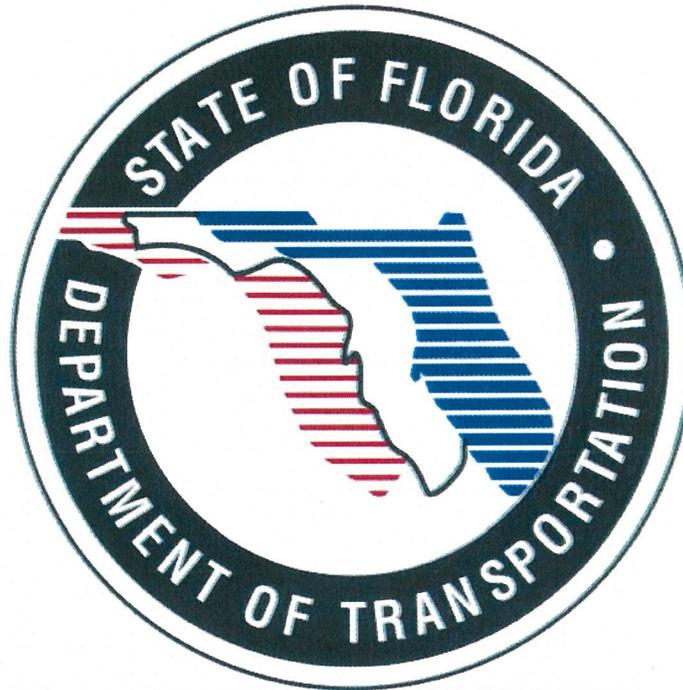


FINAL LOCATION HYDRAULICS REPORT



**I-95 / Ellis Road Interchange and Ellis Road from I-95 to Wickham Road (CR 509)
Project Development & Environment Study
Financial Project ID: 426905-1-22-01
Federal Aid Project No: SFT1251R**

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EXECUTIVE SUMMARY

This Project Design and Environment Study (PD&E) examines a direct, multi-lane Strategic Intermodal System connection from I-95 to Melbourne International Airport and Greyhound Bus Terminal via Ellis Road, and existing two-lane facility. Ellis Road is proposed to be expanded to four lanes and extended westward to tie into St. Johns Heritage Parkway, a new four-lane arterial planned by Brevard County that begins at Malabar Road and ends at John Rodes Boulevard. A new interchange connecting Melbourne International Airport directly to I-95 will relieve Eau Gallie Boulevard / Sarno Road and US 192 as the Strategic Intermodal System (SIS) Connectors. The improvements to and the extension of Ellis Road will provide a direct connection between the interstate and the airport as well as mitigate capacity deficiencies at the existing I-95 interchanges at US 192 and Eau Gallie Boulevard / Sarno Road. Upon the improvements, Ellis Road will be designated as a “SIS Connector” for the Melbourne International Airport.

This Location Hydraulics Report is provided to document any impacts to the floodplain from the proposed improvements and to provide recommendations regarding minimization and elimination of floodplain impacts.

The western end of the project near I-95 is located within the 100 year floodplain. This region exhibits an established 100-year floodplain elevation of 20. Proposed improvements will result in approximately 13 acre feet of fill being placed within the floodplain. It is proposed to mitigate this encroachment by providing compensating floodplain storage within the proposed Stormwater ponds of the project. **Therefore, it has been determined that the encroachment is not significant.**

1.0 INTRODUCTION

Ellis Road is a two-lane, east-west roadway maintained by Brevard County that begins at John Rodes Boulevard and continues westward for 1.7 miles to Wickham Road. For a portion of its length, Ellis Road forms the boundary between the cities of Melbourne to the north and West Melbourne to the south. The improvements being examined as part of the I-95 and Ellis Road Project Development and Environment Study include a new interchange with I-95 that connects to St. John’s Heritage Parkway, a new roadway connecting the interchange to Ellis Road, and the reconstruction of the existing Ellis Road as a four-lane, divided facility with bicycle and pedestrian accommodations from John Rodes Boulevard to Wickham Road. These improvements are part of an overall plan to provide a direct link between the interstate and nearby Melbourne International Airport.

A Location Hydraulic Report is required for all projects requiring a Type 2 CE, EA, EIS, or SEIR to support the conclusions drawn in these documents concerning base floodplains and regulatory floodways. This analysis ensures that all base floodplains are identified and the encroachments are quantified and evaluated. As a result of this process, a preliminary determination of impact is made as to the level of significance of the



encroachment. The FDOT drainage design standards will be applied to this project and St. Johns River Water Management District (SJRWMD) procedures will be followed to minimize encroachment and result in no significant change to flood elevations.

2.0 PROJECT DESCRIPTION

Interstate 95 is a cornerstone of the Florida SIS, linking major population centers in Florida with one-third of the US population. As an integral component of the Florida SIS, I-95 links major activity centers with other modes of transportation, such as airports, bus hubs, seaports, spaceports, and train stations. Interstate access is provided via interchanges on SIS connectors, which may be state or local roads. Currently, the emerging SIS hubs at Melbourne International Airport and Melbourne Greyhound Bus Terminal are being connected to the SIS network via the Eau Gallie Blvd/Sarno Road and the US 192 interchanges.

Both US 192 and Eau Gallie Boulevard are part of the Florida Hurricane Evacuation Network and connect population bases along the eastern Florida shore to the mainland. US 192, also known as Space Coast Parkway, is the southern-most Brevard County causeway over the Indian River and the last crossing for over 25 miles. The closest causeway to the south is in Indian River County near the town of Wabasso. As seen in the Ellis Road Interchange Justification Report (IJR), future traffic volumes on Eau Gallie/Sarno Road and US 192 will exceed the standard level of service (LOS) volumes due to the local reliance on this facility for access to I-95.

A new interchange connecting Melbourne International Airport directly to I-95 will provide additional local access to I-95, thereby relieving Eau Gallie Blvd/Sarno Road and US 192. The improvement to and extension of Ellis Road to provide this direct connection between the interstate and the airport will address deficiencies at the existing I-95 interchanges at US 192 and Eau Gallie Boulevard/Sarno Road. Upon the improvements, Ellis Road will be designated as a “SIS Connector” for the Melbourne International Airport.

The project begins approximately ¼ mile west of I-95 and extends 2.2 miles eastward, crossing John Rodes Boulevard and terminating at S. Wickham Rd. (CR 509). Improvements will include a new interchange with I-95, a new roadway connecting the interchange to Ellis Road, and the reconstruction of the existing Ellis Road as a four-lane, divided facility with bicycle and pedestrian accommodations from John Rodes Boulevard to Wickham Road. Realignment of existing drainage canals and construction of a stormwater collection system to serve Ellis Road are also proposed. Refer to *Figure 1* for project location.

The concept of the St. Johns Heritage Parkway (SJHP, formerly known as the Palm Bay Parkway) was originally developed in the mid-1970’s by Brevard County. The proposed roadway has been part of the County’s Comprehensive Land Use Plan, Traffic Circulation Element since the 1970’s. The entire Parkway alignment extends from I-95 near Micco Road in the southern portion of Brevard County to the intersection of John Rodes Boulevard and Ellis Road in the central portion of Brevard County, a distance of



approximately 20 miles. The segment of the Parkway from SR 514 (Malabar Road) to John Rodes Boulevard / Ellis Road, a distance of approximately 8 miles, was the subject of a PD&E Study conducted by FDOT. An Environmental Assessment / Finding of No Significant Impact (EA/FONSI) was approved by FHWA in December 2003.

Following this federal action, the City of Palm Bay and Brevard County independently advanced the final design and right-of-way acquisition for their respective segments. The City segment extends from SR 514 (Malabar Road) to the County line, while the County segment extends from the city limit to John Rodes Boulevard / Ellis Road. Both the City and County may require federal funding to complete the right-of-way acquisition and construction phases for their segments of the Parkway and have engaged in the appropriate federal reevaluation process to maintain this eligibility.

In addition, Brevard County has developed final design plans for SJHP to a 90% phase plan set. An Environmental Resource Permit has been applied for from the SJRWMD but has not been granted.

The initial construction phase for SJHP (both city and county segments) will be two lanes, which will ultimately serve as the eastbound lanes of the future four-lane roadway. The Brevard County project will include a new two-lane bridge over I-95, which will be expandable to a four-lane width. The proposed bridge will also include a right-turn deceleration lane into the new loop ramp of the I-95 interchange.

Due to funding uncertainties at the county, state, and federal levels, the timeline for and segment staging of the SJHP has not been determined and may not be constructed prior to the construction of the extension of Ellis Road and associated interchange.

There is approximately ½ mile of overlap between the Ellis Road PD&E Study and the SJHP final design effort. Since SJHP has not yet been constructed, the east-west alignment of the Parkway as it crosses I-95 is not considered as a fixed alignment in this study. Depending on the final preferred interchange configuration, there may be final design plans for SJHP that require revisions based upon the findings of this study. Because this PD&E study is following National Environmental Protection Act process through FDOT, the interchange and the extension of Ellis Road will be eligible for future federal funding.

3.0 EXISTING ROADWAY DRAINAGE

The project corridor is relatively flat but generally slopes east to west. Existing ground elevations vary from approximately 20 to 25 feet NGVD. There are currently no stormwater management facilities (SWMF) in place that accept runoff from the roadway.

Runoff within the segment from the western project limit to the highpoint of the proposed I-95 overpass enters existing drainage conveyances that drain west into the marshy headwaters of the St. Johns River. These marsh headwaters have been identified as being nutrient-impaired and are also classified by the State of Florida as Class I waters.



Class I waters are approved as a public potable water supply and therefore have more stringent water quality requirements for SWMF's that discharge to them.

The remainder of the project from I-95 to the eastern boundary is drained by a network of ditches and canals. The adjacent canals serve as the outfall for this segment of the project. These canals are part of a regional canal network that serves as the primary drainage conveyance for the Crane Creek Drainage Basin.

3.1 Crane Creek Drainage Basin

The Crane Creek Drainage Basin encompasses most of West Melbourne. Runoff in the basin eventually enters a network of named canals. Refer to *Figure 2* for a depiction of the canal network located proximate to the project corridor. The M-1 Canal serves as the main trunkline for the network. All other canals in the system discharge to the M-1 Canal. This canal generally drains south then turns east along US Highway 192 before it empties into Crane Creek with ultimate discharge into the Intra-Coastal Waterway. The Crane Creek Basin exhibits a second outfall located north of the project. A 6 foot X 6 foot box culvert and a set of triple-48 inch cross drains are currently located at the junction between the L-16 Canal and the M-1 Canal. These culverts discharge west underneath I-95 before ultimately entering the Lake Washington watershed.

The Crane Creek Basin has a history of flooding problems. A specific area of repeated flooding conditions is at Lamplighter Village, which is a mobile home park located just north of the project corridor on the eastern side of I-95. The M-1 and L-16 Canal experience moderate to severe flooding during intense storm events within the vicinity of the Ellis Road Corridor and Lamplighter Village.

Brevard County is currently carrying out a series of capital improvements to reduce the duration and intensity of flooding that is occurring. These improvements are part of the St. Johns/Crane Creek Outfall Lamplighter Village Staged Improvements Project. The improvements have received approval from SJRWMD (Permit No.: 4-009-119341-2) as well as an FDOT Drainage Connection Permit. Construction will begin as soon as all required easements have been secured for the proposed design.

Crane Creek canals cross the project corridor at multiple locations. The M-1 Canal crosses the proposed corridor approximately 600 feet east of the I-95 centerline. Moving west along the corridor, the L-11 Canal crosses Ellis Road just west of Greenboro Drive.

The L-15 Canal is located within the Ellis Road right-of-way and is the primary stormwater conveyance for the project corridor. This canal begins near Distribution Drive (west) and drains from east to west along the roadway before discharging into the M-1 Canal near I-95. Before reaching the M-1 Canal, the L-15 Canal intersects the L-11 Canal which crosses south underneath Ellis Road. Similar canal junctions like



this occur frequently throughout the canal network where the flow branches between the two downstream canal segments.

The intersection at Lake Ibis Drive coincides with the point in the project corridor where flow patterns change from westerly to easterly. From this point to the eastern boundary of the project, Ellis Road drains east into the L-7 Canal which drains south before merging with the M-1 Canal.

In summary, a majority of the roadway runoff sheet flows into the L-15 Canal. Some of this flow drains southward via the L-11 Canal at the L-15/L-11 junction, but most of the project runoff continues west along the L-15 Canal where it merges with the M-1 Canal and drains southward towards US Highway 192.

3.2 Existing Cross Drains

A 60-inch culvert is located at just west of Greenboro Drive and conveys the L-11 Canal underneath Ellis Road.

An existing dual 10 foot X 4 foot box culvert conveys the L-15 Canal west underneath John Rodes Boulevard. Recent roadway improvements to this intersection involved plugging the upstream end of this culvert and connecting the upstream L-15 segment with a single 48 inch X 76 inch culvert.

In addition to the two major cross drains discussed above, there are a series of smaller cross drains underneath the existing road that convey flow from the ditch network located south of the road north into the L-15 Canal. No bridge structures exist along the corridor. Refer to Figure 4 for a depiction of the major existing cross drains located along the corridor.

3.3 100-Year Floodplain

The segment of the project located west of West Drive lies within FEMA Flood Zone AE. East of West Drive the project is located within Zone X. Refer to *Figure 2* for a map which delineates the flood plain boundaries of the project corridor. Zone AE is described as areas that are inundated by the 100-year floodplain. Zone X refers to areas that are outside of the 100-year floodplain but within the 500-year floodplain. A base floodplain elevation (BFE) of 20-ft NGVD has been determined for the project area located within Zone AE.

3.4 Soils

Soils throughout the project corridor are predominately classified by Natural Resources Conservation Service (NRCS) as hydrologic soil group of B/D. This classification is given to soils that exhibit good percolation properties when in a drained state, and poor drainage properties when in a undrained state. Soil groups with this designation typically exhibit compositions that are conducive to percolation but are found to be in



sumped, depressed or otherwise poorly drained conditions when in their natural state. The proposed improvements including a piped collection system will positively affect the drainage area and consequently the soils may function as a type B soil. NRCS Soil maps also show that soils along the corridor exhibit shallow depths to the water table with typical depths ranging from 0.5 to 1.0 foot below grade. Refer to *Figure 3* for a soil map of the project corridor.

3.5 St. Johns Heritage Parkway (SJHP)

As mentioned in Section 2.0, there is approximately a ½ mile overlap between the I-95 and Ellis Road PD&E Study and the SJHP approved PD&E Study. The SJHP is currently in the final design phase and an environmental resource permit application has been submitted to SJRWMD. Regarding the assessment of floodplain impacts, the St. Johns Heritage Parkway Study assessed floodplain impacts for the mainline of St. Johns Heritage Parkway, which terminated at John Rodes Boulevard. In order to avoid duplication of the floodplain impacts within the interchange area, the Ellis Road PD&E Study assessed floodplain impacts for the additional ramps within the interchange, as the mainline floodplain impacts were identified in the SJHP environmental document.

4.0 PROPOSED DRAINAGE

Proposed roadway drainage basins were developed for the project and are depicted in *Figure 4*. Drainage divides occur at major outfall locations such as major culvert and canal crossings. The proposed roadway alternatives will all require that a piped urban collection system be introduced in order to convey stormwater runoff to the stormwater management facilities (SWMF) for treatment and attenuation. It is also assumed that contributing offsite drainage areas will be captured by a bypass collection system and not routed to the SWMF's in order to minimize SWMF requirements for the project. The bypass collection systems will preserve the flow path and discharge location of their associated offsite drainage areas. A detailed analysis of stormwater management requirements to support proposed improvements is included in the pond siting report (PSR) prepared for this project.

The proposed roadway widening will impact the existing alignment of the L-11, L-15 and M-1 Canals. It is strongly recommended that these canals remain an open channel section in order to preserve their current flood storage capabilities. All proposed modifications to the canals will be designed to exhibit the same hydraulic conveyance capabilities as the existing configuration.

4.1 Cross Drains

The proposed L-15 Canal realignment will require a new cross drain on the north side of the John Rodes Boulevard / Ellis Road intersection to replace the existing cross drain configuration. The existing 60-inch cross drain for the L-11 Canal located just west of Greenboro Drive will likely require extensions to both ends of the culvert.



A primary cross drain will be required just east of I-95 where the new roadway will cross over the M-1 Canal. The crossing, which is assumed to require at least a 40'-long arch, will convey the M-1 Canal south underneath Ellis Road. This cross-drain will convey a significant amount of flow and could potentially impact a large portion of the 1,612-acre upstream Crane Creek Regional Basin. Careful consideration should be made with regards to the design of this cross drain. This crossing may be in place if the SJHP project is constructed in advance of the interchange. The location depicted in the 90% SJHP design plans for this cross drain will be in conflict with the ramp layout of the proposed alternatives. Design coordination needs to occur in order to avoid removal and replacement of this cross drain when the proposed interchange construction takes place.

Prior to construction of the M-1 culvert, the master stormwater model for Crane Creek is recommended to be updated to include this crossing. This update should be done to ensure that the crossing structure does not result in an increase in water stage that is significant enough to impact upstream areas within the basin.

5.0 FLOODPLAINS

As stated in Section 3.3, FEMA maps show that flooding occurs up to elevation 20 during the 100-year event for the segment of the project that is within Zone AE. LIDAR elevations along this segment show that existing elevations along Ellis Road range from 16 to 24 ft in this segment. Roadway improvements within this segment will include elevating the roadway section from its current vertical alignment and therefore result in impacts to the storage capacity of the floodplain.

The impacts can be categorized as minimal floodplain encroachments. There are no impacts on emergency services, evacuation routes or regulatory floodways. Consistency with local flood plain development plans or land use elements in the comprehensive plan is not an issue as the project is a modification to an existing road. No risk assessments were performed as part of this report. As required by the FDOT PDE Manual Part 2 Chapter 24, the required discussion items for minimal encroachments are discussed below.

1. The history of flooding of the existing facilities and/or measures to minimize any impacts due to the proposed improvements.
 - **The corridor is located within the Crane Creek Basin, which has historical flooding issues as discussed in Section 3.1. Any modifications made to drainage structures will not have a negative impact on discharge carrying capacity. Floodplain compensation will be provided for all impacts below the 100-year floodplain as discussed in Section 5.1.**
2. Determination of whether the encroachment is longitudinal or transverse, and if it is a longitudinal encroachment an evaluation and discussion of practicable avoidance alternatives.



- **Longitudinal. There are no avoidance alternatives because Ellis Road is an existing alignment, and it is required to cross the floodplain in order to connect to I-95.**
3. The practicability of avoidance alternatives and/or measures to minimize impacts.
 - **Impacts were minimized to the existing canal network. No changes will be made to disrupt the existing drainage flow patterns of the area.**
 4. Impact of the proposed improvement on emergency services and evacuation.
 - **The proposed improvement will improve emergency services and evacuation by adding a high speed connection to I-95.**
 5. Impacts of the proposed improvement on the base flood, likelihood of flood risk, overtopping, location of overtopping, backwater, etc.
 - **No significant impacts.**
 6. Determination of the impact of the proposed improvements on regulatory floodways, if any, and documentation of coordination with FEMA and local agencies to determine the project's consistency with the regulatory floodway.
 - **Proposed improvements do not occur over any regulatory floodways.**
 7. The impacts on natural and beneficial floodplain values, and measures to restore and preserve these values (this information may also be addressed as part of the wetland impact evaluation and recommendations).
 - **Improvements will impact floodplain volumes. Floodplain compensation areas are proposed to restore the impacted floodplain volume.**
 8. Consistency of the proposed improvements with the local floodplain development plan or the land use elements in the Comprehensive Plan, and the potential of encouraging development in the base floodplain.
 - **A discussion with Frank Skarvelis of the Brevard County Public Works Floodplain Administration confirmed that there is no local floodplain development plan over the project corridor other than the St. Johns/Crane Creek Outfall Lamplighter Village Staged Improvements Project as discussed in Section 3.1. Proposed improvements are not in conflict with the Crane Creek outfall improvements.**
 9. A map showing project, location, and impacted floodplains. Copies of applicable FIRM maps should be included in the appendix.
 - **See figures 1-5.**



10. Results of any risk assessments performed.

- **None performed.**

5.1 Floodplain Compensation

Analysis of cross sections generated for the preliminary roadway design for this project reveal that approximately 13 acre-feet of fill is proposed within Zone AE. It is proposed to compensate for this reduced flood storage by providing compensating storage within the proposed SWMF's that will be constructed within the floodplain. The pond sizing analysis done as part of the PSR incorporate a 1-foot depth for free board. This depth of storage will provide the required compensation.

The pond siting analysis for this project includes two alternatives to provide stormwater treatment. The first alternative considers the option of providing a treatment facility to serve each roadway basin independently. This alternative is referred to as the roadway ponds alternative. In addition, a regional alternative was investigated that considers the option of providing a regional treatment pond that meets the project's treatment requirements as well as a collection of smaller "attenuation-only" ponds that are placed along the project to provide peak flow attenuation. The regional pond would meet water quality requirements through compensatory treatment of offsite flows that pass through the M-1 Canal as it crosses the project corridor.

Under the roadway ponds alternative, there are 12.03 acres of proposed pond area within the floodplain. This acreage is the estimated area of the pond at the top of the treatment volume. The floodplain storage would be supplied for a depth of 1 foot along with attenuation volume beginning at the top of the treatment volume elevation, which would equate to 12.03 acre-feet in this case. Based on this estimation, the infield areas within the loop ramp may need to be utilized for floodplain storage in order to fully provide the compensating floodplain storage.

The regional pond alternative is the preferred alternative from the pond siting analysis. It exhibits an area of 14.4 acres at the top of the staging volume which exceeds floodplain compensation requirements. Figure 5 shows the available sources of floodplain compensation provided under the regional alternative.

6.0 CONCLUSION

The stormwater collection systems along Ellis Road are expected to provide the necessary drainage capabilities to convey stormwater along the corridor. These systems together with the proposed realignment to the L-11, L-15, and M-1 Canals should eliminate the possibility of increased flooding due to the proposed widening of the roadway. Treatment and attenuation of the new roadway as well as floodplain encroachment compensation will be provided within stormwater management facilities of the project. The regional pond treatment alternative includes adequate floodplain compensation storage within the regional SWMF. If the roadway pond treatment

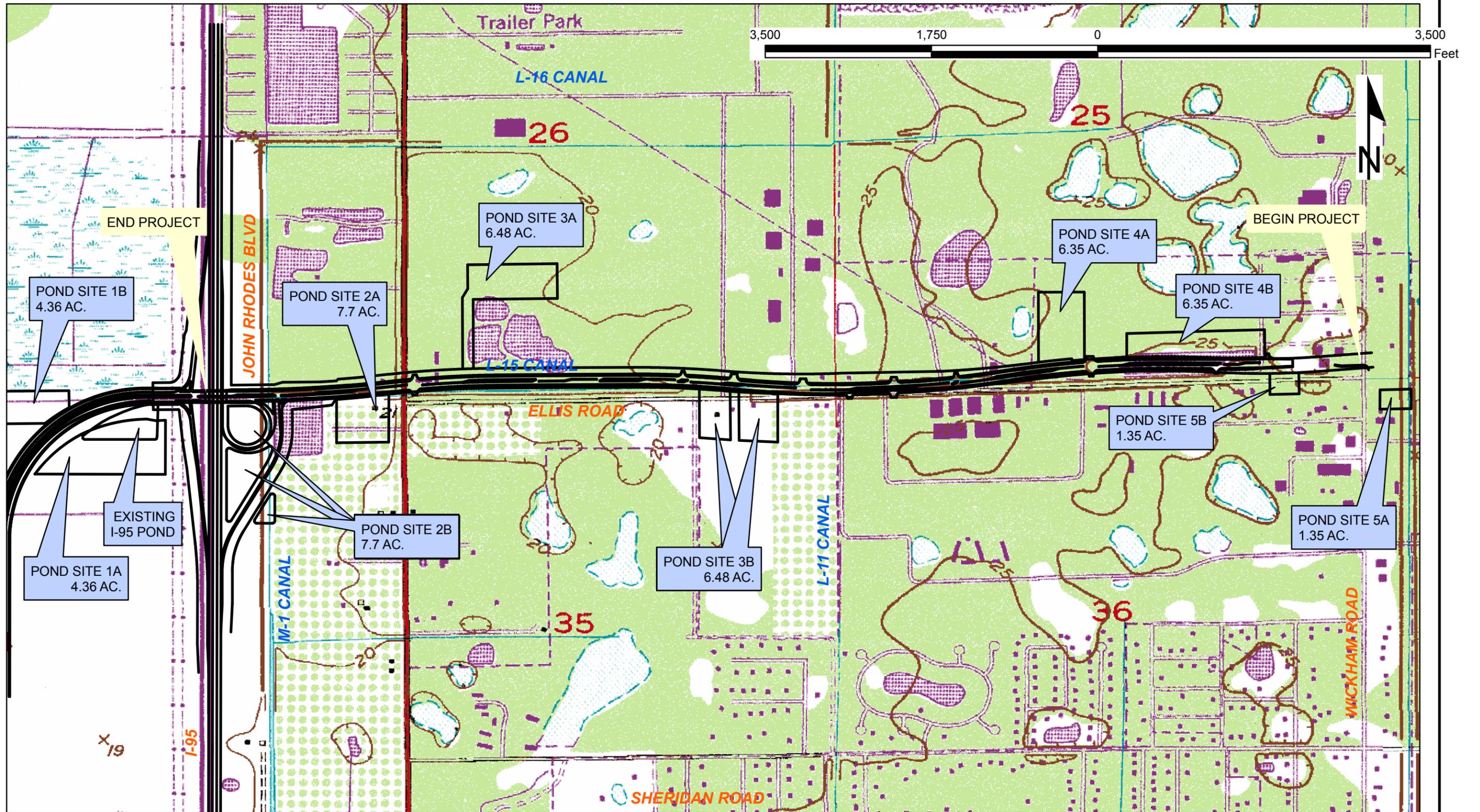


alternative is selected, additional final design-level analysis may show that the interchange loop ramp infield areas need to be utilized for floodplain storage to supplement the floodplain compensation provided by the preferred roadway pond site candidates.

It has been determined, through consultation with local, state, and federal water resources and floodplain management agencies that there is no regulatory floodway involvement on the proposed project and that the project will not support base floodplain development that is incompatible with the existing floodplain management programs.

The proposed drainage improvements will perform hydraulically in a manner equal to or greater than the existing system, and backwater surface elevations are not expected to increase. As a result, there will be no significant adverse impacts on natural and beneficial floodplain values. There will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. **Therefore, it has been determined that this encroachment is not significant.**

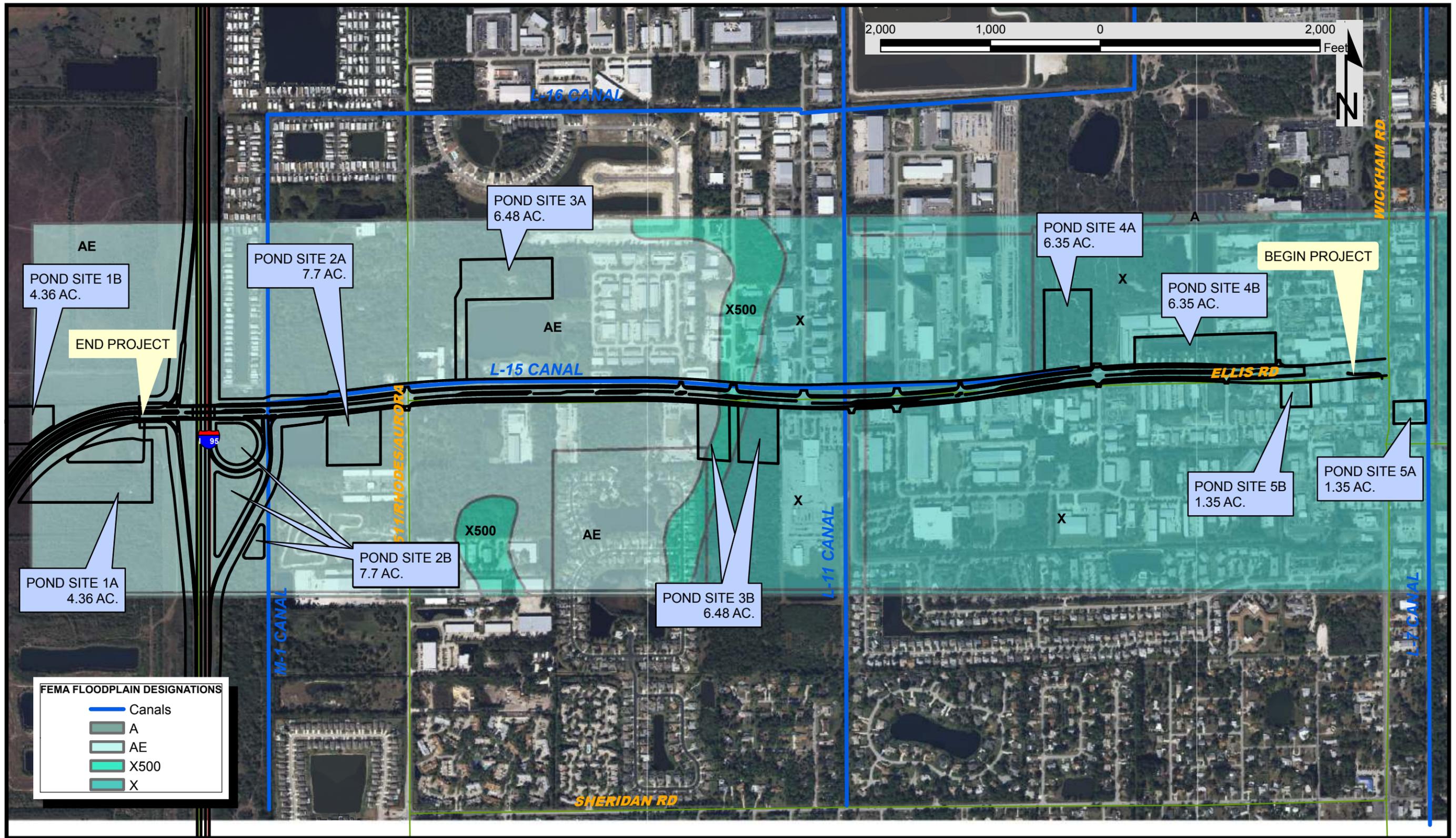




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ELLIS ROAD - PD&E STUDY

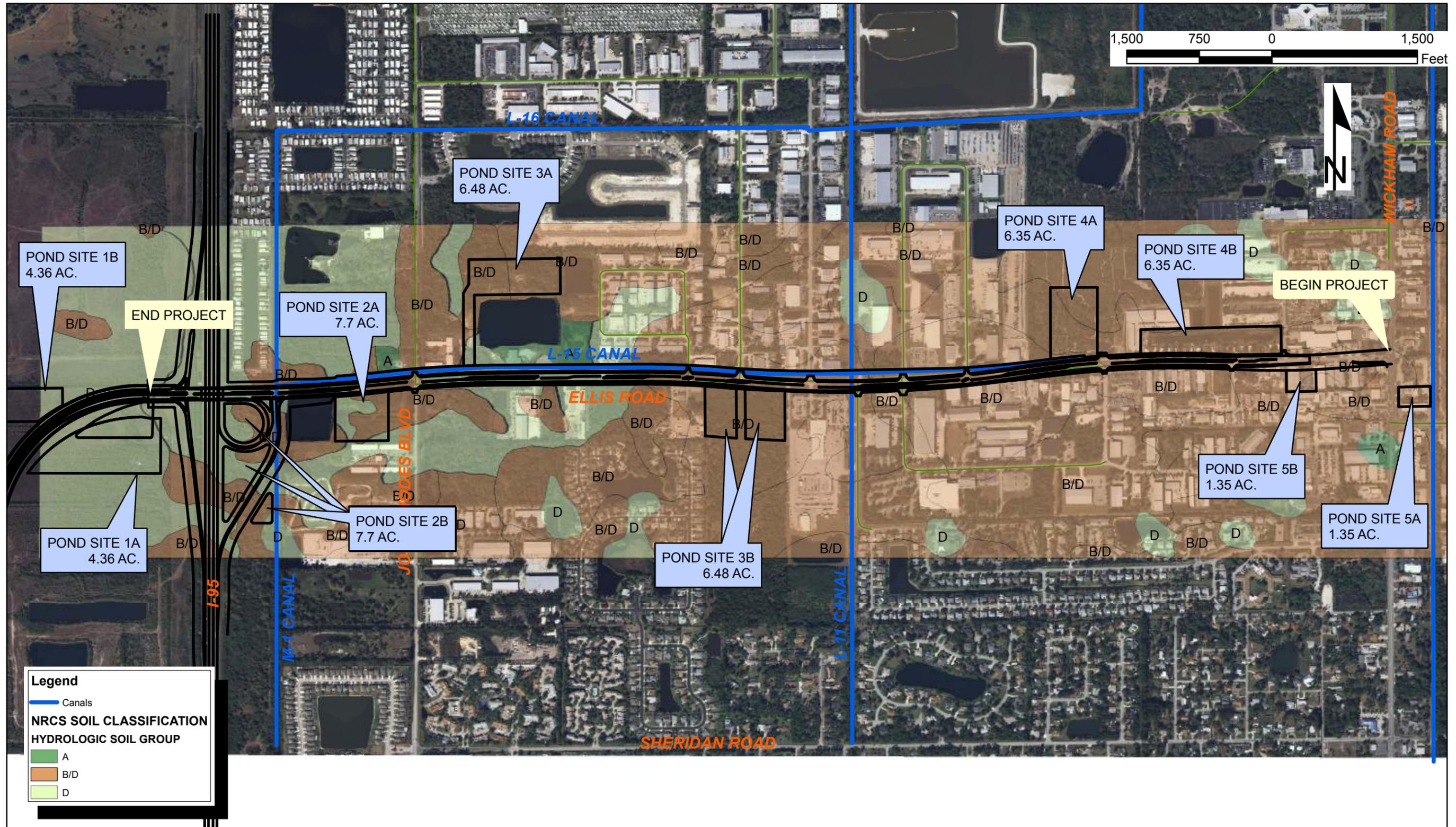
USGS QUAD MAP
FIGURE 1
 SHEET 1 of 1



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ELLIS ROAD - PD&E STUDY

FEMA FLOOD MAP
FIGURE 2
 SHEET 1 of 1



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ELLIS ROAD - PD&E STUDY

SOILS MAP
FIGURE 3
 SHEET 1 of 1



BASIN 1

BASIN 2

BASIN 3

BASIN 4

BASIN 5

LEGEND:
 EXISTING STORMWATER PONDS
 DRAINAGE DIVIDES

