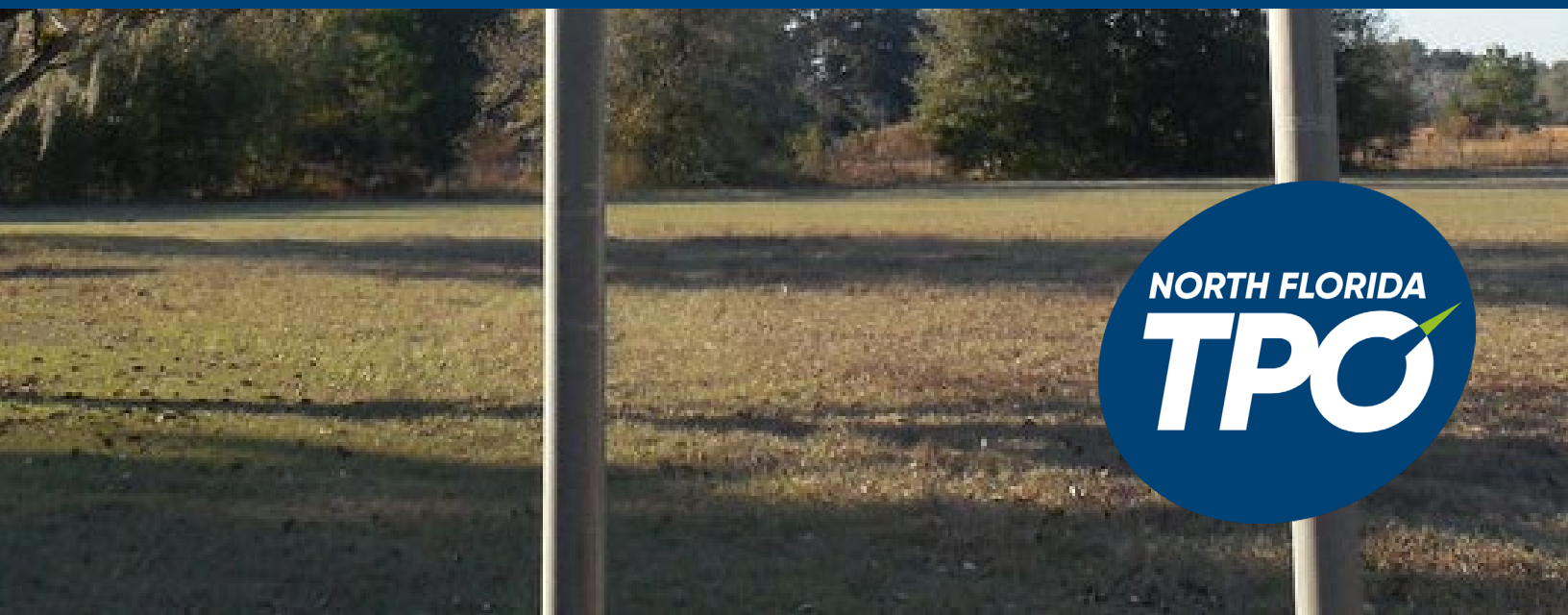
SR 16 CORRIDOR STUDY
SR 21 TO SR 23

UPWP Task 5.8

June 2023



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Executive Summary

The North Florida Transportation Planning Organization (TPO) conducted this corridor study to evaluate approximately 8.8 miles of SR 16 from SR 21 to the SR 23, the First Coast Expressway. SR 16 is a two-lane rural roadway. It is designated as the J.C. Penny Memorial Scenic Highway within Penny Farms. The following summarizes the needs along the corridor through the year 2045 and the alternatives evaluated for consideration.

The existing pavement is near the end of its design life and the Florida Department of Transportation (FDOT) is initiating the design to mill and resurface the corridor.

The corridor has a fatal crash rate over two times the statewide average for similar corridors. The population of the corridor includes a high percentage of elder drivers and two strategies to reduce crashes were evaluated to meet the needs of the drivers of the corridor.

- **Retroreflective backplates on the traffic signals to increase their visibility to motorists can reduce crashes by 15% at intersections.**
- **Advance street name signs may reduce crashes by 1% and 1.6% and are best practices for corridors with larger populations of elder drivers.**
- **Advance warning signs can reduce angle crashes at an intersection by 35%.**

There are no bicycle lanes throughout the study area. Widening the shoulders from 4-feet wide to the current FDOT design standard of 5-feet will accommodate bicyclists more safely.

Implementing a multi-use trail along SR 16 between SR 21 and CR 218 is recommended as part of the regional trails plan and can be constructed in lieu of or in conjunction with widening the shoulders along that segment to safely accommodate bicycle and pedestrian travel.

By 2045, SR 16 is anticipated to operate at a Level of Service (LOS) D from SR 21 to CR 218 and LOS E east of CR 218 due planned development and the resulting traffic growth. The FDOT standard for this corridor is to maintain a LOS C or better. The signalized intersections along SR 16 at SR 21 and CR 218 will operate at LOS E or F without any future improvements by 2045. To address these needs several alternatives were considered.

Alternative 1 includes the following improvements:

- **Construct new turn lanes in the northbound right and westbound left directions at the SR 16 and SR 21 intersection**
- **Mill and resurface the corridor from the SR 21 intersection to the beginning of Penney Farms**
- **Widen the shoulders from four-feet to five-feet to accommodate bicycle traffic from the SR 21 intersection to the beginning of Penney Farms**
- **Construct the Northeast Florida Regional Multi-use Trail from SR 21 to CR 218**

Alternative 1 is the most expensive alternative because of the potential for relocations and will impact trees and the scenic nature of the corridor in Penny Farms.

Alternative 2 includes the following improvements:

- **Construct new turn lanes in the northbound right and westbound left directions at the SR 16 and SR 21 intersection**
- **Mill and resurface the existing corridor from SR 21 to SR 23**

Alternative 2 does not meet the mobility or safety intent of the project.

Alternative 3 includes the following improvements:

- **Construct new turn lanes in the northbound right and westbound left directions at the SR 16 and SR 21 intersection**
- **Mill and resurface the existing corridor from SR 21 to SR 23**
- **Construct the Northeast Florida Regional Multi-use Trail from SR 21 to CR 218**
- **Construct a new two-lane rural roadway to bypass Penny Farms and avoid impacts from widening the existing road.**

Alternative 3 is the shorter of the two bypass alternatives but will require coordination with the County for land use consistency considering impacts on the Lake Asbury planning area.

Alternative 4 includes the following improvements:

- **Construct new turn lanes in the northbound right and westbound left directions at the SR 16 and SR 21 intersection**
- **Mill and resurface the existing corridor from SR 21 to SR 23**
- **Construct the Northeast Florida Regional Multi-use Trail from SR 21 to CR 218**
- **Construct a new two-lane rural roadway to bypass Penny Farms and avoid impacts resulting from widening the existing road.**

Alternative 4 is the longer of the two bypass alternatives and will result in greater wetland impacts.

Table E-1 on the next page summarizes the evaluation of alternatives.

No alternative is recommended at this time. Following agency coordination and public engagement, a preferred alternative will be recommended.

Table E-1. Evaluation Matrix

Component	Alternative 1 Widen from Penny Farms to SR 23	Alternative 2 Mill and Resurface	Alternative 3 North Bypass	Alternative 4 South Bypass
Costs				
Construction	$66,886,194	$10,447,998	$33,919,311	$36,510,459
Right of Way	$20,839,225	$0	$4,477,686	$7,927,066
Wetland Mitigation	$36,000	$0	$217,800	$920,160
Project Development and Environment (PD&E)	$5,309,814	$0	$1,535,654	$1,794,768
Preliminary Engineering	$8,026,344	$1,284,926	$4,101,483	$4,412,421
Construction Engineering and Inspection (CEI)	$10,701,790	$1,713,234	$5,468,644	$5,883,227
Total Implementation Costs	**$111,799,367**	**$13,446,158**	**$49,720,577**	**$57,448,101**
Right-of-Way Impacts				
Area Impacted	12.6	0	39.8	70.5
Relocations	29	0	0	0
Environmental Impacts				
Involved Land Uses	Lake Asbury Planned Community		Lake Asbury Rural Community Planned Unit Development	Agricultural Lands
Underserved Communities	Elder Populations Low Income		Low Income	Low Income

Component	Alternative 1 Widen from Penny Farms to SR 23	Alternative 2 Mill and Resurface	Alternative 3 North Bypass	Alternative 4 South Bypass
Wetland Impacts	0.5	0	3.03	12.78
Floodplain Impacts	No	No	Yes	Yes
Safety and Mobility Impacts				
Reduce crashes by alleviating congestion	●		●	●
Reduce congestion and meet FDOT LOS standards	●		●	●
Widen shoulder to current criteria for bike lanes	●	●	●	●
Construct trail improving pedestrian safety	●		●	●
Consistency with preserving Penny Farms character		●	●	●

Professional Engineer Certification

I hereby certify that I am a registered professional engineer in the State of Florida practicing engineering for Kimley-Horn and Associates, Inc. and that I have supervised the preparation of and approve the analysis, findings, opinions, conclusions and technical advice hereby reported for:

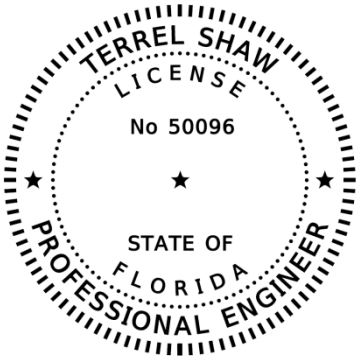
PROJECT: **SR 16 Corridor Study**
SR 21 to SR 23
Clay County, FL

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

Kimley-Horn and Associates, Inc.
Certificate of Authorization No: 696
12740 Gran Bay Parkway West, Suite 2350
Jacksonville, FL 32258

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

FLORIDA REGISTERED ENGINEER:



Terrel Shaw, State of Florida, Professional Engineer No. 50096. This item was electronically signed and sealed by Terrel Shaw, P.E. on _____, 2023.

Printed copies of this document are not considered signed and sealed.

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1 Introduction

1.1 Purpose

The North Florida Transportation Planning Organization (TPO) is conducting this corridor study to evaluate approximately 8.8 miles of SR 16 from SR 21 to SR 23 (First Coast Expressway) as shown in Figure 1. SR 16 is designated as the J.C. Penny Memorial Scenic Highway within the limits of Penny Farms.

This study evaluated the existing conditions of the corridor, known environmental features in the surrounding area, and the demographics of the community to develop alternatives that will address identified needs throughout the corridor.

This project's purpose is to:

- **Enhance safety along the roadway**
- **Prevent deterioration of the operating performance of the corridor**
- **Evaluate the traffic impact of the construction of the First Coast Expressway**

1.2 Consistency with Other Plans

Proposed improvements should be consistent with local and regional plans guiding future development of the land and roadway network in the study area. The following planning documents were reviewed.

Clay County Comprehensive Plan

- ***CON Policy 1.1.1: To reduce pollution generated from automobiles, the County shall continue to enforce the provisions of the tree protection and landscaping ordinance requiring landscaping and vegetative buffers between arterial roadways and new residential developments.***
- ***CON Policy 1.1.1: Encourage efficient traffic flow by maintaining adequate levels of service on County roadways as required under the Transportation Element of this Plan.***
- ***TRA Policy 1.9.7: Designated bicycle lanes shall be built when constructing or reconstructing roads in Clay County using FDOT standards. The outside lane of major arterial, minor arterial, and collector roadways, except for residential collector roadways, shall include a 4-foot-wide bicycle lane for urban roadways and a 5-foot-wide bicycle lane for rural roadways. Construction projects for existing roads shall be reviewed on a case-by case basis and only under extreme right-of-way width constraints will designated bicycle lanes be excluded from a project.***

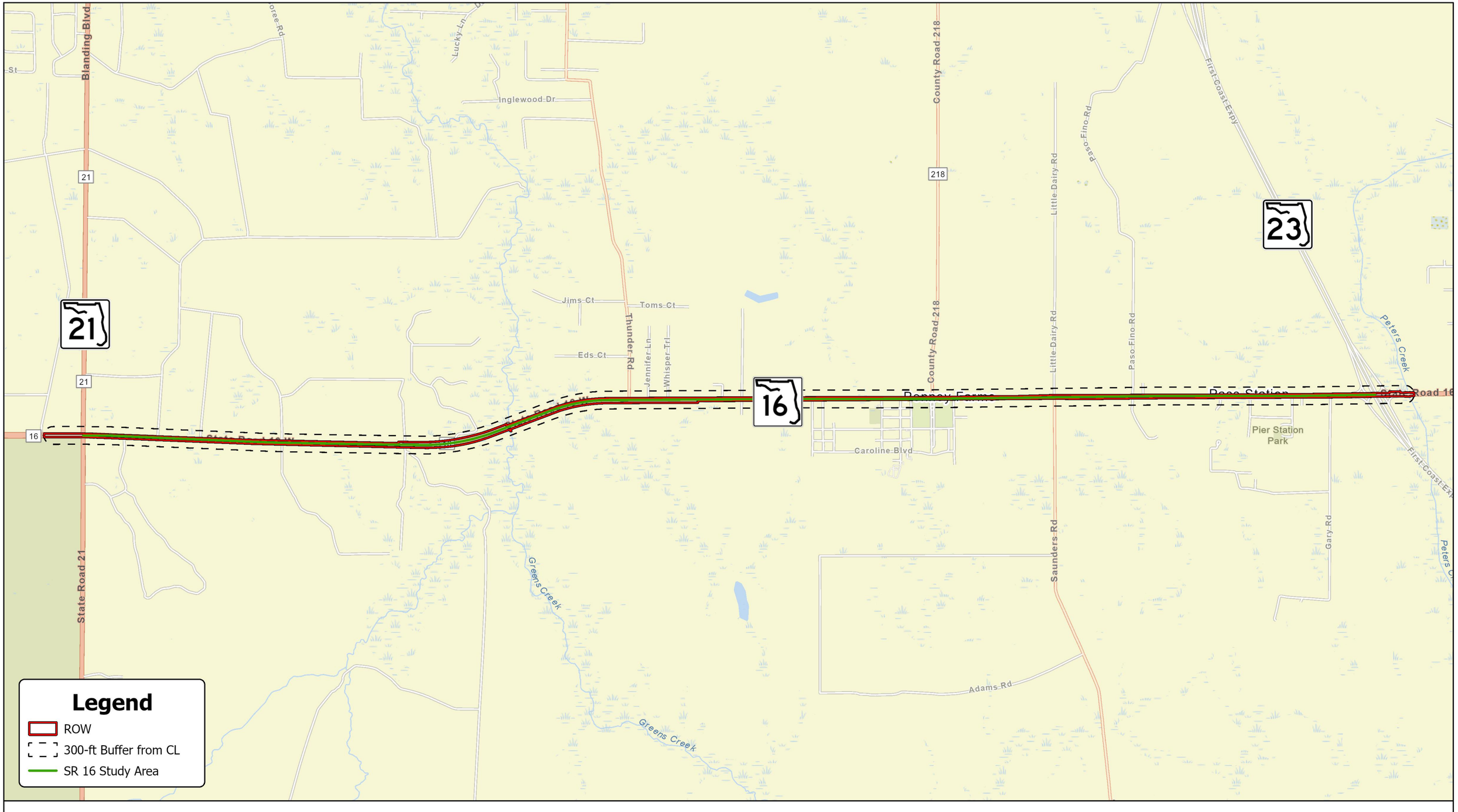

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Figure 1 - SR 16 Corridor Study
Project Location

- ***TRA Policy 3.3.1: The County shall protect historic sites and culturally or architecturally significant sites from diminishment or destruction due to transportation improvements. The level of protection shall be in a manner consistent with the objectives and policies contained in the Historic Preservation Element of this Plan and the Historic Preservation Overlay District section of the Land Development Regulations.***
- ***HIS Policy 1.5.1: The County shall enforce the historic preservation overlay zone that as a minimum shall include criteria for the protection of historic sites, structures and cemeteries, criteria and procedures for designating historically significant properties and enforcement procedures.***
- ***EDE Policy 2.2.1: Support the implementation of regulations that focus on the development of diverse housing options, multi-modal transportation, employment centers with enhanced social amenities that support placemaking in the County.***

1.3 Related Projects

Programmed projects from the Clay County Capital Improvement Program (CIP) and Bonded Transportation Program (BTP), the TPO Transportation Improvement Plan (TIP), and FDOT 2022-2026 Work Program were reviewed. Projects which are programmed within the limits of the study corridor are summarized below.

- **FDOT 2023-2027 Work Program: A bridge repair/rehabilitation is planned on SR 16 at the bridge over the South Fork of Black Creek east of Seamark Ranch Road. Construction on the bridge is projected to be completed in September 2023 (FPID 442779-1).**
- **FDOT 2023-2027 Work Program: SR 16 is scheduled to widen to a four-lane roadway from the First Coast Expressway to SR 15A (Oakridge Avenue). Although the project is just east of the study corridor, there will be traffic impacts to the corridor due to the road widening. The project is currently undergoing a Project Development and Environment (PD&E) study estimated to be complete in FY 2025 (FPID 438918-1).**
- **FDOT 2023-2027 Work Program: New road construction for SR 23 (First Coast Expressway) from east of CR 209 to north of SR 16 will impact the eastern limits of the study corridor. Construction of the Expressway began on April 4, 2019. Construction is expected to be completed in 2025 (FPID 422938-5).**
- **FDOT 2023-2027 Work Program: New road construction for SR 23 (First Coast Expressway) from north of SR 16 to north of SR 21 began on March 4, 2019. Construction is expected to be completed in 2025. The new road segment is north of the study corridor but will generate more traffic to the SR 16 corridor (FPID 422938-6).**
- **FDOT 2023-2027 Work Program: SR 21 from Commercial Circle in Keystone Heights north to SR 16 is scheduled to undergo a resurfacing project. Construction on the project began on July 17, 2022. Construction is expected to be completed in July 2023 (FPID 443305-1).**

1.4 Recently Completed Studies

The Clay-Duval County Trail Feasibility Study completed in June of 2022 on the behalf of the TPO outlined the segment of SR 16 from SR 21 to CR 218 as an alternative for the trail alignment connecting SR 21 and Old Jennings Road. The study referenced the Northeast Florida Regional Multi-Use Trail Master Plan prepared August 2019 for the TPO as the original source for the trail path. This master plan included a trail along the segment of SR 16 that traverses west from CR 218 and south along SR 21 to Gold Head Branch State Park and the segment that traverses east from CR 218 to Green Cove Springs and across the St. Johns River to St. Johns County. The base trail network outlined in this document is to be incorporated in the 2045 Long Range Transportation Plan (LRTP) for the North Florida TPO region.

1.5 Scenic Highway Program

SR 16 was designated as the J.C. Penny Memorial Scenic Highway within the limits of Penny Farms. A scenic highway corridor management entity was created. A coordinator was named a board formed to manage the corridor. This board adopted a Scenic Highway Corridor Plan. The key corridor goals and objectives related to this study are summarized below:

1. ***Protect, preserve, maintain and enhance the natural, scenic, historical, cultural and educational resources along the corridor***
   - ***1.1. Preserve and maintain a canopied roadway of majestic trees and native plant species along the Corridor and loop.***
   - ***1.2. Protect ancient trees, in Corridor, from damage by utilities or future development.***
2. ***Provide aesthetically pleasing enhancements along the Corridor, including the right of way and adjacent public and private lands, to promote alternative modes of transportation and maintain optimum safety conditions for all users.***
   - ***2.1. Ensure safe, secure and enjoyable vehicular and non-vehicular traffic along Corridor.***
   - ***2.2. Promote alternative modes of transportation.***
3. ***Solicit ongoing regional community support and participation that will guarantee continued, enthusiastic involvement with the J.C. Penney Scenic Highway, both during and after the designation phase.***
   - ***3.1. Advise the public of meetings and events in the Corridor.***
   - ***3.2. Gain community support from surrounding businesses, organizations and residents.***
4. ***Develop a Corridor Management Plan for future preservation and enhancement of the J.C. Penney Scenic Highway.***
5. ***Promote the Scenic Highway Corridor of Penney Farms as a 'garden spot' in Clay County, while educating visitors as to its natural and historic resource***
6. ***Balance the promotion of the Scenic Highway Corridor, in such a way as to encourage visitors' enjoyment while ensuring privacy for residents of the Town.***

1.6 Special Events

The special events within the area include:

- **Penney Farms Historic 5K Run – annually in the spring**
- **Penney Farms Old Fashioned Farm Festival – annually in the spring**
- **Arbor Day Observance – annually between April to June**
- **Christmas Parade – annually in December**
- **National Night Out Event – annually in August**

2 Existing Roadway Conditions

This section describes the existing roadway characteristics within the project limits based on a review of aerial photography, existing records, and site observations. The constraints, existing deficiencies, and opportunities along the corridor were considered in the recommended alternative.

2.1 Functional Classification

The functional classification was identified using the Straight-Line Diagram (SLD) for the SR 16 corridor. The SLD (Section 71050000) showed that SR 16 has a functional classification of Rural Principal Arterial throughout the entirety of the corridor.

The Florida Department of Transportation (FDOT) Context Classification is C2 – Rural from SR 21 to Clark Avenue in Penney Farms and C3R – Suburban Residential within Penney Farms from Clark Avenue to Studio Road. The classification then reverts to C2 – Rural. The SLD for this segment of SR 16 is provided in Appendix A.

2.2 Typical Section

The existing typical section along SR 16 changes as you travel east through the corridor, but it consists of two undivided 12-foot travel lanes. East of SR 21, the typical section, Typical Section 1, consists of two 12-foot travel lanes, 4-foot flush paved shoulders and between 6-foot and 8-foot grass shoulders up until Clark Avenue in Penney Farms. The corridor reverts to this typical section east of Studio Road and continues through the end of the study area. In Penney Farms, between Clark Avenue and Studio Road, there exists a third typical section, Typical Section 2 which also has two undivided 12-foot travel lanes but a 7-foot paved shoulder with 2-foot curb and gutter shoulders.

2.3 Existing Right-of-Way

The 2022 Clay County Parcels dataset published by the Clay County Property Appraiser was used to measure the right-of-way width at various locations along the corridor as shown in Table 1. The right-of-way width west of Penney Farms is much wider at segments - up to 225-feet, while the right-of-way width within the Penney Farms municipality varies between 85-feet and 110-feet. East of Studio Road, there is a substantial variation in right-of-way widths, but the typical limits are around 110-feet.

Table 1. Existing Right-of-Way Width

From	To	Minimum (ft)	Typical (ft)	Maximum (ft)
SR 21	Penney Farms West City Limits	110	125	225
Penney Farms West City Limits	Studio Road	85	90	110
Studio Road	First Coast Expressway	85	110	155

2.4 Adjacent Land Uses

The Clay County existing and future land uses maps were provided by the Clay County Government GIS Department. SR 16 runs through the Penney Farms municipality and the northeast quadrant of the study area is covered by the Lake Asbury community, both of which primarily have residential and recreational land uses. As shown in Figure 2, the corridor consists of agricultural and rural/rural fringe residential land uses. The western limit of the SR 16 corridor has a parcel zoned for public ownership and occupied by the military for Camp Blanding. One parcel west of Black Creek is designated for private services.

The future land uses are shown in Figure 3. The corridor will remain primarily agricultural rural/rural fringe residential in its land uses directly about the SR 16 corridor. The agricultural land use will be zoned as agricultural/residential in the future.

The planned developments around SR 16 were analyzed. The Black Creek Water Resource Development Intake Pump Station was found to be planned directly next to the bridge at Black Creek along the corridor. This planned development can be seen in Figure 4.

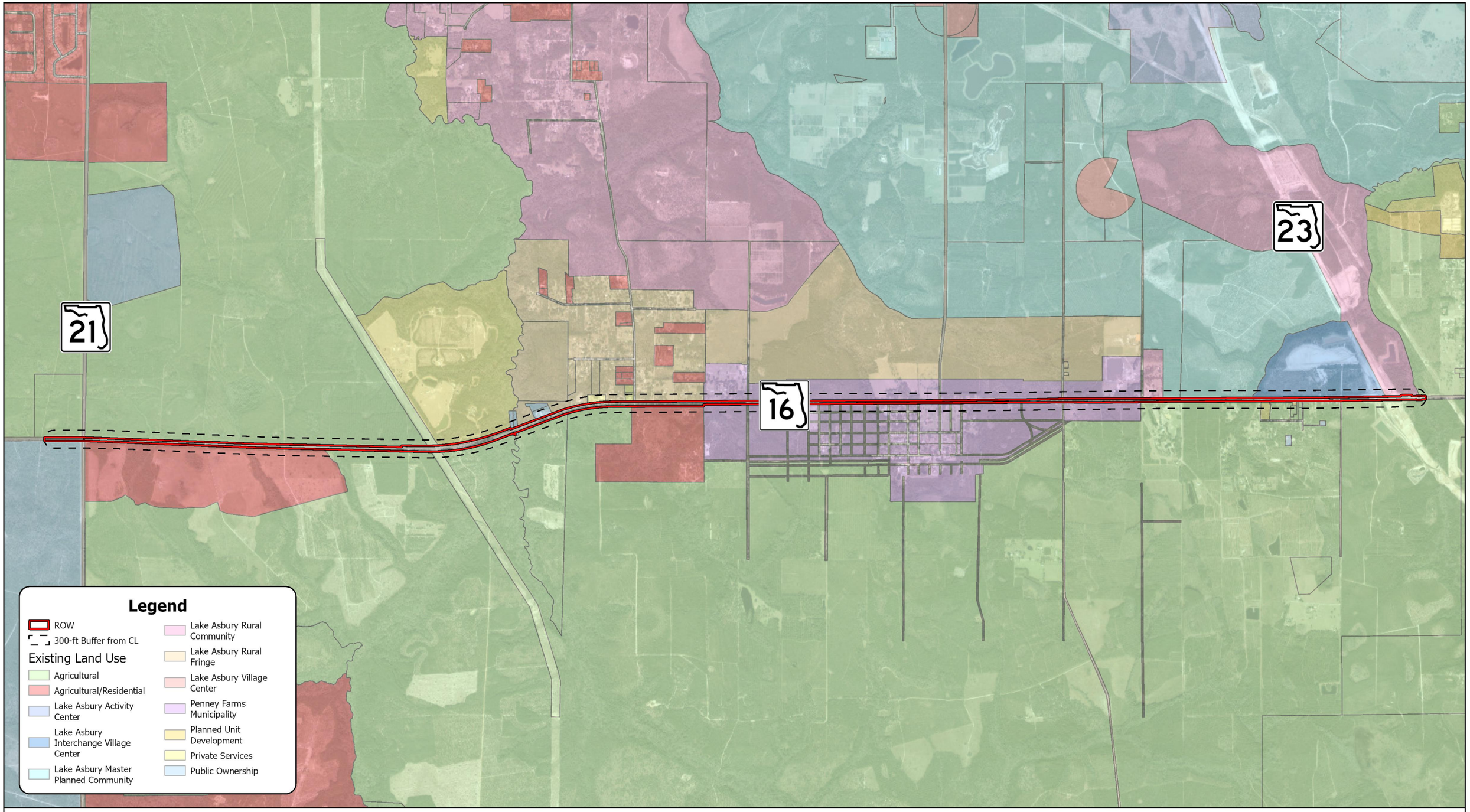

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Figure 2 - SR 16 Corridor Study
Existing Land Use

N

0 1,500 3,000 4,500 6,000 Feet

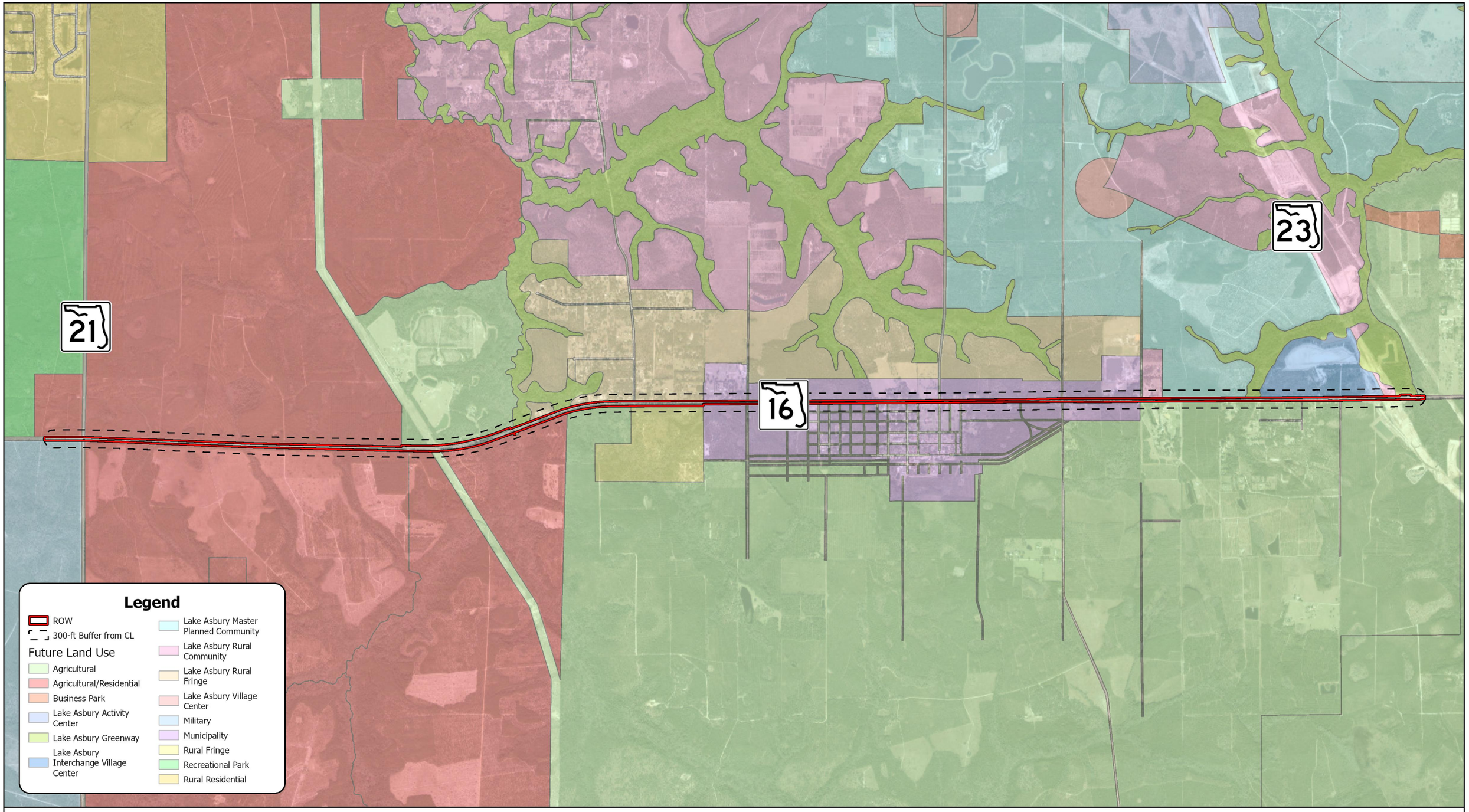

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Figure 3 - SR 16 Corridor Study
Future Land Use

N

0 1,500 3,000 4,500 6,000 Feet

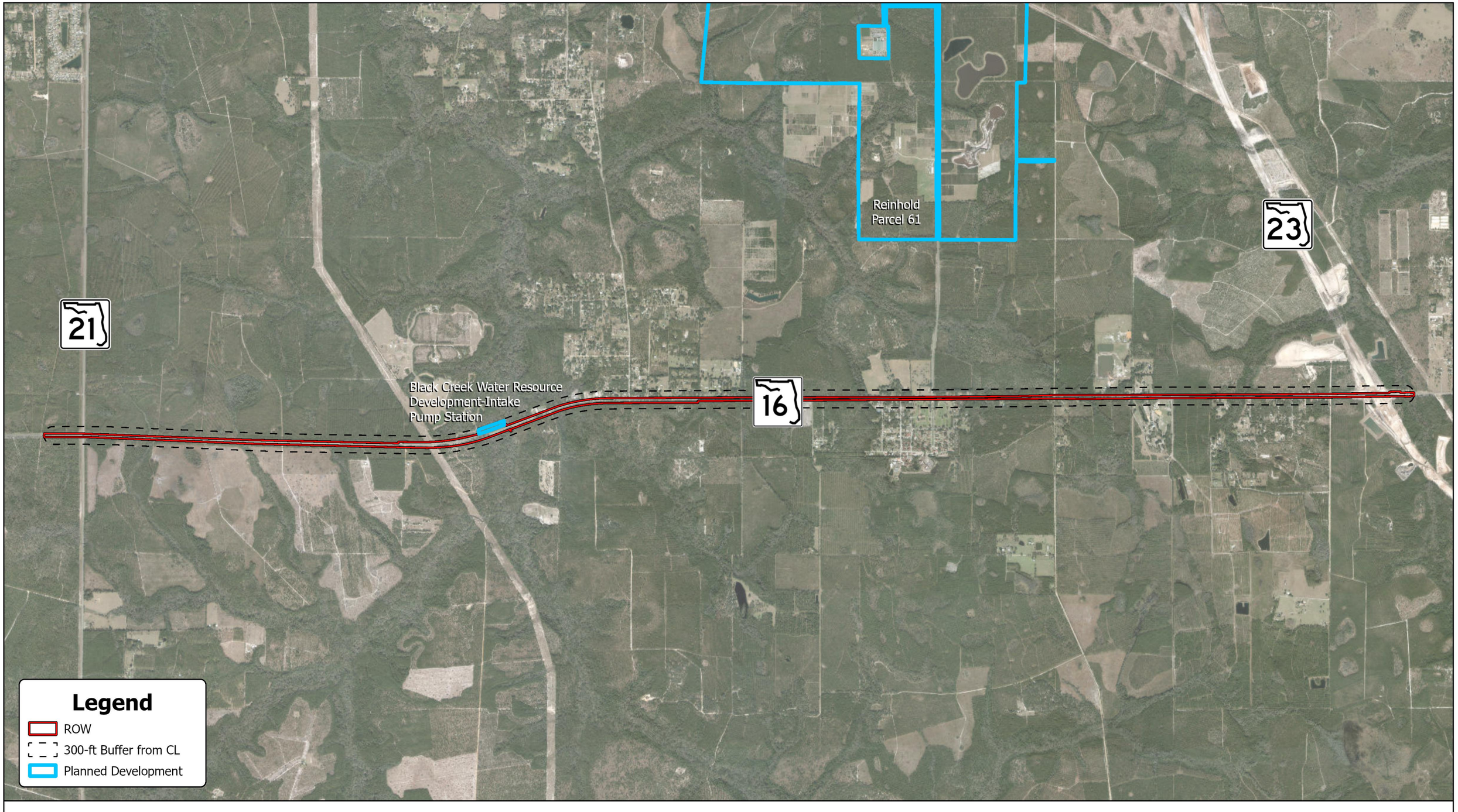

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Figure 4 - SR 16 Corridor Study
Planned Development

N

0 1,500 3,000 4,500 6,000 Feet

2.5 Posted Speed Limit

The posted speed limit of SR 16 varies throughout the study corridor according to the signalized intersections. At the western study limits, the posted speed decreased to 45 mph at the SR 21 intersection. East of SR 21, the speed increases to 55 mph and then 60 mph. This speed limit occurs until east of Kentucky Avenue when the speed decreases back down to 55 mph. The speed limit is 45 mph through Penney Farms. East of Studio Road, the speed increases again to 55 mph to the east limit of the study at SR 23.

2.6 Multimodal Accommodations

Sidewalks exist throughout the corridor primarily within the Penney Farms city limits. South of SR 16, the 5-foot sidewalk begins at the west city limits west of Etheleen Court and continues to the east city limits at Paso Fino Road. North of SR 16, the 5-foot sidewalk occurs only between Clark Avenue and Lewis Avenue. Another 5-foot sidewalk segment exists east of the Penney Farms city limits, south of SR 16, between Marshall Lane and Pier Station Road East. Bicycle lanes are not provided along the SR 16 corridor.

2.7 Intersections

There are 23 intersections within the study corridor, two of which are controlled by a traffic signal. The remaining 21 intersections are unsignalized and allow turns onto SR 16 through non-restrictive medians on the undivided highway. Table 2 below describes the existing intersections. There are curb ramps that do not meet current criteria. Detectable warning mats and pavement markings are in poor condition or do not meet current standards.

Table 3 summarizes the features at each signalized intersection. The most common deficiencies seen at the signalized intersections were signal heads with no retroreflective backplates.

Table 2. Existing Intersection Features

Intersection	Traffic Control	Left-Turn Lanes	Right-Turn Lanes	Crosswalks	Notes
SR 21	Signalized	NB, SB, EB, WB	None	None	None
Kersey Road	Uncontrolled	None	None	None	None
Sandhill Road	Uncontrolled	None	None	None	None
Seamark Ranch Road	Minor Stop	None	None	None	None
Thunder Road	Minor Stop	None	WB	None	Faded markings, no markings for WB right turn
Jennifer Lane	Uncontrolled	None	None	None	None
Whisper Trail	Uncontrolled	None	None	None	None
Etheleen Court	Uncontrolled	None	None	None	None
Kentucky Avenue	Minor Stop	None	None	S	Missing detectable warning on SW corner, faded markings, standard crosswalk style
Palmetto Avenue	Minor Stop	None	EB	S	Non-uniform detectable warning on SE corner, faded markings, standard crosswalk style, no markings for EB right turn
Haymon Avenue	Minor Stop	None	None	S	Faded markings, standard crosswalk style
Clark Avenue	Minor Stop	None	None	S	Non-uniform detectable warning on SW corner, standard crosswalk style, no sidewalk connection E
Lewis Avenue	Minor Stop	None	None	S	Standard crosswalk style, NB lane wide enough to separate to left- and right-turn lanes but no existing markings
Wilbanks Avenue	Minor Stop	None	None	None	Missing sidewalk connection S

Intersection	Traffic Control	Left-Turn Lanes	Right-Turn Lanes	Crosswalks	Notes
CR 218 / Poling Boulevard	Signalized	NB	None	N, S, E, W	Faded markings, standard crosswalk style
Studio Road	Minor Stop	None	None	S	Standard crosswalk style
Saunders Road / Little Dairy Road	Minor Stop	None	None	S	Missing detectable warning on SW & SE corners, faded markings, standard crosswalk style
Paso Fino Road	Minor Stop	None	None	None	Missing detectable warning on SW corner, no markings for stop bar
Marshall Lane	Uncontrolled	None	None	None	Missing detectable warning on SE corner
Pier Station Road W	Minor Stop	None	EB	None	Missing detectable warning on SW & SE corners, missing sidewalk connection S, faded markings
Pier Station Road E	Minor Stop	None	EB	None	Missing detectable warning on SW corner, faded markings
Juno Drive	Uncontrolled	None	None	None	None
Gary Road	Minor Stop	None	None	None	No markings for stop bar

Table 3. Signalized Intersection Features

Intersection	Structure Type	Detection Type	Retroreflective Backplates	SR 16 Left-Turn Type	Side Street Left-Turn Type
SR 21	Diagonal Span Wire	Loops	No	Protected-Permissive	Protected-Permissive
CR 218 / Poling Boulevard	Diagonal Span Wire	Video & Loops NB	No	Permissive	Permissive

2.8 Known Environmental Features

The existing environmental features in the vicinity of the study corridor were reviewed using the datasets provided by the Florida Geographic Data Library (FGDL) and other sources mentioned in the following subsections. A 300-foot study area buffer was used to identify the environmental features along the corridor. The corridor was extended for 0.25 miles beyond the study limits of SR 21 and the First Coast Expressway.

Soils

The soils present along the SR 16 corridor are comprised of Fine Sands. Table 4 below summarizes the respective soil characteristics for the soils found along the corridor, as provided by the United States Department of Agriculture (USDA) Natural Resource Conservation Service Custom Soil Resource Report for Clay County and the area of interest for the SR 16 corridor with a 300-foot surrounding buffer. The Custom Soil Resource Report is shown in Appendix B.

Wetlands and Surface Water

The SR 16 corridor runs across Black Creek and its extensions. Otherwise, surface water is not present near much of the project limits, as was shown by the dataset retrieved from the U.S. Fish & Wildlife Service. Surface waters near SR 16 are classified as Freshwater Pond or Lake, with short stretches of Riverine waters. Wetlands are present throughout the corridor, but primarily near the bridge over Black Creek between Seamark Ranch Road and Thunder Road. Wetlands are classified as either Freshwater Forested/Shrub Wetland or Freshwater Emergent Wetland. The wetlands and surface water in the corridor are shown in Figure 5.

The project is in wetland mitigation basin 4 – Northern St. Johns River and Northern Coastal. Floodplains

Data provided by the Federal Emergency Management Agency (FEMA) shows that the SR 16 corridor crosses floodplains. The western segment near Camp Blanding lies within FEMA Flood Zone A, and the roadway between Seamark Ranch Road and Thunder Road, as well as a part east of Saunders Road falls within FEMA Flood Zone AE. These floodplains are Special Flood Hazard Areas and are subject to a 1% chance of water levels meeting or exceeding the Base Flood Elevation. An analysis of the 300-foot study area buffer showed that approximately 27 acres of land lie within the Zone AE and Zone A Floodplains. The floodplains in the corridor are shown in Figure 6.

Contamination Sites

Contamination sites exist along the SR 16 study corridor which were found by analyzing datasets provided by the Florida Department of Environmental Protection in the FGDL. Within the 300-foot study area buffer, the contamination sites were classified as Petroleum Contamination Monitoring Discharges (1 site) or Environmental Restoration Integrated Cleanup Sites (1 site). There were no existing Brownfield sites in the surrounding area. The known contamination sites in the corridor are shown in Figure 7.

Table 4. Soil Data

Map Unit Symbol	Name	Percent of Corridor	Slope	Drainage Class	Runoff Class
1	Albany Fine Sand	2.7%	0-5%	Somewhat Poorly Drained	Negligible
2	Blanton Fine Sand	3.6%	0-5%	Well Drained	Negligible
3	Hurricane Fine Sand	25.9%	0-5%	Somewhat Poorly Drained	Negligible
5	Penney Fine Sand	8.0%	0-5%	Excessively Drained	Negligible
6	Mandarin Fine Sand	4.9%	0-2%	Somewhat Poorly Drained	Low
7	Centenary Fine Sand	3.7%	0-5%	Moderately Well Drained	Negligible
8	Sapelo Fine Sand	4.9%	0-2%	Poorly Drained	High
9	Leon Fine Sand	4.1%	0-2%	Poorly Drained	Ranges*
10	Ortega Fine Sand	7.9%	0-5%	Moderately Well Drained	Negligible
11	Allanton and Rutlege Mucky Fine Sands	0.2%	0-2%	Very Poorly Drained	Negligible
12	Surrency Fine Sand	0.2%	0-1%	Very Poorly Drained	Negligible
15	Quartzipsaments	0.1%	0-5%	Well Drained	Very Low
18	Ridgewood Fine Sand	7.4%	0-5%	Somewhat Poorly Drained	Negligible
19	Osier Fine Sand	0.0%	0-2%	Poorly Drained	Negligible
22	Pelham Fine Sand	1.0%	0-2%	Poorly Drained	High
29	Rutlege-Osier Complex	3.9%	0-2%	Very Poorly Drained	Very High
31	Pottsburg Fine Sand	14.7%	0-2%	Poorly Drained	Negligible
32	Blanton Fine Sand	0.4%	5-8%	Moderately Well Drained	Very Low
34	Penney Fine Sand	0.8%	5-8%	Excessively Drained	Very Low
36	Ortega Fine Sand	0.7%	5-8%	Moderately Well Drained	Very Low
37	Ridgewood Fine Sand	2.1%	5-8%	Somewhat Poorly Drained	Very Low
39	Meadowbrook Sand	0.3%	0-2%	Poorly Drained	Very High
40	Ousley Fine Sand	0.6%	0-2%	Somewhat Poorly Drained	Negligible
42	Osier Fine Sand	1.4%	0-2%	Poorly Drained	Negligible
46	Plummer Fine Sand	0.4%	0-2%	Very Poorly Drained	Negligible
65	Meadowbrook Sand	0.1%	0-2%	Poorly Drained	Negligible

*Information not found in Custom Soil Resource Report; web research suggests it ranges low to high

Source: Custom Soil Resource Report for Clay County, Florida – SR 16 Corridor 300ft Buffer

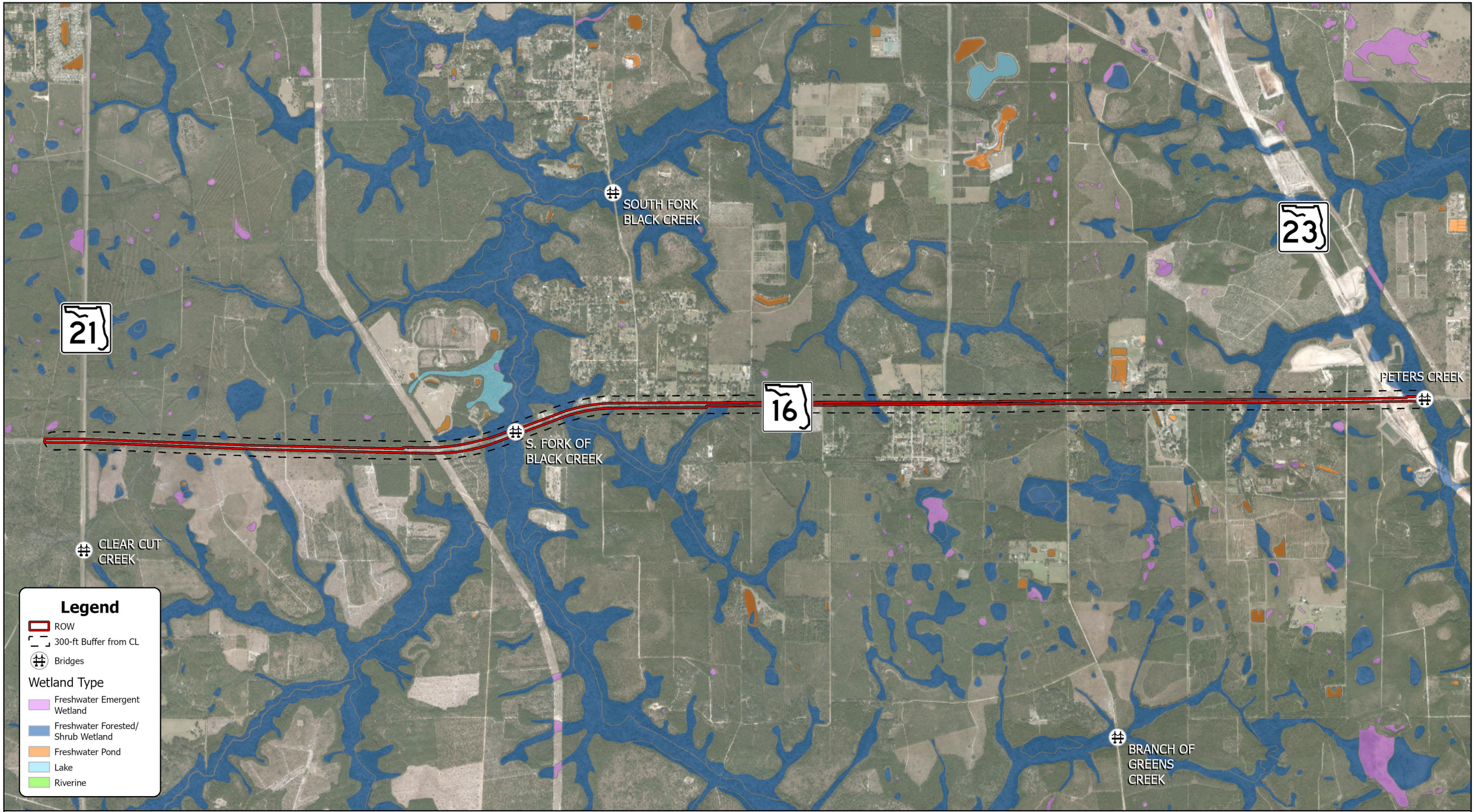

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Figure 5 - SR 16 Corridor Study
Wetlands and Surface Water

N

0 1,500 3,000 4,500 6,000 Feet

SOUTH FORK BLACK CREEK

21

23

16

PETERS CREEK

S. FORK OF BLACK CREEK

CLEAR CUT CREEK

BRANCH OF GREENS CREEK

Legend

- ROW
- 300-ft Buffer from CL
- Bridges

FEMA Flood Zone

- Zone A
- Zone AE
- Zone AE FLOODWAY
- Zone X - Areas of 0.2% annual chance flood.
- Zone X - Area determined to be outside the 0.2% annual chance

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Figure 6 - SR 16 Corridor Study Floodplains

N

0 1,500 3,000 4,500 6,000 Feet

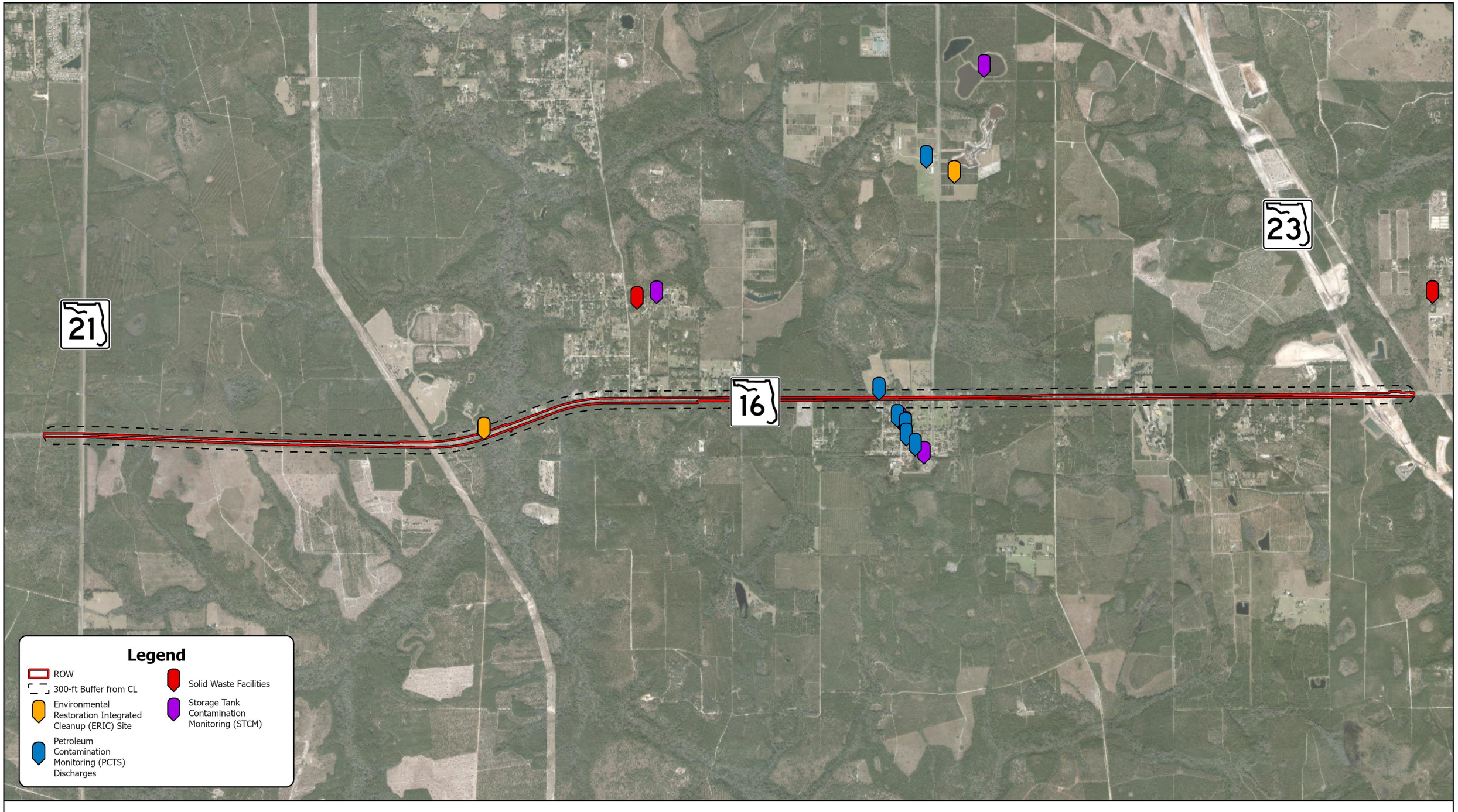

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Figure 7 - SR 16 Corridor Study
Potential Contamination Sites

N

0 1,500 3,000 4,500 6,000 Feet

Archeological and Historic Resources

The Historical Structure Locations dataset, published by the Bureau of Archeological Research in the FGDL, was reviewed to identify the presence of historical resources within the 300-foot study area buffer on the SR 16 corridor. There are four historic structures present within the study area buffer, although the Penney Farms municipality contains more in the vicinity. Their locations are displayed in Figure 8 and summarized below.

- **Two of the structures within the study area buffer were found to be private residences, one is an abandoned/vacant Colonial Inn and one is the flag pole and base at the entrance to Penney Farms.**
- **The Colonial Inn structure is the only one eligible for the National Register of Historic Places. It is also the only potential or contributor to a National Register District.**

The dataset for historical bridges was analyzed, and one was found to be located at the east end of the study corridor limits at Peters Creek. The historical and archaeological resource groups and cultural resource field surveys datasets were assessed for the SR 16 corridor. Field surveys were previously conducted within the area related to historical and cultural resources, and a historical resource group for the Memorial Home Community Historic District exists within the Penney Farms city limits. The Western Railroad Grade runs mostly parallel to SR 16 and crosses the corridor east of Saunders Road.

Conservation Areas

The Department of Environmental Protection (DEP) developed the Florida SOLARIS Conservation Lands, Easements and Recreation (CLEAR) database which has presence throughout portions of study corridor. West of SR 21, there is a parcel north of SR 16 that is the Northeast Florida Timberlands and Watershed Reserve and a parcel south of SR 16 that is the Camp Blanding Joint Training Center, both of which are considered Conservation Owned Lands and near to the study area. Within the 300-foot study area buffer, there are also three parcels near the SR 16 and Seamark Ranch Road intersection that are classified as Conservation Easements, two of which are owned by Clay County and the other is owned by the St. Johns River Water Management District. The conservation areas and their locations can be seen in Figure 9.

Parks and Recreation

The FGDL dataset for parks and recreational facilities showed that no state parks are present near the study corridor, however, there are county and municipality parks near SR 16. Recreational facilities in the Town of Penney Farms include the Penney Farms Public Playground, adjacent to Palmetto Avenue, and the Penney Farms Tennis Complex & Community Park, residing on Clark Avenue. A recreational facility called Pier Station Park is at the end of Pier Station Road East. No upcoming trail projects were found in the study area.

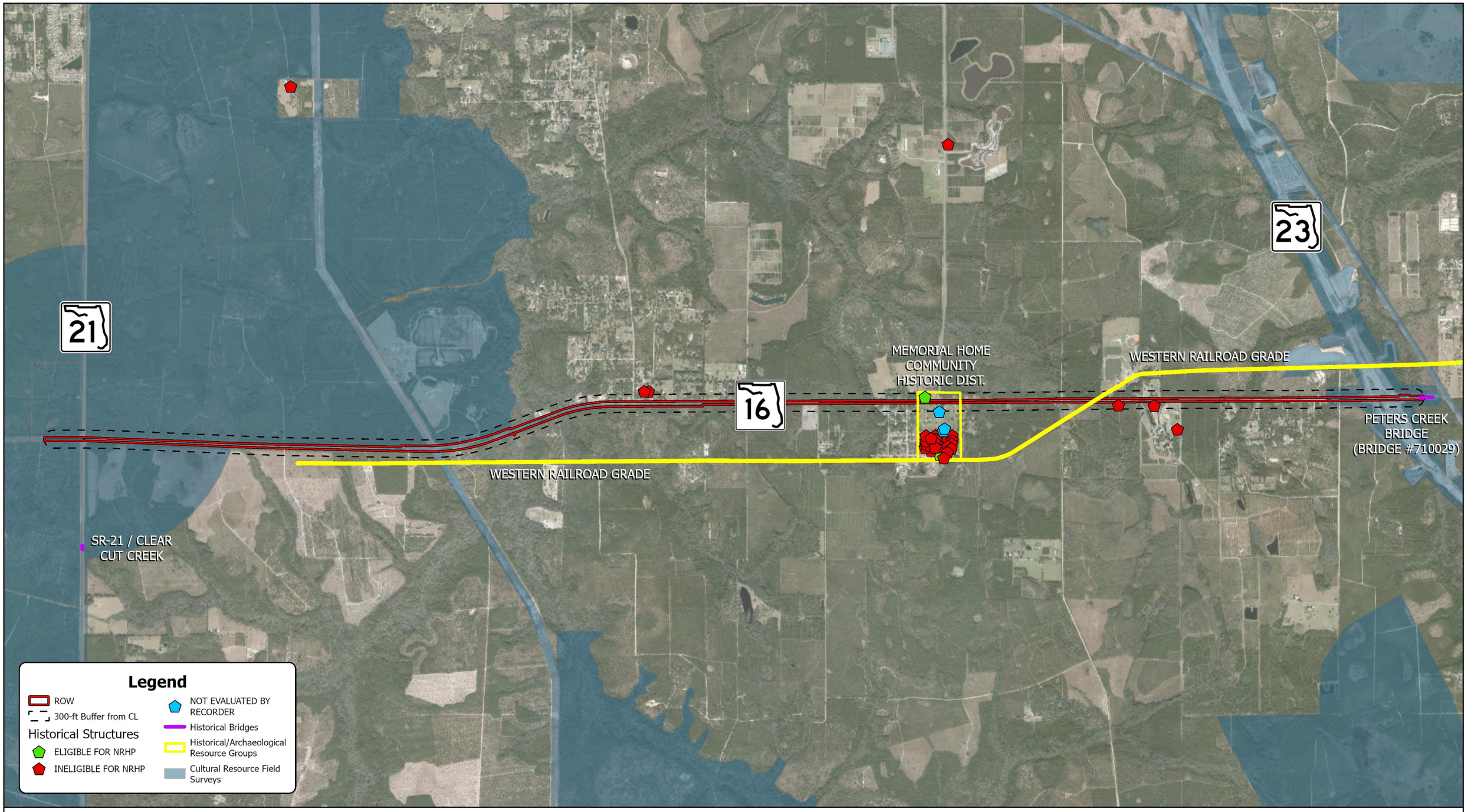

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Figure 8 - SR 16 Corridor Study
Archaeological and Historical Sites

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0 1,500 3,000 4,500 6,000 Feet

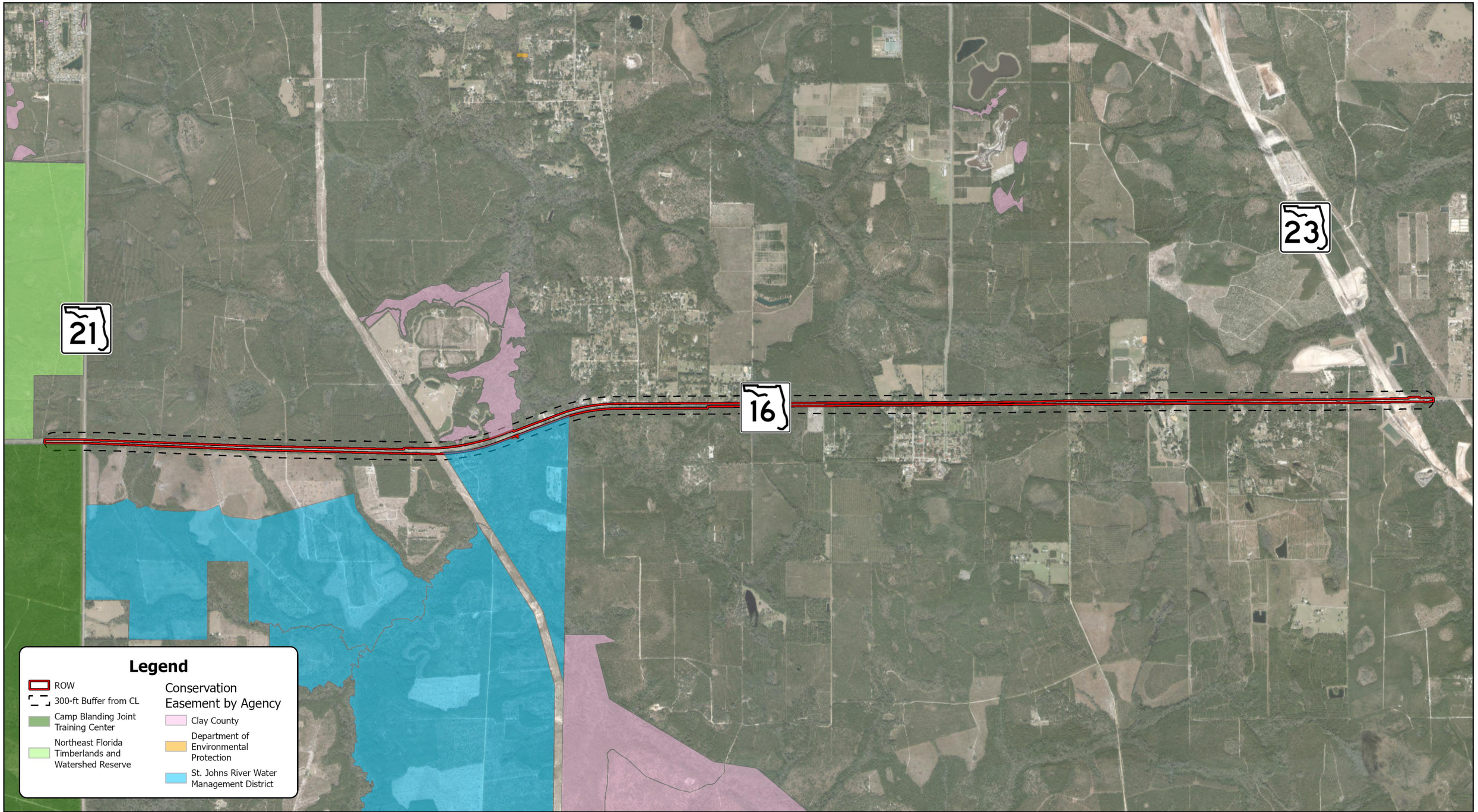

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Figure 9 - SR 16 Corridor Study
Conservation Areas

N

0 1,500 3,000 4,500 6,000 Feet

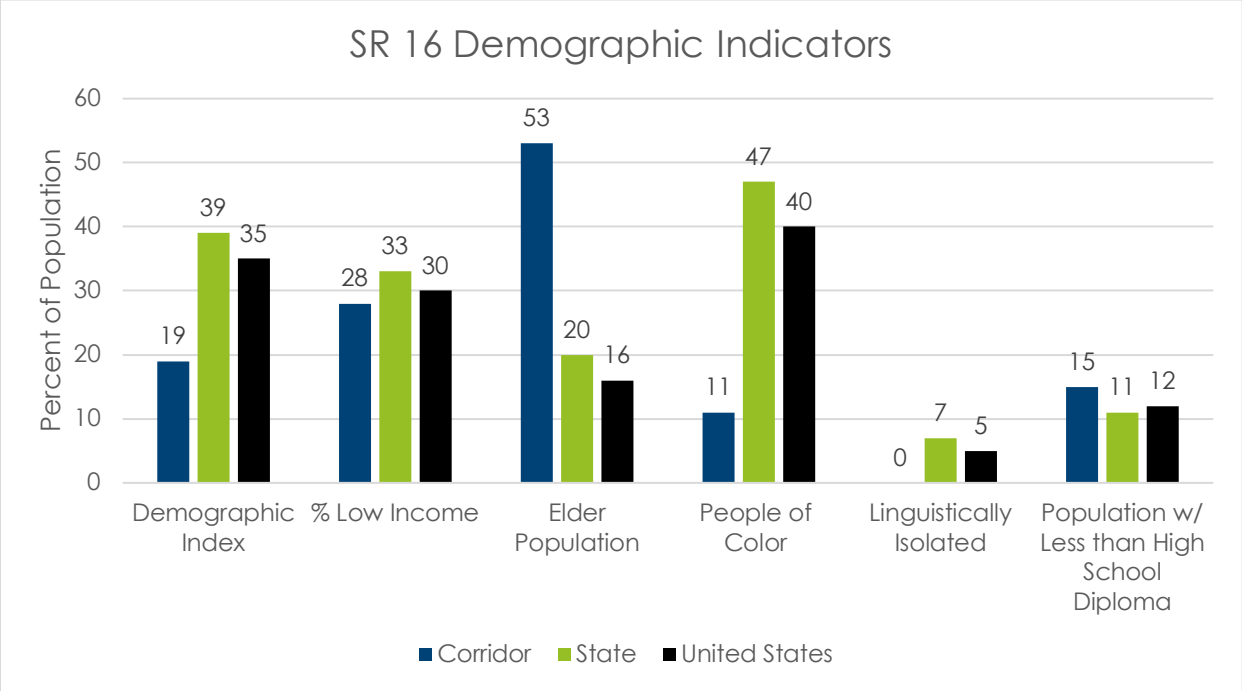
2.9 Demographics and Underserved Populations

Six demographic indicators for SR 16 were summarized using data provided by the United States Environmental Protection Agency (EPA) EJSCREEN tool. The EJSCREEN tool is an environmental justice mapping and screening tool developed by the EPA to combine nationally consistent environmental and demographic data. The tool is available at https://www.epa.gov/ejscreen. The EJSCREEN report prepared for this corridor is shown in Appendix C.

Figure 10 summarizes the percentage of the population living along the corridor within a 0.25-mile buffer. Four of the six available demographic indicators are below the statewide and nationwide targets. The percentage of citizens living along SR 16 who hold less than a high school education is above the statewide average by 4%.

The percentage of citizens living along SR 16 that are among the elder population is about 53%, well above the state average of 20%. This is due to the proximity to the Penney Farms retirement community.

Figure 10. Summary of Demographic Indicators Along SR 16 Corridor



Source: US EPA Environmental Justice Screening and Mapping Tool

3 Safety Analysis

Crash data for the SR 16 corridor was obtained from the Signal 4 Analytics (S4A) database. The crash trends from January 1, 2016, to December 31, 2021, were analyzed. The corresponding individual crash reports were reviewed to verify the accuracy of the coded data.

A total of 192 crashes were reported for the six-year period. The crashes included 47 injury crashes, resulting in 81 injuries, and five fatal crashes, resulting in six fatalities. There were 32 crashes reported in 2016, 28 crashes in 2017, 32 crashes in 2018, 43 crashes in 2019, 28 crashes in 2020 and 29 crashes in 2021. The most commonly occurring types of crashes within the SR 16 corridor include rear-end crashes, run-off-road crashes and "other" crashes. The locations below were found to have experienced crash frequencies which exceeded three crashes per year and will be discussed in greater detail.

- SR 16 at SR 21 – Signalized
- SR 16 at CR 218 - Signalized

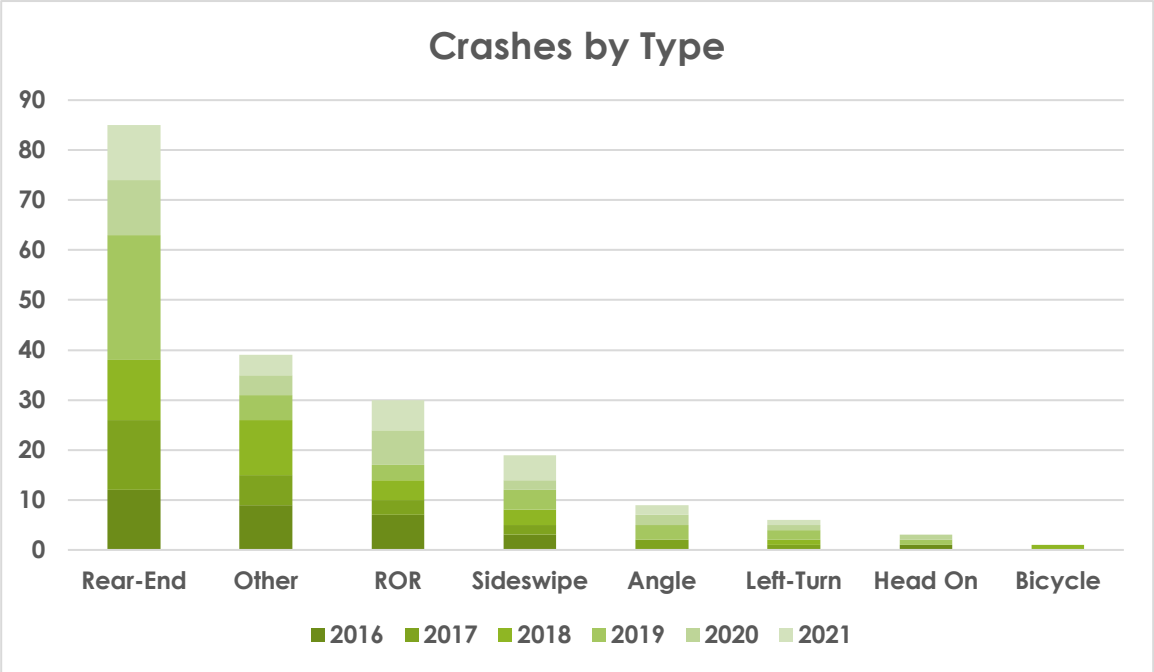
Table 5 summarizes the crashes reported at each signalized intersection. Figure 11 through Figure 14 depict the overall trends of characteristics surrounding crashes occurring within the SR 16 corridor. A crash location map is presented in Figure 15. The corresponding crash data tables are included in Appendix D.

Table 5. Summary of Crashes by Signalized Intersection

Intersection	2016	2017	2018	2019	2020	2021	Total
SR 16 at SR 21	3	8	5	11	3	6	36
SR 16 at CR 218 / Poling Boulevard	3	4	7	7	5	3	29

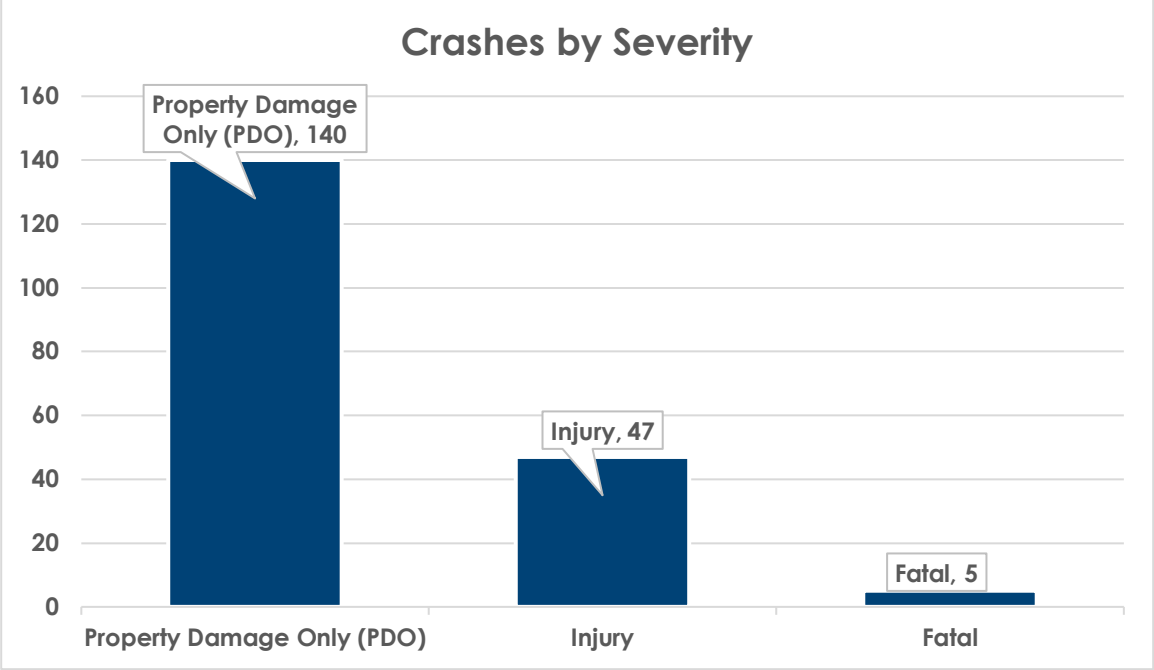
Source: Signal 4 Analytics

Figure 11. Summary of Observed Crashes by Type



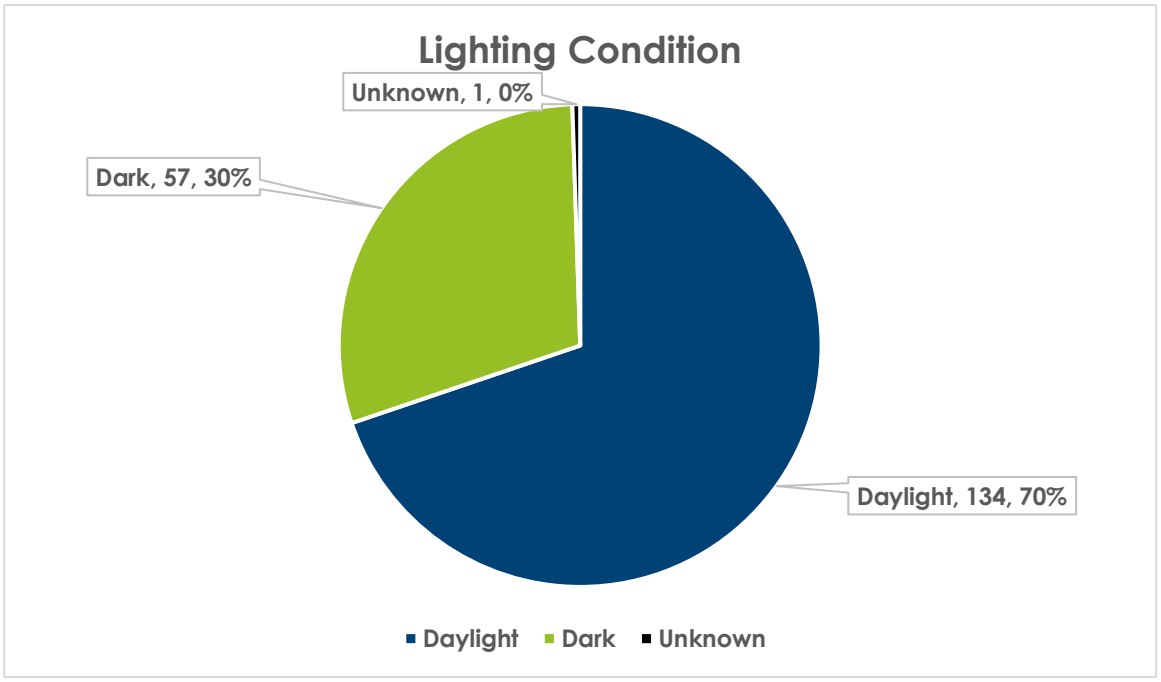
Source: Signal 4 Analytics

Figure 12. Summary of Reported Crashes by Severity



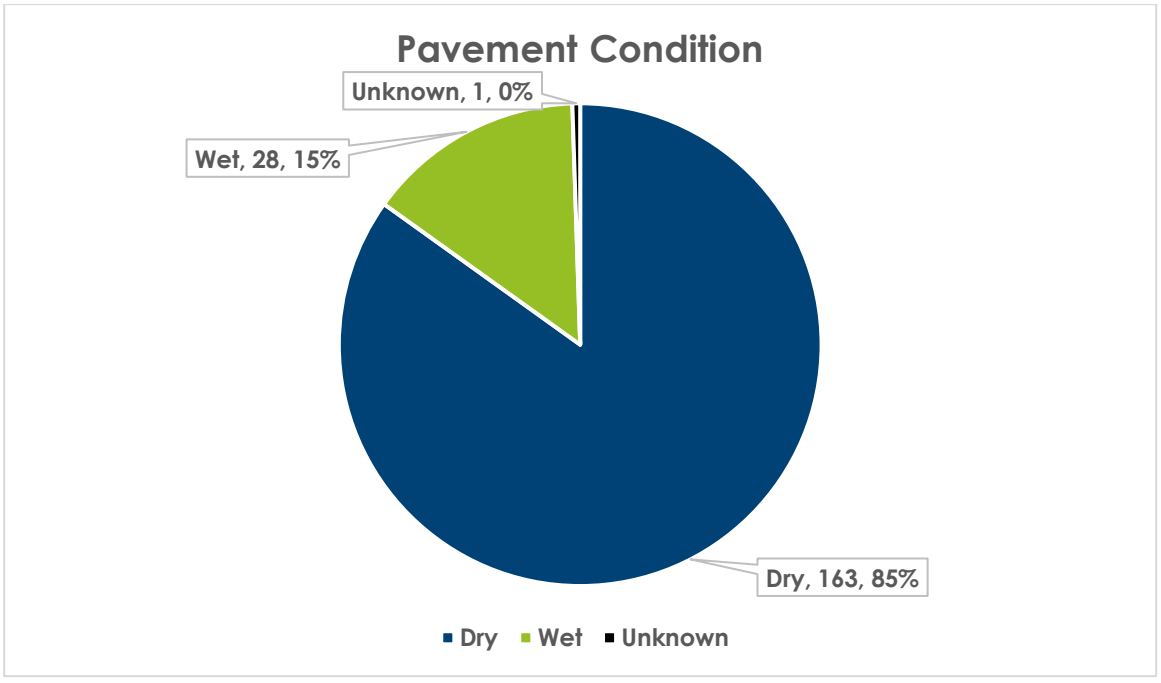
Source: Signal 4 Analytics

Figure 13. Summary of Observed Crashes by Lighting Condition

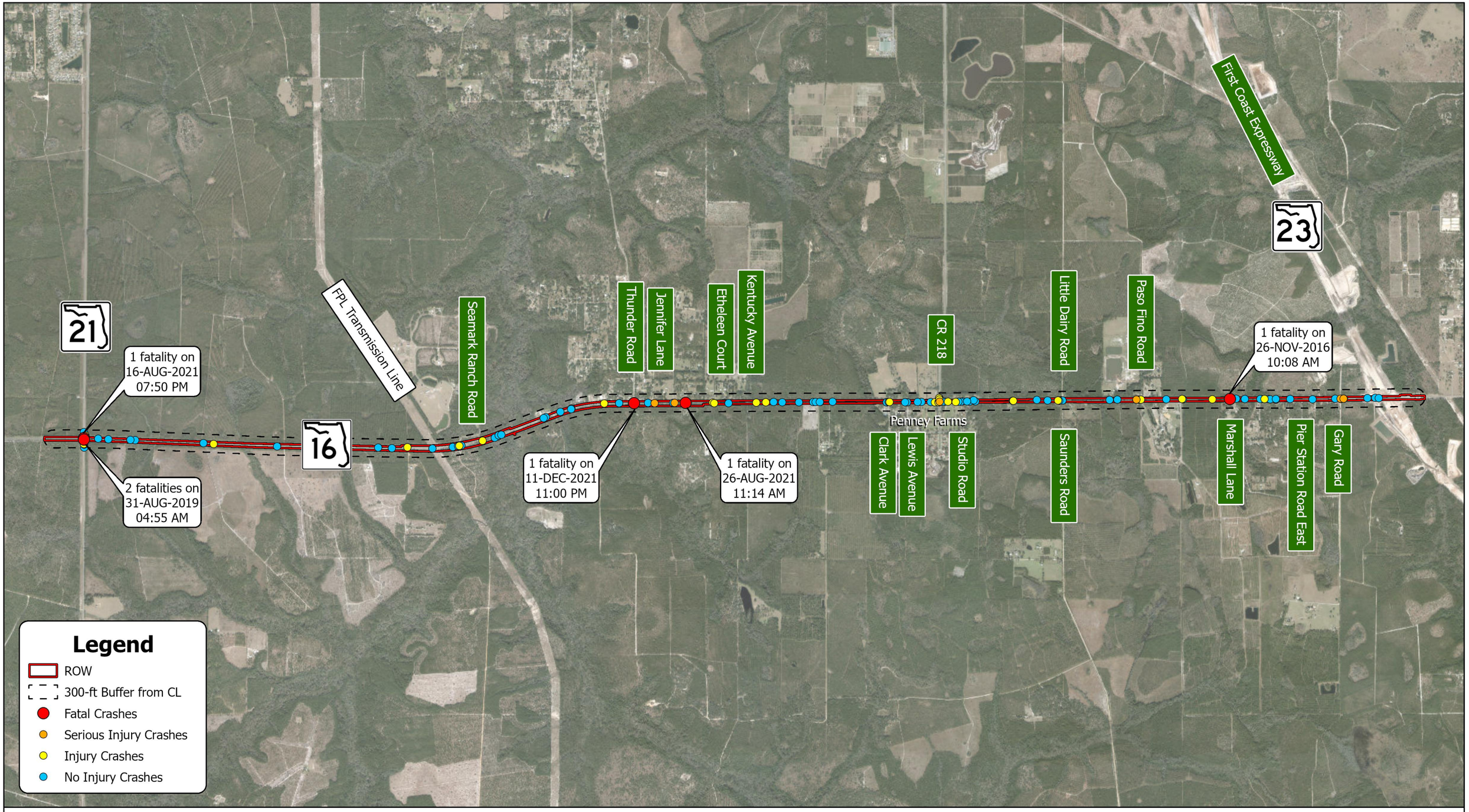


Source: Signal 4 Analytics

Figure 14. Summary of Observed Crashes by Pavement Condition



Source: Signal 4 Analytics



NORTH FLORIDA TPO

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Figure 15 - SR 16 Corridor Study Crash Locations

N

0 1,500 3,000 4,500 6,000 Feet

The crash reports for the five fatal crashes from the Signal 4 Analytics database were analyzed to evaluate the contributing causes to the crashes.

1. **November 26, 2016: a passenger vehicle traveling westbound on SR 16 near Marshall Lane drifted across the center line into the eastbound lane and collided with an eastbound vehicle head on. The driver of the eastbound vehicle (84 years old) suffered from respiratory failure. It is suspected that the driver of the westbound vehicle had a mental illness as a result of their age (77 years old) and was not found culpably negligent. The crash occurred on dry pavement during daylight conditions.**
2. **August 31, 2019: a passenger vehicle traveling westbound on SR 16 entered the intersection at SR 21 turning left simultaneously as a pickup truck traveling northbound on SR 21 entered the intersection driving straight ahead, resulting in an angle crash. The westbound vehicle ended up engulfed in flames, and both the driver (56 years old) and passenger died due to the crash. The crash occurred on dry pavement under dark, unlit conditions.**
3. **August 16, 2021: a pickup truck traveling westbound on SR 16 ran a red light at the SR 21 intersection and collided into the left side of a sport utility van traveling southbound on SR 21 through the intersection. The driver of the southbound vehicle (58 years old) later died from their injuries as a result of the crash. The crash occurred on wet pavement and in dusk lighting conditions.**
4. **August 26, 2021: a pickup truck traveling westbound on SR 16 crossed the center line and the eastbound travel lane and entered the south grass shoulder, striking a wooden fence post before being wedged between a large tree to the left and a large wooden utility pole to the right. The driver was not using their seatbelt and was also proven to have multiple drugs in their system at the time of the crash. The crash occurred east of Whisper Trail on dry pavement during daylight conditions.**
5. **December 11, 2021: a passenger van traveling southbound on Thunder Road did not stop at the stop sign at the SR 16 intersection, traveled across SR 16 and struck a wooden post and gate before striking a large tree. The driver (59 years old) was not restrained in the vehicle by his seatbelt at the time of the crash, resulting in multiple blunt force injuries causing his death. The crash occurred on dry pavement under dark, unlit conditions.**

Overall, the five fatal crashes resulted in six fatalities throughout the SR 16 project corridor. By calculating the vehicle miles traveled (VMT) over the six years of the crash study, a fatality rate of 3.44 deaths per 100 million VMT was found. The project fatality rate was over two times the statewide fatality rate of 1.60 deaths per 100 million VMT. The calculations for the fatality rate can be found in Appendix F.

3.1 SR 16 at SR 21

The crashes that occurred within the influence area of the intersection of SR 16 at SR 21 were analyzed. The following observations were made:

- **Fourteen crashes were reported to have occurred northbound, 10 occurred southbound, seven occurred westbound and five occurred eastbound.**

- **The predominant crash types at this intersection included 20 rear-end crashes, six angle crashes and three left-turn crashes.**
- **Of the six angle crashes, three occurred in the westbound direction and one crash occurred in each of the northbound, southbound and eastbound directions.**
- **All left-turn crashes were at-fault in the westbound direction. The westbound approach to this intersection operates with protected-permissive left-turn phasing.**
- **Approximately 19% (seven) of the crashes at this intersection occurred under dark lighting conditions and approximately 25% (nine) occurred on wet pavement.**
- **Three fatalities and 13 injuries resulted from crashes at this intersection.**

3.2 SR 16 at CR 218 Poling Boulevard

The crash data reported to have occurred within the influence area of SR 16 at CR 218 (Poling Boulevard) was analyzed. The following observations were made:

- **Twelve crashes were reported to have occurred westbound, nine occurred eastbound and eight occurred southbound.**
- **The predominant crash types occurring at this intersection included 18 rear-end crashes, four sideswipe crashes and three left-turn crashes.**
- **All left-turn crashes were at-fault in the southbound direction. The southbound approach to this intersection operates with permissive left-turn phasing.**
- **Approximately 17% (five) of the crashes at this intersection occurred under dark lighting conditions and approximately 7% (two) occurred on wet pavement.**
- **Fourteen injuries resulted from crashes at this intersection.**

3.3 Economic Impact of Observed Crashes

As part of its method for analyzing the economic impacts of crashes along a given segment of roadway, the FDOT assigns comprehensive crash costs to the various crash severities. The costs are listed in FDOT Design Manual Chapter 122 – Design Exceptions and Design Variations and are summarized in Table 6.

Table 6. FDOT KABCO Crash Costs

Crash Severity	Comprehensive Crash Cost
Fatal (K)	$10,890,000
Severe Injury (A)	$888,030
Moderate Injury (B)	$180,180
Minor Injury (C)	$103,950
Property Damage Only (O)	$7,700

Source: FDOT Design Manual 2023

The average annual economic impact of crashes occurring in the SR 16 study corridor was based on the six-year crash history from the S4A database and the Comprehensive Crash Costs published in the FDOT Design Manual. The crash severity categories available in the S4A differ from the FDOT KABCO categories. The following assumptions were made:

- Crashes listed as "Fatal" in S4A equated to a "Fatal" KABCO severity
- Crashes listed as "Incapacitating" in S4A equated to a "Severe Injury" KABCO severity
- Crashes listed as "Non-Incapacitating" in S4A equated to a "Moderate Injury" KABCO severity
- Crashes listed as "Possible Injury" in S4A equated to a "Minor Injury" KABCO severity
- Crashes listed as "Property Damage Only" in S4A equated to a "Property Damage Only" KABCO severity

Table 7 summarizes the average annual costs of observed crashes along US 17.

Table 7. Average Annual Crash Costs within Study Area

Crash Severity	Comprehensive Crash Cost	Total Observed Crashes 2016-2021	Total Cost	Average Annual Cost
Fatal (K)	$10,890,000	5	$54,450,000	$9,075,000
Severe Injury (A)	$888,030	8	$7,104,240	$1,184,040
Moderate Injury (B)	$180,180	19	$3,423,420	$570,570
Minor Injury (C)	$103,950	20	$2,079,000	$346,500
Property Damage Only (O)	$7,700	140	$1,078,000	$179,667
Total		192	$68,134,660	$11,355,777

4 Traffic Analysis

4.1 Existing Conditions

Traffic counts were conducted at the two signalized intersections in Table 3 November 1, 2022, for the periods from 6 – 10 a.m. and from 3 – 7 p.m. The AM peak hour for the study corridor was determined to occur from 6:30 – 7:30 a.m., and the PM peak hour was determined to occur from 4:30 – 5:30 p.m.

The Peak Season Conversion Factor (PSCF), shown in Appendix F, of 1.03 for Clay County was then applied to convert each intersection's turning movement counts into existing peak season demand. Appendix E shows the collected turning movement counts, while volume development worksheets are provided in Appendix G. The summary is displayed in Figure 16.

4.1 Traffic Forecasting

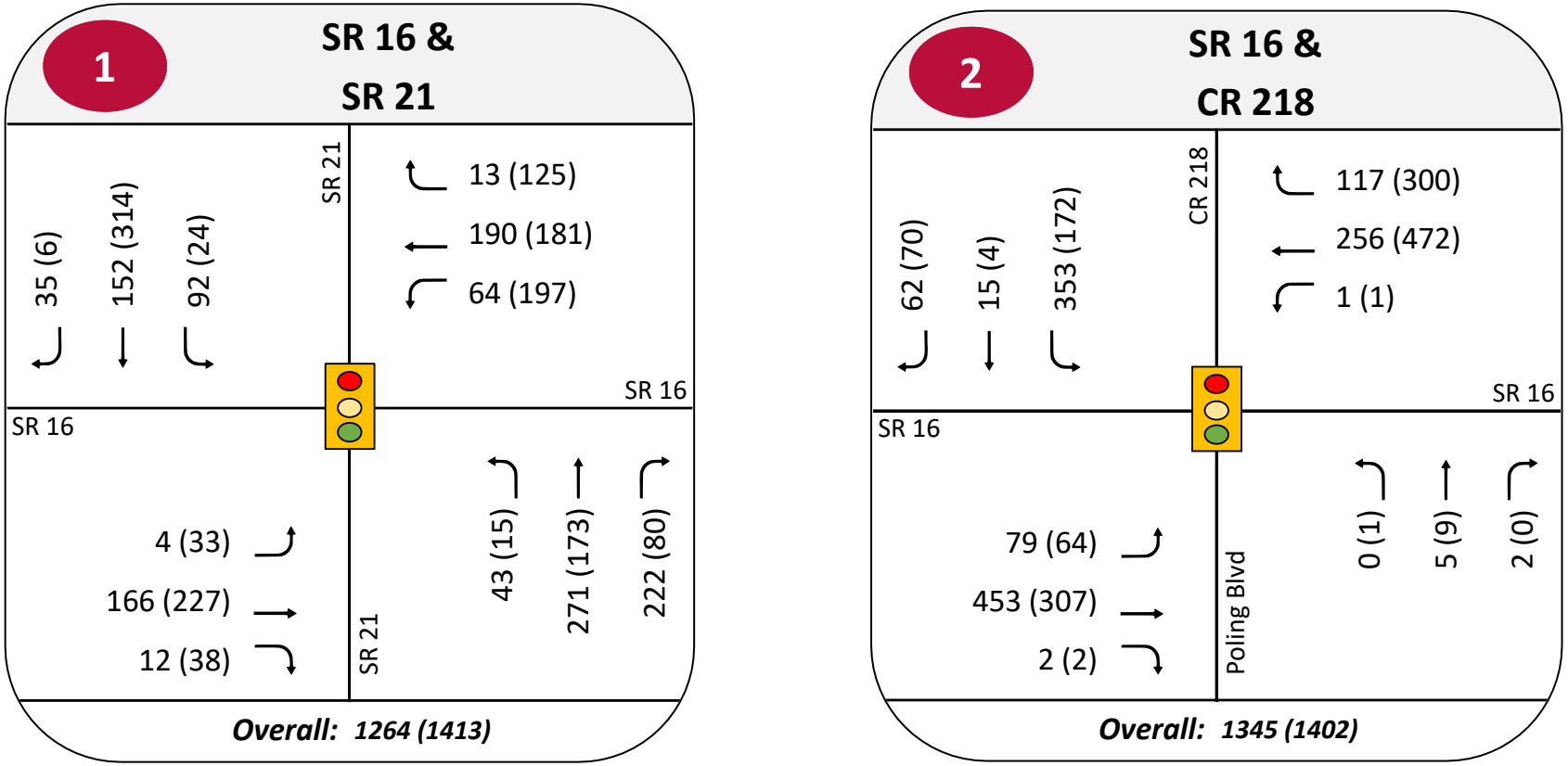
Traffic forecasting was performed using the adopted NERPM-AB V2.1.1 model to project future travel demands for the SR 16 corridor and for the intersecting links. The 2045 Cost Feasible Plan model was used to estimate growth factors. The NERPM model assumes the construction of the First Coast Expressway is complete from SR 21 in Clay County to I-95 in St. Johns County.

The outputs from the 2045 Cost Feasible model were converted to projected Annual Average Daily Traffic (AADT) using the guidance in the FDOT Project Forecasting Handbook. The outputs from the NERPM model, shown in Appendix I, represent Peak Season Weekday Average Daily Traffic volumes, which were then converted to AADTs by applying the Clay County Model Output Conversion Factor (MOCF) of 0.96 as provided from the 2021 Peak Season Conversion Factor (PSCF) report found in Appendix E. The same method was applied to the 2015 base model output from NERPM to obtain the AADTs for 2015. The resulting AADT outputs for 2015 and 2045 along SR 16 and the intersecting links were then compared to each other to calculate a growth rate. The results of the modeled scenario, with the First Coast Expressway construction complete, are presented in Table 8.

Table 8. 2045 NERPM Projections

Location	2015 AADT	2045 AADT w/ SR 23	Growth Rate
SR 16 west of SR 21	2,195	2,817	0.94%
SR 16 from SR 21 to CR 218	4,094	9,079	4.06%
SR 16 east of CR 218	7,926	23,380	6.50%
SR 21 north of SR 16	11,975	17,265	1.47%
SR 21 south of SR 16	14,122	17,004	0.68%
CR 218 north of SR 16	4,630	11,034	4.61%

Existing Conditions AM & PM Peak Hour Vehicle Volumes



LEGEND

*Intersection ID*

XX (XX) *AM (PM) Peak Hour Vehicle Volumes*

Figure 16 - SR 16 Corridor Study (Existing Conditions)

Kimley»Horn

Table 9. Historical Traffic Demand

Location	Count Station	2012 AADT	2013 AADT	2014 AADT	2015 AADT	2016 AADT	2017 AADT	2018 AADT	2019 AADT	2020 AADT	2021 AADT	Growth (2021/2012 AADT)
SR 16 west of SR 21	710104	2,800	3,000	2,800	3,300	3,700	3,700	4,000	4,400	4,300	4,600	7.14%
SR 16 from SR 21 to CR 218	710007	4,400	4,900	4,500	4,800	5,400	6,200	6,200	7,000	7,500	7,700	8.33%
SR 16 east of CR 218	710158	8,100	8,400	8,300	9,100	9,600	10,500	11,000	11,500	9,900	11,000	3.98%
SR 21 north of SR 16	710006	4,700	5,200	5,400	5,900	5,900	6,300	6,700	7,100	6,500	7,000	5.44%
SR 21 south of SR 16	710119	5,900	6,300	6,100	6,500	7,200	7,700	8,200	9,100	8,500	8,600	5.08%
CR 218 north of SR 16	710186	3,900	3,900	3,940	4,000	5,200	5,400	5,500	6,500	4,900	7,000	8.83%

A supplemental analysis of the AADTs collected from the FDOT Florida Traffic Online database for 2012-2021 was conducted. Traffic counts were performed at the locations in Table 8 . Table 9 summarizes the historical AADTs collected at each identified station, as well as their calculated Growth Rate. The calculations are provided in Appendix J.

Overall, the annual growth rates at the identified count stations averaged between 3.98% and 8.83%.

The ten years of historical counts, which were collected from the six FDOT count stations, were then input into the FDOT TRENDs tool. The tool was then used to conduct a linear regression analysis with the assumption that historic growth patterns will continue to the horizon year of 2045. Table 10 summarizes the results of the TRENDs tool, and the TRENDs outputs are provided in Appendix J.

Table 10. TRENDs Analysis

Location	Referenced Count Station	TREND Growth Rate	2045 TREND Volume
SR 16 west of SR 21	710104	4.71%	9,800
SR 16 from SR 21 to CR 218	710007	5.26%	17,200
SR 16 east of CR 218	710158	3.14%	20,000
SR 21 north of SR 16	710006	3.47%	13,200
SR 21 south of SR 16	710119	3.98%	17,800
CR 218 north of SR 16	710186	4.87%	14,100

The results were compared and a reasonable growth rate along the study corridor was selected. Table 11 summarizes the results of each method of calculation, as well as the growth rate suggested for future traffic projections.

Table 11. Linear Growth Rate Summary

Location	NERPM-AB Model	Historical Traffic Demand	TRENDs Analysis	Suggested Rate
SR 16 west of SR 21	0.94%	7.14%	4.71%	4.71%
SR 16 from SR 21 to CR 218	4.06%	8.33%	5.26%	5.26%
SR 16 east of CR 218	6.50%	3.98%	3.14%	6.50%
SR 21 north of SR 16	1.47%	5.44%	3.47%	3.47%
SR 21 south of SR 16	0.68%	5.08%	3.98%	3.98%
CR 218 north of SR 16	4.61%	8.83%	4.87%	4.87%

4.2 Corridor Level of Service

The 2020 FDOT Quality/Level of Service (Q/LOS) tables provided in the Q/LOS Handbook were referenced to complete a planning level analysis of the existing and projected AADT's along the SR 16 corridor. Table 2, Generalized Annual Average Daily Volumes for Florida's Transitioning Areas, in the Handbook was used for the limits of the corridor considering all roadways uninterrupted flow highways. The volume threshold listed in Table 12 is the maximum volume at the FDOT's standard of LOS C outside urbanized areas. The FDOT District Two LOS Report analyzed the segment of SR 16 between the Penney Farms city limits as an arterial rather than an uninterrupted flow highway, resulting in them measuring the segment as a LOS C for 2021. Table 12 shows the results of the analysis.

Table 12. Corridor Level of Service

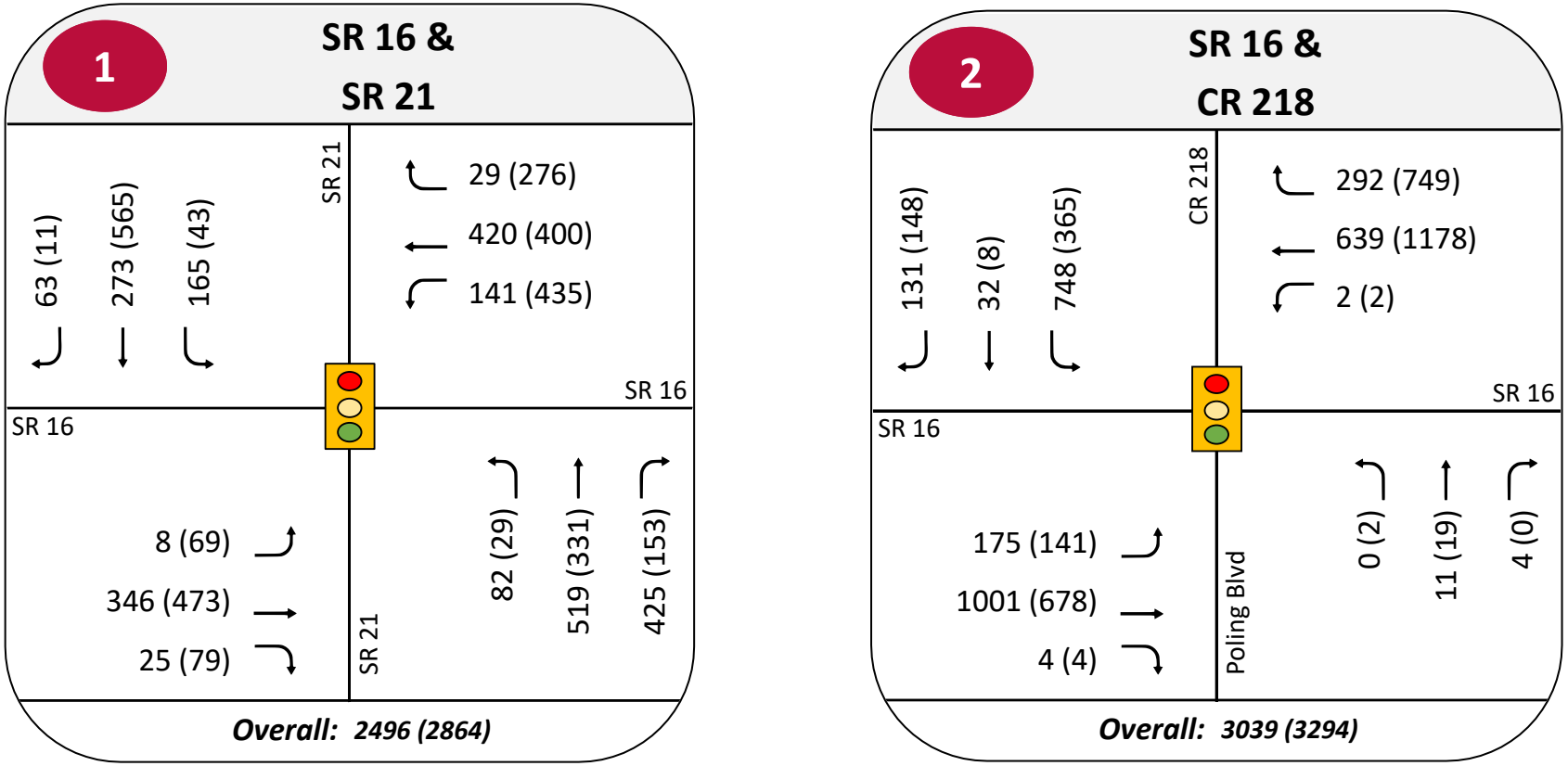
Location	LOS C Volume Threshold	2021 AADT	2021 LOS	2045 AADT	2045 LOS
SR 16 west of SR 21	49,900	4,600	B	9,800	B
SR 16 from SR 21 to CR 218	17,300	7,700	B	17,420	D
SR 16 east of CR 218	17,300	11,000	B	28,160	E
SR 21 north of SR 16	17,300	7,000	B	12,830	C
SR 21 south of SR 16	17,300	8,600	B	16,815	C
CR 218 north of SR 16	17,300	7,000	B	15,182	C

4.1 Signalized Intersection LOS

Performance analysis of the signalized intersections was conducted using the *Synchro 11* traffic analysis software. Existing signal timings were then obtained from the Clay County Traffic Signals Division and input into the *Synchro* network to model base year conditions. Signal timings were then optimized for the 2045 network by *Synchro* to account for the signal retiming maintenance which will occur along the corridor in the future. Directional Design Hour Volumes for the year 2045 were developed by applying the suggested growth rates summarized in Table 11 to the observed 2021 peak season counts. The volumes are shown in Figure 17.

Table 13 summarizes the *Synchro* results for both intersections. The critical movement at each intersection is shown beside the corresponding Volume/Capacity (V/C) ratio by direction. For example, the Eastbound Left-Turn movement is shown as (EBL). The traffic data and *Synchro* reports are shown in Appendix H.

No Build AM & PM Peak Hour Vehicle Volumes



LEGEND

*Intersection ID*

XX (XX) *AM (PM) Peak Hour Vehicle Volumes*

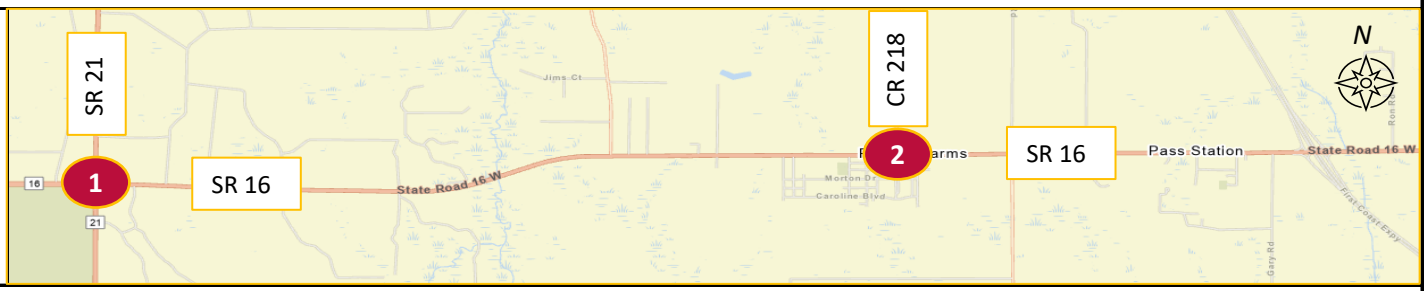


Figure 17 - SR 16 Corridor Study (2045 No Build)

Kimley»Horn

Table 13. Signalized Intersection Analysis

Intersection		Weekday AM Peak Hour			Weekday PM Peak Hour		
		LOS	Delay (sec/veh)	Max V/C	LOS	Delay (sec/veh)	Max V/C
SR 16 at SR 21	2022 Existing	C	28.3	0.90 (NBR)	C	23.5	0.75 (SBR)
	2045 No Build	E	75.3	1.11 (NBR)	E	67.4	1.01 (SBR)
SR 16 at CR 218 / Poling Boulevard	2022 Existing	B	15.9	0.77 (EBL)	B	14.9	0.84 (WBL)
	2045 No Build	F	770.7	4.54 (EBL)	F	496.0	2.92 (EBL)

5 Needs

This section summarizes the needs and opportunities for improvement along the SR 16 corridor as it relates to safety, multimodal transportation and capacity.

5.1 Safety Needs

The intersections of SR 16 at SR 21 and SR 16 at CR 218 (Poling Boulevard) had the highest concentration of observed crashes between 2016 and 2021. Both intersections are signalized and were found to not have existing retroreflective backplates on the traffic signals to increase their visibility to motorists. FDOT also cited retroreflective backplates in the 2017 Aging Road User Strategic Safety Plan as a safety countermeasure to help compensate for visual issues associated with aging. The Penney Farms community along the corridor has a large elder population to consider with safety needs. The Crash Modification Factors (CMF) Clearinghouse rate for adding a 3-inch yellow retroreflective sheeting to signal backplates is 15% for all crash types at the intersection.

To help improve drivers' visibility of the signalized intersections, there may be a need for advance street name signs approaching the intersections and advance warning signs notifying of a signal ahead. This will notify travelers in advance of the intersections and may result in fewer crashes. Advance street name signs have a reported crash reduction factor between 1% and 1.6% for all crash types at the intersection. Advance warning signs were only analyzed in one study to reduce specifically angle crashes at an intersection by a crash reduction factor of 35%.

5.2 Multimodal Transportation Needs

Currently, the multimodal options within the SR 16 corridor are limited. The existing sidewalk is primarily within the Penney Farms city limits. There are currently no bicycle lanes throughout the study area, and much of the roadway only has 4-feet flush paved shoulders rather than the FDOT design standard of 5-feet paved shoulders without shoulder gutter to allow more separation between bicyclists and motorists. There was a crash along the corridor, approximately 50-feet east of Jennifer Lane, which resulted in incapacitating injuries for the two bicyclists involved in the crash due to the lack of multimodal transportation.

Constructing a multi-use trail along SR 16 will provide physical separation between drivers and bicycle and pedestrian travel and enhance safety.

5.3 Capacity Needs

By 2045, both signalized intersections along SR 16 will operate at LOS E or F without any future improvements.

The use of FDOT's Generalized LOS Tables with our suggested growth rate also resulted in LOS E for SR 16 east of CR 218 due to the large influx of growth from the First Coast Expressway. This analysis shows it is necessary to consider widening the roadway east of CR 218 from a two-lane undivided highway to a four-lane divided highway in order to accommodate the growth.

6 Summary of Alternatives Considered

Alternatives were developed to meet the project needs, and each was evaluated for its potential to be included as a solution for the SR 16 corridor.

6.1 Alternative 1 – Widen and Reconstruct from Penny Farms to SR 23

Alternative 1 includes the following improvements:

- **Construct new turn lanes in the northbound right and westbound left directions at the SR 16 at SR 21 intersection. The proposed improvements are shown on Figure 18.**
- **Construct a multi-use path which is shown in the regional trails plan from SR 21 to CR 218**
- **Widen Peters Creek Bridge to bring bridge shoulder width to a standard 10-feet and allow room for the multi-use path.**
- **Mill and resurface the corridor between the SR 21 intersection to the beginning of Penney Farms**
- **Widen the paved shoulders from four-feet to five-feet to accommodate bicycle traffic between the SR 21 intersection to the beginning of Penney Farms**
- **Construct new turn lanes in the southbound left, eastbound left, westbound left, and westbound right directions at the SR 16 at CR 218 intersection. The proposed improvements are shown on Figure 19**
- **Widen SR 16 from a two-lane undivided road to a four-lane divided road from Penney Farms to match the construction at SR 23. The proposed four-lane typical section is shown on Figure 20.**

Figure 18. Proposed Intersection Improvements at SR 16 and SR 21

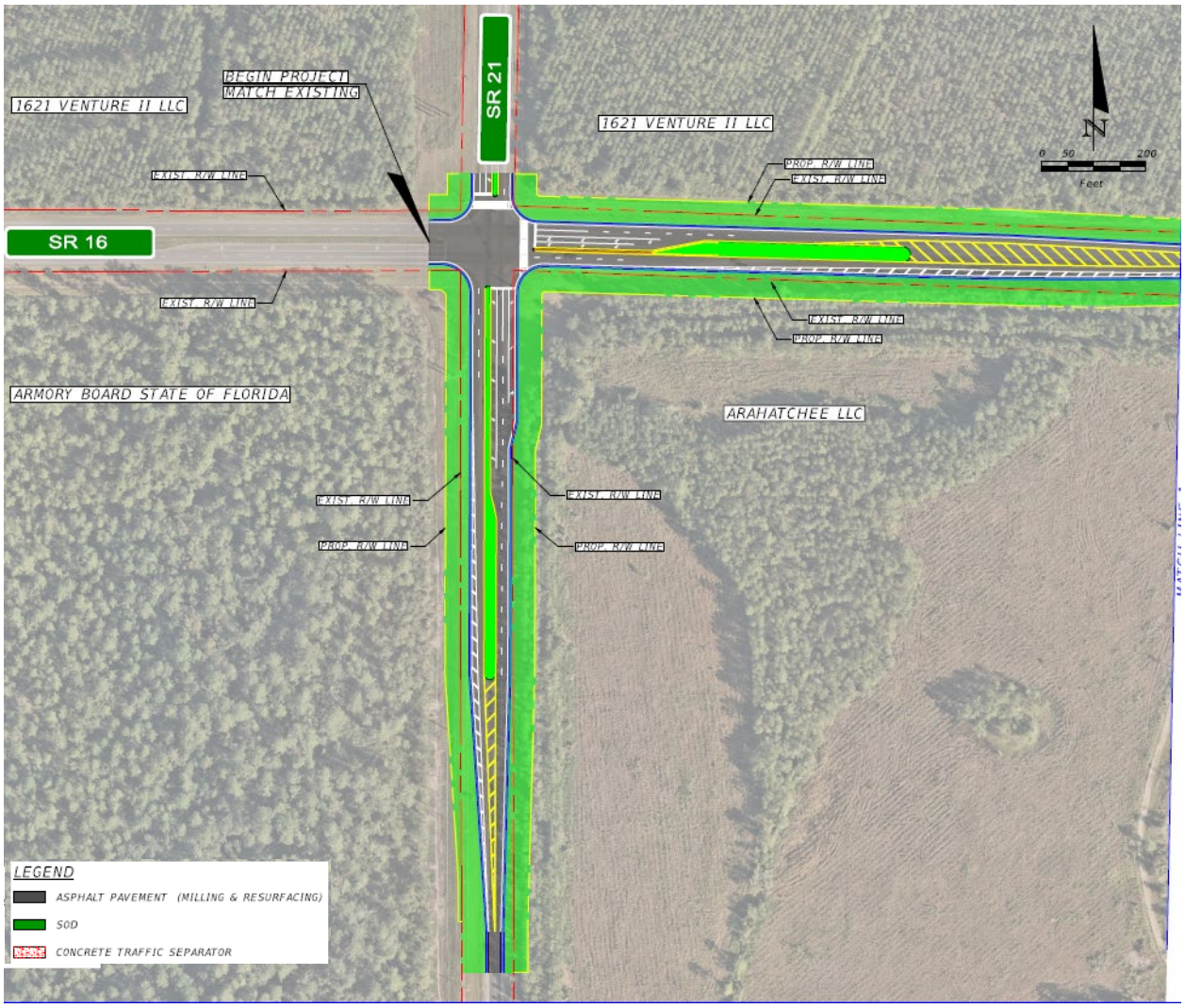
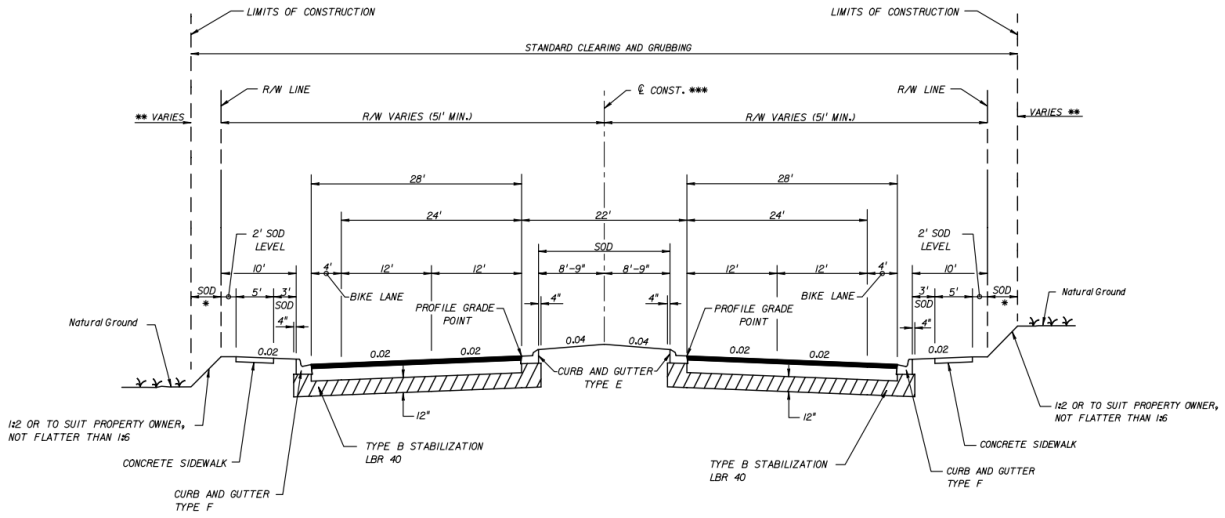


Figure 19. Proposed Improvements at SR 16 and CR 218

Figure 20. Proposed Four-Lane Typical Section



Project impacts were analyzed using GIS maps. The following summarizes the potential impacts:

- **Twenty-nine parcels will be impacted by the widening and reconstruction of SR 16. An acre of land in Clay County, FL costs $73,585 on average based on the listing price of 853 acres of land for sale based on data provided by LandSearch.com. A multiplier of 1.5 was used to estimate the total costs for acquisition or $112,500 acre.**
- **Four residential relocations are anticipated. Homes for sale in Clay County, FL have a median listing home price of $334,990. There are 1,868 active homes for sale in Clay County, FL on realtor.com. A total price per relocation of $669,800 was used based on a multiplier of 2.0 for the cost of acquisitions for relocations.**
- **Wetland impacts are anticipated in the vicinity of Peters Creek with the construction of the multi-use path and upland cut ditches along the corridor. An estimate of three acres of impacts was assumed.**

Concept plans for this alternative are provided in Appendix K.

Table 14 summarizes the estimated costs for the project. The basis for the cost estimates are provided in Appendix M.

Table 14. Summary of Costs - Alternative 1

Component	Intersection Improvements at SR-21	Northeast Florida Regional Multi-Use Trail SR 21 to CR 218	Mill and Resurface SR 21 to Penny Farms	Widen and Reconstruct Penny Farms to SR 23	Total
Construction	$2,592,939	$8,114,778	$3,080,338	$53,098,140	$66,886,194
Right of Way	$0	$0	$0	$20,839,225	$20,839,225
Wetland Mitigation				$36,000	$36,000
PD&E				$5,309,814	$5,309,814
Preliminary Engineering	$311,153	$973,773	$369,641	$6,371,777	$8,026,344
Construction Engineering and Inspection (CEI)	$414,870	$1,298,364	$492,854	$8,495,702	$10,701,790
Total Implementation Costs	$3,318,962	$10,386,915	$3,942,833	$94,150,658	$111,799,367

6.2 Alternative 2 – Mill and Resurface

This alternative address the needs for short-term improvements that could be constructed with the proposed milling and resurfacing project planned by FDOT for the segment from SR 21 to south of SR 15 (US 17). Figure 21 shows the proposed typical section west of CR 218.

- Construct new turn lanes in the northbound right and westbound left directions at the SR 16 at SR 21 intersection
- Add a stormwater pond for treatment of the runoff for the new pavement at SR 16 at SR 21 intersection
- Mill and resurface the corridor between the SR 21 intersection to the beginning of Penney Farms
- Widen the shoulders from four-feet to five-feet to accommodate bicycle traffic between the SR 21 intersection to the beginning of Penney Farms

No right-of-way or environmental impacts are anticipated. Concept plans for this alternative are provided in Appendix L.

Figure 21. Proposed Two-Lane Typical Section with Regional Multi-Use Trail

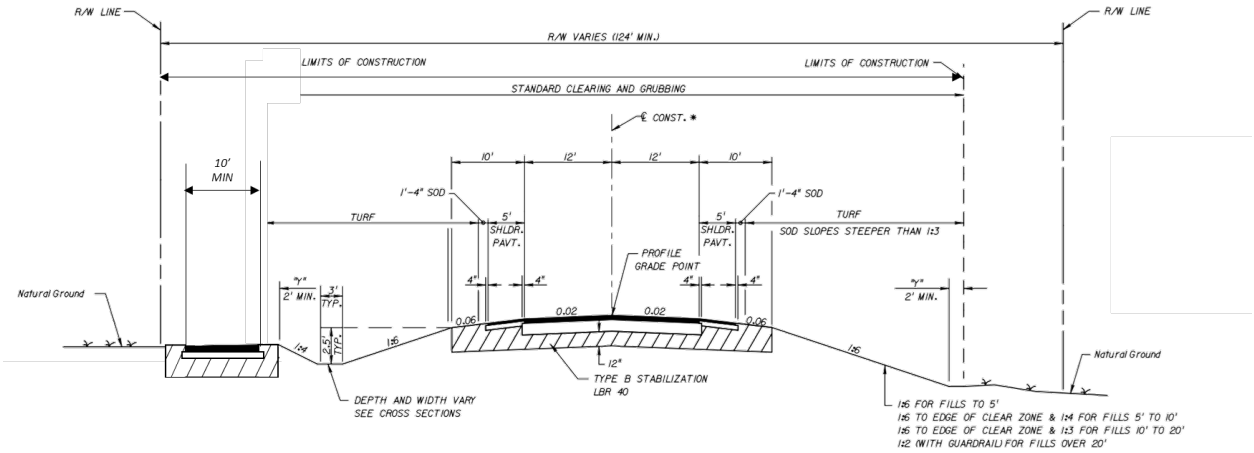


Table 15 summarizes the estimated costs for the project. The basis for the cost estimates are provided in Appendix M.

Table 15. Summary of Costs - Alternative 2

Component	Intersection Improvements at SR-21	Mill and Resurface SR 21 to SR 23	Total
Construction	$2,592,939	$7,855,059	$10,447,998
Right of Way	$0	$0	$0
Wetland Mitigation	$0	$0	$0
PD&E	$0	$0	$0
Preliminary Engineering	$311,153	$973,773	$1,284,926
CEI	$414,870	$1,298,364	$1,713,234
Total Implementation Costs	$3,318,962	$10,127,196	$13,446,158

6.3 Alternative 3 – North Penny Farms Bypass

Alternative 3 includes constructing a new two-lane bypass of Penny Farms to the north to avoid community impacts, right-of-way acquisition and landscaping associated widening SR 16 within the tight constraints of the existing rights of way. The new road is proposed to be an undivided two-lane rural road with 5-ft paved shoulders beginning near Palmetto Avenue and returning to the original SR 16 alignment east of Studio Road. The north bypass alternatives also include the improvements Alternative 2 along the entire corridor.

A 500-ft corridor was analyzed to estimate the potential impacts and costs of the bypass. A 200-ft corridor was analyzed for the SR 16 realignment to connect to the bypass at 90-degrees. The corridor is shown on Figure 22.

The baseline for the bypass alternative is based on a 55 mph design speed. The connectors are based on a 35 mph design speed, consistent with the existing corridor. The proposed typical section is shown on Figure 23.

The new alignment will require significant right-of-way acquisition, but no relocations. Wetland impacts are likely and a buffer analysis was used to estimate the impacts.

Table 16 summarizes the estimated costs for the project. The basis for the cost estimates are provided in Appendix M.

Figure 22. North Penny Farms Bypass Alternative

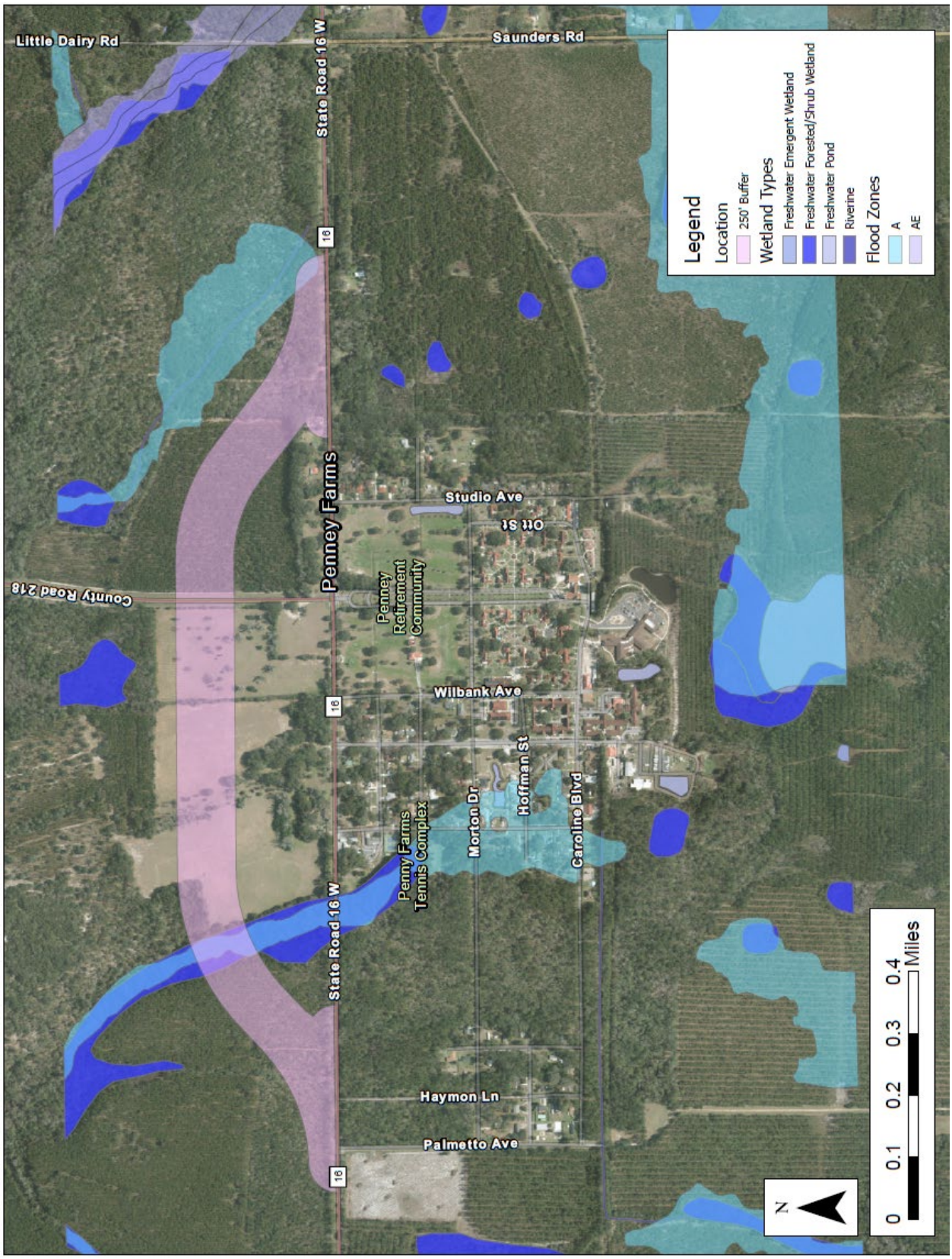


Figure 23. Proposed Bypass Typical Section

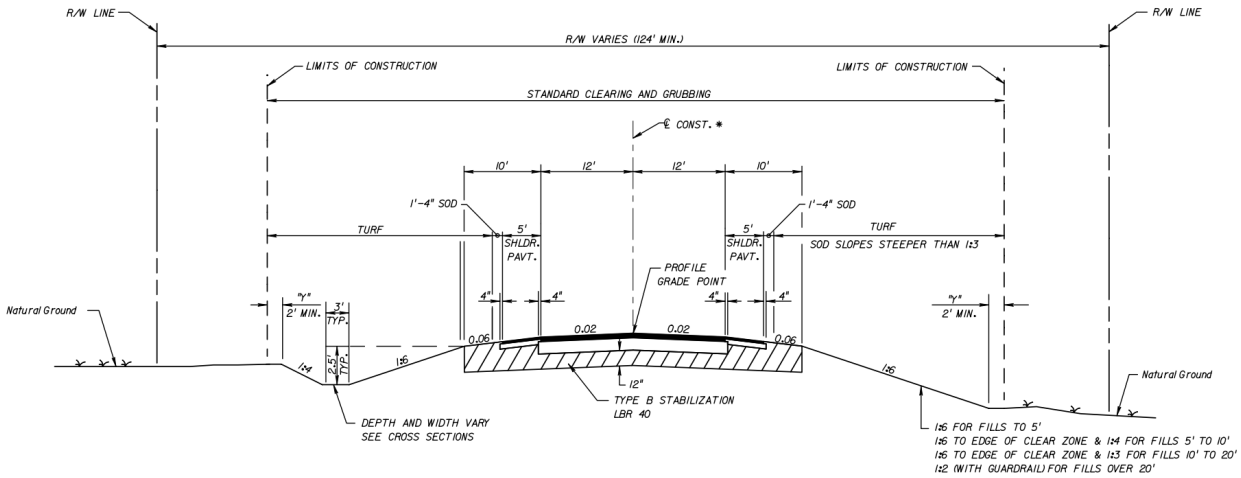


Table 16. Summary of Costs - Alternative 3

Component	Bypass	Intersection Improvements at SR-21	Northeast Florida Regional Multi-Use Trail	Mill and Resurface SR 21 to SR 23	Total
Construction	$15,356,535	$2,592,939	$8,114,778	$7,855,059	**$33,919,311**
Right of Way	$4,477,686	$0	$0	$0	**$4,477,686**
Wetland Mitigation	$217,800	$0	$0	$0	**$217,800**
PD&E	$1,535,654	$0	$0	$0	**$1,535,654**
Preliminary Engineering	$1,842,784	$311,153	$973,773	$973,773	**$4,101,483**
CEI	$2,457,046	$414,870	$1,298,364	$1,298,364	**$5,468,644**
Total Implementation Costs	**$25,887,505**	**$3,318,962**	**$10,386,915**	**$10,127,196**	**$49,720,577**

6.4 Alternative 4 – South Penny Farms Bypass

Alternative 4 consists of construction a new two-lane road to bypass Penny Farms to the south using the same approach identified with Alternative 3. This bypass alternative includes new construction of an undivided two-lane rural road with 5-ft paved shoulders beginning near Hyman Road and returning to the original SR 16 alignment east of Saunders Road. The south bypass alternative also includes the improvements outlined in Alternative 2.

The corridor is shown on Figure 24. The corridor width, design speeds and typical section are the same as in Alternative 3.

The new alignment will require significant right-of-way acquisition, but no relocations. Wetland impacts are likely and a buffer analysis was used to estimate the impacts.

Table 17 summarizes the estimated costs for the project. The basis for the cost estimates are provided in Appendix M.

Figure 24. South Penny Farms Bypass Alternative

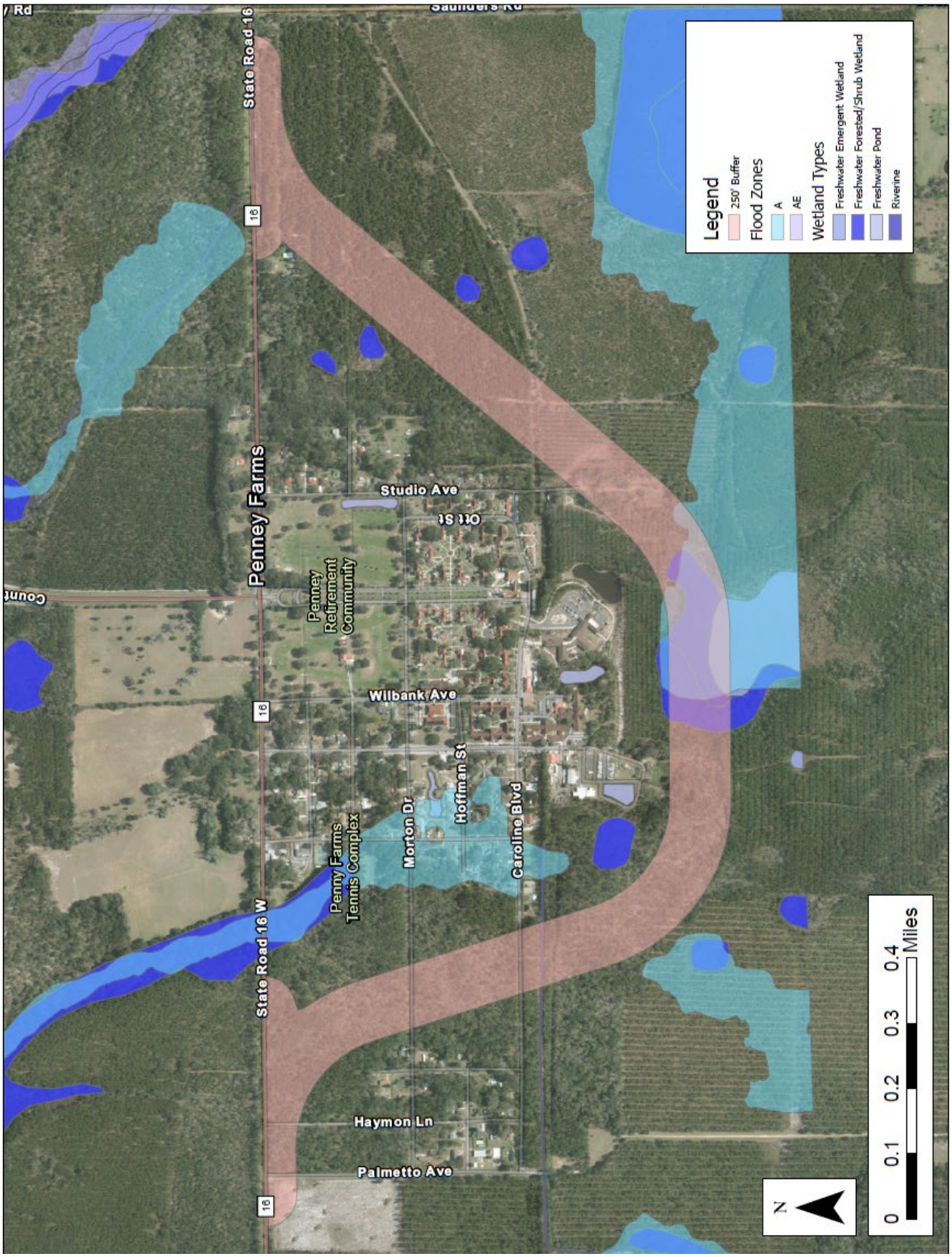


Table 17. Summary of Costs - Alternative 4

Component	Bypass	Intersection Improvements at SR-21	Mill and Resurface SR 21 to SR 23	Northeast Florida Regional Multi-Use Trail	Total
Construction	$17,947,683	$2,592,939	$7,855,059	$8,114,778	**$36,510,459**
Right of Way	$7,927,066	$0	$0	$0	**$7,927,066**
Wetland Mitigation	$920,160	$0	$0	$0	**$920,160**
PD&E	$1,794,768	$0	$0	$0	**$1,794,768**
Preliminary Engineering	$2,153,722	$311,153	$973,773	$973,773	**$4,412,421**
CEI	$2,871,629	$414,870	$1,298,364	$1,298,364	**$5,883,227**
Total Implementation Costs	**$33,615,028**	**$3,318,962**	**$10,127,196**	**$10,386,915**	**$57,448,101**

7 Evaluation of Alternatives

Table 18 summarizes the evaluation of each alternative for the costs, right-of-way, environmental, safety and mobility impacts.

Alternative 1 is the most expensive alternative because of the potential for relocations.

Alternative 2 mills and resurfaces the existing corridor, improves the intersection at SR 21 and widens the paved shoulders to provide bike lane but does not meet the long-term mobility or safety needs of the project.

Alternative 3 is the shorter of the two bypass alternatives but will require coordination with the County for land use consistency considering impacts on the Lake Asbury planning area.

Alternative 4 is the longer of the two bypass alternatives and will result in greater wetland impacts.

No preferred alternative is recommended at this time.

Table 18. Evaluation Matrix

Component	Alternative 1 Widen from Penny Farms to SR 23	Alternative 2 Mill and Resurface	Alternative 3 North Bypass	Alternative 4 South Bypass
Costs				
Construction	$66,886,194	$10,447,998	$33,919,311	$36,510,459
Right of Way	$20,839,225	$0	$4,477,686	$7,927,066
Wetland Mitigation	$36,000	$0	$217,800	$920,160
PD&E	$5,309,814	$0	$1,535,654	$1,794,768
Preliminary Engineering	$8,026,344	$1,284,926	$4,101,483	$4,412,421
CEI	$10,701,790	$1,713,234	$5,468,644	$5,883,227
Total Implementation Costs	$111,799,367	$13,446,158	$49,720,577	$57,448,101
Right-of-Way Impacts				
Area Impacted	12.6	0	39.8	70.5
Relocations	29	0	0	0
Environmental Impacts				
Involved Land Uses	Lake Asbury Planned Community		Lake Asbury Rural Community Planned Unit Development	Agricultural Lands
Underserved Communities	Elder Populations Low Income		Low Income	Low Income

Component	Alternative 1 Widen from Penny Farms to SR 23	Alternative 2 Mill and Resurface	Alternative 3 North Bypass	Alternative 4 South Bypass
Wetland Impacts	0.5	0	3.03	12.78
Floodplain Impacts	No	No	Yes	Yes
Safety and Mobility Impacts				
Reduce crashes by alleviating congestion	●		●	●
Reduce congestion and meet FDOT LOS standards	●		●	●
Widen shoulder to current criteria for bike lanes	●	●	●	●
Construct trail improving pedestrian safety	●		●	●
Consistency with preserving Penny Farms character		●	●	●

8 Public Engagement

This section will be completed following public engagement and will summarize the comments provided.

9 Summary and Next Steps

This section will be completed following public engagement and will summarize the comments provided.

The final recommendations will be sent to FDOT District 2 following public comment for funding considerations.