #2. The study areas for the current desktop analysis includes 40 proposed ponds associated with the Central Alternative #1 and 40 proposed ponds associated with Central Alternative #2 as well as 5 FPC sites. The majority of the pond footprints for both alternatives partially or entirely overlap.

The objective of this analysis is to provide preliminary cultural resource information to assist in the avoidance of previously recorded resources listed in, determined eligible for, or considered eligible for listing in the *National Register of Historic Places* (National Register).

The ponds and FPC sites are located within existing and proposed SR 29 and CR 846 right of way (ROW) in Sections 8, 16, 17, 20, 21, 28,29, 32–34 of Township 46 South, Range 29 East; Sections 2, 3, 10–14, and 24 of Township 47 South, Range 29 East; Sections 19, 29, and 32 of Township 47 South, Range 30 East; and Sections 5, 8 and 17 of Township 48 South, Range 30 East on the Immokalee (1958 Photorevised [PR] 1987), Immokalee NE (1958 PR 1973), and Sunniland (1958 PR 1982) United States Geological Survey (USGS) quadrangle map.

STUDY AREA

The study areas for archaeological and historical resources consisted of the footprints of the proposed pond and FPC sites and included a 150 feet from each pond and FPC site (Attachment 1). These study areas were established to identify any previously recorded archaeological sites and any previously recorded or potentially historic resources directly adjacent to the pond and FPC sites.

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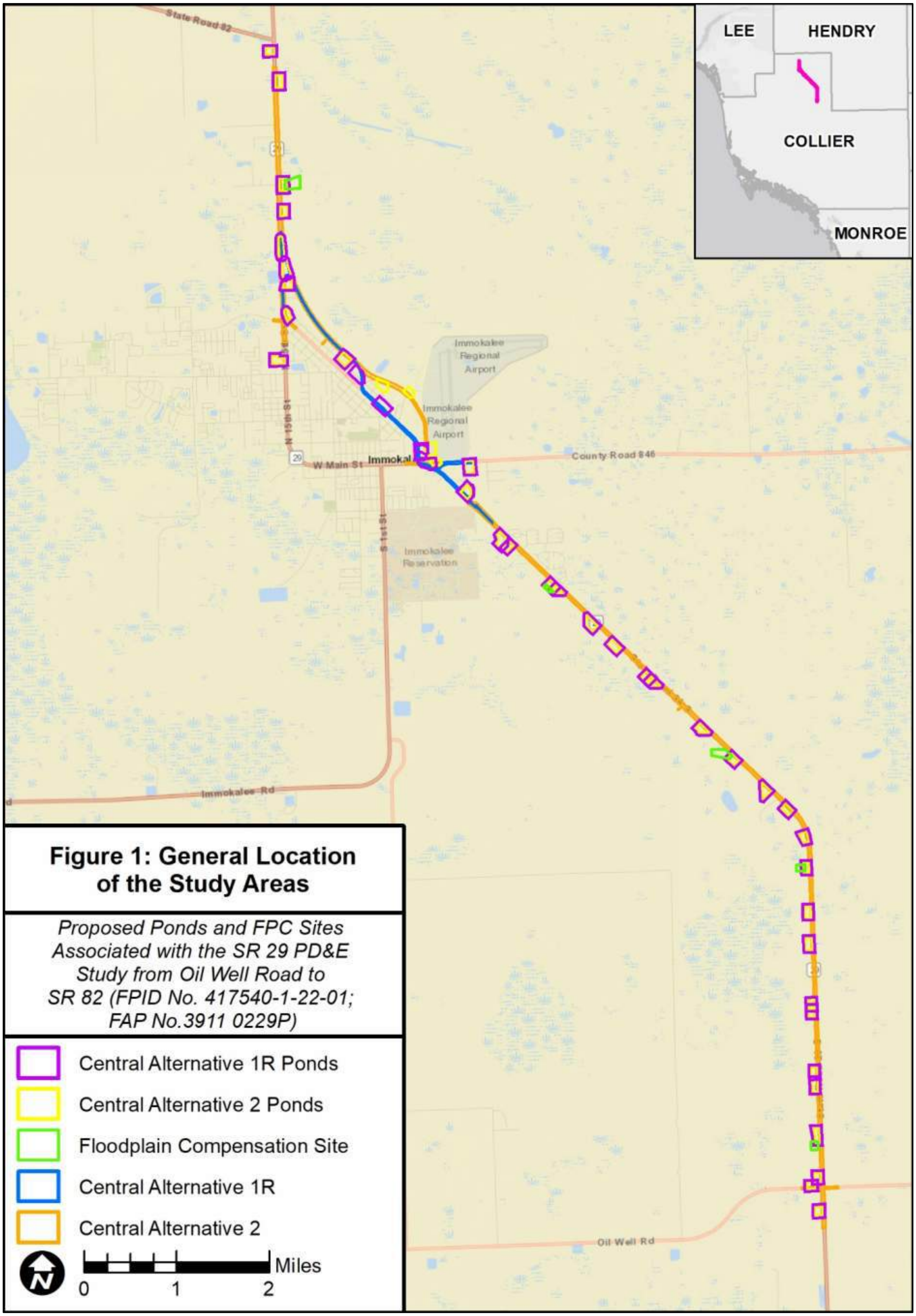

Figure 1: General Location of the Study Areas

METHODS

A desktop analysis of the study areas was performed to identify the presence of significant, or potentially significant, cultural resources that may be impacted by the proposed project, and to establish zones of archaeological probability. An archaeological and historical literature and background information search was conducted to determine the types, chronological placement, and location patterning of cultural resources within the study areas. This included a search of unpublished Cultural Resource Management (CRM) reports, property appraiser records, and county and local site inventories as well as the analysis of historic mapping. Background research methods also included a search of the Florida Master Site File (FMSF)[1] to identify cultural resources that are listed, eligible, or potentially eligible for listing in the National Register and resources with potential or confirmed human remains. A review of the General Land Office (GLO) historic plat maps, historic aerial photographs, the Collier County soil survey, and pertinent environmental variables known to be associated with archaeological sites was also conducted to establish the pre-development environment and land use history of the study areas and identify zones of archaeological site potential.

FLORIDA MASTER SITE FILE SEARCH AND LITERATURE REVIEW

A review of previous surveys, FMSF data, Collier County Property Appraiser records, and other relevant historical research materials was conducted to determine the potential for significant archaeological and historic resources within or adjacent to the study areas.

Previously Conducted Surveys

The search of the FMSF GIS data identified five previous cultural resource surveys that either intersect or contain the study areas as shown in Table 1. Additionally, most of the proposed pond locations are entirely or partially within the survey area of the *CRAS for the SR 29 PD&E Study from Oil Well Road (CR 858) to SR 82 in Collier County, Florida* (Janus Research 2018). The area of potential effect (APE) for archaeological sites consisted of the footprint of existing and proposed road ROW along SR 29 and CR 846 within the two project alternatives. The historic resources APE consisted of the footprint of the existing and proposed new ROW within the two project alternatives and adjacent parcels up to a distance of 200 feet. The pedestrian survey and subsurface testing did not identify any archaeological sites. The historic resources survey identified 16 historic resources within and adjacent to the current study areas. This report has not yet been reviewed by the SHPO.

[1] The FMSF serves as an archive and repository of information about Florida's recorded cultural resources. It represents an inventory of resources for which available information exists and describes their condition at a particular point of time. Because the inventory of resources is not all-inclusive on a statewide basis, gaps in data may exist. The FMSF is an important planning tool that assists in identifying potential cultural resources issues and resources that may warrant further investigation and protection. It can be used as a guide but should not be used to determine the Florida Division of Historical Resources'/State Historic Preservation Office's (FDHR/SHPO) official position about the significance of a resource.

Table 1:Previous Cultural Resource Surveys Within Portions of the Proposed Alternatives

FMSF Survey No.	Title	Author(s)	Date
1108	Historical/architectural survey of Collier County, Florida	Florida Preservation Services	1986
4140	Cultural Resource Assessment Survey, SR 29, From 1.5 Miles North of Oil Well Road to South of CR 846 (Two Miles and One Bridge) Collier County, Florida	Almy, Marion; Delahaye, Daniel; Hutchinson-Neff, Lee; Koski, Steve; Wise, Dawn.	1995
8141	An Archaeological and Historical Survey of the Proposed DT Immokalee Tower Location in Collier County, Florida	Batategas, Juliet	2001
10926	An Archaeological Reconnaissance Assessment of the Immokalee Regional Airport Parcel, Collier County, Florida	Beriault, John	2004
20872	Cultural Resource Assessment Survey Lee County Electric Cooperative (LCEC) SR 82 and SR 29 Distribution Line Replacement, Collier County, Florida	Archaeological Consultants, Inc.	2014

Previously Recorded Cultural Resources

A search of the FMSF data identified no previously recorded archaeological sites within or adjacent to the alternatives. In addition, no Collier County-designated archaeological sites or zones are located within one mile of the alternatives.

The FMSF GIS data did not identify any previously recorded historic resources within any of the study areas. The *CRAS for the SR 29 PD&E Study from Oil Well Road (CR 858) to SR 82 in Collier County, Florida* (Janus Research 2018) identified 16 historic resources within several of the study areas. These resources are listed in Table 2 and shown on the maps included in Attachment 1. Although the SHPO has not evaluated the eligibility of any of these resources for inclusion in the National Register, the surveyors considered all of them to be National Register–ineligible.

Table 2: Previously Recorded Historic Resources within the Study Areas

FMSF No.	Site Name/Address	Year Built	Resource Type/Style	National Register Evaluation	Pond/ FPC Site
8CR1087	Immokalee Regional Airport	1942	Resource Group/ Not applicable	Considered Ineligible	27-1R, 27-2A, 27-2B, 28-1R, 29-1R, 29-2
8CR1194	Mercury Outboards / 111 New Marking Road W	1968	Structure/ Industrial Vernacular	Considered Ineligible	30-1R

FMSF No.	Site Name/Address	Year Built	Resource Type/Style	National Register Evaluation	Pond/ FPC Site
8CR1195	Fortune Cookie Chinese Restaurant / 105 New Marking Road W	1967	Structure/ Masonry Vernacular	Considered Ineligible	30-1R
8CR1245	528 New Market Road E	1950	Structure/ Industrial Vernacular	Considered Ineligible	29-1R
8CR1246	540 New Market Road E	1962	Structure/ Masonry Vernacular	Considered Ineligible	29-1R
8CR1252	511 New Market Road E	1951	Resource Group	Considered Ineligible	29-1R
8CR1309	SR 29	1925	Resource Group/ Roadway	Considered Ineligible	13,14, 24, 26-1R, 26-2, 28-1R, 29-1R, 30-1R, 33, 34, 35, 36, 37, 38, 39, 40, 41
8CR1326	908 Glades Street	1963	Structure/ Masonry Vernacular	Considered Ineligible	31-1R
8CR1327	901 Charlotte Street	1965	Structure/ Masonry Vernacular	Considered Ineligible	30-1R
8CR1332	Immokalee Auto	1964	Structure/ Industrial Vernacular	Considered Ineligible	29-1R
8CR1334	Sunoco/730 Main Street E	1952	Structure/ Masonry Vernacular	Considered Ineligible	27-2B, 28-1R
8CR1368	Madison Avenue Canal	1953	Resource Group/ Canal	Considered Ineligible	30-2, 31-2
8CR1496	FDOT Bridge No. 030019	1965	Bridge/ Culvert	Considered Ineligible	28-1R
8CR1497	FDOT Bridge No. 030136	1948	Bridge/ Slab	Considered Ineligible	27-1R, 27-2A
8CR1498	Eutopia Canal	1950	Resource Group/ Canal	Considered Ineligible	28-1R, 291-R, 30-2
8CR1499	Drainage Ditch	1942	Resource Group/ Canal	Considered Ineligible	27-1R, 27-2A

The Collier County Property Appraiser and GIS information identified 14 parcels within the study areas for Ponds 30-1R, 31-1R, 32-1R, 32-2, 39, and 41 with potential unrecorded historic resources. The study areas extend into very small portions of two of these parcels, located at 2685 SR 29 and 3751 SR 29 N. The buildings are located over 250 feet away from the study areas. The remaining 12 parcels have buildings with an AYRB between 1958 and 1968. A preliminary review of these resources on Google Earth indicates the resources on these parcels are Masonry Vernacular buildings that exhibit a simple form and style commonly found throughout the region.

ARCHAEOLOGICAL SITE POTENTIAL

An archaeological site potential analysis provides information regarding which areas of a project have the highest probability of containing archaeological sites. Four environmental factors are typically used to help predict site locations: soil type (soil drainage), distance to fresh (potable) water, distance to hardwood hammocks, and topography. Fresh water was an important resource for precontact populations and would have been available from numerous creeks, ponds, and drainages in the area.

The study areas are located within the central portion of the Immokalee Rise physiographic region and extends slightly into the Southwestern Slope (White 1970: Map 1-C). The Immokalee Rise is a high area of limestone consisting of pine, palmetto, and cypress forests (Petuch and Roberts 2007:6). This physiographic region also features several karstic lakes including Lake Trafford (Petuch and Roberts 2007). While the Immokalee Rise can reach elevations of 40 ft. above mean sea level and is significantly higher than the surrounding physiographic regions, it is relatively level and exhibits poor drainage creating numerous pockets of wet prairie and cypress swamp (Lodge 2005:69). The natural surface drainage of the Immokalee Rise has been replaced by drainage canals, but previously flowed through sloughs into the Orange River, Caloosahatchee River, Corkscrew Swamp, and Lake Trafford (Lodge 2005:70). The study areas slope down from approximately 36 feet above mean sea level (AMSL) near SR 82 to approximately 16 feet AMSL at Oil Well Road (CR 858).

The *Soil Survey of Collier County Area, Florida* (USDA 1998) was reviewed to help determine the predevelopment environment, assess the level of modification, and identify natural features within the study areas indicative of increased archaeological site potential. The study areas are located in three general soil associations: the Immokalee-Oldsmar-Basinger association, the Urban Land-Udorthents-Holopaw-Immokalee association, and the Holopaw-Wabasso-Winder association. Most of the study areas are in the Immokalee-Oldsmar-Basinger association, which is described in the survey as consisting of nearly level, poorly drained sandy soils on flatwoods and in sloughs (USDA 1998:8). The Urban Land-Udorthents-Holopaw-Immokalee association is confined to the downtown Immokalee area. It is described as nearly level, somewhat poorly drained to poorly drained sandy and loamy fill over limestone bedrock (USDA 1998:7–8). South of Immokalee, some study areas are in the Holopaw-Wabasso-Winder association. This association consist of nearly level, poorly drained to very poorly drained sandy soil with a loamy subsoil found on the flatwoods, in sloughs, and in small closed depressions (USDA 1998:9).

Most of the study areas contain poorly to very poorly drained soils mostly associated with flatwoods, sloughs, and marshes. The study areas for Ponds 32-1R, 32-2, 33, and 35 contain a small amount of moderately well drained soils associated with low ridges on flatwoods. Half of the study area for Pond 36 contains this same moderately well drained soil. The study areas for Ponds 13 and 20 contain a small amount of a poorly drained soil type associated with hammocks. The drainage characteristics and environmental associations of detailed soil types within the APE are included in Table 3.

Table 3. Drainage Characteristics and Environmental Associations for the Detailed Soil Types Located within the APE

Drainage Characteristics	Soil Type	Associated Natural Community	Pond/ FPC Site
Moderately Well Drained	Pomello fine sand	Low ridges on flatwoods with natural vegetation consisting of oak, South Florida slash pine, saw palmetto, cactus, chalky bluestem, creeping bluestem, and pineland threeawn.	Ponds 32-1R, 32-2, 33, 35, and 36
Poorly Drained	Immokalee fine sand	Flatwoods with natural vegetation consisting of South Florida slash pine, saw palmetto, and waxmyrtle.	Ponds 3, 4, 6, 7, 8, 9, 25, 27-1R, 27-2A, 27-2B, 28-1R, 29-1R, 31-2, 33, 34, 35, and 39; FPC A, FPC E
	Malabar fine sand	Sloughs and poorly defined drainageways with natural vegetation consisting of South Florida slash pine, cypress, cabbage palm, and saw palmetto.	Ponds 11 and 12; FPC B
	Basinger fine sand	Sloughs and poorly defined drainageways with natural vegetation consisting of scattered areas of South Florida slash pine, cypress, cabbage palm, saw palmetto, waxmyrtle, blue maidencane, sand cordgrass, pineland threeawn, chalky bluestem, and St. Johnswort.	Ponds 6, 7, 8, 9, 10, 36, 37, and 38; FPC E
	Boca fine sand	Flatwoods with natural vegetation consisting of South Florida slash pine, cabbage palm, saw palmetto, waxmyrtle, chalky bluestem, and pineland threeawn.	Ponds 3, 4, 13, 14, and 21
	Ft. Drum and Malabar, high, fine sand	Ridges along sloughs with natural vegetation consisting of South Florida slash pine, saw palmetto, live oak, cabbage palm, waxmyrtle, chalky bluestem, creeping bluestem, low panicum, and pineland threeawn.	Pond 12 and FPC B
	Hilolo, Jupiter, and Margate fine sand	Hammocks and flatwoods. Natural vegetation consists of cabbage palm, saw palmetto, chalky bluestem, broomsedge bluestem, scattered areas of water oaks, and pineland threeawn.	Ponds 13 and 20

Drainage Characteristics	Soil Type	Associated Natural Community	Pond/ FPC Site
Poorly Drained	Holopaw fine sand	Slough and poorly defined drainageways with natural vegetation consisting of scattered areas of slash pine, cypress, cabbage palm, and saw palmetto.	Ponds 5, 14, 30-2, 31-1R, 31-2, and 40; FPC A
	Myakka fine sand	Flatwoods with natural vegetation consisting of South Florida slash pine, saw palmetto, and waxmyrtle.	Ponds 30-2 and 37
	Oldsmar fine sand	Flatwoods with natural vegetation consisting of South Florida slash pine, cabbage palm, saw palmetto, waxmyrtle, chalky bluestem, and pineland threeawn	Ponds 15, 16, 17, 22, 23, 31-1R, 32-1R, 32-2, 39, 40, and 41; FPC C, FPC D, FPC E
	Oldsmar fine sand, limestone substratum	Flatwoods; natural vegetation consists of cabbage palm, South Florida slash pine, saw palmetto, waxmyrtle, and chalky bluestem.	Pond 1
	Pineda and Riviera fine sand	Sloughs and poorly defined drainageways with natural vegetation consisting of scattered areas of slash pine, cypress, cabbage palm, saw palmetto, and rushes.	Ponds 12, 13, and 14; FPC B
	Tuscawilla fine sand	Flatwoods and hammocks with natural vegetation consisting of oaks, cabbage palm, red maple, and red bay.	Ponds 24 and 25
	Urban land–Immokalee–Oldsmar, limestone substratum, complex	Disturbed areas covered by commercial buildings, houses, parking lots, and streets in which original soils have been altered due to filling, grading, and shaping. No natural vegetation is present.	Ponds 26-1R, 26-2, 27-1R, 27-2A, 27-2B, 28-1R, 29-1R, 30-1R, 30-2, 31-2, 31-1R, 32-1R, and 32-2
	Wabasso fine sand	Flatwoods with natural vegetation consisting of South Florida slash pine, cabbage palm, and saw palmetto.	Ponds 21, 22, and 23; FPC D
Very Poorly Drained	Chobee, Winder, and Gator soils, depressional	Depressions and marshes with natural vegetation consisting of pickerelweed, maidencane, rushes, sawgrass, willow, and cypress.	Ponds 10, 11, 21, 25, and 41 FPC E
	Holopaw and Okeelanta soils, depressional	Depressions and marshes with natural vegetation consisting of St. Johnswort, maidencane, rushes, primrose willow, sawgrass, willow, and cypress.	Ponds 22, 24, and 25; FPC D

Drainage Characteristics	Soil Type	Associated Natural Community	Pond/ FPC Site
	Winder, Riviera, limestone substratum, and Chobee soils, depressional	Marshes with natural vegetation consisting of sawgrass, maidencane, pickerelweed, fireflag, and willow.	Ponds 18, 19 and 20
N/A	Urban land	Mostly covered by hardscape and structures.	Pond 33

Source: USDA 1998: 16–21, 23–36, 39, 40

A review of the General Land Office (GLO) historic plat maps from 1873 and 1874 (Florida Department of Environmental Protection [FDEP] 1873a, 1874a, 1874b, 1847c) and surveyors' field notes (FDEP 1972a, 1872b, 1872c, 1873b, 1874d, 1874e, 1874f) was also conducted to examine past environmental conditions within the vicinity of the study areas. The plat map and surveyors' notes did not identify any hammocks within any of the study areas. Ponds 1, 3, 4, 5, 6, and 7, and FPC A are in areas that formerly contained pine and palmetto. Ponds 8, 9, and 10 are in an area described as wet prairie. Pond 11 is in an area described as cypress flats. Pond 12 and FPC B are in a former grass pond. Ponds 13, 14, 15, 16, and 17, and FPC C are in an area described as dry prairie with scattered grass ponds. Ponds 18 and 19 are at the location of a former grass pond. Pond 20 was in a wet prairie. Ponds 21, 22, and 23, and FPC D are in an area that contained timber pine. The locations of Ponds 24 and 25 was described as an arm of a swamp with cypress maple and ash. These study areas are south of Immokalee along SR 29. Ponds 26-1R, 26-2, 27-1R, 27-24, 28-1R, 27-2B, 29-1R, and 29-2, and are in a former dry prairie. These study areas are south of the airport and on the east side of downtown Immokalee. Ponds 30-1R and 33 are in former pine land with scrub. Ponds 30-2, 31-R, 31-2, 32-1R, 32-2, 34, 35, 36, 37, 38, 39, 40, and 41, and FPC E are in former prairie. These study areas are to the north and west of downtown Immokalee and north along SR 29.

The historic plat maps and surveyors' notes were also reviewed for evidence of other early settlement. There are no military forts, roads, encampments, battlefields, homesteads, or historic Native American villages or trails depicted on the plat maps in the vicinity of the study areas. Available aerial photographs from 1940, 1947, 1953, 1962, 1963, 1968, 1973, and 1984 (Florida Department of Transportation [FDOT], Surveying and Mapping Office 1996–2018; University of Florida, George A. Smathers Libraries 1999–2016) were also analyzed to investigate land use in the vicinity of the study areas during the mid to late1900s. No tree hammocks or rises are evident within or adjacent to the ponds or FPC sites.

The analysis of the soils, drainage, and relevant environment variables suggests that the ponds and FPC sites all have a low potential or archaeological sites. This is supported by the results of the subsurface testing conducted as part of the *CRAS for the SR 29 PD&E Study from Oil Well Road (CR 858) to SR 82 in Collier County, Florida* (Janus Research 2018) which identified no archaeological sites in areas adjacent to the ponds and FPC sites.

CONCLUSIONS

No previously recorded archaeological sites were identified within any of the study areas. In general, soils associated with the study areas are predominantly poorly drained soils associated with flatwoods, swamps, or marshes. General Land Office (GLO)historic maps and associated surveyors notes also indicate that the study areas south of Immokalee are in former pinelands, wet and dry prairies, cypress flats, and grass ponds. The study areas south of the airport and east of downtown Immokalee are in former dry prairie. The study areas to the north and west of downtown Immokalee are in a former prairie and an area of scrubby pine land. No hammocks or cultural features were noted on the maps or in the surveyor's notes. The 1940 and 1947 historic aerials illustrate the area as predominantly wet prairie with numerous ponds.

Based on these factors, the study areas for the ponds and FPC sites have a low probability for archaeological sites. A total of 16 historic resources identified during the *CRAS for the SR 29 PD&E Study from Oil Well Road (CR 858) to SR 82 in Collier County, Florida* (Janus Research 2018) are located in several study areas. Although the report had not yet been reviewed by the SHPO, the surveyor considered all 16 resources to be National Register–ineligible. In addition to these resources, there is a potential for 12 unrecorded resources within the study areas. A preliminary analysis suggests that these resources are Masonry Vernacular buildings that exhibit a simple form and style commonly found throughout the region and are likely National Register–ineligible.

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1872b Surveyor's Notes for Boundaries of Township 47 South, Range 29 East. Electronic document, http://199.73.242.56/default.asp, accessed June 1, 2018.

1872c Surveyor's Notes for Boundaries of Township 47 South, Range 30 East. Electronic document, http://199.73.242.56/default.asp, accessed June 1, 2018.

1873a Plat Map for Township 46 South, Range 29 East. Division of State Lands, Board of Trustees Land Document System. Electronic document, http://199.73.242.56/default.asp, accessed June 1, 2018.

1873b Surveyor's Notes for Boundaries of Township 46 South, Range 29 East. Electronic document, http://199.73.242.56/default.asp, accessed June 1, 2018.

1874a Plat Map for Township 47 South, Range 29 East. Division of State Lands, Board of Trustees Land Document System. Electronic document, http://199.73.242.56/default.asp, accessed June 1, 2018.

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1874f Surveyor's Notes for Boundaries of Township 48 South, Range 30 East. Electronic document, http://199.73.242.56/default.asp, accessed June 1, 2018.

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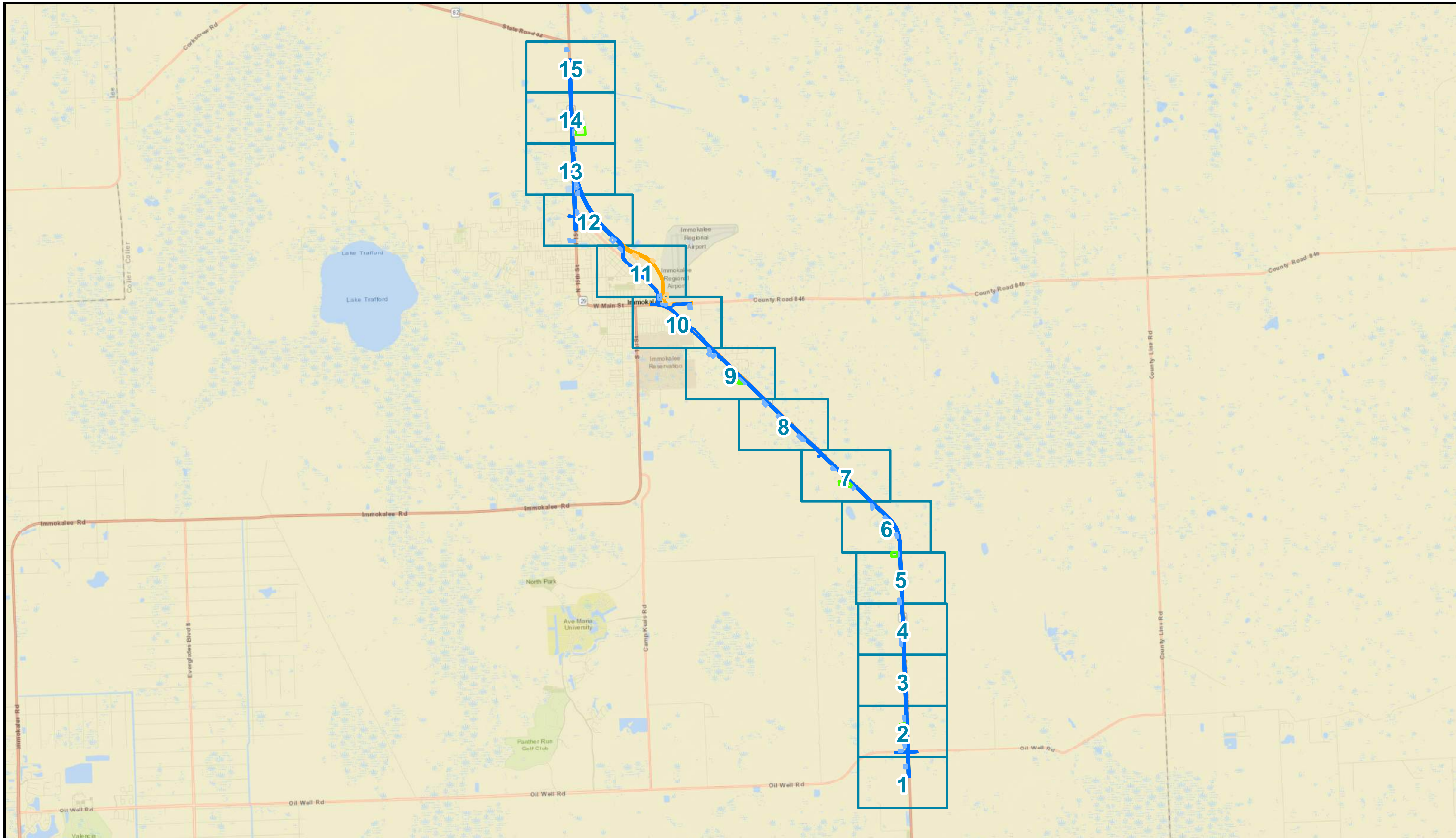
**Attachment A:
Identified Historic Resources and Potentially
Historic Resources Within the Study Areas**



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

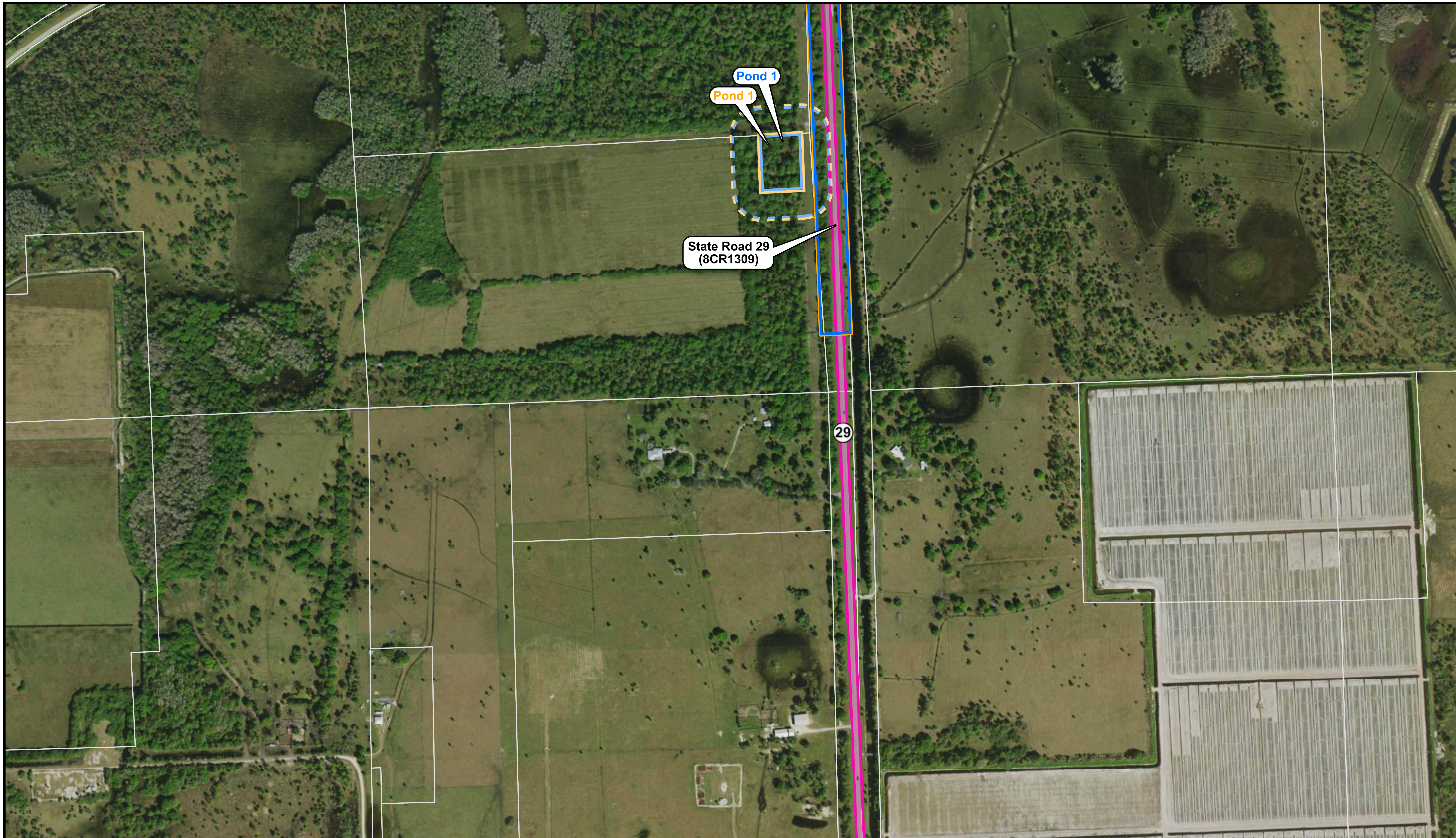
Identified Historic Resources and Potentially Historic Resources Within the Study Areas (Overview Map)

H-20

Central Alternative 1R Ponds
Central Alternative 2 Ponds
FPC Sites
Central Alternative 1R
Central Alternative 2
Map

Collier County

0 1 2 Miles



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

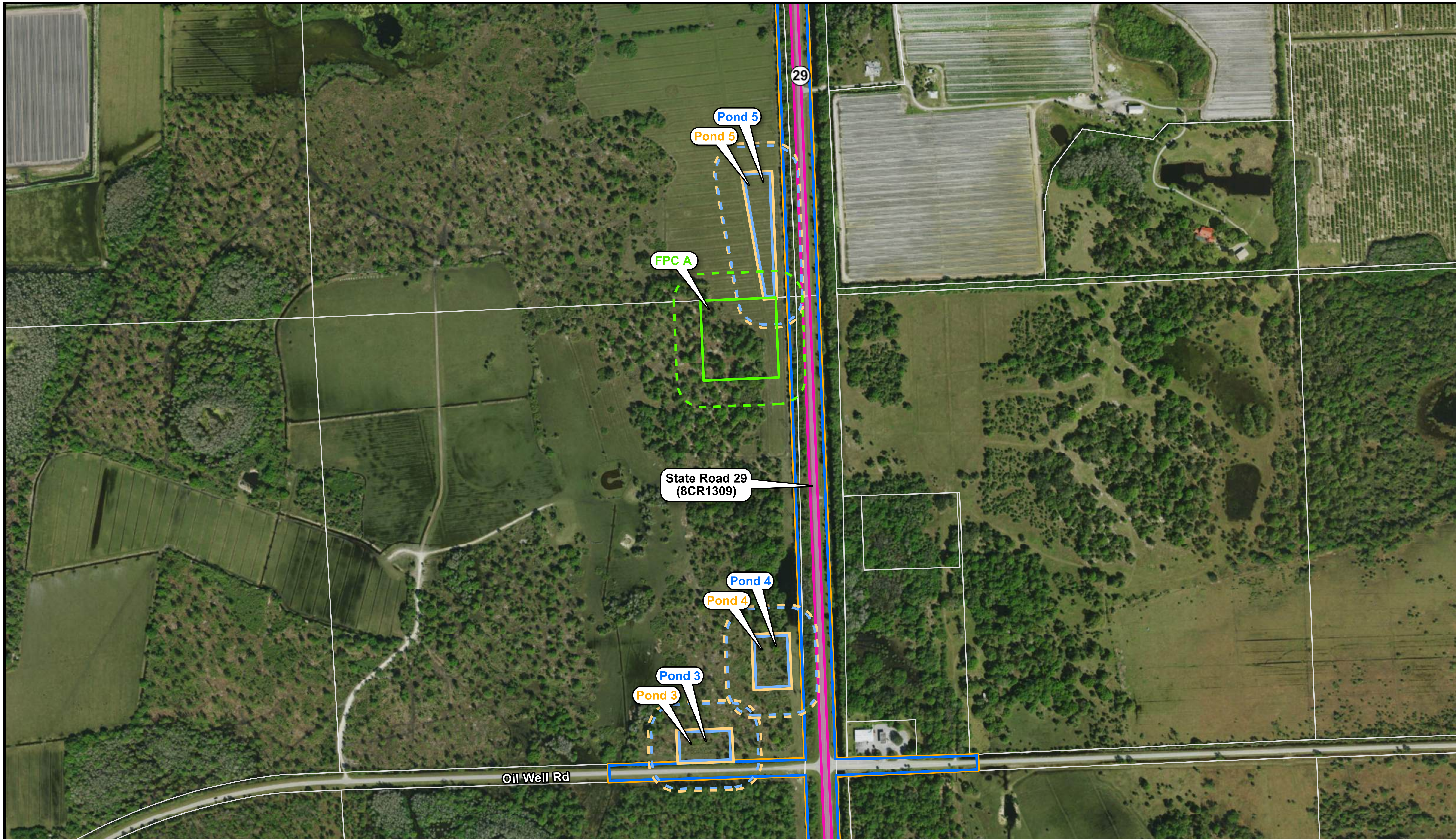
Identified Historic Resources and Potentially Historic Resources Within the Study Areas

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

0 250 500 Feet

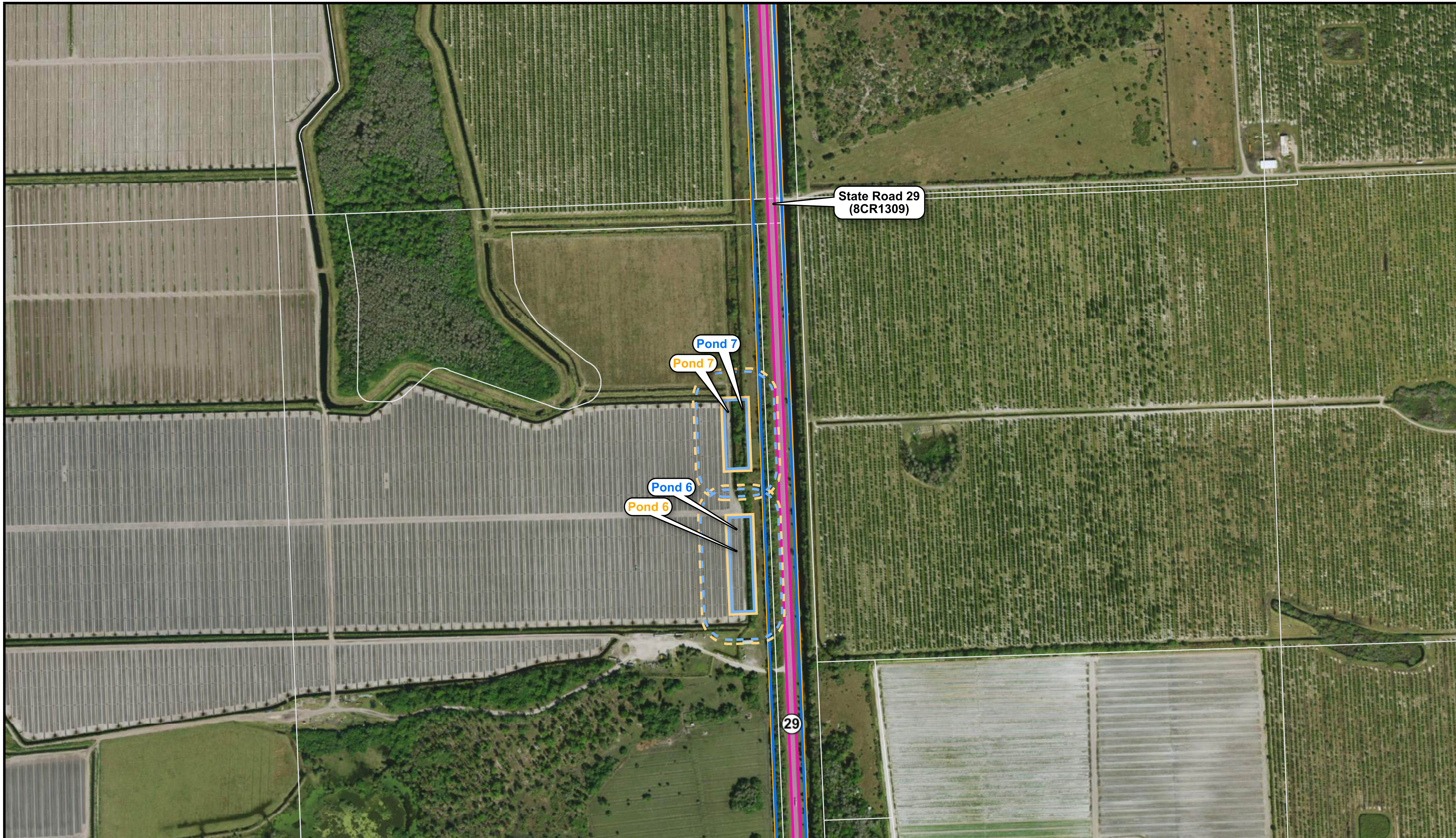
Map 1



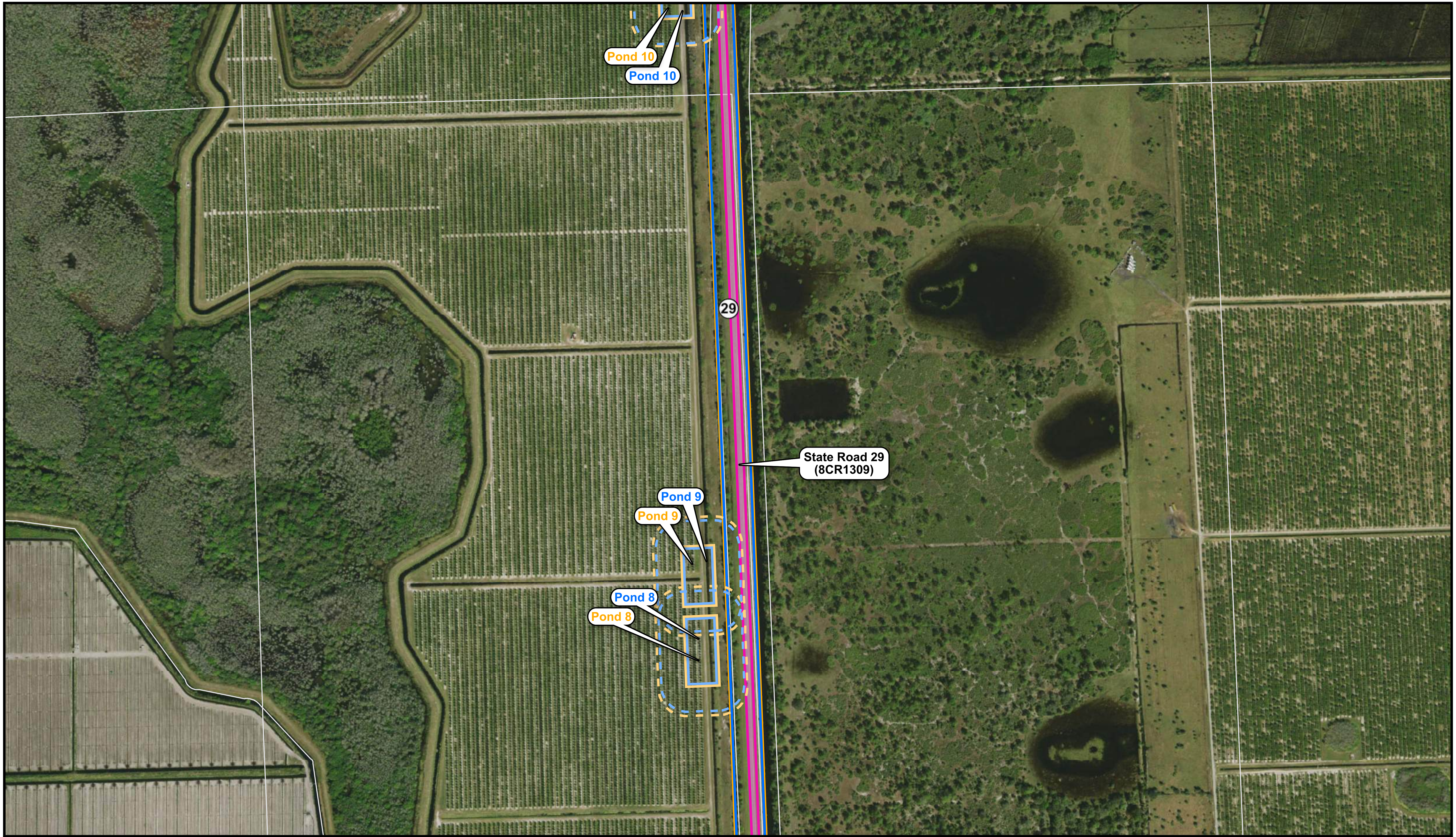
Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

Identified Historic Resources and Potentially Historic Resources Within the Study Areas

Map 2



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)	*Identified Historic Resources and Potentially Historic Resources Within the Study Areas*	Central Alternative 1R Ponds; Study Areas for Central Alternative 1R Ponds; Central Alternative 1R	Central Alternative 2 Ponds; Study Areas for Central Alternative 2 Ponds; Central Alternative 2	FPC Sites; Study Areas for FPC Sites; Historic Bridge	Unrecorded Historic Parcel; Historic Resource Group; Historic Linear Resource	Collier County; 0 250 500 Feet	Map 3



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

Identified Historic Resources and Potentially Historic Resources Within the Study Areas

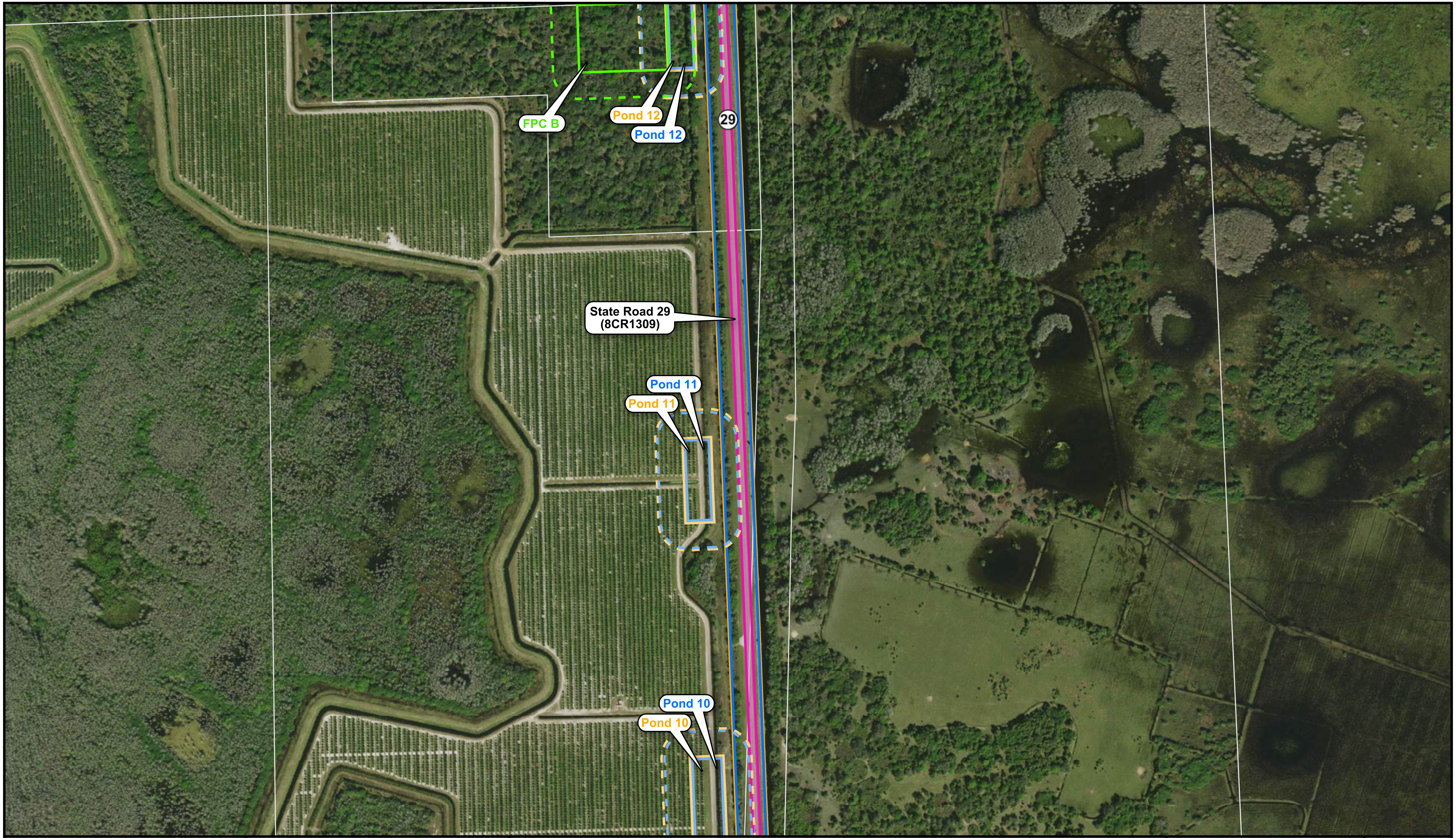
H-24

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

0 250 500 Feet

Map 4



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

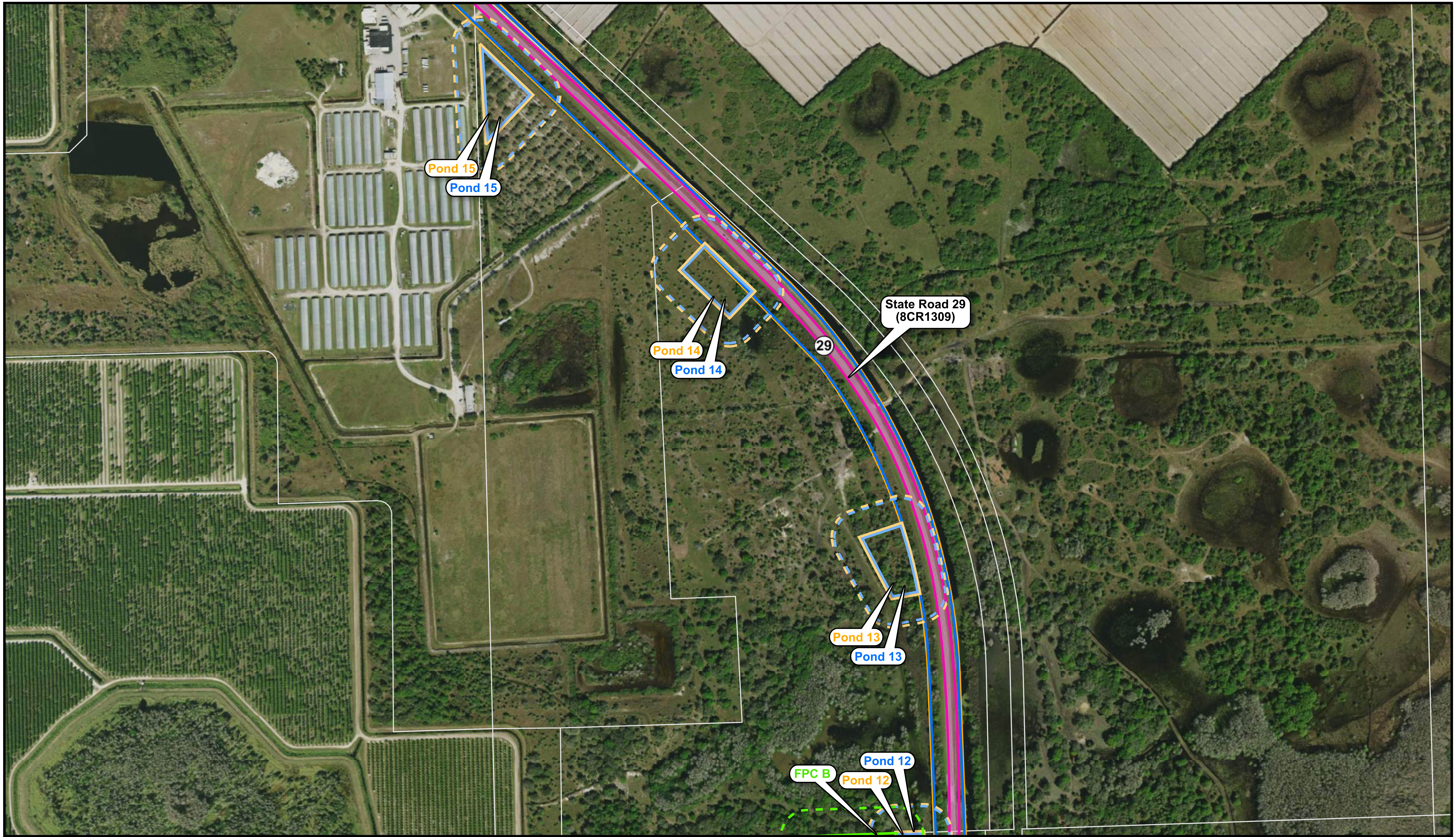
Identified Historic Resources and Potentially Historic Resources Within the Study Areas

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

0 250 500 Feet

Map 5



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

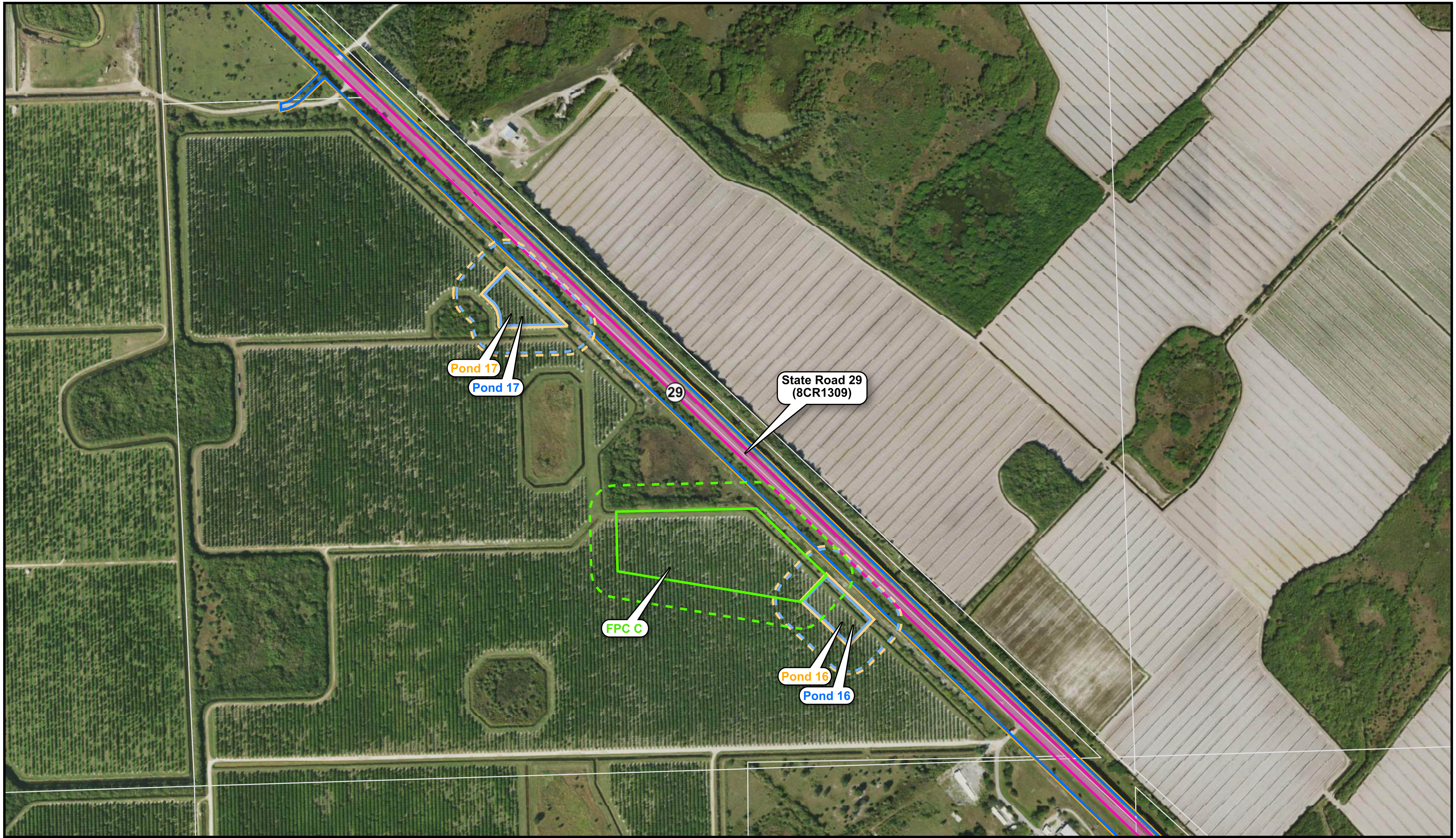
Identified Historic Resources and Potentially Historic Resources Within the Study Areas

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

0 250 500 Feet

Map 6



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

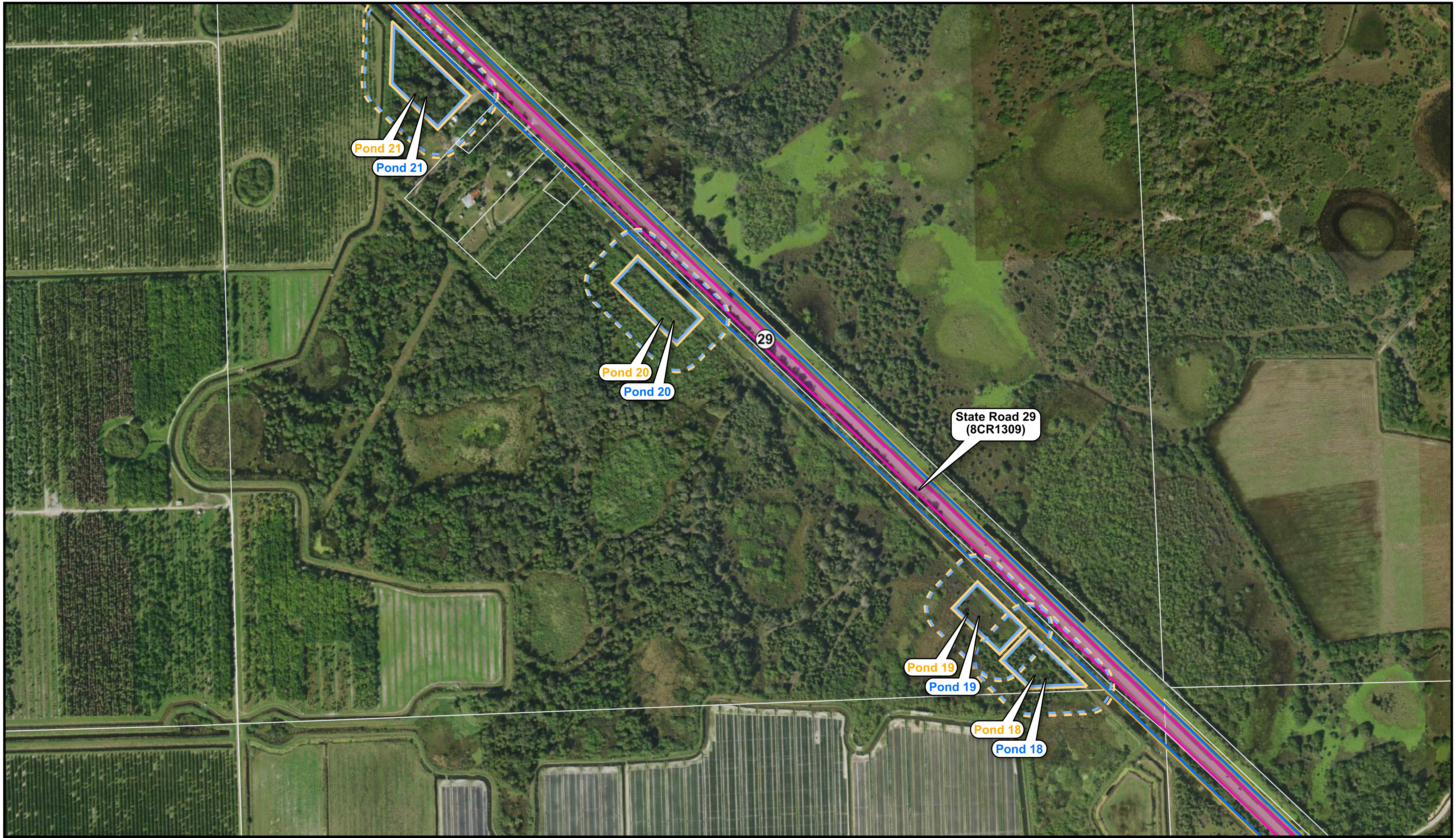
Identified Historic Resources and Potentially Historic Resources Within the Study Areas

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

0 250 500 Feet

Map 7



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

Identified Historic Resources and Potentially Historic Resources Within the Study Areas

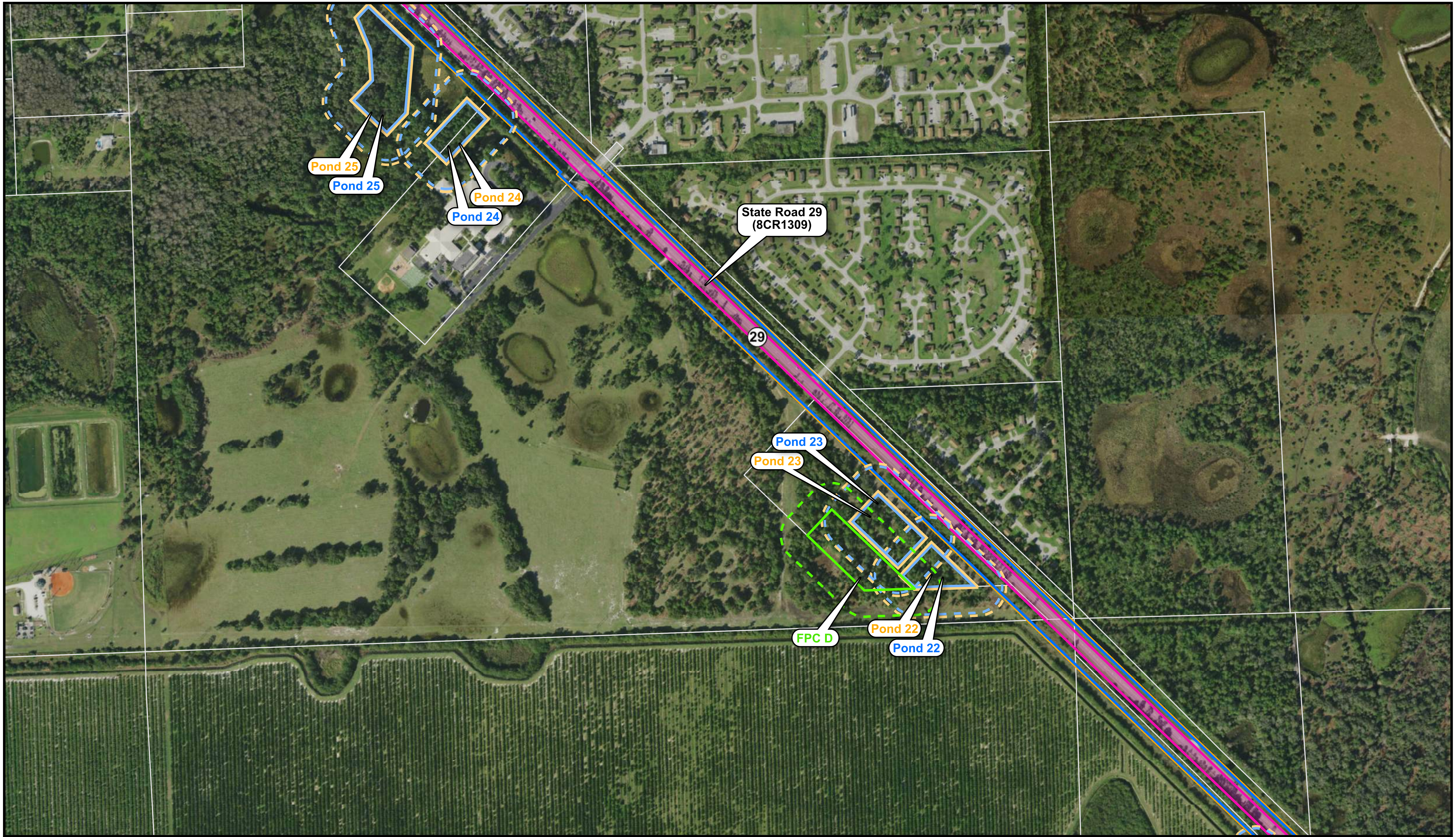
Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

N

0 250 500 Feet

Map 8



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

Identified Historic Resources and Potentially Historic Resources Within the Study Areas

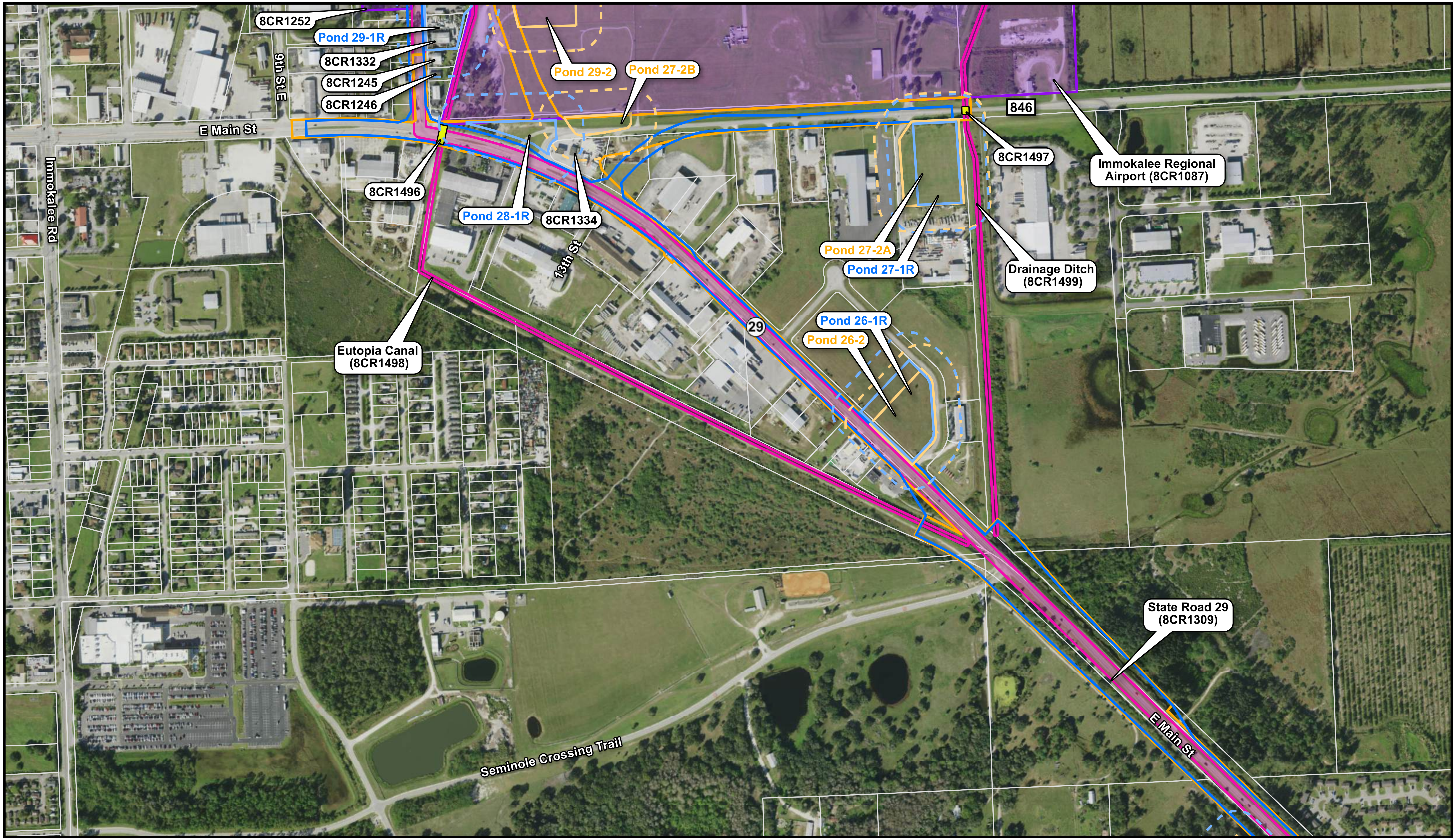
H-29

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

Feet
0 250 500

Map 9



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

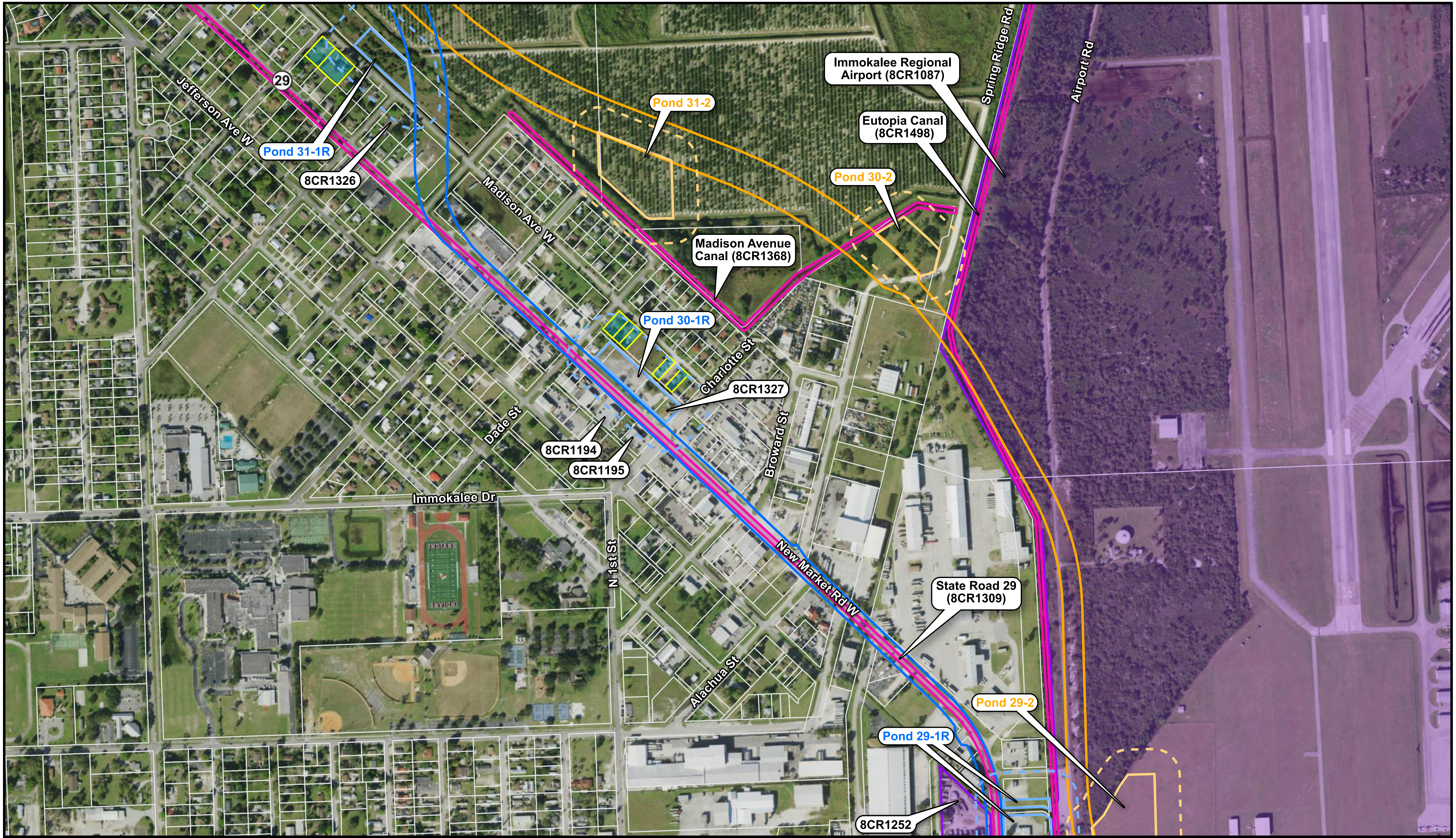
Identified Historic Resources and Potentially Historic Resources Within the Study Areas

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

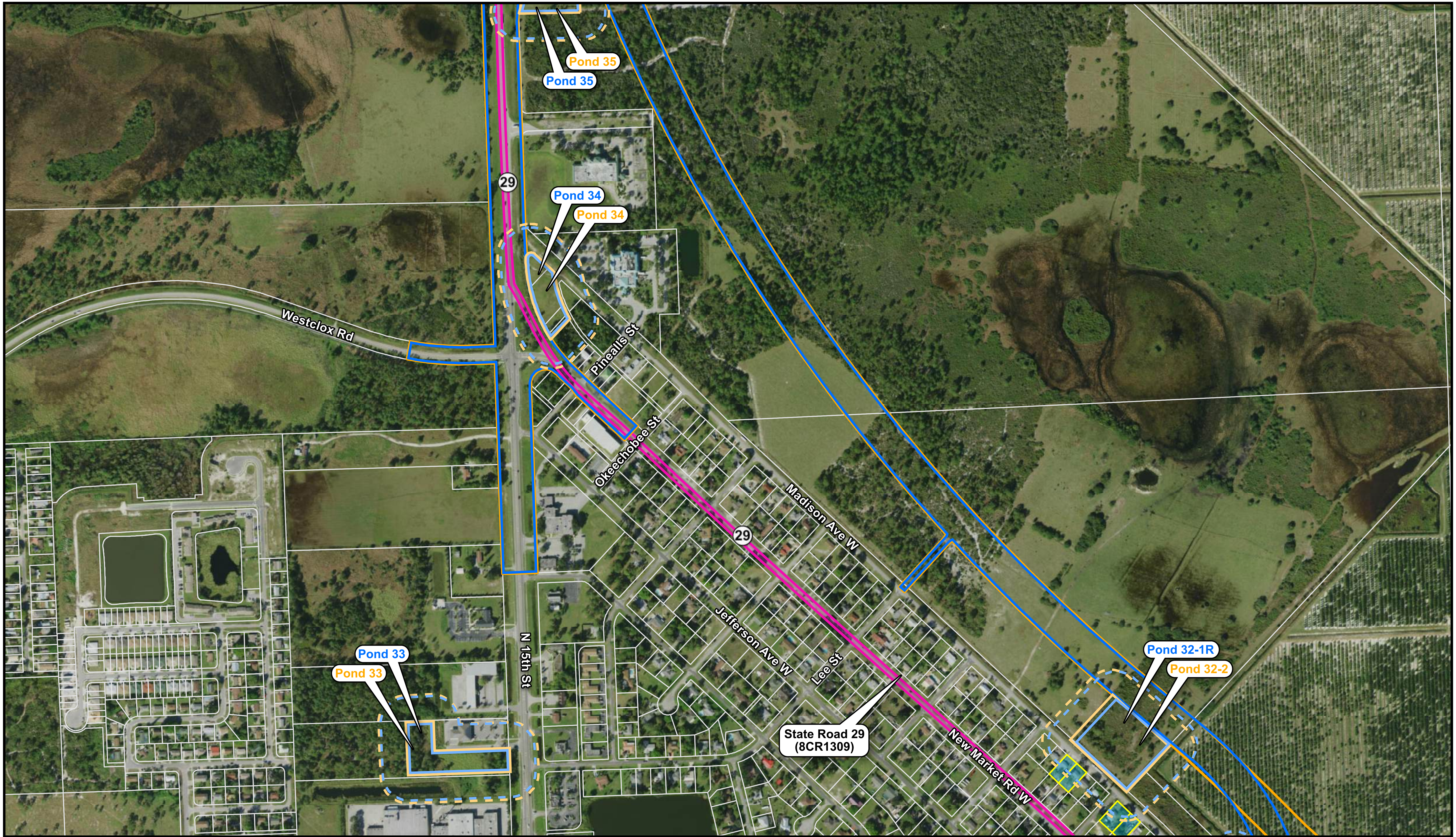
Collier County

0 250 500 Feet

Map 10



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)	*Identified Historic Resources and Potentially Historic Resources Within the Study Areas*	Central Alternative 1R Ponds; Study Areas for Central Alternative 1R Ponds; Central Alternative 1R; Central Alternative 2 Ponds; Study Areas for Central Alternative 2 Ponds; Central Alternative 2; FPC Sites; Study Areas for FPC Sites; Historic Bridge; Unrecorded Historic Parcel; Historic Resource Group; Historic Linear Resource	**Collier County** N 0 250 500 Feet	**Map 11**



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

Identified Historic Resources and Potentially Historic Resources Within the Study Areas

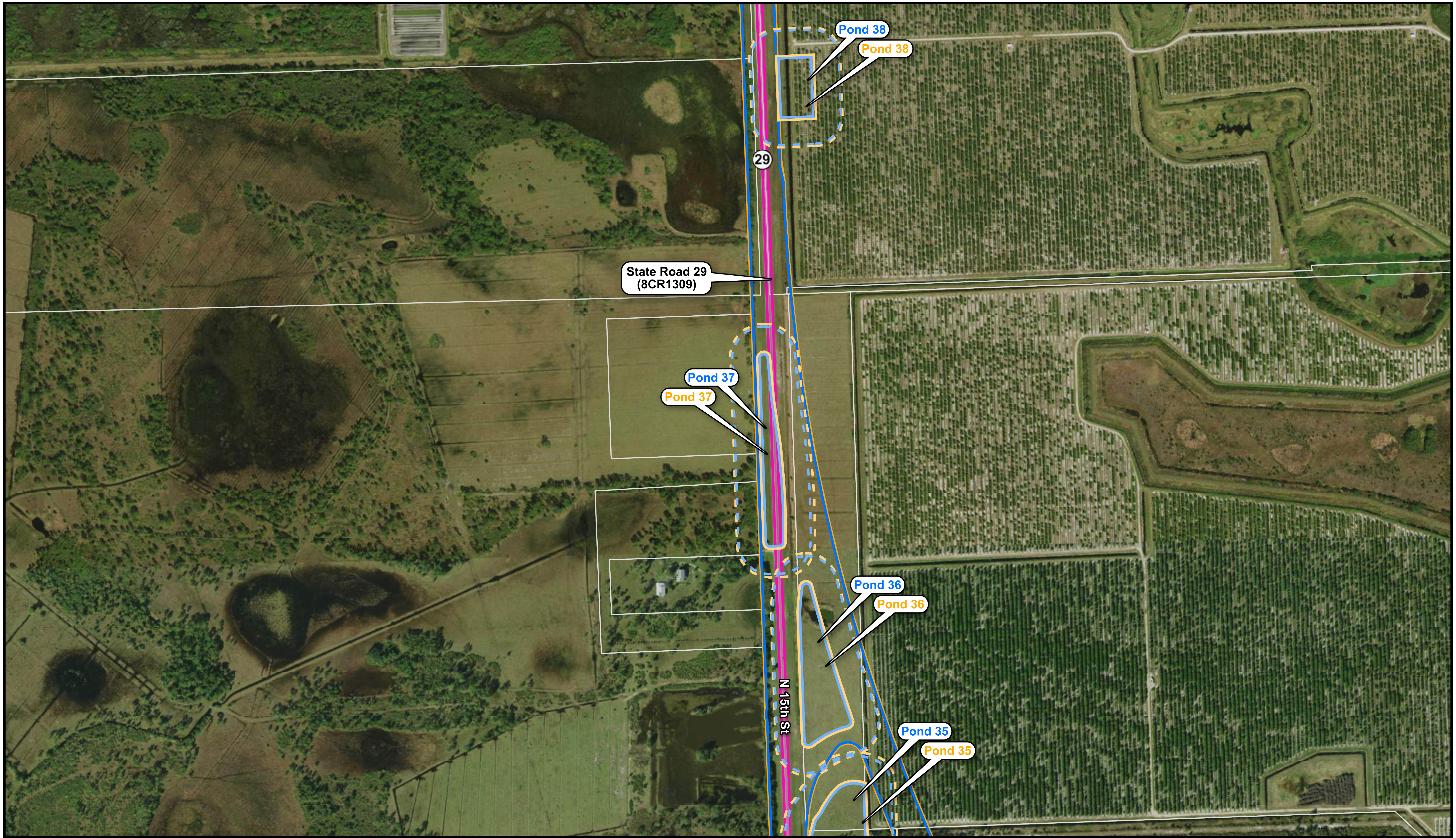
H-32

Central Alternative 1R Ponds	Central Alternative 2 Ponds	FPC Sites	Unrecorded Historic Parcel
Study Areas for Central Alternative 1R Ponds	Study Areas for Central Alternative 2 Ponds	Study Areas for FPC Sites	Historic Resource Group
Central Alternative 1R	Central Alternative 2	Historic Bridge	Historic Linear Resource

Collier County

0 250 500 Feet

Map 12



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

Identified Historic Resources and Potentially Historic Resources Within the Study Areas

H-33

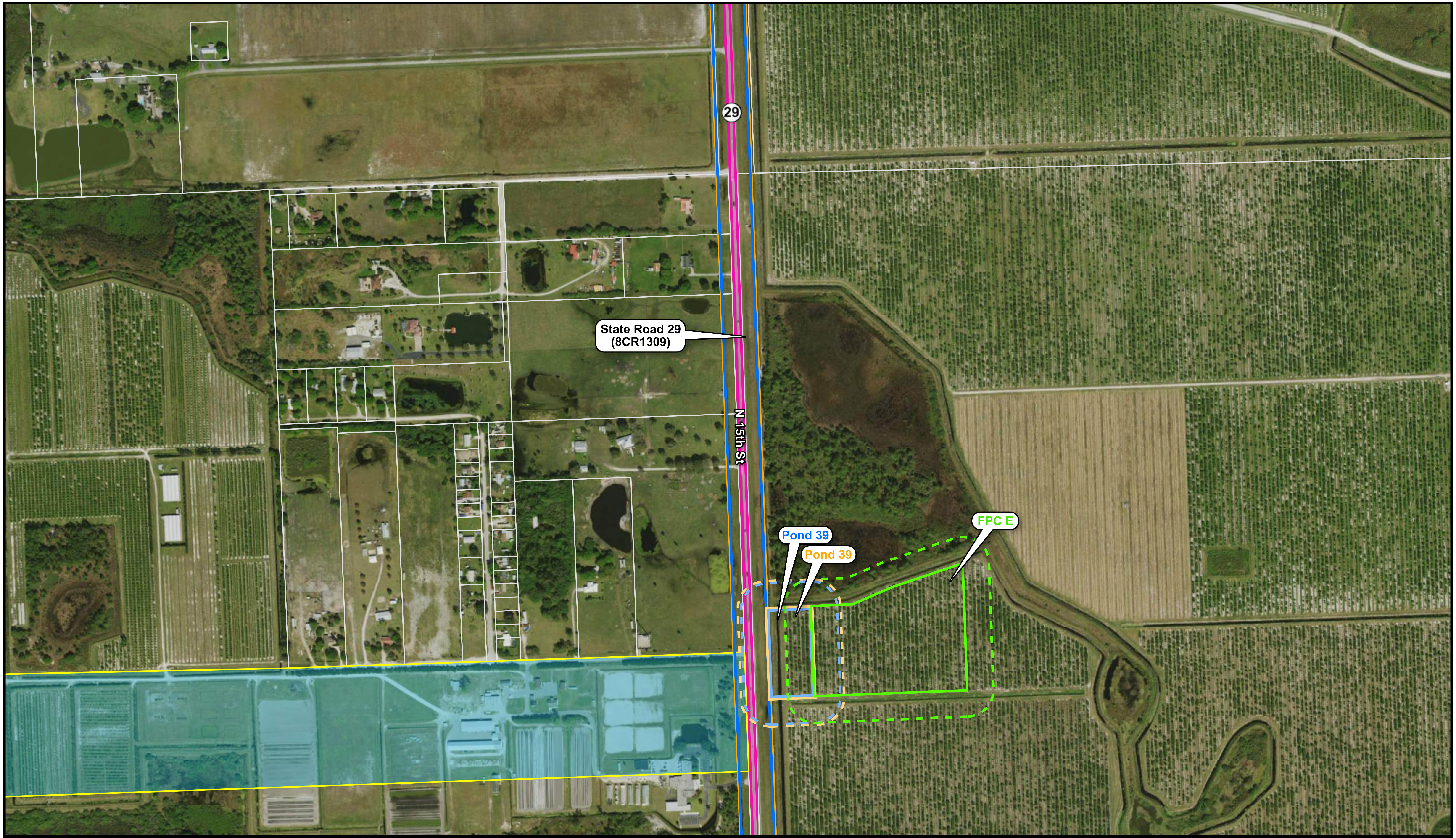
Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

N

0 250 500 Feet

Map 13



Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)	*Identified Historic Resources and Potentially Historic Resources Within the Study Areas*	Central Alternative 1R Ponds; Study Areas for Central Alternative 1R Ponds; Central Alternative 1R; Central Alternative 2 Ponds; Study Areas for Central Alternative 2 Ponds; Central Alternative 2; FPC Sites; Study Areas for FPC Sites; Historic Bridge; Unrecorded Historic Parcel; Historic Resource Group; Historic Linear Resource	**Collier County** Feet 0 250 500	**Map 14**

Proposed Ponds and FPC Sites Associated with the SR 29 PD&E Study from Oil Well Road to SR 82 (FPID No. 417540-1-22-01; FAP No.3911 0229P)

Identified Historic Resources and Potentially Historic Resources Within the Study Areas

Central Alternative 1R Ponds
Study Areas for Central Alternative 1R Ponds
Central Alternative 1R
Central Alternative 2 Ponds
Study Areas for Central Alternative 2 Ponds
Central Alternative 2
FPC Sites
Study Areas for FPC Sites
Historic Bridge
Unrecorded Historic Parcel
Historic Resource Group
Historic Linear Resource

Collier County

N
0 250 500 Feet

Map 15