ORANGE COUNTY GOVERNMENT FLORIDA

Interoffice Memorandum

AGENDA ITEM

February 24, 2021

TO: Mayor Jerry L. Demings
-AND-
County Commissioners

FROM: Jon V. Weiss, P. E., Director
Planning, Environmental and Development Services Department

CONTACT PERSON: **Renzo Nastasi, AICP, Manager**
Transportation Planning Division
(407) 836-8072

SUBJECT: March 23, 2021 – Work Session
Woodbury Road Roadway Conceptual Analysis Study

The Transportation Planning Division has completed the Roadway Conceptual Analysis Study for the widening of Woodbury Road from two to four lanes. The limits for the project are from Lake Underhill Road to SR 50 (East Colonial Drive), a distance of approximately 1.59 miles. Woodbury Road is located near Waterford Lakes in eastern Orange County. The purpose of the study was to develop the most appropriate road alignment with stormwater facilities and bicycle and pedestrian accommodations, while minimizing environmental impacts.

At the March 23, 2021 Work Session, staff will present the results of the study establishing the purpose and need for the recommended improvements. The recommendations are based on a variety of factors, including future traffic demand, operations, safety, and social and economic factors.

This item is for informational purposes only; no action is required by the Board.

JVW/RN/bh

Attachment

c: Joseph C. Kunkel, P.E., Director, Public Works Department
Diana Almodovar, P.E., County Engineer, Public Works Department
Brian Sanders, Assistant Manager, Transportation Planning Division
Blanche Hardy, P.G., Assistant Project Manager, Transportation Planning Division

WOODBURY ROAD

ROADWAY CONCEPTUAL ANALYSIS REPORT

FROM LAKE UNDERHILL ROAD TO STATE ROAD 50

PREPARED FOR

ORANGE COUNTY PLANNING, ENVIRONMENTAL & DEVELOPMENT SERVICES DEPARTMENT

TRANSPORTATION PLANNING DIVISION

ORANGE COUNTY GOVERNMENT FLORIDA

PREPARED BY

INWOOD CONSULTING ENGINEERS, INC.

January 2021

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EXECUTIVE SUMMARY

ES.1 Introduction

Orange County conducted a Roadway Conceptual Analysis (RCA) for Woodbury Road from Lake Underhill Road to State Road (S.R.) 50 in northeast Orange County. The project location is shown in **Figure ES-1-1**. The objective of the RCA is to identify a preferred improvement alternative to address the current and future transportation needs along the corridor. The preferred improvements identified in this report will serve as the basis for the subsequent design of the roadway improvements. This RCA report summarizes the essential components of the study, including public involvement, data collection, traffic analysis, roadway design, drainage design, and environmental impacts.

ES.2 Purpose and Need for Improvement

The purpose and need for the project is based on several factors. These are to provide traffic capacity, to meet social/economic demands, to be consistent with transportation plans, and to enhance safety.

The Waterford Lakes area is a community of 25 subdivisions and numerous shopping venues in east Orange County that has been under development for more than 30 years. Land use along the corridor consists of a mixture of residential, institutional, commercial, wetlands and open land.

The existing year 2019 traffic volumes along Woodbury Road from the County's annual traffic count program are approximately 18,800 AADT from Lake Underhill Road to Waterford Lakes Parkway and approximately 21,000 AADT from Waterford Lakes Parkway to S.R. 50. Woodbury Road within the project limits is currently operating at an unacceptable Level of Service (LOS) F, exceeding the available traffic carrying capacity of Woodbury Road. It is anticipated that the future traffic demands will continue to add to the traffic congestion on Woodbury Road, thus necessitating the widening of Woodbury Road beyond the existing two-lane configuration.

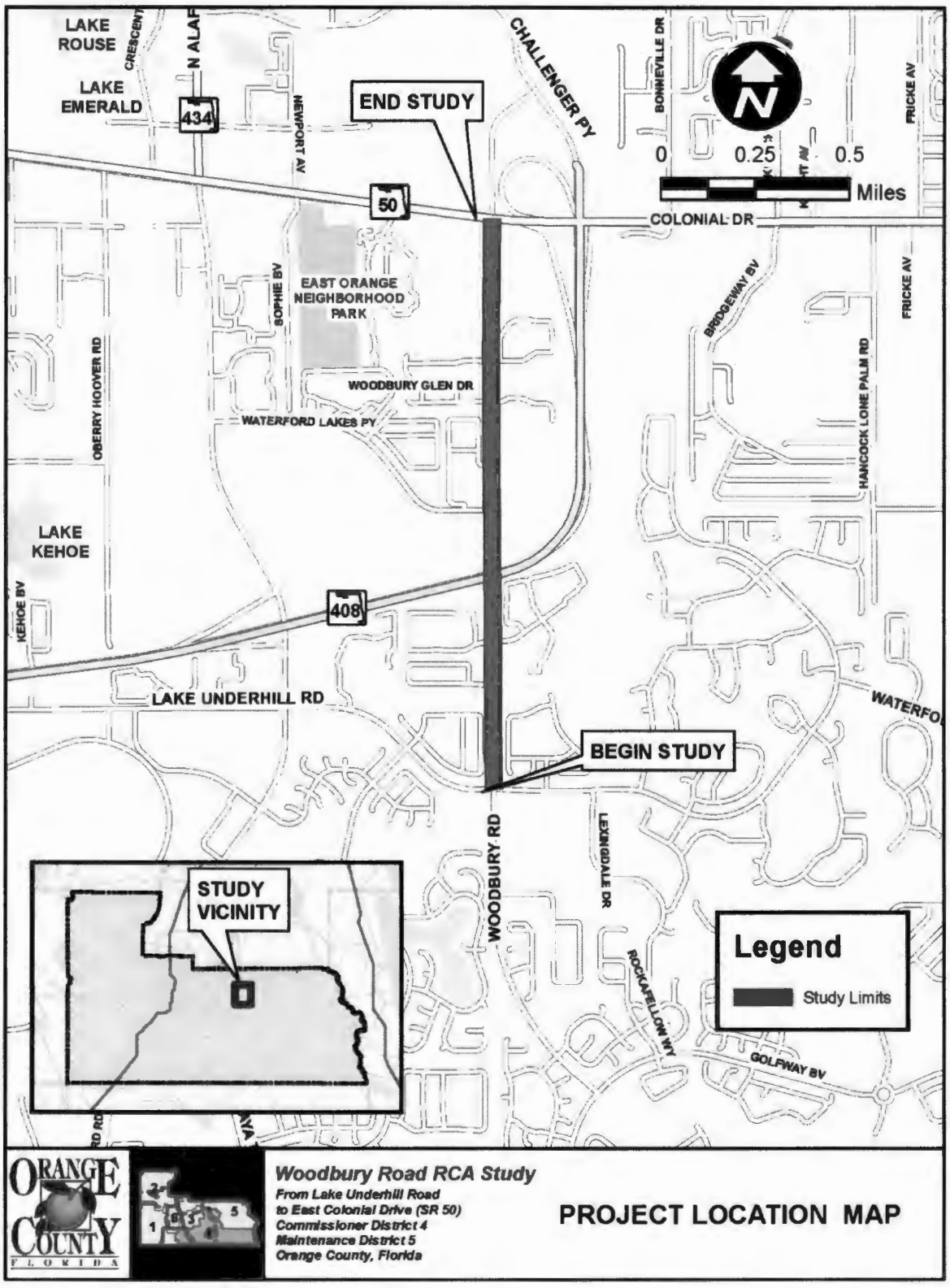
The widening of Woodbury Road, from Lake Underhill Road to S.R. 50 (East Colonial Drive), is included in the MetroPlan Orlando 2040 Long Range Transportation Plan (Blueprint 2040) and Transportation Improvement Program (TIP) as an Orange County Locally Funded Highway Project. The project is also consistent with the adopted 2010-2030 Orange County Comprehensive Plan.

Crash reports for the five-year period between April 1, 2014 and March 31, 2019 were obtained and reviewed. Crashes were considered associated with the intersection if the crash occurred due to the operation of the intersection. Four hundred forty-four crashes occurred at the study intersections over the five-year period. One hundred thirty-six crashes occurred along the segments within the study limits. Capacity and intersection improvements will enhance safety along the corridor.

ES.3 Existing Conditions

Woodbury Road, within the project limits, is a two-lane undivided collector within the study area. Woodbury Road has a north/south configuration which serves traffic routed north-south through east Orange County. Woodbury Road is located within the County's urban area boundary and is currently functionally classified as a major urban collector from Golfway Boulevard to S.R. 50. Woodbury Road has a posted speed limit of 40 miles per hour (mph).

Figure ES-1-1
Project Location Map



A sidewalk that varies in width is provided along the west side of Woodbury Road through the study limits. The sidewalk on the west side is typically seven to eight feet in width from Lake Underhill to Woodbury Glen Drive and four feet in width from Woodbury Glen Drive to S.R. 50. Sidewalk also exists on the east side of Woodbury Road from Waterford Lakes Parkway to just south of Woodbury Cove Drive. No on-road bicycle lanes or paved shoulders, other than two short segments of bike paths, are provided within the study limits. On-road bicycle lanes are provided on the south leg of Woodbury Road at the S.R. 50 intersection. There are crosswalks for all approaches at the Lake Underhill Road intersection, at Sophiamarie Loop, at Mallory Circle, at Waterford Pointe, and all approaches at the S.R. 50 intersection.

The existing right-of-way along Woodbury Road varies throughout the project corridor from 92 to 268 feet in width.

There are five intersections in total that were evaluated during this study within the project limits. Three of those intersection are signalized intersections, including Lake Underhill Road, Waterford Lakes Parkway, and S.R. 50. The other cross-streets, Mallory Circle / Island Bay Drive and Woodbury Glen Drive / Woodbury Cove Drive, serve residential neighborhoods.

LYNX service along Woodbury Road includes NeighborLink 621 which provides curb to curb service between Waterford Lakes Town Center and Bithlo Health Center. LYNX Route 320 runs Monday through Friday and includes a stop at the Waterford Lakes Parkway/Woodbury Road intersection. The LYNX Vision 2030 Plan does not include any future routes that would utilize the segment of Woodbury Road between Lake Underhill Road and S.R. 50.

Street lighting (high pressure sodium lamps) is provided along the west side of Woodbury Road with standard cobra head luminaires mounted on utility poles. Additional stand-alone light poles with cobra head luminaires are located at the intersections of Lake Underhill Road, Sophiamarie Loop, Mallory Circle, Waterford Oak Drive, Woodbury Glen Drive, and Parkbury Drive.

Thirteen Utility Agency/Owners (UAO) have been identified within the project area through a Sunshine 811 Design Ticket and utility coordination efforts.

The Woodbury Road project area is located within the Econlockhatchee (Econ) River drainage basin within the jurisdiction of the St. Johns River Water Management District (SJRWMD). Stormwater runoff from the existing roadway is collected and treated in existing ponds that were permitted and constructed to accommodate the proposed four-lane roadway typical section.

ES.4 Traffic Analysis

Detailed project traffic analyses are provided in separate documents; the Design Traffic Technical Memorandum and the Design Traffic Engineering Report. These documents provide the existing traffic conditions in the area as well as analysis of the improvement alternatives. These reports also document the need to widen Woodbury Road to four lanes to meet future traffic conditions.

ES.5 Alternatives

An evaluation matrix was developed to compare the pros and cons of the No-build alternative and three Build alternatives. The matrix, shown in **Table ES-1-1** considers the social, natural, and physical impacts, and the costs of all the alternatives.

The basic elements of the typical section include the full reconstruction of Woodbury Road and consist of two 11-foot travel lanes in each direction separated by a 15.5-foot raised median. Type E curb and gutter is used along the inside lanes, and Type F curb and gutter is used along the outside lanes. Alternative 1 includes a six-foot sidewalk on the west side of the roadway and a ten-foot shared-use path on the east side of the roadway with no on-street bike lanes. Alternative 2 includes a six-foot sidewalk on both sides of the roadway and seven-foot buffered bike lanes on the roadway. Alternative 3 includes a six-foot sidewalk on the west side of the roadway, a ten-foot shared-use path on the east side of the roadway, and seven-foot on-street buffered bike lanes.

There are three alternative typical sections for the bridge over S.R. 408 as well. All three bridge typical sections include a twelve-foot six-inch traffic separator in the median, maintain the existing bridge structure on the west side of the roadway, and widen the bridge structure to the east side. All three maintain the existing seven-foot four-inch sidewalk on the west side of the bridge. The bridge typical section for Alternative 1 continues the ten-foot shared-use path over the bridge on the east side, separated by a traffic railing. The bridge typical section for Alternative 2 continues the seven-foot buffered bike lanes on both sides and the six-foot sidewalk over the bridge on the east side of the roadway, separated by a traffic railing. The bridge typical section for Alternative 3 continues the seven-foot buffered bike lanes and the ten-foot shared-use path over the bridge on the east side of the roadway, separated by a traffic railing.

Alternative 1 can generally be constructed within existing right-of-way, which varies from 92 feet to 268 feet, including the bridge section with an overall bridge width of 86 feet. Some additional right-of-way is required at the Lake Underhill Road and SR 50 intersections. Alternative 2 requires additional right-of-way on the east side, varying from 0 feet to 10.5 feet plus at the Lake Underhill Road and SR 50 intersections. The Alternative 2 bridge can be constructed within existing right-of-way, with an overall width of 91 feet. Alternative 3 requires the most additional right-of-way on the east side, varying from 0 feet to 14.5 feet plus additional right-of-way at the Lake Underhill Road and SR 50 intersections. The Alternative 3 bridge can be constructed within existing right-of-way, with an overall width of 95 feet. Transportation Systems Management and Operations alternatives were also considered and incorporated into the build alternatives.

Table ES-1-1
Alternatives Evaluation Matrix

Woodbury Road RCA Study

From Lake Underhill Road to SR 50

Alternatives Evaluation Matrix

	No-Build Alternative	Alternative 1 Minimum RW = 92 ft.	Alternative 2 Minimum RW = 96.5 ft.	Alternative 3 Minimum RW = 103.5 ft.
Evaluation Criteria	Existing 2-Lane Road	4-Lane Urban with 6 ft. Sidewalk and 10 ft. Shared Use Path (No On-Road Bike Lanes)	4-Lane Urban with 6 ft. Sidewalks and 7 ft. On-Road Bicycle Lanes	4-Lane Urban with 6 ft. Sidewalk, 10 ft. Shared Use Path, and 7 ft. On-Road Bicycle Lanes
Relocations				
Number of Residential Acquisitions	None	0	0	0
Number of Business Acquisitions	None	0	0	0
Number of Parcels Impacted	None	12	39	39
Social, Natural, & Physical Impacts				
Social & Neighborhood	None	Low	Med	Med
Archaeological/Historical Sites	None	0	0	0
Threatened and Endangered Species	None	Low	Low	Low
Wetlands (acres)	None	4.4	6.2	6.2
Floodplains (acre-feet)	None	0	0	0
Potential High or Medium Ranked Contamination Sites	None	3	3	3
Estimated Costs (Present Day Costs)				
Design (15% of Construction)	No cost	$3,661,000	$3,878,000	$3,975,000
Right-of-Way Acquisition	No cost	$3,195,000	$3,408,000	$3,626,000
Wetland Mitigation	No cost	$447,000	$629,000	$629,000
Roadway Construction	No cost	$24,407,000	$25,856,000	$26,498,000
Reimbursable Utility Relocation	No cost	$1,000,000	$1,000,000	$1,000,000
CEI (15% of Construction)	No cost	$3,661,000	$3,878,000	$3,975,000
Total Cost	No cost	$36,371,000	$38,649,000	$39,703,000

ES.6 Preferred Alternative

The preferred roadway typical section is shown in **Figure ES-1-2** and contains the following roadway design elements:

- Four 11-foot travel lanes
- A 6-foot sidewalk located on the west side of the roadway
- A 10-foot shared-use path located on the east side of the roadway
- Type E curb and gutter along the inside lanes
- Type F curb and gutter along the outside lanes
- A 15.5-foot raised median
- Two 3-foot utility strips between the Type F curb and gutter and the sidewalk or shared-use path
- A grass strip between the shared-use path or sidewalk and the right-of-way line of varying width
- The proposed improvements can be constructed within the existing right-of-way other than at the Lake Underhill Road and S.R. 50 intersections

The preferred S.R. 408 bridge typical section is shown in **Figure ES-1-3** and involves maintaining the existing bridge and widening it to the east side. It contains the following elements:

- Four 11-foot travel lanes
- A 12.5-foot raised median
- A 9.5-inch outside barrier wall on the west side
- A 7.33-foot sidewalk on the west side
- A 1.25-foot barrier between the sidewalk and the outside shoulder on the west side
- A 2.5-foot outside shoulder on the west side
- 1.5-foot inside shoulders along both sides of the median
- A 1.33-foot wide barrier along the outside shoulder on the east side
- A 10-foot shared-use path along the east side
- A 9.5-inch outside barrier wall along the east side

Based on the matrix evaluation and public involvement activities, the preferred alternative is Alternative 1. The preferred alignment alternative minimizes right-of-way impacts, social impacts as measured by relocations, and project costs. The Preferred Alternative is shown on the concept plans contained in **Appendix A** as well as described in more detail in Section 7 Preferred Alternative. The right-of-way identification maps are contained in **Appendix B**.

Figure ES-1-2
Preferred Roadway Typical Section

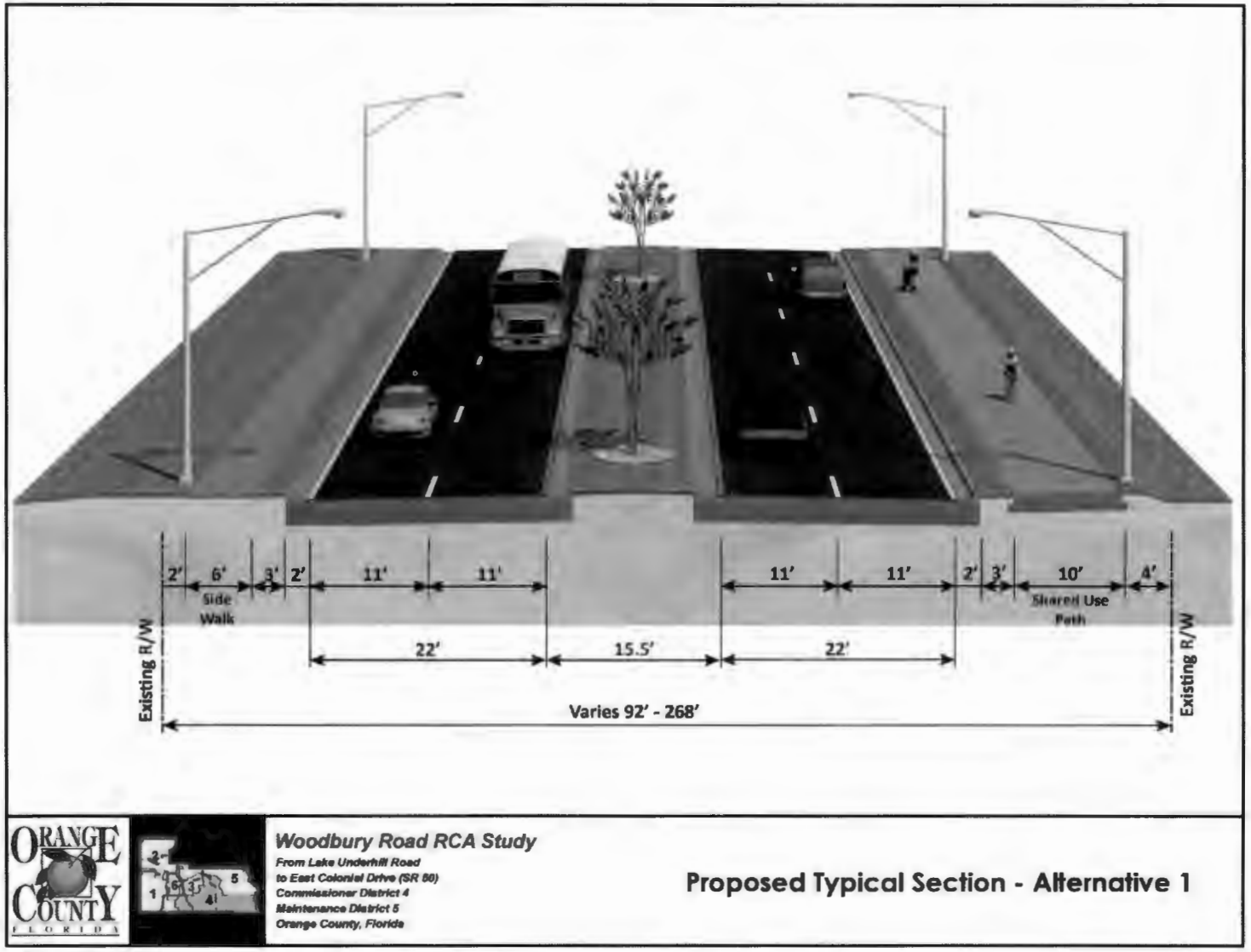
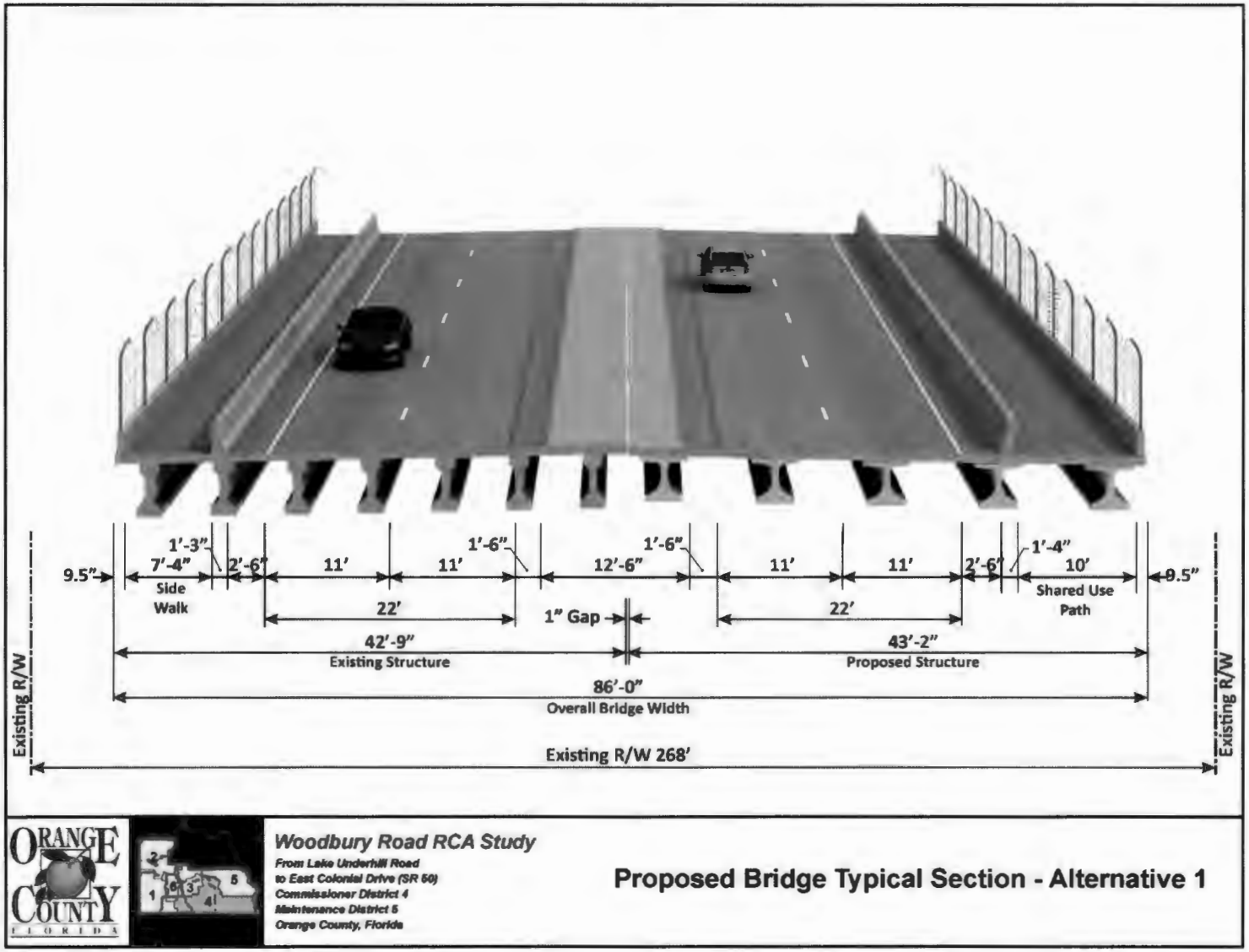


Figure ES-1-3
Preferred Bridge Typical Section



ES.7 Public Involvement

Critical to the success of this project is the feedback received from the local community. There have been two community meetings held to present project related information to the public and to receive input regarding the project. Meeting summaries, along with the Public Involvement Documents, are contained in **Appendix C**. Small group meetings were held with representatives from Waterford Lakes Community Association, Orange County Public Schools, Waterford Elementary School, Discovery Middle School, and City of Orlando Utilities. Minutes from these meetings are included in **Appendix C**.

ES.8 Conclusions and Recommendations

The objective of the Woodbury Road RCA is to develop and evaluate alternatives for improvement of Woodbury Road from Lake Underhill Road to S.R. 50. The alternatives sought to provide for the cost-feasible improvements to the roadway to balance the safety and mobility needs of all mode users in the corridor. The process incorporated the insights from planning, engineering, and the public to refine the alternatives, and ultimately advance a preferred alternative into the design phase. It is recommended that the preferred alternative detailed in Section 7 of this report be advanced by Orange County into the design phase.

Commitments:

1. During the design phase, a mid-block crossing will be evaluated in the area south of the S.R. 408 bridge crossing between Sophiamarie Loop and Mallory Circle / Island Bay Drive.
2. During the design phase, the design team will coordinate with the Waterford Lakes Master Home Owner Association regarding the inclusion of chases to the median areas for power and irrigation.
3. During the design phase, the County will work with the Orange County School Board regarding their request for a new eastbound right turn lane into the western Waterford Elementary School driveway on Lake Underhill Road.
4. The County is committed to rehabilitating/replacing subdivision screen walls that meet the County's screen wall policy which will be determined during the design phase.

1 INTRODUCTION

1.1 Introduction and Study Area

Orange County Public Works conducted a Roadway Conceptual Analysis (RCA) for Woodbury Road from Lake Underhill Road to S.R. 50 in northeast Orange County. The project corridor is approximately 1.5 miles in length. The study evaluated improvements to the intersection of Woodbury Road and Waterford Lakes Parkway from Woodbury Road to 600 feet west along Waterford Lakes Parkway. The limits of the project are shown in **Figure 1-1**, Project Location Map.

Woodbury Road passes over State Road (S.R.) 408, a limited access toll facility south of Waterford Lakes Parkway. In the eastern portion of the study area, S.R. 408 curves to the north. Lake Underhill Road and S.R. 50, as well as S.R. 408, provide east-west connections.

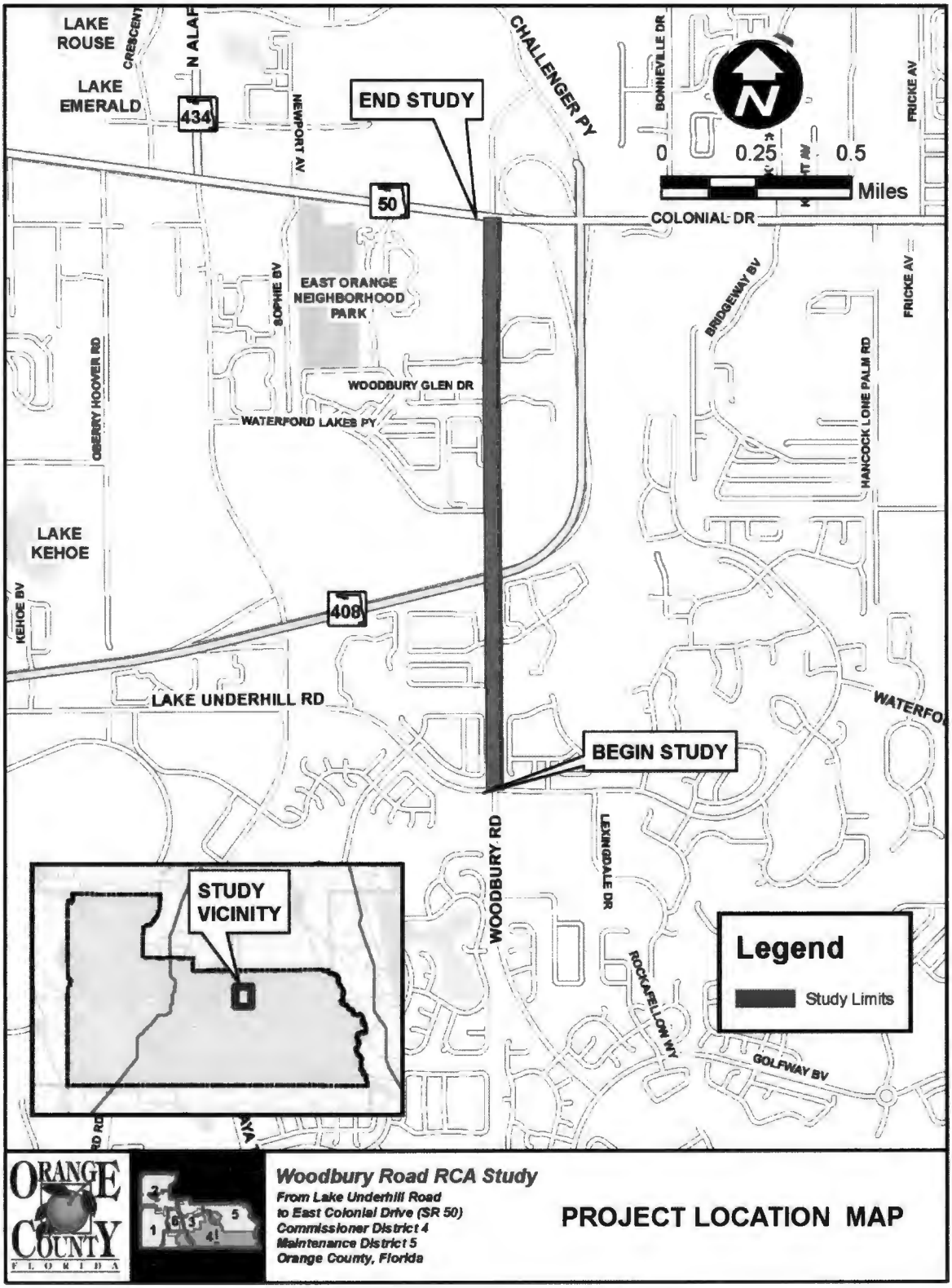
Orange County's RCA process has been implemented with the intent of applying a comprehensive interdisciplinary approach, combining the strengths of engineering and transportation planning disciplines in the initial development phases of Orange County's major roadway improvement projects. The interdisciplinary approach also seeks to assure early and systematic coordination with all effected County Departments and Divisions, the appropriate state and local entities, and the citizenry. The resulting effort is to accurately gather and convey information pertinent to the development of the project, thereby identifying viable opportunities to expedite or advance subsequent project phases.

Woodbury Road is located in unincorporated northeast Orange County in Commission District 4. Woodbury Road, within the project limits, is currently a two lane, undivided collector. Woodbury Road begins at Golfway Boulevard south of Lake Underhill Road and ends at Challenger Parkway north of S.R. 50. The proposed improvements will increase roadway capacity in order to accommodate existing and future traffic demands in the project area. Woodbury Road serves the Waterford Lakes area, a community of 25 subdivisions and numerous shopping venues. The proposed improvements will also enhance bicycle and pedestrian infrastructure along the Woodbury Road corridor, therefore improving safety for people walking and biking.

1.2 Purpose of Report

The purpose of this RCA Report is to present an overview of existing conditions, document the findings of the engineering and environmental studies conducted for this project, describe the results of the alternatives evaluation, and provide the identification of and the justification for the recommended improvements.

Figure 1-1
Project Location Map



This document describes the determinations made regarding typical roadway cross sections, a summary of existing and future traffic conditions and the comparative analysis of improvement alternatives that would satisfy existing and future transportation demands.

Potential typical section and alignment alternatives were developed based upon the engineering and environmental data collected, a review of Orange County Comprehensive Plan 2010-2030 Goals, Objectives & Policies (effective March 30, 2018), and the application of current roadway design standards. The alternatives were evaluated based on impacts resulting from the alignment locations and configurations. Each alternative was assessed using evaluation criteria developed for that purpose. From that comparative evaluation, the preferred typical section, roadway alignment, and stormwater management system were identified.

This RCA Study included analysis of existing and projected traffic conditions, development of alignment and typical section alternatives, an evaluation of impacts to the social, natural, and physical environment, and a public involvement program. This report has been prepared to assist Orange County in identifying a recommended design concept alternative and will serve as the document of record for support of subsequent engineering decisions for the final design, right-of-way acquisition, and construction phases that follow.

The recommended conceptual roadway alignment plans, included in **Appendix A**, and the right-of-way identification maps, included in **Appendix B**, are an integral part of this document and should be reviewed in concert with this document. The plans reflect specific details concerning each area of the project and will supplement information that is contained in this report.

2 PURPOSE AND NEED FOR PROJECT

The purpose and need for the project is based on several factors. These are traffic capacity, social/economic demands, consistency with transportation plans, and safety. Each of these is discussed below.

2.1 Traffic Capacity

Woodbury Road within the project limits is currently operating at an unacceptable Level of Service (LOS) F. Without improvements, Woodbury Road congestion will increase and conditions will worsen by the design year 2047.

Table 2-1 provides a list of the roadway parameters utilized in this analysis, taken from the Orange County Traffic Concurrency Management System. Included in this table are: number of lanes, functional classification, adopted Level of Service (LOS) standard, roadway service volumes, AM and PM peak hour traffic volumes, and existing LOS. Based upon this analysis, all Woodbury Road study roadway segments currently operate at beyond acceptable levels of service, except south of Lake Underhill Road.

The study intersections were analyzed under existing conditions using the procedures of the 2010 Highway Capacity Manual for signalized and unsignalized intersections. This analysis used existing traffic volumes and existing geometric conditions. **Table 2-2** includes the summary results for the AM and PM peak hour intersection delay and level of service. All of the existing study intersections within the project limits currently operate at unsatisfactory levels of service, with the exception of Waterford Lakes Parkway, which currently operates at LOS D during the PM peak hour.

In the design year 2047 and without capacity improvements, the entire corridor is projected to operate at a failing level of service (LOS F) during the PM peak hour. All signalized intersections are also projected to operate at LOS F. The two full access unsignalized intersections are projected to operate at LOS F for the minor street movements.

Under the AM peak hour analysis, the Waterford Lakes Parkway signalized intersection is projected to operate at LOS C, while the signalized intersections at S.R. 50 and at Lake Underhill Road are projected to operate at a failing level of service (LOS F). The full access unsignalized intersections are projected to operate at LOS F for the minor street movements during the AM peak hour.

Therefore, capacity improvements are needed to achieve an acceptable level of service along Woodbury Road.

Table 2-1
Existing Roadway Level of Service

Roadway/Segment	Adopted Functional Class	LOS	# of Lanes	Roadway Service Volumes Peak Hour / Peak Direction Capacity Table (1)					AADT (2)	Peak Hour Traffic Volumes (2)		Peak Time (2)	LOS
Mainline Characteristics													
Woodbury Rd				A	B	C	D	E		NB	SB		
Challenger Py to Colonial Dr (SR 50)	Collector	E	2	0	0	370	750	800	14,800	561	771	4:30-5:30 PM	E
SR 50 to Waterford Lakes Py	Collector	E	2	0	0	370	750	800	21,000	796	1094	5:00-6:00 PM	F
Waterford Lakes Py to Lake Underhill Rd	Collector	E	2	0	0	830	880	880	18,800	712	980	5:30-6:30 PM	F
Lake Underhill Rd to Woodbury Pines Cr	Collector	E	2	0	0	370	750	800	11,900	451	620	5:15-6:15 PM	D
Side Street Characteristics													
Colonial Dr (SR 50)				A	B	C	D	E		EB	WB		
West of Woodbury Rd	Arterial	E	6	0	0	2,940	3,020	3,020	43,700	2278	1655	5:15-6:15 PM	C
East of Woodbury Rd	Arterial	E	6	0	0	2,940	3,020	3,020	59,400	3096	2250	5:00-6:00 PM	F
Waterford Lakes Py				A	B	C	D	E		EB	WB		
West of Woodbury Rd	Local	E	4	0	0	730	1,630	1,700	16,900	881	640	5:30-6:30 PM	D
Lake Underhill Rd				A	B	C	D	E		EB	WB		
West of Woodbury Rd	Collector	E	4	0	0	730	1,630	1,700	28,700	1496	1087	5:00-6:00 PM	D
East of Woodbury Rd	Collector	E	4	0	0	730	1,630	1,700	24,000	1251	909	5:00-6:00 PM	D

Notes:
1. From Orange County Traffic Concurrency Management Program

2. Daily and Peak Hour traffic volumes from Table 1

Table 2-2
Existing Intersection Delay and LOS for Study Intersections

Study Intersections	Traffic Control	AM Peak Hour Delay (Sec/Veh)	AM Peak Hour LOS	PM Peak Hour Delay (Sec/Veh)	PM Peak Hour LOS
Woodbury Drive					
SR 50 / Colonial Dr	Signal	52.7	D	128.7	F
Woodbury Glen Dr / Woodbury Cove Dr	STOP [1]	8.1 / 9.3 | 30.4 / 16.2	A / A | D / C	9.5 / 9.6 | 66.2 / 26.4	A / A | F / C
Waterford Lakes Py	Signal	10.3	B	40.6	D
Mallory Cr / Island Bay Dr	STOP [1]	7.7 / 9.3 | 43.2 / 44.6	A / A | E / E	10.0 / 9.4 | 243.3 / 224.5	B / A | F / F
Lake Underhill Rd	Signal	98.4	F	182.4	F

Notes:
(1) NB / SB Left Turn Major Street Movement | EB / WB Minor Street Movements

2.2 Social/Economic Demands

Woodbury Road is located in the Waterford Lakes area of northeast Orange County. Existing land use along Woodbury Road is primarily single and multi-family residential, but also includes retail, churches, and commercial development south of the S.R. 408 crossing and at the S.R. 50 intersection. An elementary school and a middle school are located at the southern project limits in the southwest and southeast corners, respectively, of the Lake Underhill Road intersection. The majority of the land along Woodbury Road is developed with a few undeveloped parcels along the east side of the road south of S.R. 50 and in the southeast corner of Lake Underhill Road and Woodbury Road. Existing zoning along the project corridor is predominantly classified as Planned Development. Other zoning classifications found along the project corridor include, Residential 2 (Residential District), Residential 3 (Multiple Family Dwelling District), and Commercial-1 (Retail Commercial District).

The project limits fall along the border line of two census tracts. Data regarding each census tract bordering the project can be seen in **Table 2-3**.

Table 2-3
U.S. Census Data - 2018 ACS Estimates

Census Tract	Median Age	Median Income	Percent of population below poverty level	Total Population of Census Tract
167.27	27.3	$42,946	27.1%	11,754
167.29	34.1	$60,862	10.8%	18,002

Future land use data was obtained from Orange County Future Land Use Geographic Information Systems (GIS) data. Future land use along the project corridor is mostly classified as Medium Density Residential. The east side of the corridor between S.R. 408 and Lake Underhill Road is classified as Low-Medium Density Residential. The area west of Woodbury Road and south of Waterford Lakes Parkway is classified as Office, and there are areas of commercial use south of S.R. 50 and north of Waterford Lakes Parkway on the west side. Institutional uses are located in the southwest and southeast corners of the Woodbury Road/Lake Underhill Road intersection due to the elementary and middle schools. Transportation improvements are needed to provide service to this thriving community.

2.3 Consistency with Transportation Plans

The MetroPlan Orlando Transportation Improvement Program (TIP) includes the RCA study for the widening of Woodbury Road, from Lake Underhill Road to S.R. 50 (East Colonial Drive) as an Orange County Locally Funded Highway Project. The MetroPlan Orlando 2045 Long Range Transportation Plan (2045 Metropolitan Transportation Plan) is expected to include additional phases of the project.

The Orange County Public Works Department's 10-Year Roadway Program (2018-2027) identifies the years for the following phases for improving Woodbury Road between Lake Underhill Road and S.R. 50:

- RCA Study – 2019-2020
- Design – 2021
- Right of Way Acquisition – 2024-2026
- Construction - 2027

Improvements to Woodbury Road are consistent with the goals, objectives, and policies of the adopted 2010-2030 Orange County Comprehensive Plan. Improvements to Woodbury Road from Lake Underhill Road to S.R. 50 are included in the 10-year schedule of capital improvements in the Capital Improvements Section. In addition, the four-laning of Woodbury Road is shown in the Transportation Element Future Conditions Number of Lanes 2030 Map.

The RCA Study for the widening of Woodbury Road from Lake Underhill Road to S.R. 50 is included in the MetroPlan Orlando Transportation Improvement Program (TIP) as an Orange County Locally Funded

Highway Project. No funding is identified in the TIP for any phases beyond the RCA Study. And while the TIP indicates that the 2040 Long Range Transportation Plan (Blueprint 2040) would be modified to include additional phases of the project as unfunded needs, it was not amended, but additional phases of the project are anticipated to be included in the upcoming 2045 Metropolitan Transportation Plan.

2.4 Safety

Crash reports for the five-year time period between April 1, 2014 and March 31, 2019 were obtained and reviewed. Crashes were considered to be associated with the intersection if the crash occurred due to the operation of the intersection. Four hundred forty-four crashes occurred at the study intersections over the five-year period. One hundred thirty-six crashes occurred along the roadway segments withing the study limits. Capacity and intersection improvements will enhance safety along the corridor.

3 EXISTING CONDITIONS

This section presents an overview of the existing physical characteristics and conditions of the Woodbury Road study corridor.

3.1 Roadway Characteristics

3.1.1 Functional Classification

Woodbury Road, within the project limits, is a two-lane undivided roadway. Woodbury Road is located within the County's urban area boundary and is functionally classified as a major urban collector from Golfway Boulevard to S.R. 50. Woodbury Road has a posted speed limit of 40 miles per hour (mph).

3.1.2 Roadway Typical Section

Woodbury Road is predominately a two-lane undivided urban roadway with Type F curb and gutter along the west side of the road and intermittent Type E and F curb along the east side of the road. As Woodbury Road approaches S.R. 50, the road widens to a four-lane divided typical section with a left turn lane. The road widens to provide left turn lanes at Lake Underhill Road, Mallory Circle, Waterford Lakes Parkway, Waterford Oak Drive, and the entrance to Polos East at Waterford Apartments. **Figure 3-1** depicts the existing typical section.

- Lake Underhill Road (dual left turn lanes northbound and southbound)
- Mallory Circle/Island Bay Drive (northbound left turn lane)
- Waterford Lakes Parkway (northbound left turn lane, southbound right turn lane)
- Waterford Oak Drive (northbound left turn lane)
- Polos East at Waterford Apartments entrance (northbound left turn lane)
- S.R. 50 (northbound left turn lane)

3.1.3 S.R. 408 Bridge Typical Section

The existing Woodbury Road bridge over S.R. 408 consists of two 11-foot travel lanes and 4-foot shoulders on both sides. A 7.33-foot sidewalk is provided along the west side of the bridge and is separated from the roadway with a 1.25-foot wide concrete barrier. Concrete barriers with fencing are provided along the outside of the bridge in both directions. The total bridge width is 42.75 feet. **Figure 3-1** depicts the existing bridge typical section.

Figure 3-1
Woodbury Road Existing Typical Section

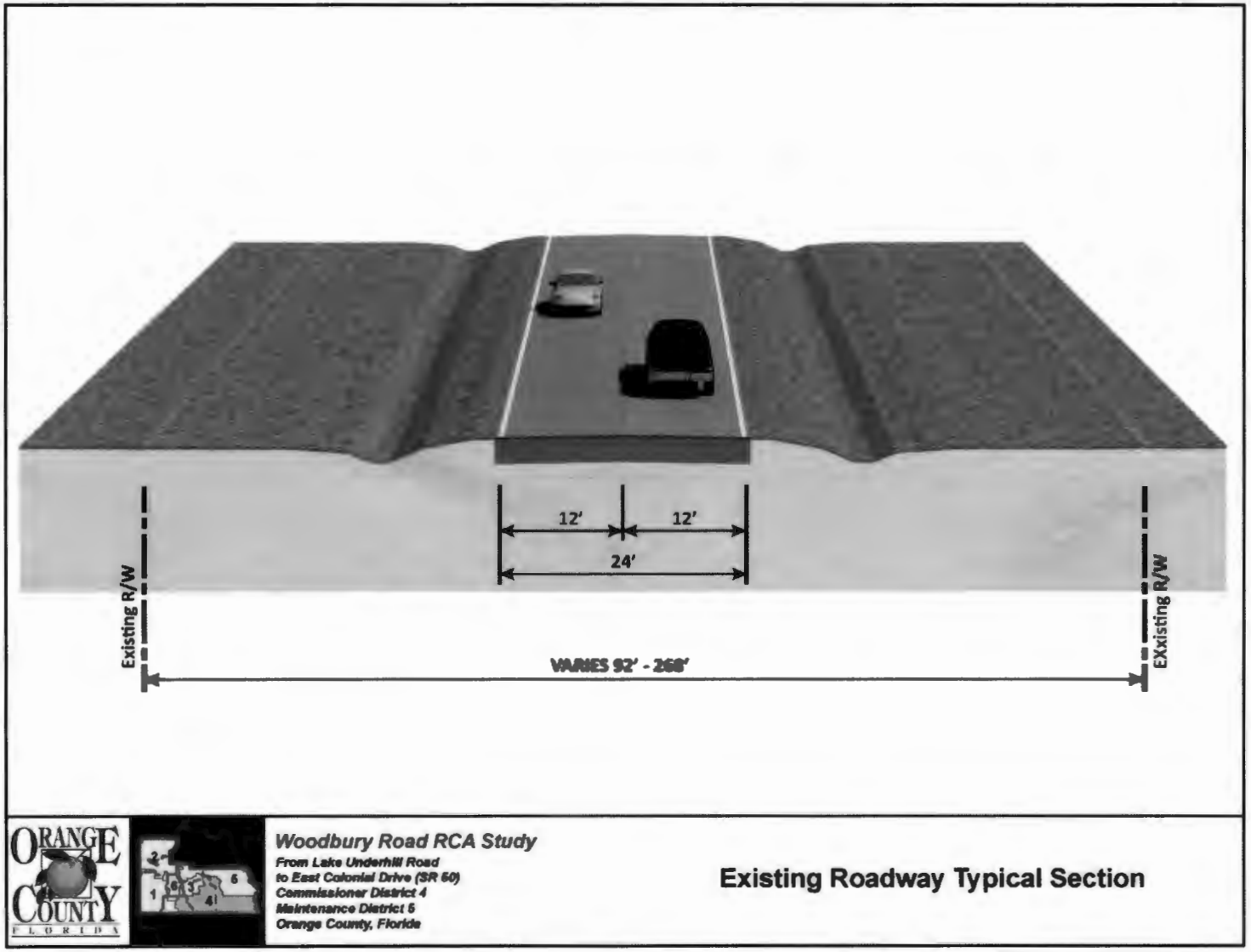
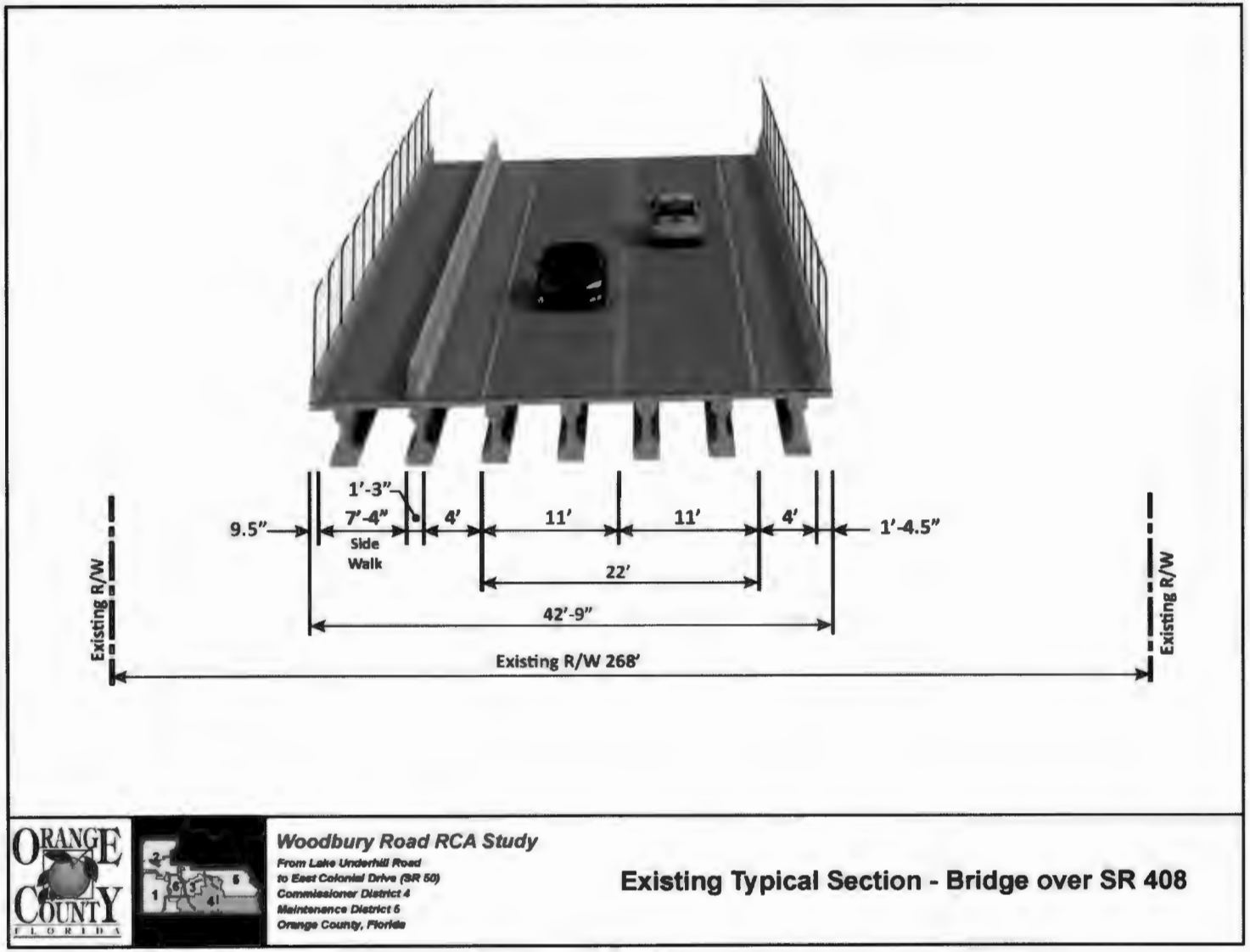


Figure 3-2
Existing Woodbury Road Bridge Over S.R. 408 Typical Section



3.1.4 Pedestrian and Bicycle Facilities

A sidewalk that varies between four and eight feet in width is provided along the west side of Woodbury Road through the study limits. Sidewalk also exists on the east side of Woodbury Road from Waterford Lakes Parkway to just south of Woodbury Cove Drive and from Lake Underhill Road to Island Bay Drive. There are currently two uncontrolled crosswalks crossing Woodbury Road. One is a school crossing at Waterford Wood Circle and the other is a pedestrian crossing at Sophiamarie Loop.

Table 3-1 provides the location of the intersections where pedestrian facilities have been constructed, the length of the sidewalk, and the location of the sidewalk relative to the east or west side of Woodbury Road and north or south of the intersection side street.

Table 3-1
Existing Pedestrian Facilities

Intersection with Woodbury Road	Sidewalk Length and Location Relative to Woodbury Road (West Side or East Side)
Lake Underhill Road	North: continuous west and east South: continuous west and east
Sophiamarie Loop	North: continuous west South: continuous west
Mallory Circle / Island Bay Drive	North: continuous west South: continuous east
Waterford Lakes Parkway	North: continuous west South: continuous west
Waterford Oak Drive	North: 140 feet east
Woodbury Glen Drive	North: continuous west South: continuous west
Parkbury Drive	North: continuous west South: continuous west
S.R. 50	North: continuous west and east South: continuous west and east

Woodbury Road has limited bicycle facilities. On-road bicycle lanes are developed at the north end of the project as the roadway transitions to four lanes on the approach to S.R. 50. In the northbound direction the bike lane begins north of Waterford Wood Circle and in the southbound direction the bike lane ends at the Advenir Apartments driveway. There are no paved shoulders on Woodbury Road, other than on the bridge.

3.1.5 Existing Right-of-Way

The existing right-of-way along Woodbury Road varies between 92 feet and 268 feet throughout the project corridor. **Table 3-2** identifies the existing Woodbury Road right-of-way widths along the corridor.

Table 3-2
Existing Right-of-Way Widths

Station	Right-of-Way Width	Location
1+69 to 12+67	93 feet	Begin of project at Lake Underhill Drive to 290 feet south of Sophiamarie Loop
12+67 to 13+67	92 feet	290 feet south of Sophiamarie Loop to 190 feet south of Sophiamarie Loop
13+67 to 21+17	93 feet	190 feet south of Sophiamarie Loop to 24 feet south of Mallory Circle
21+17 to 26+98	From 93 to 175 feet	24 feet south of Mallory Circle to 344 feet south of S.R. 408
263.0126+98 to 29+95	263 feet	344 feet south of S.R. 408 to 95 feet south of S.R. 408
29+95 to 32+39	268 feet	95 feet south of SR 408 to 92 feet north of S.R. 408
32+39 to 39+30	From 268 feet to 222 feet	92 feet north of S.R. 408 to 24 feet south of Waterford Lakes Parkway
39+30 to 40+27	223 feet	24 feet south of Waterford Lakes Parkway to 20 feet north of Waterford Lakes Parkway
40+27 to 40+29	251 feet	20 feet north of Waterford Lakes Parkway to 20 feet north of Waterford Lakes Parkway
40+29 to 42+20	From 251 feet to 161 feet	20 feet north of Waterford Lakes Parkway to 208 feet north of Waterford Lakes Parkway
42+20 to 44+08	From 161 feet to 111 feet	208 feet north of Waterford Lakes Parkway to 400 feet north of Waterford Lakes Parkway
44+08 to 54+31	100 feet	400 feet north of Waterford Lakes Parkway to Woodbury Glen Drive
54+31 to 67+34	105 feet	Woodbury Glen Drive to 512 feet north of Woodbury Glen Drive
67+34 to 70+00	105 feet	512 feet north of Woodbury Glen Drive to East Colonial Parkway, Projects end.

3.1.6 Existing Horizontal and Vertical Alignment

Woodbury Road runs in a north-south direction on a tangent alignment and does not include any horizontal curves. The vertical alignment is fairly flat along the study corridor with the exception of the vertical curves approaching the bridge over S.R. 408.

3.1.7 Signalized Intersections

There are three signalized intersections within the study limits, at Lake Underhill Road, Waterford Lakes Parkway, and S.R. 50.

3.2 Crash Data

Crash reports for the five-year time period between April 1, 2014 and March 31, 2019 were obtained from the Signal4 crash database system and reviewed. Intersection crashes, classified as those which occurred along the roadway corridor adjacent to each intersection, are summarized in **Table 3-3** through **Table 3-7**. Crashes were considered associated with the intersection if the crash occurred due to the operation of the intersection. Segment crashes are summarized in **Table 3-8** through **Table 3-11**.

The tables include the total number of crashes as well as fatalities and injuries. Crashes are also summarized by crash type and include a tabulation of DUI, failure to yield right-of-way, and other contributing causes as well.

Four hundred forty-four crashes occurred at the study intersections over the five-year period. One hundred thirty-five crashes occurred along the segments within the study limits. Of the total crashes along the segments, 78 were located between S.R. 50 and Woodbury Glen/Woodbury Drive, 16 were located between Woodbury Glen/Woodbury Drive and Waterford Lakes Parkway, 9 were located between Waterford Lakes Parkway and Mallory Circle/Island Bay Drive, and 32 were located between Mallory Circle/Island Bay Drive and Lake Underhill Road. South of Lake Underhill Road there were 16 total crashes.

Among the 579 crashes recorded along the study corridor, 427 were rear end crashes, 29 were left turn crashes, 16 were right turn crashes, five were head on crashes, 14 were angle and 53 were sideswipe. No crashes involved vehicles running off the road, 18 were one vehicle crashes, 23 were other and three were unknown. Eleven crashes involved pedestrians or bicycles and one crash was animal related. Overall, 268 drivers were cited for careless driving and 25 for failure to yield right-of-way. Four hundred ten occurred during daylight, 170 during night. Five hundred two occurred in dry weather, and the remaining 78 occurring during wet weather.

Table 3-3
Woodbury Road/S.R. 50 Intersection Crash Summary

Major Route:	Woodbury Road											
Intersecting Route:	S.R. 50											
Study Period:	4/1/2014	**To**	3/31/2019					**County:**	Orange			
								Engineer:	JAL			
				CRASH TYPE								
Total Crashes	**Fatal Crashes**	**Injury Crashes**	**Prop. Damage**	**Ped / Bike**	**Rear End**	**Left Turn**	**Right Turn**	**Head On**	**Sideswipe**	**Angle**	**Ran Off Road**	**Other**
251	0	55	249	3	193	3	9	0	29	8	0	6
100.0%	0.0%	21.9%	99.2%		76.9%	1.2%	3.6%	0.0%	11.6%	3.2%	0.0%	2.4%
					CONTRIBUTING CAUSE							
	Time of Day		**Road Condition**		**Other**	**Careless Driving**	**FTYROW**	**FTYTCD**	**Fail to Maint Lane**	**Improp Lane Chg**	**Distracted**	**Alc/Drugs**
One Vehicle	**Day**	**Night**	**Wet**	**Dry**								
5	164	87	28	223	109	115	13	1	2	11	105	10
2.0%	65.3%	34.7%	11.2%	88.8%	43.4%	45.8%	5.2%	0.4%	0.8%	4.4%	41.8%	4.0%

Table 3-4
Woodbury Road/Woodbury Glen/Woodbury Cove Drive Intersection Crash Summary

Major Route:	Woodbury Road											
Intersecting Route:	Woodbury Glen / Cove Dr											
Study Period:	4/1/2014	**To**	3/31/2019					**County:**	Orange			
								Engineer:	JAL			
				CRASH TYPE								
Total Crashes	**Fatal Crashes**	**Injury Crashes**	**Prop. Damage**	**Ped / Bike**	**Rear End**	**Left Turn**	**Right Turn**	**Head On**	**Sideswipe**	**Angle**	**Ran Off Road**	**Other**
12	0	2	12	0	8	4	0	0	0	0	0	0
100.0%	0.0%	16.7%	100.0%		66.7%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
					CONTRIBUTING CAUSE							
	Time of Day		**Road Condition**		**Other**	**Careless Driving**	**FTYROW**	**FTYTCD**	**Fail to Maint Lane**	**Improp Lane Chg**	**Distracted**	**Alc/Drugs**
One Vehicle	**Day**	**Night**	**Wet**	**Dry**								
0	10	2	2	10	5	5	0	2	0	0	1	1
0.0%	83.3%	16.7%	16.7%	83.3%	41.7%	41.7%	0.0%	16.7%	0.0%	0.0%	8.3%	8.3%

Table 3-5
Woodbury Road/Waterford Lakes Parkway Intersection Crash Summary

Major Route: Woodbury Road
Intersecting Route: Waterford Lakes Py
Study Period: 4/1/2014 **To** 3/31/2019
County: Orange
Engineer: JAL

				CRASH TYPE								
Total Crashes	Fatal Crashes	Injury Crashes	Prop. Damage	Ped / Bike	Rear End	Left Turn	Right Turn	Head On	Sideswipe	Angle	Ran Off Road	Other
58	0	15	57	1	45	2	4	1	1	2	0	2
100.0%	0.0%	25.9%	98.3%		77.6%	3.4%	6.9%	1.7%	1.7%	3.4%	0.0%	3.4%

					CONTRIBUTING CAUSE							
One Vehicle	Time of Day		Road Condition		Other	Careless Driving	FTYROW	FTYTCD	Fail to Maint Lane	Improp Lane Chg	Distracted	Alc/Drugs
	Day	Night	Wet	Dry								
3	40	18	12	46	30	25	1	1	0	1	19	1
5.2%	69.0%	31.0%	20.7%	79.3%	51.7%	43.1%	1.7%	1.7%	0.0%	1.7%	32.8%	1.7%

Table 3-6
Woodbury Road/Mallory Circle/Island Bay Drive Intersection Crash Summary

Major Route: Woodbury Road
Intersecting Route: Mallory Ci/Island Bay Dr
Study Period: 4/1/2014 **To** 3/31/2019
County: Orange
Engineer: JAL

				CRASH TYPE								
Total Crashes	Fatal Crashes	Injury Crashes	Prop. Damage	Ped / Bike	Rear End	Left Turn	Right Turn	Head On	Sideswipe	Angle	Ran Off Road	Other
20	0	5	19	2	7	5	0	0	0	2	0	4
100.0%	0.0%	25.0%	95.0%		35.0%	25.0%	0.0%	0.0%	0.0%	10.0%	0.0%	20.0%

					CONTRIBUTING CAUSE							
One Vehicle	Time of Day		Road Condition		Other	Careless Driving	FTYROW	FTYTCD	Fail to Maint Lane	Improp Lane Chg	Distracted	Alc/Drugs
	Day	Night	Wet	Dry								
2	12	8	3	17	11	4	3	1	1	0	6	0
10.0%	60.0%	40.0%	15.0%	85.0%	55.0%	20.0%	15.0%	5.0%	5.0%	0.0%	30.0%	0.0%

Table 3-7
Woodbury Road/Lake Underhill Road Intersection Crash Summary

Major Route: Woodbury Road
Intersecting Route: Lk Underhill Rd
Study Period: 4/1/2014 **To** 3/31/2019
County: Orange
Engineer: JAL

				CRASH TYPE								
Total Crashes	Fatal Crashes	Injury Crashes	Prop. Damage	Ped / Bike	Rear End	Left Turn	Right Turn	Head On	Sideswipe	Angle	Ran Off Road	Other
103	0	33	101	3	75	3	1	1	14	1	0	5
100.0%	0.0%	32.0%	98.1%		72.8%	2.9%	1.0%	1.0%	13.6%	1.0%	0.0%	4.9%

					CONTRIBUTING CAUSE							
One Vehicle	Time of Day		Road Condition		Other	Careless Driving	FTYROW	FTYTCD	Fail to Maint Lane	Improp Lane Chg	Distracted	Alc/Drugs
	Day	Night	Wet	Dry								
4	81	22	9	94	50	45	1	0	3	4	39	2
3.9%	78.6%	21.4%	8.7%	91.3%	48.5%	43.7%	1.0%	0.0%	2.9%	3.9%	37.9%	1.9%

Table 3-8
Woodbury Road from S.R. 50 to Woodbury Glen/Woodbury Cove Drive Crash Summary

Major Route: Woodbury Road
Segment: S.R. 50 to Woodbury Glen / Cove Dr
Study Period: 4/1/2014 **To** 3/31/2019
County: Orange
Engineer: JAL

				CRASH TYPE								
Total Crashes	Fatal Crashes	Injury Crashes	Prop. Damage	Ped / Bike	Rear End	Left Turn	Right Turn	Head On	Sideswipe	Angle	Ran Off Road	Other
78	0	15	78	1	59	8	1	1	5	0	0	3
100.0%	0.0%	19.2%	100.0%		75.6%	10.3%	1.3%	1.3%	6.4%	0.0%	0.0%	3.8%

					CONTRIBUTING CAUSE							
One Vehicle	Time of Day		Road Condition		Other	Careless Driving	FTYROW	FTYTCD	Fail to Maint Lane	Improp Lane Chg	Distracted	Alc/Drugs
	Day	Night	Wet	Dry								
3	60	18	15	63	34	37	5	2	0	0	32	0
3.8%	76.9%	23.1%	19.2%	80.8%	43.6%	47.4%	6.4%	2.6%	0.0%	0.0%	41.0%	0.0%

Table 3-9
Woodbury Road from Woodbury Glen/Woodbury Cove Drive to Waterford Lakes Parkway Crash Summary

Major Route: Woodbury Road
Segment: Woodbury Glen / Cove Dr to Waterford Lake Py
Study Period: 4/1/2014 **To** 3/31/2019
County: Orange
Engineer: JAL

				CRASH TYPE								
Total Crashes	Fatal Crashes	Injury Crashes	Prop. Damage	Ped / Bike	Rear End	Left Turn	Right Turn	Head On	Sideswipe	Angle	Ran Off Road	Other
16	0	6	16	0	14	0	1	0	0	1	0	0
100.0%	0.0%	37.5%	100.0%	0.0%	87.5%	0.0%	6.3%	0.0%	0.0%	6.3%	0.0%	0.0%

					CONTRIBUTING CAUSE							
	Time of Day		Road Condition									
One Vehicle	Day	Night	Wet	Dry	Other	Careless Driving	FTYROW	FTYTCD	Fail to Maint Lane	Improp Lane Chg	Distracted	Alc/Drugs
0	12	4	4	12	2	13	1	0	0	0	7	1
0.0%	75.0%	25.0%	25.0%	75.0%	12.5%	81.3%	6.3%	0.0%	0.0%	0.0%	43.8%	6.3%

Table 3-10
Woodbury Road from Waterford Lakes Parkway to Mallory Circle/Island Bay Drive Crash Summary

Major Route: Woodbury Road
Segment: Waterford Lake Py to Mallory Cl/Island Bay Dr
Study Period: 4/1/2014 **To** 3/31/2019
County: Orange
Engineer: JAL

				CRASH TYPE								
Total Crashes	Fatal Crashes	Injury Crashes	Prop. Damage	Ped / Bike	Rear End	Left Turn	Right Turn	Head On	Sideswipe	Angle	Ran Off Road	Other
9	0	3	6	0	6	0	0	0	0	0	0	0
100.0%	0.0%	33.3%	100.0%		100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

					CONTRIBUTING CAUSE							
	Time of Day		Road Condition									
One Vehicle	Day	Night	Wet	Dry	Other	Careless Driving	FTYROW	FTYTCD	Fail to Maint Lane	Improp Lane Chg	Distracted	Alc/Drugs
0	9	0	2	7	3	6	0	0	0	0	6	0
0.0%	100.0%	0.0%	22.2%	77.8%	33.3%	66.7%	0.0%	0.0%	0.0%	0.0%	66.7%	0.0%

Table 3-11
Woodbury Road from Mallory Circle/Island Bay Drive to Lake Underhill Road Crash Summary

Major Route: Woodbury Road
Segment: Mallory Ci/Island Bay Dr to Lk Underhill Rd
Study Period: 4/1/2014 **To** 3/31/2019
County: Orange
Engineer: JAL

				CRASH TYPE								
Total Crashes	Fatal Crashes	Injury Crashes	Prop. Damage	Ped / Bike	Rear End	Left Turn	Right Turn	Head On	Sideswipe	Angle	Ran Off Road	Other
32	1	7	32	0	19	4	0	2	4	0	0	3
100.0%	3.1%	21.9%	100.0%		59.4%	12.5%	0.0%	6.3%	12.5%	0.0%	0.0%	9.4%

					CONTRIBUTING CAUSE							
One Vehicle	Time of Day		Road Condition		Other	Careless Driving	FTYROW	FTYTCD	Fail to Maint Lane	Improp Lane Chg	Distracted	Alc/Drugs
	Day	Night	Wet	Dry								
1	21	11	3	29	8	17	1	1	3	2	14	0
3.1%	65.6%	34.4%	9.4%	90.6%	25.0%	53.1%	3.1%	3.1%	9.4%	6.3%	43.8%	0.0%

Table 3-12 presents the million entering vehicles (MEV) crash rates for the study intersections and the one million vehicle miles of travel (MVMT) crash rate for the study roadway segments.

The FDOT District Five average five-year crash rate in Orange County for 2-3 lane (two-way total) undivided urban roadways is 3.12 crashes/MVMT. The study segment crashes/MVMT is 4.13, greater than the county-wide average, along with most of the individual segments.

The FDOT District Five average five-year crash rate for Orange County intersection along 2-3 lane (two-way total) undivided urban roadways is 0.452 for three-leg intersections and 0.286 for four leg intersections. The S.R. 50/Colonial Drive intersection has a crash rate greater than the countywide average, while the other signalized intersections have crash rates less than the countywide average.

Table 3-12
Woodbury Road Crash Rates at Study Intersections and Study Roadway Segments

Intersection	Total Number of Vehicles Entering (AADT)	Total Number of Crashes	Crash Rate	
Woodbury Road @				
S.R. 50	69,450	1251	3.30	
Waterford Lakes Pkwy	28,350	58	1.87	
Lk Underhill Rd	41,700	103	2.26	
Roadway Segment	**Total Number of Vehicles (AADT)**	**Total Number of Crashes**	**Segment Length**	**Crash Rate**
Woodbury Road:				
S.R. 50 to Woodbury Glen / Cove Dr	21,000	78	0.480	7.06
Woodbury Glen / Cove Dr to Waterford Lakes Pkwy	21,000	16	0.287	2.42
Waterford Lake Pkwy to Mallory Ci/Island Bay Dr	18,800	9	0.341	1.28
Mallory Ci/Island Bay Dr to Lk Underhill Rd	18,800	32	0.389	3.99
		135		4.13

1 – Intersection Million Entering Vehicles Formula: (1,000,000 X Crashes) + (365 X Years of Data X Entering AADT) = MEV
2 – Segment Million Vehicle-Miles of Travel Formula: (1,000,000 X Crashes) / (365 X Years of Data X Entering AADT X Length) = MVMT
Unsignalized intersections not included as daily volume is not available.

3.3 Existing Transportation Network

The existing transportation network within the study corridor is comprised mainly of the current roadway system.

LYNX service along Woodbury Road includes NeighborLink 621 which provides curb to curb service between Waterford Lakes Town Center and Bithlo Health Center. LYNX Route 320 runs Monday through Friday and includes a stop at the Waterford Lakes Parkway/Woodbury Road intersection. The LYNX Vision 2030 Plan does not include any future routes that would utilize the segment of Woodbury Road between Lake Underhill Road and S.R. 50.

Woodbury Road currently crosses over S.R. 408, however, a study to consider extending S.R. 408 to the east includes a concept to provide an eastbound on-ramp and westbound off-ramp with Woodbury Road. However, during the course of this study, it was determined that CFX will not proceed with the S.R. 408 extension or any ramp connections with Woodbury Road

Other planned and programmed roadway capacity improvements in the vicinity of Woodbury Road include

- Econlockhatchee Trail from Lake Underhill Road to S.R. 408, widen to 4 lanes (TIP)
- Lake Underhill Road from Econlockhatchee Trail to Rouse Road, widen to 4 lanes (TIP)
- S.R. 50 from E. Old Cheney Hwy (Avalon Park Boulevard) to Chuluota Road, widen to 6 lanes (TIP and Prioritized Project List)

3.4 Long Range Transportation Improvements

The MetroPlan Orlando Transportation Improvement Program (TIP) includes the RCA study for the widening of Woodbury Road, from Lake Underhill Road to S.R. 50 (East Colonial Drive) as an Orange County Locally Funded Highway Project. The MetroPlan Orlando 2045 Long Range Transportation Plan (2045 Metropolitan Transportation Plan) is expected to include additional phases of the project.

The Orange County Comprehensive Plan, Capital Improvements Element, includes improvements to Woodbury Road, from Lake Underhill Road to S.R. 50 as part of the 10-year schedule of capital improvements. Woodbury Road is included as a four-lane roadway in Map 1C: Transportation Element Future Conditions Number of Lanes 2030.

The project is consistent with the Orange County Comprehensive Plan, the Orange County 10-Year Roadway Program (2018-2027), and the MetroPlan Orlando FY 2019/20-2023/24 Orlando Urban Area Transportation Improvement Program.

3.5 Lighting

Street lighting is provided along the west side of Woodbury Road by standard high pressure sodium cobra head luminaires mounted on utility poles. Additional stand-alone light poles with cobra head luminaires are located at the intersection of Lake Underhill Road, Sophiamarie Loop, Mallory Circle, Waterford Oak Drive, Woodbury Glen Drive, and Parkbury Drive.

3.6 Existing Utilities

Thirteen Utility Agency/Owners (UAO) have been identified within the project area through a Sunshine 811 Design Ticket and utility coordination efforts. There are numerous existing utilities within the project corridor including overhead and underground electric, water and wastewater mains, gas mains, and communication lines. All of the utility providers and operators were contacted on August 11, 2019 and were provided aerial maps of the project for review. Based on the aerial maps, UAOs were asked to assist in locating and identifying their existing and any planned facilities within the area of study. Details of the UAOs contacted on the project and a description of the facilities identified within the corridor are summarized in **Table 3-13**.

Table 3-13
Existing Utilities Summary

Utility Company	Facility Type	Description
AT&T	Phone/Fiber	High capacity buried fiber line along both sides of Woodbury Road from Lake Underhill Road to S.R. 408, where the west side of the fiber ends and the east side extends away from Woodbury Road until it meets the road again at Waterford Lakes Parkway. Here the fiber is on both sides of the road until the east side ends at the Church of Jesus Christ of Latter-Day Saints. At Woodbury Cove Drive the eastern line picks up again until Parksbury Drive. The western fiber line continues until East Colonial Parkway. High capacity buried fiber line along both sides of the entrances to Parksbury Drive, Woodbury Glen Drive, and the north side of Sophiamarie Loop and Waterford Lakes Parkway.
Century Link	Fiber Optic	Buried facilities along the south side of East Colonial Drive. CLA aerial facilities along East Colonial Drive.
Summit Broadband	Fiber Optic	There are no facilities in the project area.
Duke Energy Distribution	Electric	12.4 kV overhead electric lines from the west side of Woodbury Road at Lake Underhill Drive to Mallory Circle, where the lines cross to east of Woodbury Road until crossing back to the west of the road at Waterford Lakes Parkway until East Colonial Drive.
Duke Energy Transmission	Electric	Two lines cross Woodbury Road at 480 feet and 500 feet south of East Colonial Drive
City of Orlando	Water/Sewer	42" reclaimed water main along the east side of Woodbury Road from Waterford Elementary School to Island Bay Drive, where it extends further east beyond the road. At Waterford Lakes Parkway the main returns to the east side of Woodbury Road for the remainder of the project limits.
TECO Energy	Gas	2" coated steel gas line on the east side of Woodbury Road from Lake Underhill Road to Mallory Circle. 2" coated steel gas line on the east side of Woodbury Road
Charter Communications	Internet, Cable TV, Phone, Fiber	12.4 kV overhead electric lines from the west side of Woodbury Road at Lake Underhill Drive to Mallory Circle, where the lines cross to east of Woodbury Road until crossing back to the west of the road at Waterford Lakes Parkway until East Colonial Drive.
MCI	Fiber Optic	No response received
Orange County Utilities	Wastewater	Water and sewer pressurized mains along the east side of Woodbury Road from Lake Underhill Drive to Island Bay Drive, where the water main transitions to 100 to 150 feet east of the road and the sewer main ends. Sewer gravity mains on the west side of Woodbury Road from 150 feet south of Sophiamarie Loop to Sophiamarie Loop. The water pressurized main returns to the east side of Woodbury Road between Waterford Lakes Parkway and Waterford Oak Drive. The sewer pressurized main crosses Woodbury Road at Waterford lakes Parkway to the east side of the road and ends at Waterford oak Drive. Just south of

Utility Company	Facility Type	Description
		Woodbury Glen Drive, the main starts along the west side of Woodbury Road and continues on both sides of the road until East Colonial Drive. The sewer gravity main starts again at Woodbury Glen Drive on the east side of Woodbury Road until it enters the center of Woodbury Road 360 feet north of Waterford Point where it ends at the west of Woodbury Road at the HomeTowne Studios Apartment Complex. The sewer pressurized main starts at Waterford Point and runs east of Woodbury Road until East Colonial Drive.
CFX	Fiber Optic	Buried fiber withing L/A ROW
Comcast	CATV	12.4 kV overhead electric lines from the west side of Woodbury Road at Lake Underhill Drive to Mallory Circle, where the lines cross to east of Woodbury Road until crossing back to the west of the road at Waterford Lakes Parkway until East Colonial Drive.

3.7 Geotechnical Exploration

This section presents a summary of the preliminary geotechnical evaluation for the Woodbury Road RCA study.

3.7.1 Local Geology and Hydrology

Orange County is in the central Florida peninsular zone of the Atlantic Coastal Plain physiographic province, a geographic region typified by sedimentary materials of recent geologic age. Topography in the county is generally characterized as broad plains, low ridges and knolls, localized wetlands and marshes, and lakes.

The USGS recharge map showed the general area where Woodbury Road is located as an area of "low to moderate recharge." The general consensus among geotechnical engineers currently practicing in central Florida is that a high risk of sinkholes is usually associated with areas of high recharge. As a result, we anticipate that the risk of sinkhole activity along Woodbury Road is likely to be low compared to the average risk across central Florida.

3.7.2 Soil Exploration

The United States Geological Survey quadrangle topographic map for the general area showed the terrain in the project vicinity as gently-sloping terrain near the eastern edge of a broad irregularly-shaped knoll that was bordered on the east by an area of freshwater marsh and wetlands. Land use on the knoll was mapped as undeveloped land and woodlands. The ground surface in the project area was mapped between the elevation 65 feet NGVD (El. 65) contour and the El. 75 contour. A point along S.R. 50 near the Woodbury Road intersection was mapped at El. 69. The wetlands and freshwater marsh areas to the south and east were mapped below the El. 60 contour. An isolated wetland area west of Woodbury Road was mapped below the EL.+75 contour.

The United States Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey of Orange County, Florida reported the main soil units in the area as Immokalee fine sand, Smyrna fine

sand, and St. Johns fine sand. Ona fine sand and Pomello fine sand were mapped in areas that corresponded to higher elevations on the USGS topographic map, while Basinger fine sand was shown in areas mapped as wetlands and marsh. Samsula muck was also mapped in the nearby wetlands.

Immokalee fine sand, Smyrna fine sand, and St. Johns fine sand are found on broad, low-lying plains throughout Orange County. These soils are reported to be nearly-level to level, and poorly drained, with seasonal high groundwater levels within a foot of the ground surface in natural, undisturbed, typically rural areas. Ona fine sand and Pomello fine sand are found on low knolls and ridges on these low-lying plains. These soils are reported to be nearly level to gently sloping, and moderately well drained to well drained, with seasonal high groundwater levels between two feet and about four feet below the natural ground surface.

Basinger fine sand is found in wetlands, marshes, broad drainage areas, natural depressions and other localized, low-lying areas on the terrain. These soils are nearly level to level, and very poorly drained. They are often submerged for most of the year, sometimes by as much as two feet of water during the rainy season. These soils have a surficial layer of organic material about a foot deep, but other organic soils such as Samsula muck or Hontoon muck are sometimes found in areas mapped as Basinger fine sand, depressional. Those muck soils may have a surficial layer of organic material that may be more than four feet deep.

Characteristics of the reported soil units discussed above are summarized below in **Table 3-14**. A depiction of the soil types and their location along the project corridor is shown in **Figure 3-3.**

Table 3-14
Map USDA NRCS Soil Survey Units in Project Area

	Soil Unit No. and Name	Description	AASHTO Group	ESHGWL Depth (ft)	Hydrologic Soil Group
3	Basinger fine sand, depressional	Fine sand	A-3, A-2-4	+2 to 1	D
20	Immokalee fine sand	Fine sand	A-3, A-2-4	0 – 1	B/D
26	Ona fine sand	Fine sand	A-3, A-2-4	0 – 1	B/D
34	Pomello fine sand	Fine sand	A-3, A-2-4	2 – 3.5	C
37	St Johns fine sand	Fine sand	A-3	0 – 1	B/D
42	Sanibel muck	Muck, fine sand	A-8, A-2-4	+2 to 1	B/D
44	Smryna fine sand	Fine sand	A-3, A-2-4	0 to 1	B/D

Figure 3-3
NRCS Soil Survey Map – 1 of 2

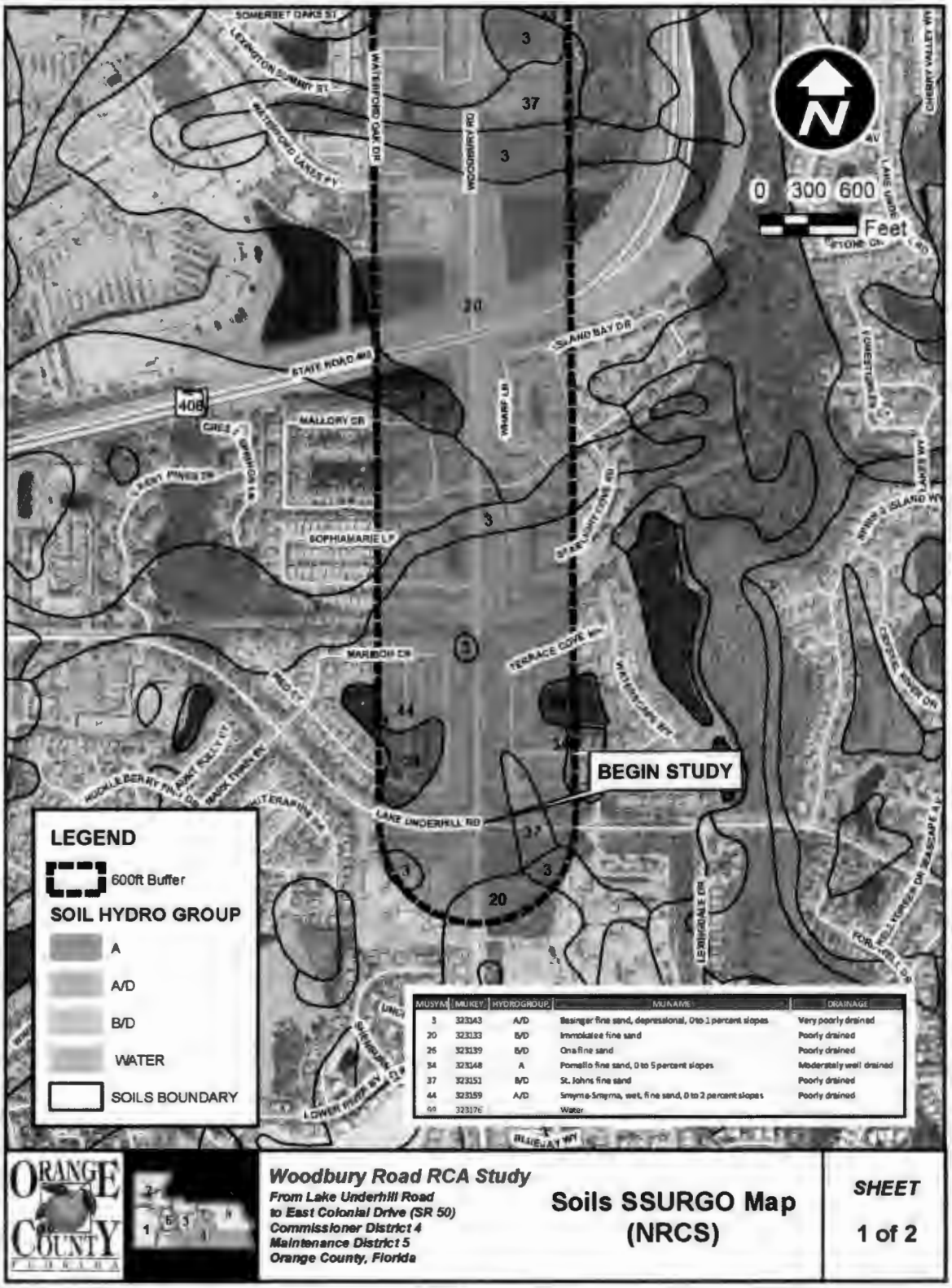
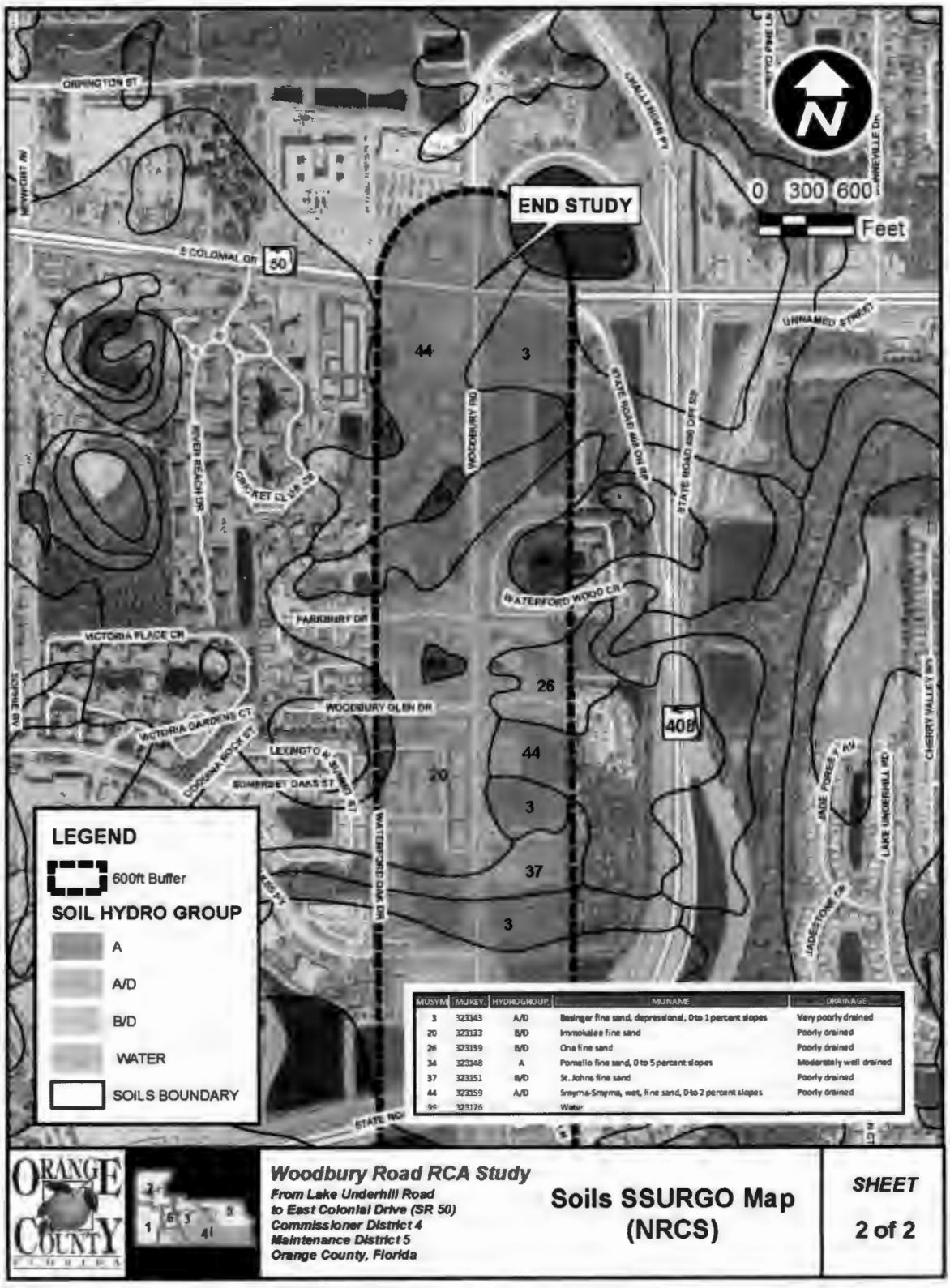


Figure 3-3
NRCS Soil Survey Map – 2 of 2



3.7.1 Existing Pavement Cores

Pavement cores were taken on Woodbury Road on November 4, 2020 to measure the thickness of the pavement surface and base layers, and to determine the general nature of the underlying materials. The asphalt course ranged from 2-7/8 to 3-7/8 inches thick and the underlying material included limerock, cement stabilized limerock, and shell cement. The base thickness ranged from 4 to 11-1/2 inches. Details of the pavement cores are included in the *Geotechnical Investigation Report* conducted for this study that is included as **Appendix E** in this report.

3.8 Potential Contamination

A contamination screening evaluation was conducted for the project. The evaluation identified 14 potential contamination sites and 11 pond sites within the study area that could have some risk of contamination impacts to this project. Two sites and one pond site were rated as having Medium contamination potential. No sites or pond sites were rated as having a High contamination potential. **Table 3-15** provides information related to the Medium rated sites. **Figure 3-4** shows the locations of the Medium rated sites. The *Contamination Screening Evaluation Report* is included in **Appendix G.**

Table 3-15
Medium and High Rated Contamination Sites within the Project Area

Site No.	Site Name	Description
12	Wawa Food Market #5161 Facility ID 9814188	This site was assigned a Medium preliminary contamination risk potential rating due to the current operation as a gas station. There have been two minor violations at this site, one in 2017 when fuel was observed on top of the sealant rings on one of the fill sumps and in 2019 related to material around spill buckets degrading leading to potential release or discharge, as well as spill buckets containing water. In 2020, a return to compliance was issued for the 2019 violation.
13	Circle K (Kangaroo) #2722207 Facility ID 9700066	This site was assigned a Medium preliminary contamination risk potential rating due to the current operations as a gas station. There was a petroleum discharge on site in 2012 which resulted in the removal of 18 tons of soil. In 2018, an Incident Notification Form was completed for a discharge observed due to a hole in a sump. The sump was repaired and the system passed tests.
15	Pond Site 4B	This site was assigned a Medium preliminary contamination risk potential rating due to the observation of dumping activities on the site and the potential for buried debris. As a result of historical aerial reviews, it appears that there was land clearing and potential dumping activities between 2006 and 2012. During site reconnaissance, there were also areas of potential buried debris noted and a trail leading to a wetland system where additional debris was observed.

Figure 3-4
Contamination Sites Map – 1 of 2

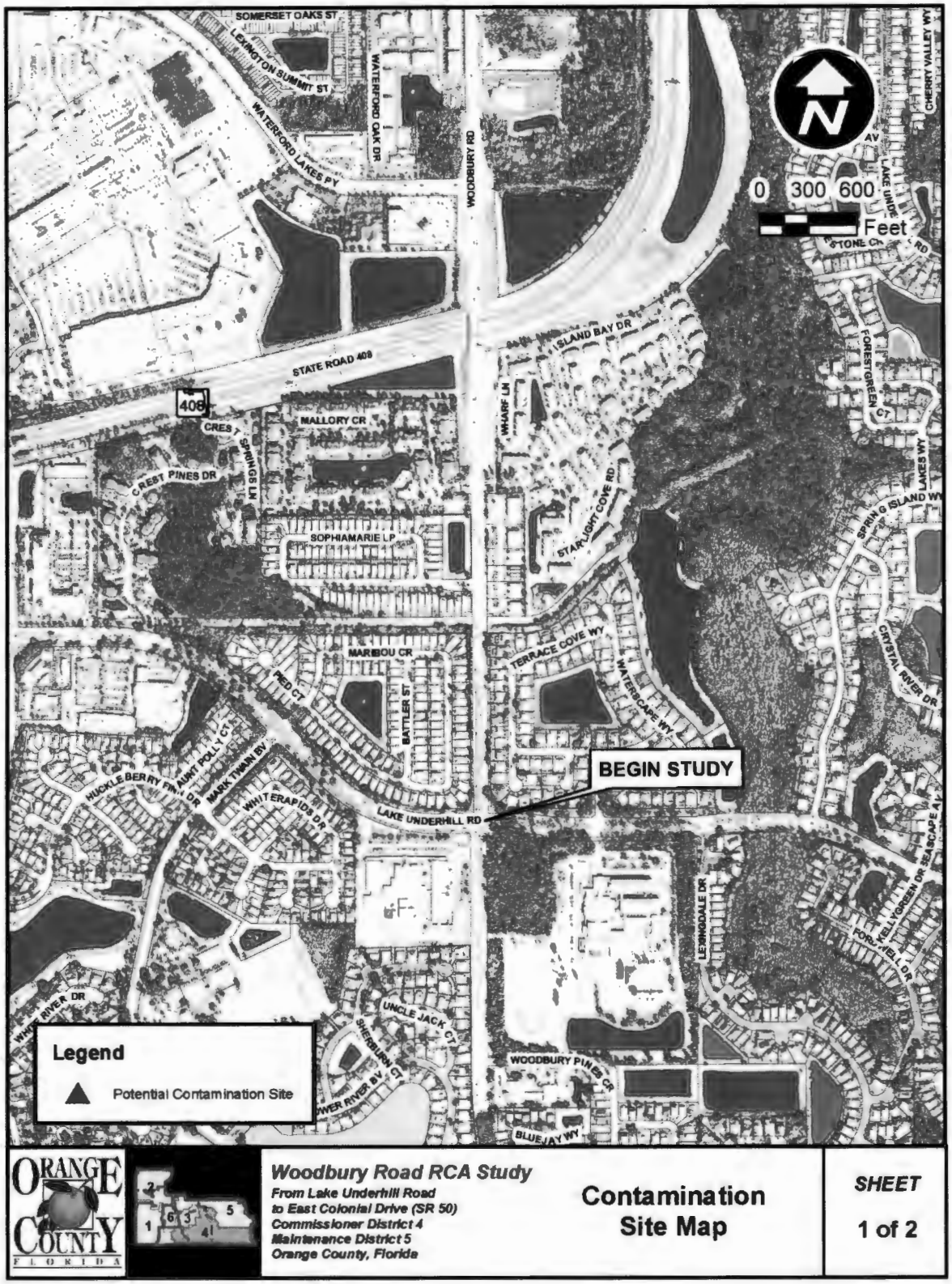
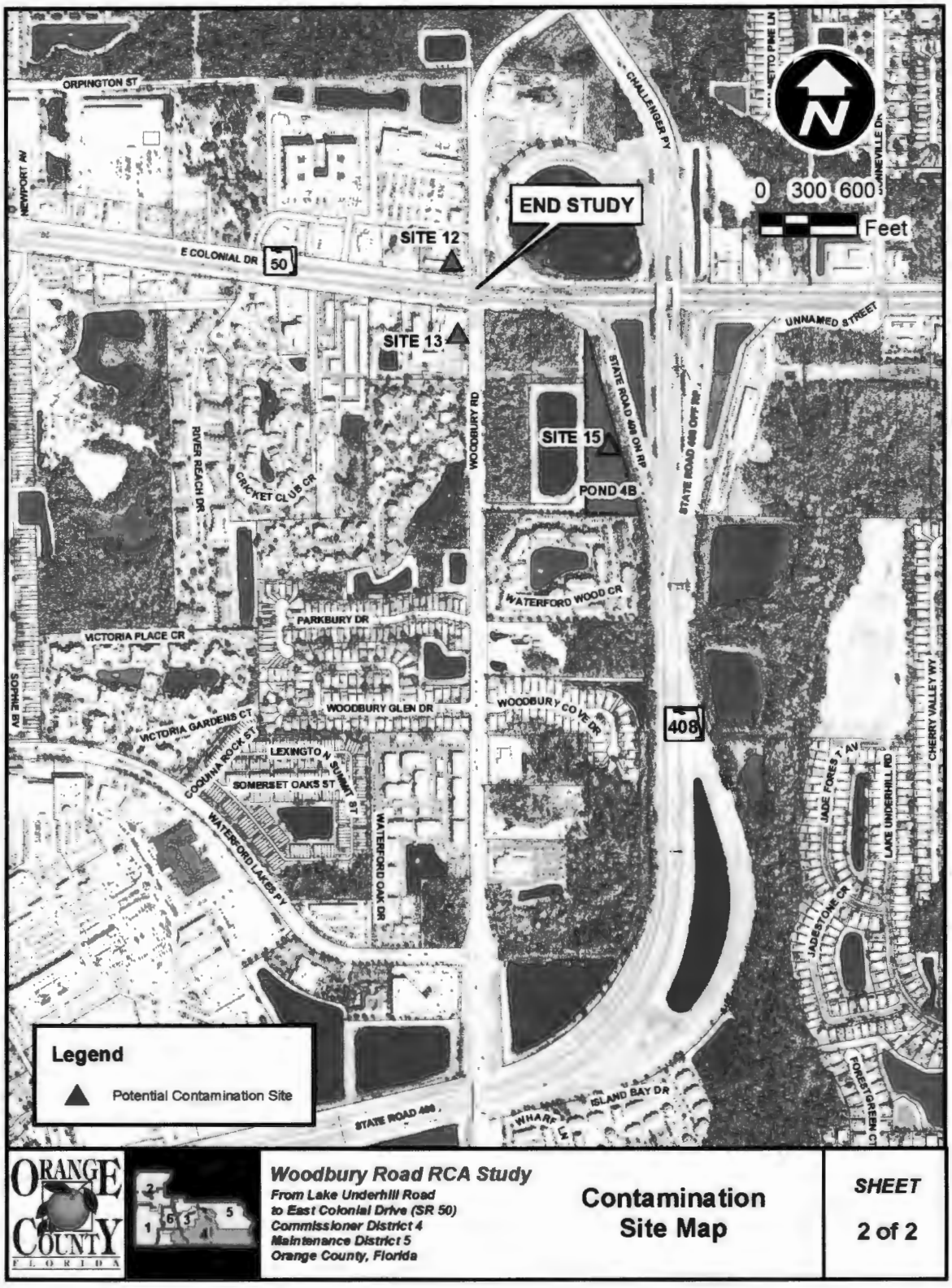


Figure 3-4
Contamination Sites Map – 2 of 2



3.9 Land Use and Current Development Plans

Woodbury Road is located in the Waterford Lakes area of northeast Orange County. Existing land use along Woodbury Road is primarily single and multi-family residential, but also includes churches and commercial development south of the S.R. 408 crossing and at the S.R. 50 intersection. An elementary school and a middle school are located at the southern project limits in the southwest and southeast corners, respectively, of the Lake Underhill Road intersection. The majority of the land along Woodbury Road is developed with a few undeveloped parcels along the east side of the road south of S.R. 50. Existing zoning along the project corridor is predominantly classified as Planned Development. Other zoning classifications found along the project corridor include, Residential 2 (Residential District), Residential 3 (Multiple Family Dwelling District), and Commercial-1 (Retail Commercial District).

Future land use data was obtained from Orange County Future Land Use Geographic Information Systems data. Future land use along the project corridor is mostly classified as Medium Density Residential. The east side of the corridor between S.R. 408 and Lake Underhill Road is classified as Low-Medium Density Residential. The area west of Woodbury Road and south of Waterford Lakes Parkway is classified as Office, and there are areas of commercial use south of S.R. 50 and north of Waterford Lakes Parkway on the west side. Institutional uses are located in the southwest and southeast corners of the Woodbury Road/Lake Underhill Road intersection due to the elementary and middle schools. **Figure 3-5** and **Figure 3-6** identify existing and future land uses, respectively, within the study area.

The Woodbury Road corridor is mostly developed with only a few vacant parcels remaining. Two new development projects have begun throughout the study time period. Gardens at Waterford Lakes is an age-restricted multi-family housing complex proposed for the southeast corner of the Lake Underhill Road intersection. Additionally, the Waterford Lakes Multi-family Project is proposed for the southeast corner of the S.R. 50 intersection.

Figure 3-5
Existing Land Use – 1 of 2

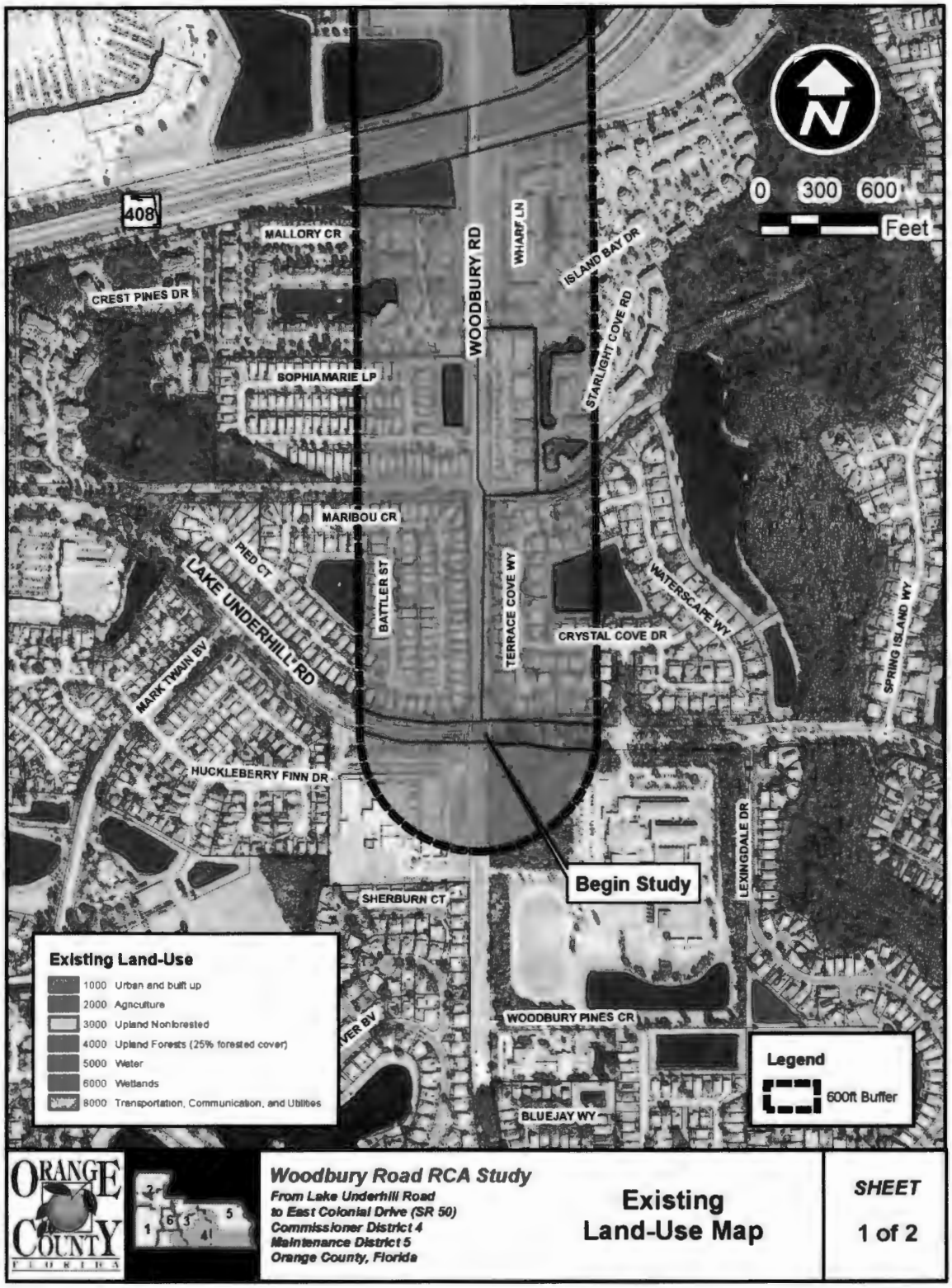


Figure 3-5
Existing Land Use – 2 of 2

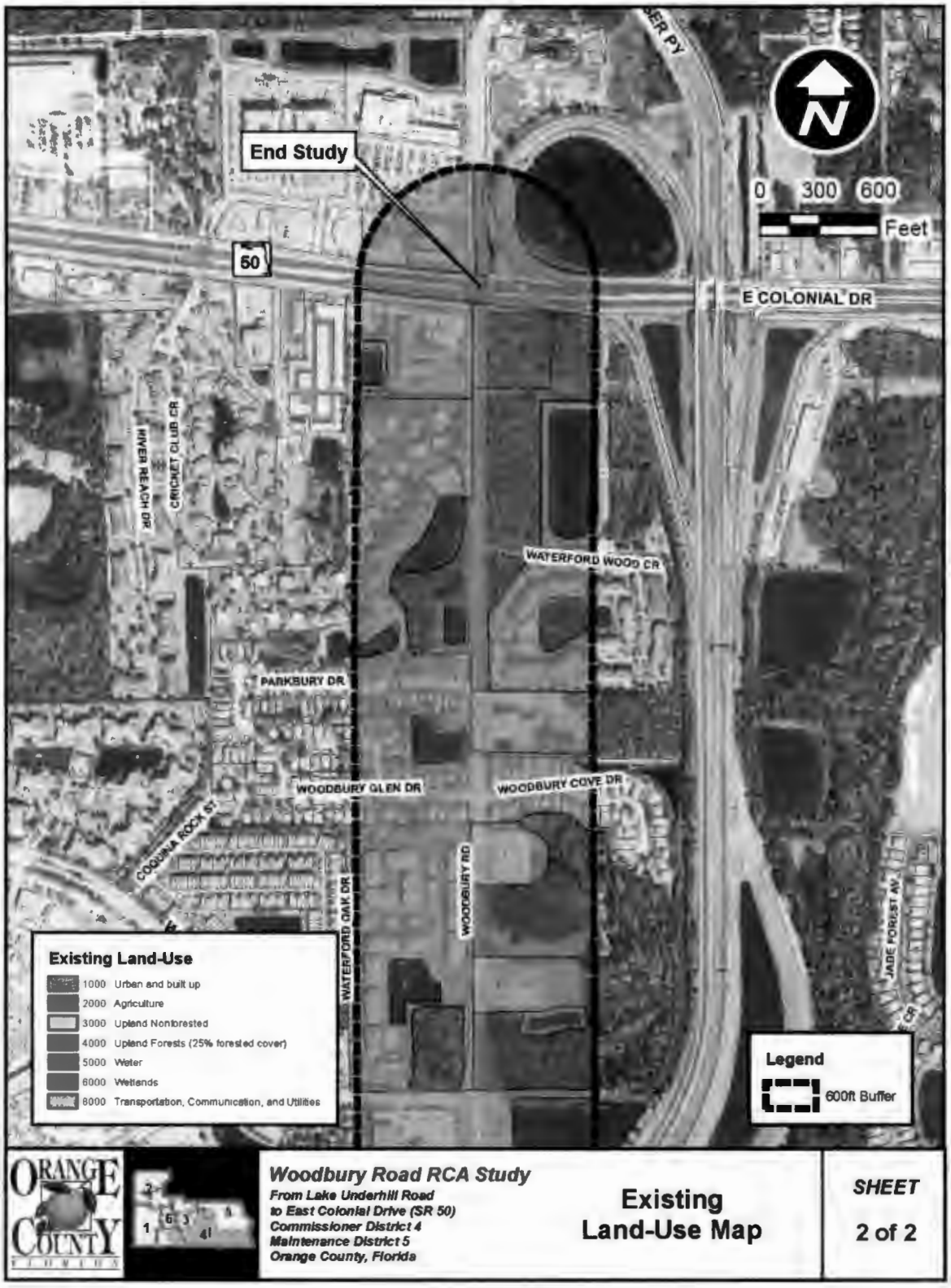


Figure 3-6
Future Land Use Map – 1 of 2

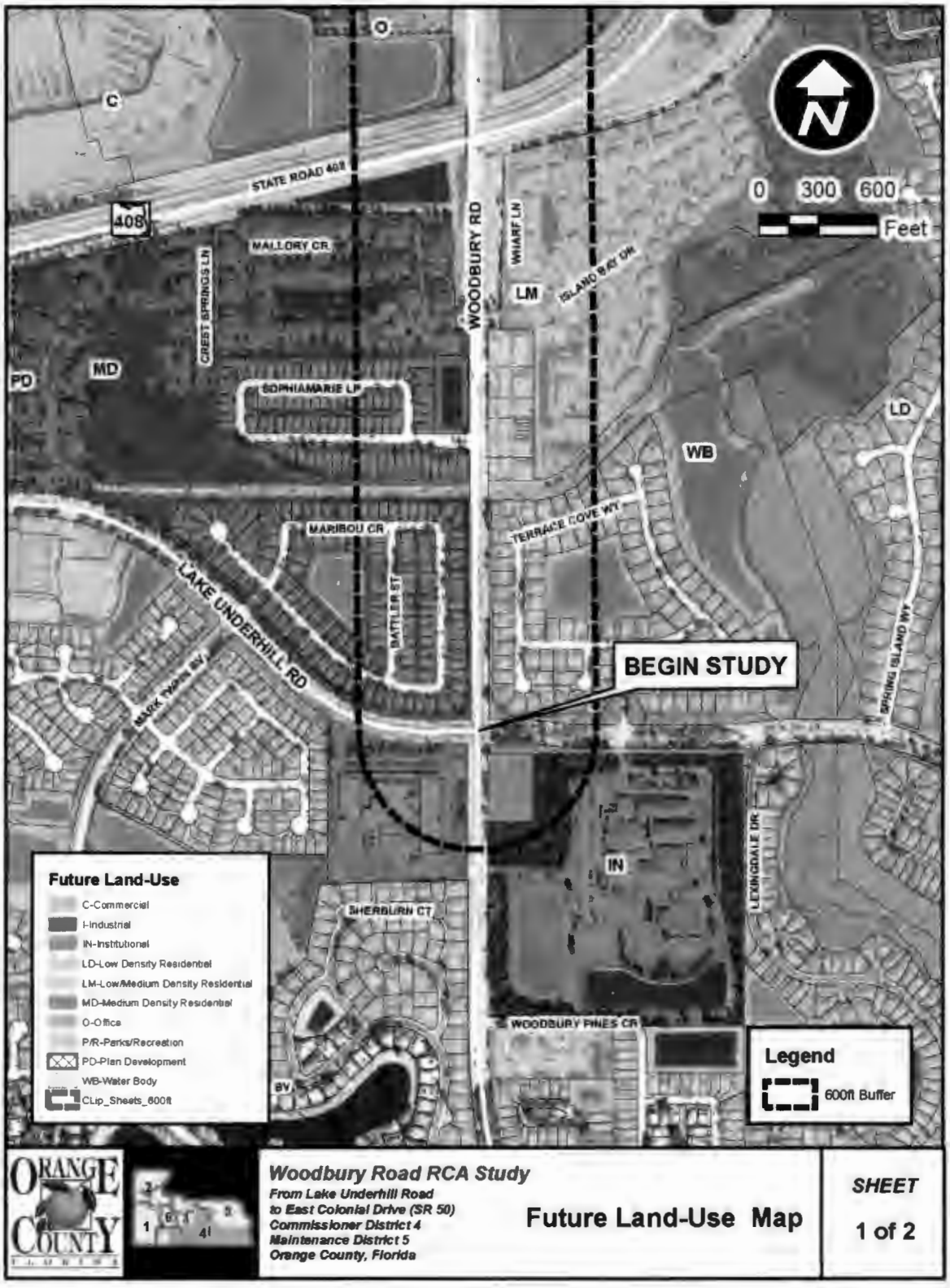


Figure 3-6
Future Land Use Map – 2 of 2

3.10 Cultural Features

Cultural features within the Woodbury Road Corridor are shown in **Figure 3-7.** Details regarding specific features are discussed below.

Schools

There are two Orange County public schools located at the south end of the project corridor. Waterford Elementary School is located in the southwest quadrant of the Woodbury Road/Lake Underhill Road intersection. Discovery Middle School is located in the southeast quadrant of the Woodbury Road/Lake Underhill Road intersection. There are several subdivisions within two miles of each school and there are many school children that walk or ride bikes to each school. **Table 3-16** lists the public school zoning within the study area.

Religious Institutions

There are three religious institutions located on Woodbury Road within the project corridor. The Church of Jesus Christ of Latter-day Saints is located on the east side of Woodbury Road, north of Waterford Lakes Parkway. The Kingdom Hall of Jehovah's Witnesses is also located on the east side of Woodbury Road, just south of the Woodbury Cove subdivision. Woodbury Presbyterian Church is located on the east side of Woodbury Road, north of the Woodbury Cove subdivision.

Police/Fire Protection

There are no police or fire protection sites located adjacent to Woodbury Road within the project limits.

Community Centers

There are no community service facilities located adjacent to Woodbury Road within the project limits.

Hospitals

There are no hospitals located adjacent to Woodbury Road within the project limits.

Cemeteries

There are no cemeteries located adjacent to Woodbury Road within the project limits.

Parks and Trails

There are no public parks located adjacent to Woodbury Road within the project limits. There are also no trails or shared use paths located along the corridor or connecting to the corridor.

Daycare Facilities

There are two daycare facilities located on Woodbury Road. Kids R Kids is located south of Lake Underhill Road on the east side and the Growing Together Academy Preschool is located on the east side, just north of Sophiamarie Loop.

Figure 3-7
Cultural Features Map – 1 of 2

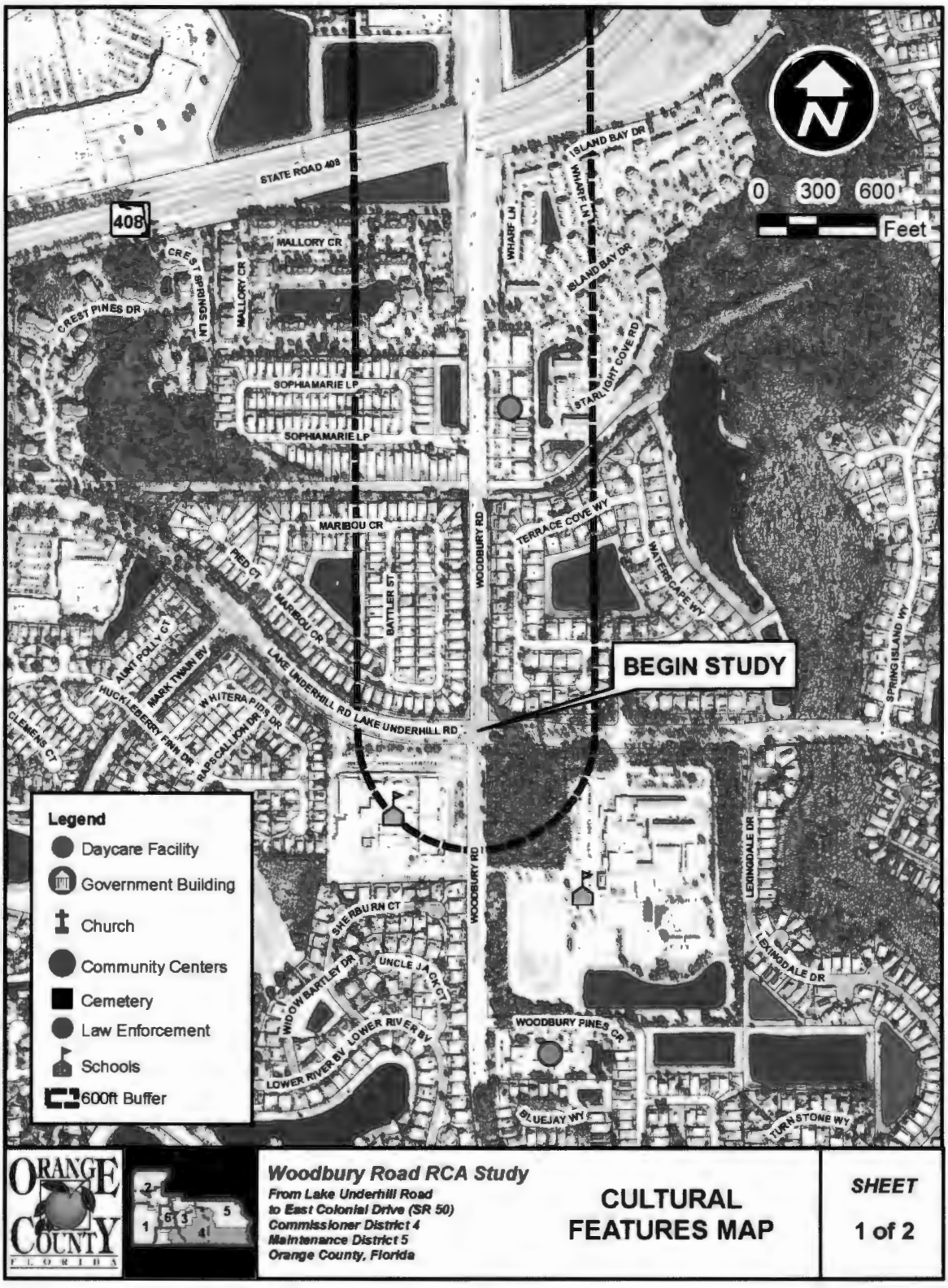


Figure 3-7
Cultural Features Map – 2 of 2

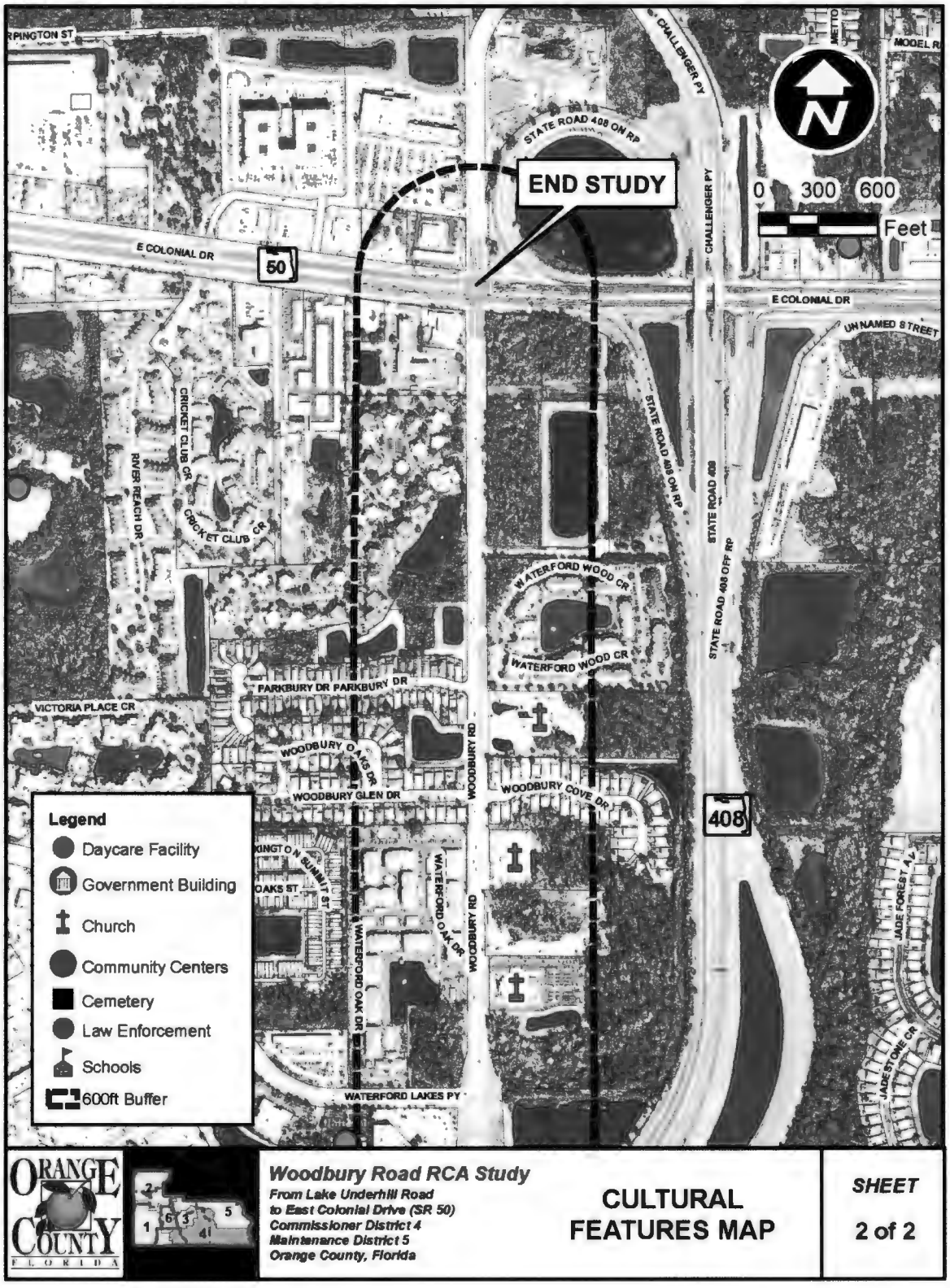


Table 3-16
Public School Zoning within the Study Area

School Type	Boundary Along Woodbury Road	School
Elementary	Lake Underhill Road to S.R. 408 overpass	Waterford
	S.R. 408 overpass to S.R. 50	Castle Creek
Middle	Lake Underhill Road to S.R. 408 overpass	Discovery
	S.R. 408 overpass to S.R. 50	Legacy
High School	Lake Underhill Road to S.R. 408 overpass	Timber Creek
	S.R. 408 overpass to S.R. 50	East River

3.11 Archaeological and Historic Features

A cultural resource assessment desktop analysis was performed for the Woodbury Road study area from Lake Underhill Road to S.R. 50 to locate any cultural and historic resources that may be impacted by the project. This analysis was completed in September 2019. Based on this analysis, there are no cultural resources listed, determined eligible, or appear to be potentially eligible for listing in the National Register of Historic Places (NRHP) within the project area. Historic resources will not be a critical issue for this project. The study area does have low to moderate potential for discovery of one or more undiscovered prehistoric sites. Sites in this area are typically small lithic and or artifact scatters which are not considered eligible for listing in the NRHP. A review of property appraiser data and historic aerial photographs indicate that there is no potential for historic structures within or adjacent to the project site. If fieldwork is required, it should comply with requirements set forth in chapters 267, 373 and 872.05, Florida Statutes (FS), as well as any federal regulations for the purpose of determining possible effects on historic properties listed, or eligible for listing in the NRHP, or otherwise of historical, architectural or archaeological value. **Appendix D** contains the *Cultural Resource Assessment Desktop Analysis*.

3.12 Hydrologic and Natural Features

3.12.1 Existing Drainage Features

The Woodbury Road project area is located within the Econlockhatchee (Econ) River drainage basin within the jurisdiction of the St. Johns River Water Management District (SJRWMD). Woodbury Road, through the project limits, consists of a two-lane urban collector roadway with turn lanes for the adjacent residential subdivisions, apartments, and businesses. Generally, stormwater sheet flows off the roadway and is collected in curb and gutter inlets that discharge to existing stormwater ponds. The ponds are typically owned by the Homeowners Associations and Apartment complexes. These ponds generally discharge to wetlands and surface waters east of Woodbury Road. The wetlands and surface waters drain to the east towards the Econ River. Additional information is documented in the *Pond Siting Report* included in **Appendix I**.

The existing ponds and storm drains were designed, permitted and constructed to accommodate the four-lane typical section of Woodbury Road. The existing ponds are mostly owned by the subdivisions. Refer to **Table 3-17.** However, the existing conveyance system will need to be reviewed during final design to ensure capacity. There are no recorded drainage maintenance issues within the project corridor.

Table 3-17
Existing Ponds

Description	Basin	Owner**	Parcel ID	Location
Pond 24A	Basin 1B	Waterford Lakes Tract N-24 Homeowners Assoc	26-22-31-9050-00-004	Waterford Lakes Villages
RET1	Basin 1A	Waterford Lakes Community Association	26-22-31-9050-00-009	Waterford Lakes Villages
Pond B-1	Basin 1C	Eastwood Community Association	35-22-31-1993-00-009	Eastwood Community (Tract I)
Pond 24B	Basin 2A	Waterford East Partners LTD	26-22-31-8970-00-010	Waterford East & Strip Mall
Pond 305-10	Basin 2B	CFX	Pond 305-10	SW corner of Woodbury Road at CFX overpass
Pond 98	Basin 3	Waterford Lakes Commercial Facilities Owners Assoc Inc	26-22-31-0000-00-030	Woodbury & S.R. 408
Exist. Pond 1	Basin 4A	VRS Town Park SC LLC	22-22-31-9464-00-001	Woodbury Park
Pond 60	Basin 5	Polos East Apartments	22-22-31-9459-00-010	South of S.R. 50, West of Woodbury Road
Pond 1	Basin 6	Orange County BCC	15-22-31-0000-00-026	West of Woodbury Rd/Challenger Pkwy Intersection

** - Per SJRWMD, ponds not owned by the County will require an easement, lease, contract to purchase, or joint-use agreement

3.12.2 Water Quality

The majority of the existing ponds have been designed, permitted and constructed to accommodate the required treatment volume for a four-lane typical section of Woodbury Road. The water quality requirements for proposed ponds or modifications to existing ponds will be required to use the current SJRWMD criteria of the greater of 1" over the total area or 2.5" over the impervious area for wet-detention ponds. Also, since this project is within the Econ River drainage basin an additional 50% treatment volume will be required to meet the Outstanding Florida Waters (OFW) criteria. However, this will only apply to proposed or modified existing ponds.

Per the conversation with SJRWMD, it was determined that as long as the proposed improvements meet the existing permit conditions and applicable criteria in the SJRWMD Applicants Handbook 6.2.1(d) for Minor Changes, the improvements would be a Minor Modification to the permit and the design would not be required to meet the current criteria. To meet the Minor Improvement (modification) for permitting the following must be met:

1) Increase the project area by no more than 10 percent or 1 acre, whichever is less, unless the activities were permitted with stormwater treatment and flood attenuation capability sufficient to meet the permitting requirements for the proposed modification, or unless the increase in

project area is to a mitigation bank, in which case any increase in the project area is considered a major modification.

2) Increase proposed impervious and semi-impervious surfaces by no more than 10 percent or 0.5 acres, whichever is less, unless the activities were permitted with stormwater treatment and flood attenuation capability sufficient to meet the permitting requirements for the proposed modification. A modification to existing facilities (re-grading or adjustments to the control structure), an increase in total or impervious area that exceeds the minimum increases mentioned above, or proposed facilities will require a Major Modification and would be required to meet the current SJRWMD criteria.

3.12.3 Existing Permits

Over 16 permits were researched to obtain stormwater and environmental design information for existing systems within the project corridor. The Woodbury Road corridor was constructed as part of the Huckleberry Development, Permit No. 4-095-19979-1 (Legacy Permit No. 4-095-0029M). The subsequent sequential permits indicate that the developers included a four-lane Woodbury Road with the proposed development, creating joint-use ponds. Per SJRWMD, *Ponds not owned by the County will require an easement, Lease, Contract to Purchase or Joint-Use agreement*. Only the ponds for Basins 4A and 6 are owned by Orange County. The remaining ponds are joint-use ponds located on the referenced property. Please refer to **Table 3-18** for a summary of permits that will be directly referenced during the development of the proposed stormwater management systems for the Woodbury Road RCA.

3.12.4 Floodplains and Floodways

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM's) dated September 25, 2009, most of the project area is located within Zone X (500 Year) floodplain. The anticipated flood plain impacts associated with this project are located in Basin 1B, Pond "RET1". The basin includes the drainage area of Lake Underhill Road and Woodbury Road (south of Lake Underhill Road). Pond "RET1" is located at the east end of the project limits just north of Lake Underhill Road. Pond "RET1" is currently located in Flood Zone A (100 Year) per FEMA Flood Map 12095C0290F. A Flood Elevation is not provided. To determine a preliminary Flood Elevation at this location, a comparison between the FEMA Flood Map 12095C0290F and permitted plans for Pond "RET1" was done. The entire Pond "RET1" is located within the flood plain so the approximate flood elevation is 67.00 (NGVD).

Should the final design determine that the floodplains are impacted, a Letter of Map Revision (LOMR) will be required if the base flood elevation decreases by more than 0.1 feet, a change in the floodway width or location, or changes in hydrology (flow). A Conditional Letter of Map Revision (CLOMR) will be required if there is an increase in base flood elevation and surcharge elevation. The floodplain map can be found in **Figure 3-8.**

Table 3-18
Existing Permits

Pond	Basin	Owner**	Permit Number	Modification
RET1	Basin 1A	Waterford Lakes Community Association	4-095-19979-86	Major
Pond 24A	Basin 1B	Waterford Lakes Tract N-24 Homeowners Assoc	4-095-19979-18 & 4-095-19979-86	Minor
Pond B-1	Basin 1C	Eastwood Community Association	4-095-20398-1	Minor
Pond 24B	Basin 2A	Waterford East Partners LTD	4-095-19979-38	Minor
Pond 305-10	Basin 2B	Central Florida Expressway Authority (CFX)	4-095-20358-26	Minor
Pond 98	Basin 3	Waterford Lakes Commercial Facilities Owners Assoc Inc	4-095-19979-38	Minor
Exist. Pond 1	Basin 4A	VRS Town Park SC LLC	4-095-27469-2	Minor
Pond 60	Basin 5	Polos East Apartments	4-095-20651-2	Minor
Pond 1	Basin 6	Orange County BCC	4-095-20069-25	Minor
Pond 500	Basin 7	Florida Department of Transportation	4-095-86445-8	Minor

**Per SJRWMD, ponds not owned by the County will require an easement, lease, contract to purchase or joint-use agreement. Only the ponds for Basins 4A and 6 are owned by Orange County. The remaining ponds are joint-use ponds located on the referenced property.

Figure 3-8
FEMA Flood Plain Map – 1 of 2

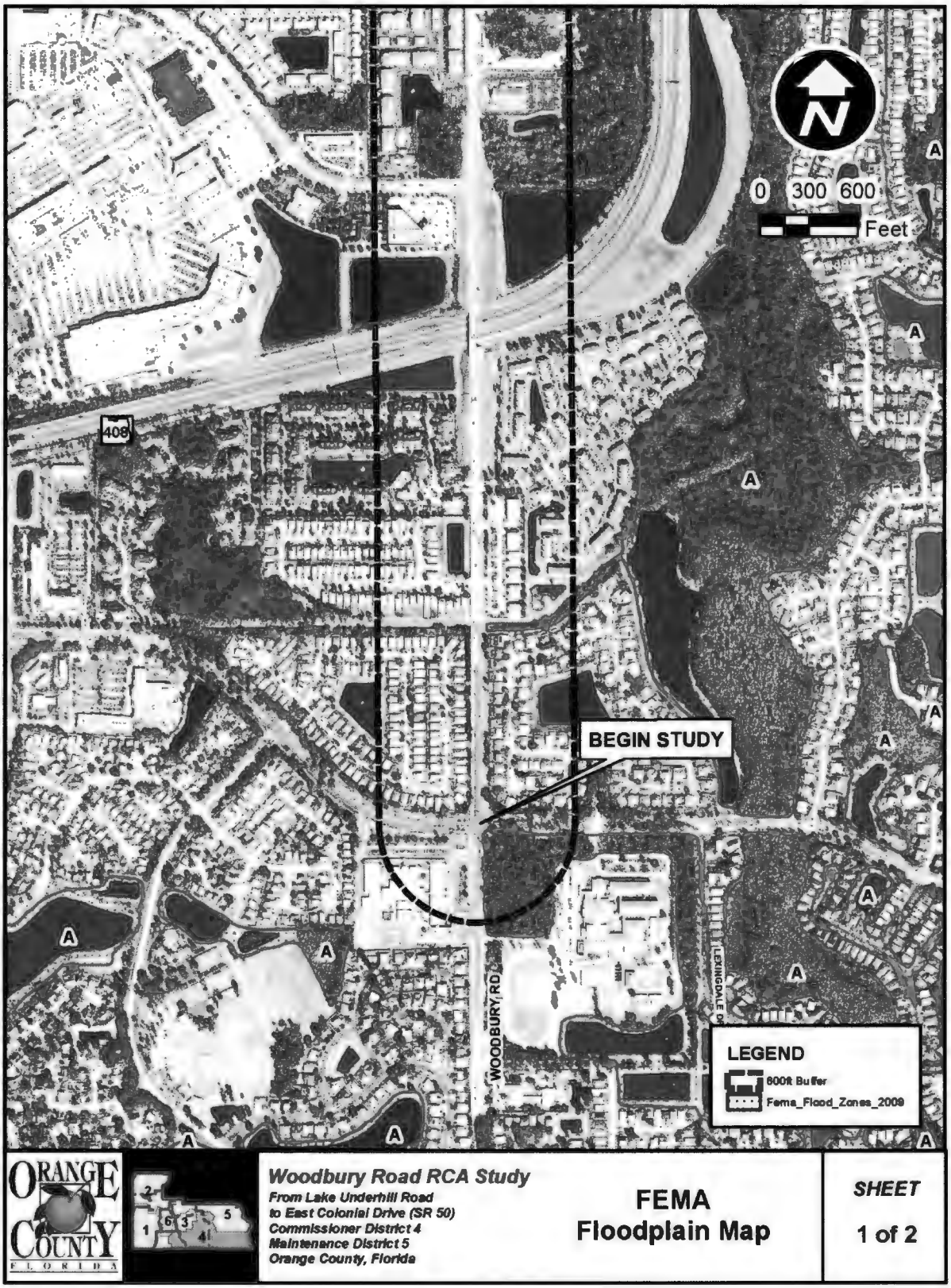
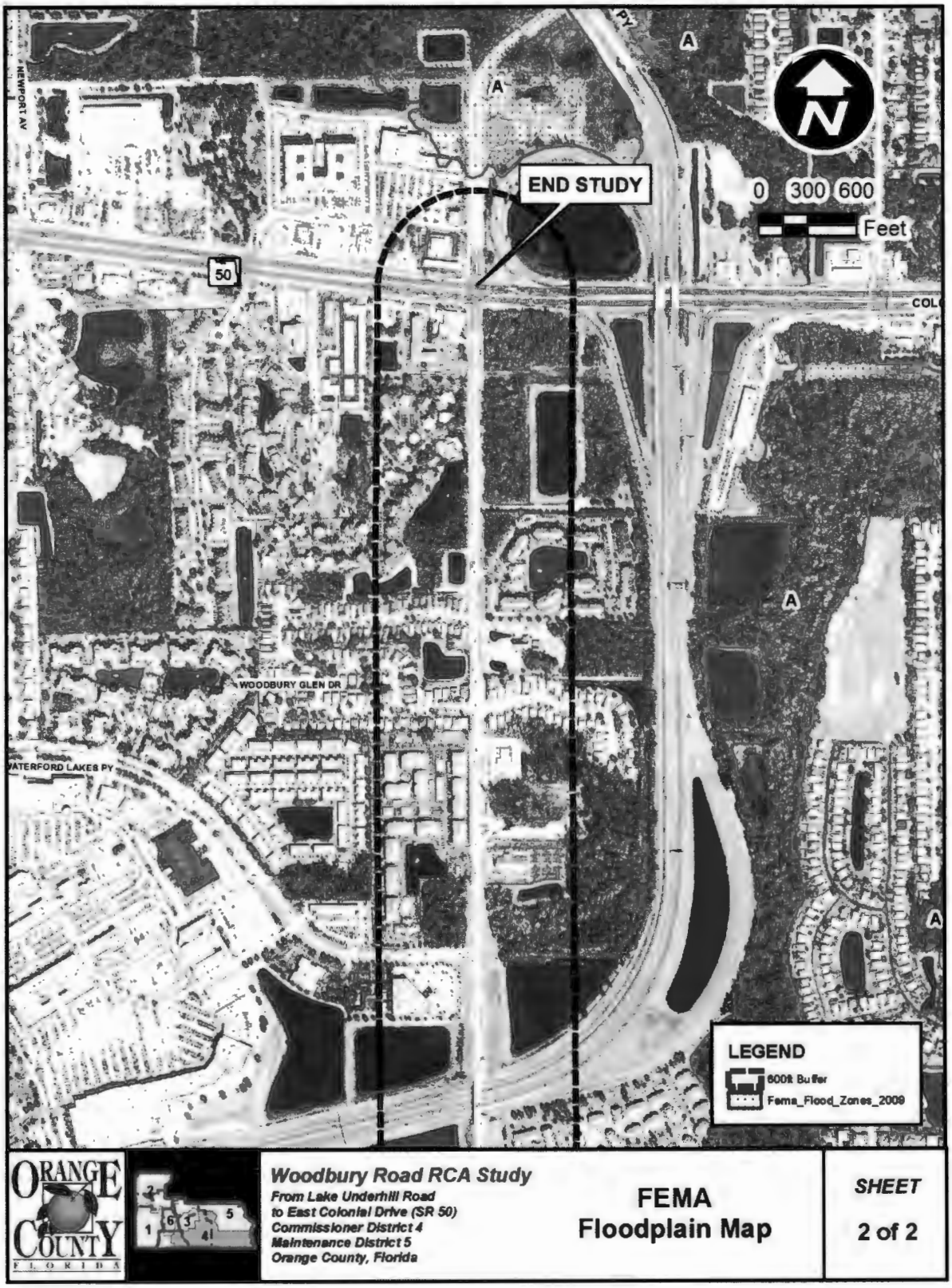


Figure 3-8
FEMA Flood Plain Map – 2 of 2



3.12.5 Existing Cross Drains

There is an existing double barrel 7'-6" x 4'-0" concrete box culvert located approximately 1200-ft north of Lake Underhill Road at the Orange County Canal. The culvert is 99'-0" long and the headwalls are located at the existing right-of-way line. No changes to the existing concrete box culvert are anticipated.

3.12.6 Drainage Basin Descriptions

Seven existing drainage basins have been identified along the corridor, see **Figure 3-9.** Sub-Basins have been delineated in Basins 1, 2 and 4 to accommodate the proposed drainage patterns within the respective Basins. Stormwater runoff from these basins is collected via curb and gutter inlets and conveyed to existing ponds for water quality treatment and peak discharge attenuation. The existing ponds have been permitted and constructed for the four-lane typical section proposed in this project. The ponds outfall to existing wetlands and ultimately discharge to the Econ River to the east of the project.

3.12.6.1 Basin 1

Basin 1 consists of three sub-basins **Basin 1A, Basin 1B and Basin 1C**. These basins start approximately 1000-ft south of Lake Underhill Road and end at the existing concrete box culvert.

Basin 1A includes Woodbury Road from south of Lake Underhill Road and the intersection plus minor improvements to Lake Underhill Road west of Woodbury Road. There are four basins as noted in the existing Permit No. 4-095-19979-86, which are Basin R100, Basin "School", Basin N24, and Basin N33. Basin R100 includes Lake Underhill Road from east of Mark Twain Blvd. east to west of Lexingdale Dr. and includes the existing wet-retention Pond "RET1". "RET1" is a joint-use pond located on property owned by the Waterford Lakes Community Association. Basin "School" is the drainage basin for Waterford Lakes Elementary School. Basin N24 is the southeast corner of the Waterford Lakes Village subdivision and Basin N33 is the northern part of the Bradford Village subdivision.

The Waterford Lakes Elementary basin provides treatment on site via shallow swales and a dry-retention pond. The site discharges to an existing storm drain along Woodbury Road. The required Pollution Abatement Volume (PAV) is 3.51 ac-ft of treatment which requires Pond "RET1" to be expanded to accommodate the additional PAV. This expansion of the pond is proposed to the east into a wooded area that will require wetland mitigation and flood plain analysis. Flood plain compensation is not anticipated as the entire pond is currently located within the flood plain and the improvements maintain the existing berm elevations. The Pond "RET1" drawdown is achieved using 6" perforated underdrain connected to the control structure of the pond at elevation 60.04-ft (NGVD). The underdrain was not inspected as part of the scope of this report and is recommended to be inspected during final design. There is an emergency drawdown orifice at elevation 63.00-ft (NGVD).

Basin 1B begins at Lake Underhill Road and ends at the existing box culvert and has two basins, Basin 100, and Basin 200. This follows the existing naming convention from Permit No. 4-095-19979-18. Basin 100 is the Waterford Lakes Village subdivision and Basin 200 is Woodbury Road from Lake Underhill Road north to the existing concrete box culvert.

Figure 3-9
Drainage Basins Map – 1 of 2

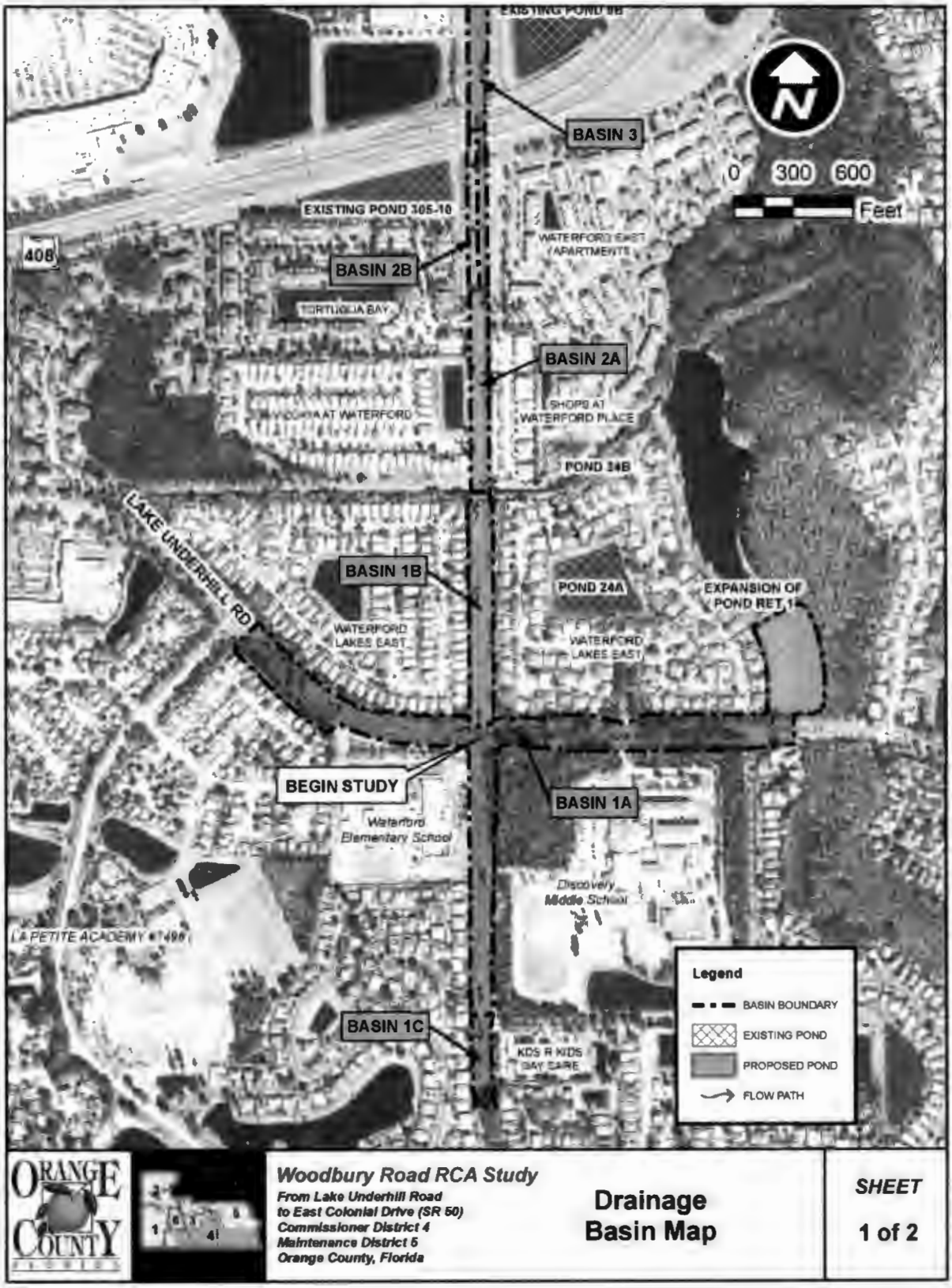


Figure 3-9
Drainage Basins Map – 2 of 2

The runoff is conveyed to the existing Pond 24A, which is a joint-use pond located in the Waterford Lakes Village subdivision, and the parcel is owned by the Waterford Lakes Community Association. The most recent SJRWMD Permit modification for existing Pond 24A is Permit No. 4-095-19979-85 and involved improvements to the Lake Underhill Road and Woodbury Road intersection. The existing Pond 24A is designed and constructed to accommodate runoff from the four-lane widening of Woodbury Road. Pond 24A was designed to retain the larger of the first ½" of runoff over the total basin area or 1" over the total impervious area. From SJRWMD Permit No. 4-095-19979-18, the total basin area is 2.6 acres which consists of a typical right-of-way width of 92-ft and 68-ft of impervious width which yielded 0.16 ac-ft of required treatment volume. With the proposed improvements, the total width and impervious widths do not change and meet the existing permit areas. There is no additional modification necessary for the proposed improvements.

The required PAV for the proposed improvement 1 is 1.13 ac-ft of treatment and the existing Pond 24A currently has a total retention volume of 1.27 ac-ft at the retention elevation of 66.50-ft (NGVD). The improvements in this basin meet the current permit criteria and no modification is necessary for the existing Pond 24A. Existing Pond 24A drawdown is achieved using 6" perforated underdrain connected to the control structure of the pond at approximate elevation 62.85-ft (NGVD). The underdrain was not inspected as part of the scope of this report and is recommended to be inspected during final design.

Basin 1C is Woodbury Road south of Basin 1A. This basin includes the improvements of the existing transition from the one-way pairs to the two-lane roadway. It appears that this basin is collected and conveyed to an existing pond approximately 2000-ft south of the project limits and was permitted under Permit No. 4-095-20398-1 for the Eastwood Community, or previously Deer Run South. Pond B-1 appears to be dedicated to Woodbury Road drainage only but is located on Tract I owned by the Eastwood Community Association. Design calculations for this pond were not able to be located for this project. It is unclear what criteria was utilized to determine the required treatment volume for this pond. Further analysis will be needed during the final design when survey information for the pond is available. Permitting requirement will depend on the extent of the changes necessary to treat the proposed additional pavement.

3.12.6.2 Basin 2

Basin 2 consists of two sub-basins **Basin 2A** and **Basin 2B**. These basins start at the existing concrete box culvert and ends at the Woodbury Road bridge over S.R. 408. **Basin 2A** stormwater is conveyed to existing Pond 24B located within the Waterford East Partners Apartment Complex along the existing Orange County Canal. Pond 24B has been constructed to accommodate runoff from the four-lane widening of Woodbury Road from the box culvert to the S.R. 408 limited access right of way. Only Woodbury Road discharges to Pond 24B, but per the Orange County Property Appraisers website, is located on the Waterford East Apartments property. It is recommended that Orange County either purchase the portion of the property with the pond or obtain an easement.

Basin 2B consists of the southbound lanes of Woodbury Road within the limited access right of way for S.R.-408 and continue to be conveyed to Pond 305-10 located in the southwest quadrant of the S.R.-408/Woodbury Road limited access right of way. As previously stated, the proposed northbound lanes will be conveyed to Pond 24B which will remove approximately 0.85 acres from Pond 305-10. Pond 305-10 was recently modified under SJRWMD Permit No. 4-095-20358-26 to convert it from a dry-detention pond to a

wet-retention pond to function properly based on the groundwater elevations. The post development impervious area contributing to Pond 305-10 for Woodbury Road will be reduced from approximately 0.75 acres to 0.65 acres. Since the overall area and the impervious area are being reduced, there is no modification necessary for Pond 305-10.

3.12.6.3 Basin 3

Basin 3 consists of the section of Woodbury Road from the S.R.-408 Bridge north to Woodbury Glen Drive. The stormwater runoff is accounted for in Pond 98 which is part of the Waterford Lakes Master Drainage Plan (SJRWMD Legacy Permit No. 4-095-0037AGM37) and was constructed with the Waterford Lakes Town Center under SJRWMD Permit No. 4-095-19979-38. A trapezoidal weir was constructed on the northeast corner of the pond. The discharge for Pond 98 is to the north along the S.R. 408 limited access right of way.

The treatment volume for Pond 98 was calculated to include the future four-lanes of Woodbury Road. However, the impervious area used was 3.45 acres and the proposed impervious area is 4.54 acres, which creates treatment volumes of 0.72 ac-ft and 0.95 ac-ft, respectively. The treatment volume based on site area (1" over basin area) is 1.22 ac-ft, which will govern. Since the governing treatment volume required did not change, no modification to the existing control structure is necessary.

3.12.6.4 Basin 4

Basin 4 consists of two sub-basins **Basin 4A** and **Basin 4B**. These basins start at Woodbury Glen Drive and end at the FDOT service drive.

Basin 4A consists of the existing Woodbury Road (proposed southbound) from Woodbury Glen Drive to north of the Waterford Pointe entrance and a portion of Parkbury Drive are conveyed to existing Retention Pond 1, which is owned by Orange County. From the Woodbury Park Permit No. 4-095-27469-2, a total 3.744 acres is treated in Retention Pond 1.

Basin 4B consists of only the proposed northbound lanes of Woodbury Road between Woodbury Glen Dr. and the FDOT access drive. The runoff is currently collected and conveyed to the north via the existing roadside ditch and then to the east along the FDOT service road to the S.R. 408 limited access right of way. This basin also serves as a conveyance system (pass through) for the discharge of ponds servicing Basin 4A, Woodbury Park subdivision (Permit No. 4-095-27469-2), Woodbury Glen (Permit No. 4-095-27469-1), and the Polos East Apartments (Permit No. 4-095-20651-2).

3.12.6.5 Basin 5

Basin 5 consists of the proposed southbound lanes from just south of the FDOT service drive to the entrance of the Advenir Apartments. Stormwater runoff from the basin is collected and conveyed to the existing Pond 10 on the apartment property. From Permit No. 4-095-20651-2 Pond 60 is a joint use pond that currently treats approximately 1.50 acres of Woodbury Road.

3.12.6.6 Basin 6

Basin 6 consists of the proposed northbound lanes from just north of the FDOT service drive to East Colonial Drive (S.R. 50) and Woodbury Road north of S.R. 50. This basin was originally permitted under Permit No. 4-095-20069-25 and is conveyed north to Pond 1 on the north side of East Colonial Drive. Pond 1 is located

within a flood plain. No modification the existing stormwater facility is anticipated. Pond 1 is owned by Orange County.

3.12.6.7 Basin 7

Basin 7 consists of the East Colonial Drive (S.R. 50) right of way. This section of S.R. 50 was widened in 2012 by the FDOT. The project was permitted under Permit No. 4-095-86445-8. The portion of S.R. 50 at the Woodbury Road intersection is collected and conveyed to Pond 500 south of S.R. 50 and east of Woodbury Road. Pond 500 is owned by the FDOT.

3.13 Wetlands and Species

An *Ecological Summary Report* was prepared as part of the Woodbury Road RCA Study and is included in **Appendix F**. The following is a summary of the results evaluation.

3.13.1 Wetlands and Other Surface Waters

Seven wetland systems, 10 other surface waters (roadside ditches and swales), and 8 existing stormwater management systems (ponds) were identified within the study corridor. Wetland and other surface water limits were not field delineated; instead, personnel used aerial interpretation and site reconnaissance conducted in August 2020 to approximate wetland and surface water limits. Wetland and other surface water systems should be delineated in accordance with federal and state regulations during the design phase.

Wetlands and other surface waters are regulated by federal, state, and local government policies. Impacts to jurisdictional wetlands and other surface waters will require coordination with regulatory agency during the permitting of the proposed project and may require mitigation to offset adverse impacts.

Wetland systems were identified from south to north and east to west along the study corridor (See **Figure 3-10).** The land use type of each system identified was then classified using the FDOT Florida Land Use and Cover Classification System (FLUCFCS) handbook. Impacts to wetlands and surface waters associated with the preferred alternative are summarized in **Table 3-19.**

- **FLUCFCS 5100 – Streams and Waterways** – This land use best describes the canal running west to east passing under Woodbury Road through a double box culvert (**SW1**). This land use consists of open water with maintained bahia grass side slopes.

- **FLUCFCS 5120 – Streams and Waterways (Upland-Cut)** – This land use best describes ditches and swales (**SW2 through SW10**) located within the existing ROW of the study corridor. Vegetation typical of this land use includes alligator weed (*Alternanthera philoxeroides*), white-top sedge (*Dichromena colorata*), and bahia grass.

Figure 3-10
Wetlands & Other Surface Waters Map – 1 of 2

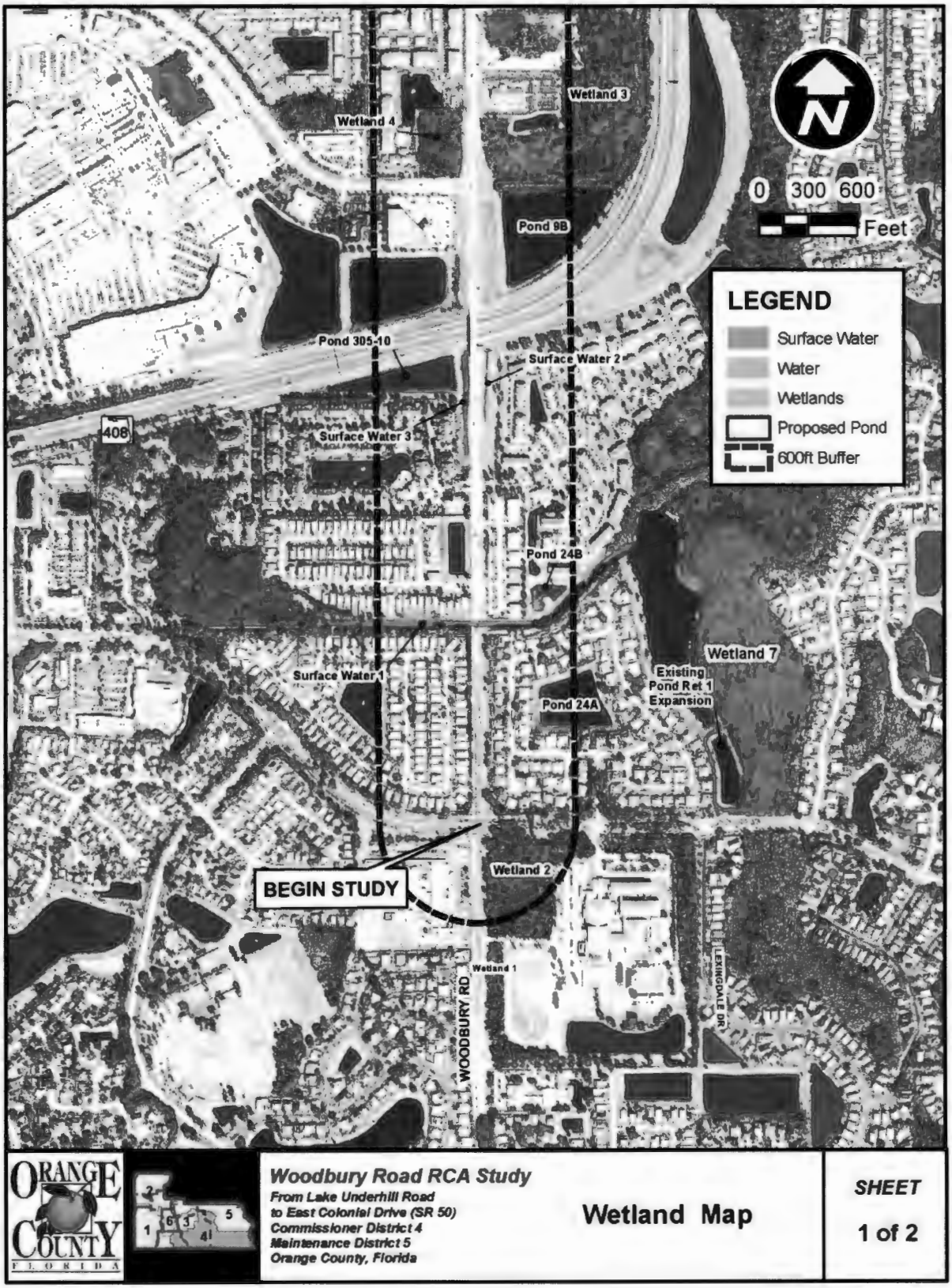
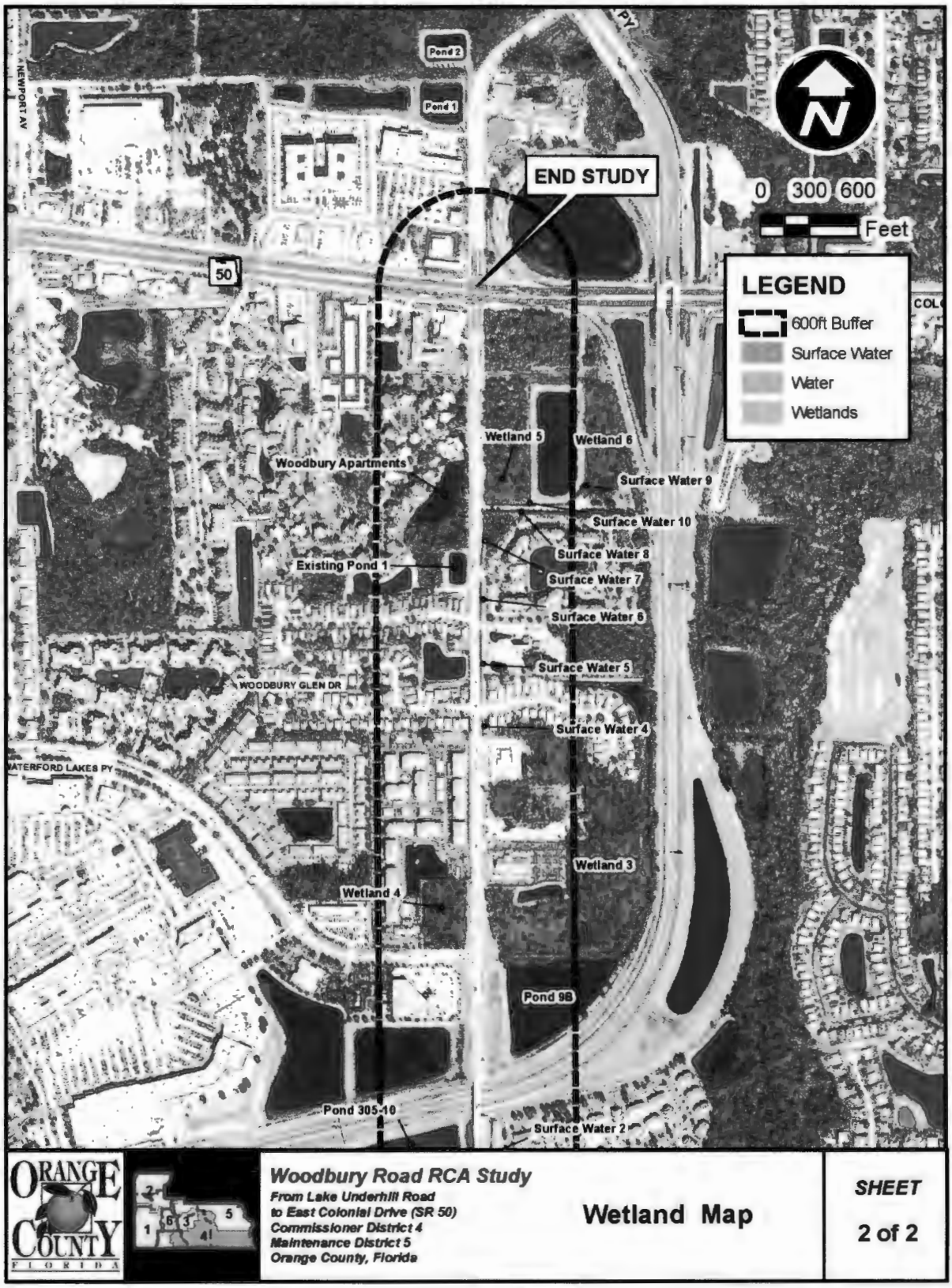


Figure 3-10
Wetlands & Other Surface Waters Map – 2 of 2



- **FLUCFCS 5300 – Reservoirs** – This land use type best describes existing stormwater management systems located within the study corridor and includes Retention 1, Pond 24A, Pond 24B, Pond 305-10, Pond 9B, Existing Pond 1, and the pond within Woodbury Apartments. These systems are comprised of open water with maintained bahia grass side slopes.
- **FLUCFCS 6250 – Hydric Pine Flatwood** – This land use type is found within **WL2**, **WL5**, and **WL 6** along the study corridor. This land use is vegetatively comprised of slash pine, Brazilian pepper, water oak, primrose willow (*Ludwigia* spp.), dahoon holly, red root (*Lachnanthes caroliana*), cinnamon fern, sedges (*Carex* spp.), muscadine grapevine, and areas of open water.
- **FLUCFCS 6300 – Wetland Forested Mixed** – This land use type best describes **WL1**, **WL3**, **WL4** and **WL7** along the study corridor. These areas are vegetatively comprised of cypress (*Taxodium* spp.), slash pine, Chinese tallow (*Triadica sebifera*), water oak (*Quercus nigra*), red maple (*Acer rubrum*), sweetbay magnolia (*Magnolia grandiflora*), loblolly bay, wax myrtle, dahoon holly (*Illex cassine*), royal fern, maidencane (*Panicum hemitomon*), muscadine grapevine, Virginia creeper (*Parthenocissus quinquefolia*), and standing water.

Table 3-19
Preferred Alternative Approximate Wetland Impacts

Wetland/Other Surface Water ID	FLUCFCS Code	Roadway Impact (ac)*	Proposed Pond ID	Proposed Pond Impact (ac)**
Wetland 1	6210	0.15		
Wetland 2	6250	0.19		
Wetland 3	6300	0.07		
Wetland 4	6300	-		
Wetland 5	6250	0.09		
Wetland 6	6250	-	Pond 4B	2.7
Wetland 7	6300		RET 1	1.19
Total		**0.50**		**3.89**
Surface Water 1	5120	0.13		
Surface Water 2	5120	0.13		
Surface Water 3	5120	0.50		
Surface Water 4	5120	0.05		
Surface Water 5	5120	0.16		
Surface Water 6	5120	0.07		
Surface Water 7	5120	0.09		
Surface Water 8	5120	-		
Surface Water 9	5120	-		
Surface Water 10	5130	0.005		
Reservoirs**		-	-	-
Total		**1.135**		-

* Impact acreages are based on approximate limits through aerial interpretation and limited ground-truthing activities.
** Previously permitted storm water management systems would not be jurisdictional unless inhabited by protected wildlife species.

3.13.2 Federal and State Listed Species

3.13.2.1 Federal and State Listed Flora

Florida Natural Areas Inventory (FNAI) is a non-profit conservation organization that maintains a database of recorded occurrences of rare habitat types and imperiled plant and wildlife species. While FNAI classifies imperiled species on a 5-tiered rarity ranking system based both globally and state-wide, they also include federal and state protection statuses for such species. FNAI is not a regulatory or law enforcement agency; however, FNAI's database was consulted for this study due to their comprehensive species occurrence records.

The Florida Department of Agriculture and Consumer Services (FDACS) regulates the economic use of flora identified as endangered, threatened, or commercially exploited. Typical economic uses include gathering live wild plants for resale as ornaments or harvesting of plant material (e.g., saw palmetto berries) for resale. Incidental destruction of rare flora caused by land clearing associated with construction or agriculture is not regulated or prohibited by FDACS.

The FNAI and FDACS list of protected and commercially exploited flora was reviewed for species known to occur within Orange County, Florida, and the potential for such species to occur within the study corridor. Protected flora species are those categorized by FWS and/or FWC as T, E, or SSC, thereby receiving a level of protection because of their status. The potential occurrence of protected flora species identified within the study corridor is based on the type of vegetative communities present. The probability of each species occurring within the study corridor was ranked using the following requirements:

1. **No** – indicates no suitable habitat present. Suitable habitat is defined as intact natural land that is typically used by the species under consideration.
2. **Low** – indicates that marginally suitable habitat may exist within the study corridor, but the species was not observed during field observations. Marginal describes natural land that has been altered from its native state due to human activity, ecological succession, or conversion; however, the species under consideration could still inhabit the environment.
3. **Moderate** – indicates that suitable habitat exists within the study corridor, but the species was not observed during field observations.
4. **High** – indicates that suitable habitat exists within the study corridor and the species of interest was observed during field observations.

Table 3-20 provides a summary of federally and/or state-listed flora species known to occur in Orange County and their potential for occurrence within the limits of the study area.

Table 3-20
Federal and State Listed Plant Species

Scientific Name	Common Name	FWS Status	FWC Status	Occurrence Potential	Habitat
Bonamia grandiflora	Florida bonamia	T	E	Low	Sand pine scrub with evergreen scrub oaks, bare sunny sand areas, road rights-of-way, fire lanes
Calopogon multiflorus	Many-flowered grass-pink	--	T	Low	Fire maintained damp pinelands and meadows
Centrosema arenicola	Sand butterfly pea	--	E	Low	sandhill, scrubby flatwoods, dry upland woods
Chionanthus pygmaeus	Pygmy fringe tree	--	E	Low	scrub, sandhill, xeric hammock
Clitoria fragrans	Scrub pigeon-wing	T	E	No	Turkey oak barrens with wire grass, bluejack and turkey oak; also scrub and scrubby high pine
Coelorachis tuberculosa	Piedmont jointgrass	--	T	Low	Found in moist to wet areas such as bogs and pine woods
Coleataenia abscissa	Cutthroatgrass	--	E	Low	Seepage slopes
Deeringothamnus pulchellus	Beautiful pawpaw/White squirrel-banana	E	E	Low	Open slash or longleaf pine flatwoods with wiregrass and dwarf live oak understory
Eriogonum longifolium var. gnaphalifolium	Scrub buckwheat	T	E	Low	Sandhill, oak-hickory scrub on yellow sands, high pineland between scrub and sandhill, turkey oak barrens
Glandularia tampensis	Tampa vervain	--	E	Low	Tampa mock vervain: live oak–cabbage palm hammocks and pine–palmetto flatwoods
Illicium parviflorum	Star anise	--	E	Low	Banks of spring-run or seepage streams, bottomland forest, hydric hammock, baygall dominated by red maple and sweet bay
Lechea cernua	Nodding pinweed	--	T	Low	Dry sandy areas, sand pine scrub, scrub, dunes, and sandy ridges
Lechea divaricata	Pine pinweed	--	E	Low	Scrub and scrubby flatwoods
Lupinus aridorum	Scrub lupine/McFarlin's lupine	E	E	Low	Sand pine and rosemary scrub
Matelea floridana	Florida spiny-pod	--	E	Low	Mesic hammock
Monotropa hypopithys	Pinesap	--	E	Low	Moist, shaded, temperate forests

Scientific Name	Common Name	FWS Status	FWC Status	Occurrence Potential	Habitat
Najas filifolia	Narrowleaf naiad	--	T	Low	Freshwater ponds
Nemastylis floridana	Celestial lily	--	E	Low	Wet flatwoods, prairies, marshes, cabbage palm hammocks edge
Nolina atopocarpa	Florida beargrass	--	T	No	Flatwoods, savannas, shell middens
Nolina brittoniana	Britton's beargrass	E	E	Low	Scrub, sandhill, scrubby flatwoods, xeric hammock
Ophioglossum palmatum	Hand fern	--	E	Low	Old leaf bases of cabbage palms in maritime hammocks and wet hammocks
Paronychia chartacea	Papery whitlow-wort	T	E	Low	Sandy openings around sandhill upland lakes and karst ponds; Lake Whales Ridge scrub
Pecluma plumula	Plume polypody	--	E	Low	Tree branches, limestone in hammocks, wet woods, and limesinks
Pecluma ptilota var. bourgeauana	Comp polypody	--	E	Low	Swamp plume polypody: rockland hammocks, strand swamps, and wet woods; often on tree bases and fallen logs
Platanthera integra	Yellow fringeless orchid	--	E	Low	Wet woods and pine barrens, often in sand soils
Polygonella lewtonii	Lewton's polygala	E	-	No	White sand scrub
Polygonella myriophylla	Small's jointweed/ sandlace	E	E	Low	Open, sandy areas within scrub, mostly white sand
Prunus geniculata	Scrub plum	E	E	Low	Sandhill and oak scrub
Pteroglossaspis ecristata	Giant orchid	--	T	Low	Sandhill, scrub, pine flatwoods, pine rocklands
Salix floridiana	Florida willow	--	E	Low	Wet, mucky soils in bottomland forests, floodplains, hydric hammocks, swamps, edges of spring-runs, and streams
Schizachyrium niveum	Scrub bluestem	--	E	Low	White sand patches in rosemary scrub; also, sand pine scrub and oak scrub
Stylisma abdita	Scrub stylisma	--	E	Low	Scrub, high pine
Warea amplexifolia	Clasping warea	E	E	Low	Sandhill with longleaf pine and wiregrass; Lake Wales Ridge
Zephyranthes simpsonii	Redmargin zephyrlily	--	T	Low	Wet pinelands, pastures, and roadsides
Commercially Exploited					
Encyclia tampensis	Butterfly orchid	--	--	Low	On trees in hammocks, hardwood swamps, cypress swamps

Scientific Name	Common Name	FWS Status	FWC Status	Occurrence Potential	Habitat
Epidendrum conopseum	Green-fly orchid	--	--	Low	On trees in moist hammocks, cypress and hardwood swamps
Lycopodium cernua	Nodding club-moss	--	--	Low	Wet depressions, ditches
Osmunda cinnamomea	Cinnamon fern	--	--	High	Swamps, wetlands
Osmunda regalis	Royal fern	--	--	High	Swamps, wetlands
Rhapidophyllum hystrix	Needle palm	--	--	Low	Hammocks, bottomlands
Rhododendron canescenx	Pink azalea	--	--	Low	Wet to well-drained woodlands
Serenoa repens	Saw palmetto	--	--	High	Wet to dry flatwoods and hammocks

E = Endangered, T = Threatened, SSC= Species of Special Concern, T S/A = Threatened Similar in Appearance

Data Source: Florida Natural Areas Inventory (FNAI) Tracking List Orange County Updated April 2019, visited August 2020; Atlas of Florida Plants Institute for Systematic Botany; Florida Department of Agriculture (FDA) Endangered, Threatened, and Commercially Exploited Species FWS North Florida Ecological Service Office Species Account

3.13.2.2 Federal and State Agencies Listed Wildlife Species

Literature reviews and database queries were conducted to identify federally and/or state-protected wildlife species known to occur in Orange County, Florida, and the potential occurrence of such species to inhabit the study corridor. Federally and/or state-protected wildlife species are those categorized by FWS and/or FWC as T, E, or SSC, thereby receiving a level of protection because of their status. The potential occurrence of protected wildlife species identified within the study corridor is based on the type and quality of present vegetative communities and the surrounding land uses. The probability of each wildlife species occurring within the study corridor was ranked using the following requirements:

1. **No** – indicates no suitable habitat present. Suitable habitat is defined as intact natural land that is typically used by the species under consideration.
2. **Low** – indicates that marginally suitable habitat may exist within the study corridor, but the species was not observed during field observations. Marginal describes natural land that has been altered from its native state due to human activity, ecological succession, or conversion; however, the species under consideration could still inhabit the area.
3. **Moderate** – indicates that suitable habitat exists within the study corridor, but the species was not observed during field observations.
4. **High** – indicates that suitable habitat exists within the study corridor and the species of interest was observed during field observations.

Table 3-21 provides a summary of those federally and/or state-protected species known to occur in Orange County and their potential for occurrence within the study corridor. A discussion of federal and/or state-protected wildlife with the occurrence potential to be found within the study area, or the study area falls within the species consultation area, are discussed in detail below.

Federal and state agencies are charged with protecting endangered, threatened, and species of special concern wildlife, and their critical habitat. A discussion of each agency charged with protection of these species within the study area follows.

U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service (FWS) regulates protected wildlife species under the Endangered Species Act (ESA) of 1973. FWS typically becomes involved during the wetland permitting process through a Section 7 Consultation with USACE. In accordance with the Fish and Wildlife Coordination Act (16 USC 661-666c), consultation with FWS and the Florida Fish and Wildlife Conservation Commission (FWC) is necessary when "waters of any stream or other body of water are proposed or authorized to be impounded, diverted, or otherwise controlled or modified" under a federal permit.

Section 10 of the ESA is designed to regulate a wide range of activities affecting endangered or threatened organisms and their habitats (protected resources). With some exceptions, the ESA prohibits activities affecting these protected species and their habitats unless authorized by a permit from FWS or the National Marine Fisheries Service (NMFS). Permitted activities are designed to be consistent with the conservation of the species and this action is undertaken when USACE permitting is not required.

During consultation with FWS, the agency will evaluate the project and provide one of the following determinations for each species identified within the project area:

- **No effect** – USACE has determined that the project will not adversely impact the species and no further coordination with FWS is required.
- **May affect** – USACE has determined that the proposed project may impact a protected resource. USACE will consult with FWS to take either of the following actions:
  - Request concurrence with "may affect, but not likely to adversely affect."
  - Request initiation of formal consultation for determinations of "may affect, likely to adversely affect."

  Both requests should include written analysis explaining the determination in the form of a Biological Assessment (BA) or a Biological Evaluation (BE) (FWS 2016).

Desktop analysis and ground-truth activities along the study corridor did not identify critical foraging, resting, or nesting habitat for wildlife species identified as threatened or endangered by FWS; therefore, coordination with FWS is not anticipated during the permitting phase of this project. Should proposed pond locations or alignments shift, additional field reviews may be warranted.

Florida Fish and Wildlife Conservation Commission

Under Article IV Section 9 of the Florida Constitution, FWC has the authority to "exercise regulatory and executive powers of the state with respect to wildlife animal life and freshwater aquatic life" (FWC Imperiled Species Management Plan [ISMP] 2016). State-protected wildlife species, prohibitions, and permits are identified in Chapter 68A-27 FAC. FWC maintains Florida's ISMP 2016-2026, which is designed to conserve 57

Table 3-21
Federal and State Listed Wildlife Species

Scientific Name	Common Name	Protection Status	Occurrence Potential	Consultation Area	Occurrence Potential
			Fish		
Pteronotropis welaka	Bluenose shiner	ST	No	--	Quiet backwaters and pools of blackwater streams and rivers and spring runs; usually with thick vegetation nearby
			Reptiles		
Alligator mississippiensis	American alligator	FT(S/A)	Moderate	--	Various aquatic habitats
Drymarchon corais couperi	Eastern indigo snake	FT	Low	--	Wide variety of habitats
Gopherus polyphemus	Gopher tortoise	ST	No	--	Sandhills, scrub, hammocks, dry prairies, flatwoods, mixed forests
Lampropeltis extenuata	Pine snake	ST	Low	--	Sandhills, scrubby flatwoods, xeric hammocks, ruderal areas
Plestiodon reynoldsi	Sand Skink	FT	No	No	Rosemary scrub, scrubby flatwoods, sand pine, oak scrub
Lampropeltis extenuate	Short-tailed snake	ST	Low	--	Longleaf pine-turkey oak, sand pine scrub, xeric hammocks
			Birds		
Haliaeetus leucocephalus	*Bald eagle	--	Low	--	Forested areas adjacent to bodies of water
Polyborus plancus	Audubon's Crested Caracara	FT	Low	Yes	Open country, dry prairie, ruderal areas
Rostrhamus sociabilis	Everglade snail kite	FE	Low	Yes	Freshwater marshes, vegetated fringes of shallow lakes and ponds
Athene cunicularia floridiana	Florida burrowing owl	ST	Low	--	Sparsely vegetated sandhills, dry prairies, ruderal areas
Grus canadensis	Florida sandhill crane	ST	Low	--	Shallow wetlands, freshwater marshes, wet prairies
Aphelocoma coeruluscens	Florida scrub-jay	FT	Low	Yes	Scrub, scrubby flatwoods
Egretta carruela	Little blue heron	ST	Moderate	--	Marshes, ponds, rivers
Picoides borealis	Red-cockaded woodpecker	FE	Low	Yes	Open, mature pine flatwoods
Egretta Tricolor	Tricolored heron	ST	Moderate	--	Marshes, ponds, rivers
Platalea ajaja	Roseate spoonbill	ST	Low	--	Coastal mangroves, Brazilian pepper on man-made dredge spoil islands, willow heads of freshwater
Mycteria americana	Wood stork	FT	Moderate	--	Fresh and brackish forested wetlands, swamps, ponds, marshes

Occurrence Potential = No, Low, Moderate, High
Consultation Area = Identified within consultation area as depicted by FWS and/or FWC GIS Data
Code Key: FE = Federally Endangered, ST = State Threatened, FT = Federally Threatened, FT S/A = Federally Threatened due to Similar in Appearance
Data Source: URL:FWS ECOS accessed August 2020: https://ecos.fws.gov/ecp0/reports/species-listed-by-state-report?stateAbbrev=FL&stateName=Florida&statusCategory=Listed&status=listed
Florida's endangered species, and threatened species dated December 2018: https://myfwc.com/media/1945/threatend-endangered-species.pdf
FNAI.org accessed August 2020. *Protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act

fish and wildlife species over the next 10 years. FWC's Species Conservation Planning Section issue permits authorizing impacts to Florida's protected land-dwelling wildlife. Protected wildlife species are those identified as endangered, threatened, or species of special concern, as well as migratory birds and other species protected by state rules. Species Conservation Measures and Permitting Guidelines (FWC 2016) have been developed for 26 species to assist in determining permit needs and minimizing impacts to wildlife. The guidelines are intended to provide clear information on requirements established in the FAC related to intentional and incidental take permitting, and guidance on species range, survey methodology, and recommended practices.

Desktop analysis and ground-truth activities along the study corridor did not identify critical foraging, resting, or nesting habitat for wildlife species identified as threatened, endangered or species of special concern by FWC; therefore, coordination with FWC is not anticipated during the permitting phase of this project. Should proposed pond locations or alignments shift, additional field reviews may be warranted.

Bald Eagle

Although the bald eagle (*Haliaeetus leucocephalus*) has been delisted, the species remains protected through the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Florida has one of the densest concentrations of nesting bald eagles in the lower 48 states, with several clustered around significant lake, river, and coastal systems throughout the state (FWC Bald Eagle Management). Bald eagles typically nest and roost in forested habitats consisting of mature canopy trees located along habitat edges, allowing an unobstructed view of surrounding areas. Daytime roosts are in the highest trees and adjacent to shorelines. High quality foraging habitat for bald eagles has a diversity and abundance of prey, access to shallow water, and tall trees or structures (FWC, Bald Eagle).

The FWC Bald Eagle Nest locator (updated through 2017) was queried for known bald eagle nest sites within a 1-mile radius of the study corridor. No documented bald eagle nest sites were identified within a 1-mile radius, and no active nest sites were identified during the site reconnaissance.

It is anticipated that the roadway and stormwater management improvements along the study corridor will not adversely impact the bald eagle.

3.13.2.3 Federally Protected Wildlife Species

American Alligator

FWS considers the American alligator (*Alligator mississippiensis*) threatened due to similarity in appearance to the federally endangered American crocodile (*Crocodylus acutus*). The American alligator inhabits fresh and brackish marshes, ponds, lakes, rivers, swamps, bayous, and large spring runs. They have been found in salt marsh and estuarine habitats in some parts of the state (Scott 2004). Alligators play a vital role in creating and maintaining microhabitats (gator holes), which can serve as refuge to water source habitats and benefit a host of species. Nests consist of a mound of compacted earth and vegetation usually 4–7 feet in diameter (Scott 2004). Nesting season occurs in the spring. The alligator has a wide variety of food sources, including fish, ducks, wading birds, raccoons, and turtles.

Although the alligator is known to inhabit stormwater management ponds and canals, proposed improvements within the study corridor associated with surface waters are limited to expansions of existing systems; therefore, proposed improvements are not anticipated to adversely impact the American alligator.

Audubon's Crested Caracara

FWS lists the crested caracara (*Polyborus plancus audubonii*) as threatened. It is typically found in dry or wet prairies with scattered cabbage palms and improved and unimproved pasturelands (FWS Multispecies Recovery Plan for South Florida). Nest sites are typically found in the tallest cabbage palm or other structures free of dense vegetation. Caracara birds are opportunistic feeders with their diets consisting of insects, fish, snakes, turtles, birds, and mammals (rabbits, skunks, prairie dogs).

The study corridor lies within the consultation area of the crested caracara; however, it is heavily developed and lacks large open area typical of the caracara's preferred habitat. Based on the location of the study area, and the lack of suitable nesting and foraging habitat, it is anticipated that proposed improvements will not adversely impact the Audubon's crested caracara.

Florida Scrub Jay

FWS lists the Florida scrub-jay (*Aphelocoma coerulescens*) as threatened. This species is typically found in sand pine, xeric oak scrub, scrubby flatwoods with sandy soils, and fire-dominated habitat types. The scrub-jay's diet consists mainly of acorns, arthropods, berries, seeds, and a wide variety of insects (Woolfenden & Fitzpatrick 1996).

Although the study corridor is located within the FWS consultation area for the Florida scrub-jay, suitable habitat for this species is not found within or immediately adjacent to the study corridor. It is anticipated that proposed roadway and stormwater management improvements to the study corridor will not adversely impact the Florida scrub-jay.

Red-Cockaded Woodpecker

FWS lists the red-cockaded woodpecker (*Picoides borealis*) (RCW) as endangered. The RCW is known to inhabit mature pine forests where they can bore out cavities. RCWs favor environments that have a diversity of grass, forb, and shrub species. Their diet consists mainly of insects and arthropods, with fruit and seeds making up a small portion (FWS March 9, 2020).

Although the study corridor falls within the FWS consultation area for the RCW, suitable nesting and foraging habitat are not within or immediately adjacent to the study corridor. In addition, RCW's were not observed during site reconnaissance.

It is anticipated that proposed roadway and stormwater management improvements to the study corridor will not adversely impact the RCW.

Everglade Snail Kite

FWS lists the Everglade snail kite (*Rostrhamus sociabilis plumbeus*) as endangered (FWS Code of Federal Regulations [CFR]). The snail kite is found near large, open freshwater marshes and lakes with shallow water and low density of emergent vegetation of natural and man-made systems. The apple snail (*Pomacea paludosa*) is the snail kite's main food source, which makes the snail kite's survival directly dependent on the hydrology and water quality of watersheds associated with the Everglades, lake Okeechobee, and the Kissimmee and the upper St. Johns Rivers (FWS Multi-Species Recovery Plan for South Florida).

The study corridor is located within the FWS consultation area for the snail kite; however, no suitable foraging or nesting habitat is located within the study corridor. It is anticipated that the proposed roadway improvements will not adversely impact the Everglade snail kite.

Wood Stork

FWS lists the wood stork (*Mycteria americana*) as threatened. This species is typically found in freshwater marshes, swamps, lagoons, ponds, flooded fields, depressions in marshes, and brackish wetlands. The critical foraging areas for this species include areas of very shallow water, generally 6–10 inches in depth, where there is an abundance of small fishes and other aquatic life. These small fishes may include mosquitofish, sailfin mollies, flagfish, and several species of sunfish. Wood storks may also prey on frogs, salamanders, snakes, crayfish, insects, and baby alligators (Scott 2004). Suitable foraging habitat (SFH) is defined in *The Corps of Engineers, Jacksonville District, U.S. Fish and Wildlife Service, Jacksonville Ecological Services Field Office and State of Florida Effect Determination Key for the Wood Stork in Central and North Peninsular Florida* (2008) as "any area containing patches of relatively open (25% aquatic vegetation), calm water, and having a permanent or seasonal water depth between 2 and 15 inches." Examples of SFH include freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. FWS has identified core foraging areas (CFA) around wood stork colonies that are deemed important for reproductive success. The CFA within the study corridor is identified as a 15-mile radius from known wood stork colonies.

The study corridor is located within the 15-mile CFA of three wood stork colonies (FWS Wood Storks 2010 – 2019 GIS Database):

- Lake Mary Jane – last active 2019, 11.09 miles south
- Orlando Wetland Park – last active 2018, 12.36 miles east
- Lake Lawne – last active 2019, 14.75 miles west

Based on the location of the study corridor within the CFA, the *Corps of Engineers and U.S. Fish and Wildlife Service Effect Determination Key for the Wood Stork in Central and North Peninsular Florida (2008)* (Key) was evaluated for the study corridor. Following the Key:

- Project is more than 2,500 feet from a colony site
- Project impacts to SFH are less than or equal to 0.5 acre

Review of the preferred alignment suggests the potential impacts to SFH are less than or equal to 0.5 acre and are not considered critical foraging habitat; therefore, the proposed project is anticipated to receive a finding of "*not likely to adversely affect (NLAA)*" this species.

3.13.2.4 State Protected Wildlife Species

Gopher Tortoise

FWC lists the gopher tortoise (*Gopherus polyphemus*) as threatened. The gopher tortoise inhabits subterranean burrows in dry upland habitats. Vegetative communities most often inhabited by gopher tortoises include longleaf pine sandhills, xeric oak hammocks, scrub, pine flatwoods, dry prairies and coastal dunes. Gopher tortoises can also be found in pastures, ruderal fields, and grassy roadsides. To be suitable for gopher tortoises, the habitat must have well-drained sandy soils for digging burrows, herbaceous plants, and open sunny areas for nesting and basking. Periodic natural fires play an important role in maintaining tortoise habitat by opening up the canopy and promoting growth of herbaceous plants for foraging. If natural fires are suppressed, the habitat becomes unsuitable for gopher tortoises (Cox 1987). Gopher tortoise burrows are an important habitat to many native species. It is estimated that 39 invertebrates and 42 vertebrate species use the gopher tortoise burrow to some degree (Cox 1987). Of those species, protected species that frequently inhabit the gopher tortoise burrow include the Florida pine snake, eastern indigo snake, and burrowing owl. This commensal relationship warranted field investigation for such species within the study corridor.

The study corridor is largely developed, with little suitable habitat for the gopher tortoise. During site review, no gopher tortoises or their burrows were observed within study corridor or proposed stormwater management sites. It is anticipated that the proposed project will not adversely impact gopher tortoises or their burrows.

Florida Pine Snake

FWC lists the Florida pine snake (*Pituophis melanoleucus*) as threatened. The Florida pine snake is found in sandhills, including old fields and pastures, with a moderate to open canopy and dry sandy soils, in which it burrows. The pine snake is also found in sand pine scrub and scrubby flatwoods; it often coexists with pocket gophers and gopher tortoises (FNAI 2018). The diet of the Florida pine snake primarily consists of moles, rabbits, mice, rats, squirrels, lizards, and other snakes and their eggs (Ernst and Ernst 2003).

The study corridor is largely developed, with little suitable habitat for the Florida pine snake. The Florida pine snake was not observed within the limits of the study corridor; therefore, is anticipated that the proposed project will not adversely impact the Florida pine snake.

Florida Sandhill Crane

FWC lists the Florida sandhill crane (*Grus canadensis*) as threatened. The Florida sandhill crane is a non-migratory bird found in freshwater marshes, prairies, and pastures (FNAI 2018). These birds nest in freshwater ponds and marshes that have an average water depth of 5 to 13 inches, and sites vary from year to year due to the fluctuation of water levels. Their preferred habitat contains short vegetation (less than 20 inches in uplands), and they generally avoid areas with tall vegetation or dense canopies (FWC 2020). The sandhill crane is often found foraging in a variety of open habitats, including roadsides. Their diet consists of berries, seeds, insects, mice, small birds, snakes, lizards, and frogs.

Foraging and nesting habitat may be found within the study corridor within the maintained ROW and existing stormwater pond locations; however, the species was not observed during the site review. It is anticipated that the proposed roadway and stormwater improvements within the study corridor will not adversely impact the Florida sandhill crane

Wading Birds

FWC lists the roseate spoonbill (*Platalea ajaja*), little blue heron (*Egretta caerulea*), and tricolored heron (*Egretta tricolor*) as threatened. These species are typically found in marshes, ponds, lakes, meadows, mudflats, lagoons, streams, mangrove lagoons, and other bodies of shallow waters. Their diet consists of various types of fishes, amphibians, and invertebrates. Nesting generally occurs in both coastal and freshwater environments in swamps and/or mangrove forests. They are known to share nesting sites with other wading birds to form rookery colonies (Rodgers 1996).

Foraging habitat is present within and immediately adjacent to the study corridor; however, these species were not observed during the site review. Proposed improvements within the study corridor include expanding and creating stormwater management ponds, which are anticipated to provide additional foraging habitat for wading birds; therefore, it is anticipated that proposed improvements within the study corridor will not adversely impact these species or their habitat

3.13.2.5 Non-listed Wildlife Species

In addition to federal and/or state-listed wildlife species, the study area supports additional wildlife species. Wildlife species observed within the study corridor during field review included southern black racer (*Coluber constrictor*), red-shoulder hawk (*Buteo lineatus*), blue jay (*Cyanocitta cristata*), great blue heron (*Ardea herodias*), northern cardinal (*Cardinalis cardinalis*), mourning dove (*Zeanida macroura*), black vulture (*Coragyps atratus*), and armadillo (*Dasypus novemcinctus*).

3.13.3 Wetland and/or Surface Water Regulatory Overview and Permitting Requirements

Wetland systems are regulated at federal, state and local levels making the presence of such systems important in planning for transportation projects. A discussion of each agency with potential jurisdiction over wetlands within the study area follows.

Clean Water Act Section 404

In December 2020, the Florida Department of Environmental Protection (FDEP) assumed the Clean Water Act (CWA) Section 404 permitting program from the U.S. Army Corps of Engineers (USACE) and is included under 62-331 F.A.C. Generally, the USACE retained waters of the US that were subject to one or more of the following criteria:

- Waters identified within the Retained Waters List (currently 567 waters). This list of waters was compiled from multiple approved and draft navigability studies conducted during the 1970's and 1980's and from local knowledge.
- Waters subject to the ebb and flow of the tide shoreward to their mean high water mark that are not specifically listed in the Retained Waters List
- Wetlands adjacent to waters identified in the Retained Waters List landward to the administrative boundary and wetlands adjacent to waters subject to the ebb and flow of the tide, landward to the administrative boundary. The administrative boundary is a 300-foot guideline established from the ordinary high water mark or mean high tide line of the retained water. When a project involved discharges to both waterward and landward of the 300-foot guideline, the USCAE will retain jurisdiction to the landward boundary of the project for the purposes of that project only.

- The USACE shall retain responsibility for permitting the discharge of dredged and fill material in waters of the US within "Indian County", as that term is defined at 18 U.S.C. § 1151.
- USACE permitting responsibilities for Section 10 of the Rivers and Harbors Act are unaffected in all waters.

Wetlands and surface waters within the project corridor were reviewed against the criteria listed above and it was determined that they will not be retained by the USACE. Therefore, permitting under CWA 404 will be facilitated by the FDEP. It should be noted that an Environmental Resource Permit (ERP) issues by the SJRWMD will also be required and will continue to serve as the Water Quality Certification required for issuance of the CWA 404 permit.

St. Johns River Water Management District

The state of Florida defines wetlands as "those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances, do support, a prevalence of vegetation typically adapted for life in saturated soils" (Chapter 62-340.200 FAC). SJRWMD regulates impacts to wetlands and/or other surface waters, pursuant to Part IV Chapter 373 of the Florida Statute (FS), and in accordance with Chapter 62-330 FAC for area of the Woodbury Road RCA. SJRWMD requires an Environmental Resource Permit (ERP) that authorizes activities in a manner that prevents flooding, manages surface water, and protects water quality, wetlands, and other surface waters. As part of the permit process, SJRWMD rules and regulations require the applicant to evaluate the elimination or reduction of impacts to wetland and/or other surface water systems. When reviewing an application, SJRWMD considers the following:

- The degree of impact to the wetland and other surface water functions caused by a proposed activity.
- Whether the impact to these functions can be mitigated.
- The practicability of design modification that could eliminate or reduce impacts to these functions, including alignment alternatives for a proposed linear system.

Pursuant to Section 10.1.1(f) of the ERP Applicant's Handbook (General and Environmental) Volume 1 (June 1, 2018), an applicant must ensure that a regulated activity will not cause adverse secondary impacts to the water resources. Secondary impact criterion consists of the following four parts in which an applicant must provide reasonable assurance that secondary impacts from construction, alteration, and intended or reasonable expected uses of a proposed project:

- will not cause violations of water quality standards or adverse impacts to the functions of wetlands or other surface waters.
- will not adversely impact the ecological value of uplands to federal and/or state protected aquatic and wetland dependent wildlife species for enabling existing nesting or denning by these species (excluding areas needed for foraging or wildlife corridors).
- will not impact any significant historical or archeological resource.
- will not cause adverse impacts in later phases that are very closely linked and casually related to the intended project.

SJRWMD regulates cumulative impacts pursuant to Section 10.1.1(g) of SJRWMD's ERP Applicant Handbook. Cumulative impacts consist of wetland and/or other surface water impacts within the same drainage basin

as the proposed project. Cumulative impacts to water quality are evaluated by criterion set in Section 10.1.1(C), and by evaluating impacts to functions identified in Section 10.2.2 ERP Applicant's Handbook.

Design modifications to reduce and eliminate impacts must be explored. Impacts remaining after practicable design modification may be offset through mitigation. Mitigation is required for direct impacts to wetland systems greater than 5 acres in size. In addition, SJRWMD assesses secondary impacts with an average of 25 feet into the system. In order to reduce and/or eliminate secondary impacts, SJRWMD may require a 15-foot minimum/25-foot average upland buffer around a preserved wetland system.

Impacts to wetland systems may be offset through preservation or the purchase of mitigation credits from an approved mitigation bank.

During the design phase of this project wetlands and other surface water systems will need to be delineated in accordance with state and federal regulations to accurately determine impacts and mitigation requirements. Mitigation in the form of bank credits area available for this project from several mitigation banks. The preferred mitigation bank for use for Orange County projects is TM-Econ Mitigation Bank Phase IV (Orange County). TM-Econ Mitigation Bank Phase IV has federal and state credits available (USACE RIBITS and SJRWMD Mitigation Bank, 2020).

Orange County Environmental Protection Division

The Orange County Environmental Protection Division (OCEPD) is a local government agency that regulates wetlands pursuant to Article X – Wetland Conservations Areas Section 15 (Conservation Ordinance of Orange County). This ordinance classifies wetland systems by size, hydrologic connection, and use of the system by protected wildlife species. All wetland systems within unincorporated Orange County, Florida, are classified using the following criteria:

- Class I – System has a hydrologic connection to natural surface water bodies, or lake littoral zone; is 40 acres or larger in size; or provides critical habitat to federal- and/or state-protected wildlife species.
- Class II – System consists of isolated wetlands or formerly isolated wetlands that have been altered to have a direct connection to other surface water drainage, and the system is greater than or equal to 5 acres or is not otherwise classified as a Class I wetland.
- Class III – System is isolated wetland less than 5 acres and does not qualify as a Class I or Class II system.

Class I wetland systems receive the greatest protection and may be impacted only when no alternative exists for the reasonable use of the land where there is an overriding public benefit. Class II wetland systems may be impacted except when contrary to public interest. Class III wetland systems may be impacted in every case.

OCEPD evaluates secondary impacts like that of SJRWMD with a 15-foot minimum, 25-foot average width into a system. In addition, direct and secondary impacts may be offset through appropriate mitigation.

3.13.4 Wildlife Corridors

As part of the Woodbury Road RCA process, the project team evaluated the opportunity of implementing wildlife crossings within the study area. Wildlife crossings are most often associated with roadways where natural habitat is located on either side of a crossing and those natural areas can be protected from site conversion through preservation or conservation. Wildlife crossings allow for wildlife to move uninterrupted and safely through a roadway corridor from one side to the other, from natural habitat to natural habitat. This study found little evidence of use by listed wildlife species within the study area.

Current Corridor Condition

Woodbury Road is currently a two-lane road with sidewalks and maintained ROW. This section of Woodbury road consists of residential, commercial, and institutional development, with areas of natural, undeveloped forested uplands and wetlands. Undeveloped areas are being evaluated for future development along the study corridor. Current undeveloped, forested wetlands and uplands are scattered and bisected by development including roads, residential and commercial development. Continuous, uninterrupted natural habitat is not present within the study corridor.

Future Corridor Condition

The Woodbury Road study corridor is largely developed; however, it includes a few parcels with potential for development. These are located in the northwest quadrant of the intersection of Waterford Lakes Parkway and Woodbury Road, the southeast quadrant of Woodbury with S.R. 50 and the southeast quadrant of Woodbury Road with Lake Underhill Road. The future corridor conditions are not anticipated to change from the current conditions.

Evaluation Criteria

Detailed analysis of the study area for wildlife crossing implementation included review of biodiversity database, identification and location of conservation lands and/or public lands, current and future development plans, as well as input from citizens. While there is no significant listed wildlife species presence within the study area, there have been records of common wildlife species (i.e. raccoons, opossums, etc.) identified.

Two critical evaluation criteria, when determining the implementation and placement of wildlife crossings, are the presence of natural habitat on both sides of the roadway that is protected from site alteration, and the ability to construct a fence along the roadway to guide wildlife to the crossing. Therefore, if a potential wildlife crossing location currently has natural habitat on both sides of the roadway that is under private ownership, and the property owner prohibits the construction of a fence or reserves the right to move or remove the wildlife fence in the future, the long-term viability of the location is greatly diminished. Using these criteria, the viability of wildlife crossings within the Woodbury Road study area is limited.

Selection of Potential Wildlife Crossing Locations

Using the evaluation criteria above, along with biodiversity data available for the study area, existing natural communities, and input from citizens, two potential wildlife locations were identified: 1) north of Waterford Lakes Parkway, and 2) north of Parkbury Drive.

Application of Evaluation Criteria to Potential Wildlife Crossing Locations

Wildlife Crossing Location 1 – North of Waterford Lakes Parkway. The following items were noted at this location:

- Biodiversity Resource Priorities – This location is classified with a priority ranking between 2 and 4 for both sides of Woodbury Road.
- Conservation Easements – FL-SOLARIS CLEAR data indicates that a portion of the wetland system located east of Woodbury Road has been placed in conservation, the remainder of the system is not within conservation.
- Current and Future Land Use – This area has natural habitat consisting of forested uplands and wetlands located on both sides of Woodbury Road.

Wildlife Crossing Location 2 – North of Parkbury Drive. This area has natural habitat consisting of forested uplands and wetlands located on both sides of Woodbury Road. The following observations were made at this location:

- Biodiversity Resource Priorities – This location is classified with a priority ranking between 2 and 4 for both sides of Woodbury Road.
- Conservation Easements – FL-SOLARIS CLEAR data indicates that a portion of the wetland system located west of Woodbury Road, south of the existing stormwater pond, has been placed in conservation.
- Current and Future Land Use – This area has natural habitat consisting of forested uplands and wetlands located on both sides of Woodbury Road. The uplands located east of Woodbury Road contain a transient camp site littered with large amount of household debris.

Conclusion

Wildlife Crossing Location 1 – North of Waterford Lakes Parkway

Based on information and analysis presented above, a wildlife crossing is not justified in this location due to the lack of sustainable natural communities (preservation or conservation lands) on both sides of the roadway that would prevent future development. A wildlife crossing at this location may be reconsidered in the future should the land be placed under conservation.

Wildlife Crossing Location 2 – North of Parkbury Drive

Based on information and analysis presented above, a wildlife crossing is not justified at this location due to the lack of sustainable natural communities (preservation or conservation lands) on both sides of the roadway that would prevent future development. A wildlife crossing at this location may be reconsidered in the future should the land be placed under conservation.

4 DESIGN CONTROLS AND STANDARDS

4.1 Roadway Design Criteria

Sources used to determine the design criteria for the Woodbury Road RCA include the FDOT Design Manual (FDM), the FDOT Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System, the FDOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Greenbook), and the Manual of Uniform Traffic Control Devices (MUTCD). Specific design criteria used for the development of the proposed design are identified below:

- Design Speed: 40 mph (Posted: 40 mph)
- Functional Classification: Major Urban Collector
- Level of Service: LOS of "E" or better
- Lane Widths: Travel lane: 11 feet
- Sidewalk Width: 6 feet
- Shared-use path (east side): 10 feet
- Bike Lane Width: 7-foot buffered
- Median Width: 15.5 feet, raised
- Curb Type: Type E (median) Type F (outside)
- Border Width: 12 feet from outside edge of pavement
- Lateral Offset: 4 feet from Face of Curb
- Pavement Design: (to be determined)
- Landscape Budget: (to be determined later in the process)

4.2 Drainage Design Criteria

The project area is located within the SJRWMD. The stormwater management systems throughout the project are designed to meet or exceed the drainage criteria established by the SJRWMD and Orange County. These design criteria include requirements for providing treatment for water quality protection and attenuation of discharge rates. The following is a summary of the design criteria required by each of the governing agencies.

4.2.1 Orange County

Orange County requires the peak discharge from the developed site to not exceed the peak rate of discharge from the site in the existing conditions for the 25-year/24-hour storm event. Where no positive outfall is available, the stormwater management system is required to retain the 100-year/24-hour storm event.

The Orange County criteria requires that pollution abatement detention volume for wet detention areas be provided for the greater of the first one (1) inch of runoff from the total developed project or the runoff from two and one-half (2.5) inches over the net new impervious area. Orange County criteria for pollution abatement volume for a dry retention system is one-half (1/2) inch of runoff from the developed site or the runoff generated from the first one (1) inch of rainfall on the developed site, whichever is greater.

Compensation will be required for all flood water displaced by development below the 100-year flood elevation. Compensating storage is to be accomplished between the normal seasonal high-water elevation and the 100-year flood elevation.

4.2.2 St. Johns River Water Management District (SJRWMD)

SJRWMD requires that the discharge rate be limited to rates that do not causing adverse impacts to existing off-site properties and either historic discharge rates, rates determined in previous District permit actions, or rates specified in District criteria. The criteria states that the design storm event to be used is the 25-year / 24-hour storm.

SJRWMD also requires that pollution abatement volume for wet detention areas be provided for the greater of the first one (1) inch of runoff from the total developed project or the runoff from two and one-half (2.5) inches over the net new impervious area. The required pollution abatement detention volume for dry retention areas shall be equal to 50% of the required pollution abatement volume for wet detention.

5 TRAFFIC CONDITIONS

The chapter presents a summary of the existing traffic conditions as well as the future traffic projections for the major intersections and roadway segments along Woodbury Road as documented within the Design Traffic Technical Memorandum (DTTM) developed as part of this study and completed in August 2020.

In analyzing the existing operating conditions, traffic counts were first conducted at pertinent roadway segments and intersections. The following intersections along Woodbury Road were evaluated as part of this study:

- Woodbury Road @ East Colonial Drive (Signalized)
- Woodbury Road @ Woodbury Glen Drive/Woodbury Cove Drive (Unsignalized)
- Woodbury Road @ Waterford Lakes Parkway (Signalized)
- Woodbury Road @ Mallory Circle/Island Bay Drive (Unsignalized)
- Woodbury Road @ Lake Underhill Road (Signalized)

Level of Service (LOS) analyses were then conducted for both intersections and roadway segments using the existing traffic counts, signal timing data and roadway and intersection geometry. The intersection LOS analysis was performed based on the Highway Capacity Manual methodologies as computed using the Synchro software. The roadway segment LOS analysis was conducted based on the generalized Annual Average Daily Traffic (AADT) volumes for urbanized areas from the latest FDOT 2013 Quality/Level of Service Handbook. The following sub-sections describe in more detail the overall process and results.

5.1 Existing Conditions

5.1.1 Traffic Counts

All existing traffic count data was collected during the month of September 2019. The data collected included:

- 72-Hour Classification Counts (9 locations)
- 10-Hour intersection turning movement counts for AM and PM peak hours (5 intersections)

The weekday turning movement counts were collected for the intersections along Woodbury Road between the peak hours of 7:00-9:00 AM and 12:00-8:00 PM.

All traffic count data collected were adjusted utilizing the latest (2018) FDOT axle and seasonal adjustment factors for Orange County to provide 2019 annual average conditions. Daily classification counts were adjusted to AADT using FDOT peak season adjustment factors only, as no axle adjustment was necessary. The traffic data collection locations and types of traffic count data collected are illustrated in **Figure 5-1.**

Figure 5-2 shows the existing AADT's for the entire corridor as well as the traffic control for the study intersections.

Table 5-1 includes the daily traffic counts and adjustments.

All nine of the 72-hour count locations were utilized in this traffic count study as vehicle classification counts. Vehicle composition for the classification counts were categorized into one of three vehicle types:

- Passenger vehicles (Motorcycles, cars, vans, pickup trucks)

- Medium Bus/Truck (Buses and 2 axle Single Unit Trucks)
- Heavy Trucks (3 or 4 axles single unit trucks, 2 axle tractors with 1 or 2 axle trailer, 3 axle trailers, and 5, 6, and 7 axle multi-trailer)

5.1.2 Traffic Characteristics

The existing traffic characteristics were established using the traffic counts collected. Specific traffic characteristics are listed below:

- K – the proportion of AADT occurring during the peak study hour for the study roadway
- D – the proportion of traffic in the design hour of the design year traveling in the peak direction
- T– the percentage of buses and trucks occurring during a day (24-hours)
- DHT – the percentage of buses and trucks occurring during the design hour

These measured K, D, and T-daily factors are annotated in **Table 5-2**. This table also includes FDOT and Orange County K and D factors for comparisons purposes.

The following design traffic characteristics were established using traffic flow characteristics obtained from the traffic count data and the FDOT Project Traffic Forecasting Handbook (PTFH):

- Standard K- the design peak hour factor utilized for the design traffic volumes within a large urbanized area
- D-represents the directional factor occurring in the traffic flow during the peak hour
- T- the percentage of buses and trucks occurring in the traffic stream during a day (24-hours)
- DHT-the percentage of trucks and buses occurring during the design hour

Table 5-3 displays the recommended design traffic characteristics for Woodbury Road and the intersecting side streets. The design traffic characteristics are used to develop design hour volumes (DHV) and directional design hour volumes (DDHV). The recommended T factor is used to determine the Equivalent Single Axle Loadings (ESALs) for the project corridor for pavement design and the recommended DHT factor is used in the intersection operational analysis.

The K factor was based on the FDOT PTFH Large Urbanized Area Arterials & Highways Standard K factor. Existing D factors were compared to historical FDOT D factors for Woodbury Road for the last six years and also compared to the range of acceptable factors found in the FDOT PTFH. Side street D factors were based on existing D percentages. The Woodbury Road T and DHT factors were based on the average of the existing traffic count percentages. Minor street T and DHT factors were also based on the Woodbury Road factors.

Figure 5-1
Traffic Count Locations by Type

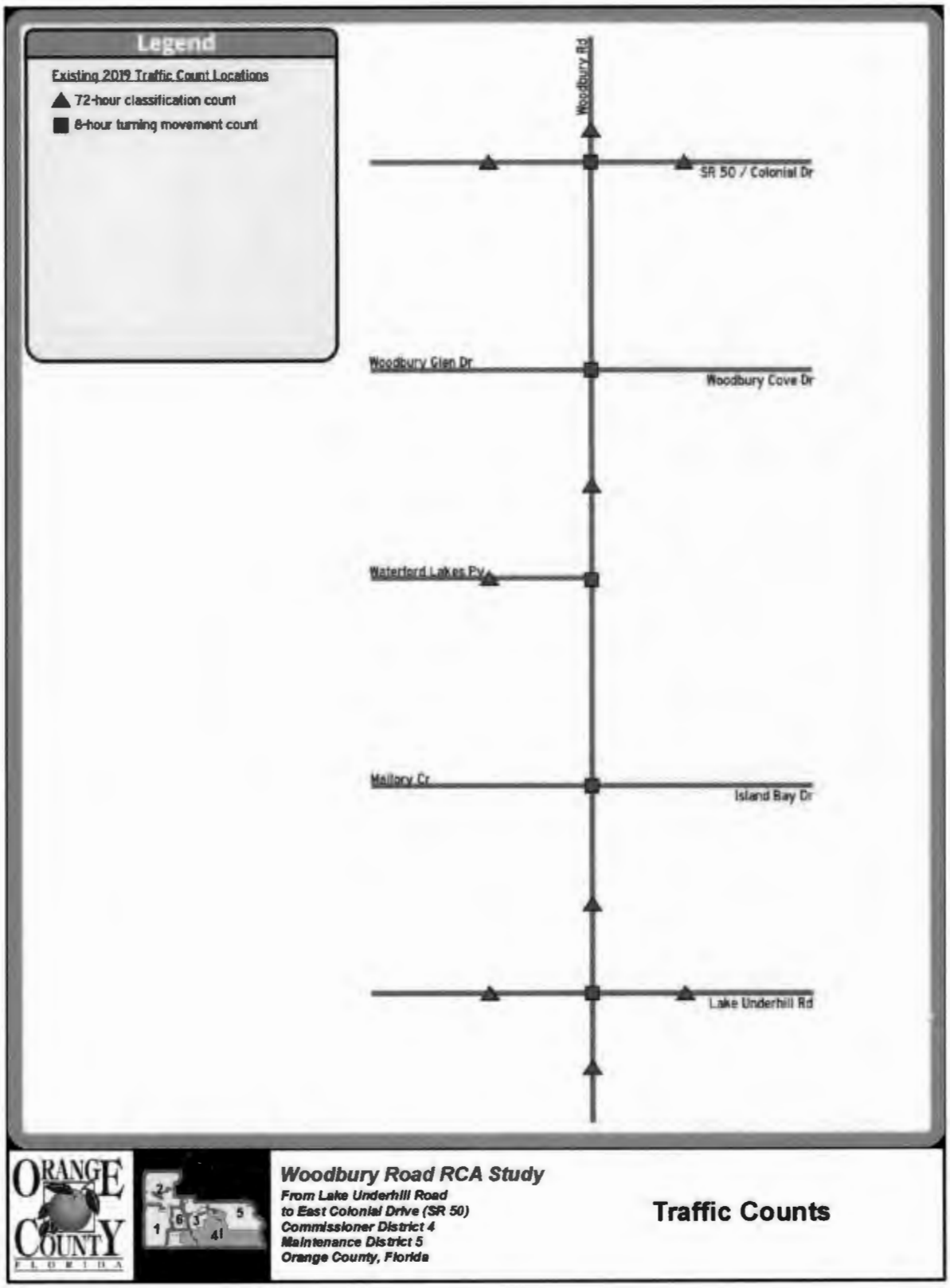


Figure 5-2
Existing AADT

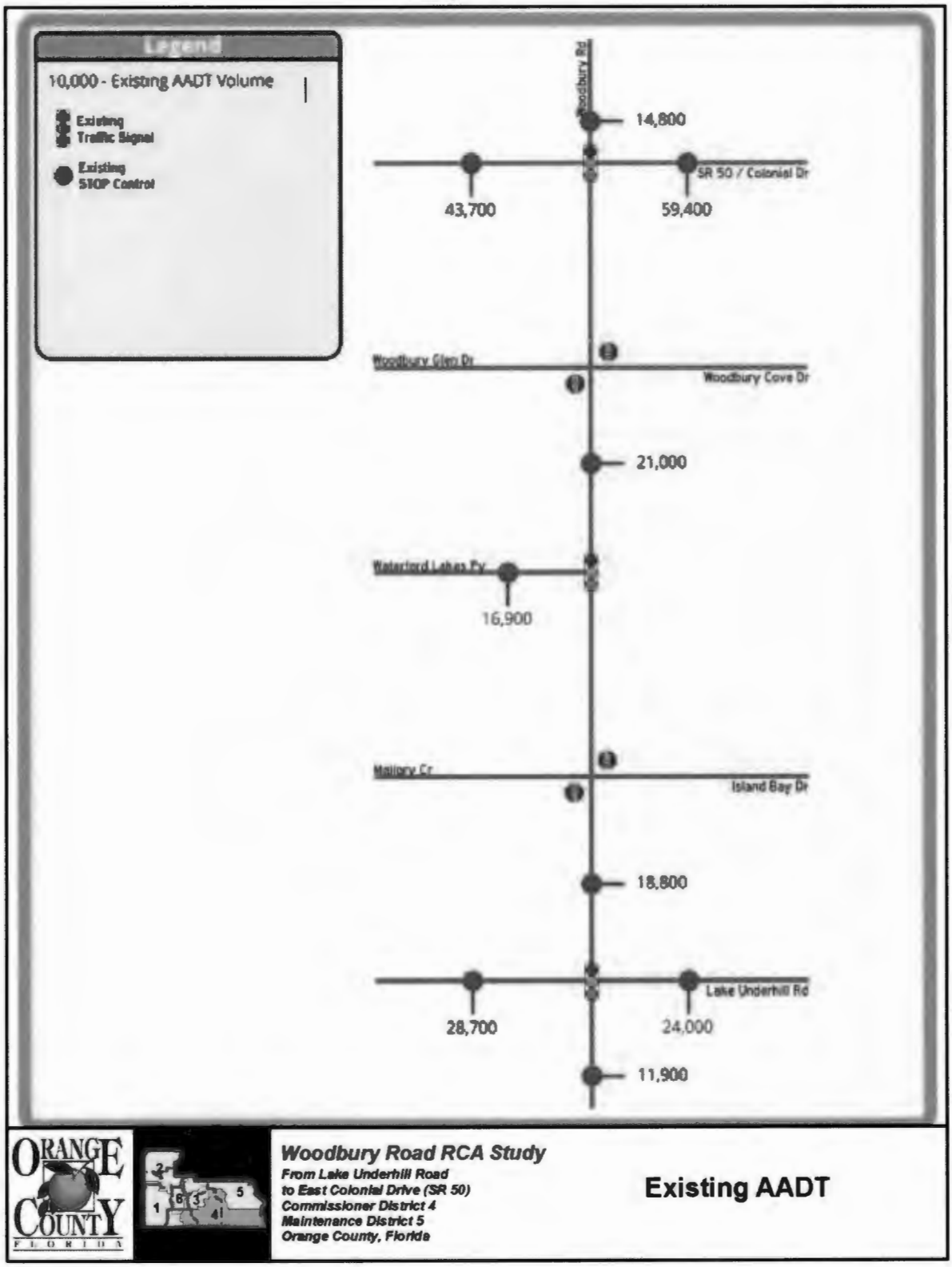


Table 5-1
2019 Existing Roadway Characteristics

Roadway/Segment	Type of Count	Measured Characteristics							Axle Adj.[1]	Seasonal Adj.[2]	Adjusted AADT[3]
		ADT	Peak Hr. Volume	NB/EB Volume	SB/WB Volume	Peak Time	"K"	"D"			
Mainline Characteristics											
Woodbury Rd											
Challenger Py to Colonial Dr (SR 50)	72 Hr Classification	14,612	1,284	312	972	4:30-5:30 PM	8.79%	75.70%	1.00	1.01	14,800
SR 50 to Waterford Lakes Py	72 Hr Classification	20,755	1,648	819	829	5:00-6:00 PM	7.94%	50.30%	1.00	1.01	21,000
Waterford Lakes Py to Lake Underhill Rd	72 Hr Classification	18,641	1,596	749	847	5:30-6:30 PM	8.56%	53.07%	1.00	1.01	18,800
Lake Underhill Rd to Woodbury Pines Cr	72 Hr Classification	11,829	1,090	440	650	5:15-6:15 PM	9.21%	59.63%	1.00	1.01	11,900
Side Street Characteristics											
Colonial Dr (SR 50)											
West of Woodbury Rd	72 Hr Classification	43,724	2,895	1,585	1,310	5:15-6:15 PM	6.62%	54.75%	1.00	1.00	43,700
East of Woodbury Rd	72 Hr Classification	59,449	4,157	2,147	2,010	5:00-6:00 PM	6.99%	51.65%	1.00	1.00	59,400
Waterford Lakes Py											
West of Woodbury Rd	72 Hr Classification	16,771	1,482	836	646	5:30-6:30 PM	8.84%	56.41%	1.00	1.01	16,900
Lake Underhill Rd											
West of Woodbury Rd	72 Hr Classification	28,404	2,287	1,392	895	5:00-6:00 PM	8.05%	60.87%	1.00	1.01	28,700
East of Woodbury Rd	72 Hr Classification	23,782	2,048	1,307	741	5:00-6:00 PM	8.61%	63.82%	1.00	1.01	24,000

Notes:

1. Axle adjustment factor for Woodbury Area Roadways is 1.00 as the classification count includes all vehicles.
2. Most recent seasonal adjustment factors for all the roadways were obtained from FDOT Florida Traffic Online (2018).
3. Measured ADT * Axle Adjustment * Seasonal Adjustment = Adjusted AADT (adjusted to nearest hundred).

Table 5-2
Traffic Roadway Design Characteristics Comparison

Roadway/Segment	Measured Characteristics			"K" Estimated[1]	FDOT 2018 FTI[2]			Orange County Counts[3]		
	"K"	"D"	"Tdaily"		"K"	"D"	"Tdaily"	"K"	"D"	"Tdaily"
Mainline Characteristics										
Woodbury Rd										
Challenger Py to Colonial Dr (SR 50)	8.79%	75.70%	1.12%	9.06%	--	--	--	9.30%	75.80%	--
SR 50 to Waterford Lakes Py	7.94%	50.30%	1.46%	8.18%	--	--	--	7.70%	52.50%	--
Waterford Lakes Py to Lake Underhill Rd	8.56%	53.07%	4.17%	8.82%	9.00%	53.20%	4.30%	8.40%	55.30%	--
Lake Underhill Rd to Woodbury Pines Cr	9.21%	59.63%	1.23%	9.49%	9.00%	53.20%	4.30%	9.20%	59.80%	--
Average	**8.63%**	**59.68%**	**2.00%**	**8.89%**	9.00%	53.20%	4.30%	8.65%	60.85%	--
Side Street Characteristics										
Colonial Dr (SR 50)										
West of Woodbury Rd	6.62%	54.75%	8.48%	6.82%	9.00%	53.20%	2.80%	7.10%	53.10%	--
East of Woodbury Rd	6.99%	51.65%	9.81%	7.20%	--	--	--	7.80%	63.00%	--
Waterford Lakes Py										
West of Woodbury Rd	8.84%	56.41%	3.04%	9.11%	--	--	--	8.80%	58.60%	--
Lake Underhill Rd										
West of Woodbury Rd	8.05%	60.87%	5.92%	8.30%	--	--	--	8.10%	63.50%	--
East of Woodbury Rd	8.61%	63.82%	4.19%	8.87%	--	--	--	8.30%	63.60%	--
Average	**7.82%**	**57.50%**	**6.29%**	**8.06%**	9.00%	53.20%	2.80%	8.02%	60.36%	--

Notes:

1. Estimated K Standard = Measured K * (median of the thirteen highest consecutive peak season factors / median of thirteen lowest consecutive peak season factors).
   (1.01 / 0.98) = 1.030612
2. FDOT Florida Traffic Online (2018)
3. Orange County Public Works 2018 Traffic Counts

Table 5-3
Recommended Design Traffic Characteristics

Roadway/Segment	Measured Characteristics			"K" Estimated[1]	FDOT 2018 FTI[2]			Orange County Counts[3]		
	"K"	"D"	"Tdaily"		"K"	"D"	"Tdaily"	"K"	"D"	"Tdaily"
Mainline Characteristics										
Woodbury Rd										
Challenger Py to Colonial Dr (SR 50)	8.79%	75.70%	1.12%	9.06%	--	--	--	9.30%	75.80%	--
SR 50 to Waterford Lakes Py	7.94%	50.30%	1.46%	8.18%	--	--	--	7.70%	52.50%	--
Waterford Lakes Py to Lake Underhill Rd	8.56%	53.07%	4.17%	8.82%	9.00%	53.20%	4.30%	8.40%	55.30%	--
Lake Underhill Rd to Woodbury Pines Cr	9.21%	59.63%	1.23%	9.49%	9.00%	53.20%	4.30%	9.20%	59.80%	--
Average	**8.63%**	**59.68%**	**2.00%**	**8.89%**	9.00%	53.20%	4.30%	8.65%	60.85%	--
Side Street Characteristics										
Colonial Dr (SR 50)										
West of Woodbury Rd	6.62%	54.75%	8.48%	6.82%	9.00%	53.20%	2.80%	7.10%	53.10%	--
East of Woodbury Rd	6.99%	51.65%	9.81%	7.20%	--	--	--	7.80%	63.00%	--
Waterford Lakes Py										
West of Woodbury Rd	8.84%	56.41%	3.04%	9.11%	--	--	--	8.80%	58.60%	--
Lake Underhill Rd										
West of Woodbury Rd	8.05%	60.87%	5.92%	8.30%	--	--	--	8.10%	63.50%	--
East of Woodbury Rd	8.61%	63.82%	4.19%	8.87%	--	--	--	8.30%	63.60%	--
Average	**7.82%**	**57.50%**	**6.29%**	**8.06%**	9.00%	53.20%	2.80%	8.02%	60.36%	--

Notes:

1. Estimated K Standard = Measured K * (median of the thirteen highest consecutive peak season factors / median of thirteen lowest consecutive peak season factors).
   (1.01 / 0.98) = 1.030612
2. FDOT Florida Traffic Online (2018)
3. Orange County Public Works 2018 Traffic Counts

5.1.3 Existing Geometry

Figure 5-3 provides the current 2020 intersection geometry for all the intersections to be evaluated in the study. The existing geometry is important, as this information is used in evaluating the need for potential geometric improvements to accommodate future travel demand. The year 2020 intersection geometry information was obtained and verified based on field visits and aerial photographs. The following intersections are evaluated as part of existing conditions analysis for this study:

- Woodbury Road at East Colonial Drive (S.R. 50) (Signalized)
- Woodbury Road at Woodbury Glen/Cove Drive (Unsignalized)
- Woodbury Road at Waterford Lakes Parkway (Signalized)
- Woodbury Road at Mallory Circle/Island bay Drive (Unsignalized)
- Woodbury Road at Lake Underhill Road (Signalized)

The intersection geometry information was collected during the traffic count data collection phase. The existing geometry plays a vital role in assessing the intersection level of service (LOS). Level of Service is a qualitative measure of how efficient a roadway or intersection operates. LOS A represents the highest traffic flow quality, while LOS E represents traffic flow at capacity. LOS F represents forced flow congested conditions. LOS B, C and D represent a gradual degradation in traffic flow quality before reaching capacity. The existing geometry will be considered as one of the factors in determining potential intersection improvements to accommodate the travel demand.

5.1.4 Existing Year Traffic Volumes

The adjusted 2019 AADT's for the individual roadway segments within the project study limits were provided in **Table 5-1** and shown in **Figure 5-4** which provides the existing AM and PM turning movement counts and LOS for each of the intersections counted.

5.1.5 Existing Condition Level of Service Analysis

Woodbury Road and intersecting roadways were evaluated to determine existing operating conditions during AM and PM peak hour periods.

The existing conditions intersection LOS analysis was performed using Synchro 10 software based on the Highway Capacity Manual, 6th Edition.

Roadway Segments

Table 5-4 also provides a list of the roadway parameters utilized in this analysis, taken from the Orange County Concurrency Management System. Included in this table are number of lanes, functional classification, adopted Level of Service (LOS) standard, roadway service volumes, AM and PM peak hour traffic volumes and existing LOS. Based upon this analysis, all Woodbury Road roadway segments currently operate at an unacceptable LOS F, except north of S.R. 50 which operates at LOS E, and south of Lake Underhill Road which operates at LOS D.

Figure 5-3
Existing Intersection Geometry

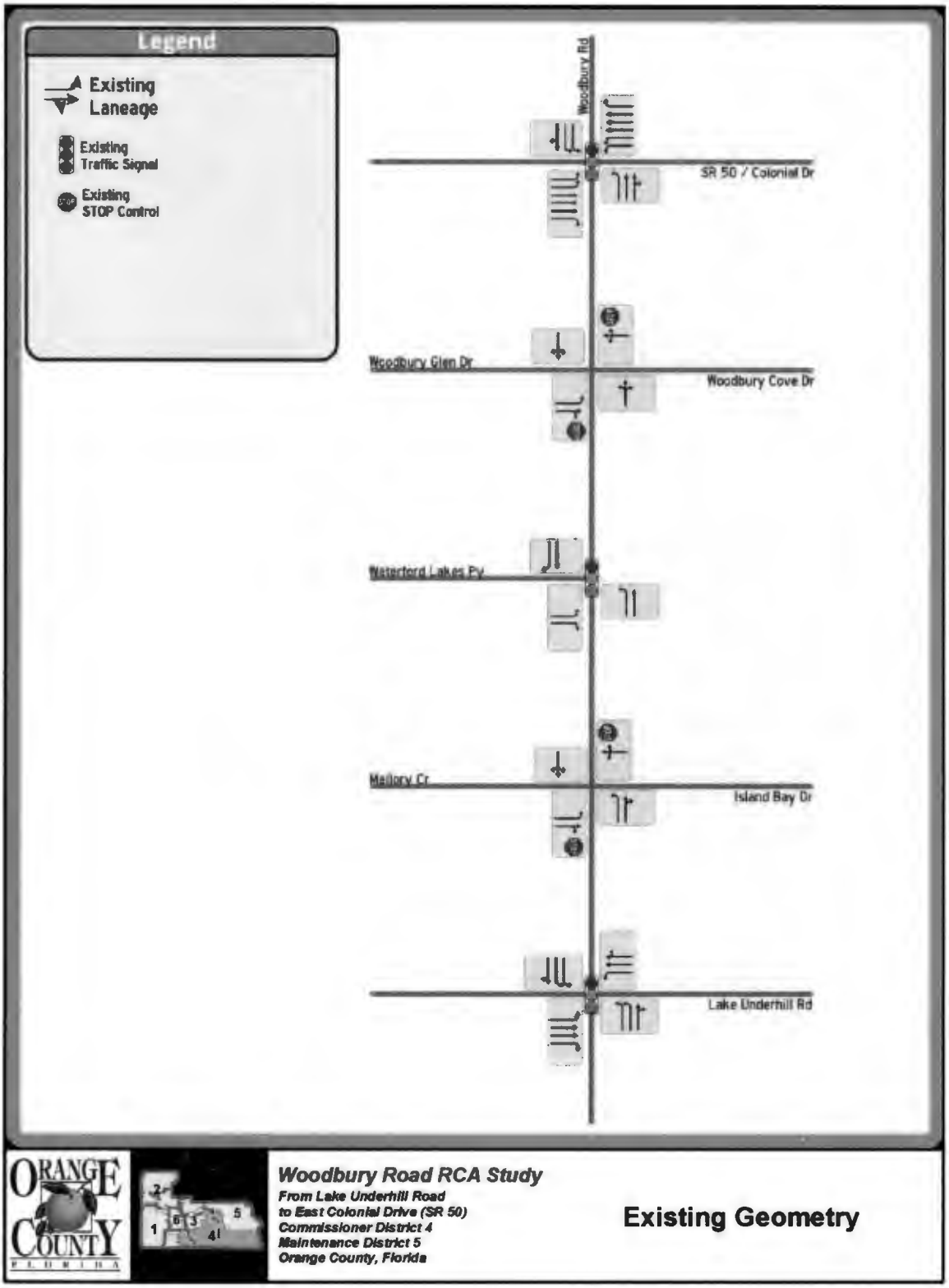


Figure 5-4
Existing AM & PM Peak Hour Turning Movement Volumes and LOS

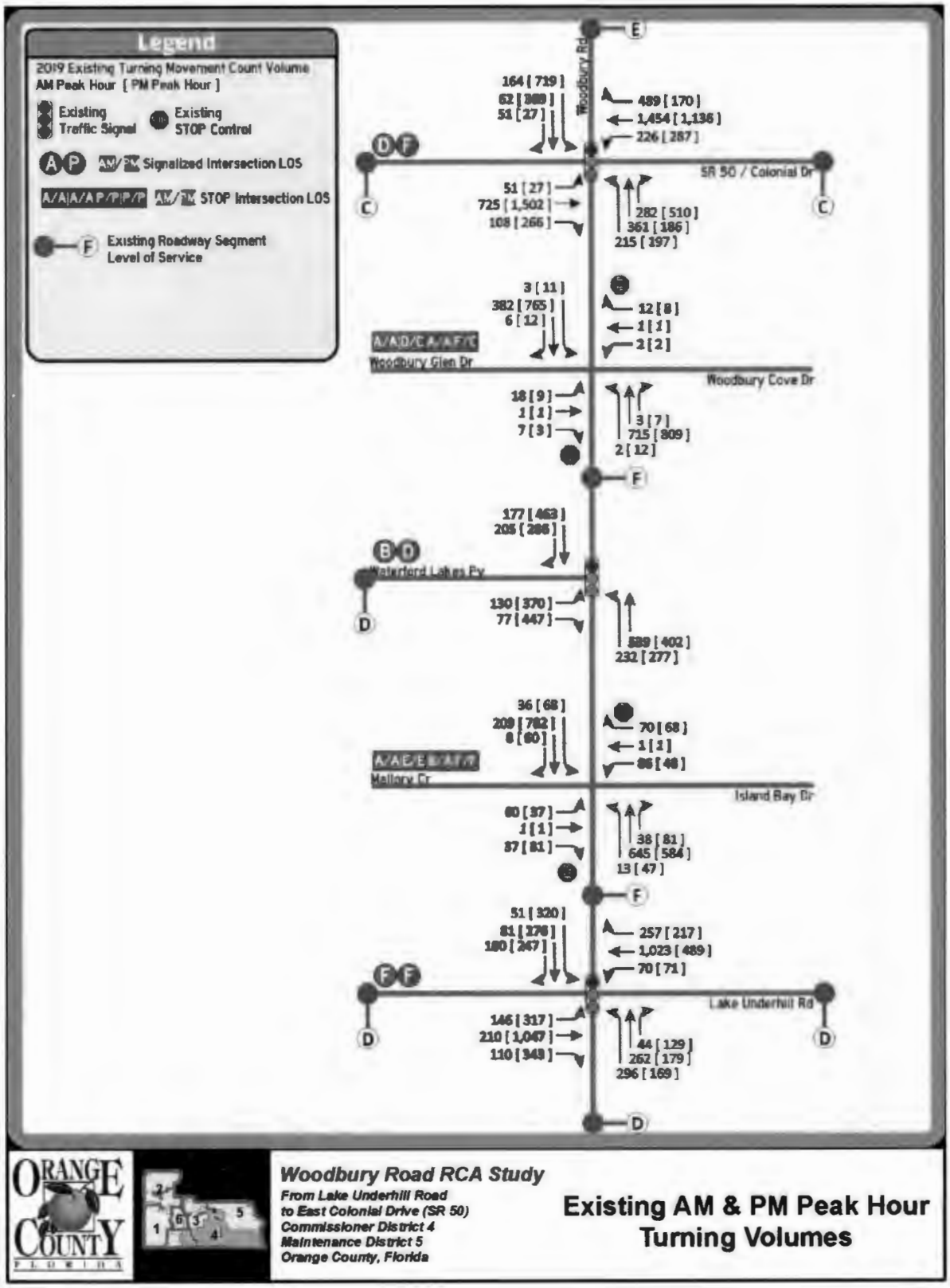


Table 5-4
Existing Roadway Level of Service

Roadway/Segment	Adopted Functional Class	LOS	# of Lanes	Roadway Service Volumes Peak Hour / Peak Direction Capacity Table (1)					AADT (2)	Peak Hour Traffic Volumes (2)		Peak Time (2)	LOS
Mainline Characteristics													
Woodbury Rd				**A**	**B**	**C**	**D**	**E**		NB	SB		
Challenger Py to Colonial Dr (SR 50)	Collector	E	2	0	0	370	750	800	14,800	561	771	4:30-5:30 PM	E
SR 50 to Waterford Lakes Py	Collector	E	2	0	0	370	750	800	21,000	796	1094	5:00-6:00 PM	F
Waterford Lakes Py to Lake Underhill Rd	Collector	E	2	0	0	830	880	880	18,800	712	980	5:30-6:30 PM	F
Lake Underhill Rd to Woodbury Pines Cr	Collector	E	2	0	0	370	750	800	11,900	451	620	5:15-6:15 PM	D
Side Street Characteristics													
Colonial Dr (SR 50)				**A**	**B**	**C**	**D**	**E**		EB	WB		
West of Woodbury Rd	Arterial	E	6	0	0	2,940	3,020	3,020	43,700	2278	1655	5:15-6:15 PM	C
East of Woodbury Rd	Arterial	E	6	0	0	2,940	3,020	3,020	59,400	3096	2250	5:00-6:00 PM	F
Waterford Lakes Py				**A**	**B**	**C**	**D**	**E**		EB	WB		
West of Woodbury Rd	Local	E	4	0	0	730	1,630	1,700	16,900	881	640	5:30-6:30 PM	D
Lake Underhill Rd				**A**	**B**	**C**	**D**	**E**		EB	WB		
West of Woodbury Rd	Collector	E	4	0	0	730	1,630	1,700	28,700	1496	1087	5:00-6:00 PM	D
East of Woodbury Rd	Collector	E	4	0	0	730	1,630	1,700	24,000	1251	909	5:00-6:00 PM	D

Notes:

1. From Orange County Traffic Concurrency Management Program

2. Daily and Peak Hour traffic volumes from Table 1

Intersections

The study intersections were analyzed under existing conditions using the procedures of the Highway Capacity Manual, 6th edition for signalized and unsignalized intersections. This analysis used existing traffic volumes and existing geometric conditions. **Table 5-5** includes the summary results for the AM and PM peak hour intersection delay and level of service. All but one of the existing study's intersections currently operate at unsatisfactory levels of service. The signalized intersection of Waterford Lakes Parkway currently operates with an LOS B condition for the minor street movement during the AM and LOS D during PM peak hours.

Table 5-5
Existing Intersection Delay and LOS for the Study Intersections

Study Intersections	Traffic Control	AM Peak Hour		PM Peak Hour	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Woodbury Drive					
SR 50 / Colonial Dr	Signal	52.7	D	128.7	F
Woodbury Glen Dr / Woodbury Cove Dr	STOP [1]	8.1 / 9.3 | 30.4 / 16.2	A / A | D / C	9.5 / 9.6 | 66.2 / 26.4	A / A | F / C
Waterford Lakes Py	Signal	10.3	B	40.6	D
Mallory Cr / Island Bay Dr	STOP [1]	7.7 / 9.3 | 43.2 / 44.6	A / A | E / E	10.0 / 9.4 | 243.3 / 224.5	B / A | F / F
Lake Underhill Rd	Signal	98.4	F	182.4	F

Notes:
(1) NB / SB Left Turn Major Street Movement | EB / WB Minor Street Movements

5.2 Future Analysis Scenarios

5.2.1 Design Period

Orange County estimates that the opening year target for the widening of Woodbury Road is 2027. Given this anticipated schedule, the following periods were used to provide design traffic forecasts for the Woodbury Road Roadway Conceptual Analysis study:

- Opening Year 2027
- Mid Design Year 2037
- Design Year 2047

5.2.2 Analysis Scenarios

Design traffic volumes were developed for two traffic conditions, No-Build and Build. The No- Build condition for Woodbury Road, between Lake Underhill Road and S.R. 50, assumes that the subject facilities will maintain existing lane geometry and intersection configurations. The Build condition includes Woodbury Road from Lake Underhill Road and S.R. 50 being widened to a four-lane roadway.

The build scenario of four-laning Woodbury Road between S.R. 50 and Lake Underhill Road (RCA Phase), is consistent with the programmed improvements identified in the FY 2020/2021 – 2024/2025 Orlando Urban Area Transportation Improvement Program (TIP) adopted by the Orlando Urban Area Metropolitan Planning Organization (MetroPlan Orlando) in June 2020. The Orange County CIP for the Fiscal Year 2019-2020 lists the Woodbury Road widening budget for $22,605,000 categorized as "Proposed Budget Future". The Orlando Urban Area Year 2040 Long Range Cost Feasible Plan does not include the widening of Woodbury Road between SR 50 and Lake Underhill Road. No additional major changes were made to the roadway network for the model.

5.3 Future Year Traffic Projections

5.3.1 Future Corridor Travel Demand

The development of traffic projections for Woodbury Road requires the examination of historical traffic growth, proposed development within the corridor vicinity, and a basic understanding of the traffic circulation patterns and characteristics of the corridor. In arriving at the volume forecasts for the Woodbury Road Corridor, various growth rates were examined. The following sections discuss the resulting growth rates from various methodologies and the recommended growth factor used in this analysis.

5.3.2 Trends Analysis

Traffic projections using historical growth patterns derived from annual traffic count reports form the basis of the Trends Analysis methodology. Trends analysis uses linear regression techniques relating traffic volumes with time. Statistical validity of trends-based analysis increases with increasing number of sample years, and increasing R2 value. R2 values of 70% or greater are recommended. It should be noted that future travel demand estimated from trends analysis is based solely on historical traffic, economic and development growth patterns. Similarly, the trend analysis method relies on historical traffic counts and does not consider traffic diversion to other roadways due to road capacity improvements within the surrounding roadway system.

The trends growth rate analysis was based on a calculation of historic growth rates from Orange County traffic count station 116, on Woodbury Road south of East Colonial Drive (S.R. 50). The historic traffic count showed a 6.2% annual growth rate from year 2012 to year 2016. This annual growth rate reflects development activities toward the end of the economic recession when development activity accelerated for areas within the Waterford Lakes area south of the Woodbury Road study limits. It was deemed that this growth rate would not be sustainable due to the following:

- The County expects that most of the remaining properties for development along Woodbury Road will be developed.
- Most of the remaining undeveloped properties along Woodbury Road will be developed over the next three years.
- The properties within the Woodbury Road corridor, within the study limits, is generally built-out or consists of conservation properties or wetlands.
- After the remaining developable properties are built-out, it is anticipated that the annual traffic growth rate will be significantly reduced.

The annual traffic growth rate from about year 2025 and beyond is expected to be approximately 2%/year.

FSUTMS Model

The most current Orlando Urban Area Transportation Study (OUATS) FSUTMS model was used in forecasting future traffic for the Woodbury Road corridor. This model has a base year 2009 validation and a long-range forecasting application for the year 2040. This model was used to forecast volumes for two scenarios, Build and No-Build conditions. The Build condition reflects the widening of Woodbury Road from S.R. 50 to Lake Underhill Road. The No-Build condition represents maintaining existing roadway geometry (two lanes) along Woodbury Road from S.R. 50 to Lake Underhill Road.

In order to simulate the Woodbury Road as a two-lane (no-build scenario) and four-lane (build scenario) roadway between S.R. 50 and Lake Underhill Road, the following network changes were made to the OUATS highway networks and socio-economic data. These changes were based on the programmed improvements listed in the most current Transportation Improvement Program (TIP) prepared by MetroPlan Orlando, field visits, aerial photos, and the planned improvements listed in the Year 2040 Long Range Plan. The following network and socio-economic ("SE") data changes that were made include:

- Construction of the programmed Richard Crotty Parkway (2037 & 2047)
- Construction of the proposed Colonial Parkway expressway with ten (10) lanes (2037 & 2047)
- Interpolation and Extrapolation of base OUATS ("SE") data to the analysis years
- Adjusted SE data to Bureau of Economic and Business Research (BEBR) medium population projections by County by analysis year
- Inclusion of the land use data for the future develop plans for The Grow and Sustany programs

Based on the revised network, under the Build scenario (4 lanes), year 2037 traffic volumes along Woodbury Road between S.R. 50 and Lake Underhill Road are projected to be approximately 31,700 vehicles per day. Similarly, based on the revised network, under the build scenario (4 lanes), year 2047 traffic volumes along Woodbury Road between S.R. 50 and Lake Underhill Road are approximately 32,000 vehicles per day. Using the model and comparing to the 2009 base year validation, an average annual growth rate to year 2035 of 2.15% was observed, while 2045 showed an annual growth rate of 1.58%.

Bureau of Economic and Business Research (BEBR)

County-wide population growth rates from BEBR were also reviewed to develop potential growth rates. This forecasted data is developed by the University of Florida, and - Bureau of Economic and Business Research (University of Florida). The BEBR Population growth county-wide was determined to be approximately 2.31% growth per year to 2025, 19.96% through year 2035, and 1.72% per year through year 2045.

Traffic Forecasts Utilized for Analysis

The growth rates obtained from the above three sources, combined with the consideration of short-range and long-range development along and surrounding the study corridor, were reviewed to derive the recommended growth rate for the study area. The travel forecast model and BEBR projections support an annual growth rate of between 1.6% and 2.5% within the Woodbury Road corridor. As part of the February 20, 2020 meeting with County staff, direction was provided for the design traffic growth rates that will be applied for the RCA study. This direction is provided below:

Build Alternative

Based on LTEC's assessment of the growth rates for the Build Alternative from the different sources and input from County staff, it was determined that an annual growth rate of 2.6% should be applied to the existing volumes to project the future traffic volumes for all future analysis years (2027, 2037, 2047).

- Existing year to Opening Year 2027 rate: 2.6% per year traffic growth
- Existing year to Year 2037: 2.6% per year traffic growth
- Existing year to Year 2047 rate: 2.6% per year traffic growth

This method results in application of a linear growth rate from Existing Year (2019) to the Design Year 2047 of 2.6% growth per year.

No Build Alternative

LTEC's recommendation for the No Build Alternative growth rates from the different sources and input from County staff, was determined to be:

- Existing year to Opening Year 2027 rate: 2.6% per year traffic growth
- Opening Year 2027 to Year 2037 and to year 2047 rate: 1.25% per year traffic growth

5.3.3 Mainline Traffic Volume Projections

Figure 5-5 and **Figure 5-6** show the future year Annual Average Daily Traffic (AADT) traffic projections for the opening year 2027, mid-design year 2037, and design year 2047 along Woodbury Road and the side streets for the No-Build and Build Scenarios, respectively. Information regarding the methodology used to develop future traffic projections are contained within the DTTM.

5.3.4 Intersection Turning Movement Volume Projections

Figure 5-7, Figure 5-8 and **Figure 5-9** show the intersection turning movement volumes projections for the opening year 2027, mid-design year 2037, and design year 2047 for the No-Build scenario along the Woodbury Road study corridor. **Figure 5-10, Figure 5-11** and **Figure 5-12** show the intersection turning movement volumes projected for the opening year 2027, mid-design year 2037, and design year 2047 for the Build scenario along the Woodbury Road study corridor. Information regarding the methodology used to develop future traffic projections is contained within the DTTM.

Figure 5-5
No Build AADT Volumes

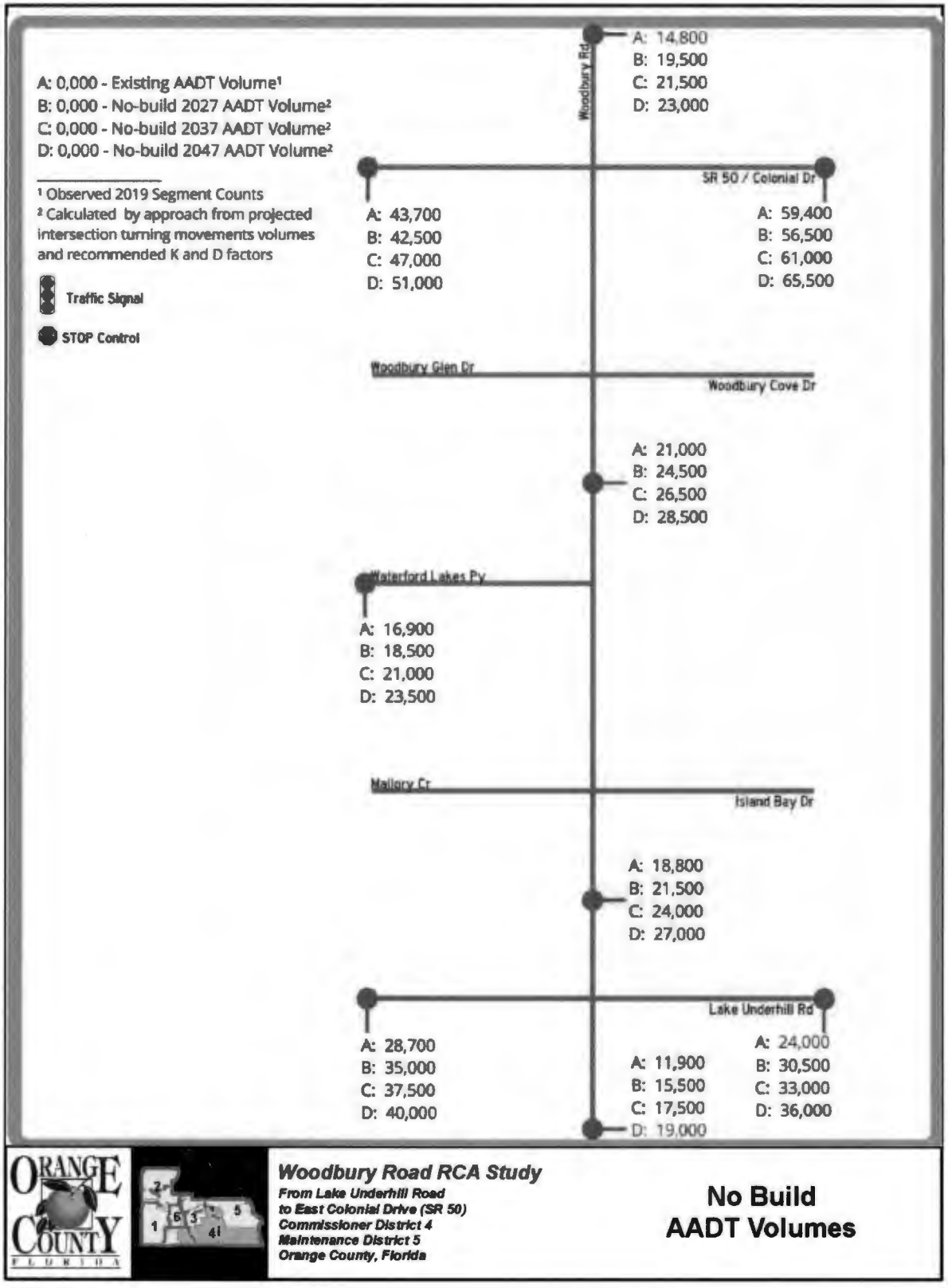


Figure 5-6
Build AADT Volumes

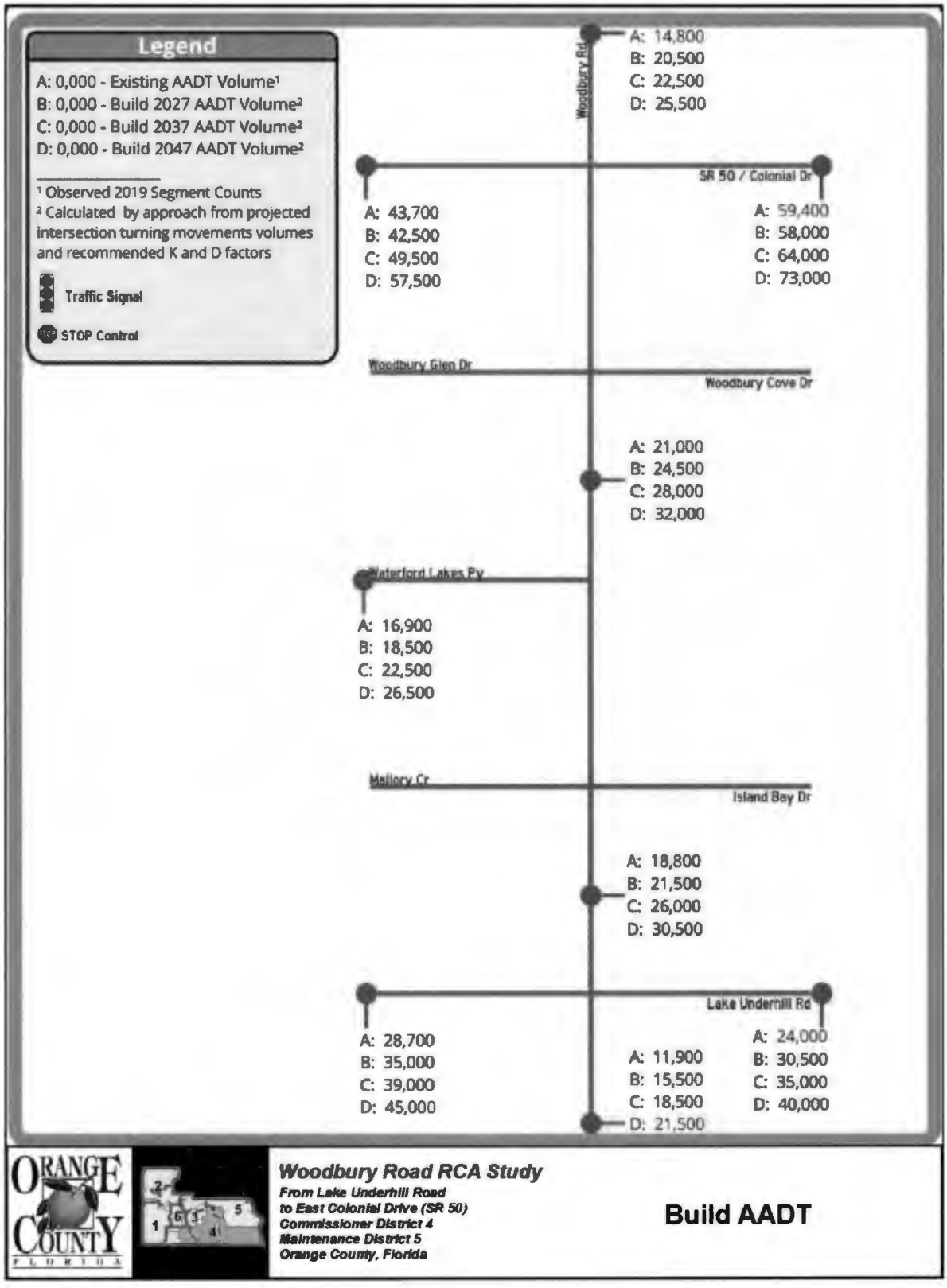


Figure 5-7
No-Build Year 2027 Peak Hour Turning Movement Volumes

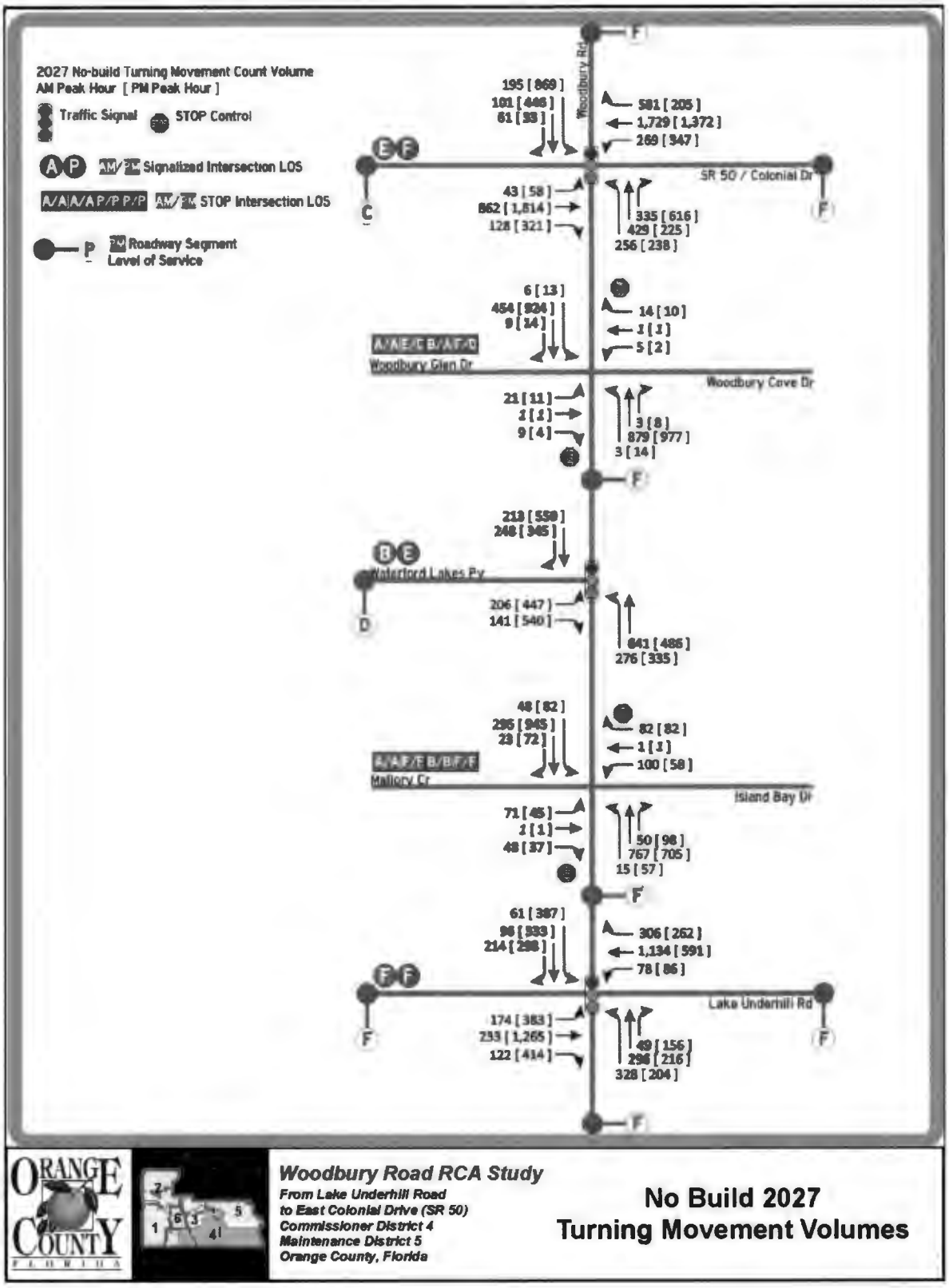


Figure 5-8
No-Build Year 2037 Peak Hour Turning Movement Volumes

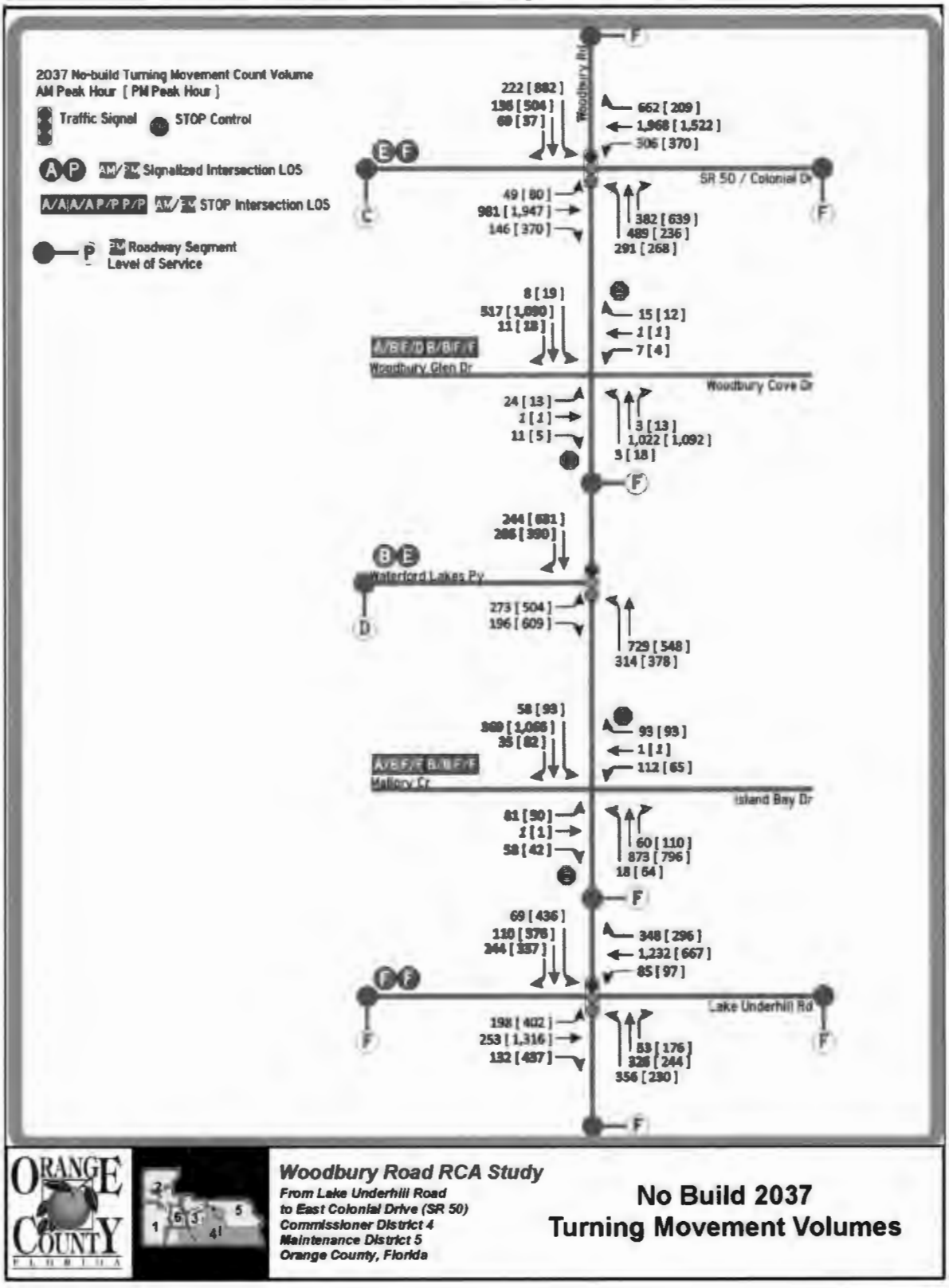


Figure 5-9
No-Build Year 2047 Peak Hour Turning Movement Volumes

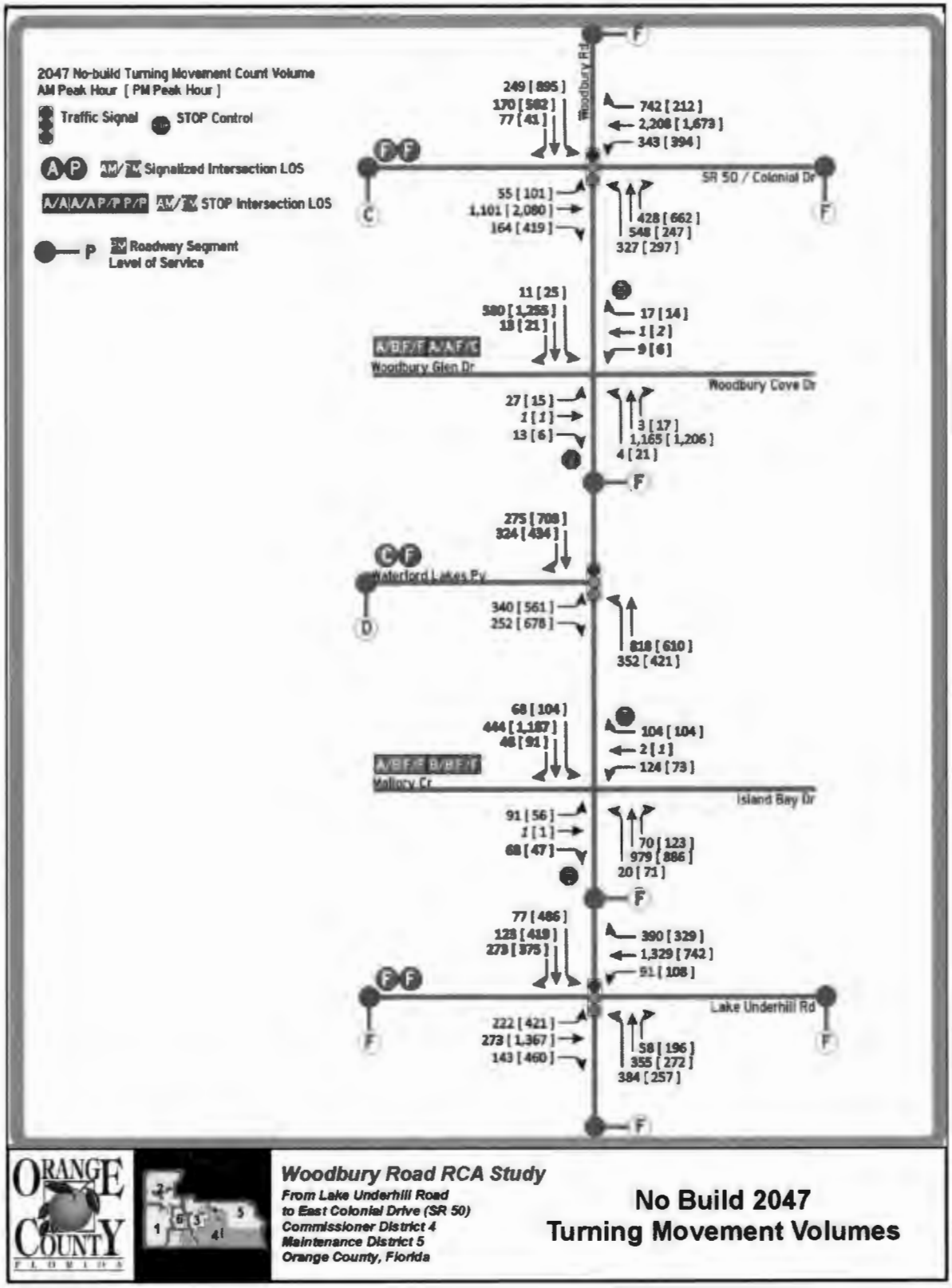


Figure 5-10
Build Year 2027 Peak Hour Turning Movement Volumes

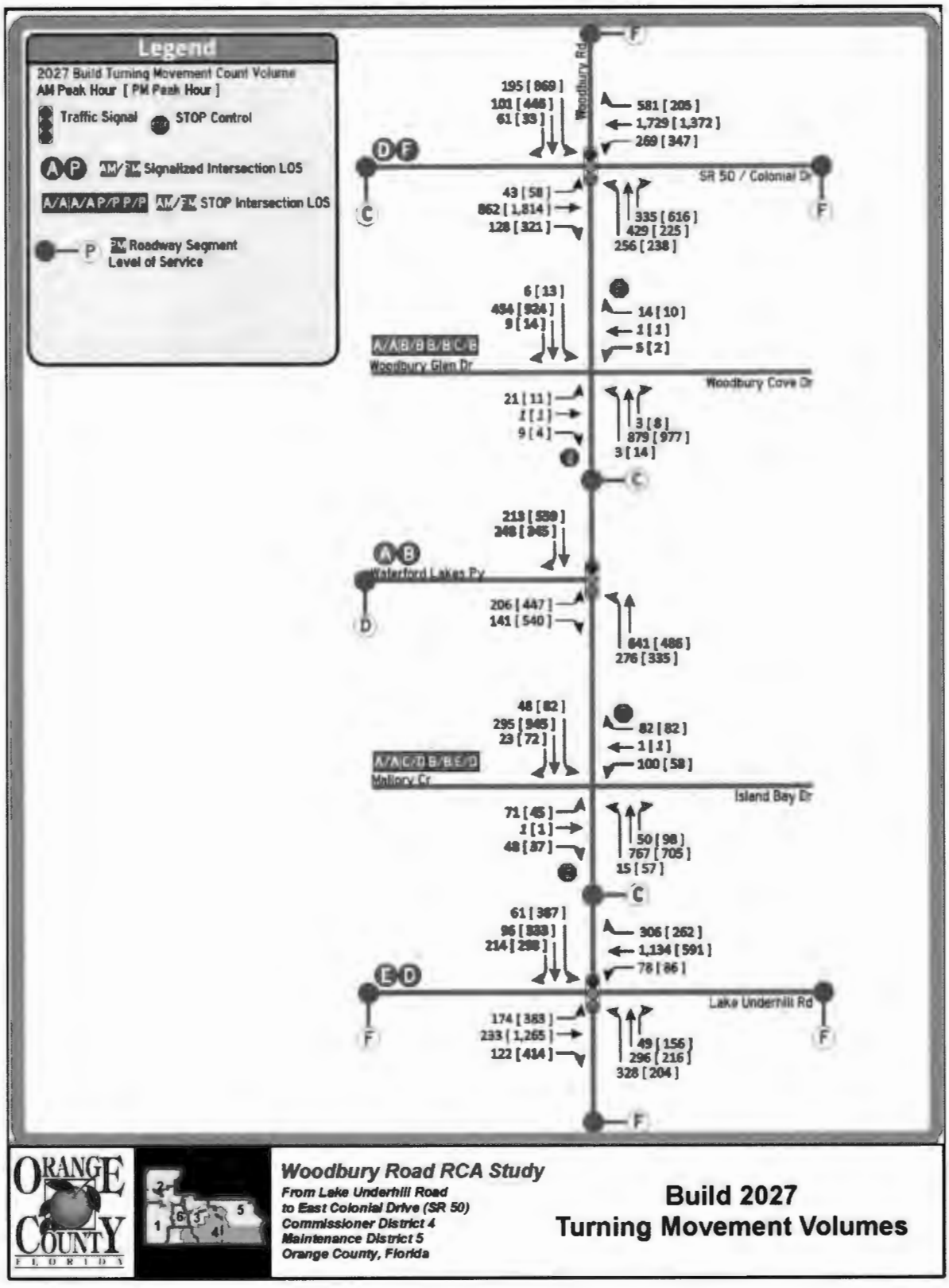


Figure 5-11
Build Year 2037 Peak Hour Turning Movement Volumes

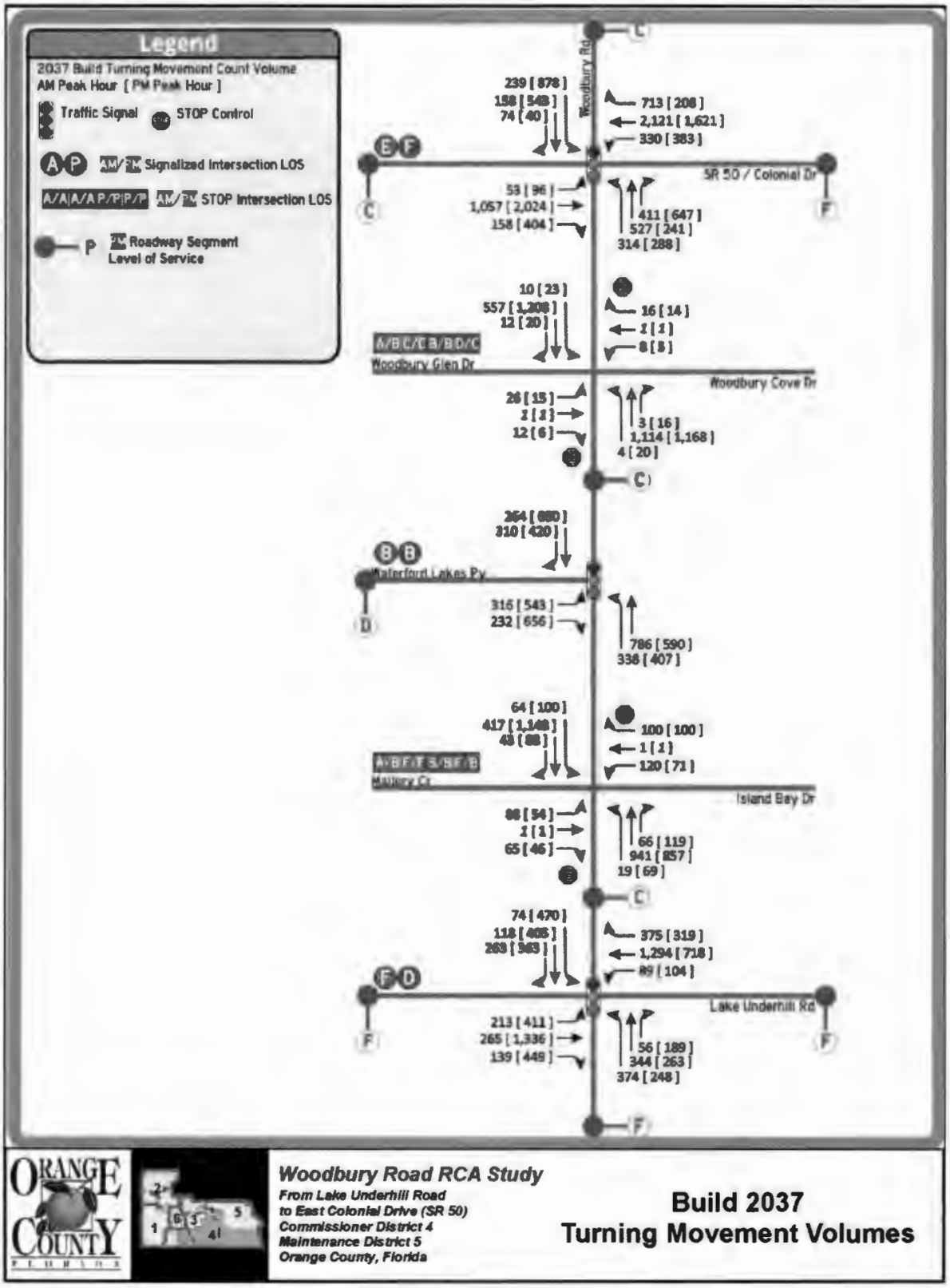
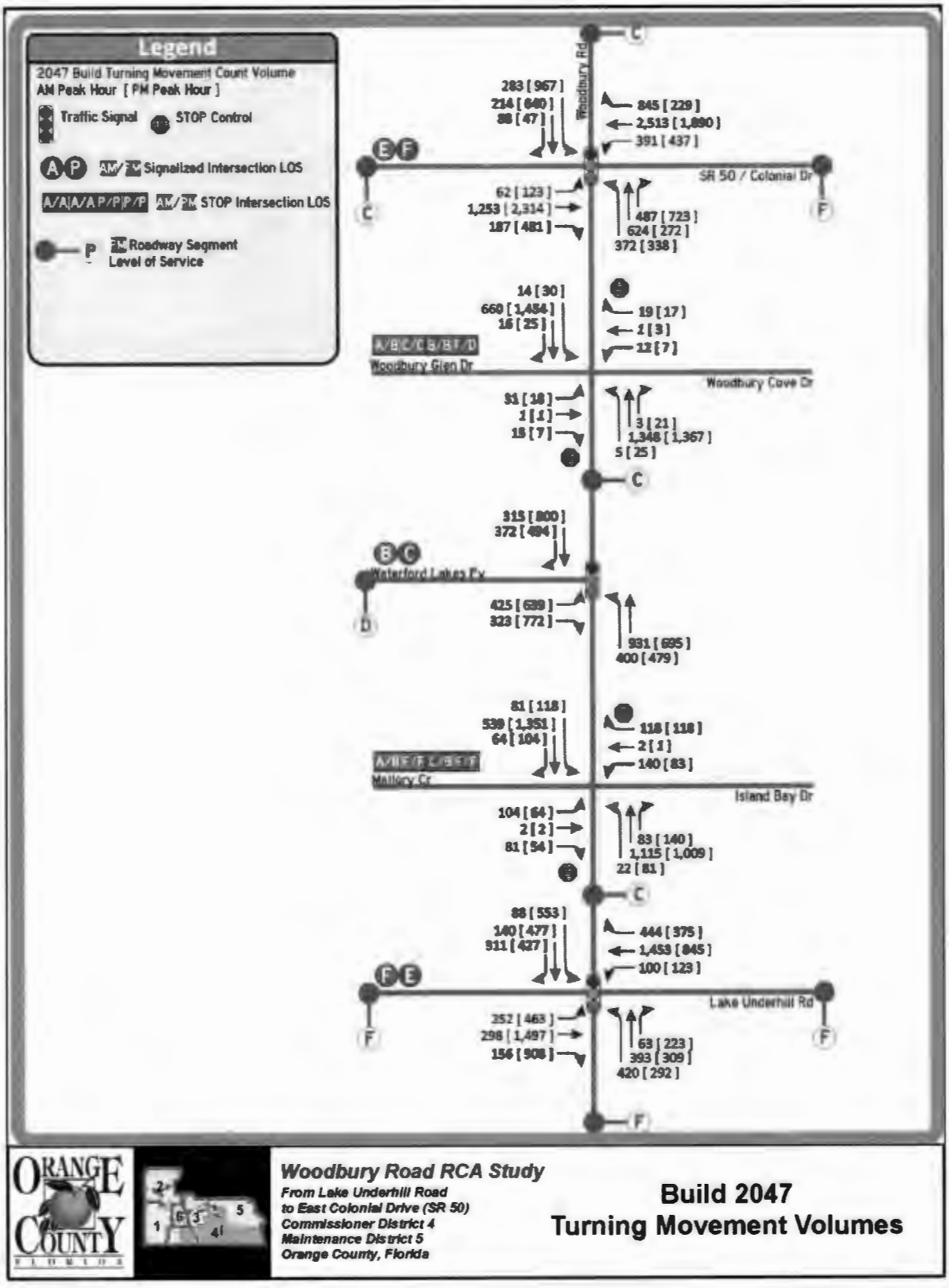


Figure 5-12
Build Year 2047 Peak Hour Turning Movement Volumes



5.4 Future Year Levels of Service

5.4.1 Future Signal Requirements

Under the No-Build and Build scenarios, the unsignalized intersections along Woodbury Road were evaluated for future signal requirements. The need for future signal requirements at these unsignalized locations was assessed using signal warrants #1, #2, #3 and #7 as specified in the latest MUTCD. The future intersection volumes at the unsignalized intersections were estimated using the same hourly percentages from the existing turning movement counts grown using the projected 2045 design hour volumes for the minor streets and the approved annual growth rates for Woodbury Road as adjusted based upon engineering judgement, to obtain the No-build and Build eight highest hourly volumes. The minor street approaches all have auxiliary turn lanes or the approach is wide enough (18/19 feet wide and vehicles were observed to treat the approach as having a de facto left turn lane), so the minor street was evaluated as a single lane approach using the left turn volumes compared to the threshold volumes as well as a two-lane approach. In addition, the major street left turn volumes were also evaluated under a single-lane approach compared to the threshold volumes. Warrant 2 and Warrant 3 are included for informational purposes only, a signal would only be assumed to be warranted if Warrant 1 minimum volumes or Warrant 7 minimum volumes and accidents were met.

This procedure was initially performed using the design year 2047 volumes, because if a signal was not warrant based on the 2047 volumes, it would not be warranted in 2027 or 2037. However, if a signal was warranted in 2047, it was then checked to see if a signal would be warranted at mid-design year 2037 and opening year 2027.

The future No-Build and Build Scenario signal warrant summary is provided in **Table 5-6**. As shown in the table, Warrant 2 and Warrant 3 are met for the Woodbury Road and Mallory Circle/Island Bay Drive intersection for design year 2047. This intersection was then checked to see if these warrants were met in mid-design year 2037. Neither warrant was met using the year 2037 analysis traffic volumes. The summary of the future signal warrant worksheets for the design year 2047 (and 2027 and 2037 where appropriate) are provided in **Appendix H** of the DTTM.

5.4.2 Operational Analysis and Level of Service

Mainline Level of Service (LOS) analysis was performed for the No-Build and Build scenarios. All conditions were analyzed using the most current adopted procedures as outlined in the Transportation Research Board's -Highway Capacity Manual (HCM), 6th Edition report procedures utilizing the Synchro Software (version 10). Specific analysis techniques utilized in this study include unsignalized intersections, signalized intersections and arterial analyses. It should be noted that detailed mainline operational LOS analysis was conducted using the Synchro software which is included in the Final Design Traffic Technical Memorandum.

Because the projected turning movement traffic volumes for the Woodbury Road and Mallory Circle/Island Bay Drive intersection are conservatively high (the subdivisions are built-out), a traffic signal is not recommendation at this time. However, the need for a traffic signal in the future should be monitored.

Table 5-6
Signal Warrant Summary

No-Build - Two-Lane Woodbury Road

Study Intersections	Meets Warrant 1A	Meets Warrant 1B	Meets Warrant 2	Meets Warrant 3	Meets Warrant 4	Meets Warrant 7
Mallory Circle/Island Bay Drive	No	No	Yes	Yes	No	No
Woodbury Glen Drive/Cove Drive	No	No	No	No	No	No

Build - Four-Lane Woodbury Road

Study Intersections	Meets Warrant 1A	Meets Warrant 1B	Meets Warrant 2	Meets Warrant 3	Meets Warrant 4	Meets Warrant 7
Mallory Circle/Island Bay Drive	No	No	Yes	Yes	No	No
Woodbury Glen Drive/Cove Drive	No	No	No	No	No	No

Notes:

(1) Roadway posted speed 40 mph, therefore minimum volumes are 100% of the minimum vehicular volumes standard.

Warrant 1A - Eight-Hour Minimum Vehicular Volume, Warrant 1B - Eight-Hour Interruption of Continuous Traffic.

Warrant 2 - Four Hour Vehicular Volume (Plotted Point)

Warrant 3 - Peak Hour Vehicular Volume (Plotted Point). Note, no delay study performed, only volumes evaluated.

Warrant 4 - Peak Hour Pedestrian/Bikes Volume Crossing Main Road

Warrant 7 - Crash Experience - 80% of Warrant 1 Minimum Threshold Volumes and 5 accidents.

Signal Warrant Analysis - Warrant 1 Minimum Vehicular Volumes

Number of Lanes for Moving Traffic on Each Approach		Vehicles Per Hour on Major Street (Total of Both Approaches)								Vehicles Per Hour on Minor Street (One Direction Only)							
		Warrant 1A				Warrant 1B				Warrant 1A				Warrant 1B			
Major St	Minor St	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1 Lane	1 Lane	500	400	350	280	750	600	525	420	150	120	105	84	75	60	53	42
2+ Lanes	1 Lane	600	480	420	336	900	720	630	504	150	120	105	84	75	60	53	42
1 Lane	2+ Lanes	500	400	350	280	750	600	525	420	200	160	140	112	100	80	70	56
2+ Lanes	2+ Lanes	600	480	420	336	900	720	630	504	200	160	140	112	100	80	70	56

(a) Basic minimum hourly volume threshold.

(b) Used for combination of Conditions 1A and 1B after adequate trial of other measures.

(c) May be used when the posted speed limit or 85th percentile speed of the major street exceeds 40 mph. Also in isolated community with population <10,000.

(d) May be used for combination of Conditions 1A and 1B after adequate trial of other measures when the posted speed limit or 85th percentile speed of the major street exceeds 40 mph.

5.4.3 No-Build Scenario

The No-Build geometry and traffic control for Woodbury Road from S.R. 50 to Lake Underhill Road as shown in **Figure 5-13** maintains the same capacity of through-lanes and auxiliary turn lanes as the existing roadway and intersection geometries. **Figure 5-5** presents the No-Build AADT for the study roadway segments. AADT volumes for the four locations that did not have existing counts were estimated based on a review of the existing PM peak hour intersection turning movements and adjacent roadway segments existing K factors.

Table 5-7 includes the opening year, mid-design year, and design year LOS results for the No-Build scenario along the Woodbury Road project corridor.

Opening Year 2027

As shown in **Table 5-7**, the signalized intersections are projected to operate at LOS E or worse during the PM peak hour. The unsignalized intersections are projected to operate at LOS F for the minor street movements.

Under the AM peak hour analysis, the Lake Underhill Road signalized intersection will operate at LOS F, while the remaining signalized intersections will operate at LOS E or better. The unsignalized intersections are projected to operate at LOS E or worse for the minor street movements.

Mid-Design Year 2037

As shown in **Table 5-7**, all three of the signalized intersections are projected to operate at LOS F during the PM peak hour. The unsignalized intersections are projected to operate at LOS F for the minor street movements.

Under the AM peak hour analysis, the Lake Underhill Road signalized intersection will operate at LOS F, while the remaining signalized intersections will operate at LOS E or better. The unsignalized intersections are projected to operate at LOS F for the minor street movements.

Design Year 2047

As shown in **Table 5-7**, all of the signalized intersections are projected to operate at LOS F during the PM peak hour. The unsignalized intersections are projected to operate at LOS F for the minor street movements.

Under the AM peak hour analysis, the S.R. 50 and Lake Underhill Road signalized intersections will operate at LOS F, while the remaining signalized intersection will operate at LOS C. The unsignalized intersections are projected to operate at LOS F for the minor street movements.

Figure 5-13
No-Build Geometry

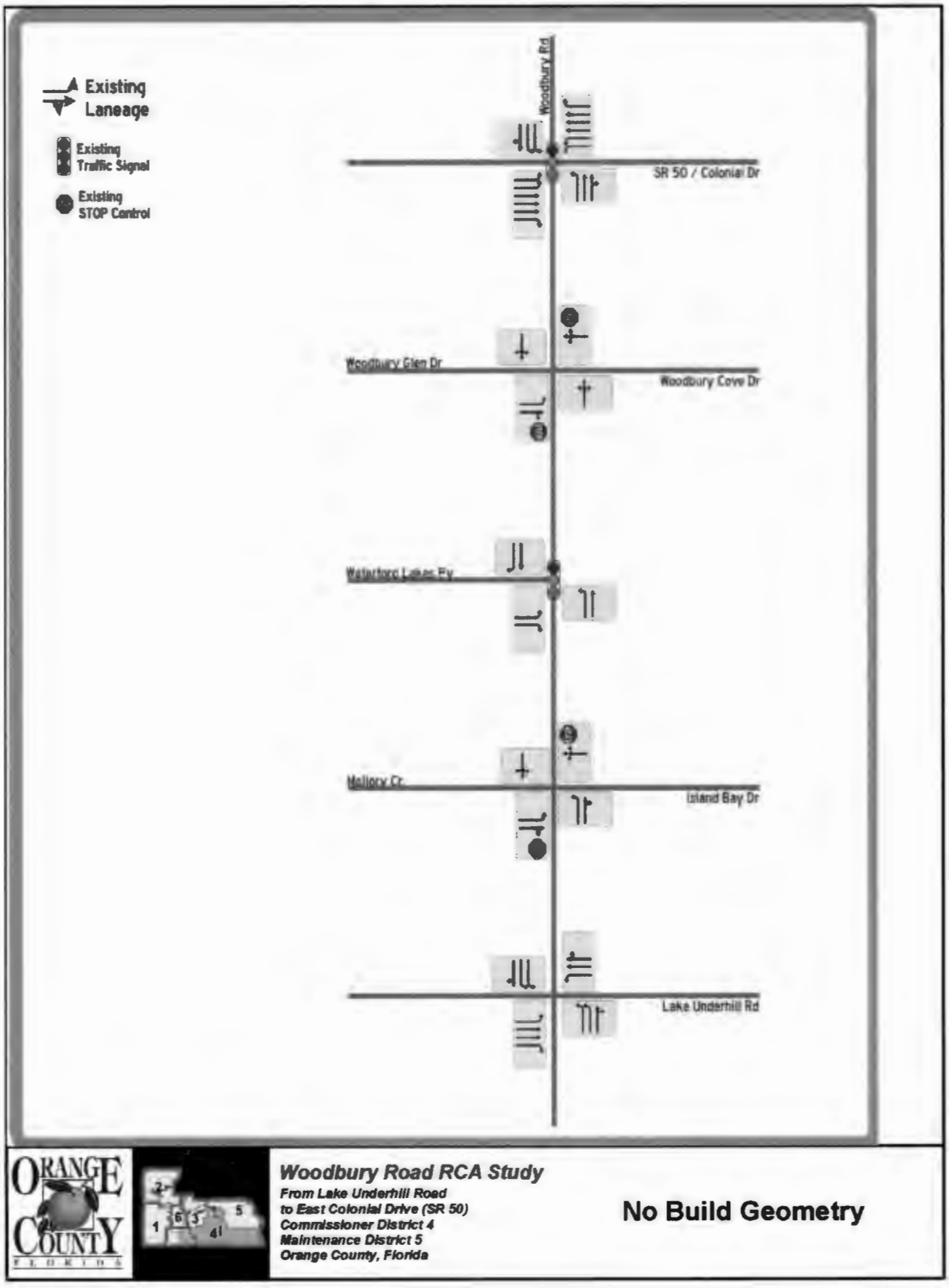


Table 5-7
Future No-build Intersection Delay and LOS

Study Intersections	Future Traffic Control	No-build AM Peak Hour - Existing 2-Lane Woodbury Road Cross Section					
		Opening Year 2027		Mid Year 2037		Design Year 2047	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Woodbury Drive							
SR 50 / Colonial Dr	Signal	61.2	E	71.9	E	96.5	F
Woodbury Glen Dr / Woodbury Cove Dr	STOP [1]	8.4 / 10.0 | 48.8 / 23.9	A / A | E / C	8.6 / 10.7 | 57.2 / 28.7	A / B | F / D	8.8 / 11.6 | 169.4 / 57.0	A / B | F / F
Waterford Lakes Py	Signal	13.6	B	17.3	B	23.3	C
Mallory Cr / Island Bay Dr	STOP [1]	8.0 / 9.9 | 133.7 / 182.3	A / A | F / F	8.2 / 10.6 | 462.3 / 525.6	A / B | F / F	8.5 / 11.5 | 1278.2 / 1157.2	A / B | F / F
Lake Underhill Rd	Signal	124.6	F	162.7	F	212.7	F

Study Intersections	Future Traffic Control	No-build PM Peak Hour - Existing 2-Lane Woodbury Road Cross Section					
		Opening Year 2027		Mid Year 2037		Design Year 2047	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Woodbury Drive							
SR 50 / Colonial Dr	Signal	167.6	F	186.3	F	211.2	F
Woodbury Glen Dr / Woodbury Cove Dr	STOP [1]	11.1 / 9.7 | 157.4 / 33.2	B / A | F / D	11.6 / 10.7 | 384.7 / 86.6	B /B | F / F	12.2 / 11.9 | 1153 / 297.3	A / A | F / C
Waterford Lakes Py	Signal	75.5	E	114.3	F	161.1	F
Mallory Cr / Island Bay Dr	STOP [1]	11.1 / 10.1 | 1100 / 1081	B / B | F / F	12.0 / 10.8 | 2655 / 2726	B / B | F / F	13.2 / 11.6 | 7935 / 1249	B / B | F / F
Lake Underhill Rd	Signal	224.1	F	250.1	F	280.1	F

Notes:
(1) NB / SB Left Turn Major Street Movement | EB / WB Minor Street Movements

5.4.4 Build Scenario

The proposed Build geometry and traffic control for Woodbury Road from S.R. 50 to Lake Underhill Road as shown in **Figure 5-14** includes an additional through lane for the major street through- movements and turn lanes as required. Based on the programmed and planned improvements, Woodbury Road, between S.R. 50 and Lake Underhill Road will be widened to four lanes by the opening year 2027. **Figure 5-6** presents the Build AADT for the study roadway segments.

Opening Year 2027

As shown in **Table 5-8**, the signalized intersections are projected to operate at LOS D or better during the PM peak hour, except the intersection of S.R. 50 which is projected to operate at LOS F. The unsignalized intersections are projected to operate at LOS E or better for the minor street movements.

Under the AM peak hour analysis, the signalized intersections are projected to operate at LOS E or better. The unsignalized intersections are projected to operate at LOS D or better for the minor street movements.

Mid-design Year 2037

As shown in **Table 5-8**, the signalized intersections are projected to operate at LOS D or better during the PM peak hour, except the intersection of S.R. 50 which is projected to operate at LOS F. The unsignalized intersection of Mallory Circle / Island Bay Drive is projected to operate at LOS F or better for the minor street movements, while the intersection of Woodbury Glen Drive / Woodbury Cove Drive will operate at LOS D or better for the minor street movements.

Under the AM peak hour analysis, the signalized intersections are projected to operate at LOS E or better, except for the intersection of Lake Underhill Road which is projected to operate at LOS F. The unsignalized intersection of Mallory Circle / Island Bay Drive is projected to operate at LOS F or better for the minor street movements, while the intersection of Woodbury Glen Drive / Woodbury Cove Drive will operate at LOS C or better for the minor street movements.

Design Year 2047

As shown in **Table 5-8**, the signalized intersections are projected to operate at LOS E or better during the PM peak hour, except the intersection of S.R. 50 which is projected to operate at LOS F. The unsignalized intersections are projected to continue to operate at LOS F for the minor street movements.

Under the AM peak hour analysis, the signalized intersections are projected to operate at LOS E or better, except for the intersection of Lake Underhill Road which is projected to operate at LOS F. The unsignalized intersection of Mallory Circle / Island Bay Drive is projected to operate at LOS F for the minor street movements, while the intersection of Woodbury Glen Drive / Woodbury Cove Drive will operate at LOS C or better for the minor street movements.

Figure 5-14
Build Geometry

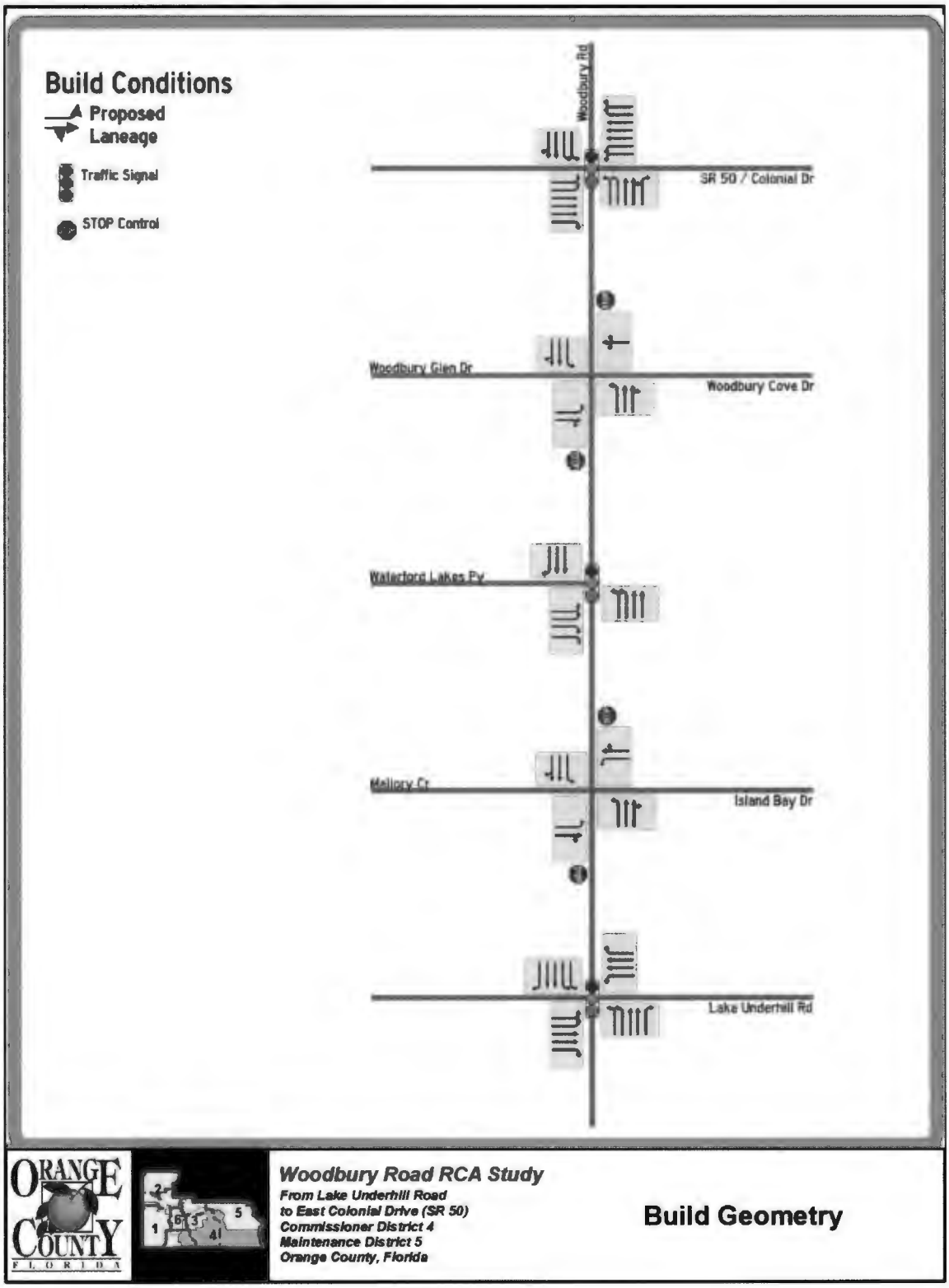


Table 5-8
Build Intersection Delay and LOS for the Study Intersections

Study Intersections	Future Traffic Control	Build AM Peak Hour - Proposed 4-Lane Woodbury Road Cross Section					
		Opening Year 2027		Mid Year 2037		Design Year 2047	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Woodbury Drive							
SR 50 / Colonial Dr	Signal	51.0	D	56.8	E	56.7	E
Woodbury Glen Dr / Woodbury Cove Dr	STOP [1]	8.3 / 9.9 | 14.6 / 13.8	A / A | B / B	8.7 / 11.2 | 17.3 / 17.9	A / B | C / C	9.1 / 12.7 | 21.0 / 24.4	A / B | C / C
Waterford Lakes Py	Signal	9.9	A	11.9	B	13.8	B
Mallory Cr / Island Bay Dr	STOP [1]	8.0 / 10.0 | 17.5 /25.3	A / A | C / D	8.2 / 10.6 | 462.3 / 525.6	A / B | F / F	8.9 / 12.8 | 52.5 / 119.5	A / B | F / F
Lake Underhill Rd	Signal	74.7	E	81.5	F	91.8	F

Study Intersections	Future Traffic Control	Build PM Peak Hour - Proposed 4-Lane Woodbury Road Cross Section					
		Opening Year 2027		Mid Year 2037		Design Year 2047	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Woodbury Drive							
SR 50 / Colonial Dr	Signal	96.0	F	100.8	F	135.5	F
Woodbury Glen Dr / Woodbury Cove Dr	STOP [1]	10.2 / 10.5 | 22.3 / 14.1	B / B |C / B	11.3 / 11.2 | 28.2 / 17.5	B /B | D / C	14.0 / 13.3 | 53.4 / 27.7	B / B | F / D
Waterford Lakes Py	Signal	17.0	B	18.2	B	22.4	C
Mallory Cr / Island Bay Dr	STOP [1]	11.1 / 10.1 | 39.4 / 32.7	B / B | E / D	12.1 / 10.8 | 59.6 / 47.7	B / B | F / B	15.4 / 13.0 | 307 / 275.1	C / B | F / F
Lake Underhill Rd	Signal	47.6	D	50.1	D	58.6	E

Notes:

(1) NB / SB Left Turn Major Street Movement | EB / WB Minor Street Movements

5.5 Recommended Improvements

Based on the evaluation of operating conditions for the design year 2047 Build scenario, this study provides the following recommendations to improve the traffic flow along Woodbury Road from SR 50 to Lake Underhill Road:

- Widen Woodbury Road from S.R. 50 to Lake Underhill Road to provide a four-lane facility
- Include the intersection geometries along Woodbury Road as shown in the proposed build geometry in **Figure 5-14**

In addition to the above improvements, this study used Synchro SimTraffic to develop the queue length requirements at the signalized intersections along the study corridor. In case of the unsignalized intersections, calculated queue lengths were based on the 95th percentile queue lengths from the Synchro analysis using HCM methods. Actual design and implementation of these storage length requirements will be a function of design and the physical practicality of their construction. Further information on the intersection storage requirements can be found in DTTM.

6 ALTERNATIVES ANALYSIS

The objective of the alternatives analysis process is to identify technically and environmentally sound alternatives to provide a safe transportation facility that meets the purpose and need of the project, is acceptable to the community, minimizes impacts on the environment, and is cost effective. The process results in the selection of a Preferred Alternative, which can be advanced to the design phase. This section summarizes the alternatives considered for this project.

6.1 Opportunities and Constraints

Several opportunities and constraints should be taken into consideration in developing the improvement alternatives. These are discussed below.

6.1.1 Right-of-Way Constraints

The existing right-of-way for Woodbury Road varies from 92 to 268 feet. Alternative 1 can be constructed within existing right-of-way, which varies from 92 feet to 268 feet, including the bridge section with an overall bridge width of 86 feet. Alternative 2 requires additional right-of-way on the east side, varying from 0 feet to 10.5 feet. The Alternative 2 bridge can be constructed within existing right-of-way, with an overall width of 91 feet. Alternative 3 requires the most additional right-of-way on the east side, varying from 0 feet to 14.5 feet. The Alternative 3 bridge can be constructed within existing right-of-way, with an overall width of 95 feet. Transportation Systems Management and Operations alternatives were also considered and incorporated into the build alternatives.

6.1.2 Development

The Orange County interactive GIS system shows several developments in the project area. Gardens at Waterford Lakes, located at 707 Woodbury Road at the intersection of Woodbury Road and Lake Underhill Road, is proposed to be a medium to high density residential development. This development is a 1.8-acre area that is planned to be used for 63 age-restricted multi-family dwelling units.

There is another planned development located at 12400 E. Colonial Drive, at the intersection at Woodbury Road and S.R. 50. This development is not named yet and will include 256 multi-family dwelling units on 10.1 acres. The land use is identified as medium to high density residential.

6.1.3 Pedestrian Accommodations

Waterford Elementary School and Discovery Middle School are located at the intersection of Lake Underhill Road and Woodbury Road, and many children in the surrounding neighborhoods walk to these schools. Currently the intersection has signalized crosswalks across all four legs. Both sides of Lake Underhill Road and Woodbury Road have sidewalks at this intersection. There are crosswalks located across Woodbury Road at Lake Underhill Road, Sophiamarie Loop, Waterford Lakes Parkway, Waterford Wood Circle, and S.R. 50. The crosswalk at Lake Underhill Road, near the schools, is 1,360 feet south of the next crosswalk at Sophiamarie Loop. The first alternative includes a 10-foot multi-use path along the east side of Woodbury Road and the 6-foot sidewalk that exists along the west side of Woodbury Road. The second alternative includes 6-foot sidewalks along both sides of Woodbury Road with 7-foot bicycle lanes on the outer lanes of Woodbury Road in each direction. The third alternative includes a 10-foot multi-use path along the east side of Woodbury

Road and the 6-foot sidewalk that exists along the west side of Woodbury Road with 7-foot bicycle lanes on the outer lanes of Woodbury Road in each direction.

6.1.4 Mid-Block Crossing

An uncontrolled pedestrian crosswalk is currently located across the south leg of the intersection of Woodbury Road with Sophiamarie Loop. Until just recently it was signed as a school crossing, but since sidewalk was constructed on the east side of Woodbury Road, students no longer need to cross Woodbury Road at this location. An analysis was conducted to determine whether this crosswalk should be included in the Woodbury Road widening project since the shopping center remains as a pedestrian attractor.

Due to changes in typical traffic patterns during COVID-19 additional pedestrian crossing counts were not collected at this time. Walk, bike, and transit trips were estimated using ITE Trip Generation, 10th Edition, land use code 820 (retail) for the 40,971 square feet of gross leasable area in the shopping center. Four hours of data were available, with Saturday during the peak hour of the shopping center generating thirty-three (33) walk-bike-transit trips. To estimate how many of the 33 trips would cross Woodbury Road, a comparison was made of the percentage of residences on the west side of the road (those that would cross) to the total residences within a ¼ mile walking distance of the Sophiamarie Loop intersection. It was assumed that 47 percent of the walk-bike-transit trips would cross Woodbury Road. It was also assumed that twenty-five percent (25%) of those crossing are children, older adults, or pedestrians with physical disabilities which are counted twice toward volume thresholds. This results in an estimated volume of 20 crossings in a single hour, which meets the Orange County and FDOT Traffic Engineering Manual criteria of 20 or more pedestrians during a single hour, justifying the crosswalk. It is recommended that a crosswalk warrant study be conducted based on actual pedestrian counts during the design phase to confirm whether the crosswalk should be included in the project design.

If warranted based on actual counts, it is recommended that the crosswalk be relocated mid-block, north of the Sophiamarie Loop intersection, so that pedestrians cross through the proposed median between the northbound left turn lane into Vizcaya at Waterford and the southbound left turn lane into the shopping center. It is also recommended that due to the speed and projected traffic volumes on Woodbury Road the crosswalk be controlled by a pedestrian hybrid beacon (PHB) or HAWK signal. This PHB could be coordinated with the adjacent signals at Lake Underhill Road and Waterford Lakes Parkway.

6.2 Alternatives Analysis

Three alternatives were evaluated to determine if they can meet the purpose and needs of this project. These alternatives include the following:

- No-Build Alternative
- Transportation Systems Management and Operations (TSMO)
- Build Alternatives
  - Build Alternative 1 – Two 11-foot travel lanes in each direction separated by a 15.5 foot median, a 10-foot shared-use path on the east side of the road and a 6-foot sidewalk along the west side of the road
  - Build Alternative 2 – Two 11-foot travel lanes in each direction separated by a 15.5-foot median, a 6-foot sidewalk on both sides of the road and 7-foot on-road bike lane in both directions

- Build Alternative 3 – Two 11-foot travel lanes in each direction separated by a 15.5-foot median, 10-foot shared-use path on the east side, a 6-foot sidewalk on the west side, and a 7-foot on-road bike lane in both directions

These alternatives are described below.

6.2.1 No-Build Alternative

The No-Build Alternative assumes that no modifications or improvements will be implemented for the mainline of Woodbury Road within the limits of the study. The primary advantages of the No-Build Alternative are that it does not directly require any capital or expenditure of funds and it produces no physical or social impacts.

Certain advantages would be associated with the implementation of the No-Build Alternative:

- No acquisition of right-of-way
- No design, right-of-way, or construction costs
- No inconvenience to the traveling public and property owners during construction
- No impacts to utilities
- No impacts to the adjacent natural, physical, and human environment
- No additional noise impacts

The potential disadvantages of the No-Build Alternative include:

- Not consistent with the Orange County Comprehensive Plan, the Orange County 10-Year Work Program (2018-2027), and the MetroPlan Orlando FY 2019/20-2023/24 Orlando Urban Area Transportation Improvement Program
- Does not improve multimodal mobility
- Results in reduced LOS and increased traffic congestion
- Motor vehicle crashes, property damage, injuries, and fatalities may increase due to increased congestion
- Emergency vehicle access is degraded
- User costs are increased due to congestion

6.2.2 Transportation Systems Management and Operations (TSM&O)

TSM&O alternatives involve improvements designed to maximize the utilization and efficiency of the existing facility through improved system and demand management. The various TSMO options generally include traffic signal and intersection improvements, access management, and transit improvements. The additional capacity required to meet the projected traffic volumes along Woodbury Road in the design year cannot be provided solely through the implementation of TSMO improvements. TSMO improvements have been incorporated into the build alternatives.

6.2.3 Build Alternatives

In conducting the alternatives analysis, typical section and alignment alternatives were first identified to meet the identified capacity needs. These alternatives were developed with consideration of future traffic needs,

input from the public, input from local governments, and standard engineering practice, including compliance with requirements of the Americans with Disabilities Act (ADA).

6.2.3.1 Roadway Typical Sections

Typical section alternatives were developed for the three alternatives. The basic elements of the typical section include the full reconstruction of Woodbury Road and consist of two 11-foot travel lanes in each direction separated by a 15.5-foot raised median. Type E curb and gutter is used along the inside lanes, and Type F curb and gutter is used along the outside lanes. The typical section alternatives include different combinations of 6-foot-wide sidewalks, a 10-foot shared-use path, and 7-foot on-road buffered bike lanes. The typical right-of-way widths vary depending on the alignment alternative and the width of the existing right-of-way. **Figure 6-1, Figure 6-2**, and **Figure 6-3** depict the roadway typical sections for the Alternative 1, 2, and 3 alignments, respectively.

Figure 6-1
Proposed Typical Section – Alternative 1

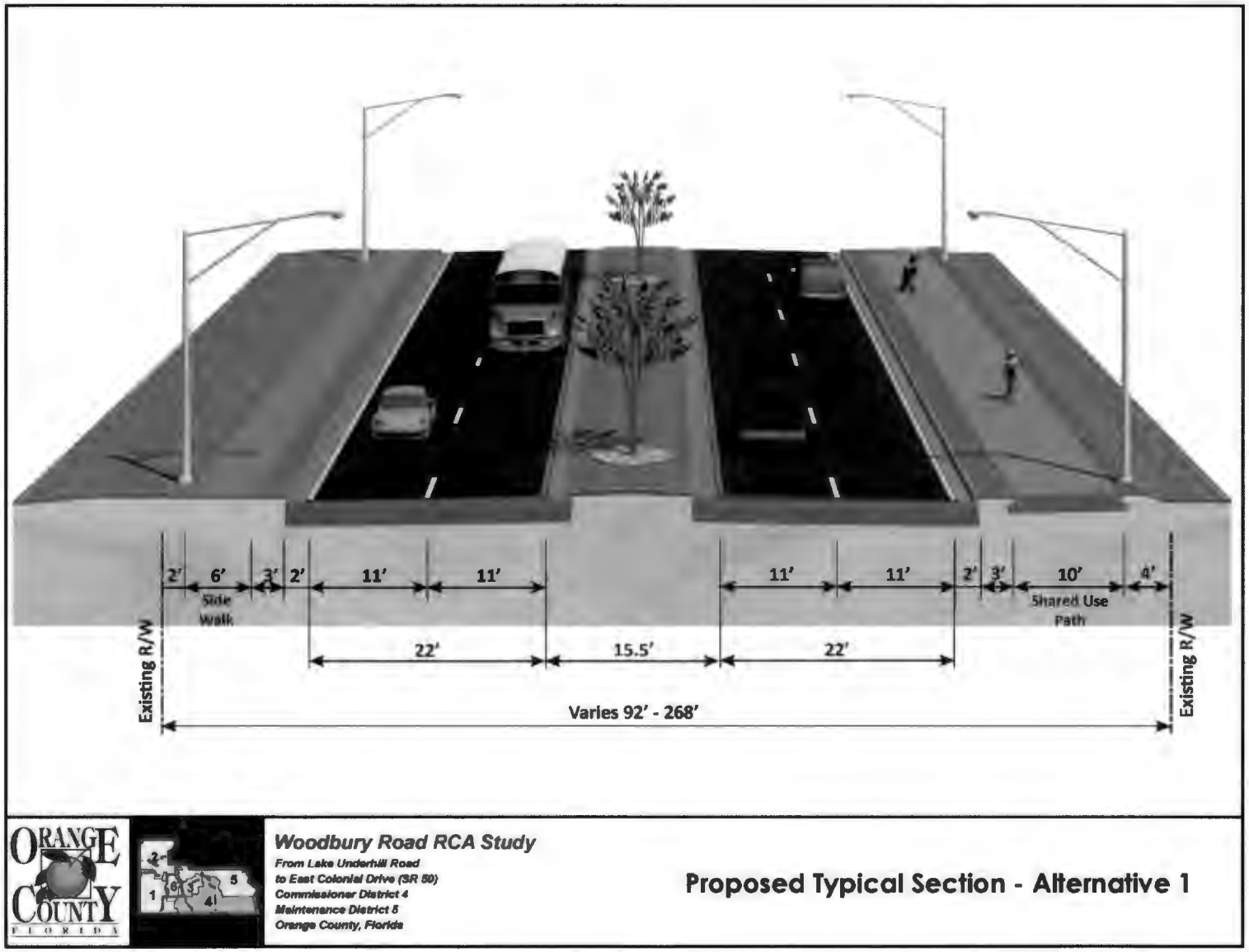


Figure 6-2
Proposed Typical Section – Alternative 2

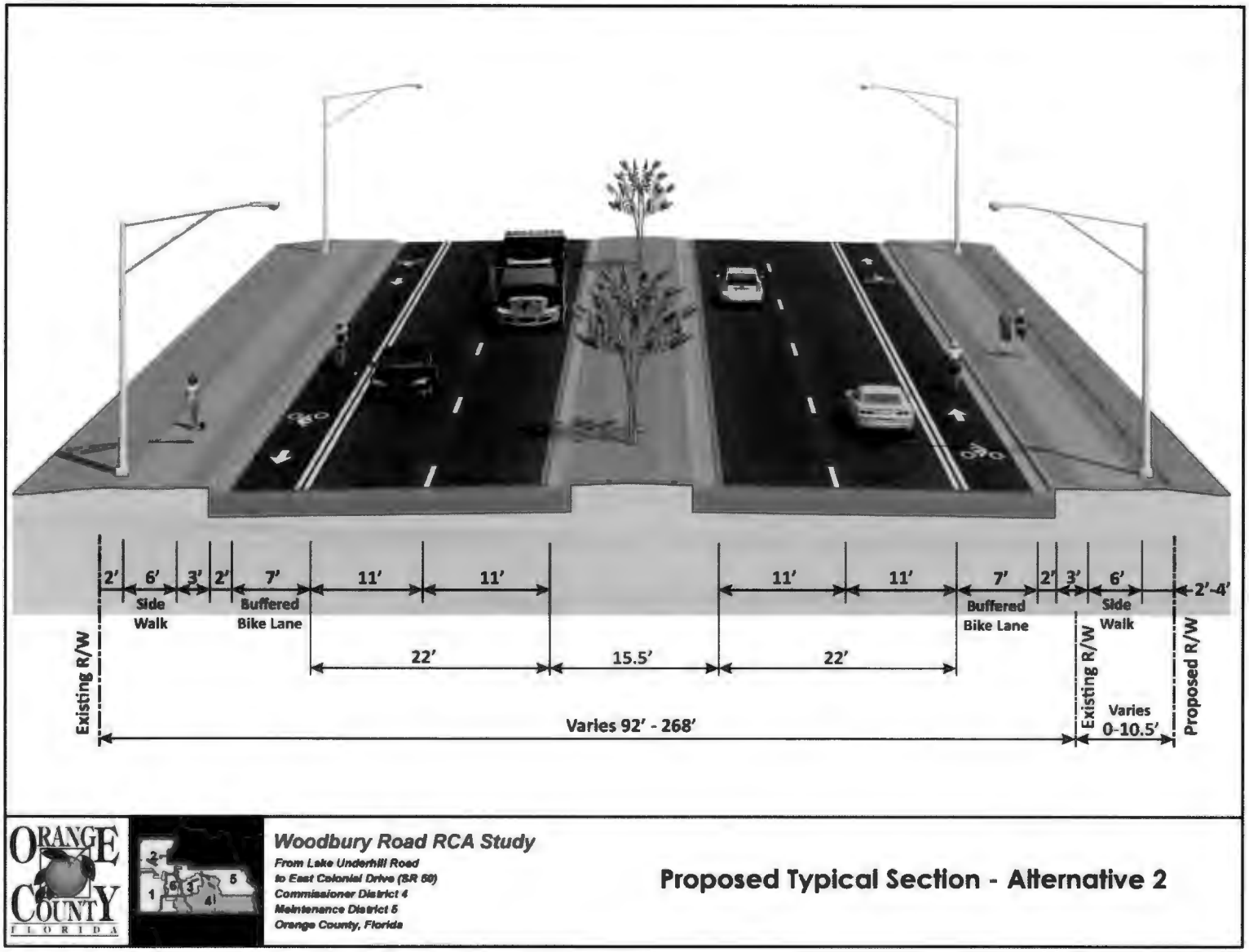
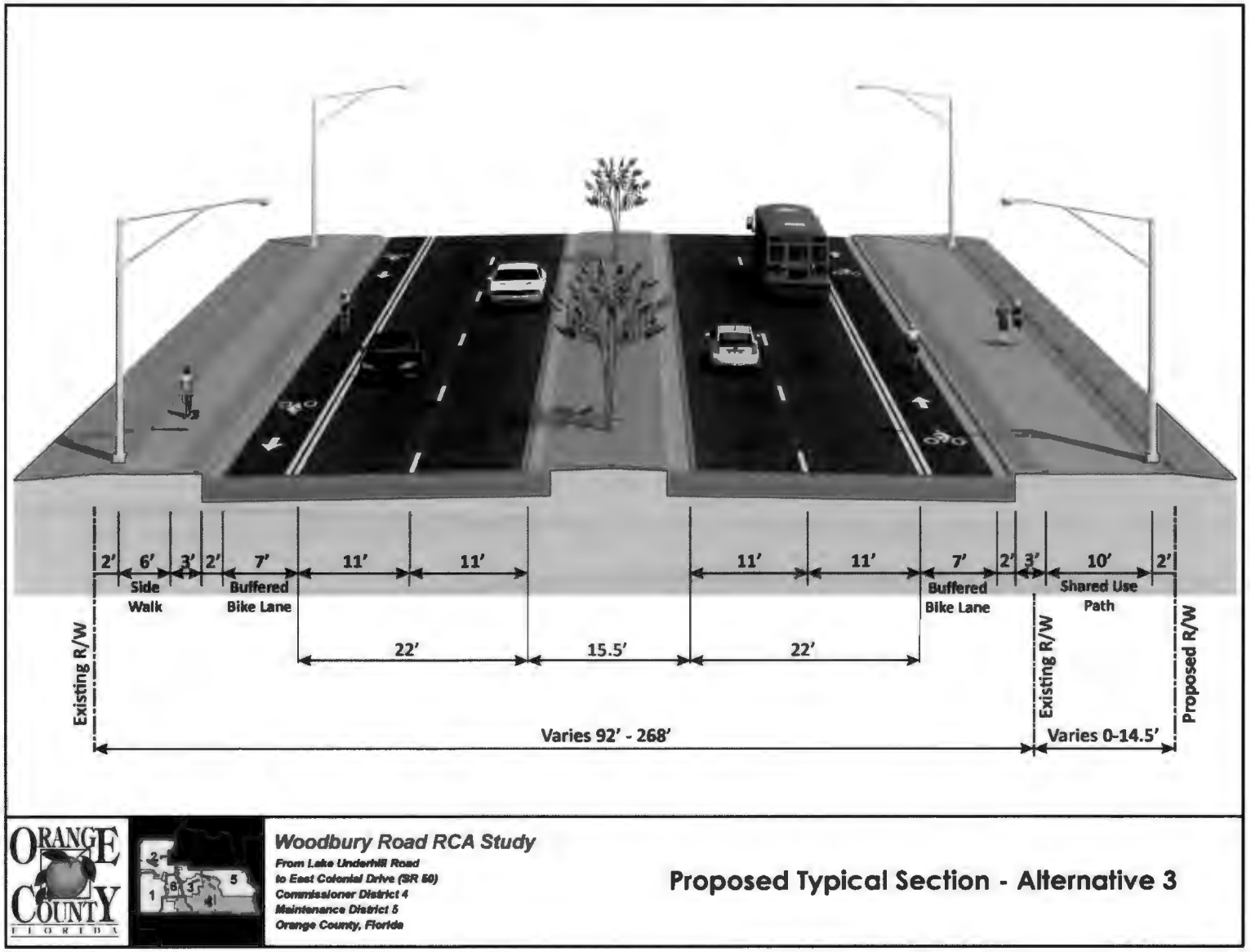


Figure 6-3
Proposed Typical Section – Alternative 3



6.2.3.2 Bridge Typical Sections

There are three alternative typical sections for the bridge over S.R. 408 as well. All three bridge typical sections include a twelve-foot six-inch traffic separator in the median, maintain the existing bridge structure on the west side of the roadway, and widen the bridge structure to the east side. All three maintain the existing seven-foot four-inch sidewalk on the west side of the bridge. The bridge typical section for Alternative 1 continues the ten-foot shared-use path over the bridge on the east side, separated by a traffic railing. The bridge typical section for Alternative 2 continues the seven-foot buffered bike lanes and the six-foot sidewalk over the bridge on the east side of the roadway, separated by a traffic railing. The bridge typical section for Alternative 3 continues the seven-foot buffered bike lanes and the ten-foot shared-use path over the bridge on the east side of the roadway, separated by a traffic railing. **Figure 6-4, Figure 6-5** and **Figure 6-6** depict the bridge typical sections for the Alternative 1, 2, and 3 alignments.

6.2.3.3 Alignment Alternatives

Alternative 1 can be constructed within existing right-of-way, which varies from 92 feet to 268 feet, including the bridge section with an overall bridge width of 86 feet. Alternative 2 requires additional right-of-way on the east side, varying from 0 feet to 10.5 feet. The Alternative 2 bridge can be constructed within existing right-of-way, with an overall width of 91 feet. Alternative 3 requires the most additional right-of-way on the east side, varying from 0 feet to 14.5 feet. The Alternative 3 bridge can be constructed within existing right-of-way, with an overall width of 95 feet. Transportation Systems Management and Operations alternatives were also considered and incorporated into the build alternatives.

6.3 Evaluation of Build Alternatives

Each of the three Build Alternatives were evaluated based on impacts to the social, natural, and physical environment; and costs. The evaluation is summarized in a matrix evaluation as shown in **Table 6-1**.

6.4 Preferred Alternative

The Preferred Alternative is Alternative 1 which includes two 11-foot travel lanes in each direction separated by a 15.5-foot median, a 6-foot sidewalk along the west side, and a 10-foot shared-use path along the east side. Type E curb and gutter will be provided along the inside lanes and Type F curb and gutter will be provided along the outside lanes. The proposed improvements can be constructed within the existing right-of-way except near the Lake Underhill Road and S.R. 50 intersections.

This is the preferred alternative due to minimizing right-of-way impacts, social impacts as measured by relocations, and project costs.

Figure 6-4
Proposed Bridge Typical Section – Alternative 1

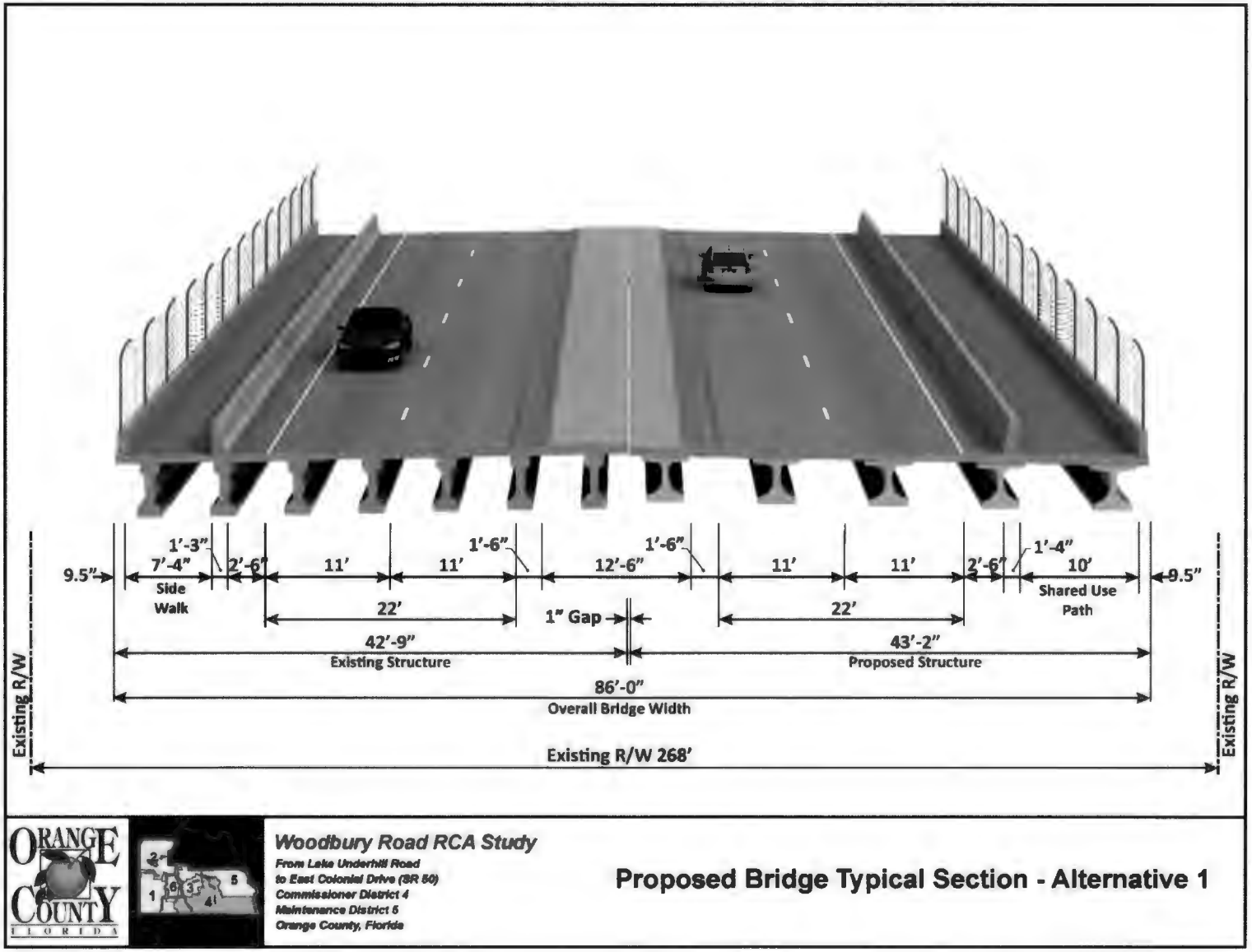


Figure 6-5
Proposed Bridge Typical Section – Alternative 2

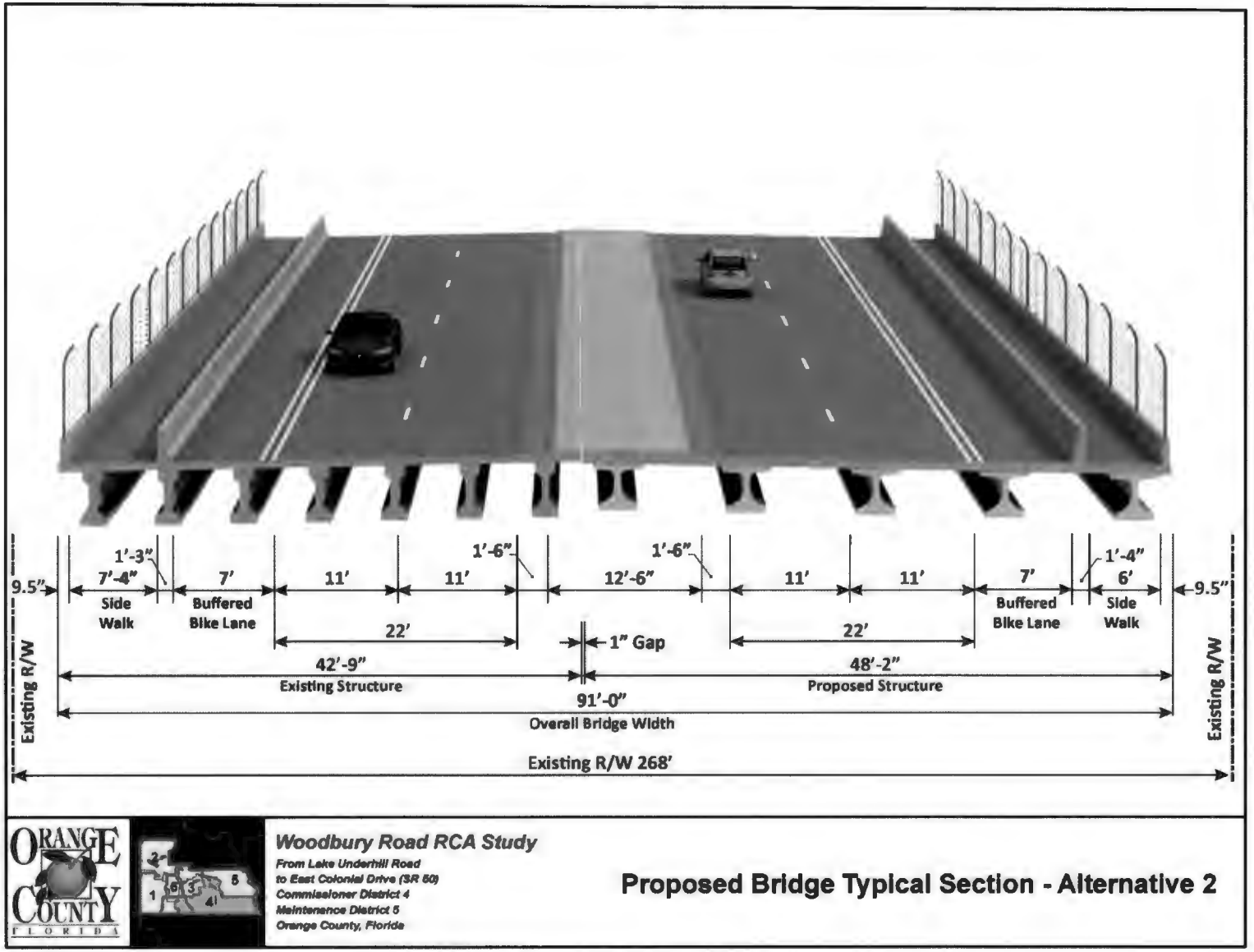


Figure 6-6
Proposed Bridge Typical Section – Alternative 3

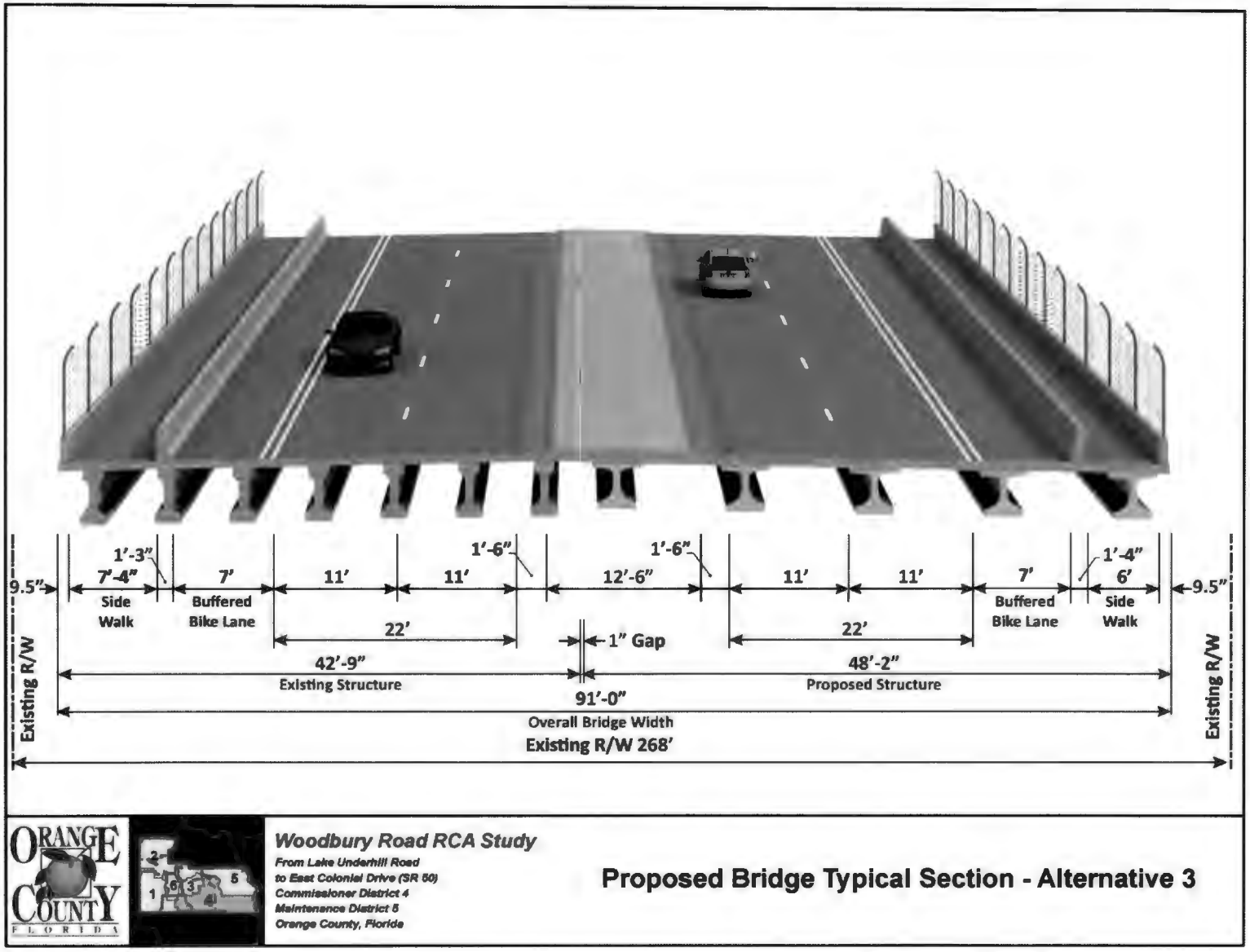


Table 6-1
Alternatives Matrix Evaluation

Woodbury Road RCA Study

From Lake Underhill Road to SR 50

Alternatives Evaluation Matrix

	No-Build Alternative	Alternative 1 Minimum RW = 92 ft.	Alternative 2 Minimum RW = 96.5 ft.	Alternative 3 Minimum RW = 103.5 ft.
Evaluation Criteria	Existing 2-Lane Road	4-Lane Urban with 6 ft. Sidewalk and 10 ft. Shared Use Path (No On-Road Bike Lanes)	4-Lane Urban with 6 ft. Sidewalks and 7 ft. On-Road Bicycle Lanes	4-Lane Urban with 6 ft. Sidewalk, 10 ft. Shared Use Path, and 7 ft. On-Road Bicycle Lanes
Relocations				
Number of Residential Acquisitions	None	0	0	0
Number of Business Acquisitions	None	0	0	0
Number of Parcels Impacted	None	12	39	39
Social, Natural, & Physical Impacts				
Social & Neighborhood	None	Low	Med	Med
Archaeological/Historical Sites	None	0	0	0
Threatened and Endangered Species	None	Low	Low	Low
Wetlands (acres)	None	4.4	6.2	6.2
Floodplains (acre-feet)	None	0	0	0
Potential High or Medium Ranked Contamination Sites	None	3	3	3
Estimated Costs (Present Day Costs)				
Design (15% of Construction)	No cost	$3,661,000	$3,878,000	$3,975,000
Right-of-Way Acquisition	No cost	$3,195,000	$3,408,000	$3,626,000
Wetland Mitigation	No cost	$447,000	$629,000	$629,000
Roadway Construction	No cost	$24,407,000	$25,856,000	$26,498,000
Reimbursable Utility Relocation	No cost	$1,000,000	$1,000,000	$1,000,000
CEI (15% of Construction)	No cost	$3,661,000	$3,878,000	$3,975,000
Total Cost	No cost	$36,371,000	$38,649,000	$39,703,000

7 PREFERRED ALTERNATIVE

This section presents the results of the preliminary design analysis that was conducted for the preferred alternative identified in Section 6.4 above. The proposed project improvements will address the increased mobility demands and safety needs along the corridor, while minimizing impacts to the social, natural, and physical environment.

7.1 Design Traffic Volumes

The Woodbury Road Roadway Conceptual Analysis Design Traffic Technical Report (August 2020) documents the existing traffic conditions and the analysis of the No-Build and Build scenarios. The existing and future traffic conditions and the analysis are summarized in Section 5 of this report.

7.2 Typical Section and Alignment

The preferred typical section and alignment is Alternative 1. The preferred roadway typical section is shown in **Figure 7-1** and the preferred bridge typical section is shown in **Figure 7-2**. The preferred alignment is presented in the concept plans contained in **Appendix A**. **Figure 7-3** shows a photographic rendering of how the roadway north of Waterford Lakes Parkway may look after construction.

The roadway design elements incorporated into the preferred alternative include the following:

- Four 11-foot travel lanes
- A 6-foot sidewalk located on the west side of the roadway
- A 10-foot shared-use path located on the east side of the roadway
- Type E curb and gutter along the inside lanes
- Type F curb and gutter along the outside lanes
- A 15.5-foot raised median
- Two 3-foot utility strips between the Type F curb and gutter and the sidewalk and shared-use path
- A grass strip between the shared-use path and sidewalk and the right-of-way line of varying width
- The proposed right-of-way is a minimum of 91.5 feet in width

Figure 7-1
Preferred Alternative Roadway Typical Section

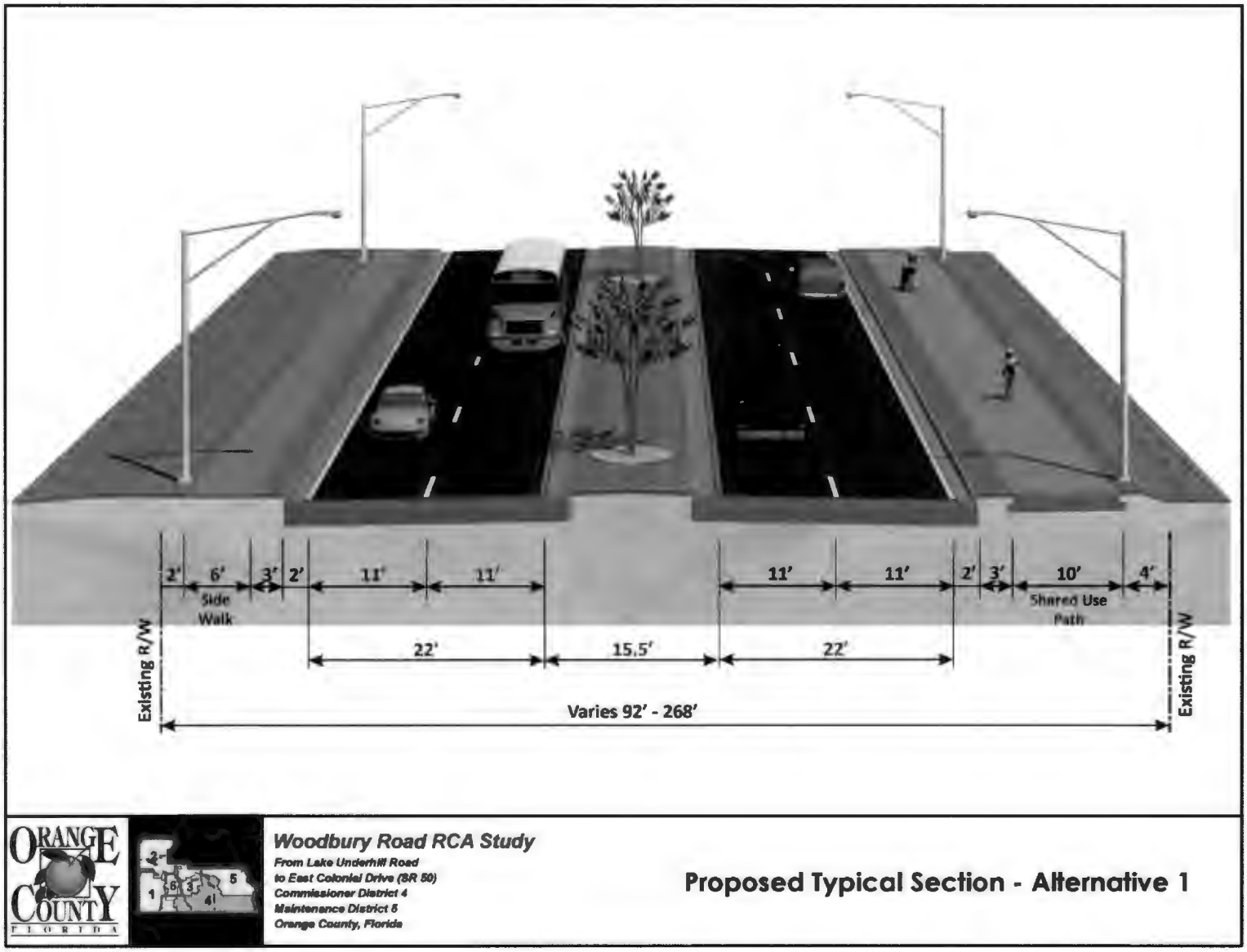


Figure 7-2
Preferred Alternative Bridge Typical Section

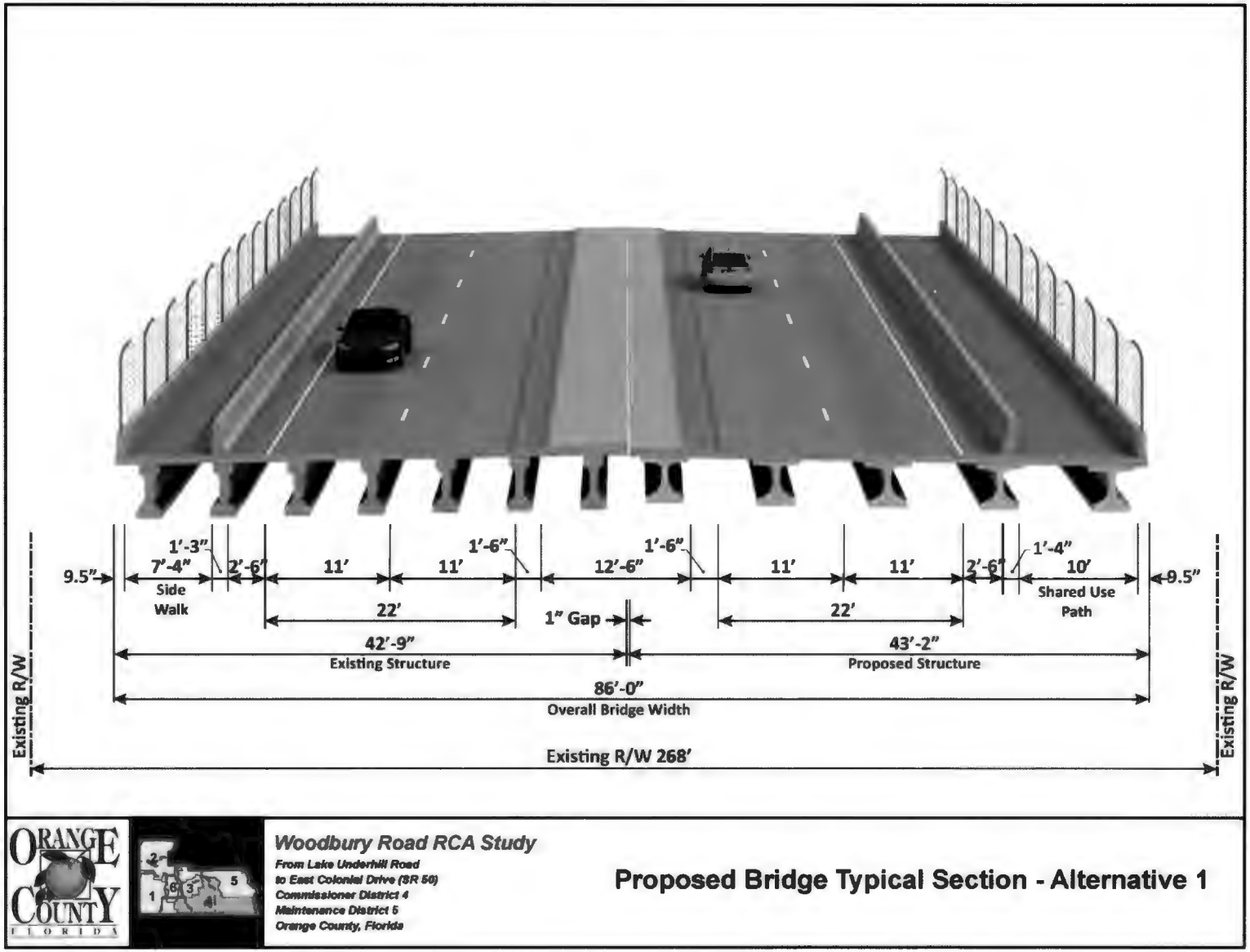


Figure 7-3
Photographic Rendering of Woodbury Road After Construction
Looking North from North of Waterford Lakes Parkway

7.3 Intersection Concepts and Signal Analysis

Within the project limits, there are no new traffic signals proposed. The existing signals are at Lake Underhill Road, Waterford Lakes Parkway, and S.R. 50. The proposed future intersection geometry at these intersections are as follows:

- Lake Underhill Road
    - Two through lanes in all four directions
    - Two eastbound left turn lanes
    - One eastbound right turn lane
    - One westbound left turn lane
    - One westbound right turn lane
    - Two northbound left turn lanes
    - One northbound right turn lane
    - Two southbound left turn lanes
    - One southbound right turn lane

- Waterford Lakes Parkway
    - Two northbound and southbound through lanes
    - Two northbound left turn lanes
    - One southbound right turn lane
    - Two eastbound left turn lanes
    - Two eastbound right turn lanes
    - Two westbound through lanes

- S.R. 50 (Colonial Drive)
    - Maintain existing turn lanes on the north, east and west legs of S.R. 50 & Woodbury Road
    - Add a second westbound right turn lane
    - Two northbound left turn lanes
    - One northbound through lane
    - One northbound shared through-right turn lane
    - One northbound right turn lane

7.4 Alignment and Right-of-Way Needs

The preferred alignment is Alternative 1 which can be constructed within the existing right-of-way except for a U-turn bulb out on the west side north of Parkbury Drive that impacts County-owned property and at the Lake Underhill Road and S.R. 50 intersections. The right-of-way requirements are shown in the concept plans contained in **Appendix A** and on the right-of-way identification maps contained in **Appendix B**.

7.5 Drainage

7.5.1 Preliminary Design Analysis

Analysis of the proposed ponds were performed calculating the runoff volume of the existing and proposed basins, using SCS runoff methodology. The proposed runoff was calculated based on the existing permit and the criteria used in the permits. The bulk of the existing ponds were permitted and designed for the four-lane typical section of Woodbury Road. The proposed improvements meet the existing permits criteria for all but one basin. Basin 4B is the only exception as this basin was not originally permitted and will follow current Orange County and SJRWMD criteria. **Appendix I** contains the *Pond Siting Report* prepared for this project.

All of the existing ponds are wet detention due to the high ground water elevations. Curve numbers for the existing and proposed conditions were developed for each roadway drainage basin utilizing their existing soil properties. Precipitation amounts for the Orange County and SJRWMD 25-year / 24-hour event of 8.6 inches were used with the developed curve numbers to calculate the volumes of runoff produced by the basins.

Runoff volumes for the proposed conditions were compared with the runoff volumes for the existing conditions. The additional runoff generated from the proposed condition for each basin was compared to the volumes provided in the existing ponds. For Basin 4B, the basin area and the area for the pond alternative were used in the development of the sizing of the preliminary pond. Water quality volumes for each basin and pond alternative were also calculated. The largest of the two volumes: water quality or 25-year / 24-hour event were used to govern the minimum volume capacity of the preliminary ponds, thus ensuring that both water quality volume requirements and peak attenuation requirements (through retaining all additional runoff volume generated by the additional impervious area) would be met. Please see the *Pond Siting Report* prepared for this project in **Appendix I** for the runoff volume and water quality volume calculations.

7.5.2 Stormwater Management Facilities

As previously stated, the Woodbury Road corridor, except for Basin 4B, was designed, permitted and constructed to accommodate the proposed four-lane roadway typical section.

The project corridor is almost completely developed and there are multiple wetlands and conservation easements throughout the corridor. The preliminary Basin 4B stormwater pond has been sized to provide the required treatment and attenuation volumes for the basin, as described in the previous section. The pond was sized for only the right of way areas that will drain to the pond.

The alternative pond sites for Basin 4B were selected based upon several criteria. This criterion included existing land use, right-of-way and drainage easements, topography, wetland impacts, and floodplain impacts. Topography was reviewed to provide sufficient elevation change for conveyance of the run-off from the roadway to the pond site. The preliminary road grades were used to control maximum pond stages, ensuring positive flow from the roadway to the ponds. Where possible wetland and flood plain impacts have been avoided.

Existing permits adjacent to the alternate pond sites and existing topography were used to determine the seasonal high / control elevations. Top of berm elevations were established using the adjacent existing grade. In some locations, top of berm elevations were raised slightly from existing ground, but only where required to increase volume of the pond and keep the peak stage below the roadway base elevation within the drainage basin. In all basins, the peak stage in each pond was kept below the bottom of the lowest base elevation within the drainage basin.

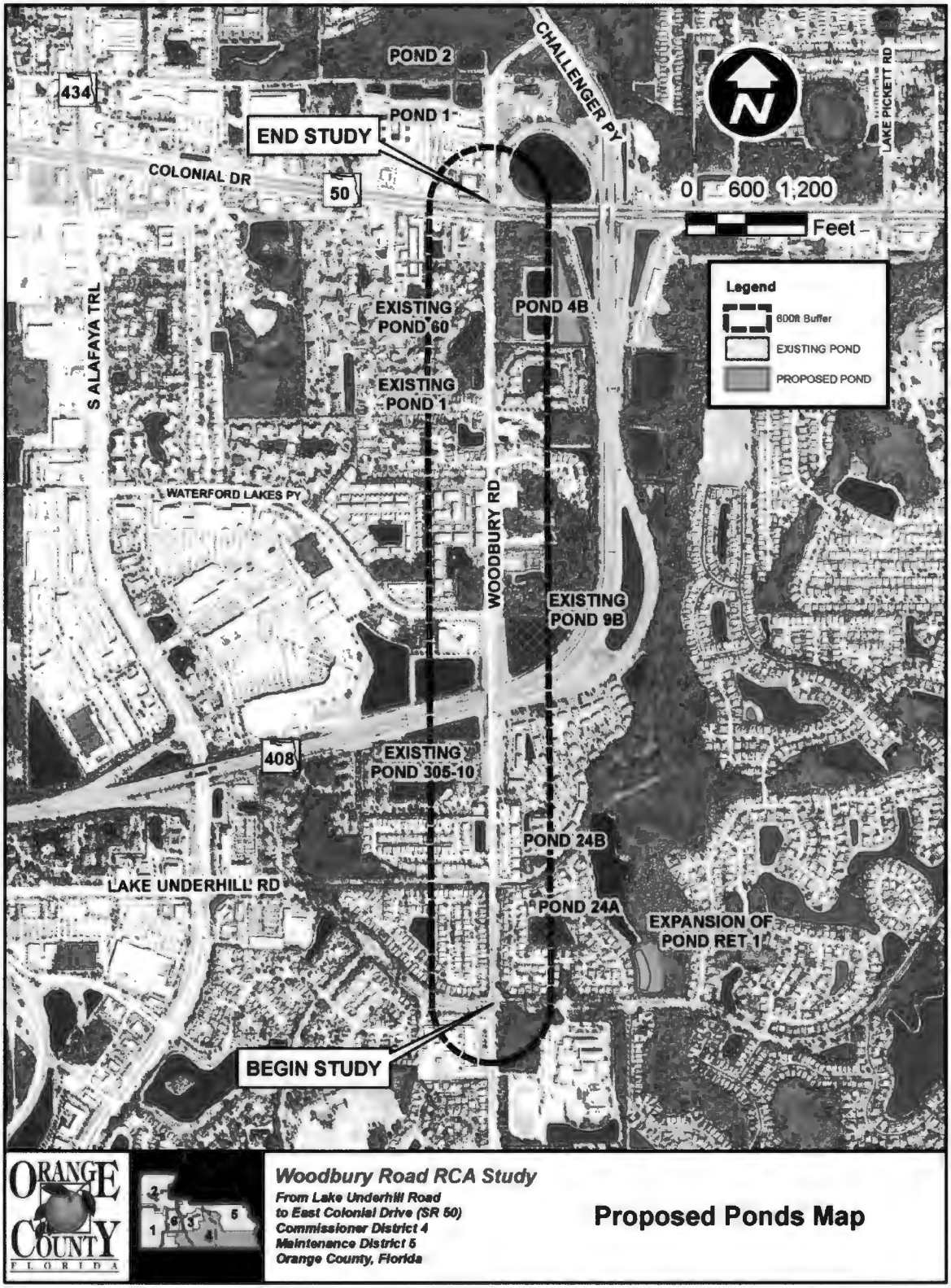
After establishing the berm and control elevations of the pond sites, each berm was sloped towards the inside, using a 20:1 slope for 20 feet and then at a 4:1 slope to the control elevation to get the pond area at this elevation. These pond stages and areas were incorporated into a pond stage-storage spreadsheet to ensure that the maximum required volume could be maintained within the pond. Please see **Figure 7-4** for the pond locations.

The preferred ponds are:

- Expansion of existing Pond RET 1
- Pond 24A
- Pond 24B
- Pond305-10
- Pond 3
- Pond 98
- Existing Pond 1
- New Pond 4B
- Pond 60
- Pond 1

During final design: pond bottom elevations, pond control elevations, pond sizes and pond configurations could vary from the preliminary ponds shown in this report based upon final topographic survey and geotechnical information that were not available during this conceptual pond design. The existing storm sewer system will need to be reviewed for appropriate capacity and conveyance.

Figure 7-4
Proposed Stormwater Ponds



7.5.3 Cross Drains

There is an existing double barrel 7'-6" x 4'-0" concrete box culvert located approximately 1200-ft north of Lake Underhill Road at the Orange County Canal. The culvert is 99'-0" long and the headwalls are located at the existing right-of-way line. No changes to the existing concrete box culvert are anticipated.

7.5.4 Floodplain and Floodways

Impacts to floodplains are not anticipated with the proposed improvements. There are no floodways within the project area.

7.5.5 Stormwater Permits

There are eleven drainage basins for the project. Seven existing drainage basins have been identified along the corridor and sub basins were delineated in three basins to reflect the existing drainage patterns within each basin. The existing ponds along the corridor have been sized, permitted, and constructed for the ultimate four-lane typical section that is proposed. One new pond site (Pond 4B) is also proposed and one existing pond is proposed to be expanded (Pond RET1).

7.6 Displacements

The preferred alignment has no business or residential displacements resulting from the project.

7.7 Estimated Project Costs

The estimated project costs for the preferred alternative are $3,596,000 for design, $3,195,0000 for roadway and pond right-of-way acquisition, $447,000 for wetland mitigation, $24,407,000 for construction, $1,000,000 for reimbursable utility relocations, and $3,661,000 for construction engineering and Inspection (CEI). The total estimated project costs are $36,371,000 as shown in **Table 7-1.**

Table 7-1
Total Estimated Project Costs

Project Item	Cost
Design (15% of Construction)	$3,661,000
Right-of-Way Acquisition	$3,195,000
Wetland Mitigation	$447,000
Roadway Construction	$24,407,000
Reimbursable Utility Relocation	$1,000,000
CEI (15% of Construction)	$3,661,000
Total Cost	**$36,371,000**

7.8 Recycling of Salvageable Materials

The opportunity to recycle any salvageable materials by the contractor is encouraged by Orange County. Such materials may include old asphaltic concrete pavement, base material and drainage structures.

The existing pavement on existing roadways, may be milled for recycling during the construction of the project. Any other salvageable materials will be identified during the design of the project. If these materials should be removed from the construction site, it is to be done as specified in the current FDOT Standard Specifications for Road and Bridge Construction.

7.9 User Benefits

Highway user costs are defined by AASHTO's A Manual on User Benefit Analysis of Highway and Bus-Transit Improvements, 1977, as the sum of (1) motor vehicle running cost, (2) the value of the vehicle user travel time and (3) traffic accident cost. User benefits are the cost reductions and other advantages that occur to highway motor vehicle users through the use of a particular transportation facility as compared with the use of another. Benefits are generally measured in terms of a decrease in user costs. It is anticipated that the preferred alternative will provide user benefits due to a reduction in roadway congestion as compared to the "No Build" alternative. In addition, the improved horizontal geometry and access management provided with the project should reduce the occurrence rate of many crash types on the roadway.

7.10 Pedestrian and Bicycle Facilities

A continuous 6-foot wide sidewalk will be provided on the west side of Woodbury Road and a 10-foot wide shared-use path will be provided along the east side of Woodbury Road. The sidewalk and the shared-use path will be separated from the roadway by curb and gutter and a 3-foot wide grass/utility strip. Pedestrian features, including crosswalks and pedestrian signals, will be provided at each signalized intersection. The pedestrian and bicycle facilities will comply with the Americans with Disabilities Act (ADA).

The existing all-way, all-red pedestrian phase that is currently employed at the Lake Underhill Road intersection with Woodbury Road is proposed to remain. This all-red phase was employed due to the large number of students who walk and bike to both Waterford Elementary School and Discovery Middle School located in the southwest and southeast quadrants of the intersection, respectively.

There is currently an uncontrolled school crosswalk located at the Sophiamarie Loop intersection with Woodbury Road. An uncontrolled crosswalk proposed as part of the widening of Woodbury Road to a four-lane divided roadway requires a traffic analysis to justify the need. However, due to the COVID-19 pandemic, it was decided that traffic counts taken during the study would not accurately reflect the true demand for a crosswalk at this location. A preliminary analysis using ITE Trip Generation rates did support a mid-block crossing. Therefore, it is recommended that this issue be revisited during the design phase of this project to consider a mid-block crossing between Sophiamarie Loop and Mallory Circle/Island Bay Drive. Preliminary discussion with Orange County staff indicated a preference for a Pedestrian Hybrid Beacon or HAWK when compared to a signalized pedestrian crosswalk or RRFB. See Section 6.1.4 for additional information on the proposed mid-block crossing.

7.11 Environmental Impacts

Detailed studies and evaluations were conducted to determine the potential for adverse impacts that may result from the proposed project. Baseline data, evaluation procedures and analysis of results are contained in the project files and the following reports: "Cultural Resource Assessment Survey", "Ecological Summary Report" and "Contamination Screening Evaluation Report".

7.11.1 Land Use

The land use along the corridor is primarily residential with some commercial and institutional (churches) land uses. The project is consistent with the existing and future land use along the corridor.

7.11.2 Community Cohesion

The project does not bifurcate any neighborhoods or developments.

7.11.3 Cultural Impacts

Based on the analysis conducted for this study, there are no cultural resources listed, determined eligible, or appear to be potentially eligible for listing in the NRHP. As such, historic resources will not be a critical issue. There is a potential for discovery of one or more prehistoric sites. Sites in this area are typically small lithic and/or artifact scatters which are not considered eligible for listing in the NRHP.

7.11.4 Wetlands

The project is anticipated to impact approximately 4.4 acres of wetlands (roadway and ponds). Federal, state, and local government agencies with regulatory authority over wetland and/or other surface waters generally require mitigation to offset unavoidable impacts as a condition of the permit. Mitigation requirements are based on a compilation of wetland parameters including quality, type, function, and size. Impacts to wetlands and/or other surface waters will be avoided and minimized to the maximum extent possible while maintaining safe and sound engineering and construction practices. Primarily, avoidance and minimization efforts are related to the proposed stormwater management pond locations.

A mitigation plan that adequately offsets adverse impacts will be developed and implemented during the design phase. Adverse wetland impacts that may result from the construction of this project will be mitigated, satisfying the requirements of Part IV. Chapter 373, F.S. and 33 U.S.C.S.1344. Compensatory mitigation for this project will be completed using mitigation banks and/or any other mitigation options that satisfy federal and state requirements.

7.11.5 Wildlife and Habitat

The potential impact to federal and/or state-listed wildlife species was evaluated based upon the occurrence determinations for Orange County, Florida. Further analysis will be required to specifically address potential impacts, current status of wildlife species, and other design and/or construction measures which can be incorporated to reduce or eliminate the potential impact. Impacts to protected species or their habitat is not anticipated.

7.12 Utility Impacts

Table 7-2 summarizes the potential utility impacts and provides the total estimated cost for each utility relocation and the estimated reimbursable cost to the UAO. The proposed widening of Woodbury Road will potentially conflict with the City of Orlando's 42" reclaimed water main that runs very near where the future northbound curb line will be located. This potential conflict will need to be considered during final design when design level survey is available. Consideration could be given to shifting the northbound lanes and curb line to avoid conflicts, the use of shallow inlets/drainage structures along the east curb line to avoid conflicts with the reclaimed water main, and/or sloping the northbound lanes towards the median and constructing

the stormwater inlets and piping in the median. Consideration should also be given to avoiding impacts to the existing Duke transmission pole located on the right side of Woodbury Road, just south of S.R. 50. For this estimate, it was assumed that there will be some involvement with the 42" reclaimed water line and valves and an impact to the Duke transmission pole that will involve relocation of the pole upstream and downstream as well.

Table 7-2
Preferred Alternative Utility Impacts and Costs

UAO Contact	Relocation Cost Estimate	Reimbursable Relocation Cost Estimate	Total Relocation Cost Estimate	Remarks / Utility Cost Basis
AT&T Distribution	$506,500	$0	$506,500	5065 LF of Buried Fiber/Coax @ $100/LF
Charter Communications	$100,000	$0	$100,000	500 LF of aerial Fiber/Coax @ $50/LF 750 LF of Fiber @ $100/LF (includes vaults and pedestals)
Century Link	$20,000	$0	$20,000	200 LF of Buried Fiber/Coax @ $100/LF
Duke Energy-Distribution	$240,000	$0	$240,000	9 Distribution poles @ 10k/pole 1250 LF of BE @ $100/LF 500 LF of OE @ $50/LF
Duke Energy-Transmission	$0	$900,000	$900,000	3 Transmission poles @ $300k/pole
TECO Peoples Gas	$459,600	$0	$459,600	3830 of 2" Coated Steel Gas Main @ $120/LF
Orange County Utilities*	$0	$0	$0	0 of 24" WM (Upsize) @ $150/LF 0 of 16" RCW @ $75/LF 0 of 16" FM @ $75/LF
Orlando Telephone Company	$150,000	$0	$150,000	1500 LF of Fiber @ $100/LF (includes vaults and pedestals)
CFX	$0	$0	$0	No Impacts anticipated
Comcast Communications	$25,000	$0	$25,000	500 LF of aerial CATV @ $50/LF
City of Orlando	$0	$100,000	$100,000	42" Reclaimed Water; adjustment of valve boxes, ARV assemblies
Summit	$10,000	$0	$10,000	100 LF of Buried Fiber @ $100/LF
Totals:	**$1,511,100**	**$1,000,000**	**$2,511,100**	

* - Existing utility information was not provided by Orange County Utilities

7.13 Traffic Control Plan

The traffic control plan will be developed during the design process.

7.14 Special Features

7.14.1 Access Management

The access management plan for Woodbury Road is generally based on the Florida Department of Transportation (FDOT) Access Class 5 criteria. The median opening spacing distances for the Class 5 criteria are as follows:

- Directional median opening spacing – 660 feet
- Full median opening spacing criteria – 1320 feet

The access management plan for Woodbury Road is shown on the concept plans contained in **Appendix A**.

7.14.2 Wildlife Crossing

Based on biodiversity mapping, field surveys, and public input, no wildlife crossings are proposed. There is a lack of sustainable natural communities (preservation or conservation lands) on both sides of the roadway that would prevent future development of any existing vacant land and existing development would preclude the including of fencing needed for wildlife crossings.

7.14.3 Street Lighting

It is the County's policy to provide street lighting along the corridor. Street lighting will be addressed during the design phase.

7.14.4 Connected Automation

The **Design Traffic Technical Report** prepared for this project under separate cover, discusses the innovations in technologies related to smart city/county applications for improving safety and enhanced mobility for connected, semi-autonomous and autonomous vehicles that should be considered for the Woodbury Road improvements. Connected automation in transportation systems could offer substantial benefits for reducing traffic crashes, improving mobility and accessibility, and minimizing environmental impacts such as fuel consumption and air quality. With advancements in information and communications technology coupled with smart infrastructure systems, new approaches to integrated and connected transportation systems are being explored at the convergence of urban signal infrastructure with innovations in Connected Vehicles (CV), and Connected and Automated Vehicles (CAVs).

The following recommendations are proposed for the Woodbury Road Corridor:

- The existing traffic signals along the Woodbury Road corridor should be interconnected using fiber optic conduit links and cable where necessary to tie into the existing S.R. 50 east/west traffic signal network and existing Lake Underhill Road east/west traffic signal network. Currently the County is installing Advance Traffic Controllers (ATC) signal controllers made by Intelight. As part of the Woodbury Road widening design, the County should install an ATC controller at each of the signalized intersections and

the controller should include a connected vehicle module. Each signal cabinet should also include an uninterrupted power source (UPS).

- At this time installation of an adaptive signal control system as part of the reconstruction of Woodbury Road from a roadway with a two-lane cross-section to a four-lane divided cross-section is not recommended.
- CCTV cameras are currently existing at the Lake Underhill Road and S.R. 50 intersections. A CCTV camera should also be installed at the signalized intersection of Woodbury Road and Waterford Lakes Parkway.
- Currently the Lake Underhill Road uses InSync Traffic Adaptive video detection, the Waterford Lakes Parkway intersection uses microwave detection for the through movements with loops for the side street approach, and the S.R. 50 intersection uses video detection. With the widening of Woodbury Road, the video cameras should be upgraded to provide Advanced Traffic Signal Performance Measures (ATSPM) data with vehicle/bicycle/pedestrian counting capability and bicycle detection.
- As a way to track vehicle origins and destinations within the Central Florida area, Bluetooth travel sensor readers could be located at each of the traffic signals along the Woodbury Road corridor from Challenger Parkway to Lake Underhill Road. As more locations have Bluetooth readers installed, an areawide or area specific travel pattern map of traveled roadways and intersection utilization could be developed to identify potential congestion spots or travel corridors for further study.
- At this time, no message display signs are recommended for the Woodbury Road corridor.
- The County may want to consider including passive pedestrian detection as part of the design phase for the Woodbury Road corridor. The passive pedestrian detection is currently part of the ATTAIN Central Florida CAV project along Alafaya Trail, but the system is still experimental.
- As part of the design phase of the widening of Woodbury Road, if adequate sight distance can be provided, a four-section flashing yellow arrow signal assembly should be considered as a replacement signal assembly for the existing westbound protected left-turn three-section head at the intersection of Woodbury Road and Lake Underhill Road. This would allow the option of protected/permissive signal phasing.
- LYNX has two transit routes that travel along a portion of Woodbury Road. They are Route 320 which is a transit route that operates only during school days and Route 621 which provides pick-ups from Waterford Lakes Town Center to Bithlo Health Center and also provides curb to curb service in the Bithlo and Wedgefield communities (residents must call at least 2 hours in advance). Both routes travel on Woodbury Road from Waterford Lakes Parkway to S.R. 50. As part of the design phase of the widening of Woodbury Road, a Transit Priority Signal should be designed with optical preemption for emergency vehicles and GPS antennas for transit. In addition, optical preemption should also be installed on all approaches at all the signalized intersections.

7.14.5 Subdivision Screen Walls

Orange County Subdivision Regulation Section 34-209 outlines the standard for construction of screen walls around residential subdivisions. This section requires construction of a six-foot-high masonry wall to separate residential subdivisions from all adjacent roadways where Average Daily Traffic Volumes are project to exceed 8,000 vehicles within five years of the date of approval of the Preliminary Subdivision Plan. The regulations also require that the wall not be located within the road right-of-way. There are instances when the Board of County Commissioners may approve the construction of a landscape buffer in lieu of a screen wall.

The County will construct a new six-foot-high, split-face concrete block screen wall for the section of a subdivision affected by the construction or widening of a roadway if all of the following conditions are met:

a) The subdivision has no existing screen wall adjacent to the roadway.

b) The proposed road right-of-way abuts the property line of the subdivision.

c) A landscape buffer or other screening was not accepted by the County in lieu of a screen wall during the subdivision approval process.

d) The Average Daily Traffic Volume of the roadway is projected to exceed 8,000 vehicles within five years of roadway construction.

e) Access rights from all affected lots have been dedicated to Orange County.

If the effective height of the majority of an existing subdivision screen wall is reduced by 10% or less due to the construction of a roadway project, such an impact will be considered minor and no action will be taken by the County. Effective height shall be defined as the height of the wall in comparison to the edge of the roadway. If the roadway construction results in the removal of an existing screen wall, the County will construct a replacement screen wall. The County will also construct a replacement screen wall if the effective height is reduced by 30% or more. If the effective height is reduced by more than 10% or less than 30%, the impact will be mitigated in one of the following ways:

1. The County will rehabilitate, where practical, the affected sections of the wall by restoring the effective wall height to is pre-roadway construction condition. The County will use its best efforts to ensure that this restoration uses materials and workmanship similar to the existing wall construction.

2. In lieu of option 1, the subdivision residents may choose the option of replacing the entire section of the wall abutting the proposed road, based on a 50/50 cost sharing arrangement with the County. The residents may petition the Board of County Commissioners to establish a MSTU to fund their 50% cost share. The MSTU will be established in accordance with the County's standard procedures. The 50/50 cost sharing arrangement shall be based on the cost for a six-foot-high split-face concrete block wall.

Table 7-3 identifies the subdivision along Woodbury Road within the project limits and whether they meet the criteria for consideration of a screen wall or for potential screen wall replacement.

Table 7-3
Woodbury Road Subdivision Screen Wall Evaluation

Subdvision	Subdivision has an Existing Screen Wall	Subdivision Meets New Screen Wall Criteria	Subdivision Meets Criteria for Rehab or Reconstruction Consideration	Reason Subdivision Does Not Meet Criteria
The Estates	Yes (split face concrete)	No	No	There is a tract of land and landscape buffer between the road right-of-way and the subdivision.
Waterford Cove	Yes (brick, metal picket, plastic panel, wood panel)	No	No	There is a tract of land between the road right-of-way and the subdivision.
Waterford Place	No	No	No	There is a tract of land between the road right-of-way and the subdivision.
Viscaya at Waterford	Yes (brick)	Yes	Yes	N/A
Woodbury Glen	Yes (brick)	Yes	Yes	N/A
Woodbury Cove	Yes (brick)	Yes	Yes	N/A
Woodbury Park	Yes (concrete block and metal picket)	Yes	Yes	N/A

8 PUBLIC INVOLVEMENT

8.1 Public Involvement Plan

In May 2019 a Public Involvement Plan (PIP) was created for the Woodbury Road RCA and implemented into the project's public involvement approach. The PIP identifies key local and state agency, elected, and appointed officials; and property owners and tenants for the study area, in addition to outlining public outreach strategies. Specific strategies established in the PIP are: project newsletter mailouts, contact with the media, community and small group stakeholder meetings, presentation to the Orange County Planning and Zoning Commission/Local Planning Agency, and presentation to the Orange County Board of County Commissioners. All public involvement documents can be found in **Appendix C**.

8.2 Public Information Distribution

Public information for this project has been dispersed through the following methods:

- Newsletters mailed to property owners, tenants, and other interested persons
- Public meeting advertisements were placed in *The Orlando Sentinel*, and *El Sentinel*
- A project website was provided which contains information such as: project study area map, project schedule, meeting notices, newsletters, and other study documents

8.3 Coordination and Small Group Meetings

Small group meetings were held with representatives from Waterford Lakes Community Association, Orange County Public Schools, Waterford Elementary School, Discovery Middle School, and City of Orlando Utilities. Minutes from these meetings are included in **Appendix C**.

8.4 Public Meetings

Two community public meetings were held for the project. The initial public meeting was held virtually due to the COVID-19 pandemic. The meeting was held online via Webex Events and included a presentation and then an opportunity for attendees to type in questions, have them read aloud, and then answered by the study team. An online MetroQuest survey was also provided on the project website to receive additional feedback on the project and the alternatives being considered. The Kick-off Alternative Virtual Public Information Meeting was held on August 13, 2020 from 6 to 7 PM.

The second public meeting was held on December 16, 2020 and was also held virtually from 6 to 7 PM. The meeting was held via GoTo Meeting and included a presentation and then an opportunity for attendees to type in questions, have them read aloud, and then answered by the study team. The public meeting summaries are contained in **Appendix C**.

8.5 Local Planning Agency and Board of County Commissioners Meetings

8.5.1 Orange County Planning and Zoning Commission/Local Planning Agency

To be completed after the LPA hearing

8.5.2 Orange County Board of County Commissioners

To be completed after the BCC hearing.

9 Conclusion and Recommendations

The objective of the Woodbury Road RCA was to develop and evaluate alternatives for improvements to Woodbury Road from Lake Underhill Road to S.R. 50 in order to address the current and future transportation needs along the corridor. The preferred improvements identified in this report will serve as the basis for the subsequent design of the roadway improvements. The process incorporated the insights from planning, engineering, and the public to refine the alternatives and to ultimately advance a preferred alternative. It is recommended that the preferred alternative detailed in Section 7 of this report be advanced to the design phase.

Appendix A
Concept Plans

Appendix B
Right-of-Way Identification Maps

Appendix C
Public Involvement Documents

Appendix D
Cultural Resource Assessment

Appendix E
Geotechnical Investigation Report

Appendix F
Ecological Summary Report

Appendix G
Contamination Screening Evaluation Report

Appendix H
Design Traffic Technical Report

Appendix I
Pond Siting Report