APPENDIX C

TECHNICAL MEMORANDUM 3: EXISTING CONDITIONS REPORT

Pine Hills Road Pedestrian/Bicycle Safety Study

Existing Conditions Report

Technical Memorandum No. 3

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ORANGE COUNTY GOVERNMENT FLORIDA

ORANGE COUNTY WALK•RIDE•THRIVE!

INVEST Our HOME for Life

Many Cultures, One Bright Future PINE HILLS NEIGHBORHOOD IMPROVEMENT DISTRICT

Pine Hills Road Pedestrian/Bicycle Safety Study

On behalf of Orange County Mayor Teresa Jacobs, District 2 Commissioner Bryan Nelson and District 6 Commissioner Victoria P. Siplin, Orange County is pleased to present this Existing Conditions Report for the Pine Hills Road Pedestrian/Bicycle Safety Study. The study limits are from Colonial Drive (State Road (SR) 50) to Bonnie Brae Circle, a distance of approximately 3.6 miles. This Pine Hills Road corridor has been identified as a high crash corridor for pedestrian and bicycle crashes. In addition, there are a variety of land uses along the corridor including multiple schools, residential, retail and office land uses, as well as heavily used transit routes, which result in a truly multi-modal corridor.

The Pine Hills Road Pedestrian/Bicycle Safety Study is a comprehensive review of the Pine Hills Road corridor which will investigate various measures to provide a safe integration of walkers and bicyclists with other modes of transportation. This study is a result of Mayor Jacobs' "Walk-Ride-Thrive!" and "INVEST in Our Home for Life" initiatives to make Orange County roads safer for all pedestrians and bicyclists.

Honorable Teresa Jacobs
Orange County Mayor

Bryan Nelson
Orange County District 2 Commissioner

Victoria P. Siplin
Orange County District 6 Commissioner

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1. Introduction

In January 2017, Orange County initiated a Pedestrian/Bicycle Safety Study to develop safety alternatives and strategies for pedestrian/bicycle mobility along Pine Hills Road between Colonial Drive (SR 50) and Bonnie Brae Circle, and place special emphasis at the Silver Star Road (SR 438) intersection. The *Pine Hills Road Pedestrian/Bicycle Safety Study Existing Conditions Summary Report* summarizes existing conditions within the Pine Hills Road study area, a 3.6 mile section beginning at Colonial Drive at the southern end and terminating at Bonnie Brae Circle to the north (illustrated in Figure 1.1). This report presents existing land use information, population and demographic characteristics, transportation infrastructure, transit service, safety analysis, travel demand characteristics, and access management.

This report considers previous studies, planned and programmed improvements, as well as ongoing planning efforts by the Florida Department of Transportation (FDOT), Orange County, MetroPlan Orlando, and the Pine Hills Neighborhood Improvement District (PHNID). Provided below is a brief summary of each chapter of the report:

- **Existing Land Use, Population, and Demographics**: This chapter presents existing land use patterns within the study area, demographic data within the study area, including population, housing, race, language, income, and employment.
- **Existing Transportation Infrastructure**: This chapter presents existing transportation infrastructure within the study area, including roadway characteristics, right-of-way, typical section, intersection geometry, bicycle/pedestrian infrastructure, signage, markings, speed analysis, lighting analysis, transit service, and safety/crash analysis.
- **Existing Travel Demand**: This chapter presents existing travel demand characteristics within the study area, including existing traffic volumes, pedestrian and bicycle volumes, and an existing corridor operations summary.
- **Existing Access Management**: This chapter presents existing access management, intersection, and median spacing within the study area.

Several documents were reviewed as part of the development of this report, listed below:

- Orange County Capital Improvement Program (CIP)
- Orange County Long-Range Transportation Plan (LRTP)
- Orange County Walk-Ride-Thrive! Program
- Orange County Multi-Modal Corridor Plan
- MetroPlan Orlando Transportation Improvement Plan (TIP)
- Orange County Americans with Disabilities (ADA) Transition Plan
- Pine Hills Neighborhood Improvement District (PHNID) Master Plan
- Pine Hills: Many Cultures, One Bright Future CPAT Report

Figure 1.1

Location Map
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

2. Existing Land Use, Population, and Demographics

This chapter presents an overview of the existing land use patterns, population characteristics, and demographic characteristics within the study area. This information is intended to identify current socioeconomic patterns that contribute to pedestrian and bicyclist safety along Pine Hills Road. The remainder of this chapter covers the following topics:

- Summary of Transportation Plans
- Land Use
- Population and Demographics

2.1 Summary of Transportation Plans

A review of various transportation plans was performed to identify planned improvements throughout the study area. The results of the review are included in a separate Technical Memorandum #2 (TM #2). To summarize, the following are applicable projects currently being considered or are underway that may have an effect on this study:

- Orange County Capital Improvement Program (CIP) and Long Range Transportation Plan (LRTP)
  - Pine Hills Trail (Alhambra Drive to Silver Star Road)
  - Roadway Lighting Improvements (Silver Star Road to North Lane)
- Orange County Walk-Ride-Thrive! Program (WRT!)
- Orange County Multi Modal Corridor Plan
  - Identified Livability Corridor (Colonial Drive to Silver Star Road)
- Orange County ADA Transition Plan
- Orange County Development Projects
  - Silver Pines (120 Multi-Family Units at Silver Star Road/Pine Hills Road)
  - Pine Hills SuperStop (Belco Drive)
- LYNX Transit Development Plan (TDP)
  - Pine Hills SuperStop (Belco Drive)
- MetroPlan Orlando Transportation Improvement Program (TIP)
  - TSM&O Improvements (Silver Star Road/Pine Hills Road intersection)
- Pine Hills Neighborhood Improvement District 2015-2045 Improvement Plan
- American Planning Association Community Planning Assistance Team (CPAT) Report
  - Town Center Master Plan

2.2 Land Use

Existing and future land use patterns along the Pine Hills Road corridor are very important to consider when evaluating current and future pedestrian and bicyclist safety. This section presents existing and future land use data within the Pine Hills Road study area.

The highest share of existing land uses within the Pine Hills Road study area are residential and institutional, though the majority of land uses with frontage on Pine Hills Road are either institutional or commercial. Along the corridor, there are small businesses directly adjacent to Pine Hills Road, with neighborhoods behind and extending to the east and west of the corridor.

There are several schools and major churches that contribute to the bicycle and pedestrian activity along the Pine Hills Road corridor including:

- Schools
  - Mollie E. Ray Elementary, on Hernandes Drive to the east of Pine Hills Road
  - Pine Hills Elementary, on Balboa Drive to the west of Pine Hills Road
  - Rolling Hills Elementary, on Donovan Street to the east of Pine Hills Road
  - Ridgewood Park Elementary, on Pioneer Road to the west of Pine Hills Road
  - Meadowbrook Middle School, on North Lane to the west of Pine Hills Road
  - Maynard Evans High School, on Pine Hills Road north of Silver Star Road
  - Robinswood Middle School, on Vernon Street west of Pine Hills Road
  - St. Andrews Catholic School, on N. Hastings Street west of Pine Hills Road
- Churches
  - Ebenezer Baptist Church, on Pine Hills Road at Pipes O the Glen Way
  - All Nation Church of God, on Pine Hills Road at Spring Hill Dr
  - Joshua Generation Outreach Church, on Pine Hills Road at Indialantic Dr
  - Mission of Hope Worship Center, on Pine Hills Road at Hernandes Dr
  - New Covenant Church of Jesus Christ, on Pine Hills Road at Cortez Dr
  - Faith Christian Center, on Pine Hills Road at Deauville Dr
  - Pine Hills Community Church, on Pine Hills Road at Hernandes Dr
  - Eglise Baptiste Haitienne Philadelphie, on Pine Hills Road at Deauville Dr
  - Devi Mandir Hindu Temple, on Pine Hills Road, south of Silver Star Road

The Future Land Use (FLU) designations assigned to the study area are generally consistent with the existing land uses (displayed in Figure 2.1). The FLU pattern remains generally residential, with some commercial and institutional land uses along Pine Hills Road. The PHNID and American Planning Association CPAT Report envision a future potential town center at the Pine Hills Road/Silver Star Road intersection.

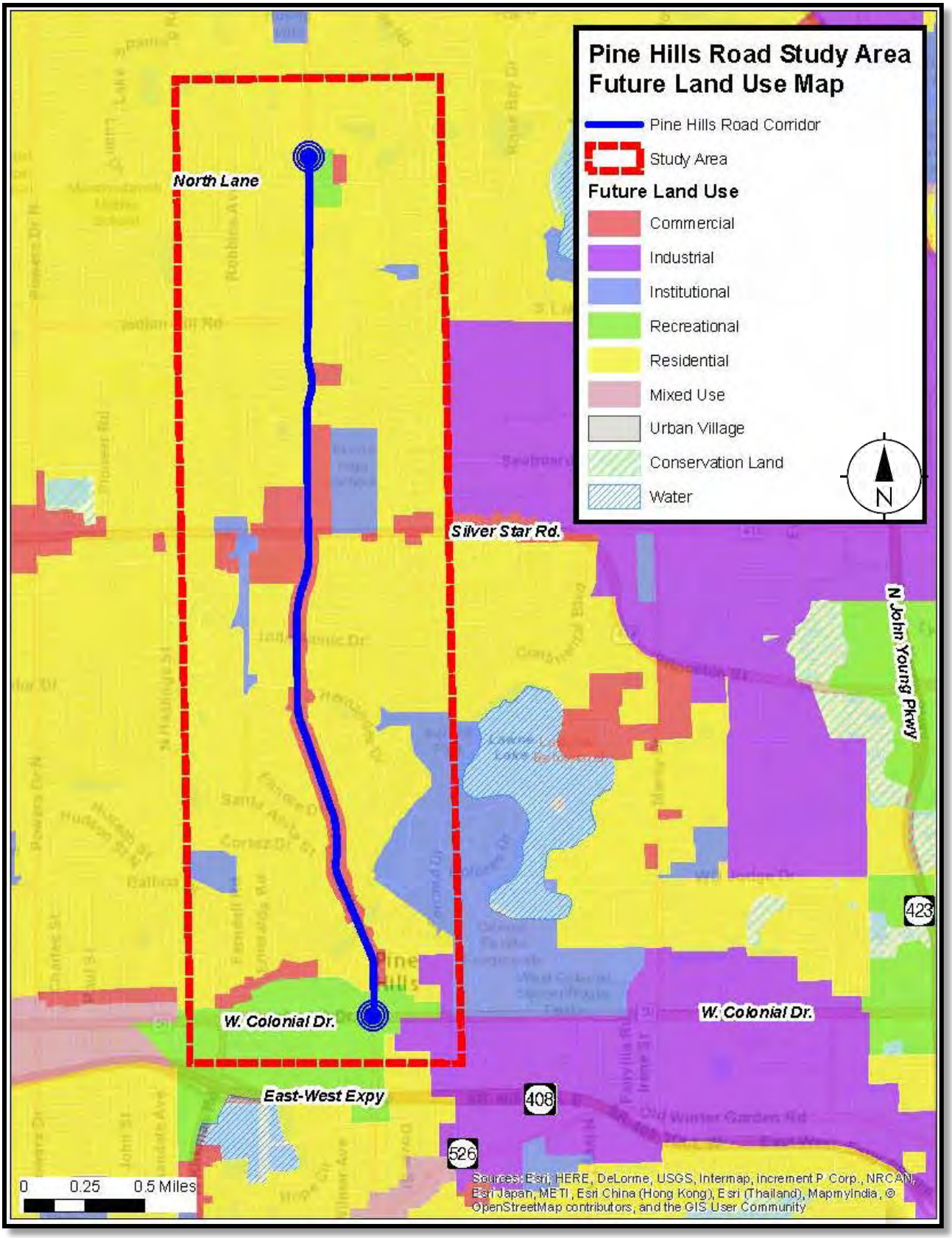


Figure 2.1

Location Map
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

2.3 Population and Demographics

Information on existing population, housing, income, employment, and land use data within the Pine Hills Road study area is detailed below.

2.3.1 Population Characteristics

Population data were obtained from the 2015 U.S. Census American Community Survey (ACS), and are summarized in Table 2.1. The study area is a three and a half square mile area (approximately 2,240 acres) including roughly one-half mile east and west of Pine Hills Road between Colonial Drive (SR 50) and Bonnie Brae Circle. Census data were overlaid and clipped to include only the portions within the Pine Hills Road study area. Key highlights include:

- The share of study area population under 5 years old (7.5 percent) is higher than both Orange County (6.3 percent) and the State (5.5 percent).
- There is a lower share of the study area population enrolled in either undergraduate or graduate college (7.0 percent), as compared to Orange County (10.3 percent).
- Around 12.3 percent of the study area population has some form of disability, which falls just between Orange County (10.2 percent) and State (13.2 percent) averages.
- The racial makeup of the study area includes black (66.2 percent), followed by white (14.7 percent) and Hispanic/Latino (13.8 percent).

Table 2.1: Population Characteristics

Population Characteristic	Study Area
Population	
Total Population	13,964
Total Population over 5	12,922 (92.5%)
Population Density (persons/acre)	5.98
Age	
Median Age	30
Population under 5	1,042 (7.5%)
Population over 65	2,286 (16.4%)
Race (All Ages)	
White	2,050 (14.7%)
Black	9,243 (66.2%)
Asian	304 (2.2%)
Hispanic or Latino (of any race)	1,922 (13.8%)
Other	445 (3.2%)

Population Characteristic	Study Area
Language at Home (Age 5 and Over)	
English Only	8,969 (69.4%)
Spanish Only	651 (5.0%)
French Creole Only	687 (5.3%)
Other Languages	2,617 (20.3%)
School Enrollment (All Ages)	
Population Enrolled in K-12	3,152 (22.6%)
Population Enrolled in College	978 (7.0%)
Household (All Ages)	
Total Households	3,961
Average Household Size	3.53
Household Density (households/acre)	1.69
Households with Children under Age 18	27.5%
Disability (All Ages)	
Population with a Disability	1,715 (12.3%)

Source: U.S. Census American Community Survey, 2015.

2.3.2 Socioeconomic Data

Socioeconomic (SE) data were obtained from the 2015 ACS and are summarized in Table 2.2. As indicated in the previous table, there are an estimated 13,964 residents within the study area. Across the study area, the median household income is $32,169, which is below the County and State average (of $47,943 and $42,433, respectively), and the median home value is also below the County and State average (of $169,900 and $165,200, respectively).

Table 2.2: Socioeconomic Characteristics

Socioeconomic Characteristic	Study Area
Income	
Median Household Income	$32,169
Median Home Value	$103,722
Households Below Poverty Level	30.6%
Housing Units	
Total Housing Units	4,725
Owner-Occupied	1,985 (42.0%)
Renter-Occupied	2,126 (45.0%)
Vacant	614 (13.0%)
Vehicle Access	
Total Households	3,961
Households with No Vehicles	632 (4.5%)

Source: U.S. Census American Community Survey, 2015.

3. Existing Transportation Infrastructure

This chapter includes an evaluation of the transportation infrastructure conditions within the corridor. Figures 3.1 through 3.5 illustrate the overall features along the corridor. The existing physical features were collected through field inspection, aerial photography, data provided by Orange County and previous plans/studies. This information is intended to identify current roadway design issues and aid in identifying study area roadway segments and intersections requiring closer examination as part of the future recommendations for the corridor.

This chapter covers the following topics:

- Roadway Characteristics
- Right-of-Way
- Typical Section
- Intersection Geometry
- Bicycle/Pedestrian Infrastructure
- Signage, Markings, Design & Posted Speed, Traffic Volumes, & School Zones
- Spot Speed Study
- Lighting
- Transit Service and Infrastructure
- Safety and Crash Analysis

3.1 Roadway Characteristics

Pine Hills Road is classified as a Minor Arterial and is owned and maintained by Orange County (CR 431). The posted speed limit on the corridor is 40 miles per hour (mph). The existing typical section is discussed in greater detail in Section 3.3.

3.2 Right-of-Way

The roadway right-of-way (ROW) information was obtained using available property appraisal parcel data. The ROW varies along the corridor, ranging from 85 to 100 feet. No additional right-of-way is expected to be needed as a result of this study, with the possible exception of limited acquisitions at several intersections associated with potential access management changes.

The features of the corridor facilities are displayed in Figures 3.1 through 3.5, which were gathered through field inspection, aerial photography, Orange County data, and previous plans. The information is intended to identify current roadway design issues and aid in identifying study area roadway segments and intersections requiring closer examination as part of future recommendations for the corridor. As can be seen in Figures 3.1 through 3.5, most of the Pine Hills Road frontage contains separate properties with single or multiple driveways directly accessing the roadway. This resulted in high number of driveways serving low volumes of inbound and outbound traffic.

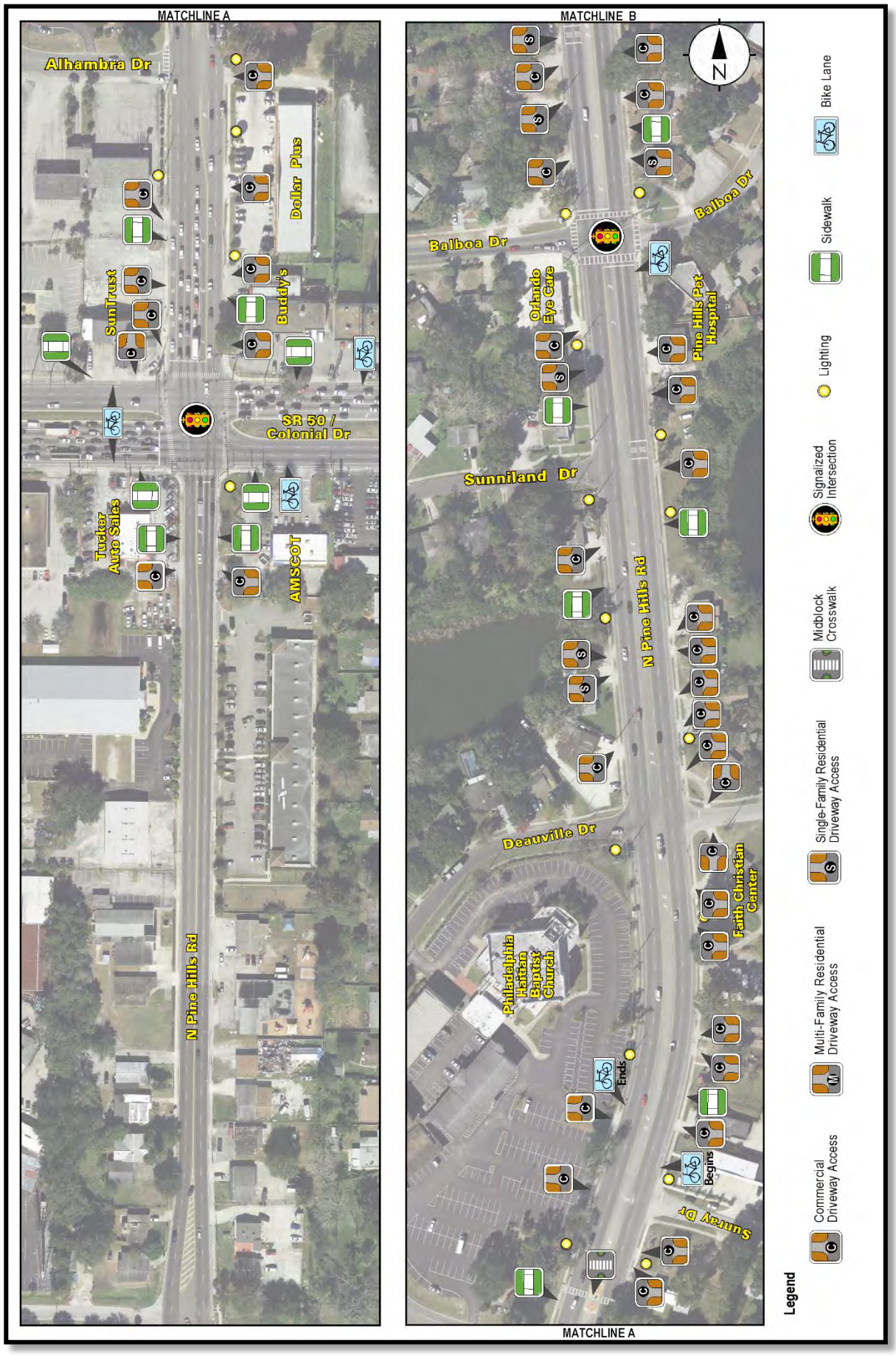


Figure 3.1

Corridor Features
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.2
Corridor Features
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

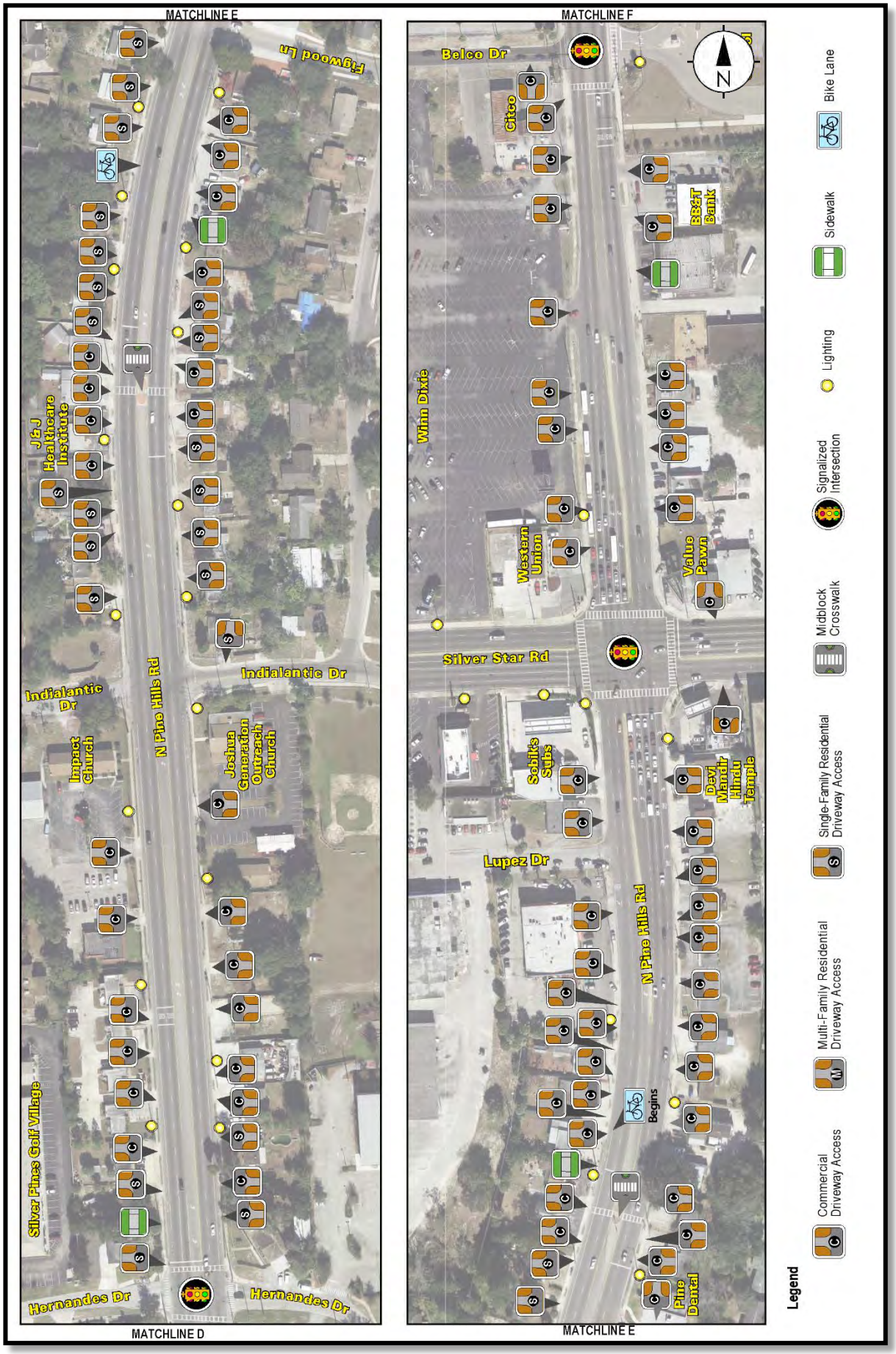


Figure 3.3
Corridor Features
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

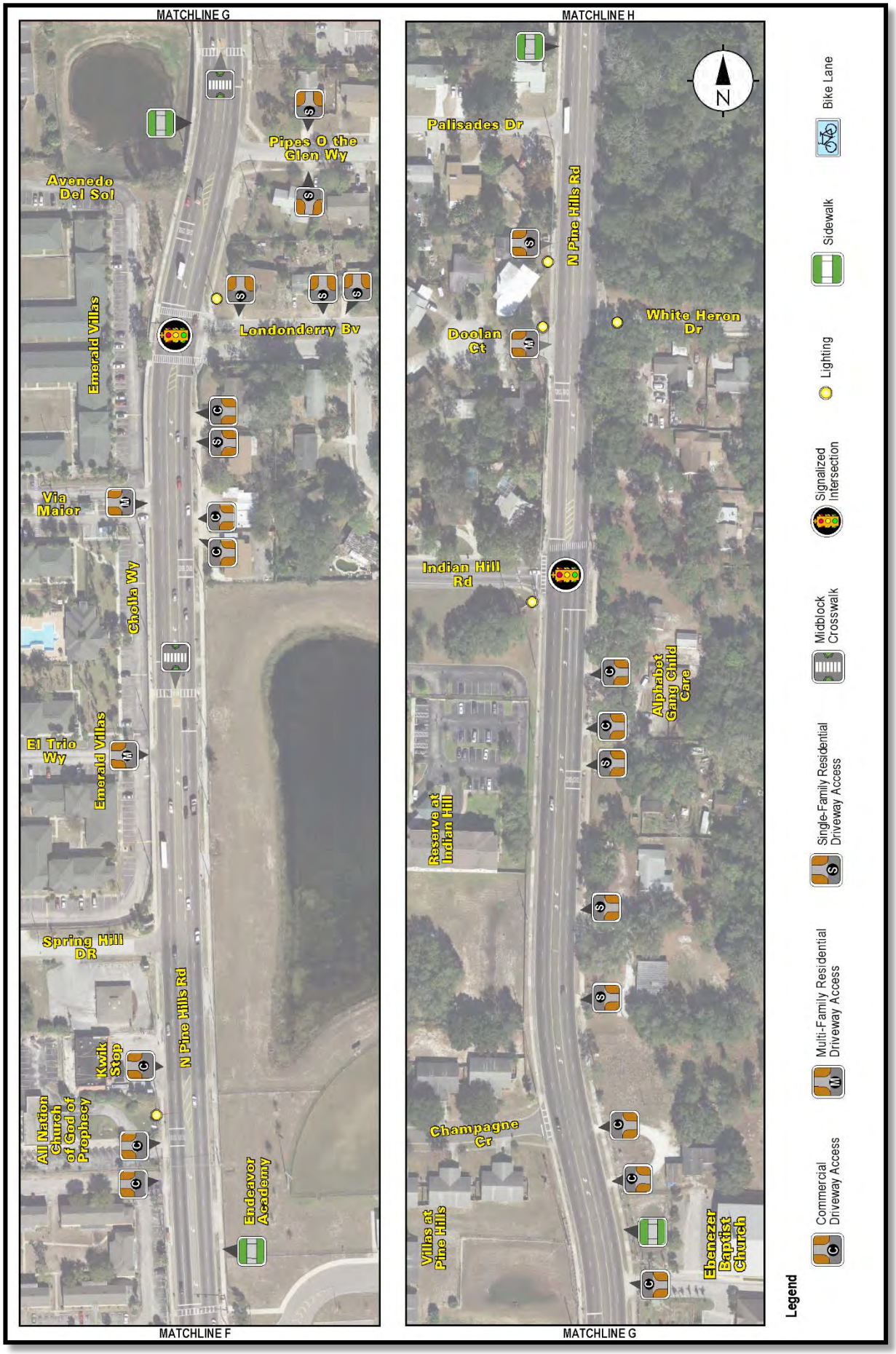


Figure 3.4
Corridor Features
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

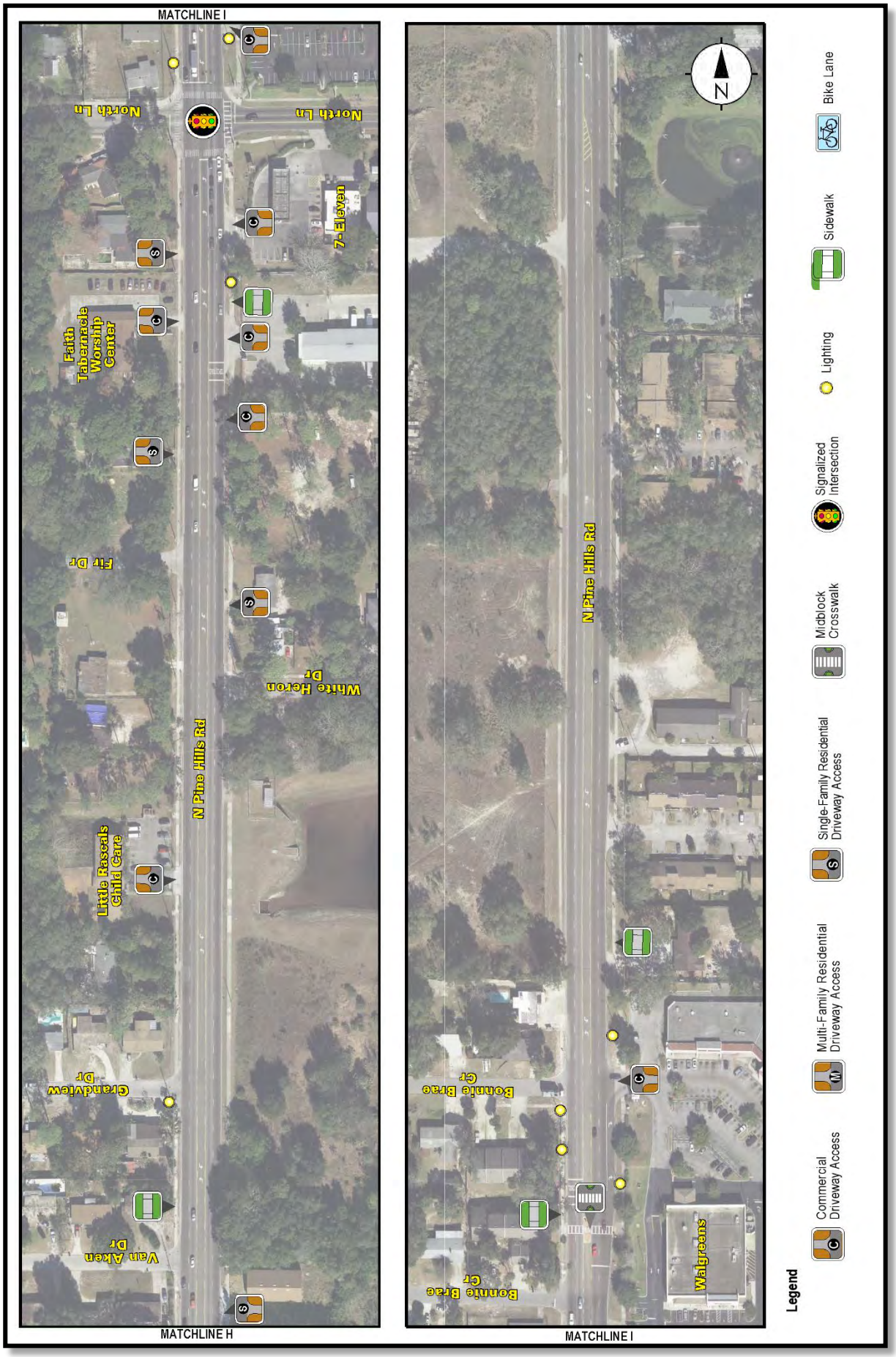


Figure 3.5
Corridor Features
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

3.3 Typical Section

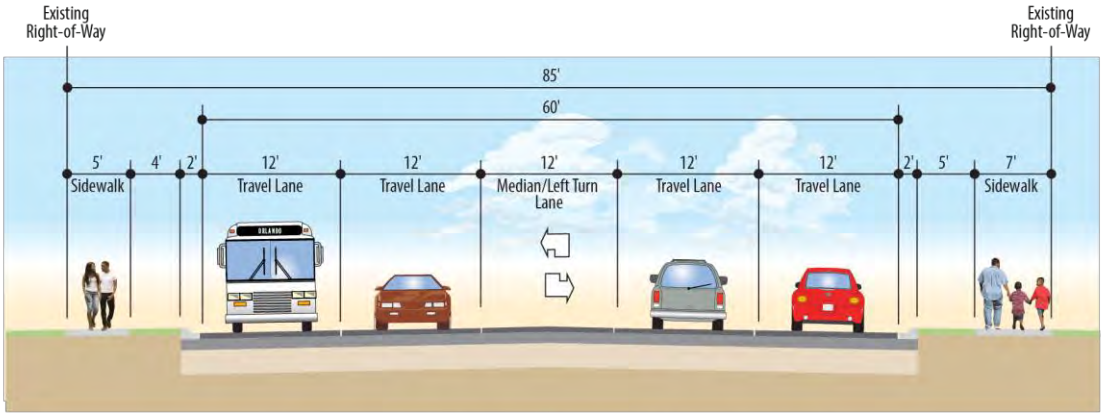
Through the study area, Pine Hills Road is generally a five-lane arterial with two travel lanes in each direction. There are 15 pedestrian crossing locations across Pine Hills Road at 8 signalized intersections and 7 mid-block locations. Along the corridor, there are continuous sidewalks along both sides of Pine Hills Road.

There are two typical sections along the study area corridor – Pine Hills Road (north of Silver Star Road (SR 438)) and Pine Hills Road (south of Silver Star Road (SR 438)).

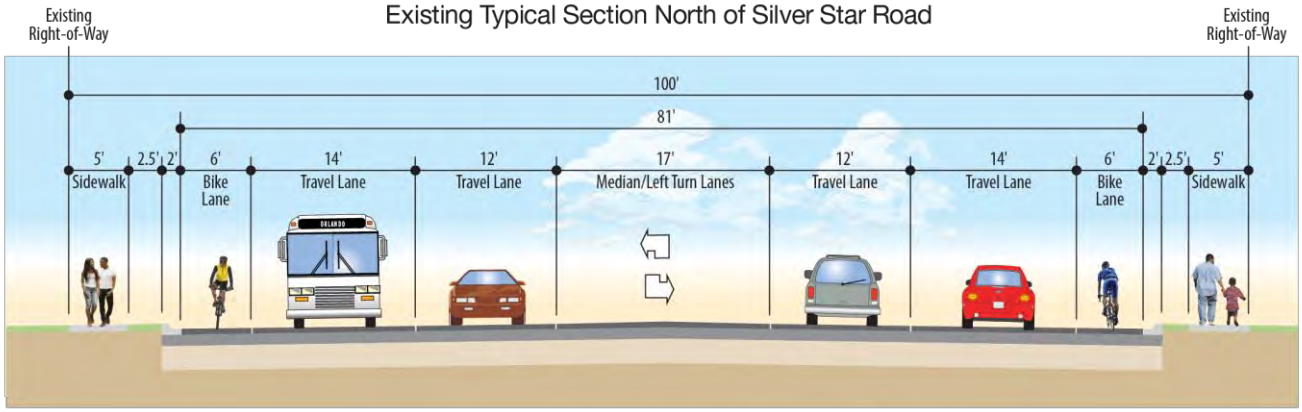
- **Pine Hills Road (North of Silver Star Road)** - the typical section consists of four 12-foot travel lanes (two in each direction), a 12-foot two-way left turn lane, 2-foot curb and gutters, 4-5 foot grass buffer strips, a 5-foot sidewalk on the west side of the roadway, and a 7-foot sidewalk on the east side of the roadway.
- **Pine Hills Road (South of Silver Star Road)** - the typical section consists of four 12-14 foot travel lanes (two in each direction), a 17-foot two-way left turn lane, 6-foot bicycle lanes, 2-foot curb and gutters, 2.5-foot grass buffer strips, and 5-foot sidewalks on both sides of the roadway.

Figure 3.6 illustrates the existing typical sections for Pine Hills Road.

Figure 3.6: Typical Sections



Existing Typical Section North of Silver Star Road



Existing Typical Section South of Silver Star Road

3.4 Intersection Geometry

Figures 3.7 through 3.11 illustrates the intersection geometries for the following signalized and non-signalized intersections:

- Colonial Drive (SR 50) (signalized)*
- Alhambra Drive
- Sunray Drive
- Deauville Drive
- Sunniland Drive
- Balboa Drive (signalized)
- Dolores Drive
- Cortez Drive
- Elinore Drive
- Ferdinard Drive
- Golf Club Parkway
- Hernandes Drive (signalized)
- Indialantic Drive**
- Figwood Lane
- Silver Star Road (SR 438) (signalized)
- Belco Drive (signalized)
- Spring Hill Drive
- El Trio Way
- Via Maior
- Londonderry Blvd (signalized)
- Pipes O the Glen Way
- Champagne Circle
- Indian Hill Road (signalized)
- White Heron Drive
- Palisades Drive
- Van Aken Drive
- Grandview Drive
- Fir Drive
- North Lane (signalized)
- Bonnie Brae Circle

** It should be noted that characteristics were collected and included in the study for the signalized intersection of Colonial Drive (SR 50) and Pine Hills Road. These characteristics included lane geometry, signage, sidewalks and bicycle lanes. Per the scope of the study identified by Orange County, existing traffic counts and analysis were not included for the intersection of Colonial Drive (SR 50) and Pine Hills Road.*

*** New signal improvements are planned at the Pine Hills Road and Indialantic Drive intersection.*

Left turn lanes (on Pine Hills Road) are provided at the signalized study intersections as well as the northbound approach of the unsignalized intersection of Alhambra Drive. The remaining unsignalized intersections have left turn lanes on Pine Hills Road that are part of the continuous two-way left turn lane. At each of the unsignalized intersections (except Alhambra Drive), the continuous two-way left turn lane is interrupted by dashed lines to demarcate the unsignalized intersection location and indicate the appropriate left turn direction.

Orange County is responsible for the operation and maintenance of all eight traffic signals within the study area. In addition, new signal improvements are planned at Pine Hills Road and Indialantic Drive as well as at Dolores Drive to accommodate the proposed extension of the Pine Hills Trail to Barnett Park.

It was also noted that LED/Fiber Optic Blank Out Signs are incorporated into the signalization for all approaches at the intersection of Pine Hills Road and Hernandes Drive.

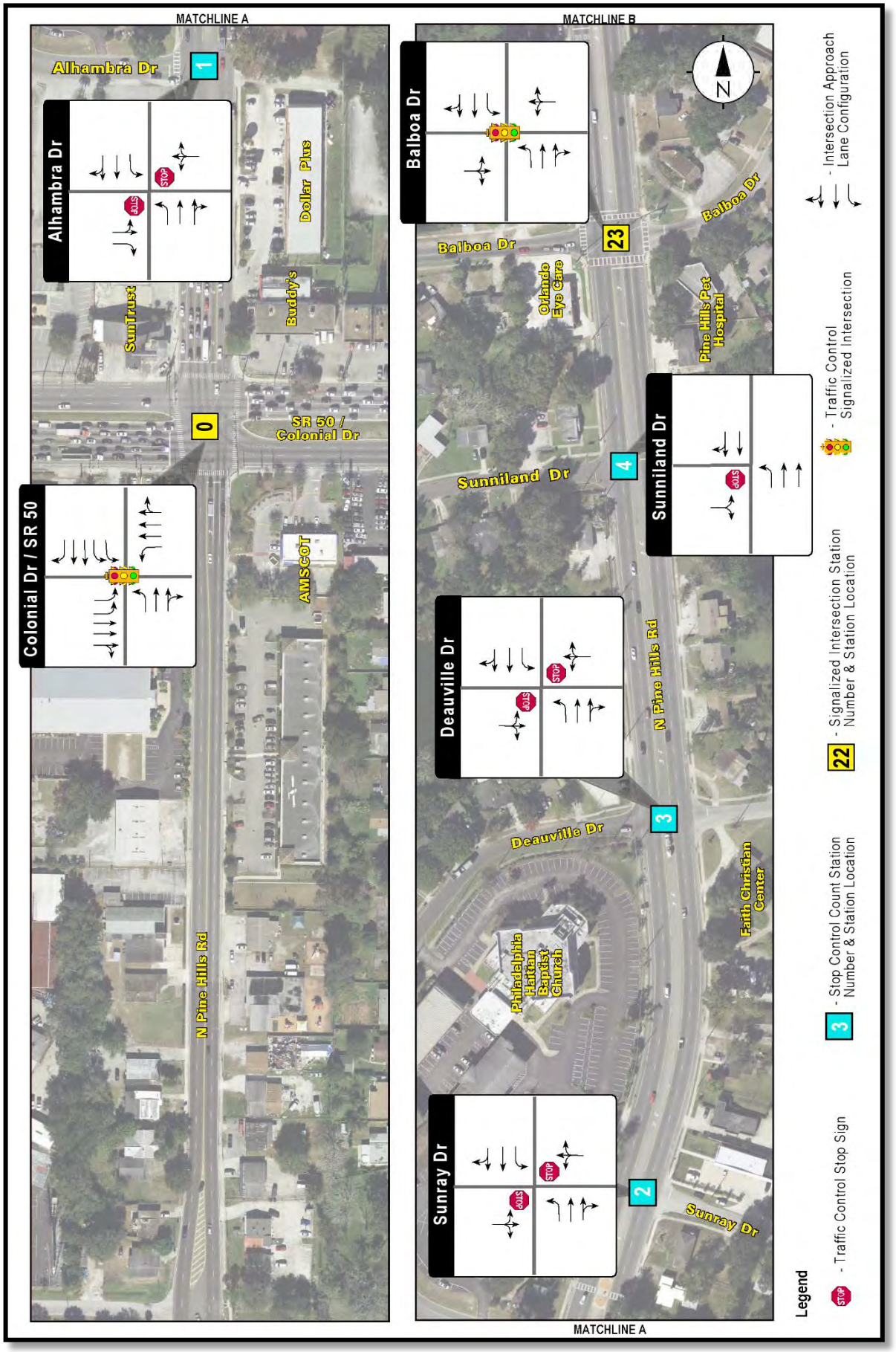


Figure 3.7

Intersection Geometry
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

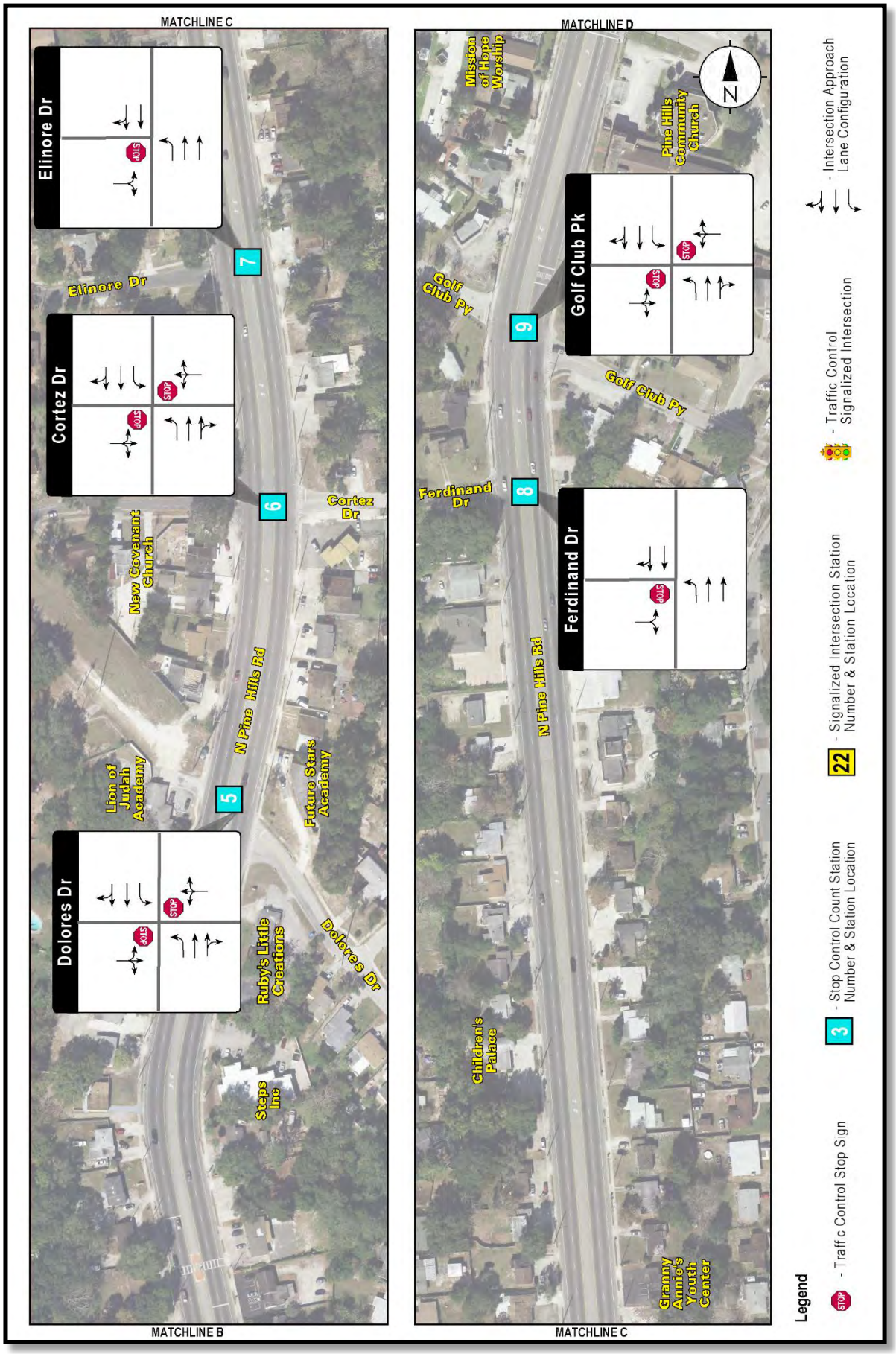


Figure 3.8
Intersection Geometry
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

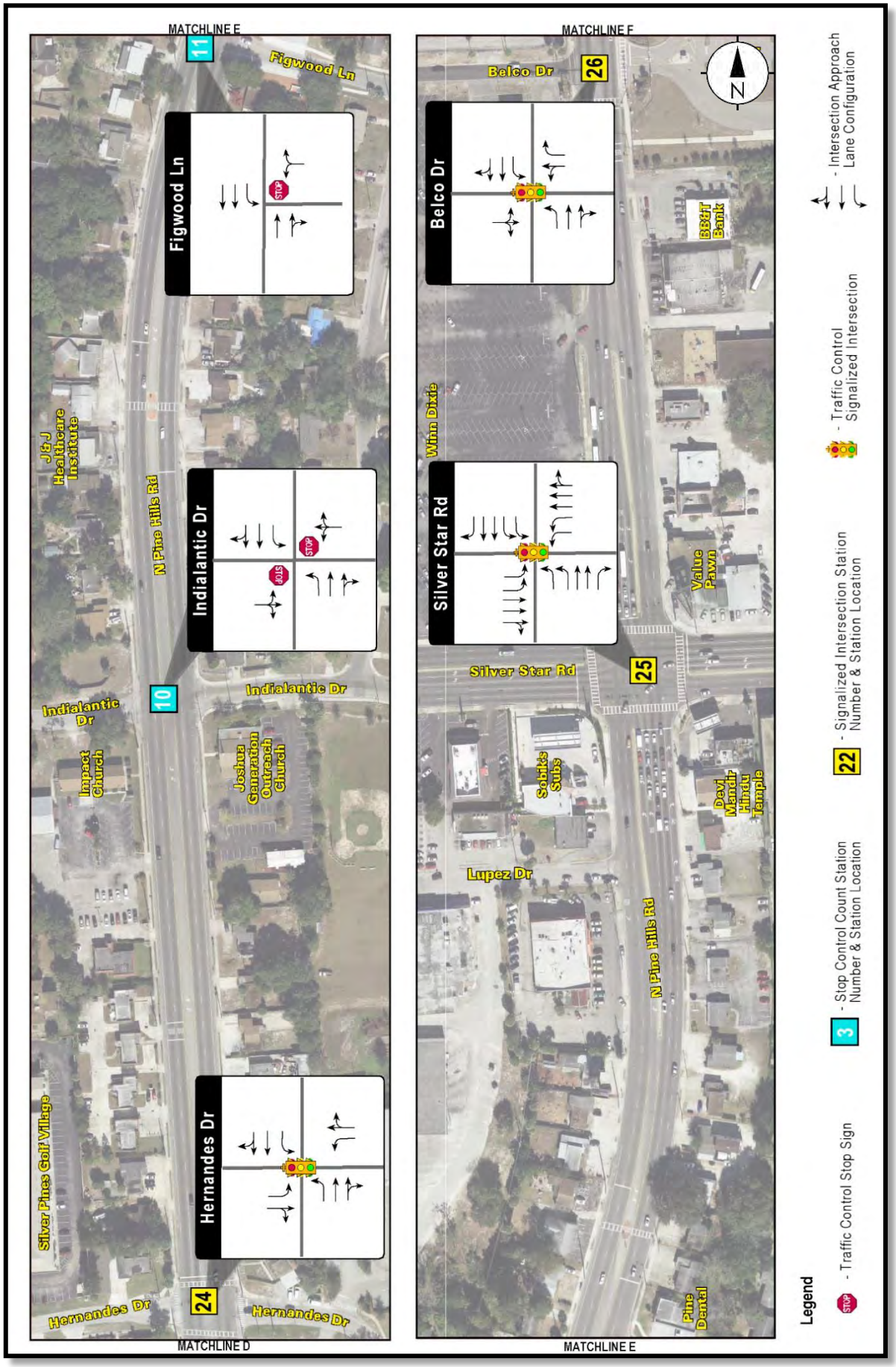


Figure 3.9
Intersection Geometry
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

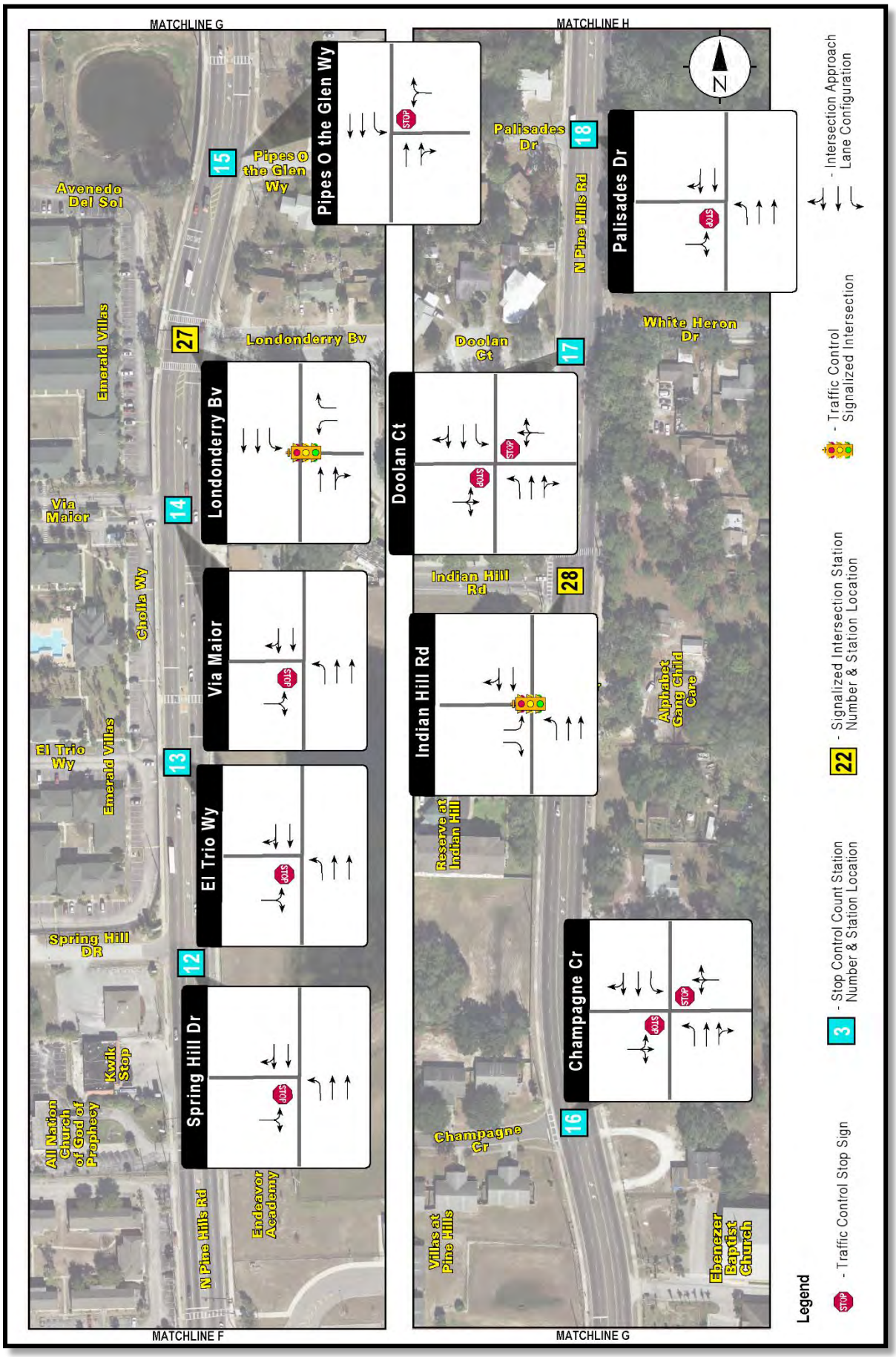


Figure 3.10
Intersection Geometry
Pine Hills Road Pedestrian/Bicycle Safety Study
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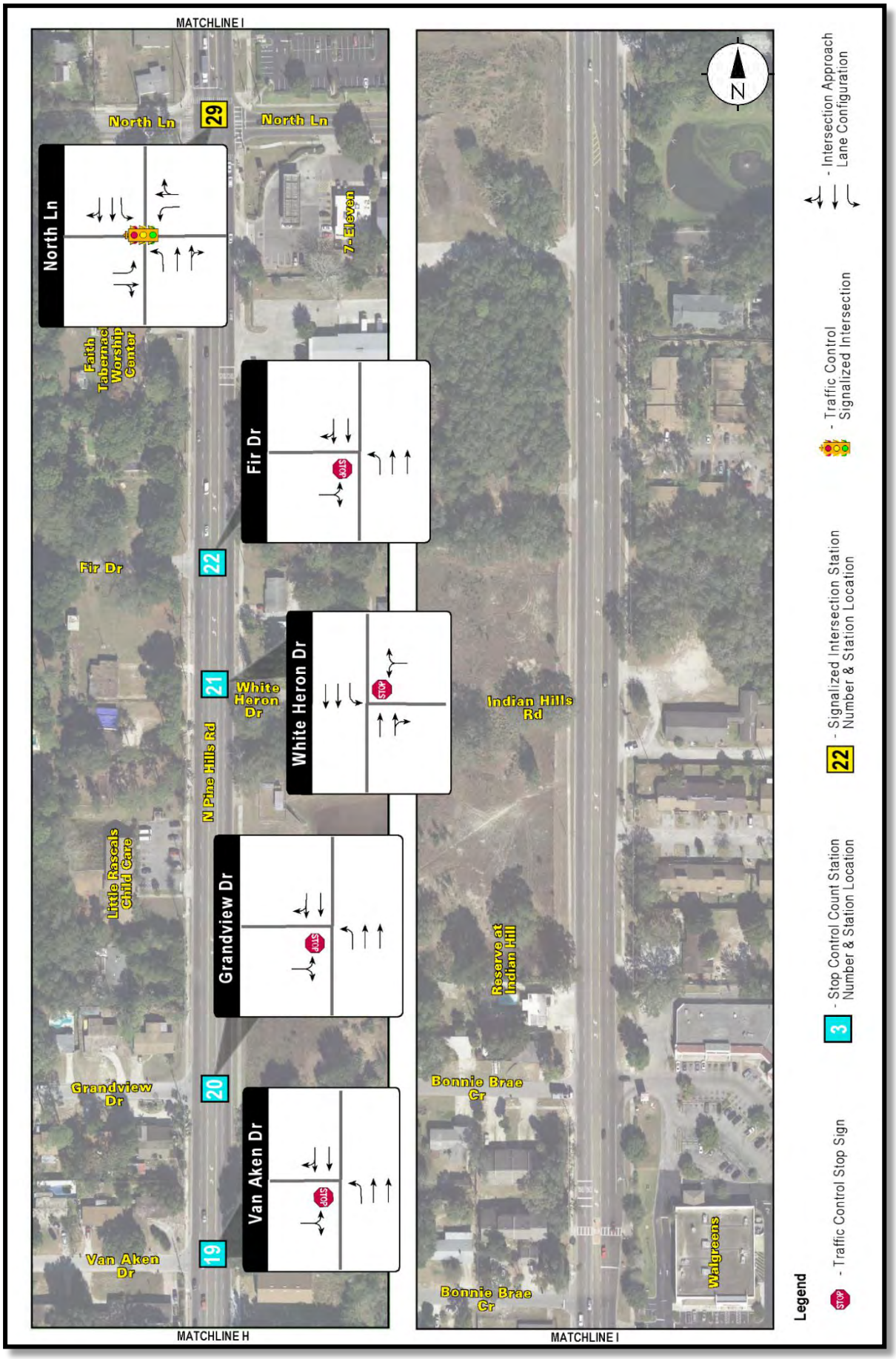


Figure 3.11
Intersection Geometry
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

3.5 Bicycle and Pedestrian Infrastructure

This section provides the location, interconnectivity and continuity of sidewalks/crosswalks, bicycle trails/facilities (e.g. Pine Hills Trail), and crossings at and away from intersections and in relation to the transit network (include any multi-use paths).

3.5.1 Bicycle Lanes

An inventory of bicycle lanes was completed for the corridor utilizing the latest Google Earth aerial photography and field visits. South of Figwood Lane, existing bicycle lanes are generally six feet wide, adjacent to the outside vehicular travel lanes, and delineated with pavement markings along both northbound and southbound Pine Hills Road. North of Figwood Lane, no bicycle lanes are present, and bicyclists either ride in the outside vehicle travel lane or on the adjacent sidewalks. The locations of the bicycle lanes are indicated on Figures 3.1 to 3.3.

3.5.2 Pedestrian Facilities

Pedestrian facilities along the corridor consist of sidewalks, crosswalks, and trails. Similar to the bicycle lane inventory, an inventory of pedestrian facilities was completed for the study area utilizing the latest Google Earth aerial photography and field visits.

Sidewalks

There are continuous sidewalks on both sides of the roadway, over the entire limits of the Pine Hills Road study area. The sidewalk width along the corridor is typically five feet in width. North of Belco Drive along the east side of Pine Hills Road, the sidewalk width is seven feet. The sidewalks are shaded by trees in several locations along the corridor; however, the majority of the sidewalks are without shade. Street furniture is limited to transit infrastructure. No other sidewalk amenities and enhancements were identified along the corridor. Sidewalks are generally in fair condition along the corridor although there are various obstructions that may impede pedestrian movements in some areas such as overgrown landscaping of adjacent properties, utility poles, and road signs which effectively narrow the sidewalk width.

Crosswalks

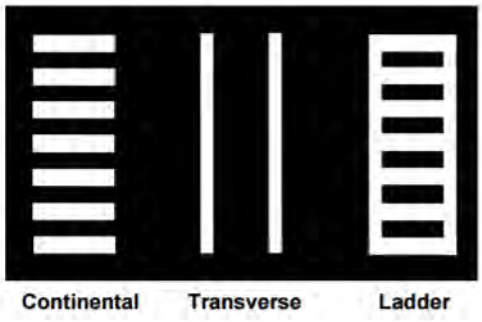
There are 24 intersections with some type of pedestrian crossings within the corridor - 15 pedestrian crossing locations are *across* Pine Hills Road at 8 signalized intersections and 7 mid-block locations, and 9 pedestrian crossings are *along* Pine Hills Road at unsignalized intersection approaches to Pine Hills Road (Table 3.1). At those 24 intersections, there are a total of 47 crosswalk legs (23 across Pine Hills Road, 24 along Pine Hills Road).

Table 3.1: Number of Crosswalks

Direction	Crosswalk Location	Number of Intersections with Some Type of Crossing	Number of Crosswalk Legs
Across Pine Hills Road	Midblock	7	7
	Signalized Intersections	8	29
Across Side Street Approaches to Pine Hills Road	Unsignalized Intersections	9	11
Total		**24**	**47**

Detailed information about the pedestrian crosswalks along Pine Hills Road is provided in Table 3.2, including crosswalk location, traffic control, crosswalk type, warning type, maximum crossing distance, median/refuge island width, marking patterns, number of legs, and general condition. According to the San Francisco Municipal Transportation Authority, there are three types of crossing marking patterns, illustrated in Figure 3.12 below, which were used to classify existing crossings in the study area.

Figure 3.12: Crossing Marking Patterns



Source: SFMTA Crosswalk Guidelines, Page 15.

As indicated in Table 3.2, the distance between pedestrian crosswalks *across* Pine Hills Road varies from approximately 241 feet to 3,871 feet, averaging 1,059 feet (0.20 mile). The longest distance without either a pedestrian crossing or a midblock crosswalk is 3,871 feet (0.73 mile), between the midblock crossing north of Balboa Drive and the signalized crossing at Hernandes Drive. This high average spacing between pedestrian crosswalks along Pine Hills Road is one of the factors that may encourage pedestrians or bicyclists to cross the road outside of a marked crosswalk.

For a number of unsignalized intersections, the minor street approach did not have any crosswalks marked. These intersections are listed below:

- Sunray Drive
- Deauville Drive
- Sunniland Drive
- Spring Hill Drive
- White Heron Drive
- Palisades Drive
- Van Aken Drive
- Grandview Drive
- Fir Drive
- Bonnie Brae Circle

Two locations (Balboa Drive and the crossing north of Indialantic Drive) with ladder markings were identified as not meeting FDOT criteria for special emphasis markings since the gaps between markings did not meet standards.

Trails

In addition to sidewalks, bicycle lanes, and crosswalks, existing and planned regional trails that cross through the study area were also inventoried. Trails are multi-use paths that are used by runners, bicyclists and other non-motorized users.

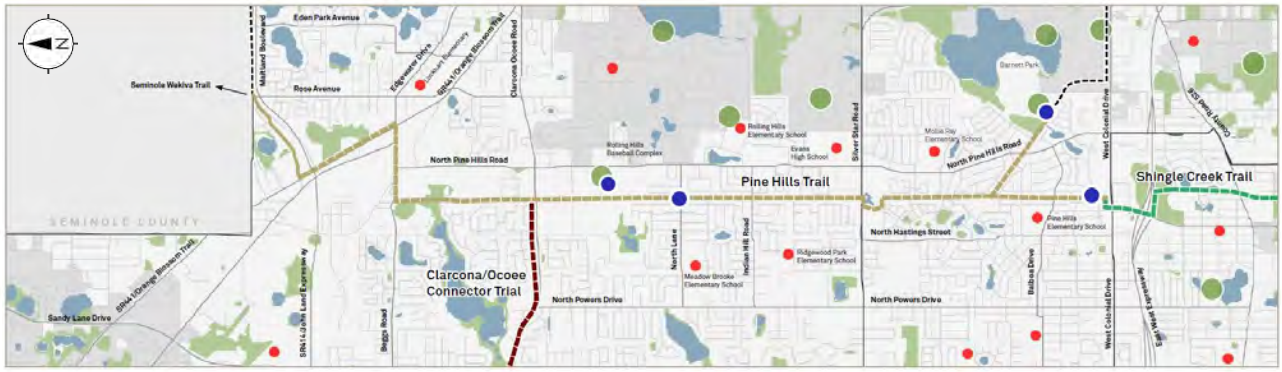
As part of the Orange County Trails Master Plan, the Pine Hills Trail is being constructed west of Pine Hills Road from Colonial Drive to Silver Star Road (Phase 1), as shown in

Figure 3.13. The second phase of the Pine Hills Trail will complete the 8.2 miles long trail (including an existing 0.7 mile section) north of Silver Star Road at a later date. The County is currently considering routing Phase 2 trail improvements along Pine Hills Trail north of Silver Star Road.

The trail primarily utilizes an existing Duke Energy power-line corridor in its alignment from Colonial Drive (SR 50) north to the Seminole Wekiva Trail at Rose Avenue. In addition to the connection to the Seminole Wekiva Trail and Seminole County's trail system, the intersection of Clarcona Ocoee Road provides a link west to the West Orange Trail (WOT) and Lake County's trail system.

A future spur from the Pine Hills Trail is proposed to extend easterly along Dolores Drive which will connect to Barnett Park. There are no existing crosswalks across Pine Hills Road at Dolores Drive for the proposed Pine Hills Trail spur, though there is an existing north-south crosswalk across Dolores Drive.

Figure 3.13: Pine Hills Trail



Source: Orange County Trails Master Plan, page 9 (2012).

Table 3.2: Crosswalk Locations along Pine Hills Road

#	Crosswalk Location (along Pine Hills Road)	Type	Across or Along Pine Hills Road	Crossing Type	Maximum Crossing Distance (ft.)	Distance to Previous E-W Crosswalk (ft.)	Distance to Nearest LYNX Bus Stop (ft.)	Median/ Refuge Island (width in ft.)	Marking Patterns and Legs	General Conditions
1	Colonial Drive (SR 50)	Signalized Intersection	Both	Pedestrian	134	0	185	None	Continental (4)	Fair
2	Alhambra Drive	Stop-Controlled Intersection	Along	None	56	N/A	115	None	Ladder (1-W)	Good
3	109 ft. N of Alhambra Drive	Uncontrolled Midblock Crossing	Across	Pedestrian	80	566	30	Raised (12)	Ladder	Fair
4	Balboa Drive	Signalized Intersection	Both	School	89	1,567	160	None	Ladder (4)	Good
5	405 ft. N of Balboa Drive	Uncontrolled Midblock Crossing	Across	Pedestrian	84	371	220	Raised (12)	Ladder	Fair
6	Dolores Drive	Stop-Controlled Intersection	Along	None	79	N/A	130	None	Continental (1–E)	Fair
7	Cortez Drive	Stop-Controlled Intersection	Along	None	54	N/A	330	None	Continental (1–E)	Worn
8	Elinore Drive	Stop-Controlled Intersection	Along	None	54	N/A	45	None	Transverse (1-W)	Worn
9	Ferdinand Drive	Stop-Controlled Intersection	Along	None	58	N/A	585	None	Transverse (1-W)	Worn
10	Golf Club Parkway	Stop-Controlled Intersection	Along	None	67	N/A	360	None	Continental (1-E) Transverse (1-W)	Worn
11	Hernandes Drive	Signalized Intersection	Both	School	88	3,871	110	None	Continental (2-N/S) Ladder (2-E/W)	Good (N/S), Fair (E/W)
12	Indialantic Drive	Stop-Controlled Intersection	Along	None	56	N/A	100	None	Continental (1-E) Transverse (1-W)	Worn
13	440 ft. N of Indialantic Drive	Uncontrolled Midblock Crossing	Across	Pedestrian	80	1,310	300	Raised (12)	Ladder	Fair
14	Figwood Lane	Stop-Controlled Intersection	Along	None	54	N/A	20	None	Continental (1-E)	Fair
15	160 ft. N of Figwood Lane	Uncontrolled Midblock Crossing	Across	Pedestrian	82	716	230	Raised (12)	Ladder	Fair
16	Silver Star Road (SR 438)	Signalized Intersection	Both	Pedestrian	124	780	500	None	Ladder (4)	Good
17	Belco Drive	Signalized Intersection	Both	School	82	787	10	None	Ladder (4)	Good (N/S), Fair (E), Worn (W)
18	375 ft. N of Belco Drive	Uncontrolled Midblock Crossing	Across	Pedestrian	60	917	100	Raised (12)	Ladder	Fair
19	Londonderry Blvd.	Signalized Intersection	Both	School	77	495	230	None	Ladder (3)	Fair
20	136 ft. N of Pines O' The Glen Way	Uncontrolled Midblock Crossing	Across	Pedestrian	62	388	50	Raised (12)	Ladder	Fair
21	Champagne Circle	Stop-Controlled Intersection	Along	None	60	N/A	475	None	Transverse (1-W)	Good
22	Indian Hill Road	Signalized Intersection	Both	School	64	1,338	85	None	Ladder (1-W) Continental (1-N)	Good
23	North Lane	Signalized Intersection	Both	School	73	2,541	10	None	Ladder (1-E) Continental (3-N/W/S)	Good
24	Bonnie Brae Circle	Uncontrolled Midblock Crossing	Across	Pedestrian	67	241	350	Raised (12)	Ladder	Fair

3.5.3 Vehicle Gap Size Study

As part of the existing conditions analysis, a vehicle gap size study was conducted to determine the size and the number of gaps in the vehicular traffic stream for pedestrians crossing Pine Hills Road. In order for pedestrians to utilize midblock crossings or attempt to cross Pine Hills Road at undesignated locations, a certain vehicle gap size should be available. Vehicle gap studies were conducted at two (2) locations along Pine Hills Road during the AM and PM peak hours.

Two scenarios were considered for the gap studies with the first consisting of pedestrians crossing half the roadway, then pausing in the two-way center turn lane for a gap, and then crossing the remainder of the roadway. The second scenario allows pedestrians to cross all of the road at one time.

For the first scenario, the vehicle gap sizes were tabulated separately in the northbound and southbound directions. A conservative walking speed of 3.0 feet per second (fps) was use which is lower than the average walking speed of 3.5 fps. For the roadway section near Dolores Road, where the crossing distance is 32 feet to the center turn lane refuge, the minimum gap interval was calculated to be 14 seconds (32 feet/3.0 fps + 3 second reaction time). The number of simultaneous gaps that occurred across two lanes, and in each direction of the traffic stream, which were greater than 14 seconds were tabulated.

Similarly for the roadway section near Grandview Drive, the crossing distance is 24 feet to the center two-way center turn lane (TWCTL) and the minimum gap interval was calculated to be 11 seconds (24 feet/3.0 fps + 3 second reaction time). The number of simultaneous gaps that occurred across two lanes, and in each direction of the traffic stream, which were greater than 11 seconds were tabulated. The summary of the AM peak hour and PM peak hour gaps greater than or equal to 14 seconds and 11 seconds respectively is provided in Table 3.3 and Table 3.4.

For the second scenario, vehicle gap sizes using the full width of pavement with no intermediate stop at the median were tabulated. The full width of pavement for Dolores Road area segment is 81 feet, while the width for the Grandview Drive area segment is 60 feet. The minimum gap size was calculated to be 30 seconds (81 feet/3.0 fps + 3 sec reaction time) and 23 seconds (60 feet/3.0 fps + 3 sec reaction time) respectively. The number of simultaneous gaps exceeding these thresholds, across all travel lanes on Pine Hills Road, was much less than the first scenario, and is also included in Table 3.3 and Table 3.4.

Table 3.3: AM Gap-Size Study Summary

Location at Pine Hills Road	Time Period	Distance to Cross TWCTL	Seconds to Cross to TWCTL	Number of Gaps Available		Distance to Cross Full Roadway	Seconds to Cross Full Roadway	Number of Gaps Available
				NB	SB			Full Roadway
Dolores Drive	7:00 AM – 9:00 AM	32	14	59	21	81	30	0
Grandview Drive	7:00 AM – 9:00 AM	24	11	120	53	60	23	0

Table 3.4: PM Gap-Size Study Summary

Location at Pine Hills Road	Time Period	Distance to Cross TWCTL	Seconds to Cross to TWCTL	Number of Gaps Available		Distance to Cross Full Roadway	Seconds to Cross Full Roadway	Number of Gaps Available
				NB	SB			Full Roadway
Dolores Road	4:00 PM – 6:00 PM	32	14	91	55	81	30	0
Grandview Drive	4:00 PM – 6:00 PM	24	11	77	56	60	23	1

3.6 Signage, Markings, Design, & School Zones

This section summarizes the signage and pavement markings along the corridor.

3.6.1 Signage for Pedestrians, Bicyclists and at School Crossings

The pedestrian, bicycle, and school crossing signage along the corridor is illustrated in Figures 3.14 through 3.18. There are 15 marked pedestrian crosswalks across Pine Hills Road. A summary of the signage along the corridor includes the following:

- Seven crosswalk legs are at midblock crosswalks
- Twenty-nine crosswalk legs are at signalized intersections
- Six crosswalks are signed with school crossing signs
- Thirteen crosswalks are signed with pedestrian crossing signs
- There are no pedestrian warning signs at or ahead of the Colonial Drive (SR 50) intersection or the Silver Star Road (SR 438) intersection.

Most of the school pedestrian crosswalk warning signs (S1-1 and W11-2, respectively) are supplemented by downward diagonal arrow plaques (W16-7) and have advance school and pedestrian crosswalk warning signs which are supplemented with “Ahead” (W-15-9p) plaques. It was noted that the W16-7 signs were missing for the north leg crosswalk at Londonderry Boulevard.

3.6.2 School Crossing Areas (Begin and End Points)

School crosswalks are present at Balboa Drive, Hernandes Drive, Belco Drive (Evans High School access), Londonderry Boulevard, Indian Hill Road, and North Lane, as illustrated in Figures 3.14 through 3.18. All of the school crossings have school pavement markings and school ahead signs, however there are no signed school zones along Pine Hills Road with reduced speed limits.

Schools that exist along or in the vicinity of Pine Hills Road include:

- Mollie E. Ray Elementary, Hernandes Drive to the east of Pine Hills Road
- Pine Hills Elementary, Balboa Drive to the west of Pine Hills Road
- Rolling Hills Elementary, Donovan Street to the east of Pine Hills Road
- Ridgewood Park Elementary, Pioneer Road to the west of Pine Hills Road
- Meadowbrook Middle School, North Lane to the west of Pine Hills Road
- Maynard Evans High School, Pine Hills Road north of Silver Star Road (SR 438)
- Robinswood Middle School, Vernon Street west of Pine Hills Road
- St. Andrews Catholic School, N. Hastings Street west of Pine Hills Road

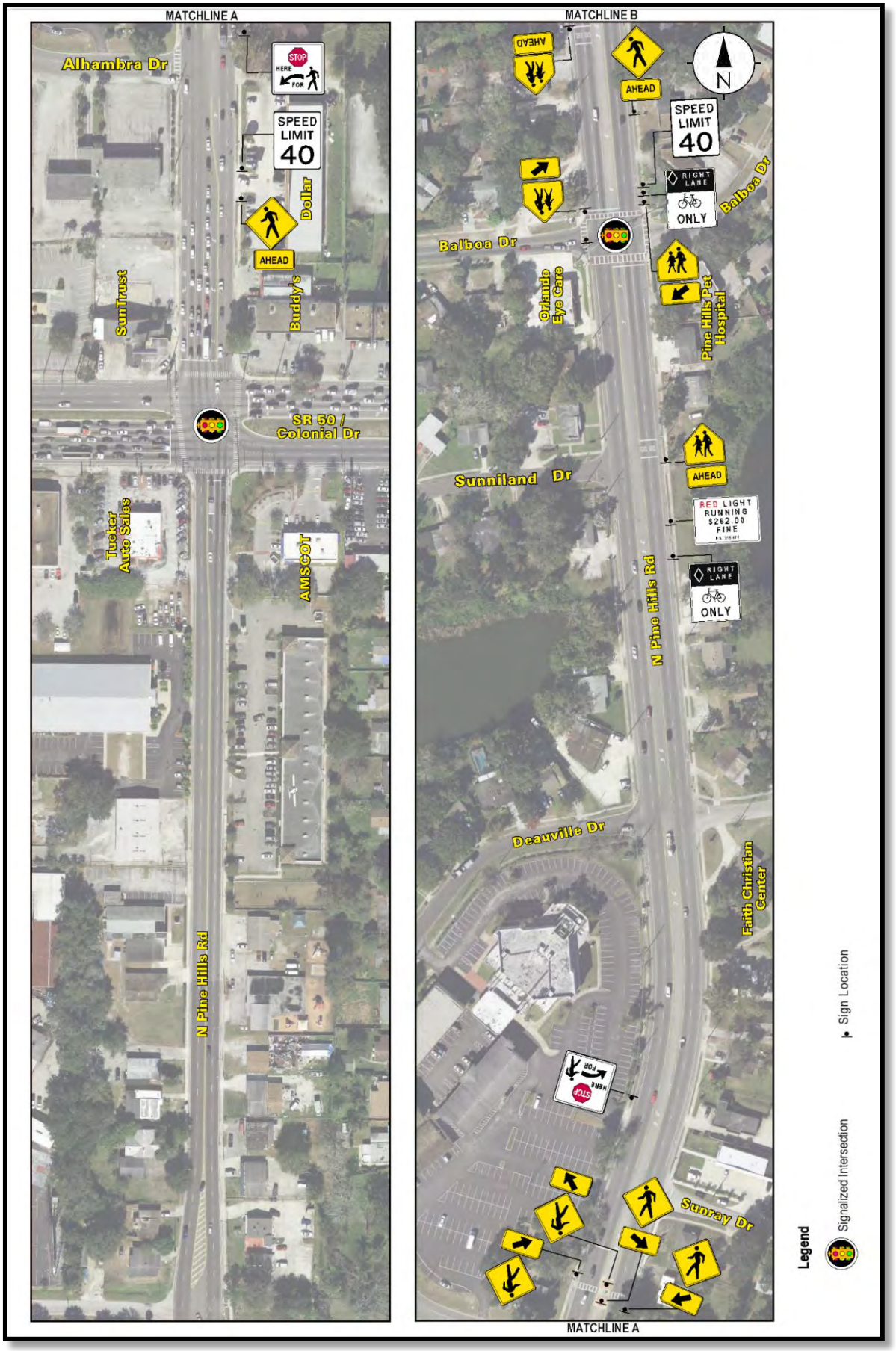


Figure 3.14

Signage and Markings
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

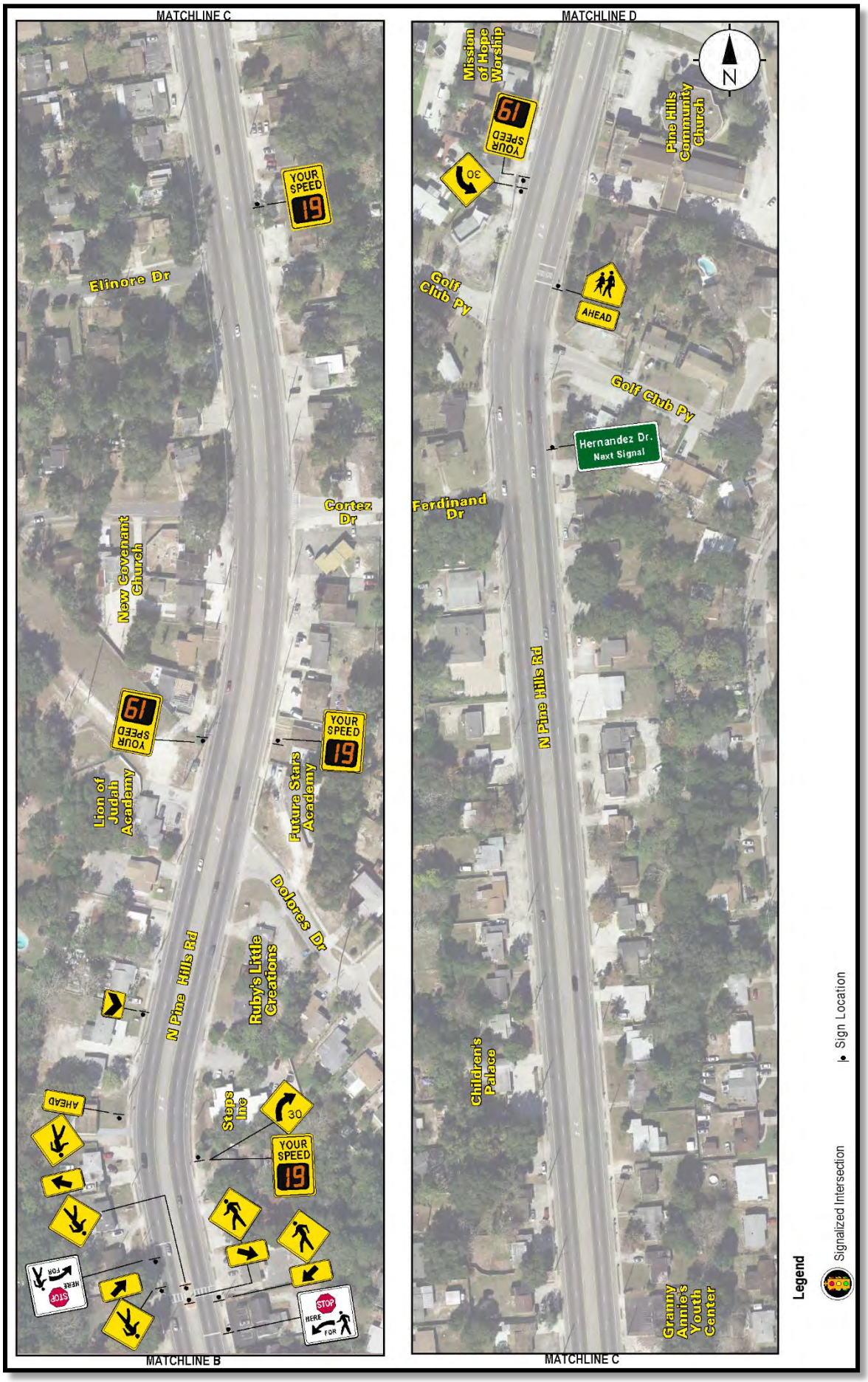


Figure 3.15
Signage and Markings
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

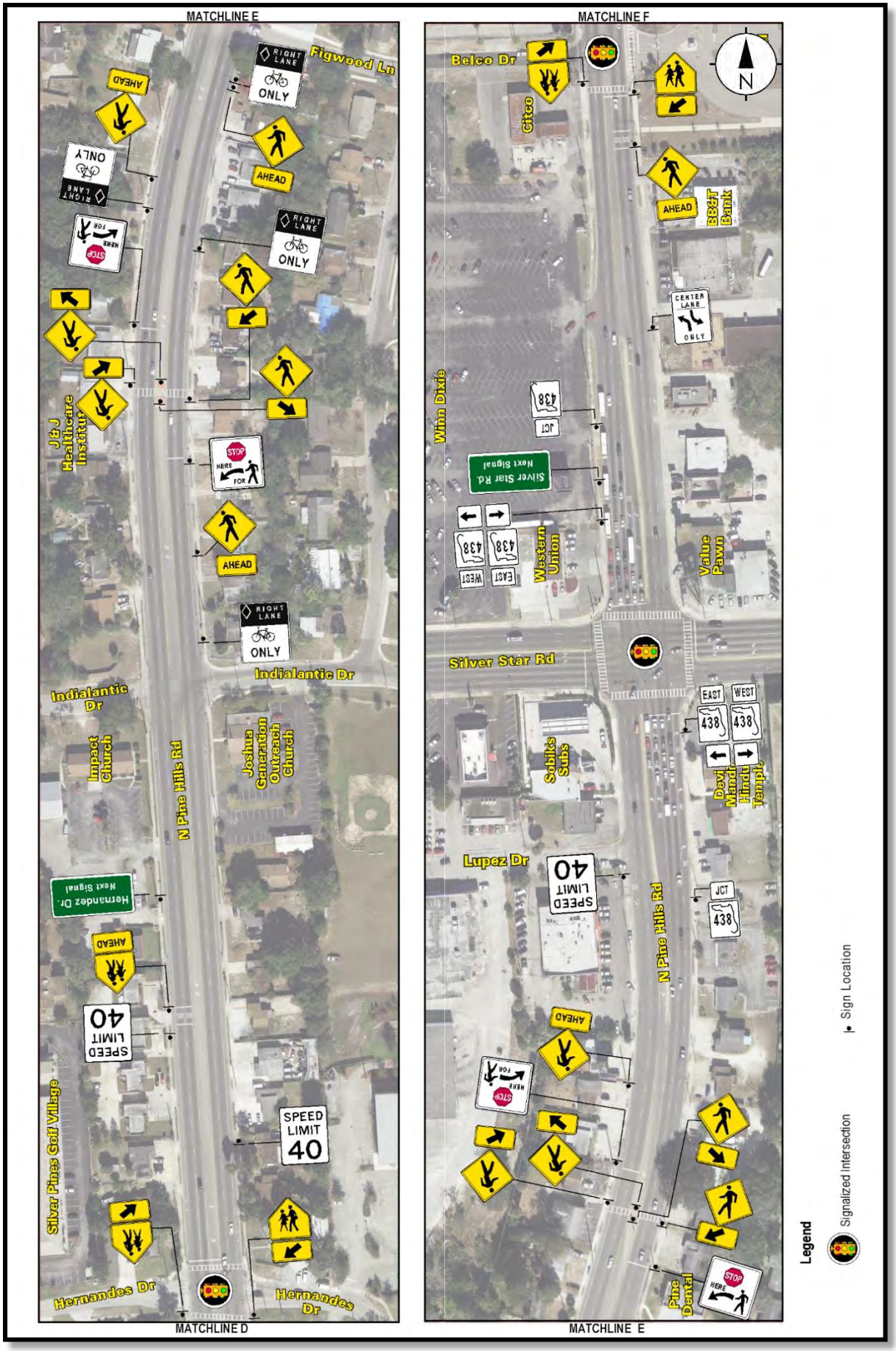


Figure 3.16
Signage and Markings
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

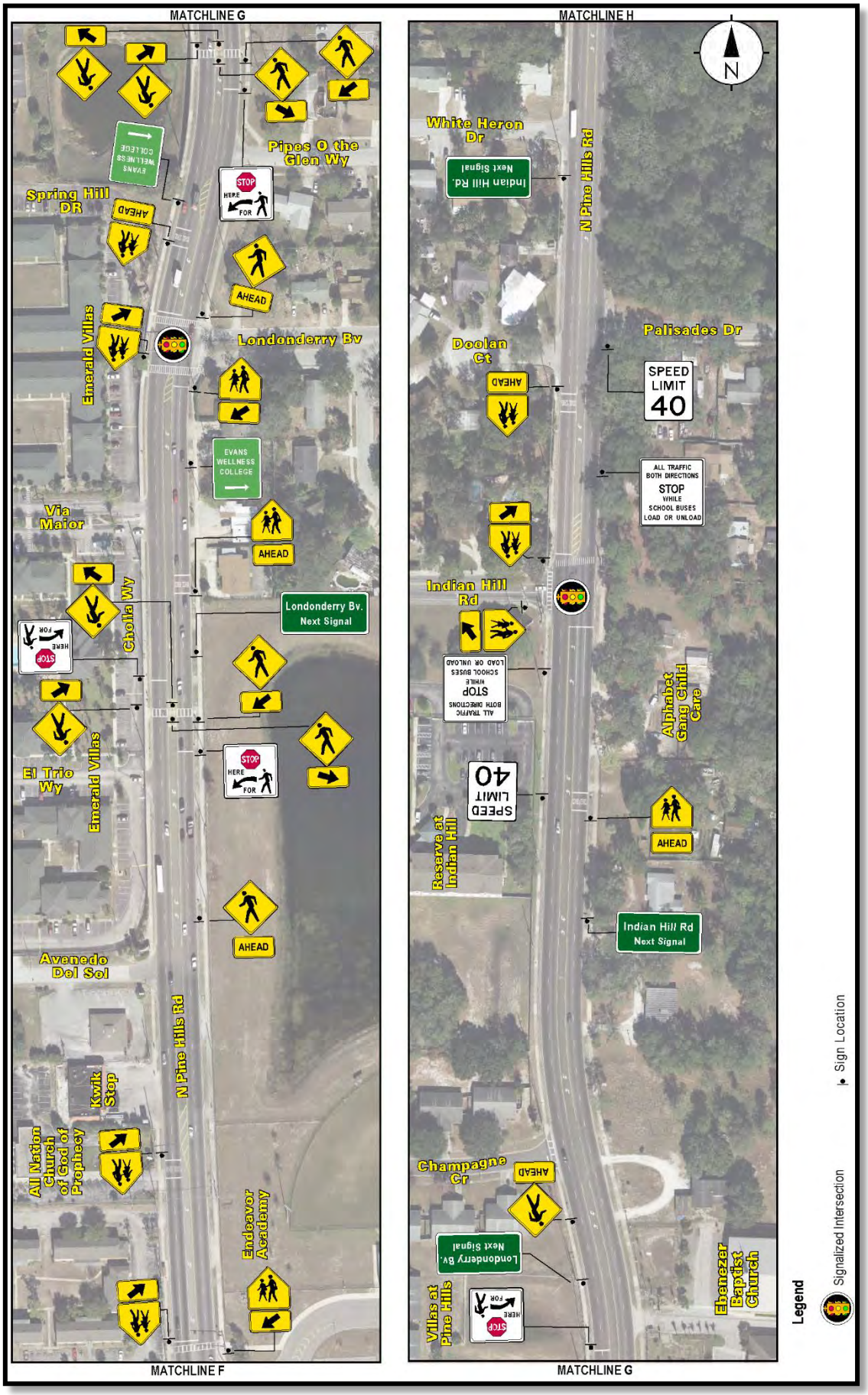


Figure 3.17
Signage and Markings
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

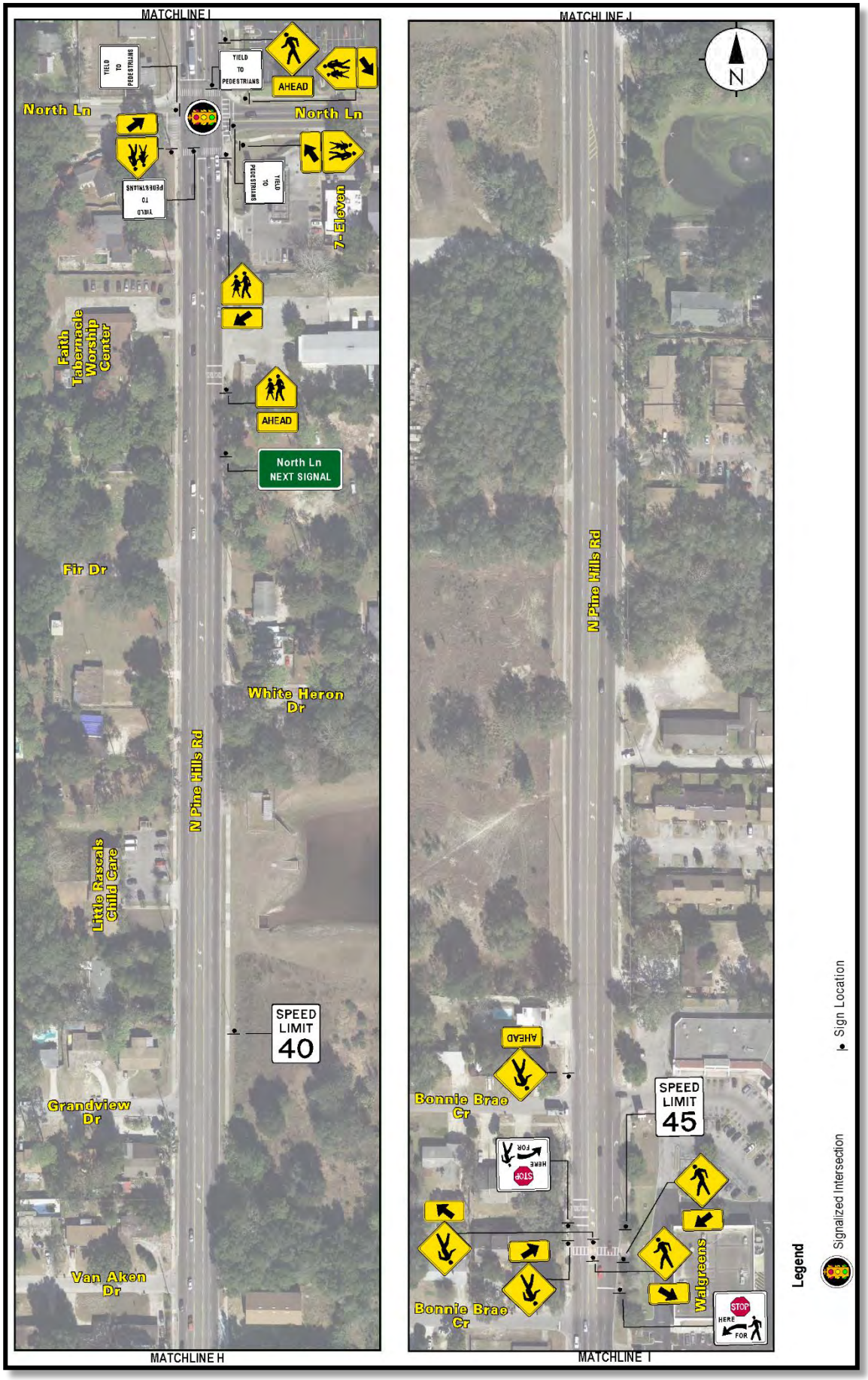


Figure 3.18
Signage and Markings
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

3.7 Spot Speed Study

The posted speed limit is 40 mph for the entire corridor. To analyze existing travel speeds along the corridor, spot speed studies were performed to collect speed data. Spot speed studies were conducted for a 24-hour period at three different locations along the Pine Hills Road corridor: south of Indian Hill Road, and north and south of Balboa Drive. The locations were selected based upon crash history, sections where drivers would not be constrained from speeding, areas prime for pedestrians and bicyclists crossing mid-block, and the lack of an adjacent traffic signal that could result in platooning of vehicles.

The studies were performed utilizing MetroCount tube counters and analyzed using the methods prescribed in the Manual on Uniform Traffic Studies (MUTS) and the FDOT Manual on Speed Zoning for Highways, Roads and Streets. Several statistical measures are used to determine the basis for establishing the regulatory speed limit on a roadway, including the following:

- 85th Percentile Speed: The speed at which 85% of the free flowing vehicles are traveling along the road.
- 50th Percentile Speed or Mean Speed: The speed at which 50% of the free flowing vehicles are traveling along the road.
- Pace: A 10-mph range that includes the highest number of vehicles observed 35-45 miles per hour

Generally, the 85th percentile speed and the 10 miles per hour (mph) pace represent the speed range recorded by the highest number of vehicles along the corridor, which can serve as the basis for setting the posted speed limit on a road segment. Table 3.5 includes a summary of the spot speed studies.

Table 3.5: Spot Speed Study Summary

LOC ID	Location (Posted Speed)	Direction	85th Percentile Speed (mph)	50th Percentile Speed (mph)	Pace (mph)
65	Pine Hills Road S of Indian Hill Road (40 mph)	NB	47.1	41.6	35 – 45
		SB	47.5	42.0	35 – 45
		Combined	47.3	41.8	35 – 45
66	Pine Hills Road S of Balboa Drive Crosswalk (40 mph)	NB	47.3	39.8	35 – 45
		SB	47.0	39.0	35 – 45
		Combined	47.1	39.5	35 – 45
67	Pine Hills Road N of Balboa Drive Crosswalk (40 mph)	NB	46.6	41.5	35 – 45
		SB	49.8	44.0	40 – 50
		Combined	48.2	42.3	35 – 45

The 85th percentile speed data revealed that northbound and southbound traffic travel above the posted speed limit at all of the studied locations. The 50th percentile speed data indicates that 50% of the traffic is traveling at or just over the speed limit. The 10 mph pace data shows that the majority of vehicles traveled with a speed in the range of 35 mph and 45 mph. In addition, more than half of the 10 mph pace vehicles exceeded the posted speed limit. Overall, the speed data indicate that much of the traffic along Pine Hills Road are traveling at or near the posted speed limit.

3.8 Lighting

Street lighting and pedestrian lighting were evaluated along the corridor. Conventional High Pressure Sodium (HPS) street lighting is present along both sides of Pine Hills Road throughout the project.

3.8.1 Luminosity Measurements

Luminosity measurements were conducted along the corridor on January 12th, 2017, between the hours of 11:00 pm and 4:00 am, in accordance with the 2017 Florida Plans Preparation Manual (PPM). Luminosity measurements were taken at signalized intersection crosswalks, pedestrian midblock crossings, and transit stops along the corridor. At each signalized intersection, the standard horizontal illumination level average initial foot candle (H.F.C.) value is 3.0. Lighting at all the signalized intersection crosswalks do not meet FDOT standards. Illuminance levels for each intersection are illustrated in Table 3.6 and Figures 3.19 through 3.25.

Table 3.6: Summary of Luminosity Measurements at Signalized Intersections

Signalized Intersection	Measured H.F.C.				Standard H.F.C.
	Northbound	Eastbound	Southbound	Westbound	
Balboa Dr.	0.1 - 0.4	0.4 - 2.5	1.1 - 3.7	1.1 - 3.7	3.0
Hernandes Dr.	0.2 - 3.1	0.2 - 4.5	0.0 - 1.4	0.0 - 3.1	3.0
Silver Star Road (SR 438)	0.2 - 2.5	0.4 - 2.5	0.3 - 1.5	0.8 - 1.5	3.0
Belco Dr.	0.1 - 0.5	0.1 - 0.2	0.0 - 0.2	0.1 - 0.5	3.0
Londonderry Blvd.	0.2 - 0.4	0.2 - 1.3	0.2 - 0.7	N/A	3.0
Indian Hill Road	N/A	0.1 - 0.2	0.0 - 0.2	N/A	3.0
North Lane	0.1 - 0.4	0.1 - 0.2	0.1 - 0.2	0.1 - 0.4	3.0
Note: Standard Horizontal Illumination Level (H.F.C.) is based on the 2017 FDOT PPM.					

At each midblock crossing, the standard vertical illumination level average initial foot candle (V.F.C.) value is 3.0. All seven of the midblock crossings failed to meet the standard. Illuminance levels for each midblock crossing are illustrated in Table 3.7 and Figure 3.26.

Table 3.7: Summary of Luminosity Measurements at Midblock Crossings

Midblock Crossing	Measured V.F.C.			Standard V.F.C.
	Southbound	Median	Northbound	
Midblock #1 – North of SR 50	0.1	0.3	0.1	3.0
Midblock #2 – North of Balboa Dr.	0.0	0.0	0.1	3.0
Midblock #3 – North of Indialantic Dr.	0.3	0.0	0.0	3.0
Midblock #4 – North of Figwood Ln.	0.2	0.3	0.0	3.0
Midblock #5 – North of El Trio Way	0.1	0.3	0.1	3.0
Midblock #6 – North of Londonderry Blvd.	0.5	0.2	0.1	3.0
Midblock #7 – North of Bonnie Brae Cir.	0.1	0.8	0.3	3.0
Note: Standard Vertical Illumination Level (V.F.C.) is based on the 2017 FDOT PPM.				

In terms of lighting at transit stops, the FDOT PPM does not provide minimum standards for lighting at bus stops; therefore, a standard H.F.C. value of 2.0 was assumed. Only four of the stops and seven of southbound stops were found to have sufficient lighting conditions. It should be noted that 27 stops had no lighting provided by the transit agency. The Accessing Transit Design Handbook for Florida Bus Passenger Facilities states that "when lighting at the stop is not provided by the transit agency at night, local stops without shelter should be located within 30 feet of overhead light source." Based on this requirement, there are fifteen transit stops that are non-compliant, exceeding 30 feet to the nearest overhead light source. Illuminance levels for each transit stop are displayed in Table 3.8.

Table 3.8: Summary of Luminosity Measurements at Bus Stops

Northbound		Southbound		Standard
Transit Stop #	Measured H.F.C.	Transit Stop #	Measured H.F.C.	H.F.C.
1	4.7*	15	2.8*	2.0
2	4.2**	16	0.0**	2.0
3	4.1**	17	0.4**	2.0
4	0.3*	18	0.0**	2.0
5	3.4**	19	6.2*	2.0
6	1.6*	20	0.0**	2.0
7	0.9*	21	6.6*	2.0
8	0.2*	22	5.5*	2.0
9	0.0**	23	0.3**	2.0
10	0.0**	24	0.1**	2.0
11	0.0**	25	7.8*	2.0
12	0.0**	26	2.8*	2.0
13	0.0**	27	2.7*	2.0
14	1.1	28	0.2	2.0
		29	0.0**	2.0

* = No lighting present at transit stop.
** = No lighting present at transit stop, and nearest light source farther than 30 feet.

Figure 3.19

Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

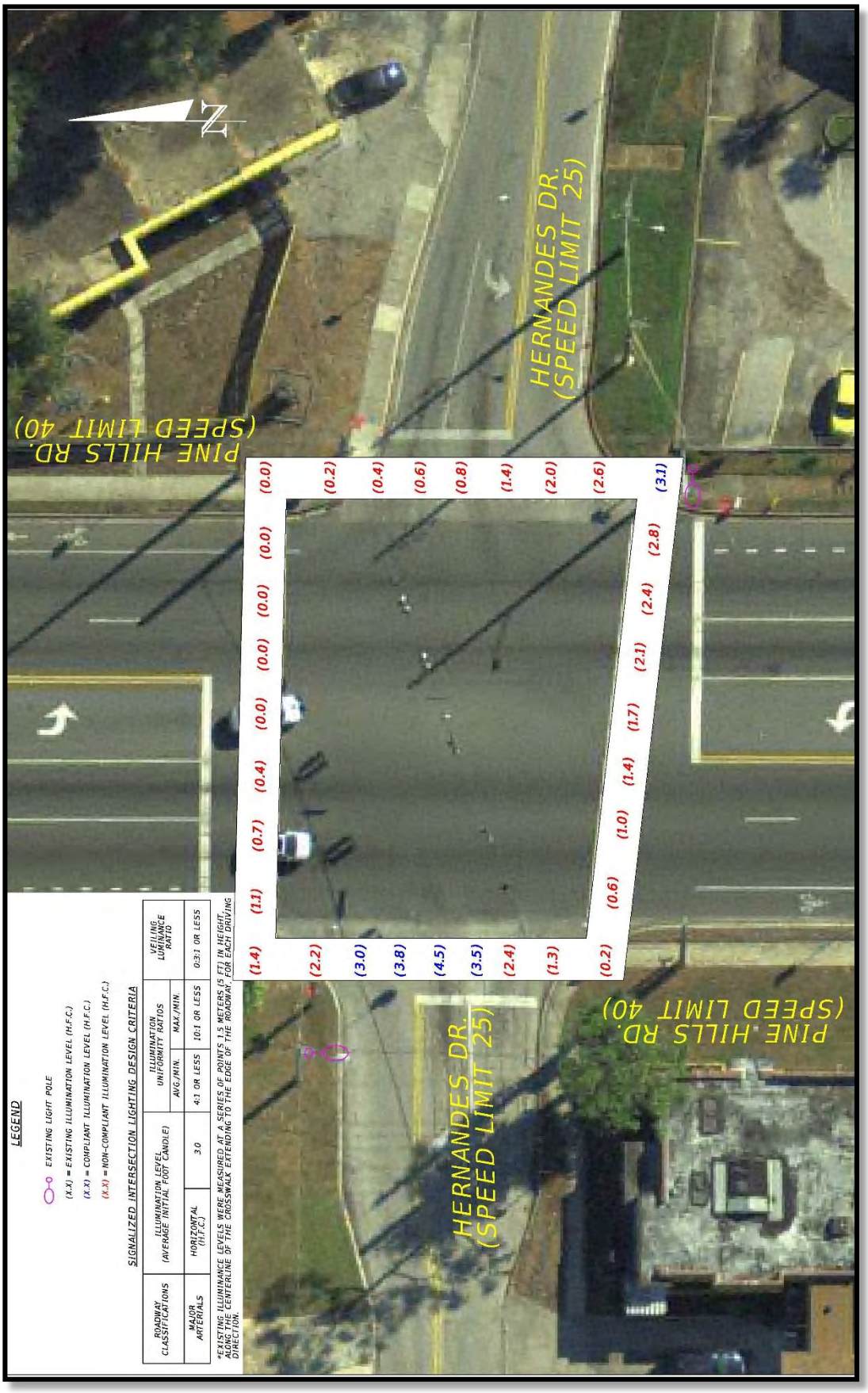


Figure 3.20
Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

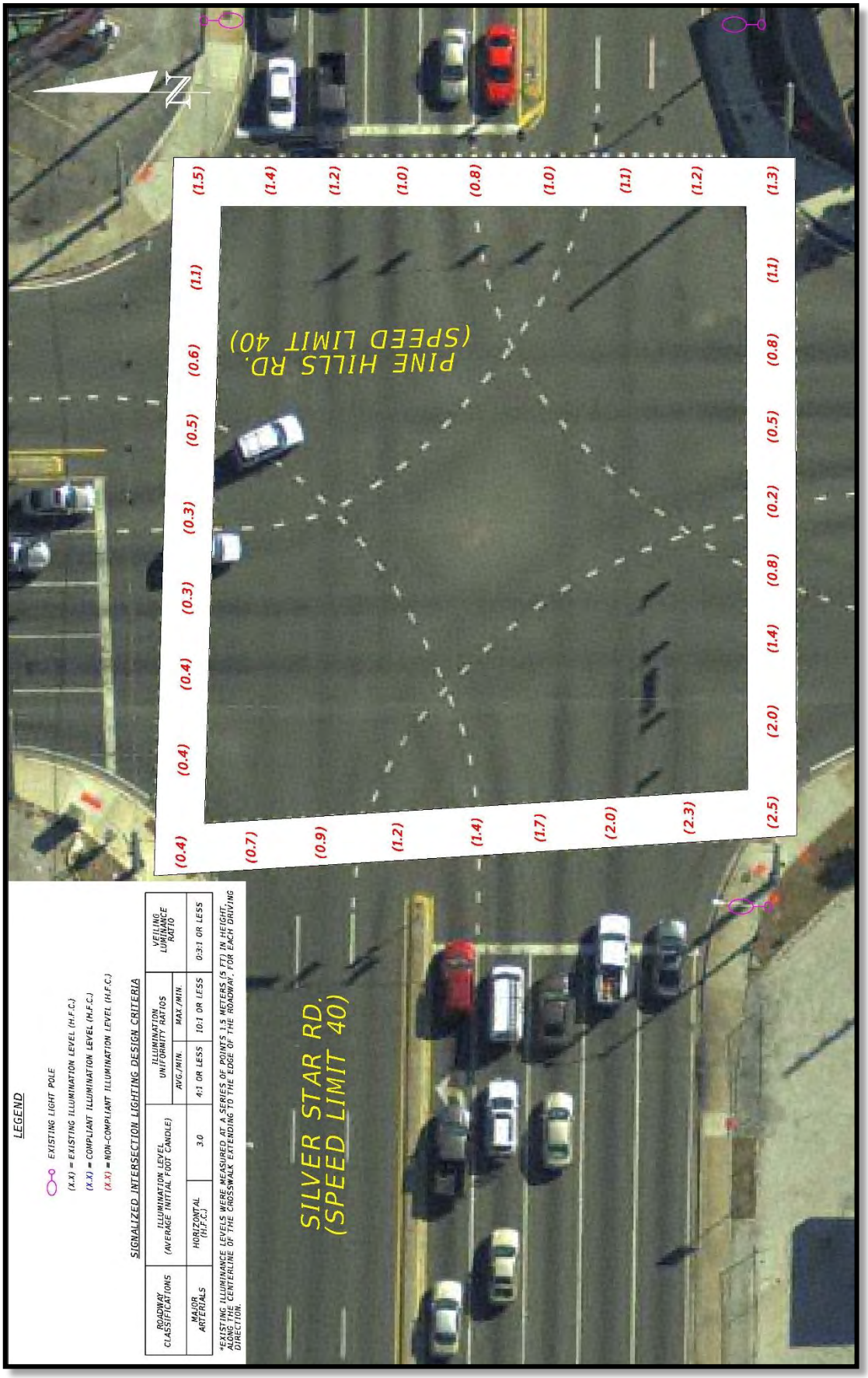


Figure 3.21
Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.22

Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.23

Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.24

Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.25

Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

MIDBLOCK CROSSWALK LIGHTING DESIGN CRITERIA

AMBIENT LUMINANCE	VERTICAL ILLUMINATION LEVEL AVERAGE INITIAL FOOT CANDLE (V.F.C.)
MEDIUM & HIGH	3.0

*EXISTING ILLUMINANCE LEVELS WERE MEASURED AT A SERIES OF POINTS 1.5 METERS (5 FT) IN HEIGHT, ALONG THE CENTERLINE OF THE CROSSWALK EXTENDING TO THE EDGE OF THE ROADWAY, FOR EACH DRIVING DIRECTION.

Figure 3.26
Midblock Crossing Luminosity Levels
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

3.9 Transit Service and Infrastructure

The Central Florida Regional Transportation Authority (LYNX) provides transit service to Orange, Seminole, and Osceola counties.

3.9.1 Overview of LYNX

LYNX's service area covers more than 2,500 square miles extending through Orange, Seminole and Osceola Counties and serving over 1.8 million residents. LYNX also offers shuttle service to special events; commuter assistance with vanpools and carpools; special door-to-door transportation for customers who cannot use the regular bus service; and special fares for students, physically and mentally challenged customers and riders aged 65 and older. Throughout Orange, Seminole, Osceola, Lake, and Polk counties, there are 4,402 bus stops available from which 3,334 bus stops are located in Orange County. A total number of 1,108 Active Shelters are provided from which 771 shelters are located in Orange County.

The following sections summarize the transit service, ridership and infrastructure along the corridor.

3.9.2 Transit Service

There are four LYNX routes that serve Pine Hills Road between Colonial Drive (SR 50) and Bonnie Brae Drive, including Routes 49, 301, 302, and 613 (illustrated in Figure 3.27). There are other LYNX routes that intersect the study area but do not travel along Pine Hills Road, including Routes 9, 48, 105, 125, and 443. The following is a description of the four LYNX routes serving the study area:

- *Route 49 (Colonial Drive/Pine Hills)* – This route begins at LYNX Central Station, serving the Central Florida Fairgrounds, Pine Hills, Evans High School, Meadowbrook, North Lane, Rolling Hills, Silver Hills Center, and the Department of Children and Families.
- *Route 301 (Pine Hills/Animal Kingdom)* - This route begins at Walt Disney World's Animal Kingdom, serving several Disney hotels and theme parks, and serves Conroy/Vineland, Kirkman Road, Pine Hills Road, and Silver Star Road.
- *Route 302 (Rosemont/Magic Kingdom)* - This route begins at Walt Disney World's Magic Kingdom, serving several Disney hotels and theme parks, and serves Kirkman Road, Ivey Lane, Mercy Drive, Pine Hills Road, and Rosemont.
- *Route 613 (NeighborLink 613 – Pine Hills Neighborhood Link)* - This route is based out of the West Oaks Mall bus transfer area, and provides on-demand service within the Pine Hills area (bordered by the West Oaks Mall, Silver Star Road, Pine Hills Road, and Colonial Drive (SR 50)).

LYNX service in the study area is provided on weekdays, Saturdays, and Sundays/Holidays. The earliest route begins at 4:30 AM and the latest route ends at 12:45 AM. Frequencies vary by route, time of day, and day of the week. Table 3.9 presents the span of service, frequency, and ridership for each of the routes in the study area. The frequencies presented in the table represents the typical range for the service.

Table 3.9: LYNX Routes Summary

Route	Route Description	Span of Service	Service Frequency	Annual Ridership (FY 2016)
49	Colonial Drive/ Pine Hills	4:30 am – 12:45 am (Weekday) 6:00 am – 11:00 pm (Saturday) 6:15 am – 9:00 pm (Sunday)	30 - 60 min	589,992
301	Pine Hills/Animal Kingdom	6:00 am – 6:30 pm	Every 3 hours	60,532
302	Rosemont/Magic Kingdom	6:00 am – 6:30 pm	Every 3 hours	53,488
613	NeighborLink 613 – Pine Hills Neighborhood Link	6:00 am – 7:30 pm (Weekday) 6:00 am – 7:30 pm (Saturday)	On Demand	13,784

3.9.3 Transit Stops and Location Analysis

There are 33 transit stops along Pine Hills Road to accommodate the LYNX routes servicing the area. The average daily ridership along the corridor is based on the latest four-month service period, from December 2015 to April 2016. The boarding and alighting information is an average daily estimate based on sampled ridership data during the last service changes (bid) period, which occurs three times per year. The corridor ridership summary and features for each of the bus stops along the corridor is listed in Table 3.10 and illustrated in Figure 3.28.

The average distance from an existing LYNX bus stop to a designated pedestrian crossing across Pine Hills Road (at a signalized intersection or midblock crossing) is 495 feet. The shortest distance between a bus stop and a crossing is 10 feet (Stop #10 located just north of the Belco Drive intersection) and the longest distance between a bus stop and a crossing is 2,300 feet (Stop #6 located south of Ferdinand Drive).

There are four LYNX bus stops that are more than 1,000 feet from a designated pedestrian crossing across Pine Hills Road (Stops #5, #6, #21, and #22) that are all located within the segment of Pine Hills Road between Hernandes Drive and the midblock crossing 405 feet north of Balboa Drive. Future efforts will evaluate whether bus stops should be relocated, consolidated, or new pedestrian crossings added to serve existing bust stops.

3.9.4 Transit Stop Infrastructure

A review was performed using current aerial footage and LYNX data to assess the bus stop infrastructure within the study area. Amenities for existing transit stops may include availability of landing pad, shelter, seating, and lighting. Table 3.11 presents the transit infrastructure at each stop location, with corresponding stop numbers found in Figure 3.27 and 3.28.

Out of the 33 LYNX bus stops within the study area, only five stops have landing pads (15 percent), which provide a connection from the sidewalk to bus doors. Over half of the LYNX bus stops within the study area have seating (58 percent) and over half have lighting (52 percent). There is only one stop, #28, which has a landing pad, shelter, seating, and lighting. There are five stops that do not have any of the above infrastructure elements, and merely consist of a sign.

Table 3.10: LYNX Existing Bus Stop Ridership Summary

No.[1]	Location	LYNX Bus Stop ID	Avg. Daily On	Avg. Daily Off	Total	Routes	Shelter
Northbound Direction							
1	N of Colonial Drive	2065	81	51	132	49, 301	No
2	S of Deauville Drive	2066	7	10	17	49, 301	No
3	N of Balboa Drive	2758	6	14	20	49, 301	No
4	N of Dolores Drive	2759	12	37	49	49, 301	No
5	N of Elinore Drive	2760	0	0	0	49, 301	No
6	S of Ferdinand Drive	2761	1	7	8	49, 301	No
7	S of Hernandes Drive	2762	8	36	44	49, 301	No
8	N of Indialantic Drive	2763	2	29	31	49, 301	No
9	S of Figwood Lane	2764	6	86	92	49, 301	No
10	N of Belco Drive	2081	46	64	110	49, 302	No
11	S of Via Maior	2082	4	24	28	49, 302	No
12	N of Pipes O the Glen Way	2083	4	17	21	49, 302	No
13	S of Indian Hill Road	2765	0	0	0	49, 302	No
14	N of Van Aken Drive	2766	0	1	1	302	No
15	S of White Heron Drive	2767	0	0	0	302	No
16	S of North Lane	2768	0	2	2	302	Available
Southbound Direction							
17	N of Alhambra Drive	2113	7	61	68	49, 301	No
18	S of Deauville Drive	2112	7	6	13	49, 301	Available
19	N of Sunniland Drive	2111	14	7	21	49, 301	No
20	S of Dolores Drive	2920	29	9	38	49, 301	Available
21	N of Elinore Drive	6014	21	5	26	49, 301	No
22	S of Ferdinand Drive	2110	4	3	7	49, 301	No
23	S of Hernandes Drive	2109	44	11	55	49, 301	No
24	S of Indialantic Drive	2108	37	4	41	49, 301	No
25	S of Figwood Lane	2107	10	1	11	49, 301	No
26	S of Lupez Drive	2106	84	6	90	49, 301	No
27	S of Belco Drive	2105	49	14	63	49, 302	No
28	N of Belco Drive	9166	16	19	35	49, 302	Available
29	N of El Trio Way	2103	10	1	11	49, 302	No
30	S of Pipes O the Glen Way	2102	5	3	8	49, 302	No
31	S of Indian Hill Road	2101	18	2	20	49, 302	No
32	N of Van Aken Drive	2100	14	4	19	49, 302	No
33	N of Fir Drive	2099	13	3	16	49, 302	No

[1] *Refer to stop locations on Figures 3.27 and 3.28.*

Table 3.11: LYNX Existing Bus Stop Features

No.[1]	Location	Approximate Distance to Nearest Crosswalk across Pine Hills Road (ft)	Landing Pad	Shelter	Seating	Lighting	LYNX Condition Index[2]
Northbound Direction							
1	N of Colonial Drive	200	No	No	Available	Available	47
2	S of Deauville Drive	700	No	No	No	Available	47
3	N of Balboa Drive	170	No	No	No	Available	47
4	N of Dolores Drive	830	No	No	No	No	47
5	N of Elinore Drive	2,300	No	No	No	Available	47
6	S of Ferdinand Drive	1,390	Available	No	No	Available	75
7	S of Hernandes Drive	100	No	No	Available	Available	47
8	N of Indialantic Drive	300	No	No	No	Available	47
9	S of Figwood Lane	220	No	No	No	Available	47
10	N of Belco Drive	10	No	No	Available	No	47
11	S of Via Maior	230	No	No	No	No	47
12	N of Pipes O the Glen Way	50	No	No	Available	No	47
13	S of Indian Hill Road	90	No	No	Available	No	47
14	N of Van Aken Drive	890	No	No	Available	No	47
15	S of White Heron Drive	870	No	No	Available	Available	47
16	S of North Lane	10	No	Available	Available	Available	75
Southbound Direction							
17	N of Alhambra Drive	40	No	No	No	Available	47
18	S of Deauville Drive	690	Available	Available	Available	No	75
19	N of Sunniland Drive	250	No	No	Available	No	47
20	S of Dolores Drive	720	Available	Available	Available	Available	75
21	N of Elinore Drive	1,590	No	No	Available	Available	47
22	S of Ferdinand Drive	1,350	No	No	No	No	47
23	S of Hernandes Drive	280	No	No	Available	No	47
24	S of Indialantic Drive	590	No	No	No	No	47
25	S of Figwood Lane	310	No	No	No	Available	47
26	S of Lupez Drive	260	Available	No	No	Available	75
27	S of Belco Drive	190	No	No	Available	No	47
28	N of Belco Drive	70	Available	Available	Available	Available	75
29	N of El Trio Way	100	No	No	Available	Available	47
30	S of Pipes O the Glen Way	160	No	No	No	No	69
31	S of Indian Hill Road	110	No	No	Available	No	47
32	N of Van Aken Drive	730	No	No	Available	No	47
33	N of Fir Drive	560	No	No	Available	No	47

[2] The LYNX Condition Index in the bus stop data represents a calculation of accessibility ranging from 25 – 75, 25 would be a low level of accessibility and 75 would be the highest level of accessibility. Accessibility is calculated based on the following site amenities/conditions: Landing Area Present, Landing Area Hard Surface, Problems with Landing Area, Wheelchair Obstacles, Sidewalk/Street Connected, Sidewalk more than 3' Wide, Good Sidewalk Condition, Curb Cuts Available, and Landing Area Flush w/ Curb.

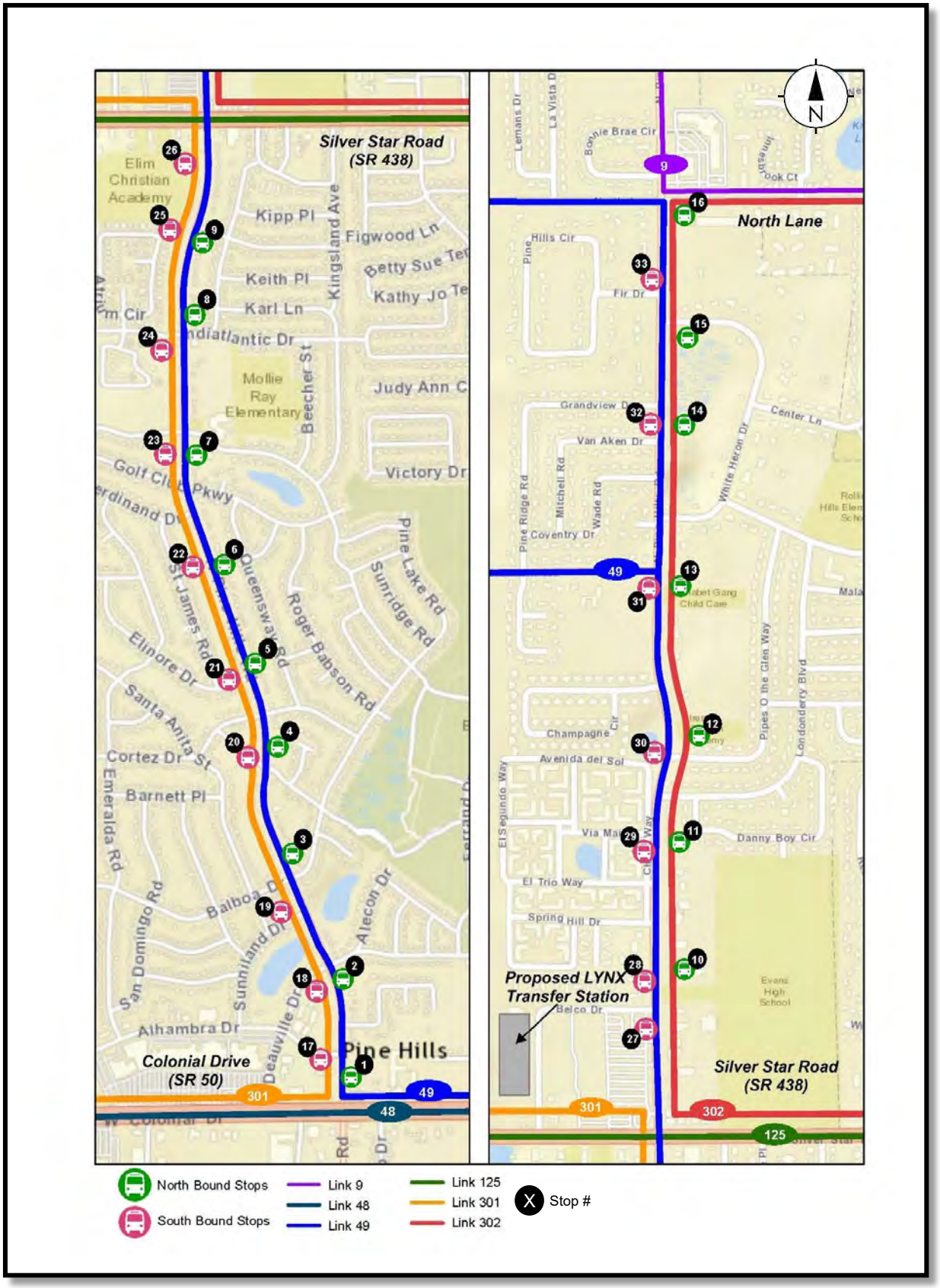
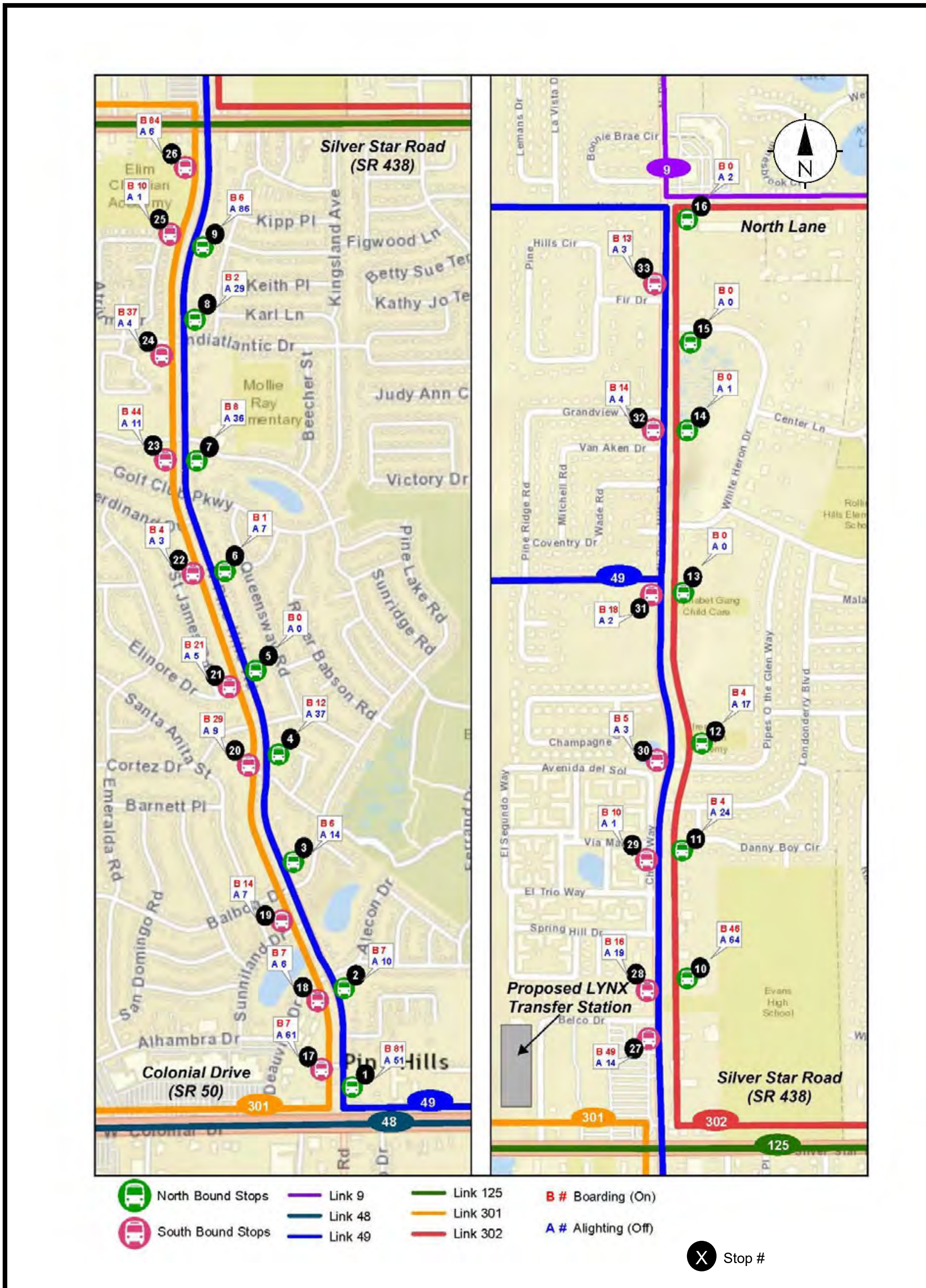


Figure 3.27

Bus Routes and Stops
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report



Silver Star Road (SR 438)
North Lane
Colonial Drive (SR 50)
Silver Star Road (SR 438)
Proposed LYNX Transfer Station
North Bound Stops
South Bound Stops
Link 9
Link 48
Link 49
Link 125
Link 301
Link 302
B # Boarding (On)
A # Alighting (Off)
Stop #

Figure 3.28

3.10 Safety and Crash Analysis

A historical crash review was performed for the corridor to identify the pedestrian/bicycle crash patterns and hotspots within the corridor. To identify crash patterns along the corridor, crash data was obtained from the Orange County Traffic Engineering Division for crashes that involved only pedestrians or bicycles for the previous three years (January 1, 2014 to December 31, 2016) within 150 feet of the Pine Hills Road centerline. Two additional fatal pedestrian crashes that occurred in 2017 are included in the analysis. This tends to show a higher percentage of fatalities and pedestrian crashes, as only fatal crashes were considered, and for a non-specific period outside the three-year period analyzed.

Crash diagrams indicating the locations of crashes are shown in Figures 3.30 through 3.47 (along with the 2017 fatalities), and a detailed summary of the crash data is included in Table 3.17 and **Appendix A.**

3.10.1 Crash Summary by Year and Condition

Table 3.12 displays a summary of pedestrian and bicycle crashes from January 2014 to December 2016. Based on the crash data, a total of 73 pedestrian and bicycle crashes were recorded within the corridor from 2014-2016 and early 2017 which reflected less than 5% of the total 1,462 crashes. According to the police reports, 59 crashes (81 percent) resulted in some type of injury, and 7 crashes (10 percent) resulted in a fatality. Based on the pavement conditions mentioned in the police reports, a total of 33 crashes (45 percent) occurred during dusk or night conditions. Table 3.13 summarizes the number of crashes by type (pedestrian/bicycle) along the Pine Hills Road corridor. The majority of crashes involved pedestrians (71 percent), with the remainder (29 percent) involving bicyclists.

Table 3.12: Crash Data Summary by Year (2014 – 2016)*

Year	Total Number of Crashes	Number of Crashes with Injury	Number of Crashes with Fatality	Dark - Lighted	Dark – Unknown, Not Lighted
2014	20	19	0	4	5
2015	23	15	3	7	3
2016	28	25	2	8	4
2014-2016	***71***	***59***	***5***	***19***	***12***
2017*	***2****	***0****	***2****		***2****
Percent	***100%***	***81%***	***10%***	***26%***	***19%***

** Two pedestrian crashes with fatalities occurred in early 2017; non-fatal crashes in the same period are not included in Table 3.12.*

Table 3.13: Summary of Crashes by Type (2014 – 2016)*

Year	Total Number of Crashes	Pedestrian Crashes	Bicycle Crashes
2014	20	16	4
2015	23	15	8
2016	28	19	9
2017	2	2	0
2014-2016	***73***	***52***	***21***
2017*	***2****	***2****	***0****
Percent	***100%***	***71%***	***29%***

** Two pedestrian crashes with fatalities occurred in early 2017; non-fatal crashes in the same period are not included in Table 3.13.*

3.10.2 Crash Summary by Location

A summary of the bicycle and pedestrian crashes by signalized intersection and roadway segment within the corridor, including the distribution of crashes along the corridor are listed in Table 3.14. Table 3.14 displays the segment location, crash frequency, and crash type (pedestrian/bicycle) that resulted from the crashes within specific segments and intersections along the Pine Hills Road corridor.

Table 3.14: Summary of Ped/Bike Crashes by Location (2014 – 2016)*

Segment/Intersection	Description	Number of Crashes	Crash Type
Colonial Drive (SR 50)	Signalized Intersection	14	11 Ped, 3 Bike
Colonial Drive (SR 50) to Balboa Drive	Segment	7	3 Ped, 4 Bike
Balboa Drive	Signalized Intersection	0	N/A
Balboa Drive – Hernandes Drive	Segment	6	5 Ped, 1 Bike
Hernandes Drive	Signalized Intersection	2	1 Ped, 1 Bike
Hernandes Drive – Silver Star Road (SR 438)	Segment	6	4 Ped, 2 Bike
Silver Star Road (SR 438)	Signalized Intersection	18	15 Ped, 3 Bike
Silver Star Road (SR 438) – Belco Drive	Segment	0	N/A
Belco Drive	Signalized Intersection	2	1 Ped, 1 Bike
Belco Drive – Londonderry Blvd	Segment	5	3 Ped, 2 Bike
Londonderry Blvd	Signalized Intersection	0	N/A
Londonderry Blvd – Indian Hill Road	Segment	4	4 Ped
Indian Hill Road	Signalized Intersection	2	1 Ped, 1 Bike
Indian Hill Road - North Lane	Segment	5	4 Ped, 1 Bike
North Lane	Signalized Intersection	2	2 Bike
North Lane – Study Limit	Segment	0	N/A
	Total	**73**	**52 Ped, 21 Bike**

** Two pedestrian crashes with fatalities occurred in early 2017, non-fatal crashes in the same period are not included.*

The following signalized intersections and roadway segments have experienced 5 or more crashes in the three-year crash history:

- Pine Hills Road at Colonial Drive (SR 50): A total of 14 pedestrian/bicycle related crashes were reported at this intersection as detailed below:
  - All crashes except one occurred in dry conditions, and seven crashes occurred at night, but with lighted conditions (1 occurred in unlit conditions).
  - One crash was related to alcohol (suspected drunk pedestrian who darted/dashed) and another was a distracted driver who failed to stop on red.
  - The pedestrian was at fault for 7 crashes at this intersection, the driver was at fault for 3 crashes, and the bicyclist was at fault for 2 crashes. The other 1 crash was a conflicting account.
  - Four crashes occurred within the intersection crosswalk (two of which a pedestrian and bicyclist crossed on a “Do Not Cross” signal), three crashes occurred within a bicycle lane (two of which involved drivers driving in the bicycle lane), and three

crashes occurred midblock with pedestrians/bicyclists attempting to dart across either Pine Hills Road or SR 50 (at the fault of the pedestrian/bicyclist).

- Colonial Drive (SR 50) to Balboa Drive: A total of 7 pedestrian/bicycle related crashes were reported in this segment as detailed below:
  - All crashes occurred in dry conditions, and three crashes occurred during daylight. Two crashes occurred at dusk, and one at night, but with lighted conditions.
  - The bicyclist was at fault for three crashes in this segment (all going the wrong way), the driver for three crashes, and a pedestrian for one crash (dart/dash).
  - Three crashes occurred at Sunniland Drive, though there do not appear to be any common, causative factors to explain the crashes.
- Balboa Drive to Hernandes Drive: A total of 6 pedestrian/bicycle related crashes were reported in this segment as detailed below:
  - All crashes occurred in dry conditions, and three crashes occurred at night (1 lighted, 1 not lighted, and 1 with unknown lighting).
  - The driver was at fault for three crashes in this segment (failure to yield to pedestrian, bicycle, and improper backing), and the pedestrian was at fault for the other three crashes (dart/dash).
  - One of these crashes, a fatality, occurred in unlit conditions at night with a pedestrian making a dart/dash movement across Pine Hills Road.
- Hernandes Drive to Silver Star Road (SR 438): A total of 6 pedestrian/bicycle related crashes were reported in this segment as detailed below:
  - Half of the crashes occurred in wet conditions (two of the three in the dark).
  - The driver was at fault for three crashes in this segment (failure to yield to pedestrian), the pedestrian was at fault for two crashes (dart/dash), and a bicyclist was at fault for the remaining crash (wrong way).
  - One of these crashes, a fatality, occurred at dusk with a pedestrian making a dart/dash movement across Pine Hills Road.
- Pine Hills Road at Silver Star Road (SR 438): A total of 18 pedestrian/bicycle related crashes were reported at this intersection as detailed below:
  - All crashes occurred in dry conditions, and four crashes occurred at night, but with lighted conditions (the other 12 crashes occurred during dawn or day).
  - Two crashes were related to alcohol/drugs, one in which a bicyclist darted into Pine Hills Road from Lupez Drive and the other where a drug-positive pedestrian darted into Pine Hills Road and was killed.
  - The pedestrian was at fault for 9 crashes at this intersection, the bicyclist was at fault for 2 crashes, there were conflicting accounts for 3 crashes, and there was two crashes where the driver was at fault (didn't yield to bicyclist crossing).
  - Three crashes occurred within the intersection crosswalk (one of which a pedestrian crossed on a "Do Not Cross" signal) and 10 crashes occurred midblock with pedestrians/bicyclists attempting to dart across either Pine Hills Road or Silver Star Road (at the fault of the pedestrian/bicyclist).
- Belco Drive to Londonderry Blvd: A total of 5 pedestrian/bicycle related crashes were reported in this segment as detailed below:
  - All crashes occurred in dry conditions, and one crash occurred at night.
  - The driver was at fault for two crashes in this segment, the pedestrian was at fault for two crashes (dart/dash), and a bicyclist was at fault for the remaining crash (wrong way).
- Indian Hill Road to North Lane: A total of 5 pedestrian/bicycle related crashes were reported in this segment as detailed below:

- All crashes except one occurred in dry conditions, and most occurred at night (or dusk).
- The driver was at fault for one crash in this segment (ran stop sign), the pedestrian was at fault for two crashes (dart/dash), a bicyclist was at fault for one crash (inattentive), and the remaining crash had unassigned fault.
- Two fatalities occurred in this segment, both involved pedestrians dart/dashing across the road in dark conditions (one lit, one unlit). One involved alcohol/drug use.

3.10.3 Crash Summary by Age

The crash reports provided contributing factors for the crashes within the corridor, including fault and improper movement. The majority of crashes along Pine Hills Road from 2014 through 2016 affected pedestrians and bicyclists between the ages of 18 and 60 (49 percent of pedestrian crashes and 85 percent of bicycle crashes), with a large share of pedestrians below the age of 18 affected by crashes (38 percent). There were no bicyclists over the age of 60 involved in any crashes. A summary of the persons involved in crashes by age group is listed in Table 3.15. The two fatalities listed for early 2017 generally followed the same trends.

Table 3.15: Summary of Persons Involved in Crashes by Age (2014 – 2016)*

Crash Factor	2014	2015	2016	2014-2016	2017*	Percent of Total
Pedestrian Age < 18	9	9	2	20	0	36%
Pedestrian Age 18-60	8	7	13	28	1	52%
Pedestrian Age > 60	0	1	5	6	1	13%
Total Pedestrian	***17***	***17***	***20***	***54***	***2***	***100%***
Bicycle Age < 18	1	1	2	4	0	18%
Bicycle Age 18-60	3	8	7	18	0	82%
Total Bicycle	***4***	***9***	***9***	***22***	***0***	***100%***

** The number of persons involved in crashes (76) is greater than the number of total crashes (73) from 2014 through 2016, since multiple pedestrians or bicyclists were involved in some crashes. Two pedestrian crashes with fatalities occurred in early 2017, non-fatal crashes in the same time period are not included.*

3.10.4 Crash Summary by Fault

A summary of crash fault is listed in Table 3.16, and by cause is displayed in Figure 3.29. The majority of crashes were caused by either pedestrian fault (41 percent) or driver fault (37 percent). There were a variety of common causes for crashes assigned as “driver fault,” with the most common being driving straight (7 crashes), turning right (4 crashes), turning left (4 crashes), or driving in the bicycle lane (3 crashes). Other causes included loss of control (1 crash), failure to yield to traffic control device (1 crash), improper pass (1 crash), ran stop sign (1 crash), and improper backing (1 crash).

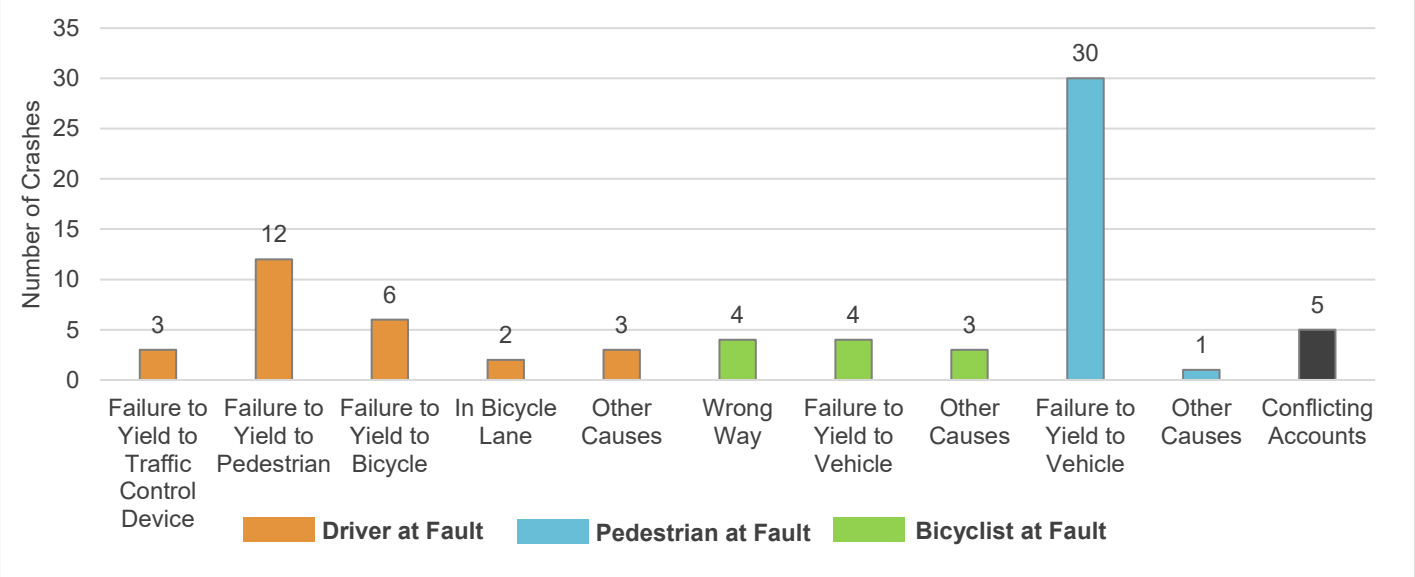
The majority of crashes assigned as “pedestrian fault” were caused by pedestrian “dart/dash” movements into the roadway (23 crashes), followed by 2 crashes where the pedestrian crossed against the light. The majority of crashes assigned as “bicyclist fault” were caused by riding the wrong way (5 crashes), “dart/dash” movements (2 crashes), turning into vehicle (1 crash), crossing against the light (1 crash), and not assigned (2 crashes).

Table 3.16: Summary of Ped/Bike Crashes by Fault (2014 – 2016)*

Year	Drive	Pedestrian	Bicyclist	Other
2014	9	9	2	0
2015	10	8	2	3
2016	7	12	7	2
2014-2016	***26***	***29***	***11***	***5***
Percent	***37%***	***41%***	***15%***	***7%***
2017*	***0****	***2****	***0****	***0****

** Two pedestrian crashes with fatalities occurred in early 2017, non-fatal crashes in the same time period are not included.*

Figure 3.29: Summary of Ped/Bike Crashes by Primary Cause (2014-2016)*



** Two pedestrian crashes with fatalities occurred in early 2017, non-fatal crashes in the same time period are not included.*

Table 3.17: Collision Summary (2014 – 2016)

#	Date	Day	Time	Type	Age of Ped/Biker	Fatalities	Injuries	Day/Night/ Lighting	Wet/ Dry	Distracted/ Drugs/ Alcohol	Cause	At Fault	Improper Movement	Notes
1	01/07/14	Tue	06:55 AM	Pedestrian	53	0	1	Dark – Not Lighted	Dry	None	FTY Ped	Driver	Left	
2	01/18/14	Sat	02:20 PM	Pedestrian	17	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Ped Walked into Veh
3	03/11/14	Tue	04:00 PM	Pedestrian	14	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
4	03/14/14	Fri	02:48 PM	Pedestrian	15	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dart/Dash	School Bus
5	03/23/14	Sun	11:20 PM	Pedestrian	40	0	1	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Hit/Run
6	03/29/14	Sat	05:07 PM	Bicycle	45	0	1	Daylight	Wet	None	FTY Ped	Driver	Loss of Control	
7	05/14/14	Wed	10:26 PM	Pedestrian	52	0	1	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Drunk Ped
8	05/21/14	Wed	06:52 PM	Bicycle	20	0	1	Daylight	Dry	None	FTY Veh	Bicyclist	Wrong Way	Hit/Run
67	05/31/14	Sat	11:15 PM	Pedestrian	25	0	1	Dark – Not Lighted	Dry	Distracted	Inattentive	Driver	Rear-End	
9	06/19/14	Thu	06:24 PM	Pedestrian	17/16	0	1	Daylight	Dry	None	FTY TCD	Driver	Straight	Hit/Run
10	07/01/14	Tue	03:20 PM	Pedestrian	12	0	1	Daylight	Dry	None	Drive in Bike Lane	Driver	Drive in Bike Lane	Ped in Bike Lane
11	07/07/14	Mon	05:50 PM	Pedestrian	32	0	1	Daylight	Dry	None	Drive in Bike Lane	Driver	Drive in Bike Lane	Ped in Bike Lane
12	08/18/14	Mon	08:52 PM	Pedestrian	40	0	1	Dark - Lighted	Dry	Alcohol	FTY Ped	Driver	Straight	Hit/Run
13	09/30/14	Tue	06:44 AM	Pedestrian	16	0	1	Dark – Not Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
14	10/15/14	Wed	07:15 AM	Bicycle	15	0	1	Daylight	Dry	None	FTY Ped	Driver	FTY TCD	To School
15	10/28/14	Tue	08:00 PM	Pedestrian	17	0	0	Dark – Unknown	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
16	11/03/14	Mon	12:20 PM	Pedestrian	16	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
18	11/08/14	Sat	06:54 PM	Pedestrian	55	0	1	Dark - Lighted	Wet	None	FTY Veh	Pedestrian	Dart/Dash	Homeless with Cart
20	11/21/14	Fri	06:03 PM	Pedestrian	26	0	1	Dusk	Dry	None	FTY Ped	Driver	Straight/Right	
21	12/28/14	Sun	02:00 PM	Bicycle	34	0	1	Daylight	Dry	None	FTY Veh	Bicyclist	T into Vehicle	
22	01/05/15	Mon	07:10 PM	Pedestrian	13	0	1	Dark – Unknown	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
23	01/14/15	Wed	01:36 PM	Pedestrian	17	0	1	Daylight	Dry	None	FTY Veh	Conflict	Dart/Dash	Conflicting Accounts
68	01/17/15	Sat	03:28 PM	Pedestrian	48	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dat/Dash	
24	01/31/15	Sat	09:50 PM	Pedestrian	21	0	1	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
25	02/25/15	Wed	06:27 PM	Pedestrian	25	1	0	Dark - Lighted	Dry	Alcohol/ Drug	FTY Veh	Pedestrian	Dart/Dash	Ped Positive for Drugs
26	03/13/15	Fri	11:13 PM	Pedestrian	26	0	1	Dark – Unknown	Dry	None	FTY Ped	Driver	Left	
69	03/15/15	Sun	06:15 PM	Bicycle	35	0	1	Daylight	Dry	None	FTY Ped	Driver	Straight	Hit Ped in Sidewalk
27	04/28/15	Tue	08:24 PM	Pedestrian	17	0	0	Dark - Lighted	Dry	None	FTY Ped	Conflict	Straight	Conflicting Accounts
28	06/24/15	Wed	05:46 PM	Pedestrian	46/10	0	2	Daylight	Wet	None	FTY Ped	Driver	Straight	Hit/Run
29	06/30/15	Tue	08:37 PM	Bicycle	34	0	1	Dark - Lighted	Dry	None	Careless	Driver	Drive in Bike Lane	Bike Wrong Way
30	07/14/15	Tue	04:47 PM	Bicycle	57	0	0	Daylight	Dry	None	FTY Bike	Driver	Left	Driver L into Driveway
31	07/30/15	Thu	06:51 PM	Bicycle	18	0	1	Daylight	Dry	None	FTY TCD	Bicyclist	Cross Against Light	Do Not Cross Light On
32	09/03/15	Thu	10:25 AM	Pedestrian	42	0	1	Daylight	Dry	None	Unknown	Conflict	Unknown	Conflicting Accounts
33	09/11/15	Fri	11:35 AM	Bicycle	26	0	0	Daylight	Dry	None	FTY Bike	Driver	Improper Pass	Sideswipe
34	10/19/15	Mon	08:05 AM	Pedestrian	9	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
70	10/23/15	Fri	05:00 PM	Bicycle	15	0	0	Daylight	Dry	Distracted	FTY Bike	Driver	Right Turn	

Table 3.17: Collision Summary (2014 – 2016), Continued

#	Date	Day	Time	Type	Age of Ped/Biker	Fatalities	Injuries	Day/Night/ Lighting	Wet/ Dry	Distracted/ Drugs/ Alcohol	Cause	At Fault	Improper Movement	Notes
35	10/24/15	Sat	08:45 AM	Pedestrian	20	0	2	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
36	11/05/15	Thu	05:00 PM	Pedestrian	16	0	1	Daylight	Dry	Distracted	FTY Ped	Driver	Straight	Sign Too Small
37	11/08/15	Sun	05:50 PM	Bicycle	49/35	0	0	Dark - Lighted	Dry	Distracted	FTY TCD	Driver	Right	Fail to Stop on Red
71	11/19/15	Thu	08:15 PM	Pedestrian	9	1	0	Dark - Lighted	Wet	None	FTY Veh	Pedestrian	Dart/Dash	Hit in Crosswalk
38	12/17/15	Thu	09:41 AM	Bicycle	41	0	1	Daylight	Dry	None	Wrong Way Bike	Bicyclist	Wrong Way	
39	12/17/15	Thu	03:20 PM	Pedestrian	7/8	0	2	Daylight	Dry	Distracted	FTY TCD	Driver	Ran Stop Sign	No Crosswalk
40	12/27/15	Sun	07:33 PM	Pedestrian	75	1	0	Dark – Not Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Hit/Run
41	01/08/16	Fri	09:00 PM	Pedestrian	27	0	1	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Hit/Run
42	01/10/16	Sun	10:15 PM	Pedestrian	55	1	1	Dark - Lighted	Dry	None	Ped in Road	N/A	N/A	
43	01/15/16	Fri	05:23 AM	Pedestrian	82	0	1	Dark - Lighted	Wet	None	FTY Veh	Pedestrian	Dart/Dash	Veh turning WBL
44	01/25/16	Mon	04:57 PM	Bicycle	42	0	1	Daylight	Dry	None	Inattentive	Bicyclist	N/A	Sch Bus RT
45	01/31/16	Sun	06:10 PM	Bicycle	35	0	1	Daylight	Dry	Alcohol	FTY Veh	Bicyclist	Dart/Dash	
46	03/03/16	Thu	11:40 AM	Pedestrian	43	0	1	Daylight	Dry	None	FTY TCD	Pedestrian	Cross Against Light	Do Not Cross Light On
47	03/05/16	Sat	09:13 PM	Pedestrian	83/4	0	2	Dark – Not Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Hit/Run
48	03/10/16	Thu	04:39 PM	Pedestrian	15	0	1	Daylight	Dry	None	FTY Ped	Driver	Straight	In Crosswalk
49	03/10/16	Thu	05:53 PM	Bicycle	15	0	0	Daylight	Dry	None	FTY Bike	Driver	Right	NM Hit V1
50	03/25/16	Fri	11:55 AM	Bicycle	25	0	1	Daylight	Dry	None	FTY Bike	Driver	Left	Hit/Run
51	03/31/16	Thu	07:03 PM	Bicycle	22	0	1	Daylight	Dry	None	Improper Turn	Bicyclist	Enter Intersection	Bike from SW
52	04/15/16	Fri	08:42 PM	Pedestrian	57	0	1	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	NM hit V1
53	04/19/16	Tue	09:25 PM	Pedestrian	48	0	1	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
54	04/22/16	Fri	04:45 PM	Bicycle	13	0	0	Daylight	Dry	None	FTY Bike	Driver	Right	
55	04/29/16	Fri	06:11 AM	Pedestrian	33	0	1	Daylight	Dry	None	Wrong Way Bike	Bicyclist	Wrong Way	V1 turning R
56	05/07/16	Sat	08:51 PM	Pedestrian	35	0	2	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
57	06/01/16	Wed	01:48 PM	Bicycle	19	0	1	Daylight	Dry	None	Wrong Way Bike	Bicyclist	Wrong Way	Gas Power Bike
58	06/08/16	Wed	12:02 AM	Pedestrian	73	1	0	Dark – Not Lighted	Wet	Alcohol/ Drug	FTY Veh	Pedestrian	Dart/Dash	No Crosswalk
59	06/12/16	Sun	06:32 PM	Pedestrian	18	0	1	Dark – Not Lighted	Wet	None	FTY Ped	Driver	Straight	In Crosswalk
60	06/20/16	Mon	10:02 PM	Pedestrian	61	0	1	Dark - Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
72	07/18/16	Mon	05:58 PM	Pedestrian	20	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Exit Bus, Crossed in Front
61	08/03/16	Wed	06:16 PM	Pedestrian	57	0	1	Daylight	Dry	None	Improper Backing	Driver	Improper Backing	Backing into Road
62	08/11/16	Thu	08:44 AM	Pedestrian	47	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Cross Against Light	Do Not Cross Light On
73	08/23/16	Tue	11:17 AM	Pedestrian	53	0	1	Daylight	Dry	None	FTY Veh	Pedestrian	Dart/Dash	Lawn Maint Worker
64	09/02/16	Fri	09:31 PM	Pedestrian	64	0	1	Dark - Lighted	Wet	None	FTY Ped	Driver	Right	Motorized Wheelchair
65	09/20/16	Tue	01:50 PM	Bicycle	26	0	1	Daylight	Dry	None	FTY Veh	Bicyclist	Dart/Dash	
74	10/22/16	Sat	03:00 PM	Pedestrian	35	0	1	Daylight	Dry	Alcohol	Unknown	Not Assigned	Unknown	Hit and Run
66	10/23/16	Sun	09:19 PM	Bicycle	18	0	1	Dark – Not Lighted	Dry	None	Wrong Way Bike	Bicyclist	Wrong Way	
2017-B	01/14/17	Sat	07:20 PM	Pedestrian	62	1	0	Dusk	Dry	None	FTY Veh	Pedestrian	Dart/Dash	
2017-A	02/20/17	Mon	08:36 PM	Pedestrian	49	1	0	Dark – Not Lighted	Dry	None	FTY Veh	Pedestrian	Dart/Dash	

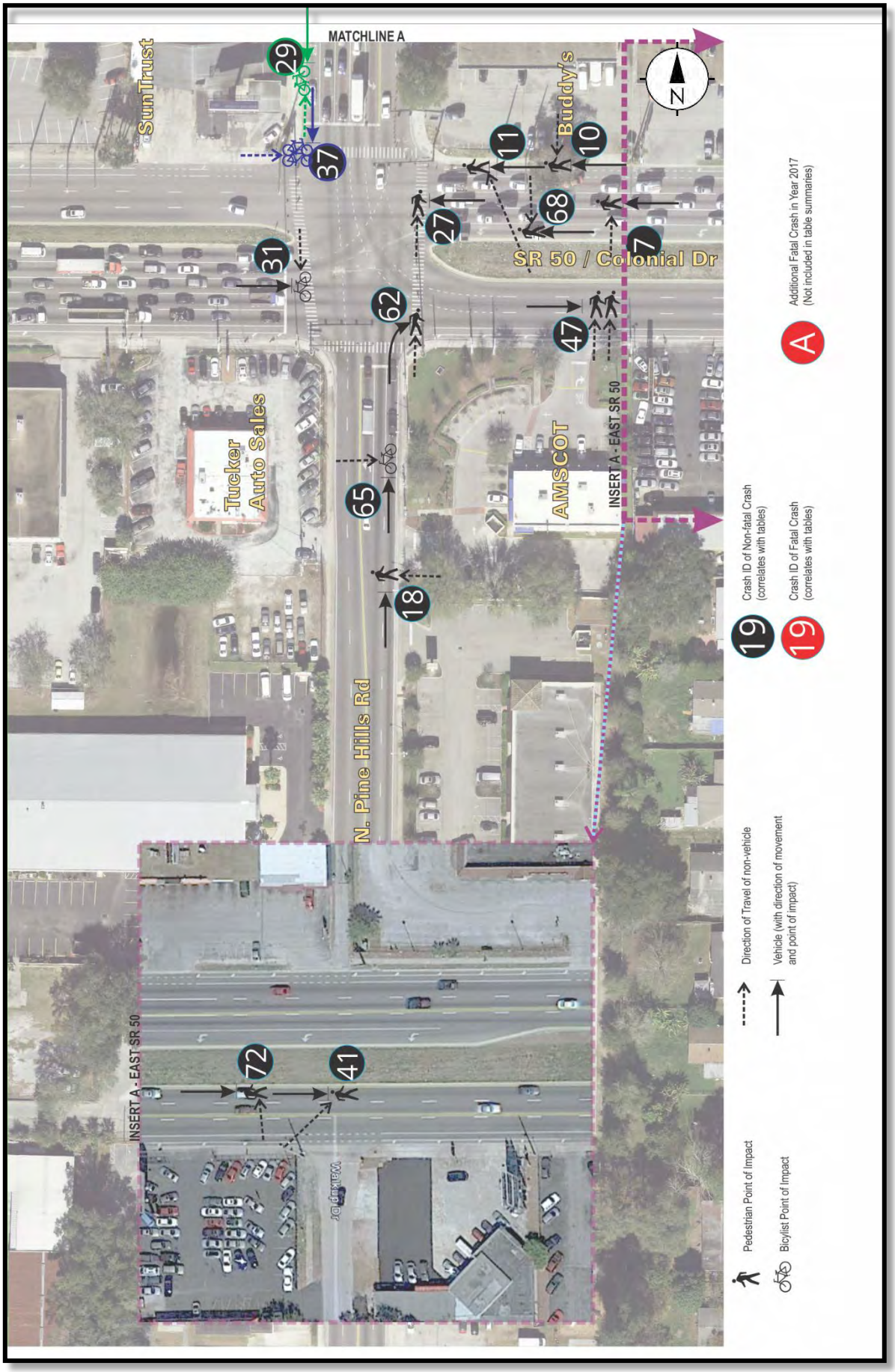
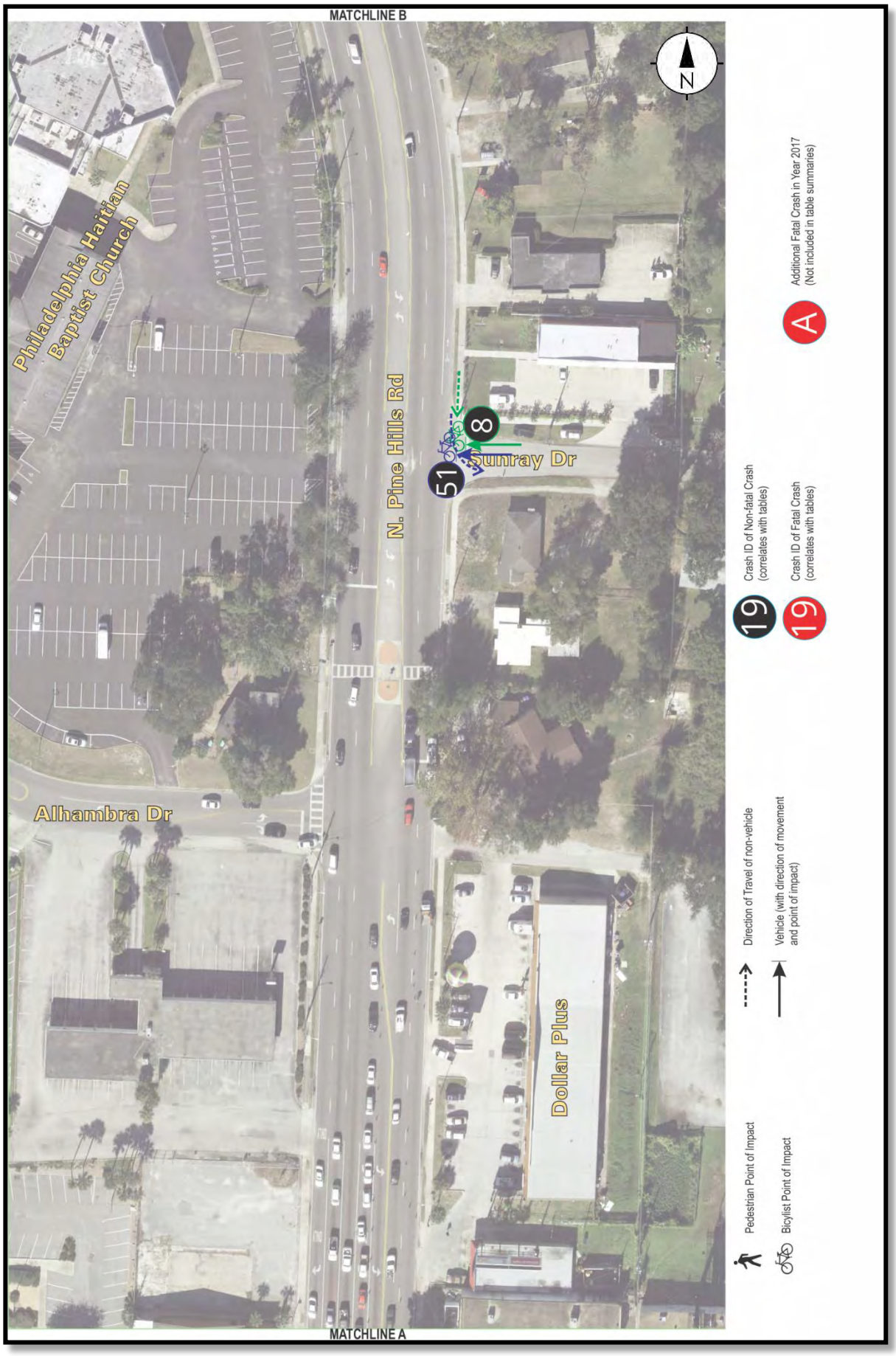


Figure 3.30

Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report



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Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

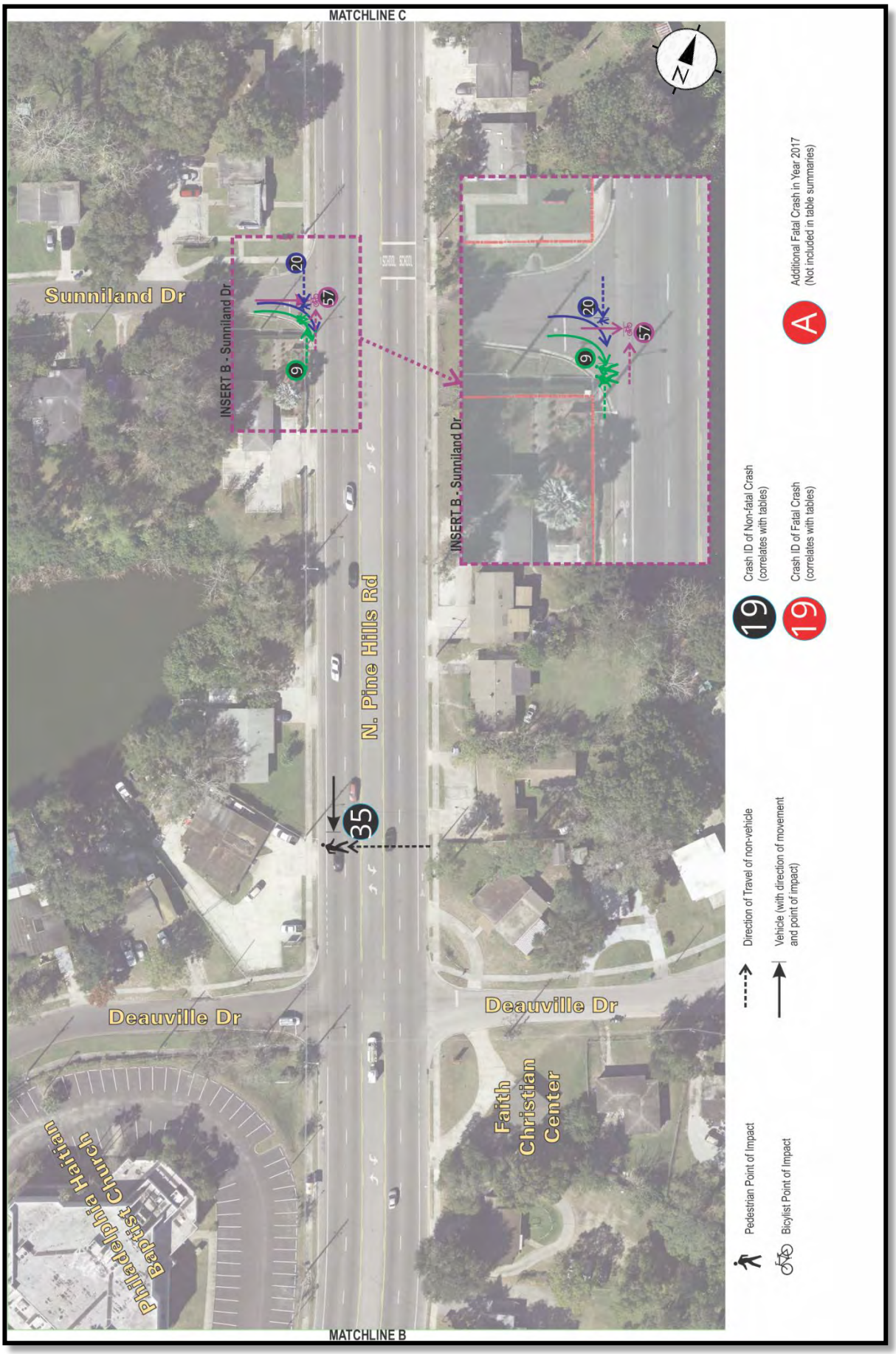

Figure 3.32
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.33

Crash Locations and Types

Pine Hills Road Pedestrian/Bicycle Safety Study

Existing Conditions Report

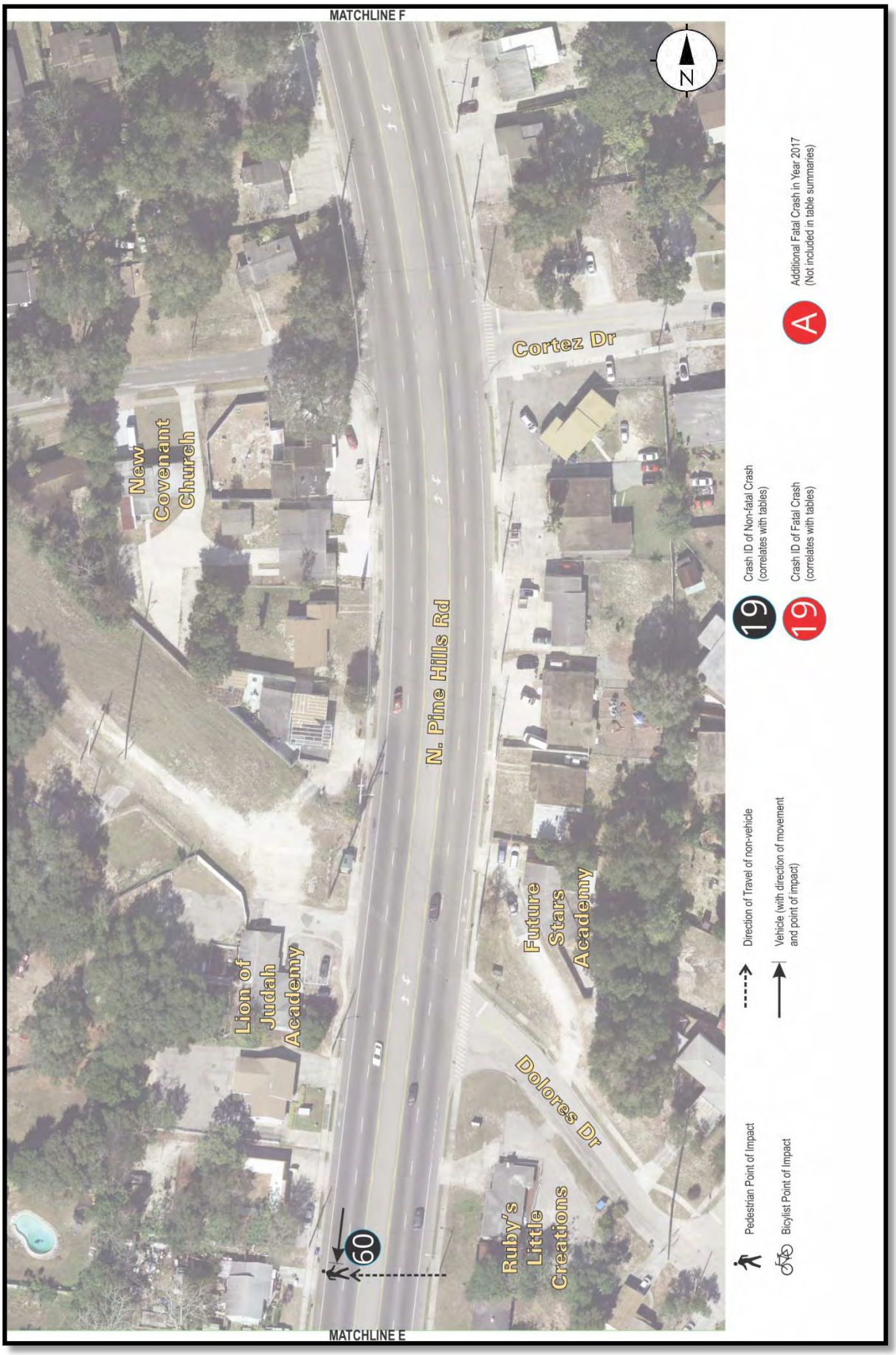

Figure 3.34
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.35
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

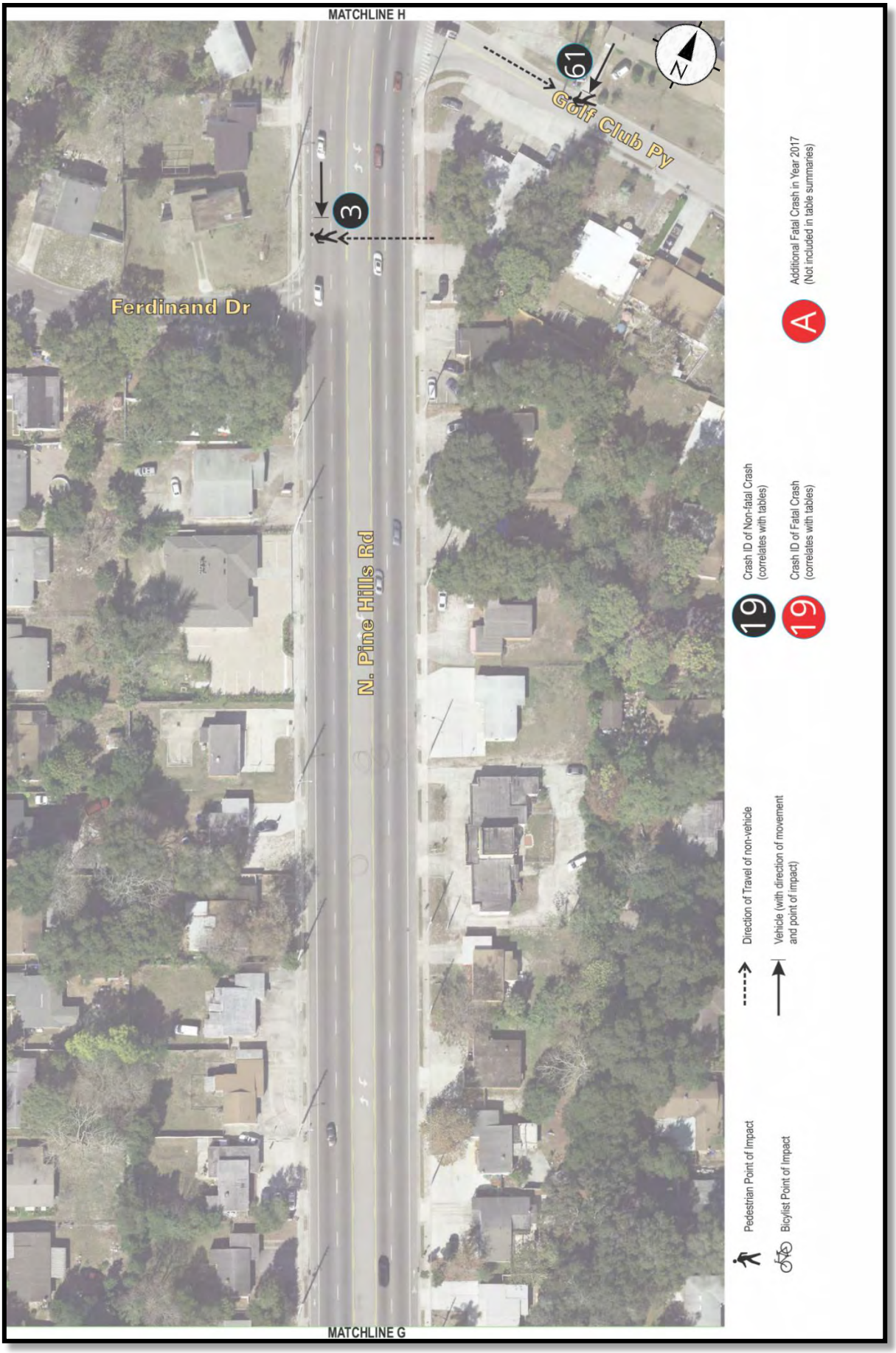

Figure 3.36
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.37
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.38
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.39
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

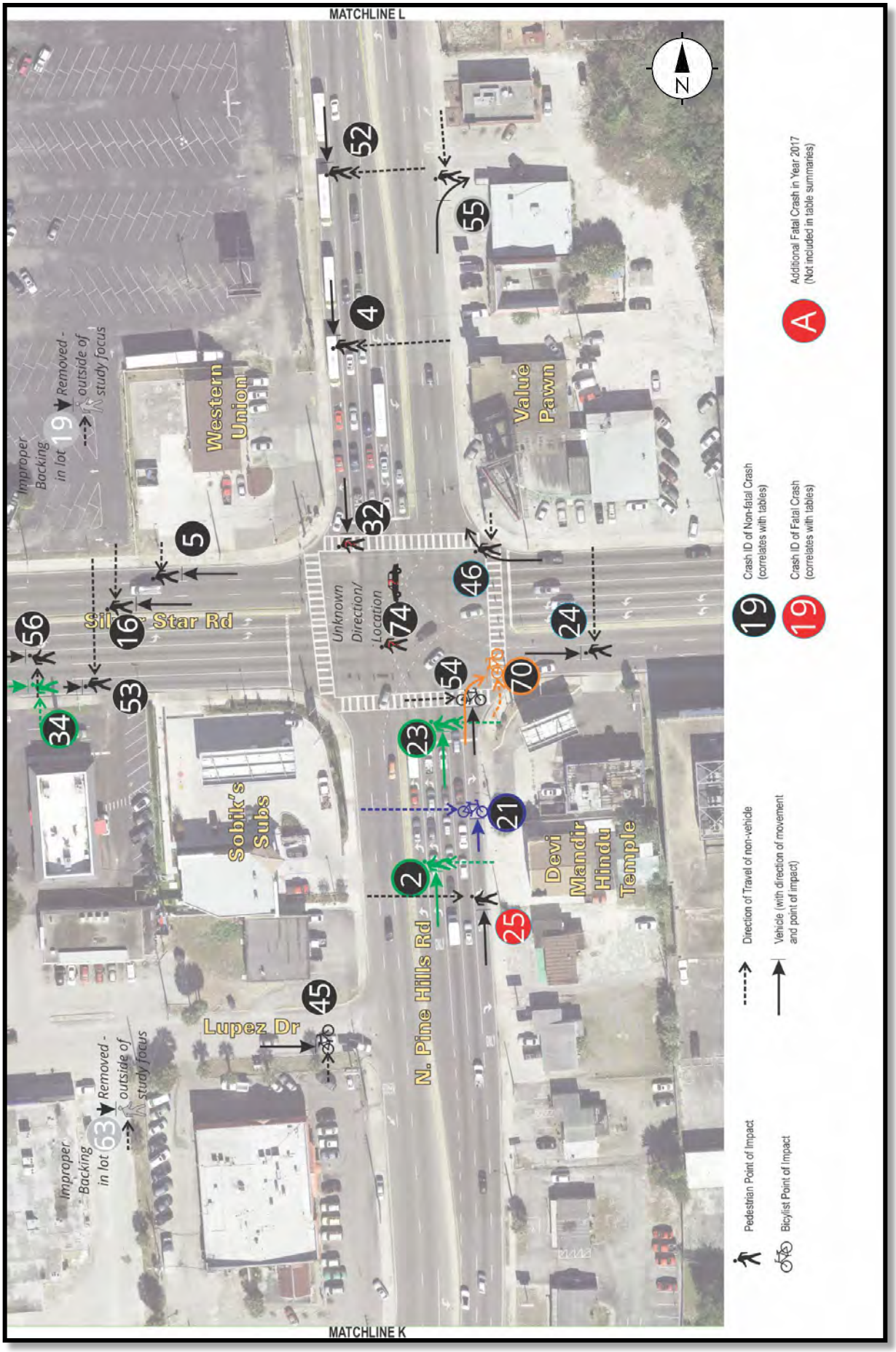

Figure 3.40
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.41
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.42
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

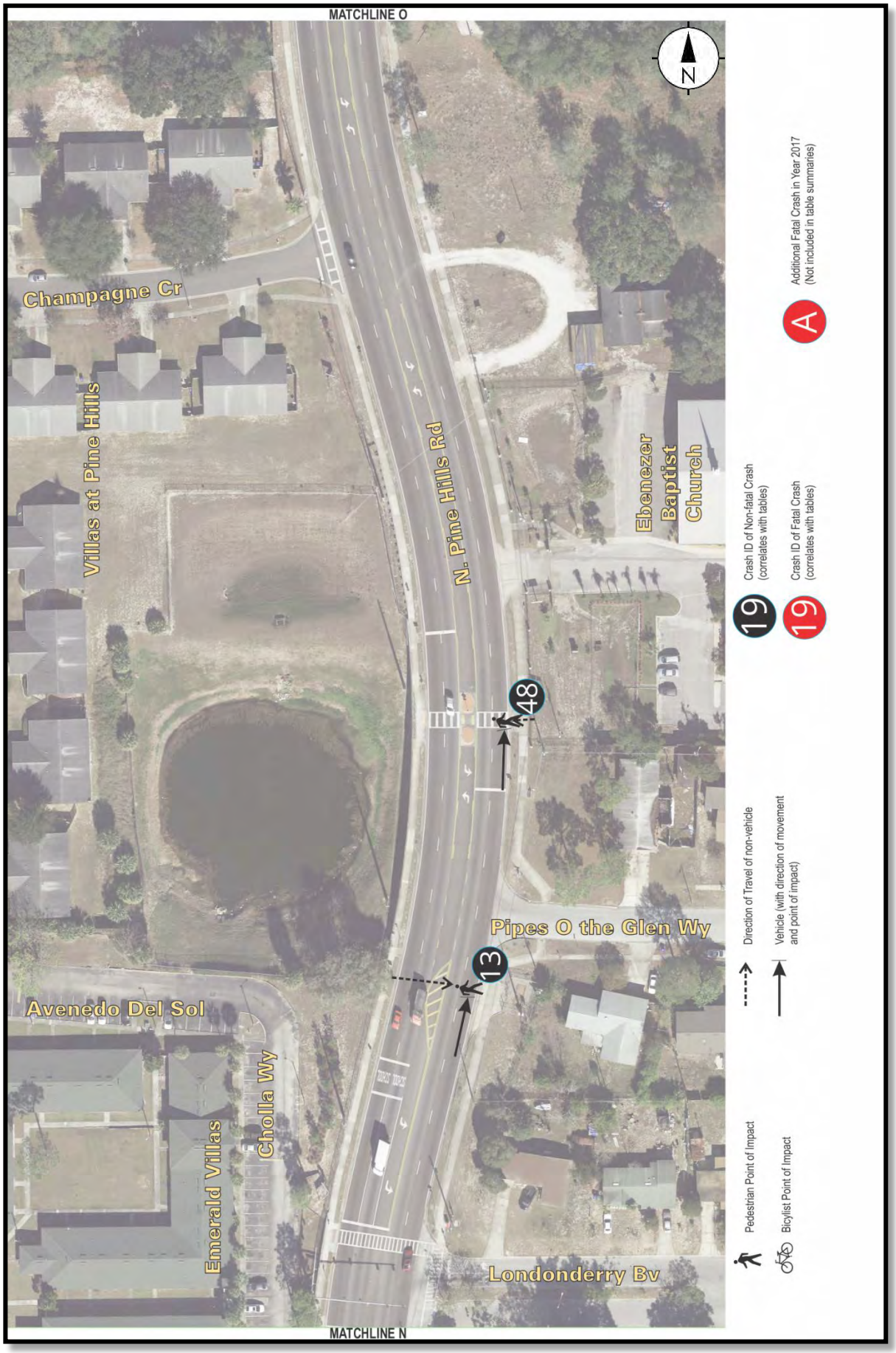

Figure 3.43
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.44
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

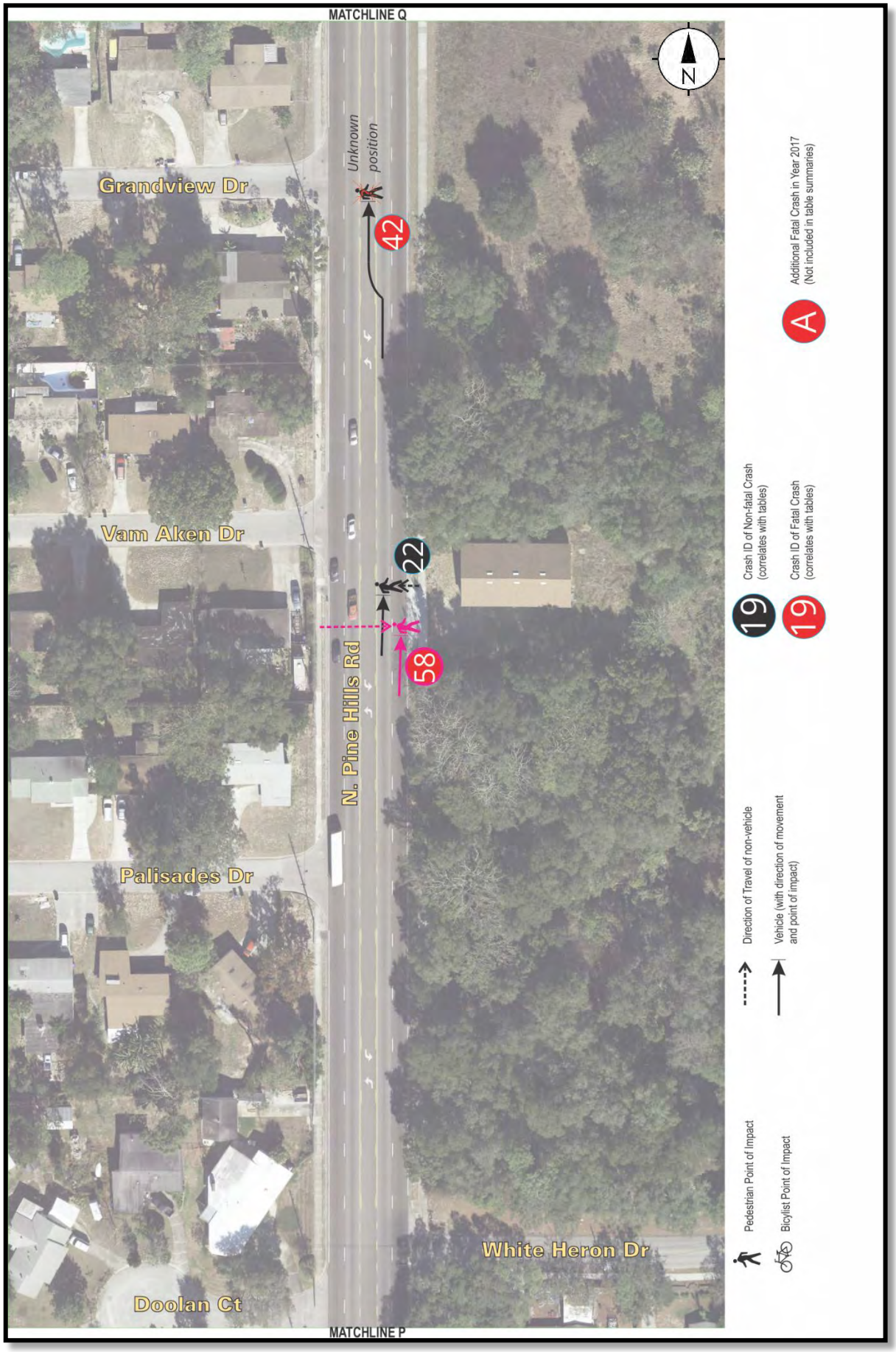

Figure 3.45
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.46
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 3.47
Crash Locations and Types
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

4. Existing Travel Demand

This chapter summarizes existing travel demand characteristics along the Pine Hills Road corridor, using daily and hourly traffic volume data for vehicular traffic, bicycle traffic, and pedestrian traffic.

4.1 Existing Traffic Volumes

Weekday daily and hourly traffic volumes along the corridor were collected by LTEC and supplemented from Florida Transportation Information (FTI). These counts included the following:

- Type A: 6-hour turning movement counts from 7:00 – 9:00 AM, 11:00 – 1:00 PM and 4:00 – 6:00 PM; at 22 intersections
- Type B: 8-hour turning movement counts from 7:00 – 9:00 AM, 11:00 – 1:00 PM and 2:00 – 6:00 PM; at 7 intersections
- Type C: AM and PM Major driveway counts at 6 locations from 7:00 – 9:00 AM and 4:00 – 6:00
- Type D: 72-hour bidirectional volume counts (12 locations)
- Type E: 24-hour classification counts (2 locations)
- Type F: Midblock crossing pedestrian and bicycle counts at 11 locations over three days for 4 hours from 7:00 – 9:00 AM and 4:00 – 6:00
- Type G: 72-hour speed counts (3 locations)
- Type H: Gap Studies

The counts were collected in January and February 2017. Table 4.1 contains a detailed list of each count location, by count type. All collected traffic counts and seasonal factors are provided in **Appendix B**. Figures 4.1 through 4.5 illustrates the traffic count locations and Figures 4.6 through 4.22 illustrates the peak-hour turning movement counts along the study area. The peak-hour counts illustrated in Figures 4.6 through 4.22 represent the highest hour of each of the peak study periods, AM (7:00-9:00), Mid-Day (11:00-1:00 PM), School (2:00-4:00 PM, signalized intersections only) and PM (4:00-6:00 PM).

Based on the 72-hour volume counts, the annual average daily traffic (AADT) along the Pine Hills Road corridor ranges from a low of 25,060 daily trips south of Deauville Drive to a high of 34,733 daily trips south of Silver Star Road (SR 438). North of Silver Star Road, AADT volumes range from 29,606 to 32,671 daily trips. The AADT traffic volumes are summarized in Table 4.2.

The percentage of truck volumes along the corridor range from a low of approximately 7.2 percent of the AADT north of Balboa Drive to a high of approximately 8.2 percent of AADT north of Belco Drive (see **Appendix B**).

Table 4.1: Count Locations and Reference Numbers

Count #	Count Type	Location	Count #	Count Type	Location
1	6-Hour TMC	Alhambra Drive	36	72-Hour Bi-Directional	Pine Hills Rd: South of Deauville Dr
2	6-Hour TMC	Sunray Drive	37	72-Hour Bi-Directional	Pine Hills Rd: South of Silver Star Rd
3	6-Hour TMC	Deauville Drive	38	72-Hour Bi-Directional	Pine Hills Rd: South of Indian Hill Rd
4	6-Hour TMC	Sunniland Drive	39	72-Hour Bi-Directional	Pine Hills Rd: South of North Ln
5	6-Hour TMC	Dolores Drive	40	72-Hour Bi-Directional	Balboa Dr: West of Pine Hills Rd
6	6-Hour TMC	Cortez Drive	41	72-Hour Bi-Directional	Dolores Dr: East of Pine Hills Rd
7	6-Hour TMC	Elinore Drive	42	72-Hour Bi-Directional	Hernandes Dr: East of Pine Hills Rd
8	6-Hour TMC	Ferdinand Drive	43	72-Hour Bi-Directional	Hernandes Dr: West of Pine Hills Rd
9	6-Hour TMC	Gold Club Parkway	44	72-Hour Bi-Directional	Silver Star Rd: East of Pine Hills Rd
10	6-Hour TMC	Indialantic Drive	45	72-Hour Bi-Directional	Silver Star Rd: West of Pine Hills Rd
11	6-Hour TMC	Figwood Lane	46	72-Hour Bi-Directional	Belco Dr: West of Pine Hills Rd
12	6-Hour TMC	Spring Hill Drive	47	72-Hour Bi-Directional	Evan HS: East of Pine Hills Rd
13	6-Hour TMC	El Trio Way	48	72-Hour Bi-Directional	Londonderry Bv: East of Pine Hills Rd
14	6-Hour TMC	Via Maior	49	72-Hour Bi-Directional	Indian Hill Rd: West of Pine Hills Rd
15	6-Hour TMC	Pipes O the Glen Way	50	72-Hour Bi-Directional	North Ln: East of Pine Hills Rd
16	6-Hour TMC	Champagne Circle	51	72-Hour Bi-Directional	North Ln: West of Pine Hills Rd
17	6-Hour TMC	White Heron Drive	52	24-Hour Classification	Pine Hills Rd: North of Balboa Rd
18	6-Hour TMC	Palisades Drive	53	24-Hour Classification	Pine Hills Rd: North of Belco Dr
19	6-Hour TMC	Van Aken Drive	54	Ped/Bike Mid-Block	Pine Hills Rd: North of Alhambra Dr (existing mid-block crossing)
20	6-Hour TMC	Grandview Drive	55	Ped/Bike Mid-Block	Pine Hills Rd: Btwn Sunray Dr & Deauville Dr (Haitian church/homes)
21	6-Hour TMC	White Heron Drive N.	56	Ped/Bike Mid-Block	Pine Hills Rd: North of Balboa Dr (existing mid-block crossing)
22	6-Hour TMC	Fir Drive	57	Ped/Bike Mid-Block	Pine Hills Rd: Btwn Hernandes Dr & Indialantic Dr (Apts & YMCA)
23	8-Hour TMC	Balboa Drive	58	Ped/Bike Mid-Block	Pine Hills Rd: North of Indialantic Dr (existing mid-block crossing)
24	8-Hour TMC	Hernandes Drive	59	Ped/Bike Mid-Block	Pine Hills Rd: North of Figwood Ln (existing mid-block crossing)
25	8-Hour TMC	Silver Star Road	60	Ped/Bike Mid-Block	Pine Hills Rd: Silver Hill Shopping Ctr, North of Silver Star Rd
26	8-Hour TMC	Belco Drive	61	Ped/Bike Mid-Block	Pine Hills Rd: North of El Trio Wy (existing mid-block crossing)
27	8-Hour TMC	Londonderry Drive	62	Ped/Bike Mid-Block	Pine Hills Rd: North of Pipes O The Green Wy (existing mid-block crossing)
28	8-Hour TMC	Indian Hill Road	63	Ped/Bike Mid-Block	Pine Hills Rd: Btwn Fir Dr & North Ln (Res. & Retail)
29	8-Hour TMC	North Lane	64	Ped/Bike Mid-Block	Pine Hills Rd: Silver Star Rd: Btwn Belco Dr & Pine Hills Rd
30	AM/PM Driveway	Stabroek Plaza/SunTrust Plaza	65	72-Hour Speed	Pine Hills Rd: South of Indian Hill Rd
31	AM/PM Driveway	Pine Hills Christian Church	66	72-Hour Speed	Pine Hills Rd: South of Balboa XW
32	AM/PM Driveway	Faith Christian Center Church	67	72-Hour Speed	Pine Hills Rd: North of Balboa XW
33	AM/PM Driveway	Silver Hill Shopping Center	68	Gap Studies	Pine Hills Rd: Near Dolores Road
34	AM/PM Driveway	First Baptist Church	69	Gap Studies	Pine Hills Rd: Near Grandview Drive:
35	AM/PM Driveway	7-11/North Lane Plaza			

Table 4.2: 72-Hour Traffic Volume Counts

Roadway/ Segment ID	Roadway/Segment	Traffic Count Date	Measured Characteristics							Seasonal Factor	Adjusted AADT
			ADT	Peak Hour Total	NB/EB Volume	SB/WB Volume	Peak Time	"K"	"D"		
36	Pine Hills Rd: South of Deauville Dr	1/17/17-1/19/17	24,213	1,913	1,328	586	4:45-5:45 PM	0.079	0.694	1.035	25,060
37	Pine Hills Rd: South of Silver Star Rd	1/17/17-1/19/17	33,558	2,648	1,556	1,093	5:00-6:00 PM	0.079	0.588		34,733
38	Pine Hills Rd: South of Indian Hill Rd	1/17/17-1/19/17	31,566	2,401	1,305	1,095	5:00-6:00 PM	0.076	0.544		32,671
39	Pine Hills Rd: South of North Ln	3/7/17-3/9/17	28,605	2,101	1,187	914	5:00-6:00 PM	0.073	0.565		29,606
40	Balboa Dr: West of Pine Hills Rd	1/17/17-1/19/17	4,652	448	191	258	5:15-6:15 PM	0.096	0.576		4,815
41	Dolores Dr: East of Pine Hills Rd	1/17/17-1/19/17	315	22	11	12	5:00-6:00 PM	0.069	0.569		326
42	Hernandes Dr: East of Pine Hills Rd	1/17/17-1/19/17	2,055	214	107	109	6:00-7:00 PM	0.104	0.509		2,127
43	Hernandes Dr: West of Pine Hills Rd	1/17/17-1/19/17	1,247	138	56	83	5:15-6:15 PM	0.111	0.601		1,291
44	Silver Star Rd: East of Pine Hills Rd	1/17/17-1/19/17	46,177	4,140	2,999	1,142	5:00-6:00 PM	0.090	0.724		47,793
45	Silver Star Rd: West of Pine Hills Rd	1/17/17-1/19/17	38,841	2,869	1,791	1,078	5:00-6:00 PM	0.074	0.624		40,200
46	Belco Dr: West of Pine Hills Rd	1/17/17-1/19/17	2,329	241	112	128	7:00-8:00 AM	0.103	0.531		2,411
47	Evan HS: East of Pine Hills Rd	1/17/17-1/19/17	111	8	5	3	7:00-8:00 AM	0.072	0.667		115
48	Londonderry Bv: East of Pine Hills Rd	1/17/17-1/19/17	3,999	326	144	183	3:15-4:15 PM	0.082	0.561		4,139
49	Indian Hill Rd: West of Pine Hills Rd	1/17/17-1/19/17	6,734	555	237	318	5:15-6:15 PM	0.082	0.573		6,970
50	North Ln: East of Pine Hills Rd	1/17/17-1/19/17	10,145	839	397	440	5:30-6:30 PM	0.083	0.524		10,500
51	North Ln: West of Pine Hills Rd	1/17/17-1/19/17	7,703	616	310	308	5:00-6:00 PM	0.080	0.503		7,973

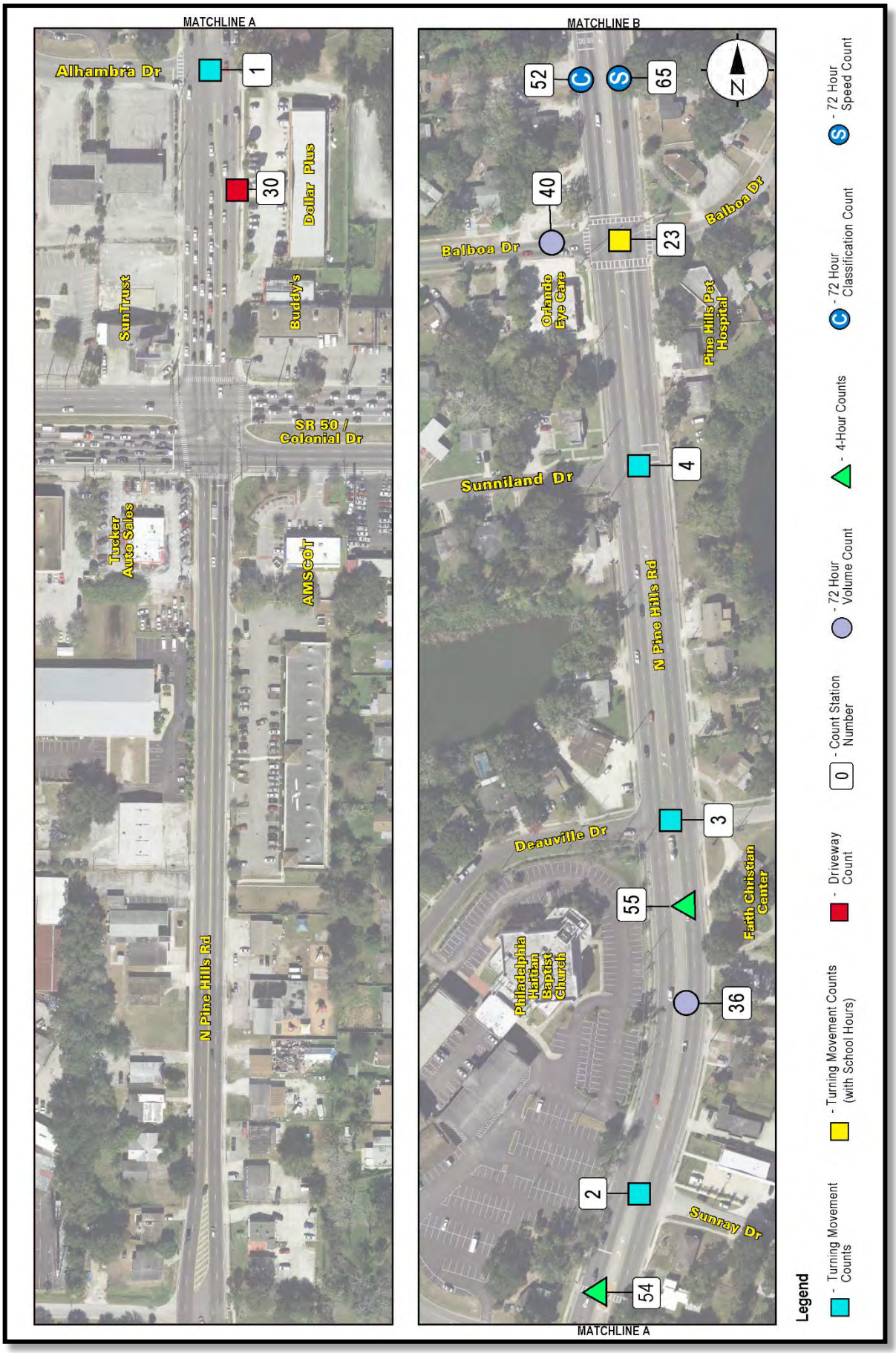

Figure 4.1

Traffic Count Locations
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

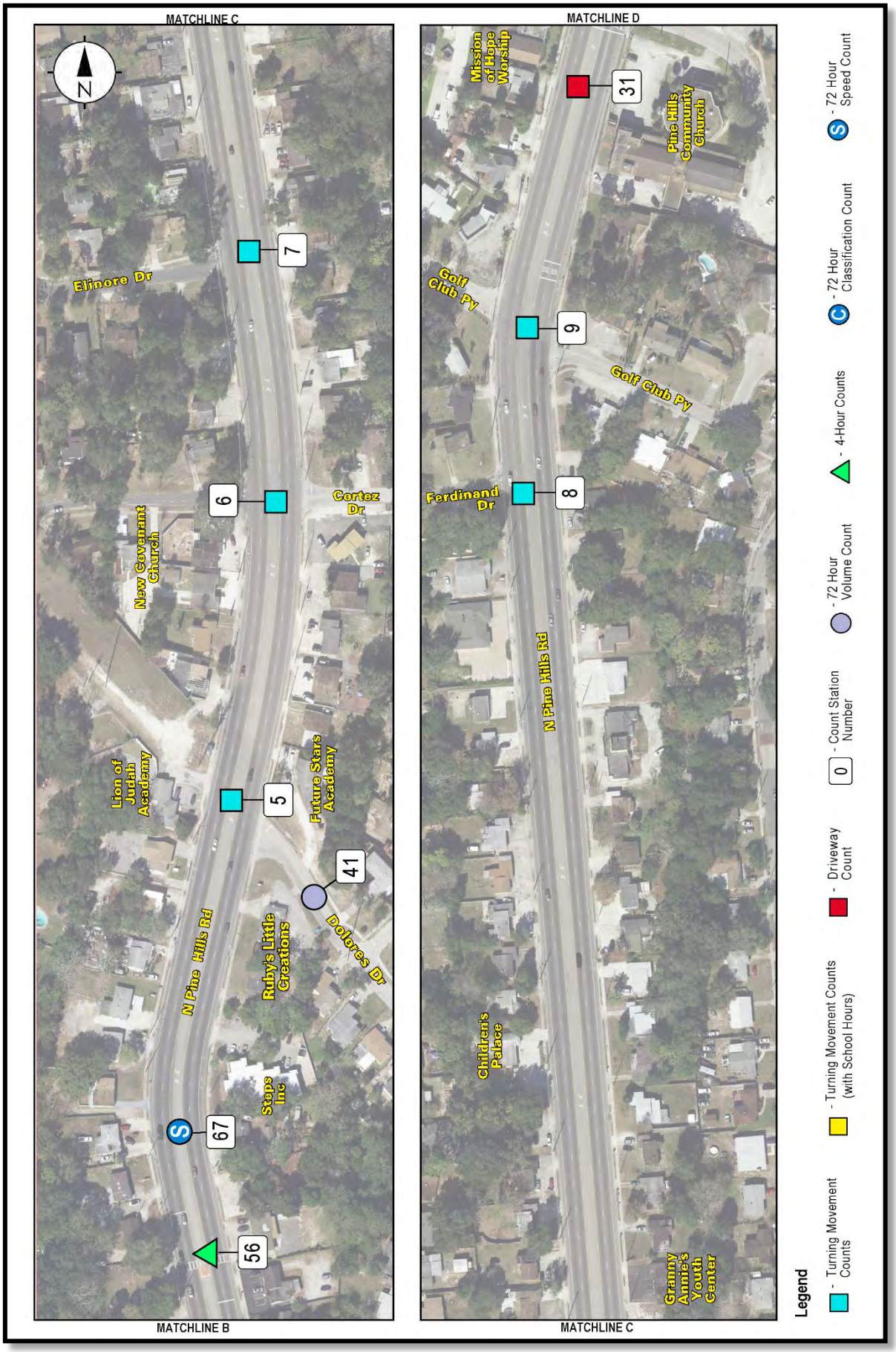

Figure 4.2
Traffic Count Locations
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
Page 78

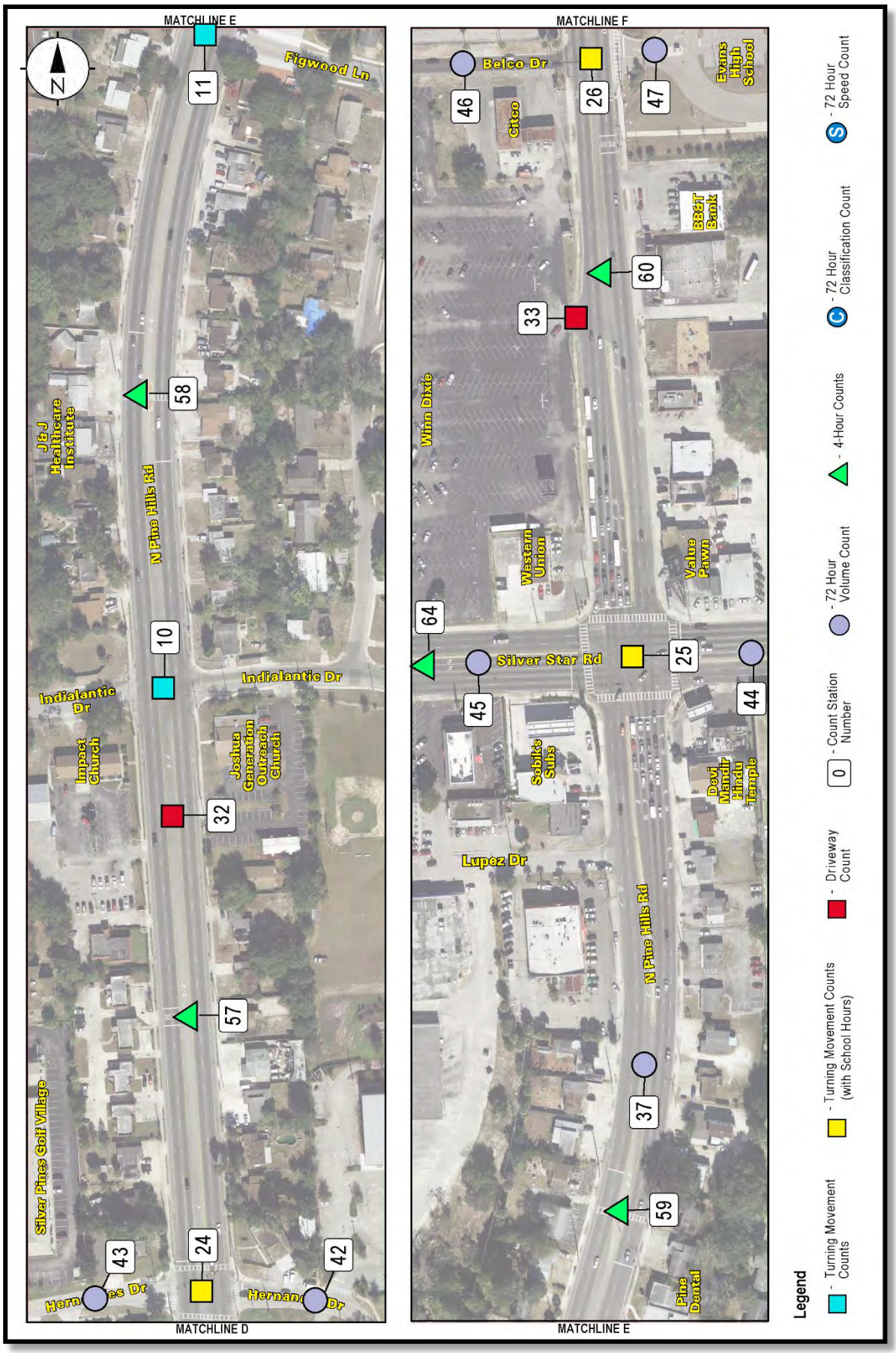

Figure 4.3
Traffic Count Locations
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

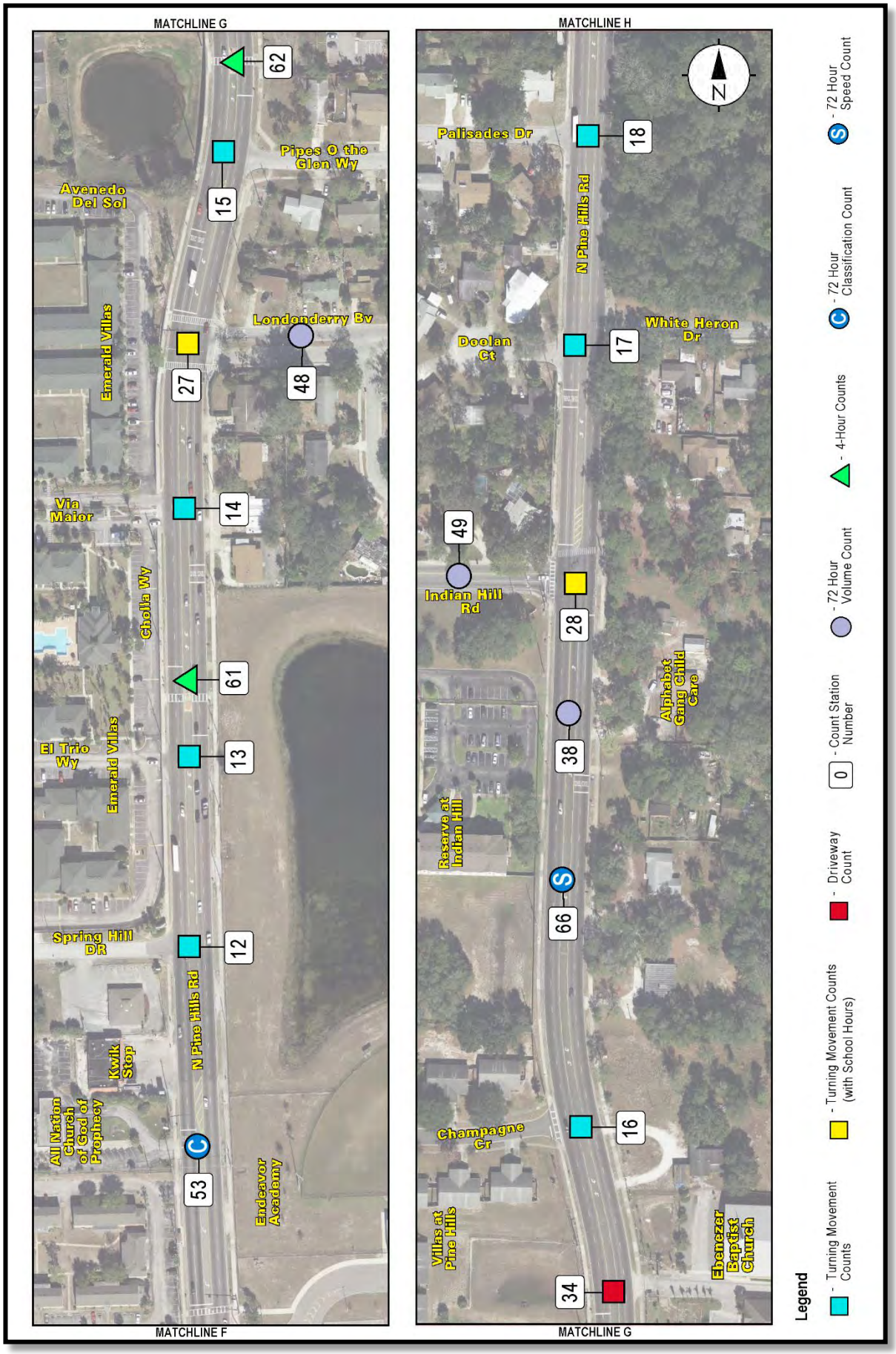

Figure 4.4
Traffic Count Locations
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 4.5
Traffic Count Locations
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 4.6

Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

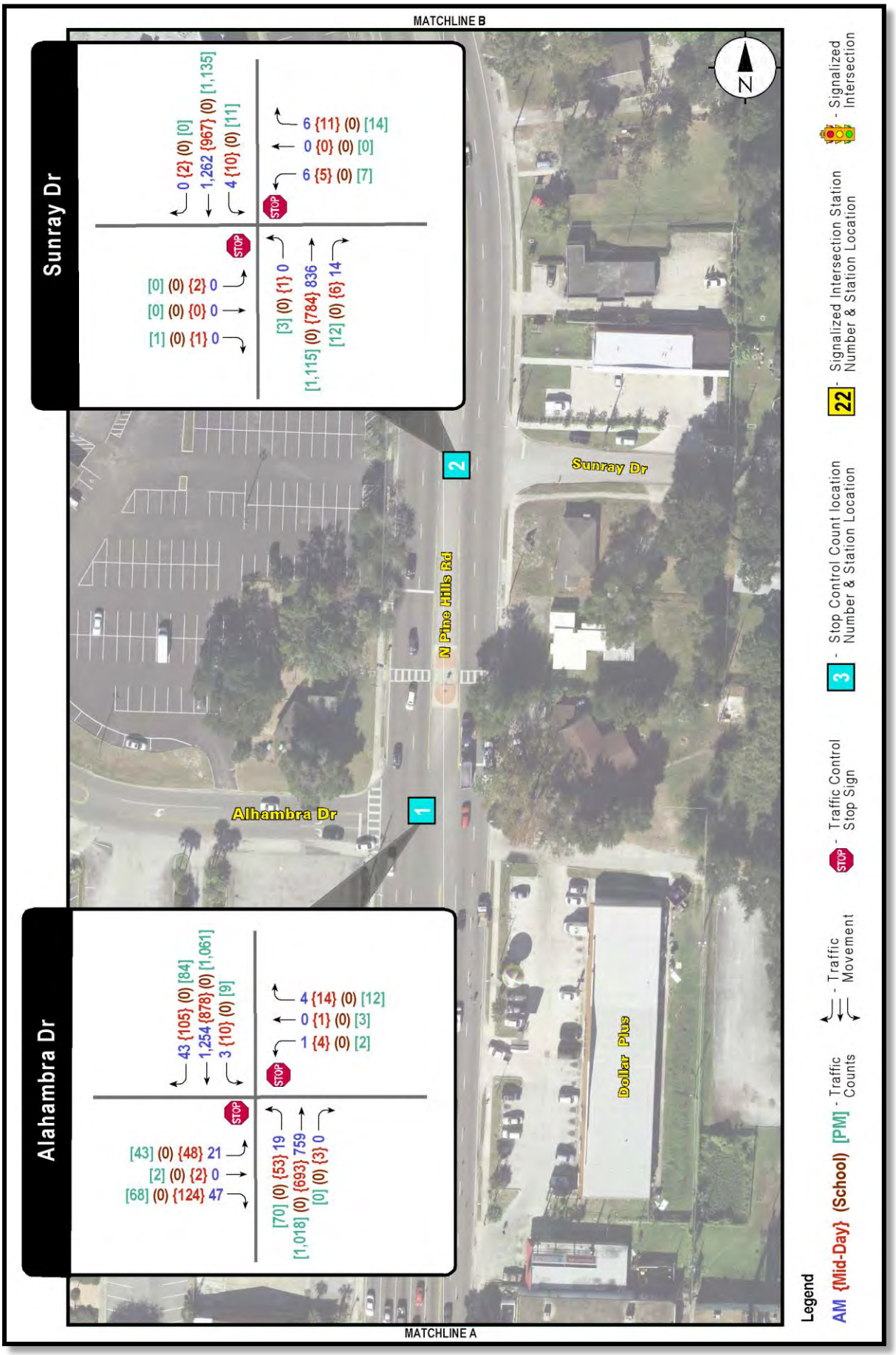

Figure 4.7
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

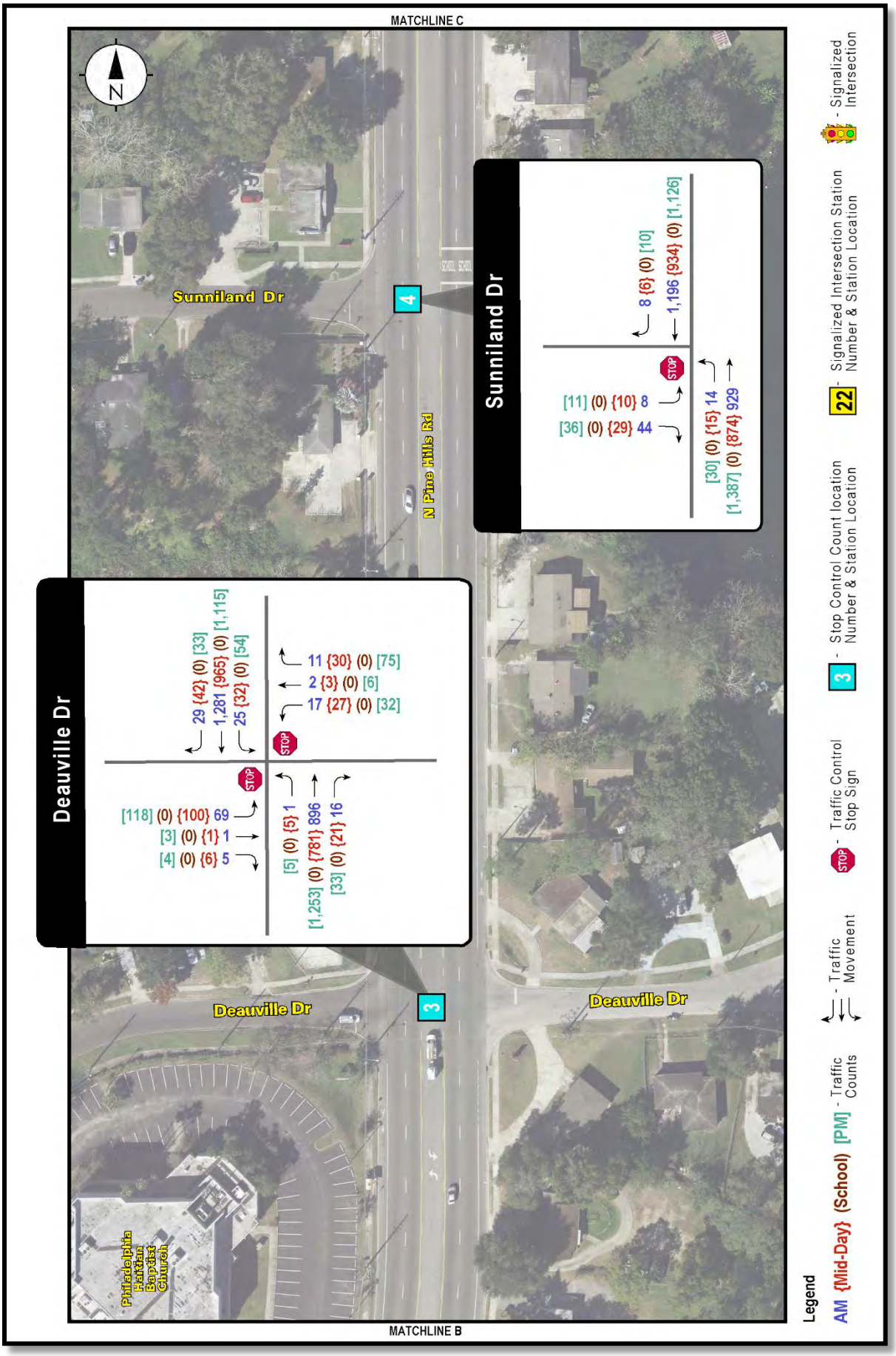

Figure 4.8
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
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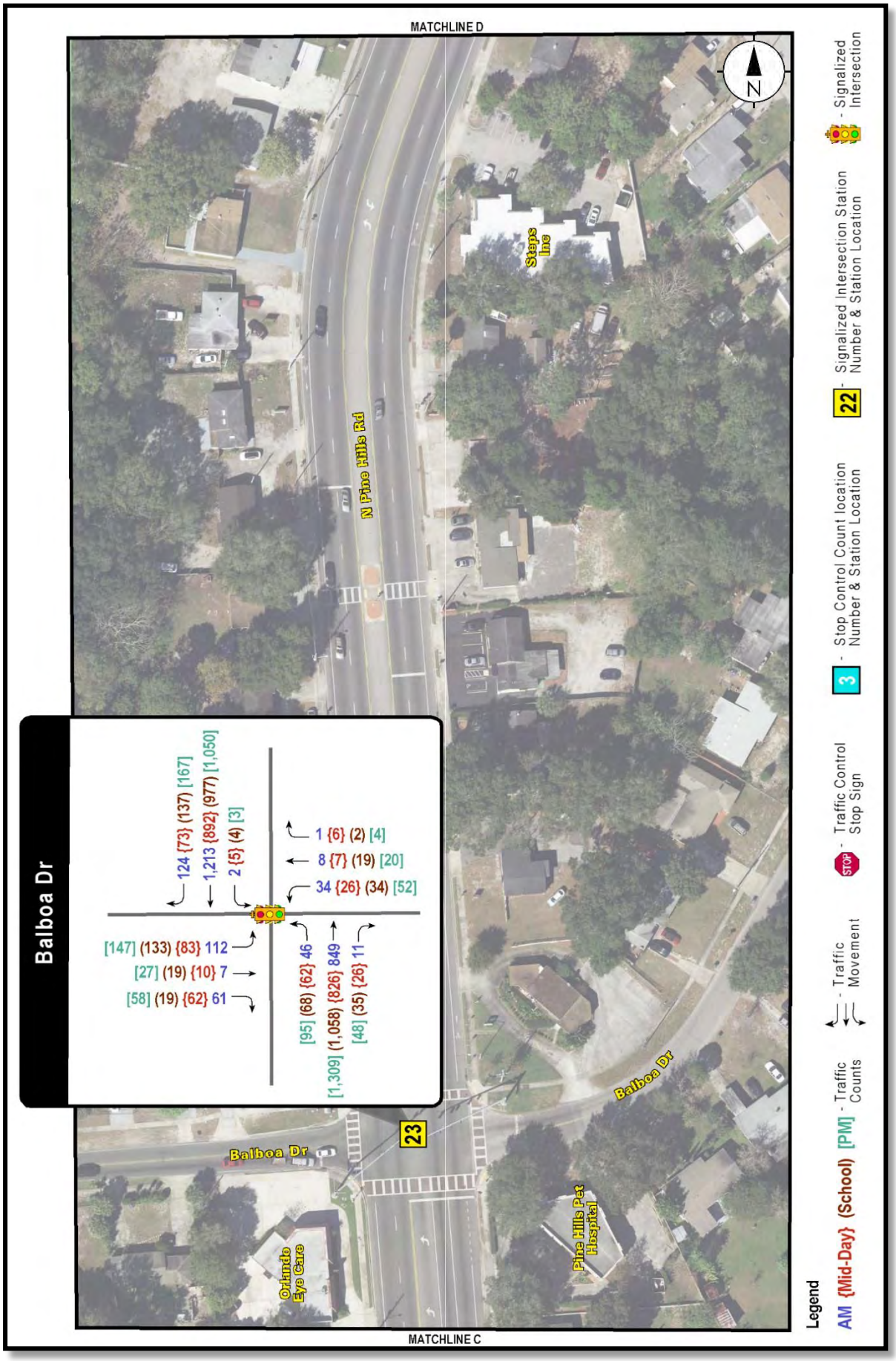


Figure 4.9
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

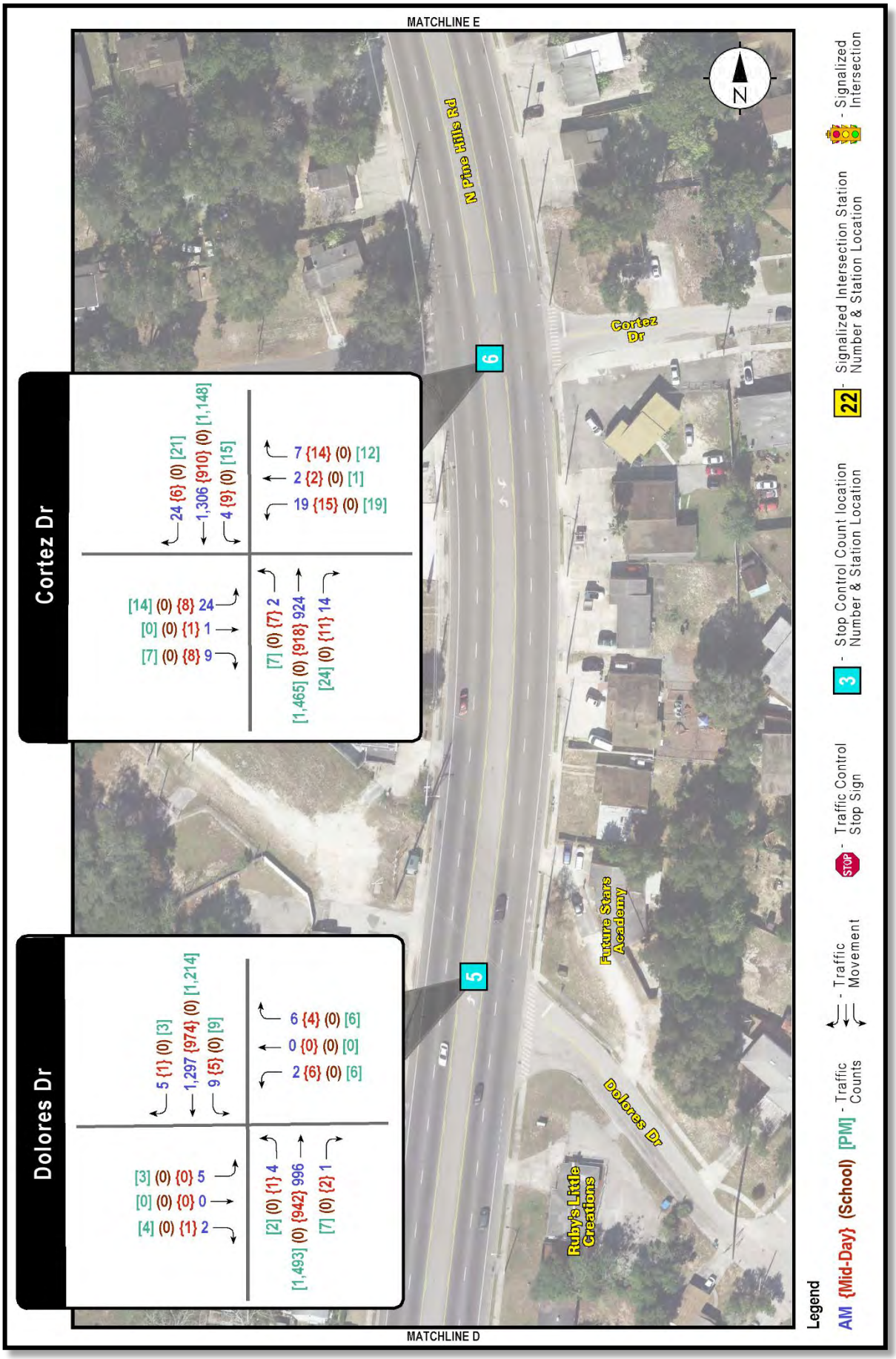


Figure 4.10
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
Page 86

Figure 4.11
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

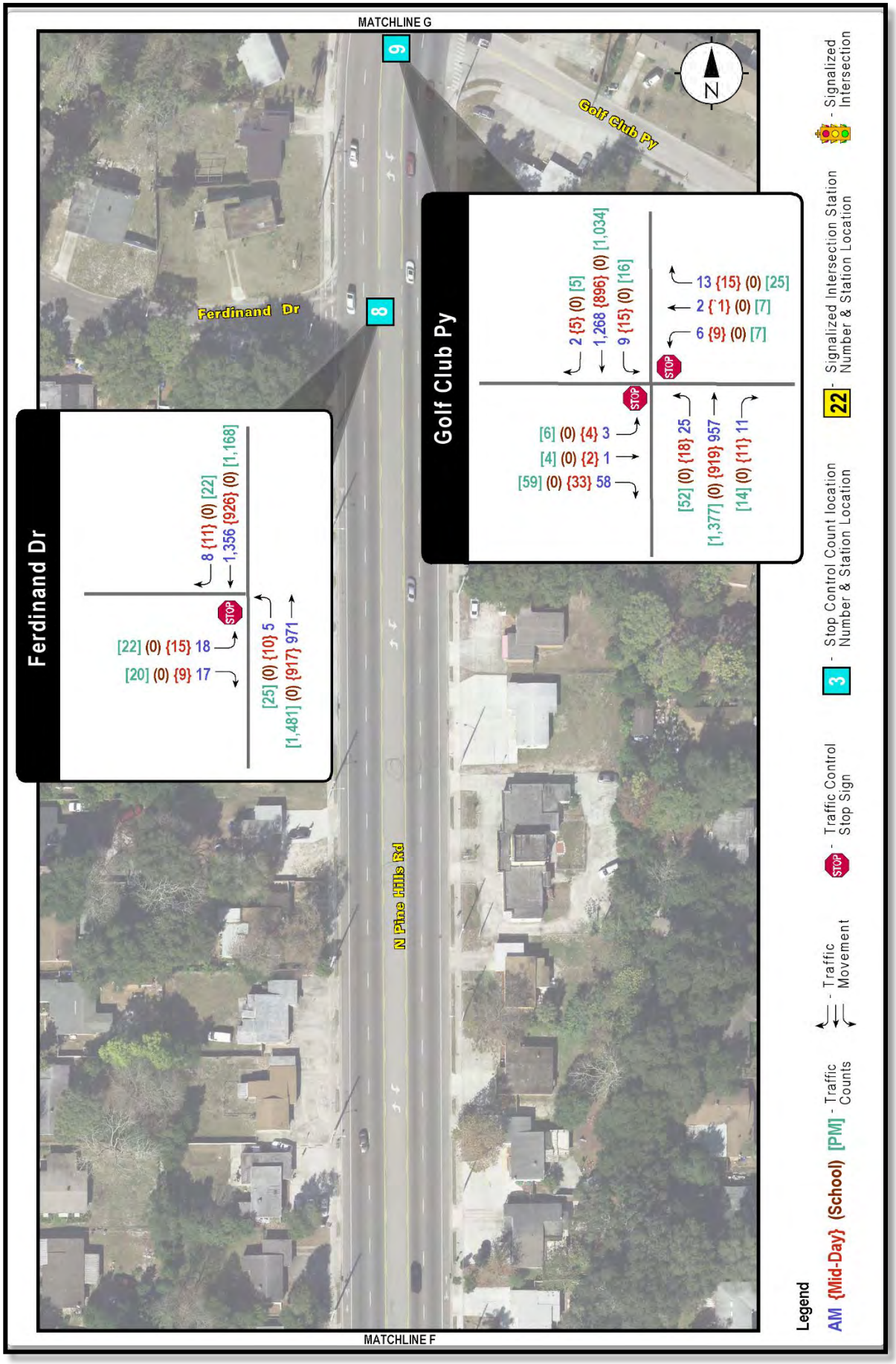


Figure 4.12
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

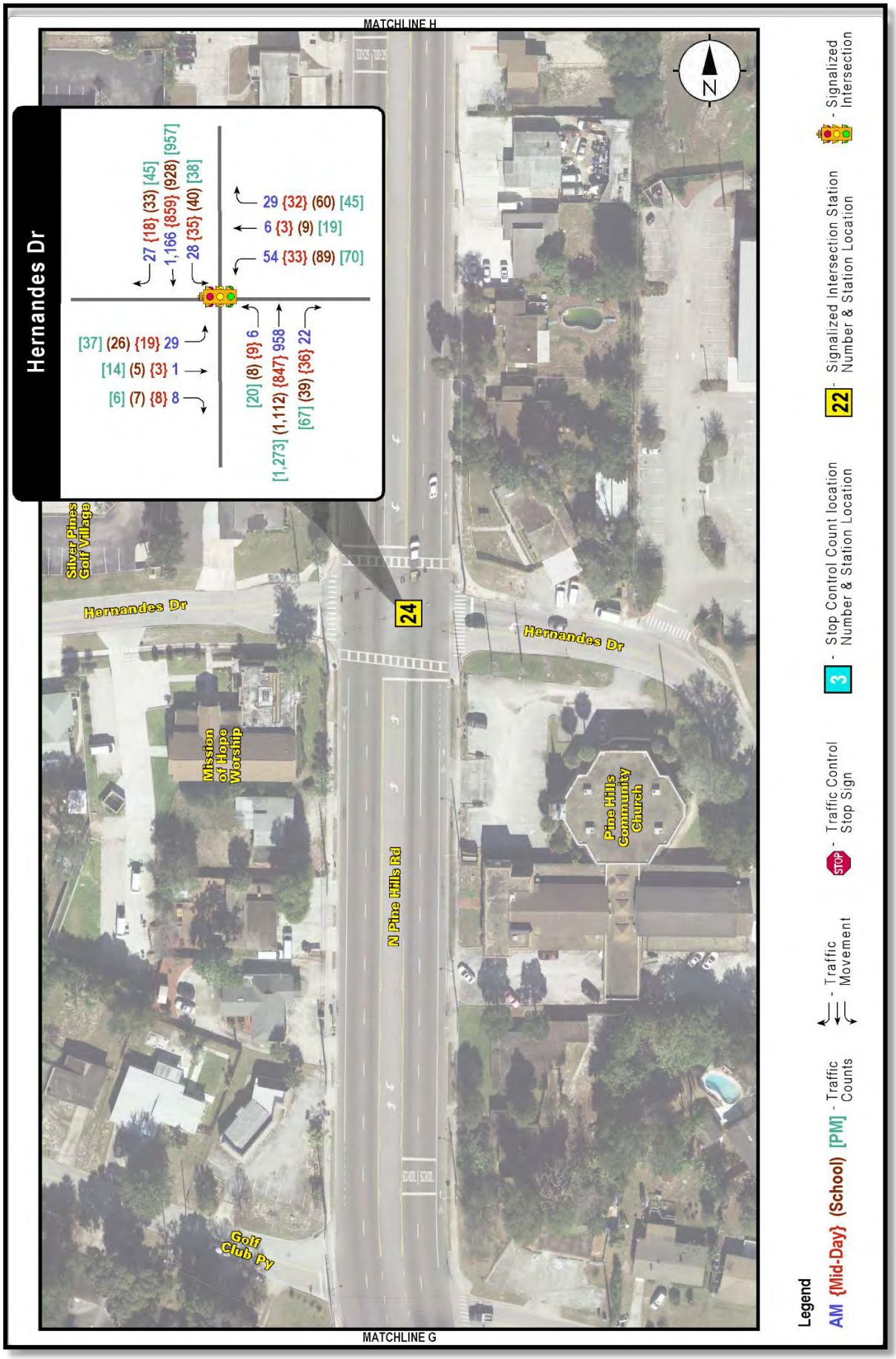


Figure 4.13
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

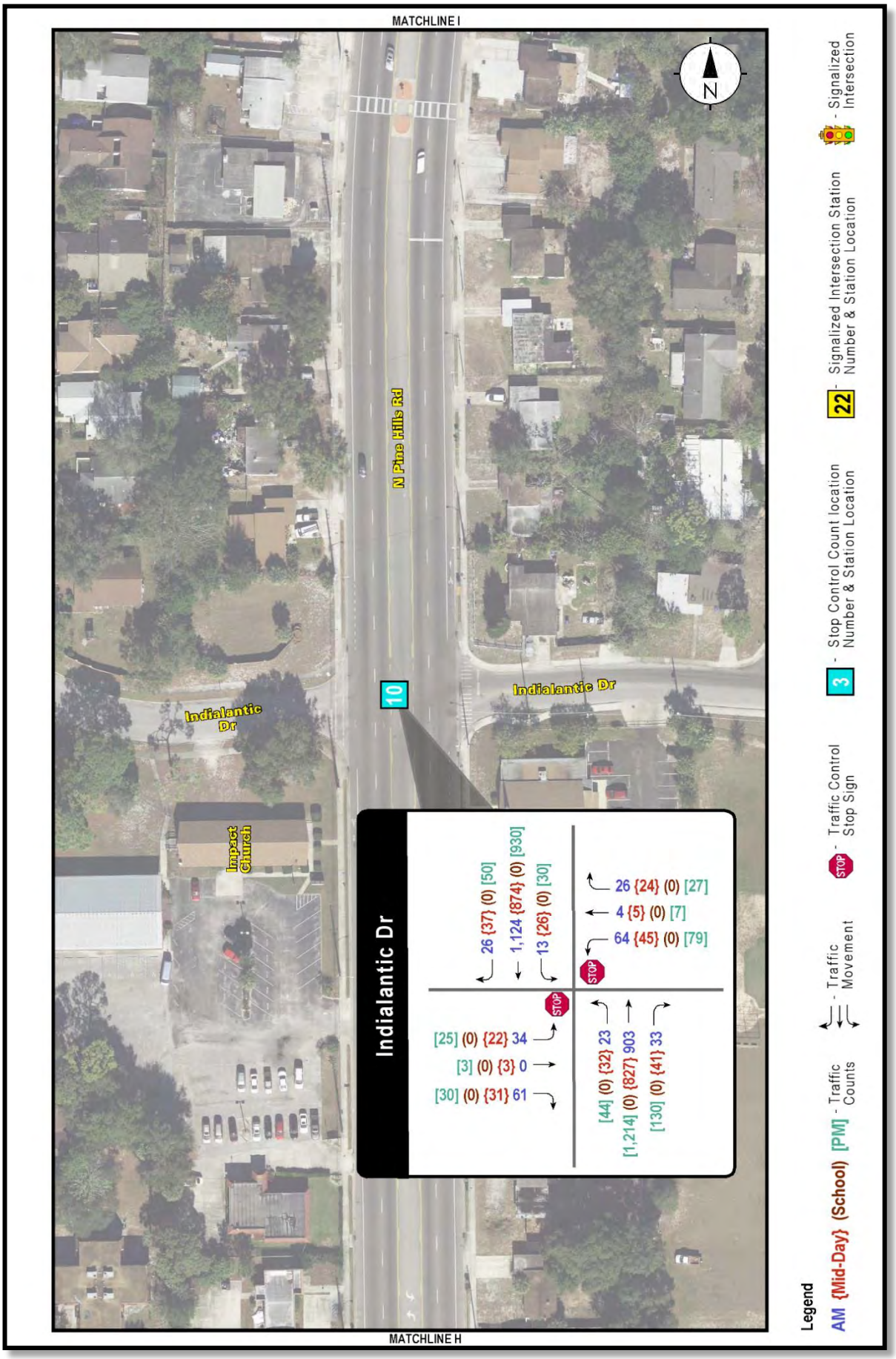
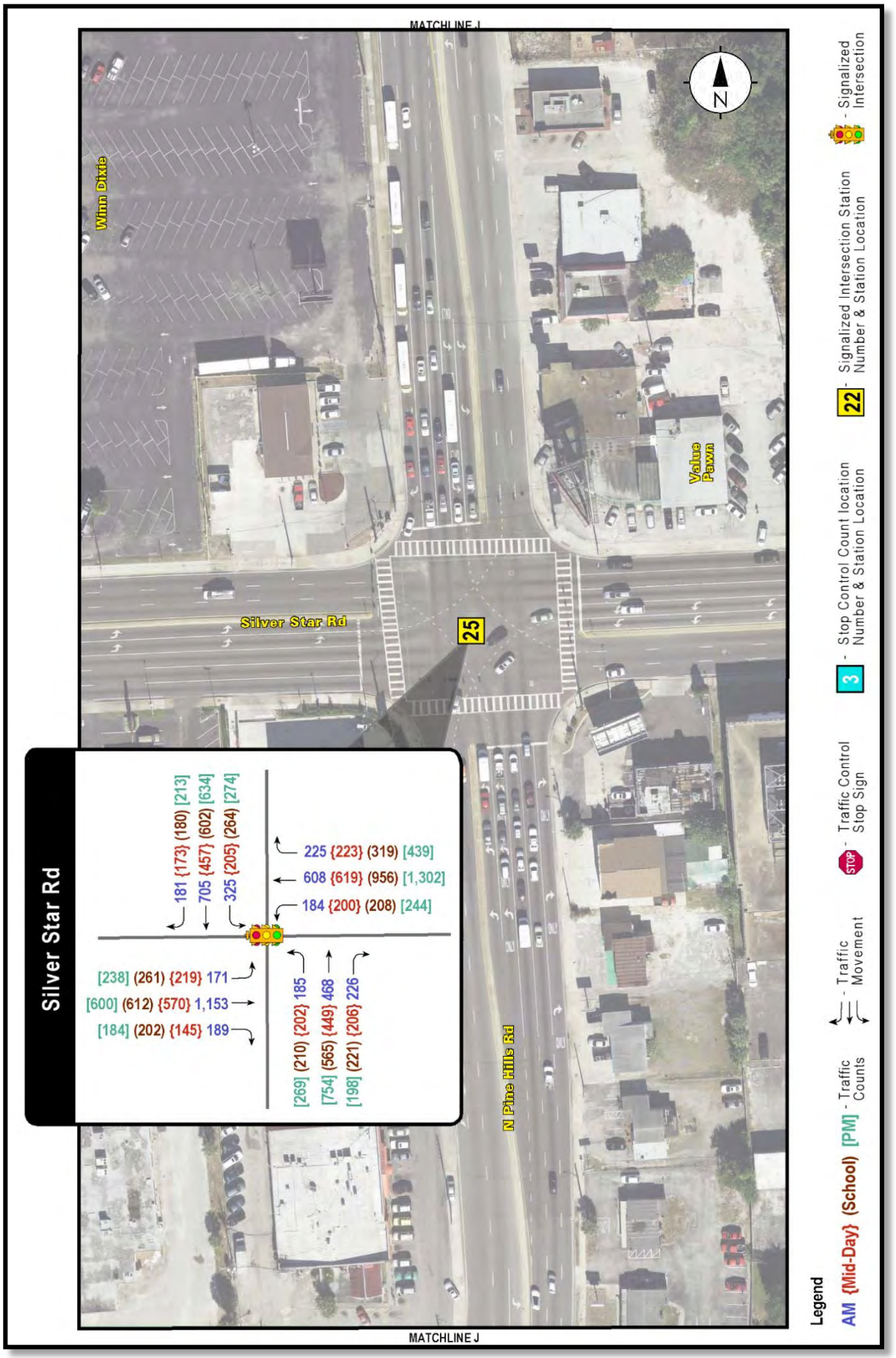


Figure 4.14
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 4.15
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report



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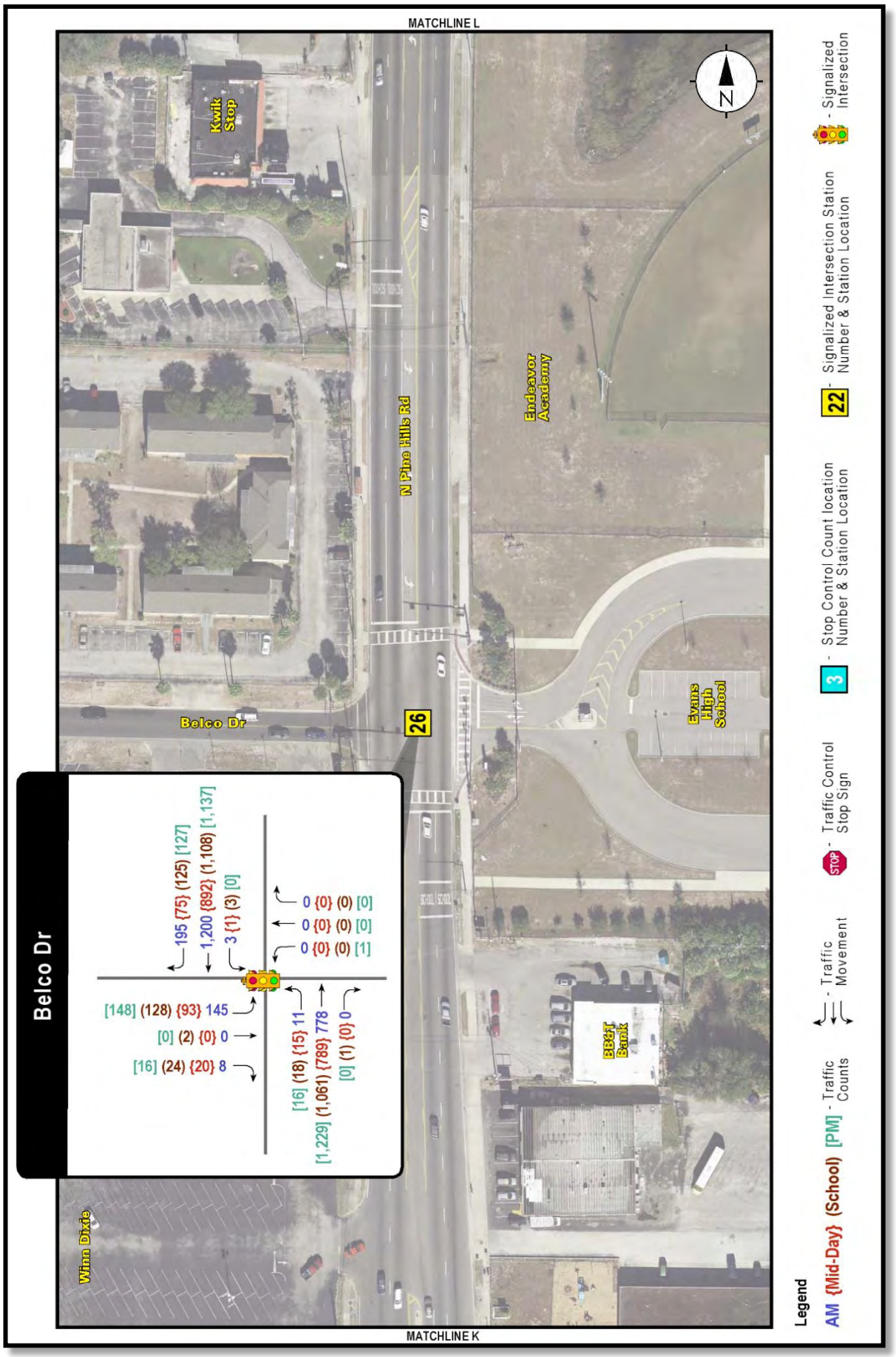
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report



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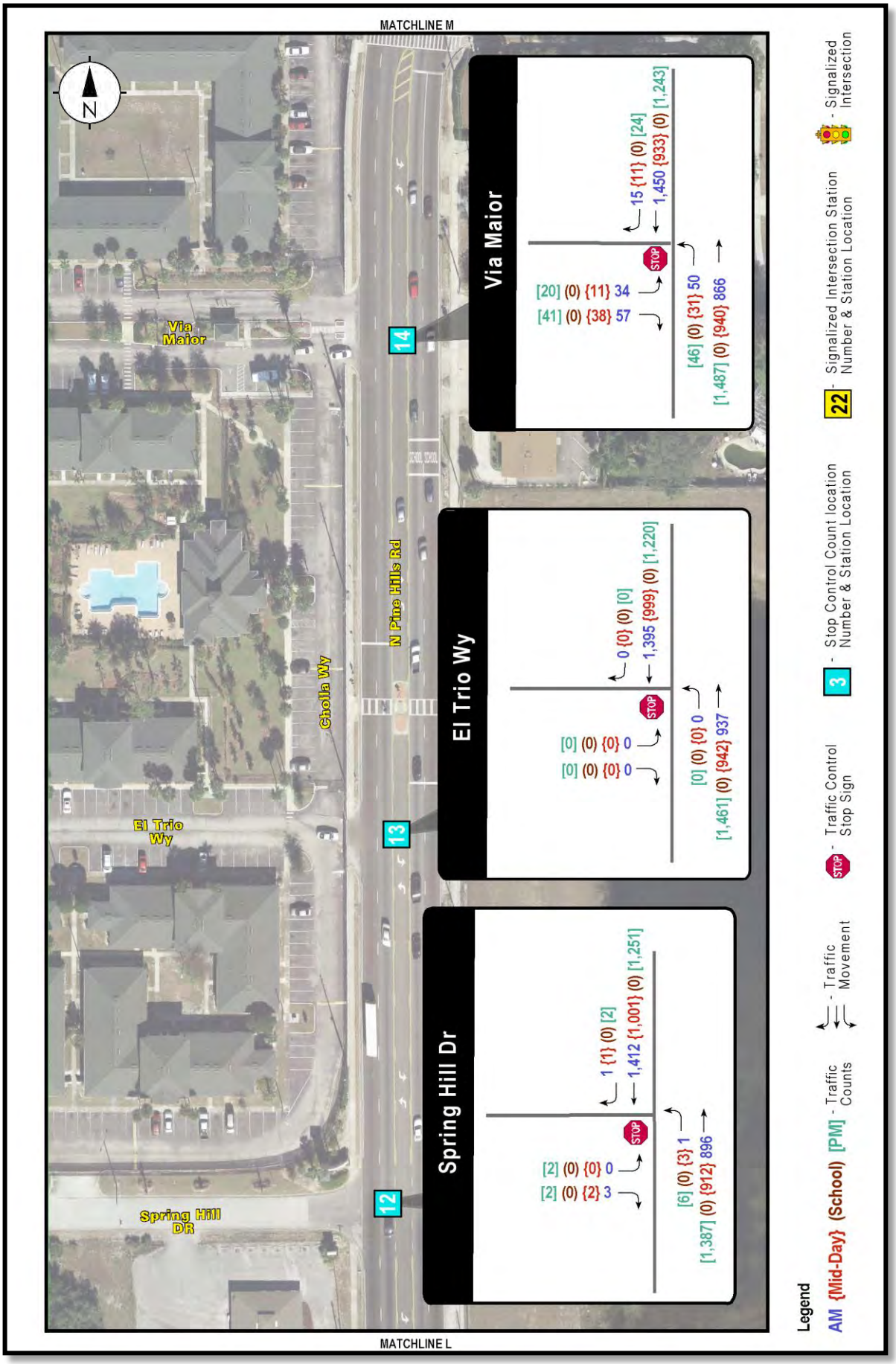
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report



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Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

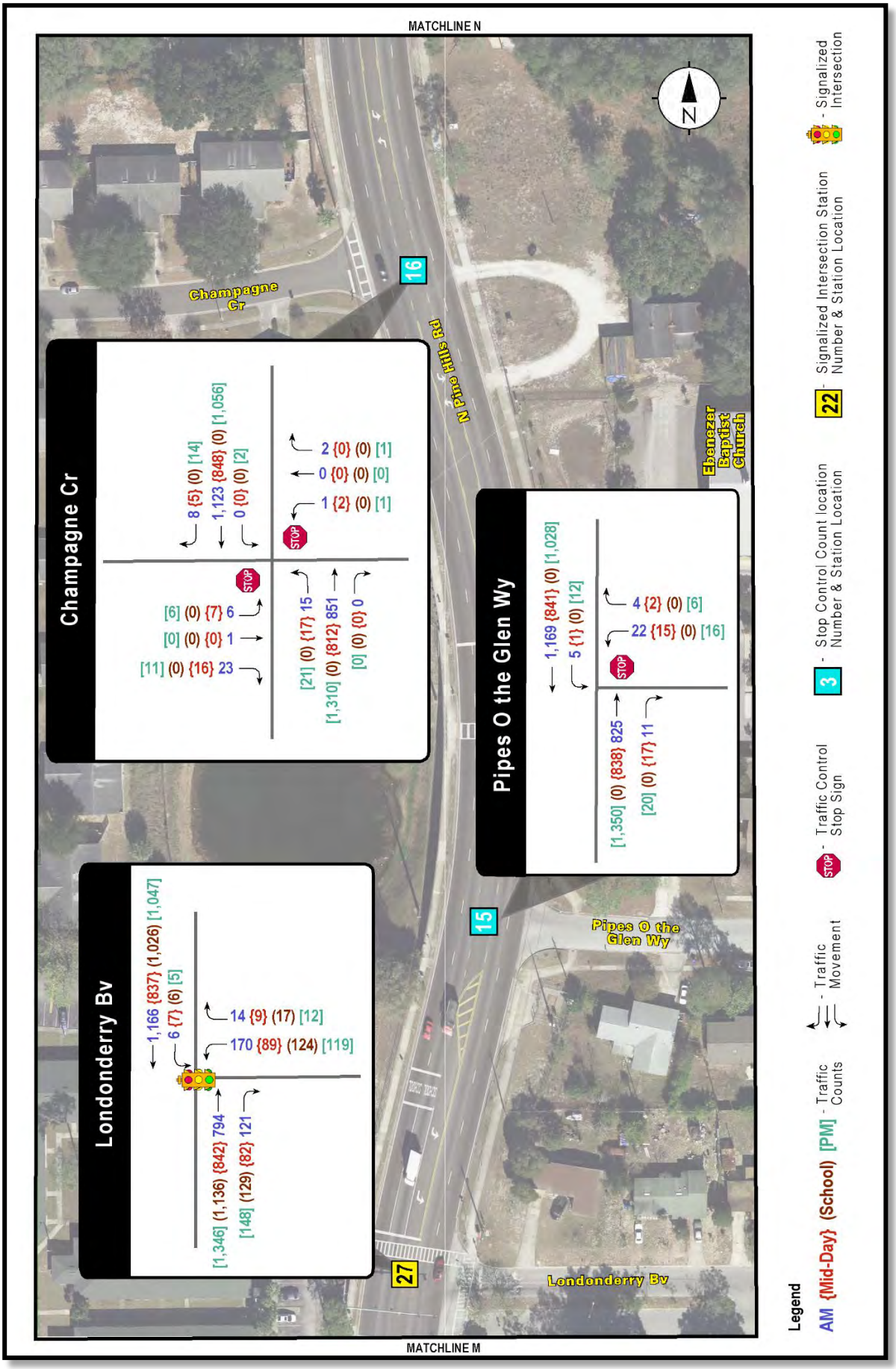

Figure 4.19
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

Figure 4.20
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

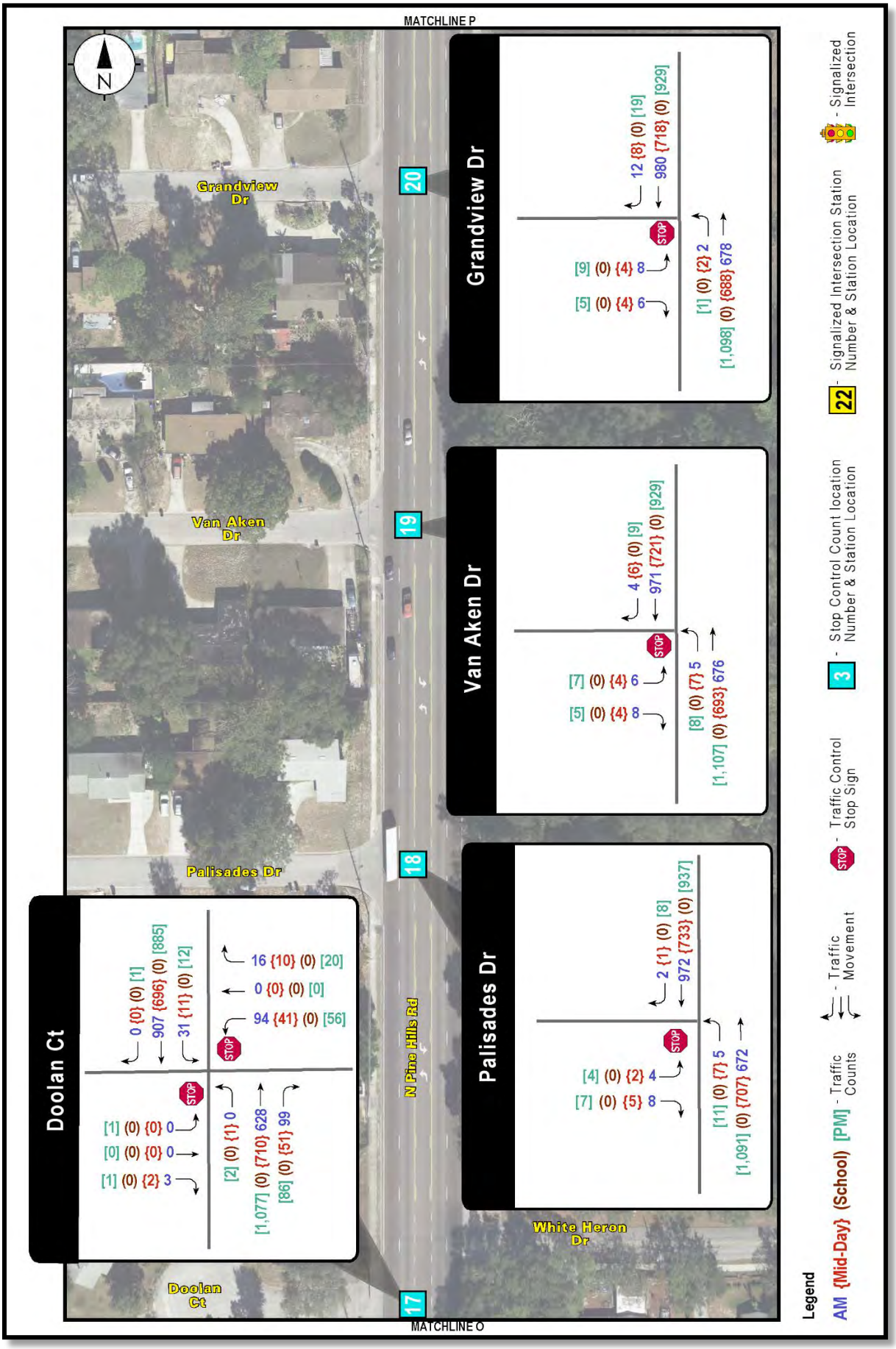

Figure 4.21
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

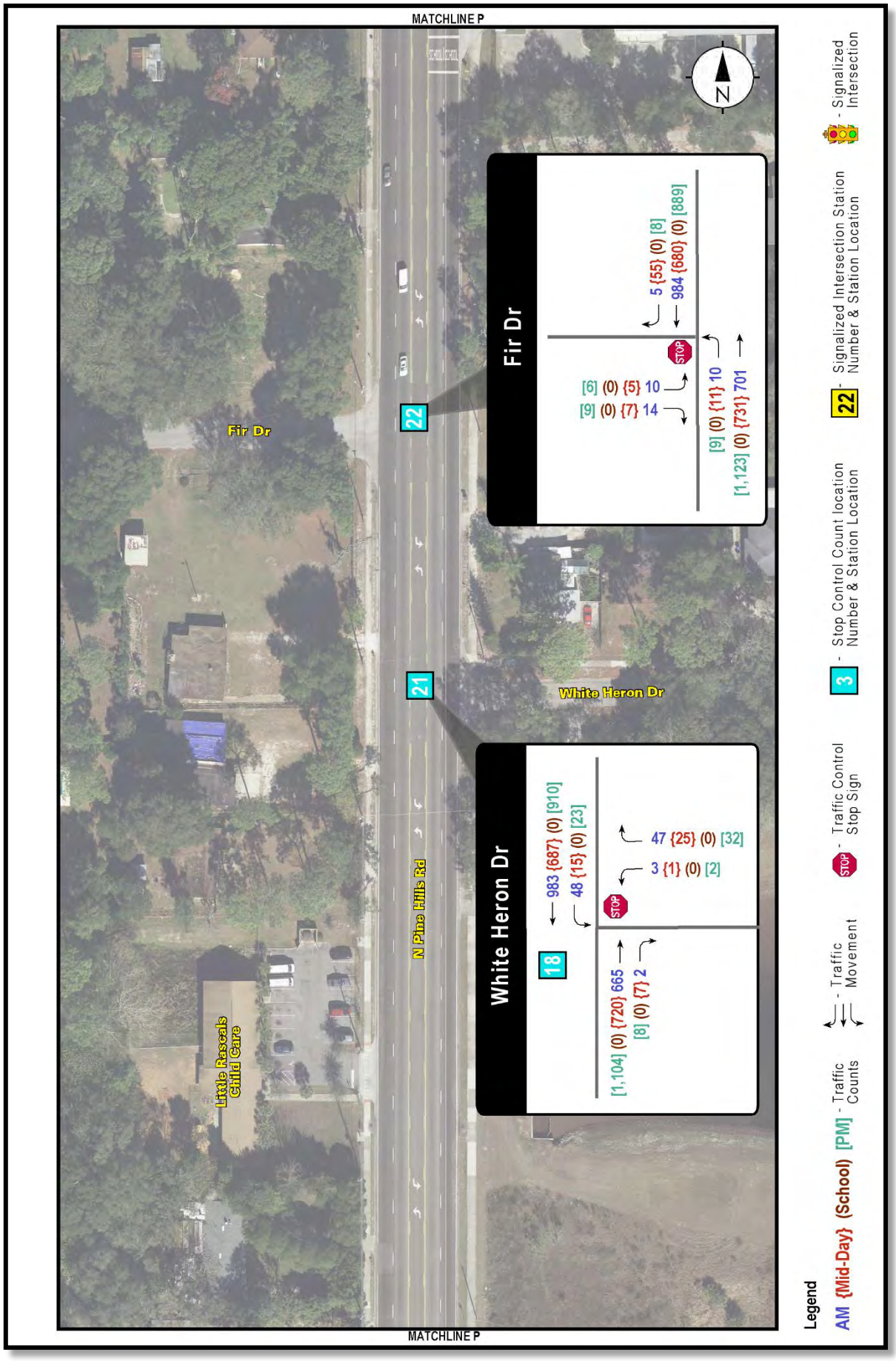

Figure 4.22
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

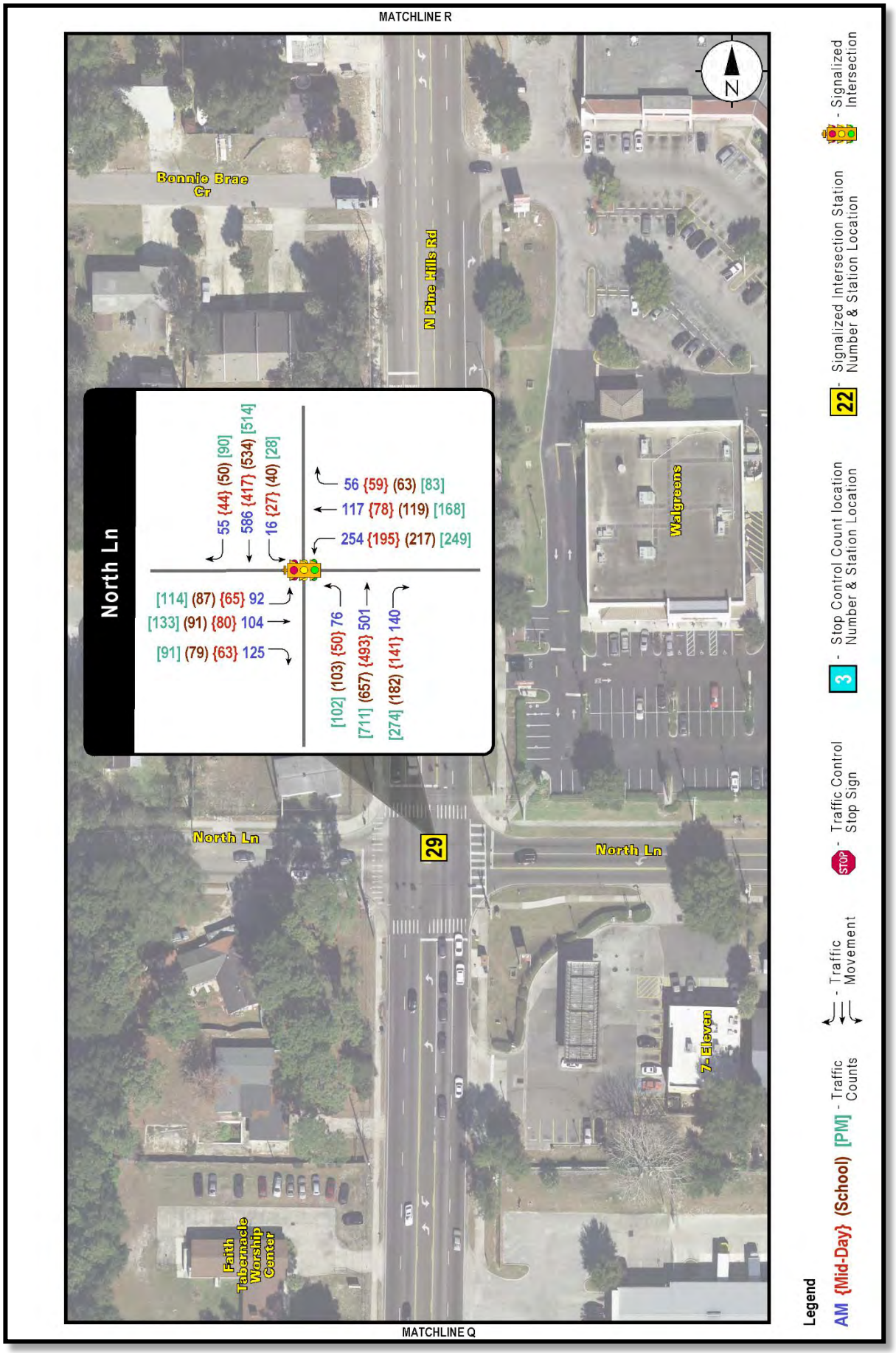

Figure 4.23
Turning Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
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4.2 Pedestrian and Bicycle Traffic Volumes

As presented in an earlier section, crosswalks are provided at midblock crossings, signalized intersections, unsignalized intersections, and at major driveways.

4.2.1 Midblock Crossings

Pedestrian and bicycle counts were collected over a three-day period (from 7:00 to 9:00 AM and 4:00 to 6:00 PM) along the corridor at midblock crosswalk crossing locations as well as five (5) non-crosswalk locations provided by Orange County. The mid-block hourly counts are summarized in Table 4.3 and include pedestrians and bicyclists within approximately 25-feet of the crosswalk or non-crosswalk count location that cross Pine Hills Road. The 2-Hour Peak represents the highest two-hour total observed during one day of the three-day count period. The Peak Hour represents the highest one-hour total observed during one day of the three-day count period.

The highest set of pedestrian and bicycle volumes for mid-block crossings were observed at the non-crosswalk crossings approximately 335 feet north of Fir Drive adjacent to the Nature's Own Bakery Outlet store driveway. The observed counts were consistently high during all the count periods, as shown in Table 4.3. The second highest set of pedestrian and bicycle volumes were observed to occur at the existing crosswalk located approximately 160 feet north of Figwood Lane. Again, the observed counts were consistently during the AM peak period but higher during the PM peak period.

Table 4.3: Pedestrian and Bicycle Traffic Volumes at Midblock Crossings

MB #	Pedestrian/Bicycle Crossing Location	2-Hour Peak				Peak-Hour			
		Pedestrian Volume		Bicycle Volume		Pedestrian Volume		Bicycle Volume	
		AM	PM	AM	PM	AM	PM	AM	PM
54	Existing Crosswalk 109 feet North of Alhambra Drive	11	14	5	8	8	8	4	6
55	Survey Location 275 feet North of Sunray Drive (No Crosswalk)	12	21	1	8	9	15	1	4
56	Existing Crosswalk 405 feet North of Balboa Drive	1	7	1	1	1	6	1	1
57	Survey Location 200 feet North of Hernandes Drive (No Crosswalk)	8	7	3	2	6	5	2	2
58	Existing Crosswalk 440 feet North of Indialantic Drive	5	6	2	0	4	6	2	0
59	Existing Crosswalk 160 feet North of Figwood Ln	25	45	1	10	16	24	1	7
60	Survey Location 500 feet North of Silver Star Rd (No Crosswalk)	12	37	5	5	7	23	5	4
61	Existing Crosswalk 375 feet North of Belco Drive	19	21	2	3	11	11	2	3
62	Existing Crosswalk 135 feet North of Pipes O the Glen Way	20	17	0	16	12	9	0	11
63	Survey Location 335 feet North of Fir Drive (No Crosswalk)	67	73	1	11	36	43	1	7
64	Survey Location 530 feet West of Pine Hills Road (No Crosswalk)	20	22	2	2	15	18	1	2

4.2.2 Signalized Intersections

Pedestrian and bicycle counts were collected at signalized intersections during the 7:00-9:00 AM, 11:00 AM -1:00 PM mid-day, 2:00-4:00 PM school and 4:00-6:00 PM peak periods. The signalized intersection pedestrian and bicycle counts which were observed using the crosswalks (within approximately 25-feet of the crosswalk or crossing area) on each of the approaches are summarized for the peak hour of each of the study periods in Table 4.4.

At the signalized intersections along the study area, the highest pedestrian and bicycle traffic volumes were observed at two intersections, Silver Star Road (SR 438) and Belco Drive, with the highest counts occurring during the Mid-Day and School peak periods. It should be noted that Evans High School is located just east of Belco Drive.

Table 4.4: Pedestrian and Bicycle Traffic Volumes at Signalized Intersections (Peak Hour)

SI #	Pedestrian/Bicycle Crossing Location	Pedestrian Volume				Bicycle Volume			
		AM	Midday	School	PM	AM	Midday	School	PM
23	Balboa Drive	8	7	11	17	3	3	11	4
24	Hernandes Drive	9	17	28	26	7	6	8	4
25	Silver Star Road (SR 438)	50	202	231	146	1	10	12	15
26	Belco Drive	51	187	168	74	1	15	12	25
27	Londonderry Boulevard	45	44	54	26	3	9	6	7
28	Indian Hill Road	12	6	19	11	2	1	1	4
29	North Lane	37	39	107	113	4	6	7	25

4.2.3 Unsignalized Intersections

Pedestrian and bicycle counts were also collected at unsignalized intersections during 7:00-9:00 AM, 11:00 AM -1:00 PM mid-day and 4:00-6:00 PM peak periods. The unsignalized intersection pedestrian and bicycle counts which were observed (within approximately 25 feet of the unsignalized intersection) on each of the approaches are summarized for the peak hour of each of the study periods in Table 4.5.

At the unsignalized intersections along the study area, the highest pedestrian and bicycle traffic volumes were observed at the intersection of Spring Hill Drive, which is located just north of Belco Drive. The highest counts occurring during the AM and PM peak periods. It should be noted that Evans High School is located just southeast of Spring Hill Drive.

Table 4.5: Pedestrian and Bicycle Traffic Volumes at Unsignalized Intersections (Peak Hour)

UI #	Pedestrian/Bicycle Crossing Location	Pedestrian Volume			Bicycle Volume		
		AM	Midday	PM	AM	Midday	PM
1	Alhambra Drive	4	0	6	0	0	1
2	Sunray Drive	12	32	28	10	3	10
3	Deauville Drive	12	18	20	3	2	6
4	Sunniland Drive	5	7	8	0	4	6
5	Dolores Drive	10	6	10	3	3	7
6	Cortez Drive	12	9	13	6	3	3
7	Elinore Drive	4	0	11	3	0	5
8	Ferdinand Drive	6	6	9	0	1	4
9	Golf Club Pakrway	11	14	14	3	5	4
10	Indialantic Drive	16	14	26	4	7	8
11	Figwood Lane	12	13	16	4	4	1
12	Spring Hill Drive	60	36	44	4	10	10
13	El Trio Way	44	37	53	2	2	0
14	Via Maior	36	10	28	2	6	4
15	Pipes O the Glen Way	20	9	38	2	4	5
16	Champagne Circle	32	17	53	2	8	8
17	White Heron Drive/Doolan Court	15	3	7	1	1	4
18	Palisades Drive	22	4	10	1	0	5
19	Van Aken Drive	14	9	9	0	2	4
20	Grandview Drive	8	4	11	1	6	5
21	White Heron Drive North	6	15	17	3	2	5
22	Fir Drive	15	11	18	1	1	4

4.2.4 Major Driveways

Major driveway pedestrian and bicycle counts were collected for the AM period (7:00 to 9:00) and PM period (4:00 to 6:00) for pedestrians and bicyclists crossing each driveway at six of major driveway locations on Pine Hills Road. The peak-hour major driveway pedestrian and bicycle counts which were observed (within approximately 25-feet of the major driveway location) on each of the approaches results are summarized for the peak hour in Table 4.6.

Table 4.6: Pedestrian and Bicycle Traffic Volumes at Major Driveways (Peak Hour)

MB #	Pedestrian/Bicycle Crossing Location	Pedestrian Volume		Bicycle Volume	
		AM	PM	AM	PM
30	Suntrust Plaza/Stabroek Plaza	12	17	5	2
31	Pine Hills Christian Church	2	7	0	1
32	Faith Christian Center Church	17	22	4	13
33	Silver Hill Shopping Center	5	15	0	1
34	First Baptist Church	9	17	0	1
35	7/11 Entrance	17	16	1	2

4.3 Existing Corridor Operations Summary

The existing (2017) operational analysis was conducted to determine the Level of Service (LOS) for the Pine Hills Road study area intersections. The LOS for the study area intersections were determined using the procedures as outlined in the Highway Capacity Manual (HCM 2010) using Synchro Software (version 9.0) for both signalized and unsignalized intersections. The traffic signal timings used for the analysis were provided by Orange County.

In addition to the LOS for the automobile mode, the LOS for the pedestrian and bicycle mode was also evaluated for the mid-block crosswalks, the signalized intersections, the unsignalized intersections, and the major driveways. Approximately 50 percent of Pine Hills Road has dedicated bicycle lanes between Sunray Drive and Figwood Lane, within the project limits. Table 4.7 presents the generalized peak hour service volumes for pedestrian and bicycle level of service threshold values (based on 2013 FDOT Quality/Level of Service Handbook methodology) at unsignalized crossings (including mid-block crossings) is determined by the major street traffic volumes.

The pedestrian mode and bicycle mode make use of three important factors in determining the level of service for pedestrian and bicycles. These are motorized vehicles, sidewalks for pedestrians and paved shoulders/bike lanes for bicycles. Unlike the automobile LOS, which is dependent on the number of other motorized vehicles on the roadway, the pedestrian and bicycle LOS is not determined by the number of additional pedestrians on the sidewalk or additional bicycles in the bike lane, rather it is primarily determined by the volume of motorized vehicles. Thus, Table 4.7 represents the motor vehicular thresholds for establishing the pedestrian and bicycle LOS.

Table 4.7: Pedestrian and Bicycle Peak Hour Directional Service Volumes

Sidewalk Coverage	B	C	D	E	F
85% - 100%	200	540	880	1,001	1,001
Bicycle Coverage	**B**	**C**	**D**	**E**	**F**
50% - 84%	110	340	1,000	1,001	1,001

(1) Based on 2013 FDOT Q/LOS Handbook

Figure 4.24

Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

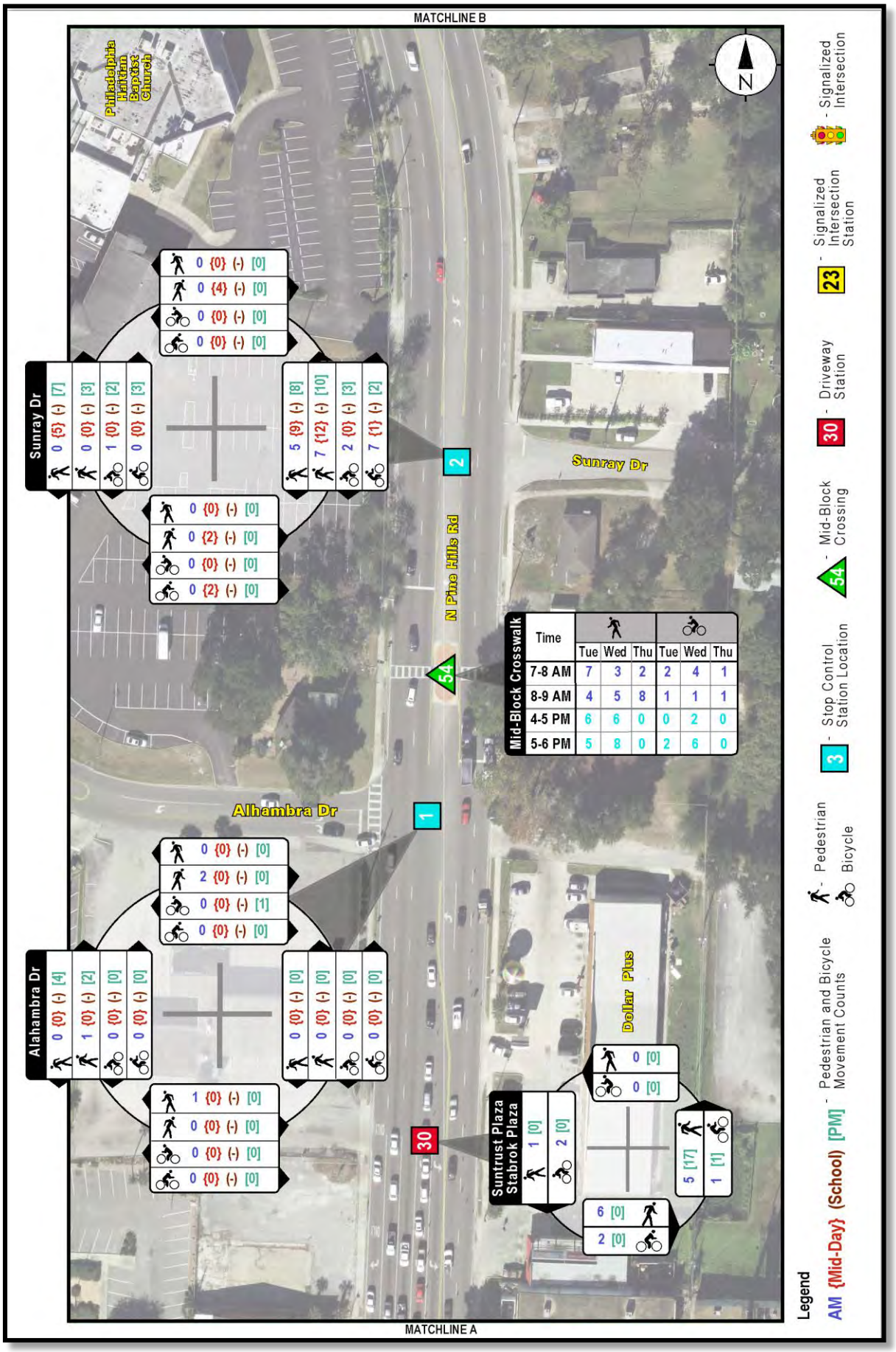

Figure 4.25
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

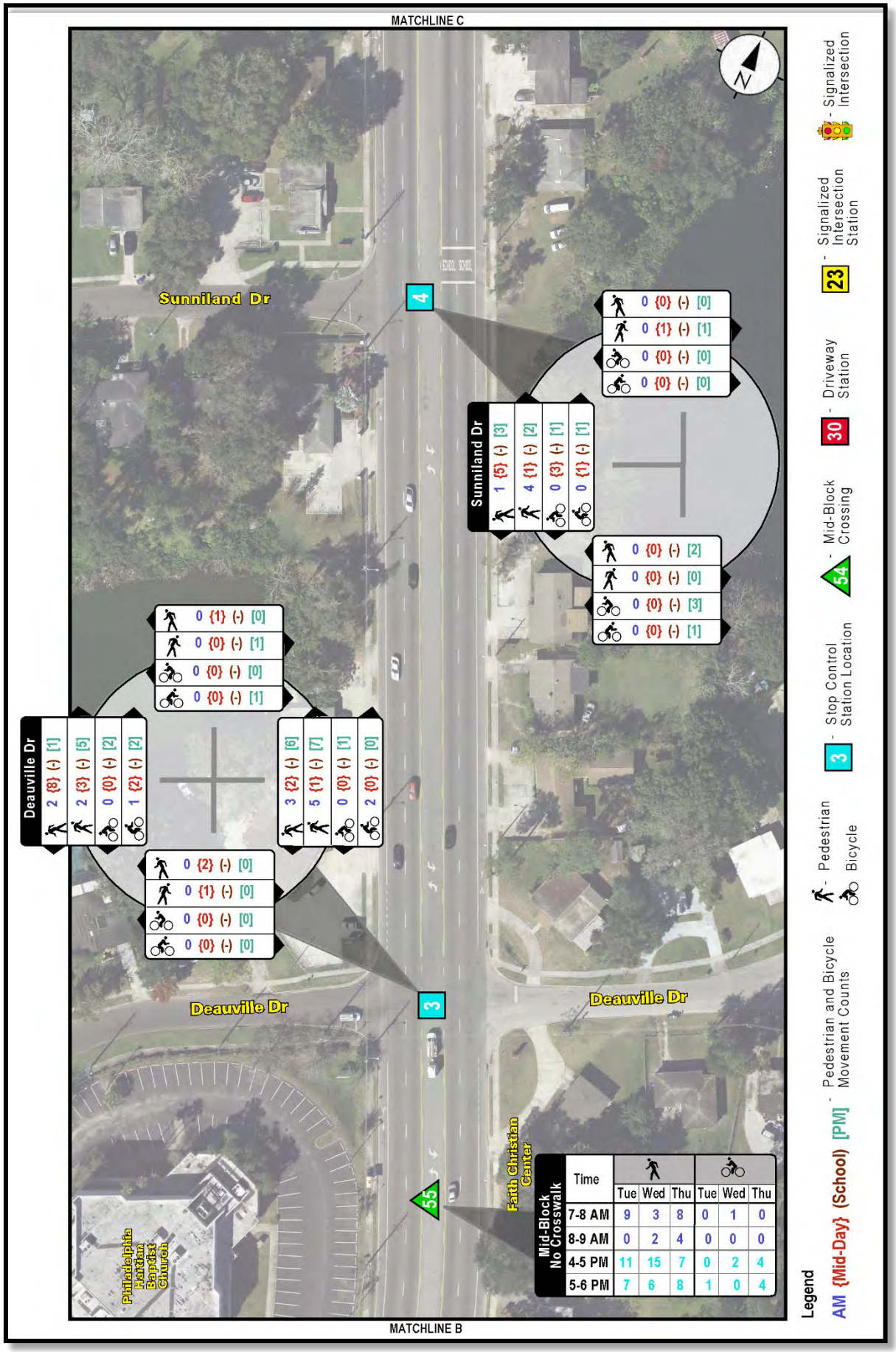

Figure 4.26
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

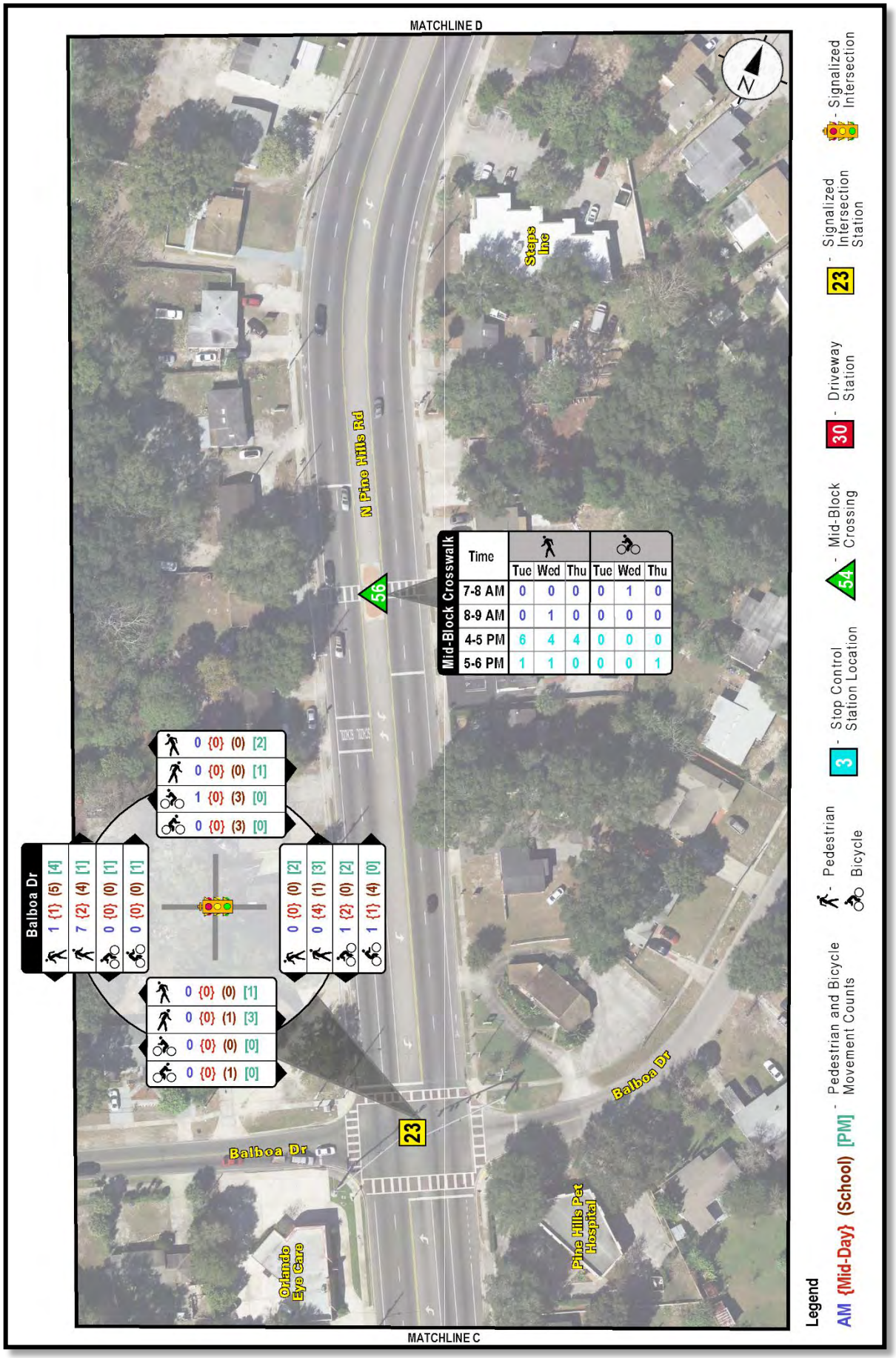

Figure 4.27
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

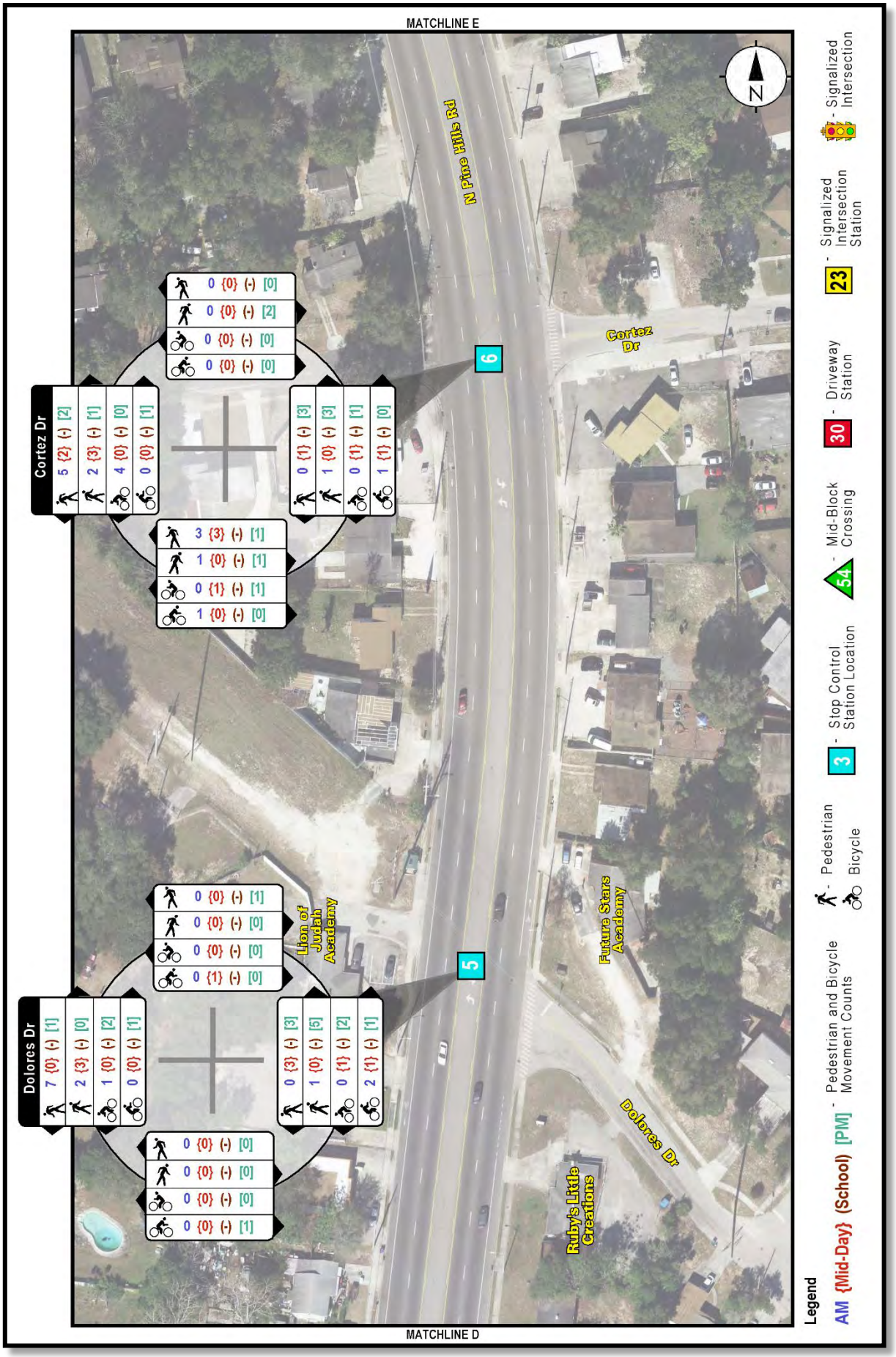

Figure 4.28
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
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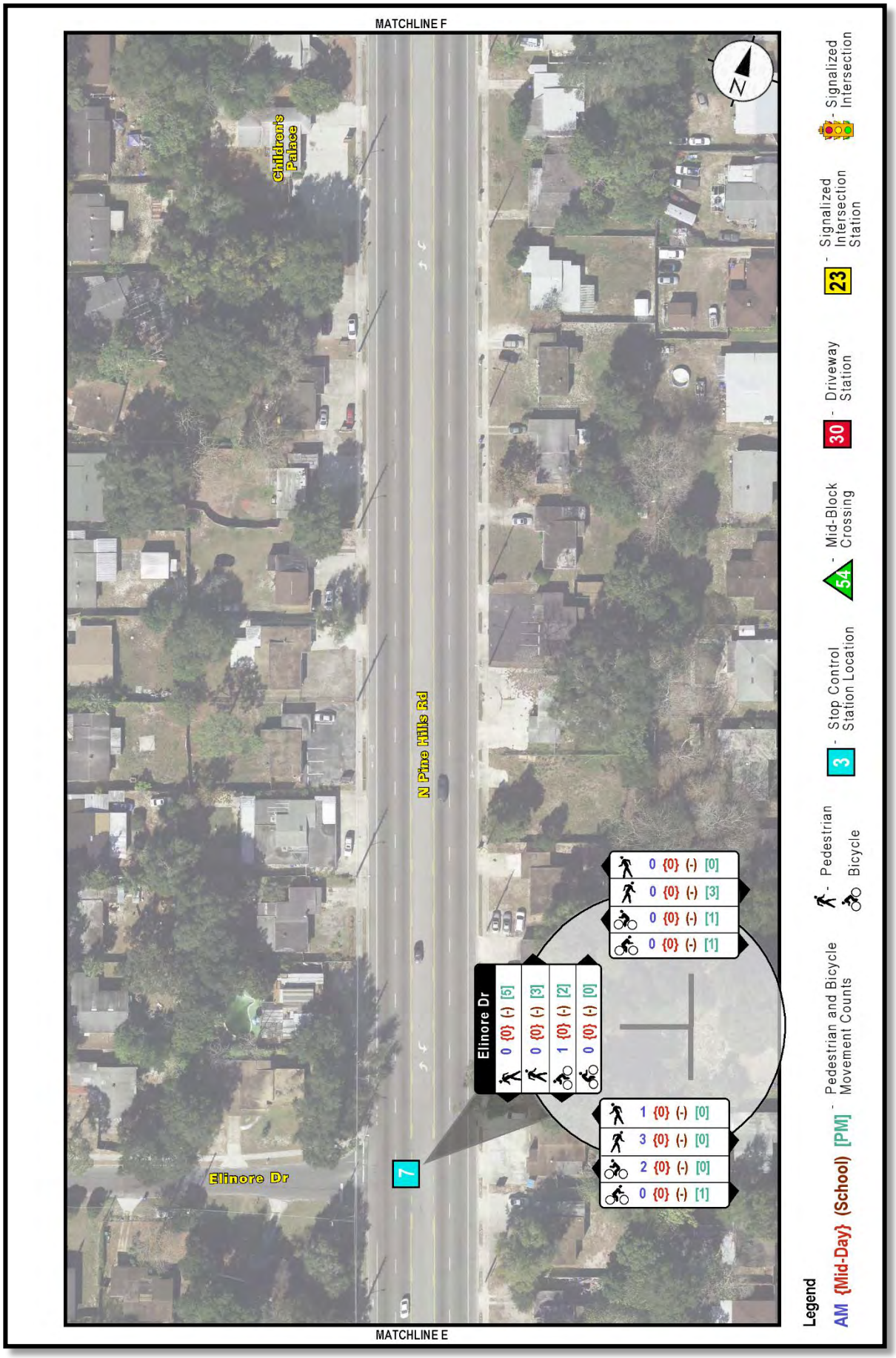

Figure 4.29
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
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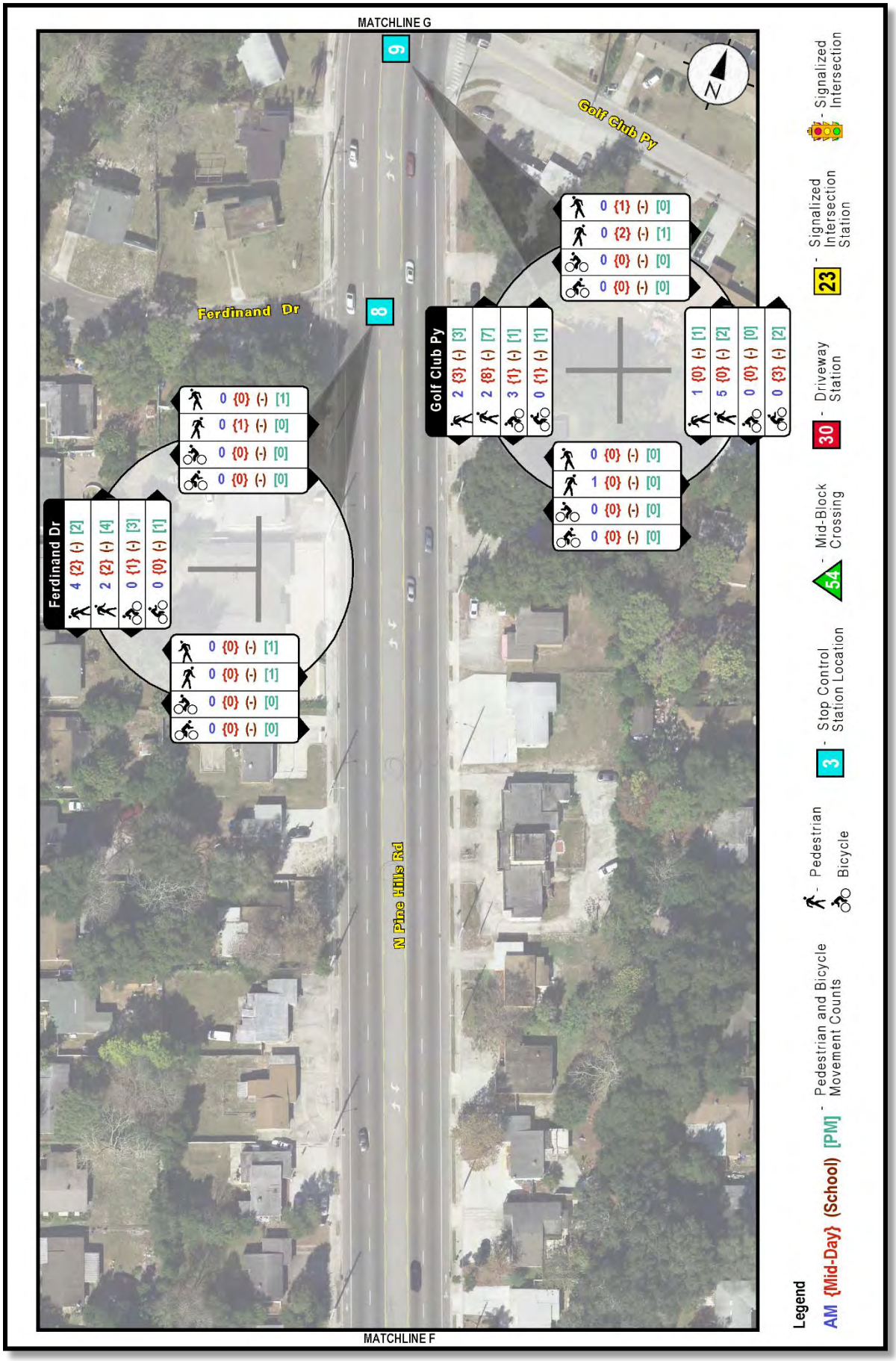

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Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
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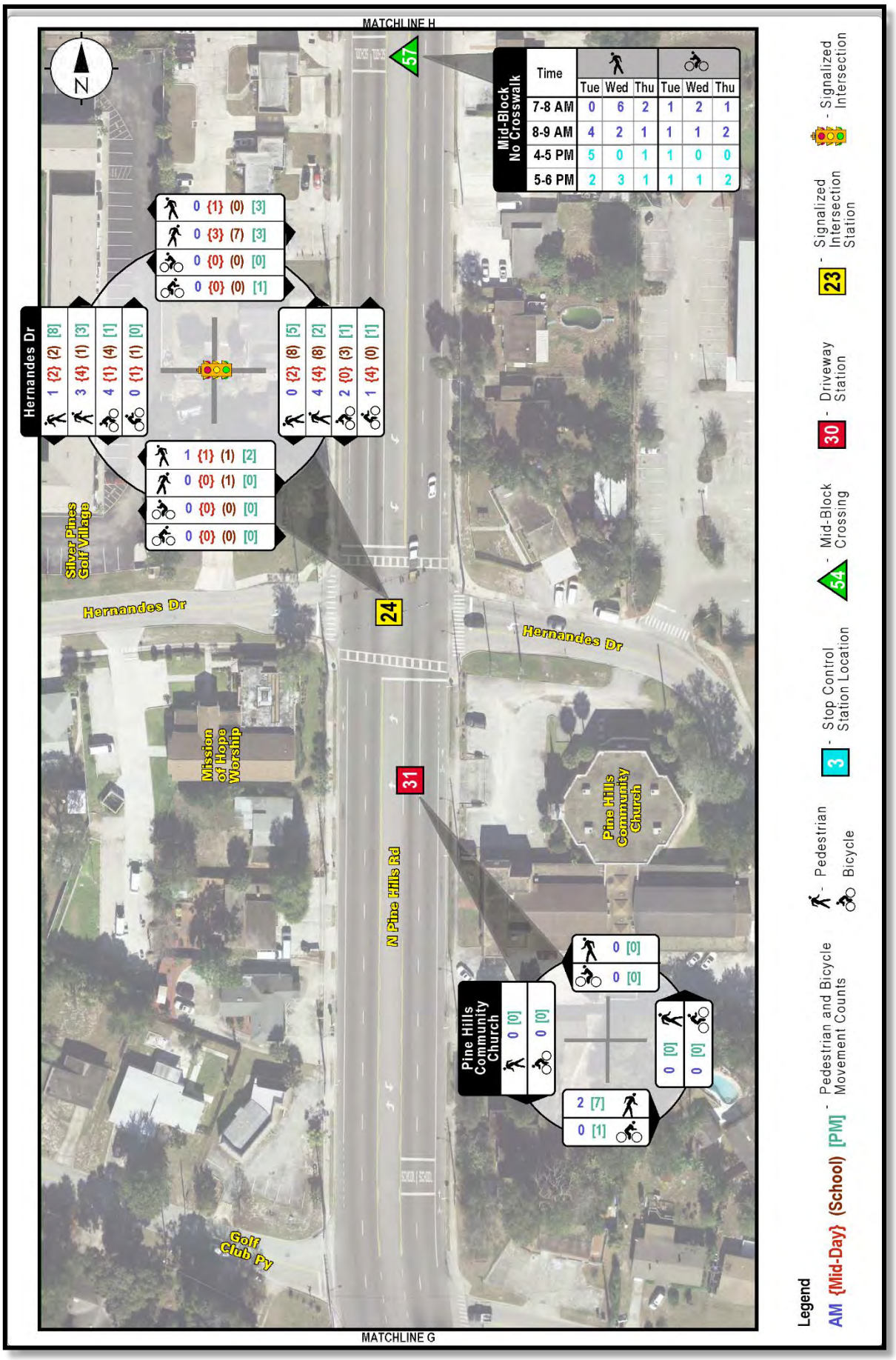

Figure 4.31
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
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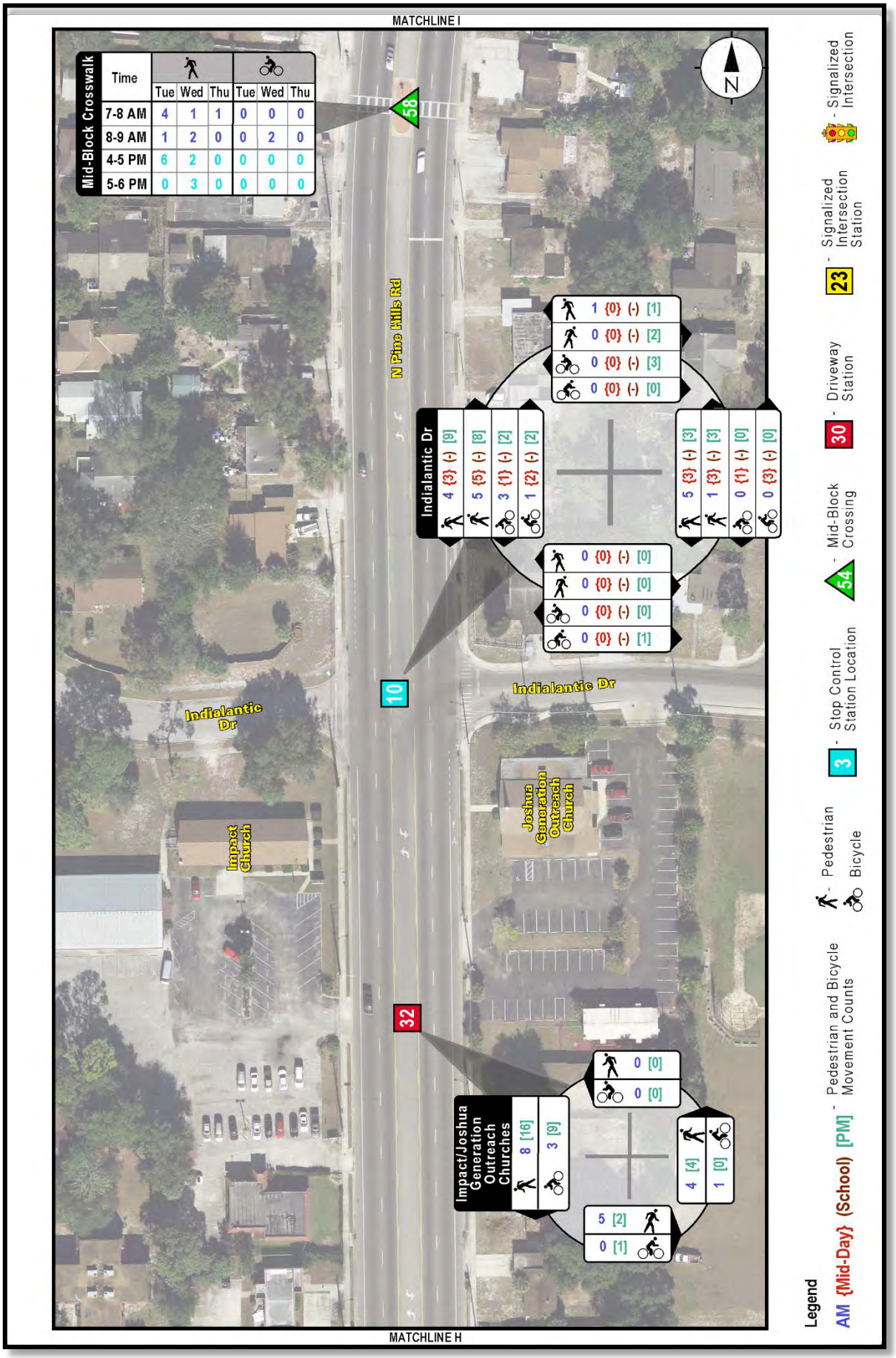

Figure 4.32
Pedestrian and Bicycle Movement Counts
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Existing Conditions Report

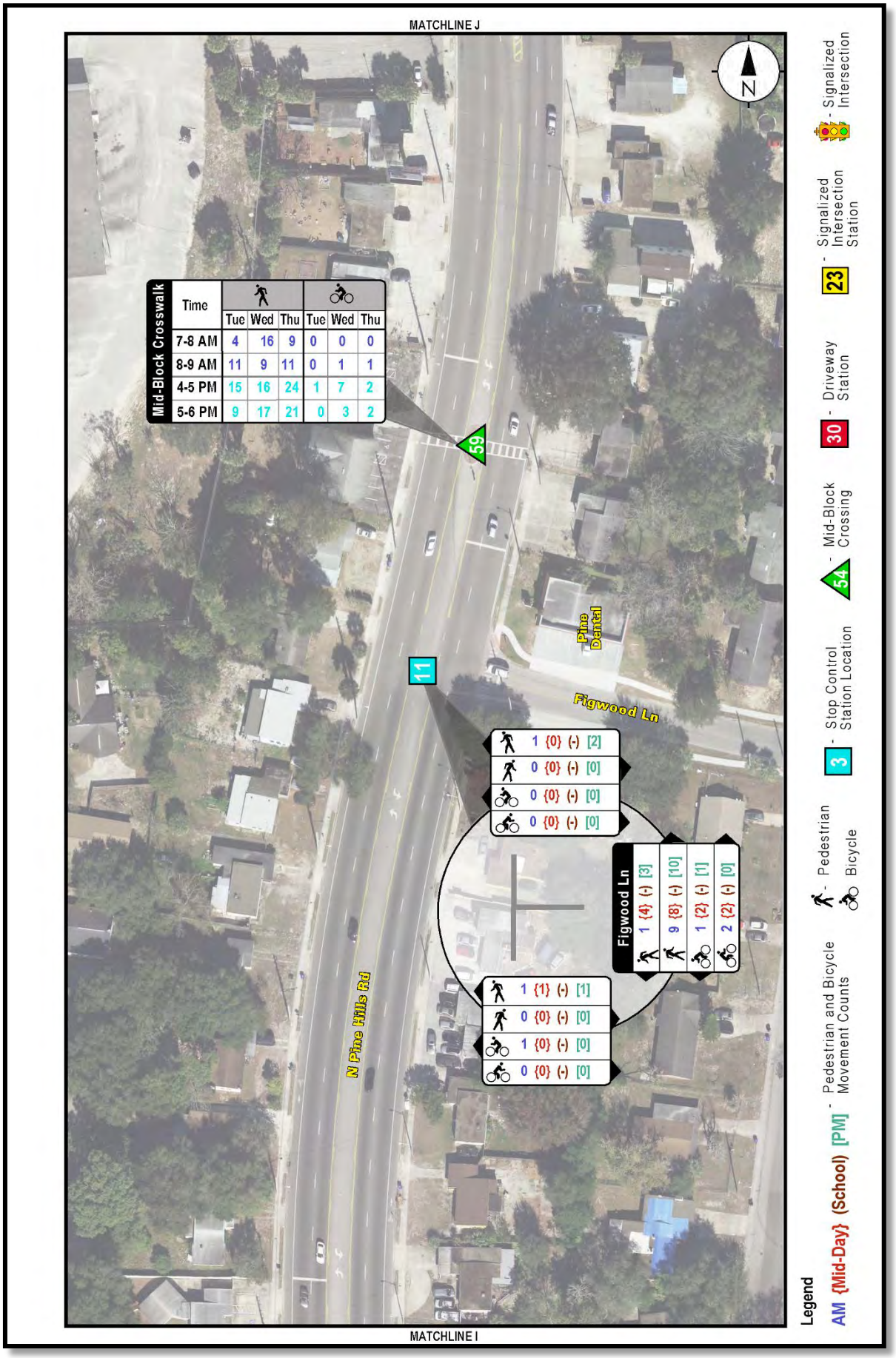

Figure 4.33
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

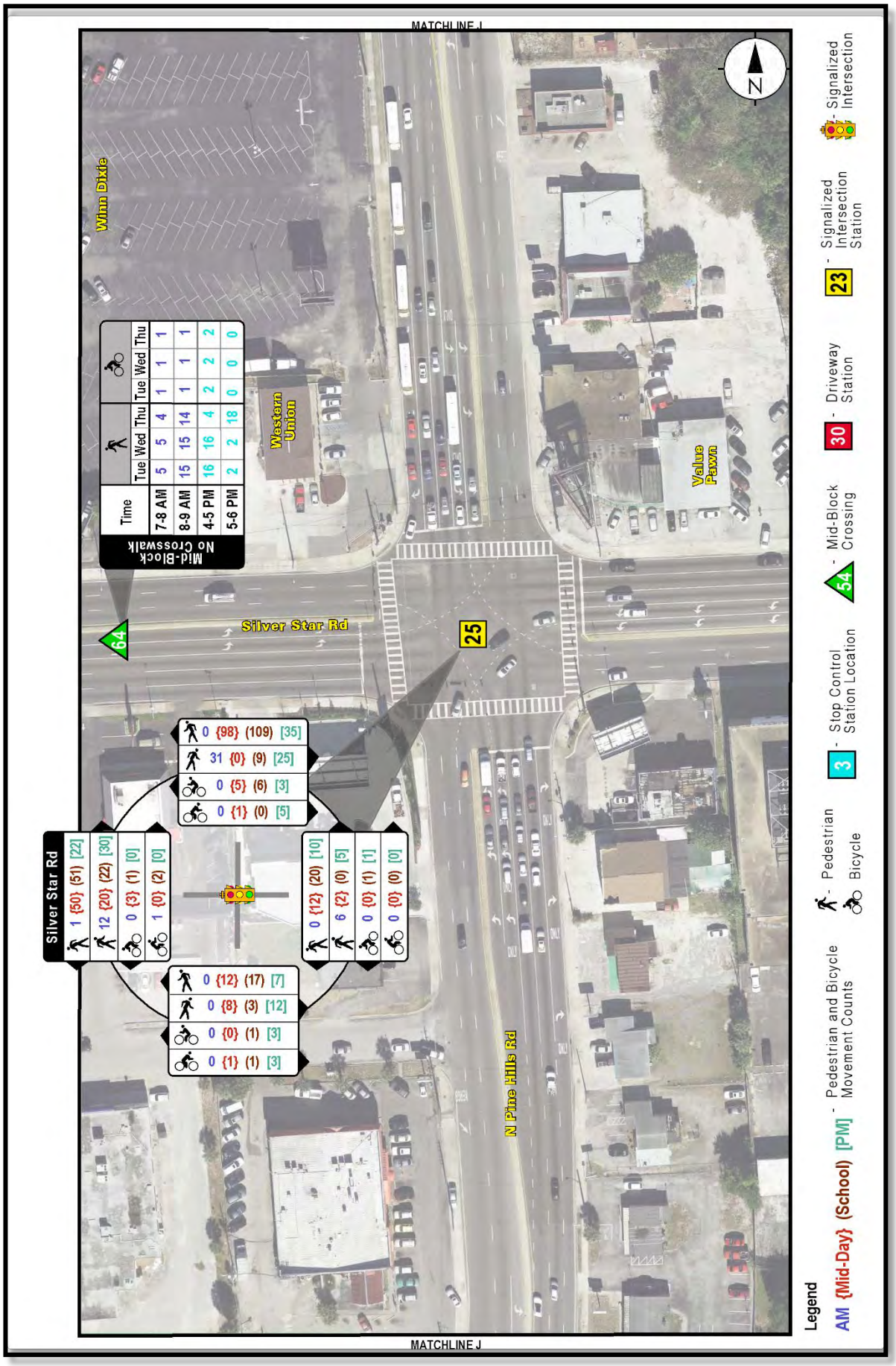

Figure 4.34
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
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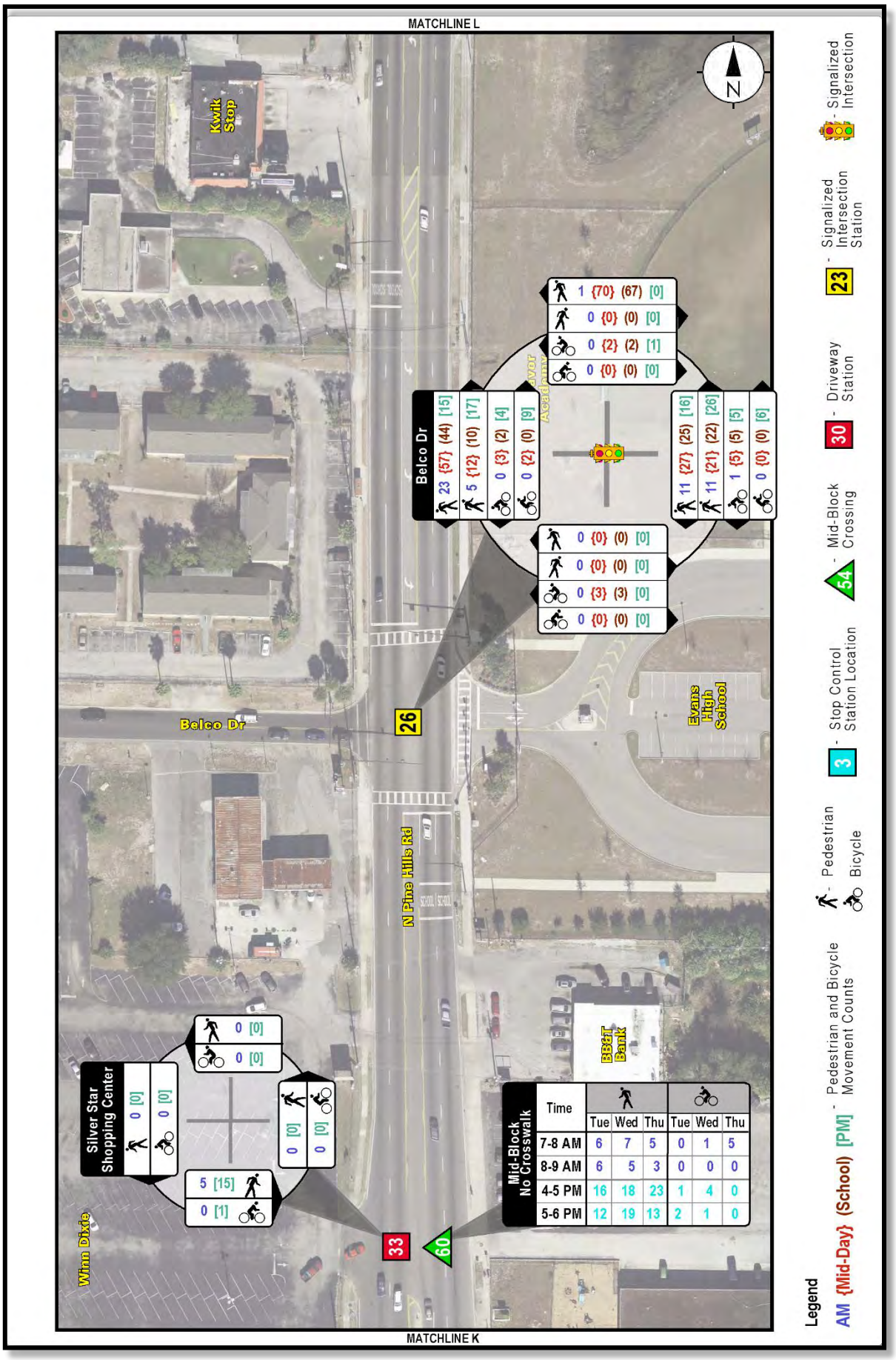

Figure 4.35
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
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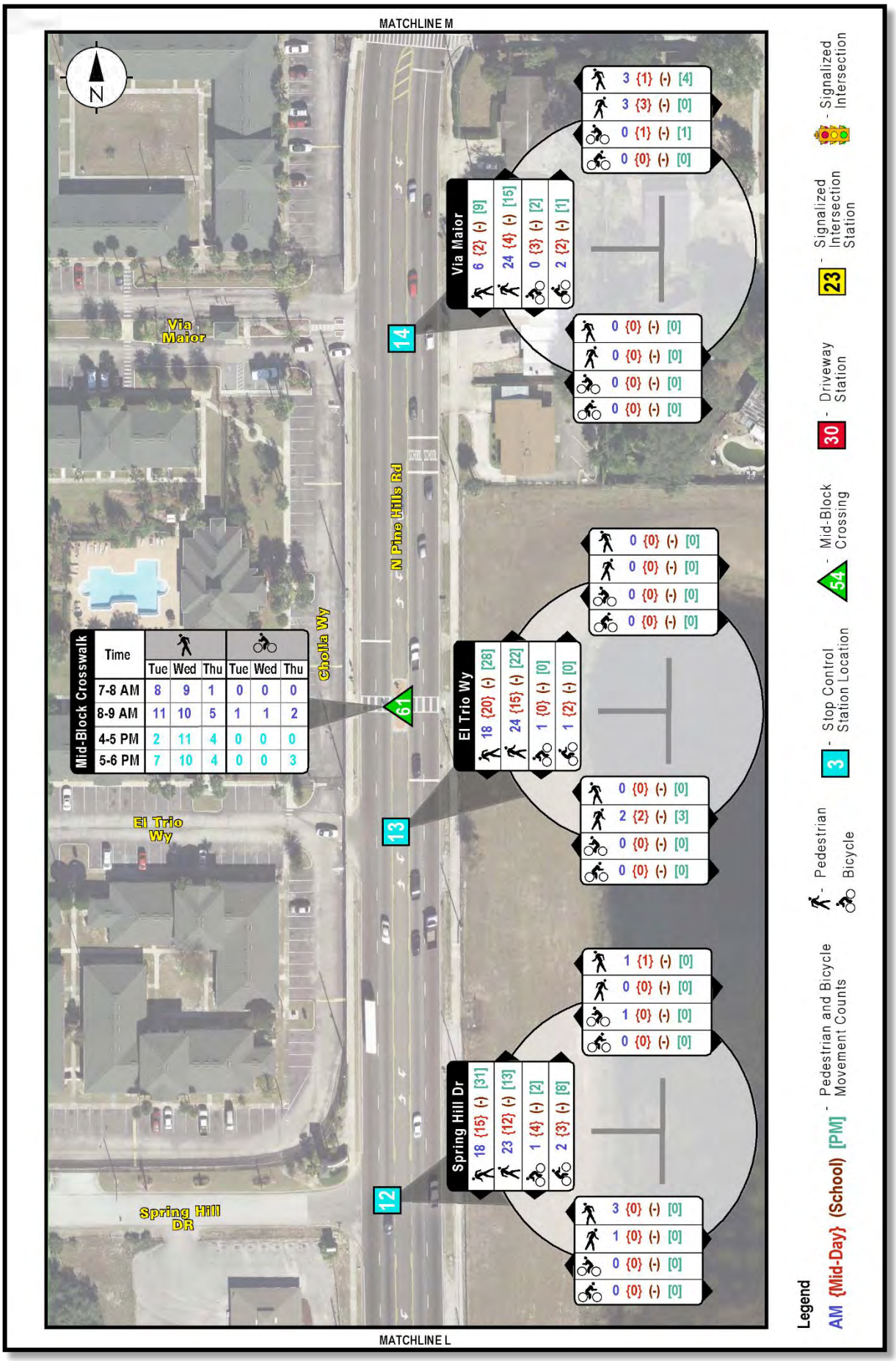

Figure 4.36
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

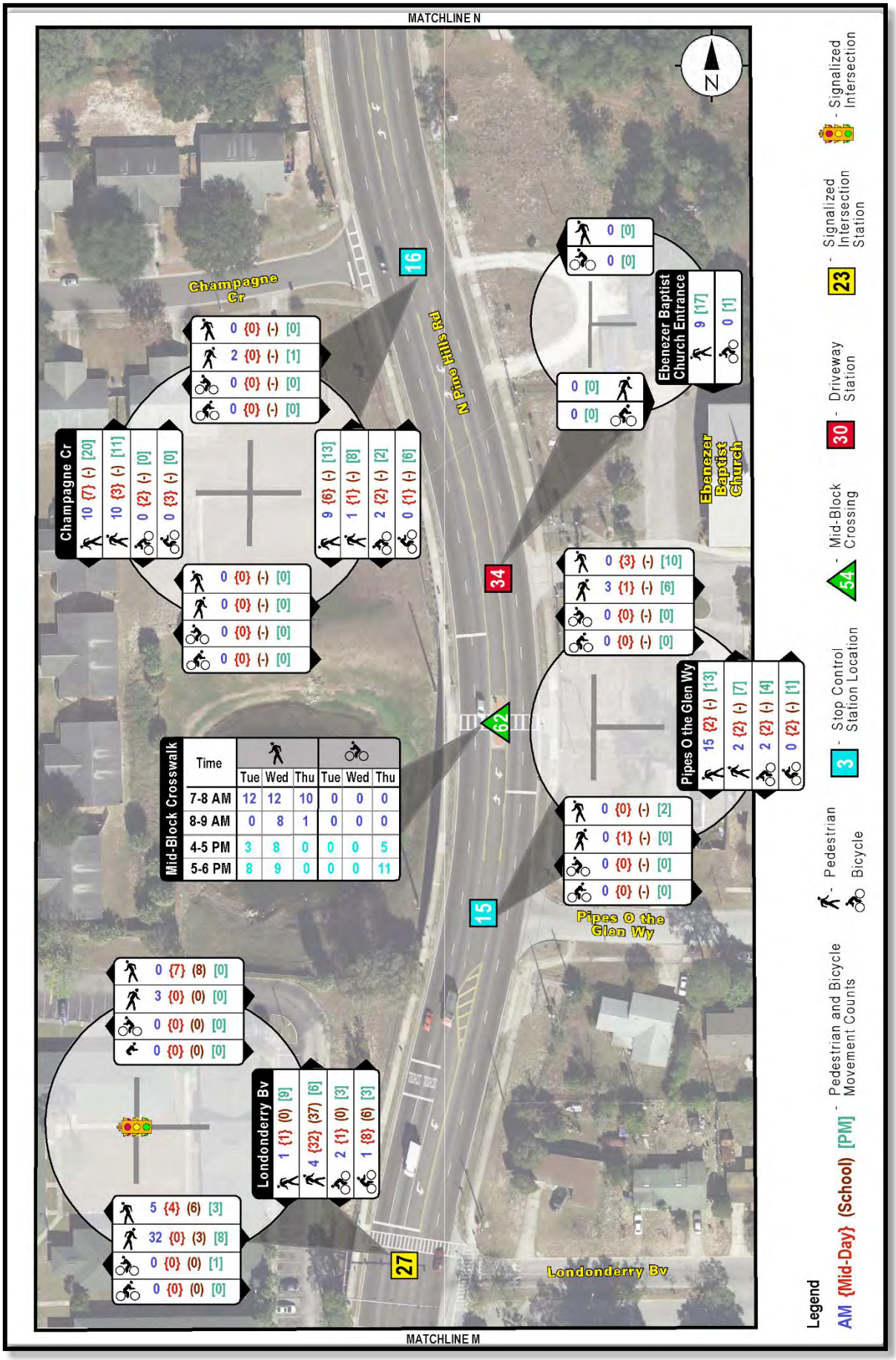

Figure 4.37
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

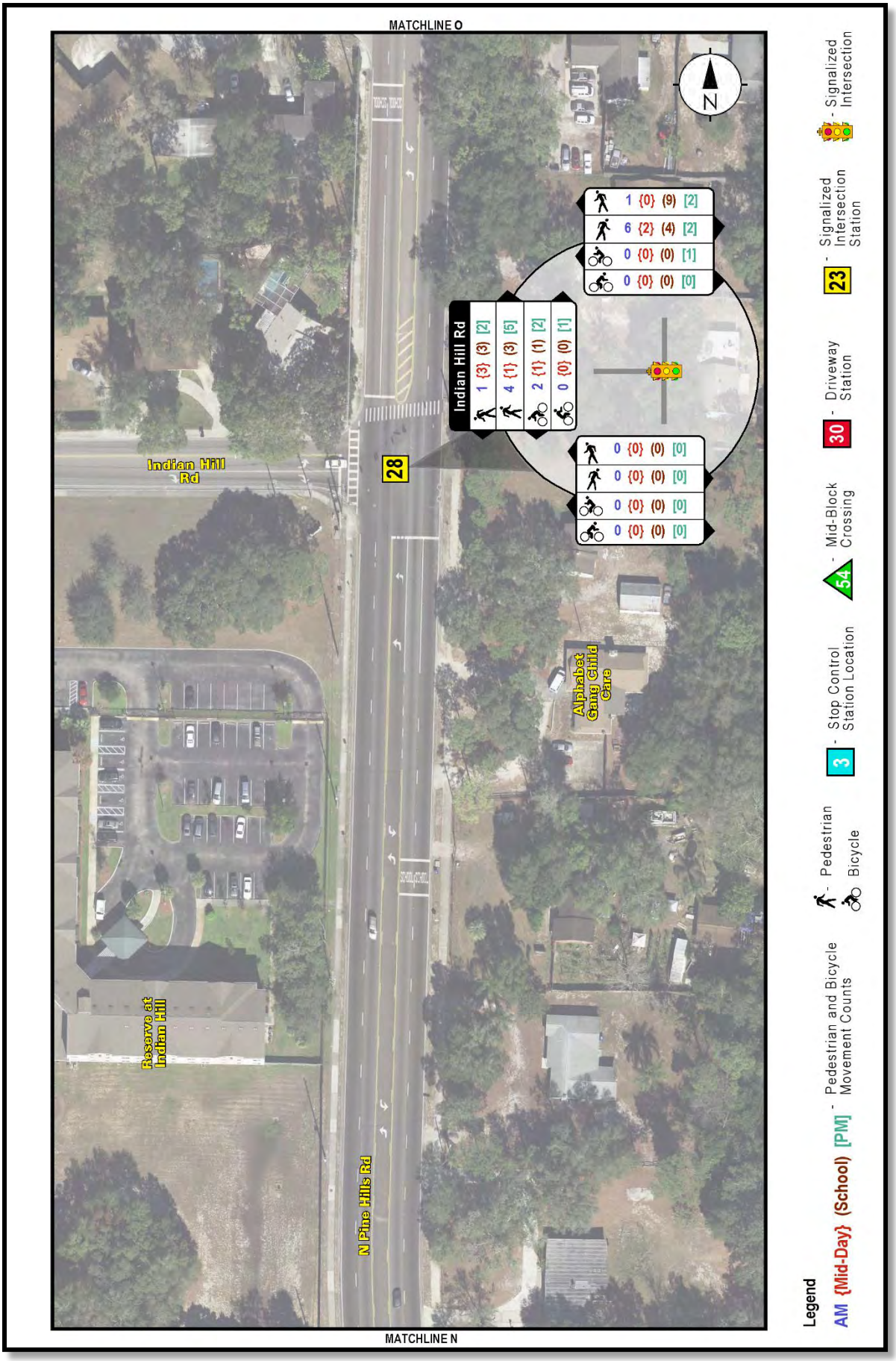

Figure 4.38
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

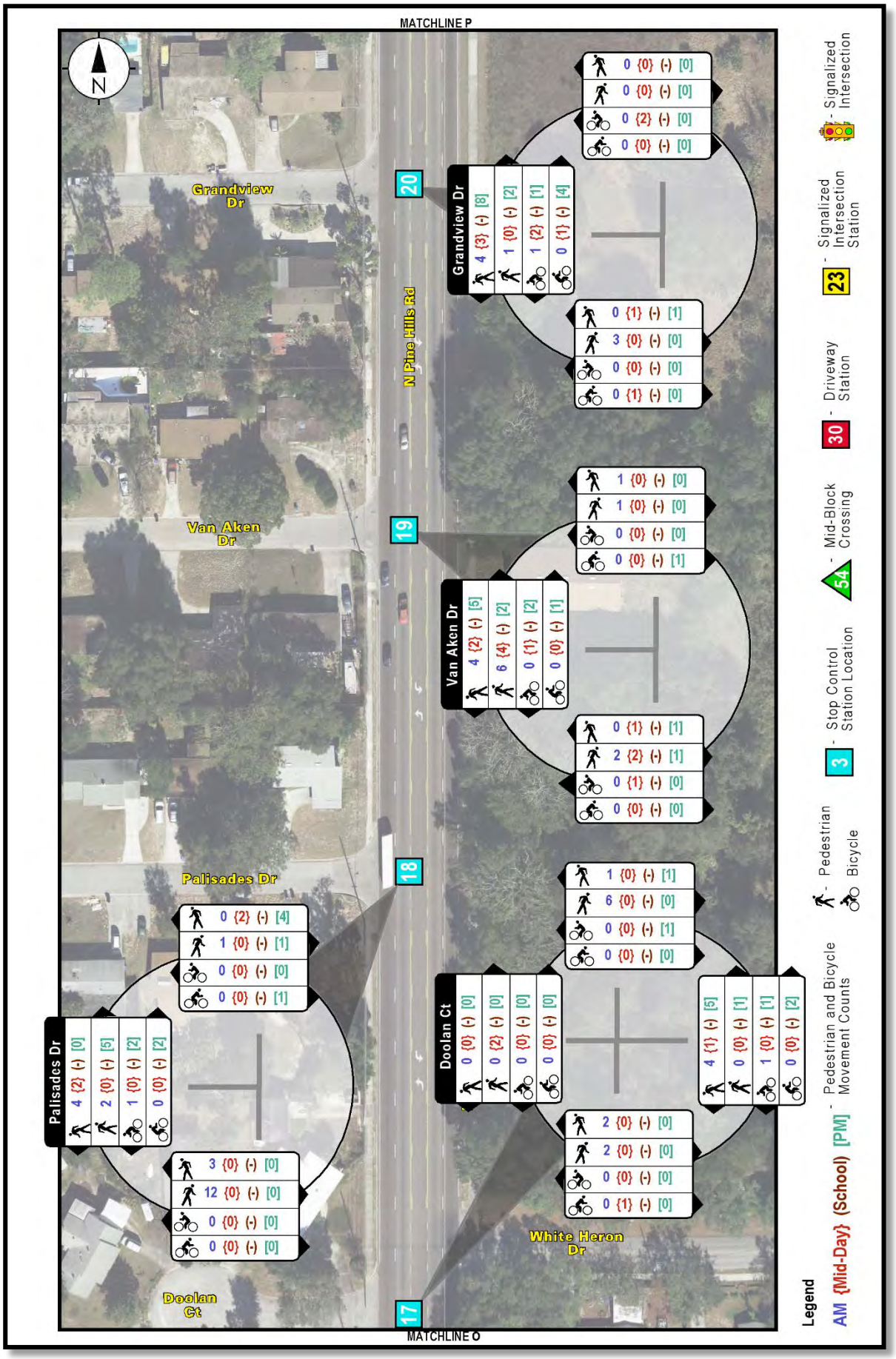

Figure 4.39
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

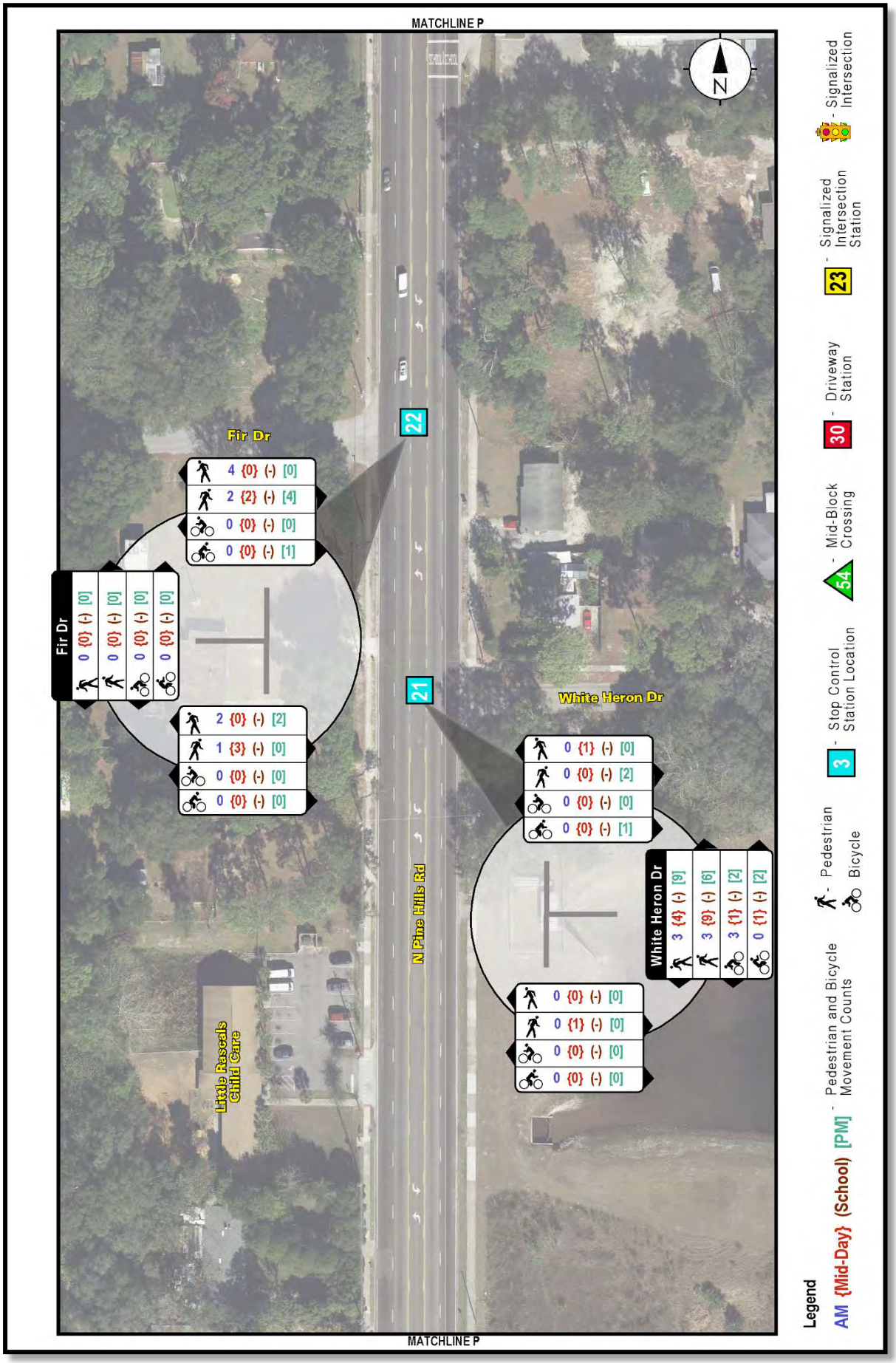

Figure 4.40
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

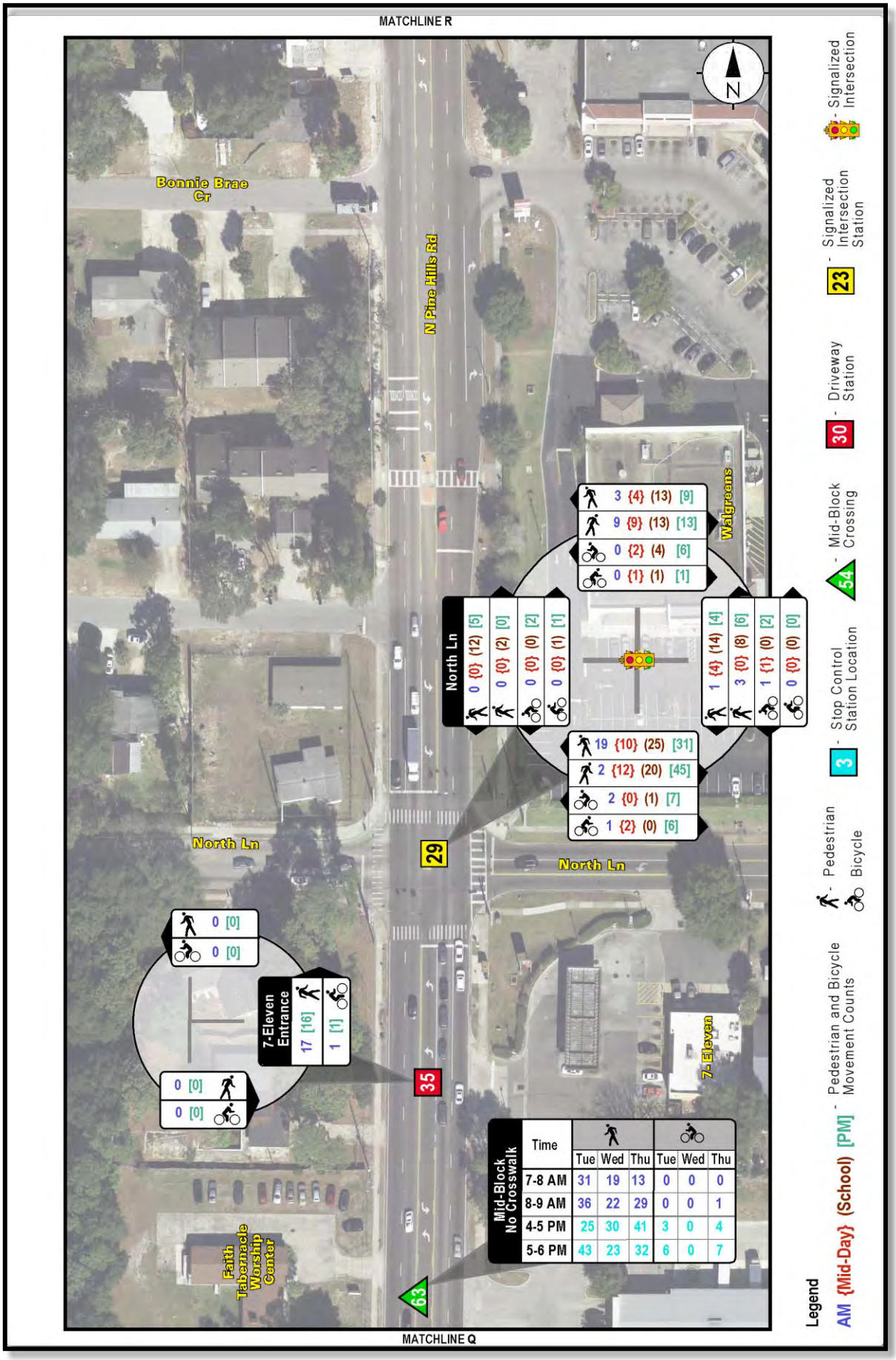

Figure 4.41
Pedestrian and Bicycle Movement Counts
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

4.3.1 Level of Service for Automobiles

Per the Orange County Comprehensive Plan, the minimum peak hour level of service standard for Pine Hills Road is LOS E. A summary of the automobile LOS results for the AM, mid-day, school (signalized intersections only) and PM peak hours are shown in Table 4.8 thru Table 4.11, respectively, and in Figures 4.42 through 4.46.

Based on the AM peak hour analysis results for the automobile LOS, all the signalized intersections along Pine Hills Road corridor, with the exception of the Silver Star Road intersection, are observed to operate at LOS D or better during the AM peak period. Silver Star Road operates at LOS E during AM peak period. Eight (8) of the unsignalized intersections have minor street approaches that operate at LOS F during the AM peak period. The eight unsignalized intersections are:

- Alhambra Drive
- Sunray Drive
- Deauville Drive
- Dolores Drive
- Cortez Drive
- Golf Club Parkway
- Indialantic Drive
- Heron Drive/Doolan Court

Three (3) of the unsignalized intersections have minor street approaches that operate at LOS E during the AM peak period. The remaining 11 unsignalized intersection operate at LOS D or better during the AM peak period.

During the mid-day peak hour, the analysis results for the automobile LOS, all the signalized intersections along Pine Hills Road corridor are observed to operate at LOS D or better during the Mid-Day peak period. Four (4) of the unsignalized intersections have minor street approaches that operate at LOS F during the Mid-Day peak period. The four unsignalized intersections are:

- Alhambra Drive,
- Deauville Drive,
- Cortez Drive, and
- Indialantic Drive.

Three (3) of the unsignalized intersections have minor street approaches that operate at LOS E during the Mid-Day peak period. The remaining 15 unsignalized intersection operate at LOS D or better during the Mid-Day peak period.

During the school peak hour, the analysis results for the automotive LOS, all the signalized intersections along Pine Hills Road corridor, with the exception of the Silver Star Road intersection, are observed to operate at LOS D or better during the school peak period. Silver Star Road operates at LOS E during school peak period

During the PM peak hour, the analysis results for the automobile LOS, all the signalized intersections along Pine Hills Road corridor, with the exception of the Silver Star Road intersection, are observed to operate at LOS D or better during the PM peak period. Silver Star Road operates at LOS E during PM peak period. Ten (10) of the unsignalized intersections have

minor street approaches that operate at LOS F during the PM peak period. The ten unsignalized intersections are:

- Alhambra Drive
- Sunray Drive
- Deauville Drive
- Dolores Drive
- Cortez Drive
- Golf Club Parkway
- Indialantic Drive
- Pipes O the Glen Way
- Champagne Circle
- Heron Drive/Doolan Court

The remaining 12 unsignalized have minor street approaches that operate at LOS D or better during the PM peak period.

It is important to note that HCM 2010 Unsignalized Intersections module of Synchro may provide a delay estimate for the minor approaches at unsignalized intersections that may not reflect the short gap acceptance behavior of drivers wanting to cross Pine Hills Road.

4.3.2 Pedestrian/Bicycle LOS

A summary of the multimodal (Pedestrian and Bicycle) LOS results for the AM, mid-day, School (signalized intersections only) and PM peak hours are also shown in Tables 4.8, 4.9, 4.10, and 4.11, respectively. Based on the analysis results, the pedestrian/bicycle LOS at all the signalized intersections along the Pine Hills Road corridor are observed at LOS D or better during each of the analysis periods.

Because there are no pedestrian refuge areas at the unsignalized study intersection, the pedestrian/bicycle LOS at all the unsignalized stop locations operate at LOS F for pedestrians and bicycles crossing Pine Hills Road. The absence of pedestrian refuge areas at these locations result in pedestrians/bicyclists having to cross the five-lane section in one stage, versus the two-stages made possible with a mid-block crossing location.

In terms of the Mid-Block (MB) crossings, Table 4.12 shows the Level of Service during the AM and PM peak periods at the existing mid-block crosswalk crossings and non-crosswalk crossing locations along Pine Hills Road in the study area. Pedestrian LOS (based on FDOT Quality/Level of Service Handbook methodology) at unsignalized crossings (including mid-block crossings) is determined by the major street traffic volumes. All the existing mid-block crosswalk crossings and non-crosswalk crossings operate adversely during the AM and PM peak periods with the exception of the non-crosswalk crossing located approximately 335 feet north of Fir Drive. This non-crosswalk crossing operates at LOS D during the AM period and LOS E during the PM period.

Table 4.13 shows the Level of Service during the AM and PM peak periods at the Major Driveway (MD) locations along Pine Hills Road in the study area. All the existing Major Driveway locations operate adversely during the AM and PM peak periods.

Appendix C includes the Synchro reports for the AM, Mid-day, school and PM peak period analysis, and **Appendix D** includes the signal timings and seasonal factors used in the analysis.

Table 4.8: Existing Intersection Multimodal LOS – AM Peak Hour

No.	Intersection		Automobile (1)		Pedestrian LOS (2) (3)				Bicycle LOS (2) (3)			
		Control Type	Delay (sec/veh)	LOS	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach
1	Pine Hills Road and Alhambra Drive	Stop	12.6 / 142.2	B / F	B	B	F	F	C	B	F	F
2	Pine Hills Road and Sunray Drive	Stop	12.1 / 67.3	B / F	N/A	B	F	F	N/A	B	F	F
3	Pine Hills Road and Deauville Drive	Stop	12.5 / 775.0	B / F	B	B	F	F	B	B	F	F
4	Pine Hills Road and Sunniland Drive	Stop	11.8 / 17.5	B / C	B	N/A	F	F	B	N/A	F	F
5	Pine Hills Road and Dolores Drive	Stop	12.4 / 100.0	B / F	B	B	F	F	B	B	F	F
6	Pine Hills Road and Cortez Drive	Stop	12.4 / 153.0	B / F	B	B	F	F	B	B	F	F
7	Pine Hills Road and Elinore Drive	Stop	12.4 / 22.0	B / C	B	N/A	F	F	B	N/A	F	F
8	Pine Hills Road and Ferdinand Drive	Stop	12.8 / 27.2	B / D	B	N/A	F	F	B	N/A	F	F
9	Pine Hills Road and Golf Club Parkway	Stop	12.3 / 54.9	B / F	B	B	F	F	B	B	F	F
10	Pine Hills Road and Indialantic Drive	Stop	11.4 / 288.7	B / F	B	B	F	F	C	C	F	F
11	Pine Hills Road and Figwood Lane	Stop	10.5 / 21.2	B / C	N/A	B	F	F	N/A	C	F	F
12	Pine Hills Road and Spring Hill Drive	Stop	13.7 / 22.0	B / C	B	N/A	F	F	B	N/A	F	F
13	Pine Hills Road and El Trio Way	Stop	0.0 / 0.0	A / A	N/A	N/A	F	F	N/A	N/A	F	F
14	Pine Hills Road and Via Maior	Stop	15.5 / 45.7	B / E	B	N/A	F	F	C	N/A	F	F
15	Pine Hills Road and Pipes O the Glen Way	Stop	14.4 / 43.2	B / E	N/A	B	F	F	N/A	B	F	F
16	Pine Hills Road and Champagne Circle	Stop	11.4 / 41.0	B / E	B	B	F	F	B	B	F	F
17	Pine Hills Road and White Heron Drive/Doolan Court	Stop	10.0 / 87.6	A / F	B	C	F	F	B	C	F	F
18	Pine Hills Road and Palisades Drive	Stop	10.4 / 15.2	B / C	B	N/A	F	F	B	N/A	F	F
19	Pine Hills Road and Van Aken Drive	Stop	10.4 / 15.9	B / C	B	N/A	F	F	B	N/A	F	F
20	Pine Hills Road and Grandview Drive	Stop	10.4 / 17.2	B / C	B	N/A	F	F	B	N/A	F	F
21	Pine Hills Road and White Heron Drive North	Stop	9.3 / 11.8	A / B	N/A	B	F	F	N/A	B	F	F
22	Pine Hills Road and Fir Drive	Stop	10.7 / 16.9	B / C	B	N/A	F	F	B	N/A	F	F
23	Pine Hills Road and Balboa Drive	Signal	14.8	B	A	A	C	C	C	B	B	C
24	Pine Hills Road and Hernandes Drive	Signal	5.8	A	A	A	C	C	C	B	B	C
25	Pine Hills Road and Silver Star Road	Signal	59.1	E	C	C	C	C	D	C	D	D

Table 4.8: Existing Intersection Multimodal LOS – AM Peak Hour (continued)

No.	Intersection		Automobile (1)		Pedestrian LOS (2) (3)				Bicycle LOS (2) (3)			
		Control Type	Delay (sec/veh)	LOS	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach
26	Pine Hills Road and Belco Drive	Signal	18.8	B	A	A	C	C	C	B	C	C
27	Pine Hills Road and Londonderry Boulevard	Signal	6.6	A	N/A	B	C	C	N/A	C	C	C
28	Pine Hills Road and Indian Hill Road	Signal	14.7	B	B	N/A	C	B	C	N/A	C	C
29	Pine Hills Road and North Lane	Signal	35.9	D	B	B	C	B	C	C	B	B

(1) Automobile Delay and LOS based on Synchro 9 Unsignalized and Signalized Intersection analysis
Note the Unsignalized intersection delay and LOS are reported for "Major Street Left Turn Movement / Minor Street Movement."
Worst condition delay and LOS for the Major Street/Minor Street
(2) Signalized Intersection Pedestrian and Bicycle LOS based on Synchro 9 intersection analysis
(3) Unsignalized Intersection Pedestrian and Bicycle LOS based on 2013 FDOT Q/LOS Handbook
Pedestrian Mode (85%-100% Sidewalk Coverage) & Bicycle Mode (50%-84% Bicycle Lane Coverage)

Table 4.9: Existing Intersection Multimodal LOS – Mid-Day Peak Hour

No.	Intersection		Automobile (1)		Pedestrian LOS (2) (3)				Bicycle LOS (2) (3)			
		Control Type	Delay (sec/veh)	LOS	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach
1	Pine Hills Road and Alhambra Drive	Stop	10.9 / 98.6	B / F	C	B	F	F	C	B	F	F
2	Pine Hills Road and Sunray Drive	Stop	10.3 / 40.7	B / E	N/A	B	F	F	N/A	B	F	F
3	Pine Hills Road and Deauville Drive	Stop	10.6 / 342.5	B / F	B	B	F	F	C	B	F	F
4	Pine Hills Road and Sunniland Drive	Stop	10.3 / 15.0	B / C	B	N/A	F	F	B	N/A	F	F
5	Pine Hills Road and Dolores Drive	Stop	10.5 / 43.4	B / E	B	B	F	F	B	B	F	F
6	Pine Hills Road and Cortez Drive	Stop	10.3 / 97.1	B / F	B	B	F	F	B	B	F	F
7	Pine Hills Road and Elinore Drive	Stop	10.1 / 16.7	B / C	B	N/A	F	F	B	N/A	F	F
8	Pine Hills Road and Ferdinand Drive	Stop	10.3 / 15.9	B / C	B	N/A	F	F	B	N/A	F	F
9	Pine Hills Road and Golf Club Parkway	Stop	10.5 / 38.9	B / E	B	B	F	F	B	B	F	F
10	Pine Hills Road and Indialantic Drive	Stop	10.6 / 177.5	B / F	B	B	F	F	C	C	F	F
11	Pine Hills Road and Figwood Lane	Stop	9.9 / 14.5	A / B	N/A	B	F	F	N/A	C	F	F
12	Pine Hills Road and Spring Hill Drive	Stop	10.7 / 16.4	B / C	B	N/A	F	F	B	N/A	F	F
13	Pine Hills Road and El Trio Way	Stop	0.0 / 0.0	A / A	N/A	N/A	F	F	N/A	N/A	F	F
14	Pine Hills Road and Via Maior	Stop	11.1 / 16.8	B / C	B	N/A	F	F	B	N/A	F	F
15	Pine Hills Road and Pipes O the Glen Way	Stop	11.7 / 32.5	B / D	N/A	B	F	F	N/A	B	F	F
16	Pine Hills Road and Champagne Circle	Stop	10.1 / 31.1	B / D	B	B	F	F	B	B	F	F
17	Pine Hills Road and White Heron Drive/Doolan Court	Stop	9.4 / 32.6	A / D	B	B	F	F	B	C	F	F
18	Pine Hills Road and Palisades Drive	Stop	9.4 / 12.6	A / B	B	N/A	F	F	B	N/A	F	F
19	Pine Hills Road and Van Aken Drive	Stop	9.4 / 13.9	A / B	B	N/A	F	F	B	N/A	F	F
20	Pine Hills Road and Grandview Drive	Stop	9.3 / 15.0	A / C	B	N/A	F	F	B	N/A	F	F
21	Pine Hills Road and White Heron Drive North	Stop	9.5 / 11.7	A / B	N/A	B	F	F	N/A	B	F	F
22	Pine Hills Road and Fir Drive	Stop	9.2 / 13.2	A / B	B	N/A	F	F	B	N/A	F	F
23	Pine Hills Road and Balboa Drive	Signal	13.3	B	A	A	C	C	C	B	C	C
24	Pine Hills Road and Hernandes Drive	Signal	5.6	A	A	A	C	C	B	B	C	C
25	Pine Hills Road and Silver Star Road	Signal	54.0	D	C	C	C	C	C	D	D	D

Table 4.9: Existing Intersection Multimodal LOS – Mid-Day Peak Hour (continued)

No.	Intersection		Automobile (1)		Pedestrian LOS (2) (3)				Bicycle LOS (2) (3)			
		Control Type	Delay (sec/veh)	LOS	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach
26	Pine Hills Road and Belco Drive	Signal	7.6	A	A	A	C	C	C	B	C	C
27	Pine Hills Road and Londonderry Boulevard	Signal	4.0	A	N/A	B	C	C	N/A	B	C	C
28	Pine Hills Road and Indian Hill Road	Signal	8.7	A	B	N/A	C	C	C	N/A	C	C
29	Pine Hills Road and North Lane	Signal	40.1	D	B	B	C	B	C	C	C	B

(1) Automobile Delay and LOS based on Synchro 9 Unsignalized and Signalized Intersection analysis
Note the Unsignalized intersection delay and LOS are reported for "Major Street Left Turn Movement / Minor Street Movement."
Worst condition delay and LOS for the Major Street/Minor Street
(2) Signalized Intersection Pedestrian and Bicycle LOS based on Synchro 9 intersection analysis
(3) Unsignalized Intersection Pedestrian and Bicycle LOS based on 2013 FDOT Q/LOS Handbook
Pedestrian Mode (85%-100% Sidewalk Coverage) & Bicycle Mode (50%-84% Bicycle Lane Coverage)

Table 4.10: Existing Intersection Multimodal LOS – School Peak Hour

No.	Intersection		Automobile (1)		Pedestrian LOS (2) (3)				Bicycle LOS (2) (3)			
		Control Type	Delay (sec/veh)	LOS	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach
23	Pine Hills Road and Balboa Drive	Signal	15.8	B	A	A	C	C	C	B	C	C
24	Pine Hills Road and Hernandes Drive	Signal	8.5	A	A	B	C	C	B	C	C	C
25	Pine Hills Road and Silver Star Road	Signal	64.5	E	C	C	C	C	C	D	D	D
26	Pine Hills Road and Belco Drive	Signal	10.0	A	A	A	C	C	C	B	C	C
27	Pine Hills Road and Londonderry Boulevard	Signal	5.0	A	N/A	B	C	C	N/A	B	C	C
28	Pine Hills Road and Indian Hill Road	Signal	11.9	B	B	N/A	C	C	C	N/A	C	C
29	Pine Hills Road and North Lane	Signal	32.9	C	B	B	C	B	C	C	C	B

(1) Automobile Delay and LOS based on Synchro 9 Unsignalized and Signalized Intersection analysis
Note the Unsignalized intersection delay and LOS are reported for "Major Street Left Turn Movement / Minor Street Movement."
Worst condition delay and LOS for the Major Street/Minor Street
(2) Signalized Intersection Pedestrian and Bicycle LOS based on Synchro 9 intersection analysis
(3) Unsignalized Intersection Pedestrian and Bicycle LOS based on 2013 FDOT Q/LOS Handbook
Pedestrian Mode (85%-100% Sidewalk Coverage) & Bicycle Mode (50%-84% Bicycle Lane Coverage)

Table 4.11: Existing Intersection Multimodal LOS – PM Peak Hour

No.	Intersection		Automobile (1)		Pedestrian LOS (2) (3)				Bicycle LOS (2) (3)			
		Control Type	Delay (sec/veh)	LOS	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach
1	Pine Hills Road and Alhambra Drive	Stop	12.4 / 475.9	B / F	B	B	F	F	C	B	F	F
2	Pine Hills Road and Sunray Drive	Stop	11.7 / 97.8	B / F	N/A	B	F	F	N/A	B	F	F
3	Pine Hills Road and Deauville Drive	Stop	13.3 / 3,294.7	B / F	B	B	F	F	B	B	F	F
4	Pine Hills Road and Sunniland Drive	Stop	11.7 / 19.0	B / C	B	N/A	F	F	B	N/A	F	F
5	Pine Hills Road and Dolores Drive	Stop	14.1 / 139.3	B / F	B	B	F	F	B	B	F	F
6	Pine Hills Road and Cortez Drive	Stop	13.9 / 339.1	B / F	B	B	F	F	B	B	F	F
7	Pine Hills Road and Elinore Drive	Stop	11.7 / 18.3	B / C	B	N/A	F	F	B	N/A	F	F
8	Pine Hills Road and Ferdinand Drive	Stop	12.0 / 32.9	B / D	B	N/A	F	F	B	N/A	F	F
9	Pine Hills Road and Golf Club Parkway	Stop	13.0 / 118.1	B / F	B	B	F	F	B	B	F	F
10	Pine Hills Road and Indialantic Drive	Stop	13.1 / 1,461.3	B / F	B	B	F	F	C	C	F	F
11	Pine Hills Road and Figwood Lane	Stop	12.6 / 28.2	B / D	N/A	B	F	F	N/A	C	F	F
12	Pine Hills Road and Spring Hill Drive	Stop	12.3 / 24.1	B / C	B	N/A	F	F	B	N/A	F	F
13	Pine Hills Road and El Trio Way	Stop	0.0 / 0.0	A / A	N/A	N/A	F	F	N/A	N/A	F	F
14	Pine Hills Road and Via Maior	Stop	13.3 / 28.2	B / D	B	N/A	F	F	C	N/A	F	F
15	Pine Hills Road and Pipes O the Glen Way	Stop	13.9 / 120.6	B / F	N/A	B	F	F	N/A	B	F	F
16	Pine Hills Road and Champagne Circle	Stop	12.4 / 108.0	B / F	B	B	F	F	B	B	F	F
17	Pine Hills Road and White Heron Drive/Doolan Court	Stop	11.4 / 195.2	B / F	B	C	F	F	B	C	F	F
18	Pine Hills Road and Palisades Drive	Stop	10.4 / 16.0	B / C	B	N/A	F	F	B	N/A	F	F
19	Pine Hills Road and Van Aken Drive	Stop	11.2 / 20.6	B / C	B	N/A	F	F	B	N/A	F	F
20	Pine Hills Road and Grandview Drive	Stop	10.4 / 19.0	B / C	B	N/A	F	F	B	N/A	F	F
21	Pine Hills Road and White Heron Drive North	Stop	11.3 / 14.8	B / B	N/A	B	F	F	N/A	B	F	F
22	Pine Hills Road and Fir Drive	Stop	10.2 / 16.2	B / C	B	N/A	F	F	B	N/A	F	F
23	Pine Hills Road and Balboa Drive	Signal	18.8	B	B	A	C	C	C	B	C	C
24	Pine Hills Road and Hernandes Drive	Signal	8.1	A	A	B	C	C	B	B	C	C
25	Pine Hills Road and Silver Star Road	Signal	69.6	E	C	C	C	C	C	D	D	D

Table 4.11: Existing Intersection Multimodal LOS – PM Peak Hour (continued)

No.	Intersection		Automobile (1)		Pedestrian LOS (2) (3)				Bicycle LOS (2) (3)			
		Control Type	Delay (sec/veh)	LOS	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach	Crossing EB Approach	Crossing WB Approach	Crossing NB Approach	Crossing SB Approach
26	Pine Hills Road and Belco Drive	Signal	10.0	B	A	A	C	C	C	B	C	C
27	Pine Hills Road and Londonderry Boulevard	Signal	4.8	A	N/A	B	C	C	N/A	B	C	C
28	Pine Hills Road and Indian Hill Road	Signal	13.5	B	B	N/A	C	C	C	N/A	D	C
29	Pine Hills Road and North Lane	Signal	39.8	D	B	B	C	C	C	C	C	B

(1) Automobile Delay and LOS based on Synchro 9 Unsignalized and Signalized Intersection analysis
Note the Unsignalized intersection delay and LOS are reported for "Major Street Left Turn Movement / Minor Street Movement."
Worst condition delay and LOS for the Major Street/Minor Street
(2) Signalized Intersection Pedestrian and Bicycle LOS based on Synchro 9 intersection analysis
(3) Unsignalized Intersection Pedestrian and Bicycle LOS based on 2013 FDOT Q/LOS Handbook
Pedestrian Mode (85%-100% Sidewalk Coverage) & Bicycle Mode (50%-84% Bicycle Lane Coverage)

Table 4.12: Pedestrian and Bicycle Traffic Volumes Crossing Pine Hills Road LOS at Mid-block Crossing Locations

MB #	Pedestrian/Bicycle Crossing Location	Peak Direction Traffic Volumes		Pedestrian LOS (1)		Bicycle LOS (1)	
		AM	PM	AM	PM	AM	PM
54	Existing Crosswalk 100 feet North of Alhambra Dr	1,300	1,154	F	F	F	F
55	Survey Location 275 feet North of Sunray Dr (No Crosswalk)	1,266	1,146	F	F	F	F
56	Existing Crosswalk 400 feet North of Balboa Dr	1,339	1,460	F	F	F	F
57	Survey Location 200 feet North of Hernandes Dr (No Crosswalk)	1,221	1,356	F	F	F	F
58	Existing Crosswalk 440 feet North of Indialantic Dr	1,163	1,265	F	F	F	F
59	Existing Crosswalk 165 feet North of Figwood Ln	1,152	1,293	F	F	F	F
60	Survey Location 500 feet North of Silver Star Rd (No Crosswalk)	1,211	1,382	F	F	F	F
61	Existing Crosswalk 100 feet North of El Trio Way	1,395	1,461	F	F	F	F
62	Existing Crosswalk 145 feet North of Pipes O the Glen Way	1,174	1,357	F	F	F	F
63	Survey Location 335 feet North of Fir Dr (No Crosswalk)	989	1,129	E	F	D	F
64	Survey Location 530 feet West of Silver Star Rd (No Crosswalk)	1,513	1,824	F	F	F	F

(1) Based on 2013 FDOT Q/LOS Handbook Pedestrian Mode (85%-100% Sidewalk Coverage) & Bicycle Mode (50%-84% Bicycle Lane Coverage)

Table 4.13: Pedestrian and Bicycle Traffic Volumes Crossing Pine Hills Road LOS at Major Driveways

MB #	Pedestrian/Bicycle Crossing Location	Peak Direction Traffic Volumes		Pedestrian LOS (1)		Bicycle LOS (1)	
		AM	PM	AM	PM	AM	PM
30	Pine Hills Road and Suntrust Plaza/Stabroek Plaza	1,300	1,154	F	F	F	F
31	Pine Hills Road and Pine Hills Christian Church	2,225	2,225	F	F	F	F
32	Pine Hills Road and Faith Christian Center Church	2,027	2,027	F	F	F	F
33	Pine Hills Road and Silver Hill Shopping Center	1,211	1,382	F	F	F	F
34	Pine Hills Road and 1st Baptist Church	1,994	1,994	F	F	F	F
35	Pine Hills Road and 7/11 Entrance	1,685	1,685	F	F	F	F

(1) Based on 2013 FDOT Q/LOS Handbook Pedestrian Mode (85%-100% Sidewalk Coverage) & Bicycle Mode (50%-84% Bicycle Lane Coverage)

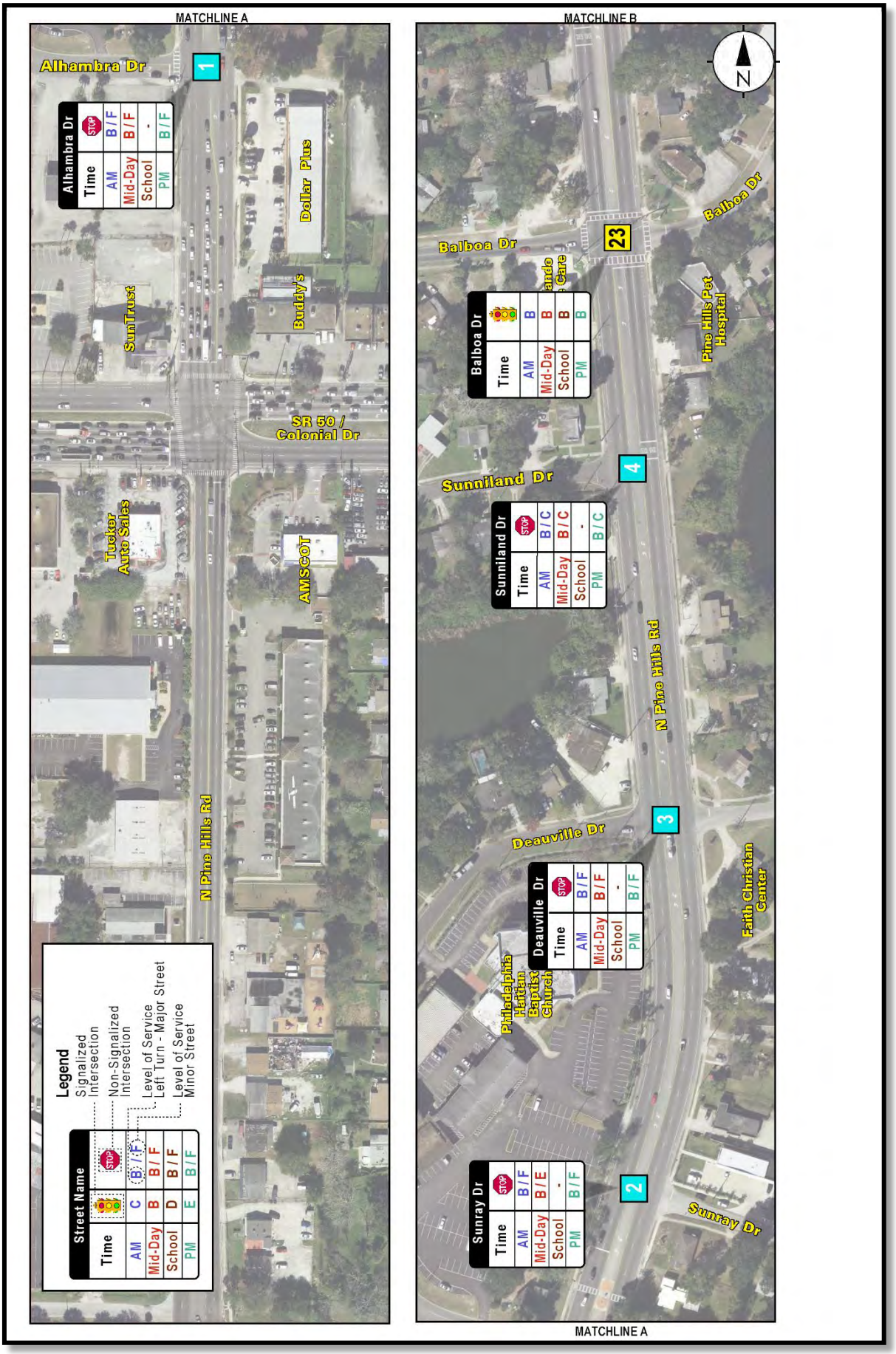

Figure 4.42

Intersection Level of Service
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

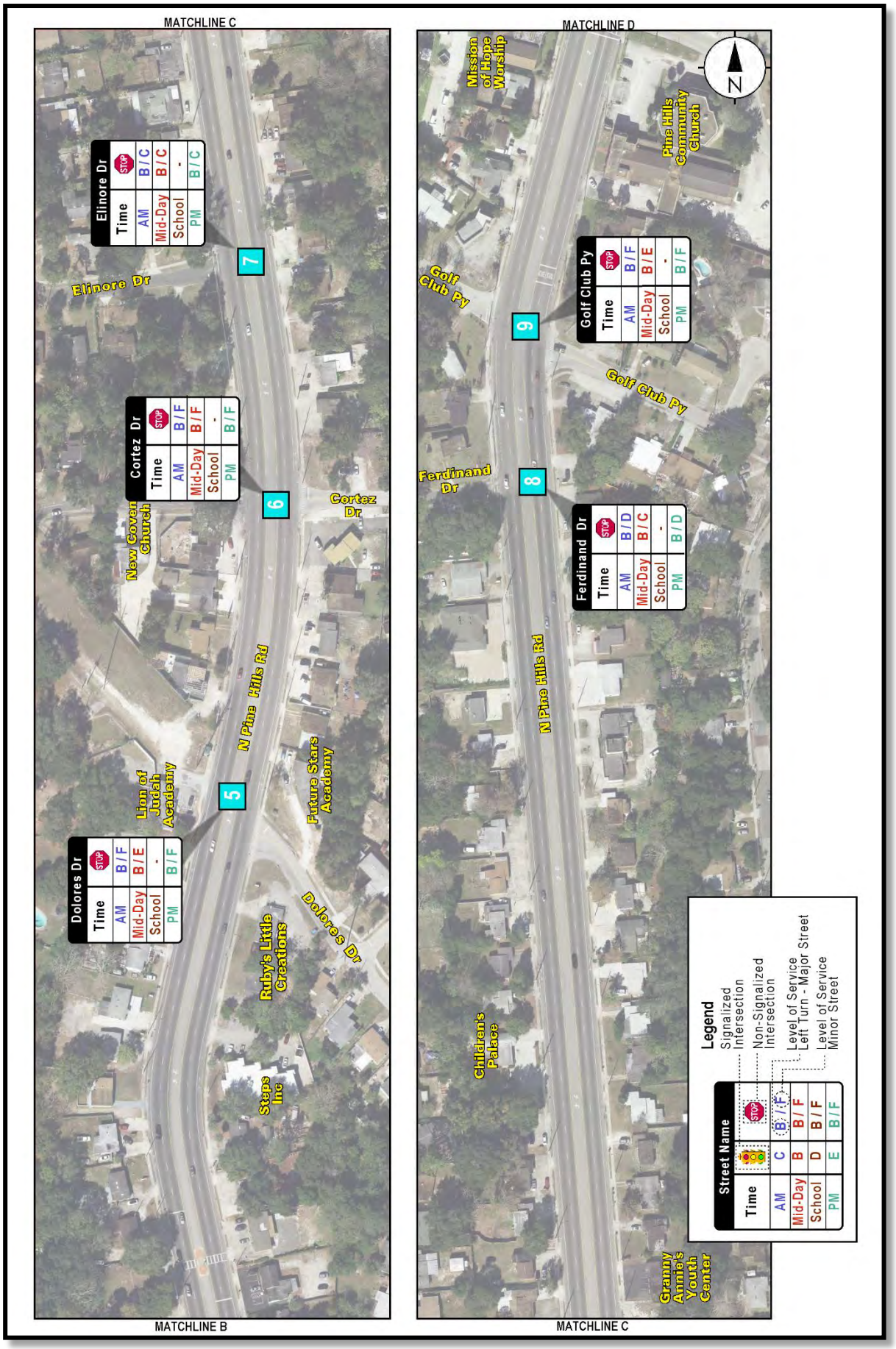

Figure 4.43

Intersection Level of Service
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

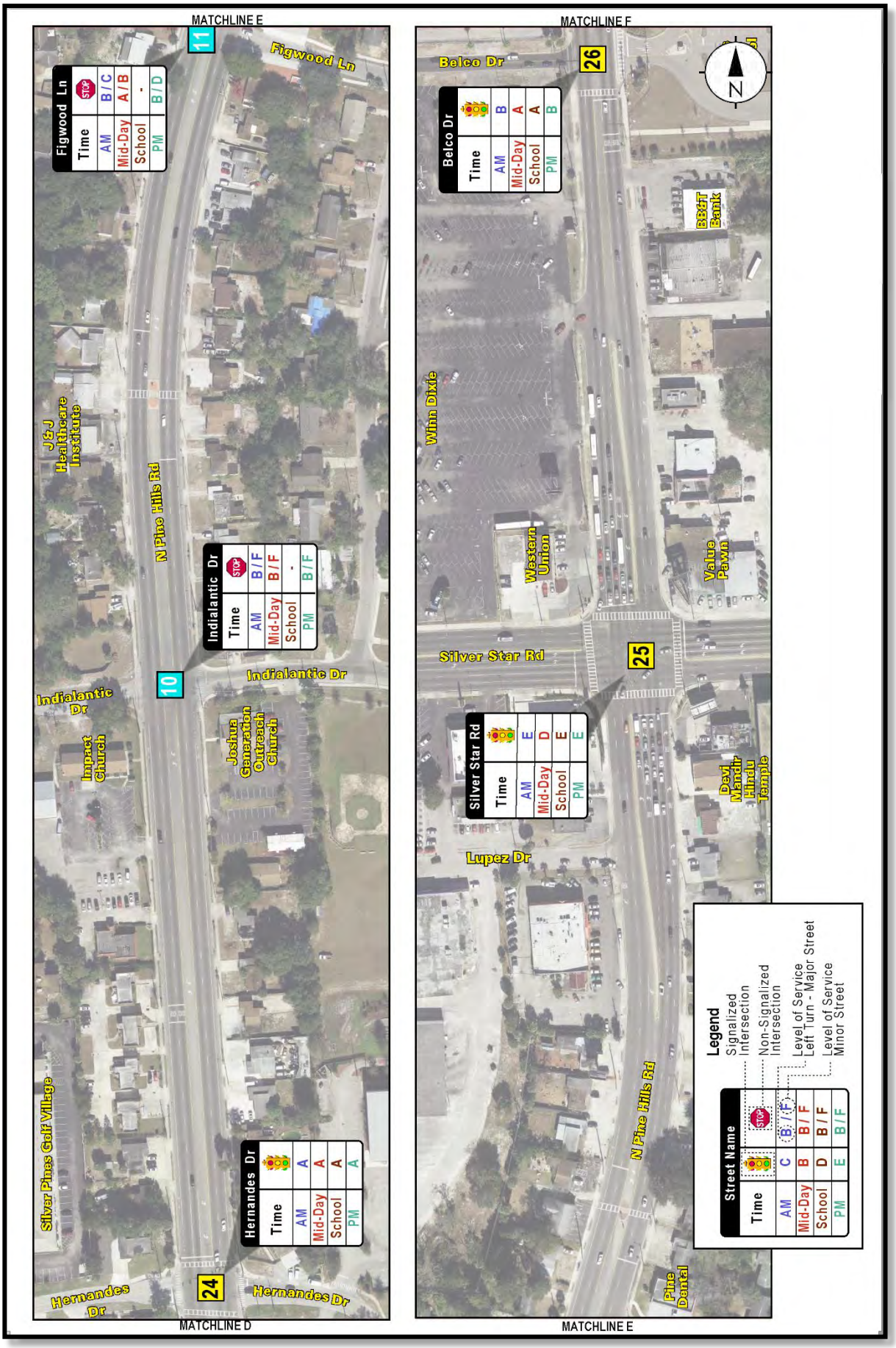

Figure 4.44

Intersection Level of Service
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
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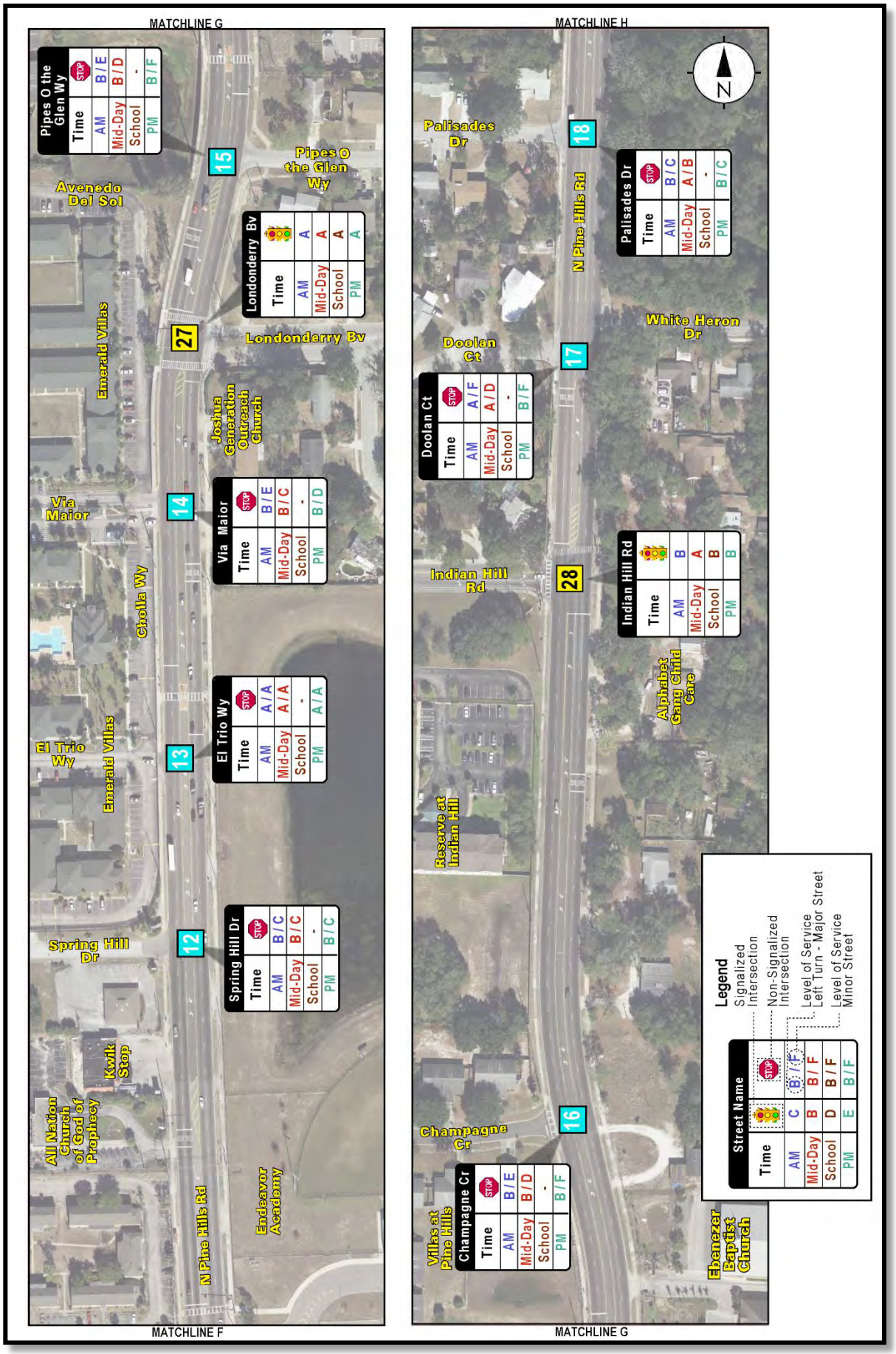

Figure 4.45

Intersection Level of Service
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

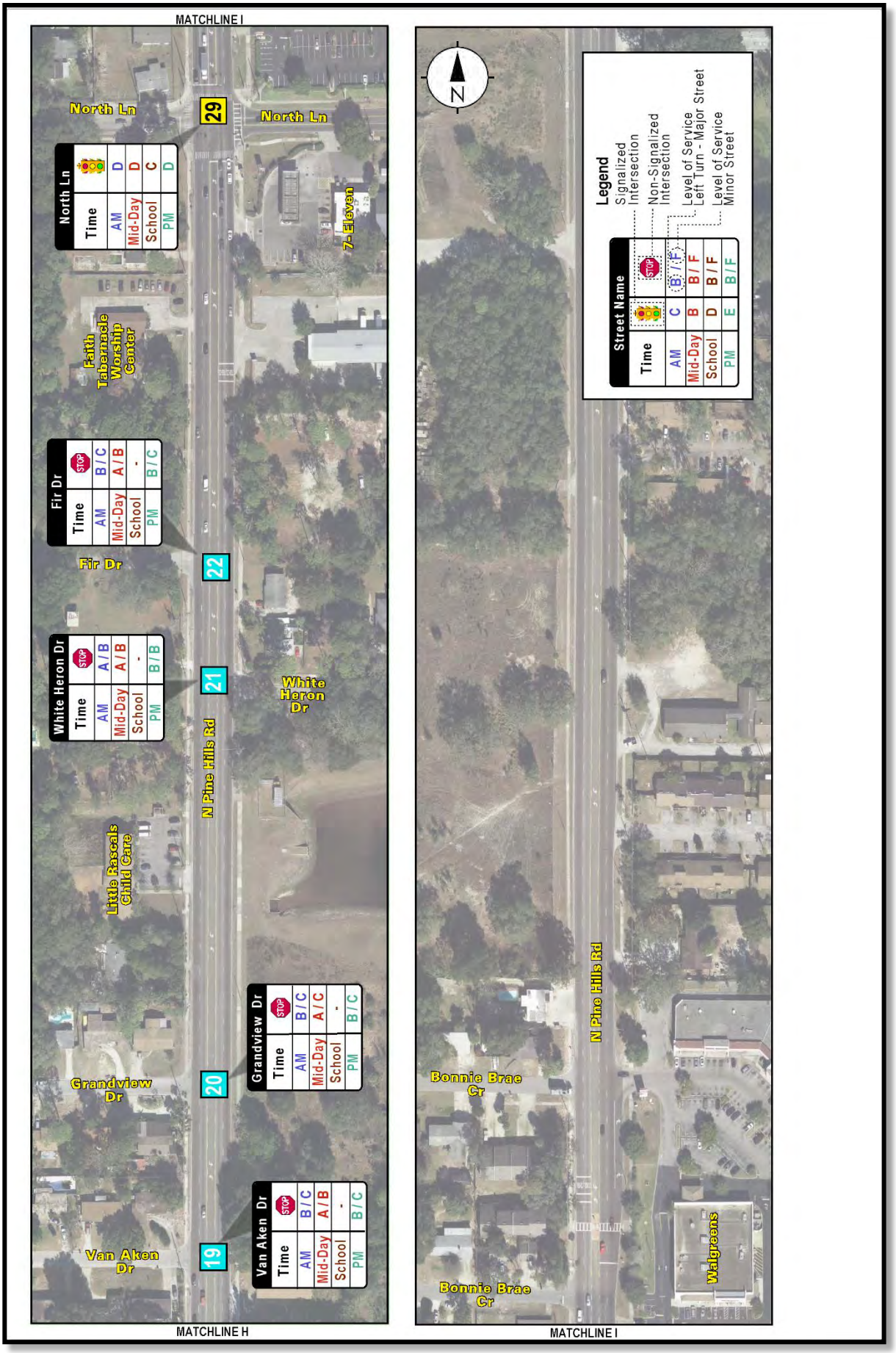

Figure 4.46

Intersection Level of Service
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

5. Existing Access Management

Pine Hills Road serves many different types of abutting land uses, as discussed previously in Chapters 2, 3, and 4. The presence of closely spaced driveways along an arterial and the entering and exiting vehicle movements can create conflict points for vehicles, pedestrians, and bicyclists. While necessary to provide access to abutting land uses, there are instances where consolidation of driveways, and the management of median openings and signal spacing are recommended to mitigate the conflict points to improve mobility and safety. For this reason, a survey of the driveway/connection, median opening, and signal spacing along the study area corridor was completed. Figures 5.1 through 5.5 illustrate the existing driveway, intersection, and median spacing along the corridor.

Detailed analysis of the existing access management conditions and the proposed access management recommendations are available in Technical Memorandum #4.

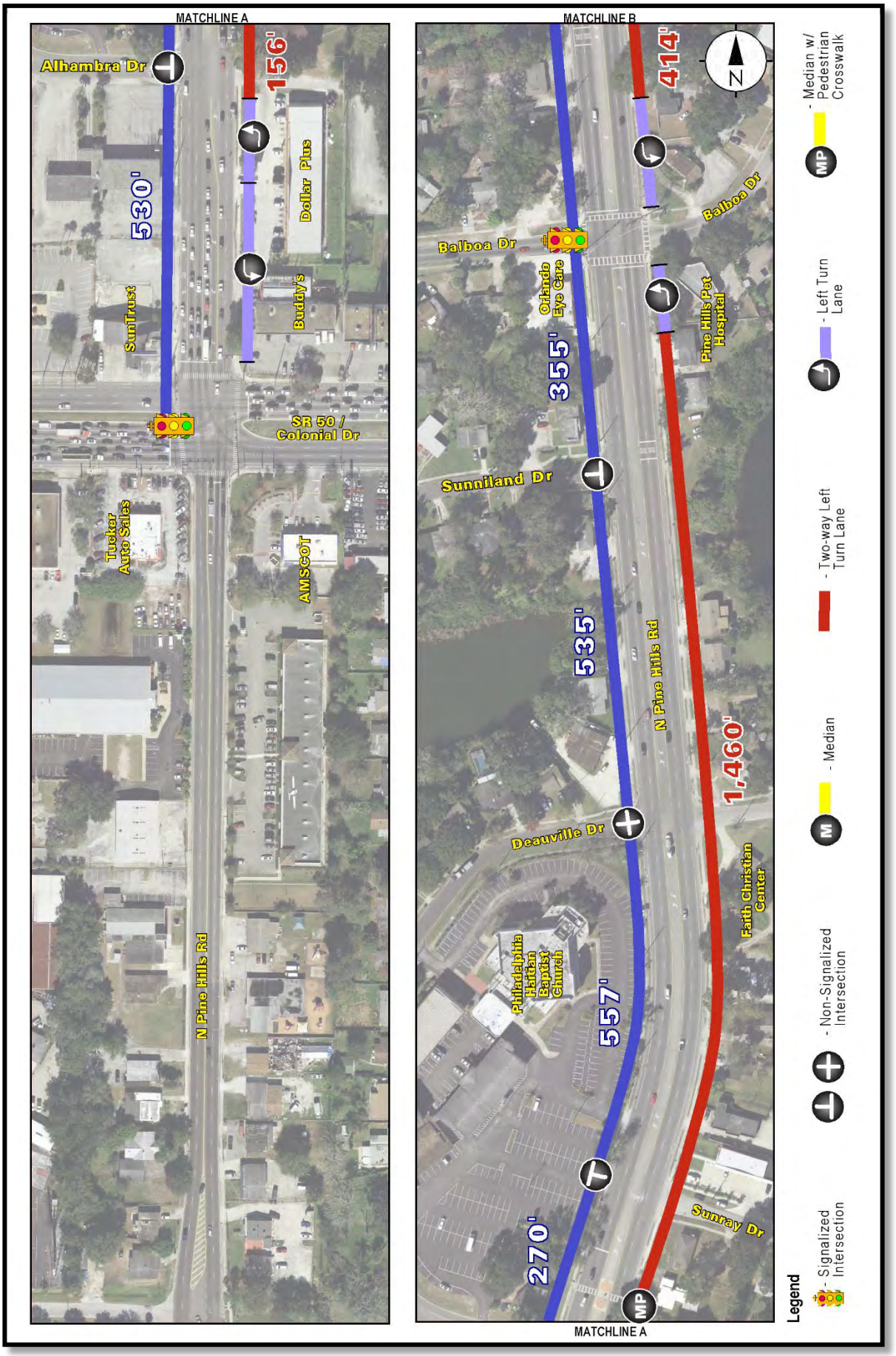

Figure 5.1

Intersection Spacing
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

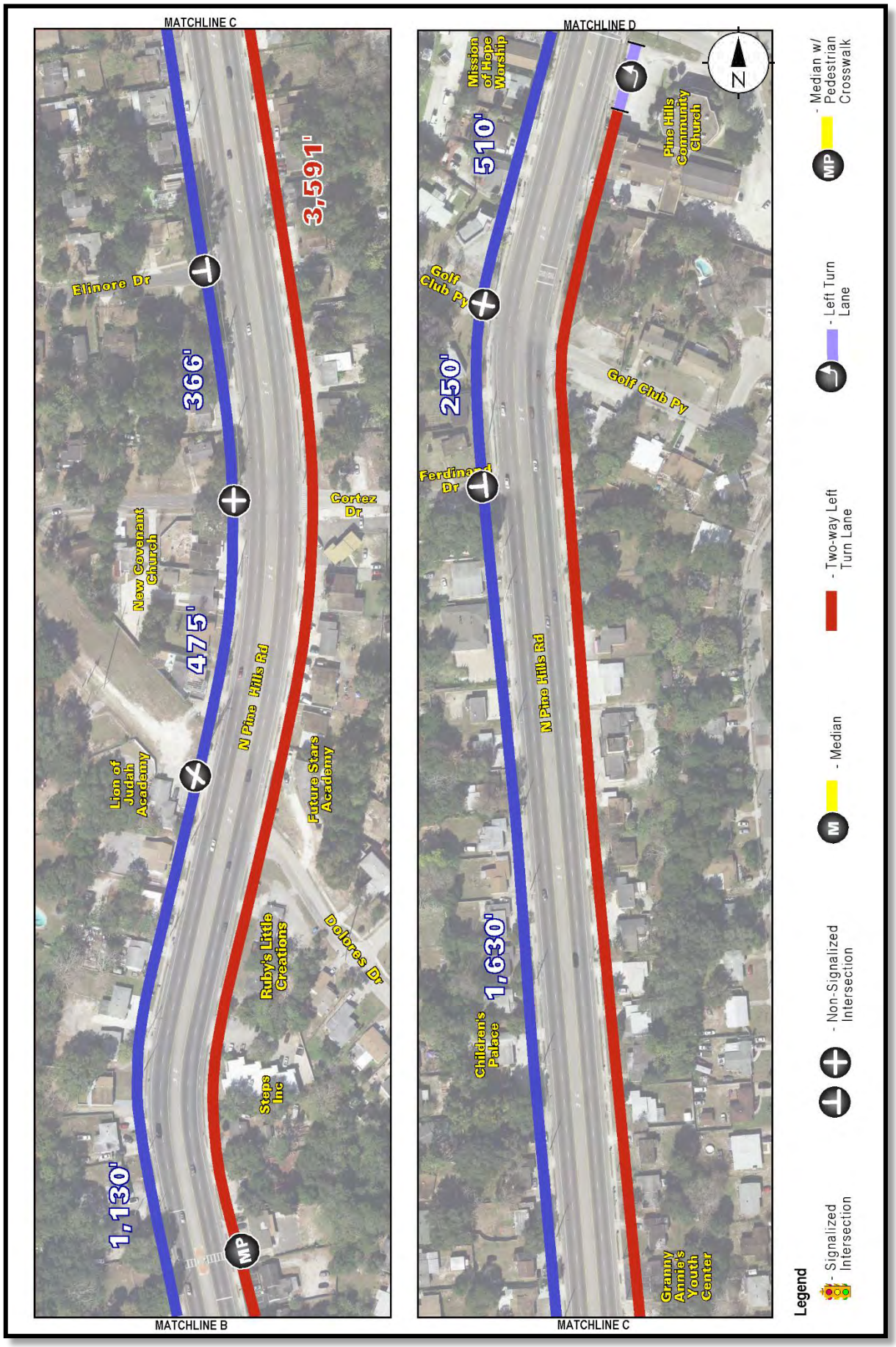

Figure 5.2
Intersection Spacing
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

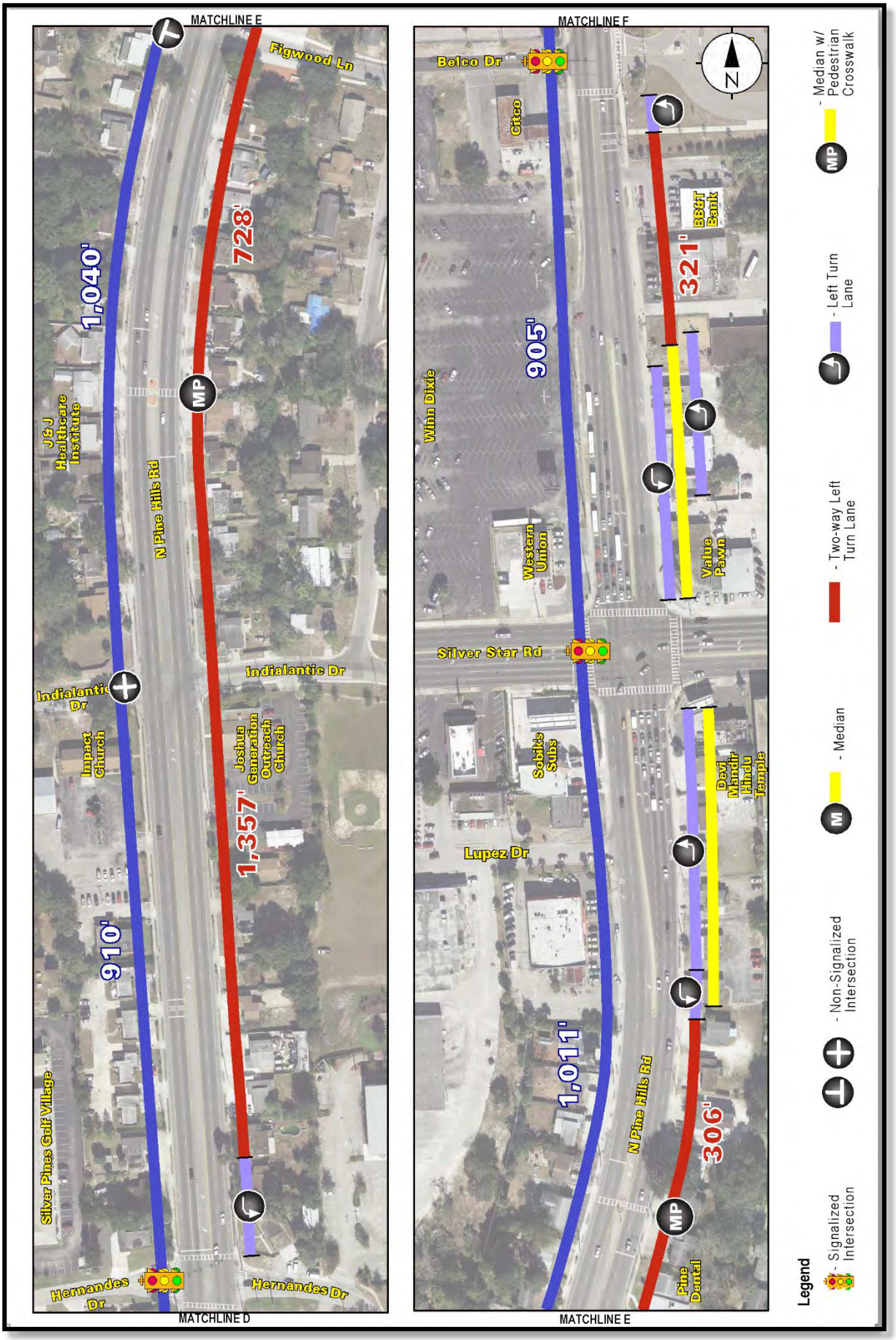

Figure 5.3
Intersection Spacing
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

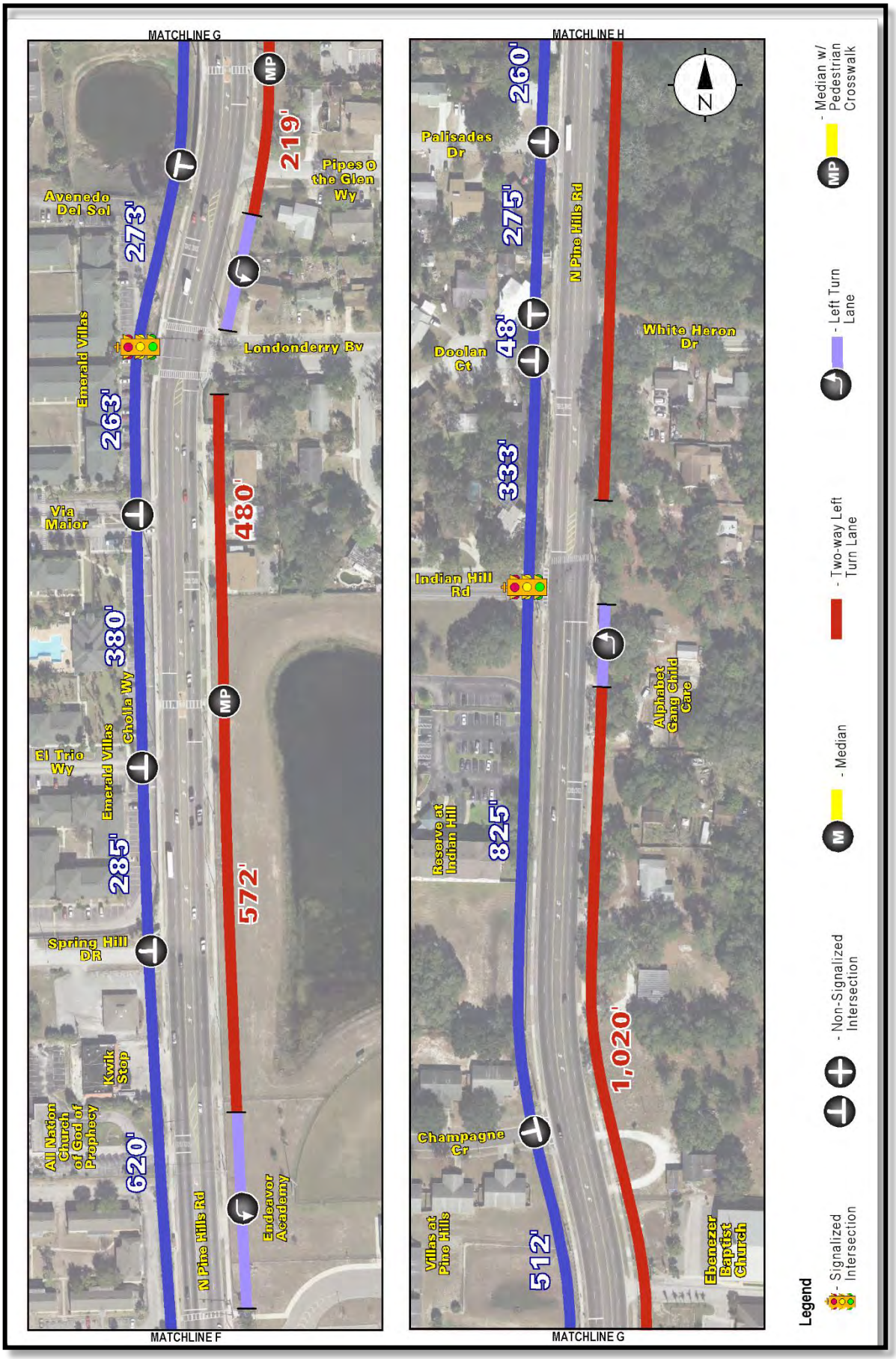

Figure 5.4
Intersection Spacing
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report
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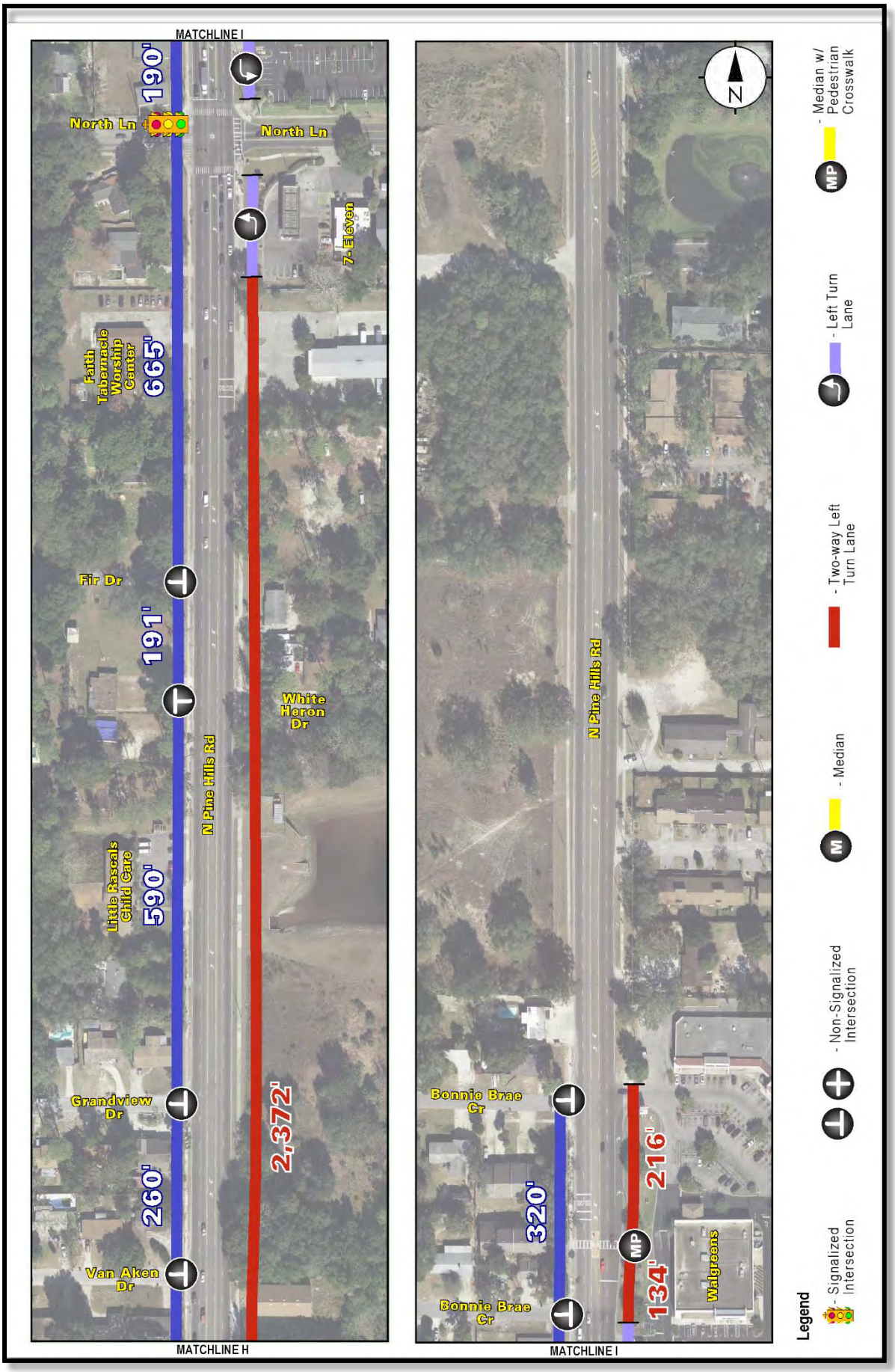

Figure 5.5
Intersection Spacing
Pine Hills Road Pedestrian/Bicycle Safety Study
Existing Conditions Report

6. Next Steps

The data and studies undertaken by this report provide the framework for identifying potential measures to improve safety in the Pine Hills Road study area. Several recommendations have been developed thus far from the findings of this report as noted below.

- As indicated in Table 3.12, 45 percent of the pedestrian/bicycle crashes occurred in at dusk or dark conditions. The luminosity study also found that with the wide spacing of existing luminaires and aging high pressure sodium lamps, lighting levels do not meet FDOT standards. Based on these conditions and relatively high night-time crash rates, we would suggest new lighting be provided for Pine Hills Road. LED fixtures should be considered since they would provide long term operational and maintenance cost benefits.

- As indicated in Table 3.14, 45 percent of the pedestrian/bicycle crashes occurred in between intersections along Pine Hills Road. For the most part, these crashes were not found to be focused at specific locations along Pine Hills Road, but were widely dispersed along the corridor. The Gap Analysis Study (Tables 3.3 and 3.4) also found that only one gap was available for pedestrians attempting to fully cross the entire roadway at one time during the hours studied. Consequently, these findings suggest the following approach:

    - Convert the two-way left turn lane to a curbed median which would dramatically increase the number of available gaps to as much as 120 in a two-hour period.
    - The Spot Speed Study (Table 3.5) indicated the 85 percentile speed was in the range of 47-48 mph which is higher than the posted speed limit of 40 mph. To reduce operating speeds and provide more gaps for pedestrian crossings, 11-foot travel lanes are recommended which are recognized as a traffic calming measure that may lower vehicular speeds.
    - The alignment of Pine Hills Road has a number of horizontal curves which may impair the ability of motorists to detect pedestrians crossing Pine Hills Road. To improve the visibility at mid-block crossings or at unsignalized intersections, the use of RRFB's are suggested to alert motorists of pedestrians crossing the roadway.

- The Pine Hills Road/Silver Star intersection incurred 18 crashes over a three-year period and had the highest crash history in the study area. Observations taken during the course of the study indicated heavy southwest to northeast (and vice versa) pedestrian and student movements. Suggestions to encourage pedestrians to use the existing signals at this intersection would include the following measures, subject to FDOT approvals.

    - Employ a signal phase that once actuated, given acceptable impacts to automobile traffic, would provide an all-red sequence that would allow pedestrians to move across or diagonally through the intersection which should encourage pedestrian usage. This phase would likely be used during off-peak hours to avoid increased delays to motorists during peak hour operations.
    - During off-peak periods, adjust the pedestrian signal operations to call up pedestrian phases immediately after pedestrians activate the push-button actuation. This measure will encourage pedestrians to use the intersection crosswalks and protected phases during off-peak hours which should have minimal effects on roadway capacity issues.

  - Reconstruct the curb returns at the northeast and southwest quadrants by eliminating the acceleration lanes, thereby allowing shorter crossing distances.

- After analyzing the information in Table 3.11, the average distance from an existing LYNX bus stop to a designated pedestrian crossing across Pine Hills Road (at a signalized intersection or midblock crossing) is 495 feet. The shortest distance between a bus stop and a crossing is 10 feet (Stop #10 located just north of the Belco Drive intersection) and the longest distance between a bus stop and a crossing is 2,300 feet (Stop #6 located south of Ferdinand Drive). To focus and encourage bus patrons to utilize designated crosswalks, existing bus stops will be examined to determine if they can be relocated and/or consolidated near existing pedestrian crosswalks, or if new pedestrian crossings are needed to serve existing bus stops.

- As indicated in Table 3.15, one-third (24) of the crashes involved persons less than 18 years of age. There were 30 crashes (41 percent) involving dart/dash movements across roadways. These data suggest that an educational program may be helpful to reinforce safe crossing behavior and movements.

APPENDIX D

TECHNICAL MEMORANDUM 4: ACCESS MANAGEMENT REPORT

Pine Hills Road Pedestrian/Bicycle Safety Study

Access Management Report

Technical Memorandum No. 4

wsp

ORANGE COUNTY GOVERNMENT FLORIDA

ORANGE COUNTY WALK•RIDE•THRIVE!

INVEST Our HOME for Life

Many Cultures, One Bright Future PINE HILLS NEIGHBORHOOD IMPROVEMENT DISTRICT

Pine Hills Road Pedestrian/Bicycle Safety Study

On behalf of Orange County Mayor Teresa Jacobs, District 2 Commissioner Bryan Nelson and District 6 Commissioner Victoria P. Siplin, Orange County is pleased to present this document as part of the Pine Hills Road Pedestrian/Bicycle Safety Study. The study limits are from Colonial Drive (State Road (SR) 50) to Bonnie Brae Circle, a distance of approximately 3.6 miles.

This Pine Hills Road corridor has been identified as a high crash corridor for pedestrian and bicycle crashes. In addition, there are a variety of land uses along the corridor including multiple schools, residential, retail and office land uses, as well as heavily used transit routes, which result in a truly multi-modal corridor.

The Pine Hills Road Pedestrian/Bicycle Safety Study is a comprehensive review of the Pine Hills Road corridor which will investigate various measures to provide a safe integration of walkers and bicyclists with other modes of transportation. This study is a result of Mayor Jacobs' "Walk-Ride-Thrive!" and "INVEST in Our Home for Life" initiatives to make Orange County roads safer for all pedestrians and bicyclists.

Honorable Teresa Jacobs
Orange County Mayor

Bryan Nelson
Orange County District 2 Commissioner

Victoria P. Siplin
Orange County District 6 Commissioner

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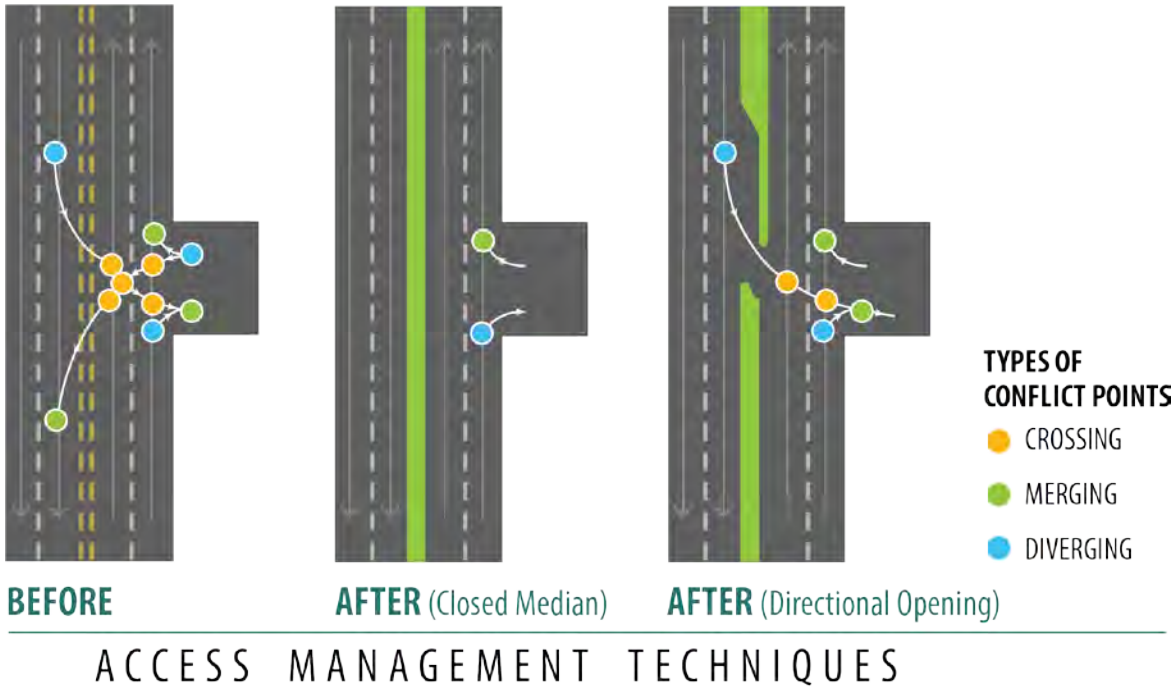
1. Access Management and Classification

In January, 2017, Orange County initiated a Pedestrian/Bicycle Safety Study to develop safety alternatives and strategies for pedestrian/bicycle mobility along Pine Hills Road between Colonial Drive (SR 50) and Bonnie Brae Circle. The *Pine Hills Road Pedestrian/Bicycle Safety Study Existing Conditions Summary Report* summarizes existing conditions within the Pine Hills Road Study Area, a 3.6-mile section beginning at Colonial Drive at the southern end and terminating at Bonnie Brae Circle at the northern end. This report presents existing access conditions and proposed access management improvements in the study corridor.

The goal of access management is to control access along roadways by limiting the number of driveway and median access points. The intended results are to reduce potential conflicts as well as improve safety and operations along the roadway. The presence of closely spaced driveways along a corridor coupled with an existing center two-way left turn lane can create numerous conflict points for vehicles, pedestrians and bicyclists as depicted in Figure 1.1.

With access management techniques such as replacing the center two-way left turn lane with a median, the number of potential conflict points can either be focused at selected intersections (Full Openings), or reduced at other locations where only right in, right out movements (see Closed Median illustration below), or where Directional Openings are allowed. Figure 1.1 illustrates the difference in conflict points between roadways with no or limited access management techniques vs those where access is controlled. Signals can provide both operational and access management benefits since they control traffic movements which can result in reducing conflict points.

Figure 1.1: Conflict Points Before and After Access Management Techniques



The Florida Department of Transportation (FDOT) classifies access on state roadways using a seven-tier access management system established in Chapter 14-97, Administrative Rules of the Department of Transportation, State Highway System Access Management Classification System and Standards (Rule 14-97). The classification system ranges from Access Class 1, reserved for limited access freeways, to Access Class 7, assigned to lower priority roadways in areas that are already highly urbanized. This classification system assigns standards for the spacing of median openings (full and directional) and signal spacing.

For each access class, Table 1.1 displays the allowable spacing of signalized and unsignalized intersections, as well as the type of median opening allowed. The most restrictive, Access Class 1, is for limited access roadways and allows for no signalized intersections or driveways. The least restrictive, Access Class 7, allows signalized intersections at 1,320 foot (1/4-mile) spacing with full median openings at a 660-foot spacing. Although Pine Hills Road is a county road, Orange County generally follows FDOT guidelines.

Table 1.1: FDOT Access Class Spacing Standards

FDOT Access Management Class	Median	Minimum Median Opening Spacing (feet)		Minimum Signal Spacing (feet)	Minimum Connection Spacing (feet)
		Full	Directional		
Class 1[1]	Restrictive	-	-	-	5,280 (CBD) – 31,680 (Rural)
Class 2	Restrictive with Service Roads	2,640	1,320	2,640	1,320 / 660[2]
Class 3	Restrictive	2,640	1,320	2,640	660 / 440[2]
Class 4	Non-Restrictive			2,640	660 / 440[2]
Class 5	Restrictive	2,640 / 1,320[2]	660	2,640 / 1,320[2]	440 / 245[2]
Class 6	Non-Restrictive			1,320	440 / 245[2]
Class 7	Both Median Types	660	330	1,320	125

Source: Section 14-97.003, Florida Administrative Code (http://www.fdot.gov/planning/systems/programs/sm/accman/pdfs/1497.pdf)
[1] Access Class 1, for limited access facilities, only applies to interchange spacing, not median or signal spacing.
[2] Greater than 45 MPH posted speed / Less than or equal to 45 MPH posted speed

Since Pine Hills Road currently has little or no existing raised medians, there is essentially unlimited access to/from side streets and properties. As a result, Pine Hills Road does not have a formal FDOT access management class designation. This condition, along with the existing speed limit for Pine Hills Road, are noted in Table 1.2.

Table 1.2: Existing Access Management Classifications and Posted Speeds

Roadway	Limits	Access Class	Posted Speed
Pine Hills Road	Colonial Drive (SR 50) to Bonnie Brae Circle	N/A	40 mph

As discussed in the *Pine Hills Road Pedestrian/Bicycle Safety Study Existing Conditions Report*, Pine Hills Road serves many abutting land uses. While necessary to provide access to these properties, there are instances where access management strategies should be considered to improve mobility and safety. One such measure would be to provide a closed median with designated median openings to reduce conflict points, instead of allowing the current two-way left turn center lane to remain in place which essentially provides unlimited and uncontrolled access.

To further evaluate the feasibility of this measure, a survey of the driveway and side street connections, median openings, and signal spacing along the study area corridor was conducted as part of this study. Figure 1.2 illustrates the distances between existing intersections and the type of median (Two-Way Left Turn Lane or Raised Median) found along the Pine Hills Road corridor.

Figure 1.2: Existing Intersection and Median Spacing

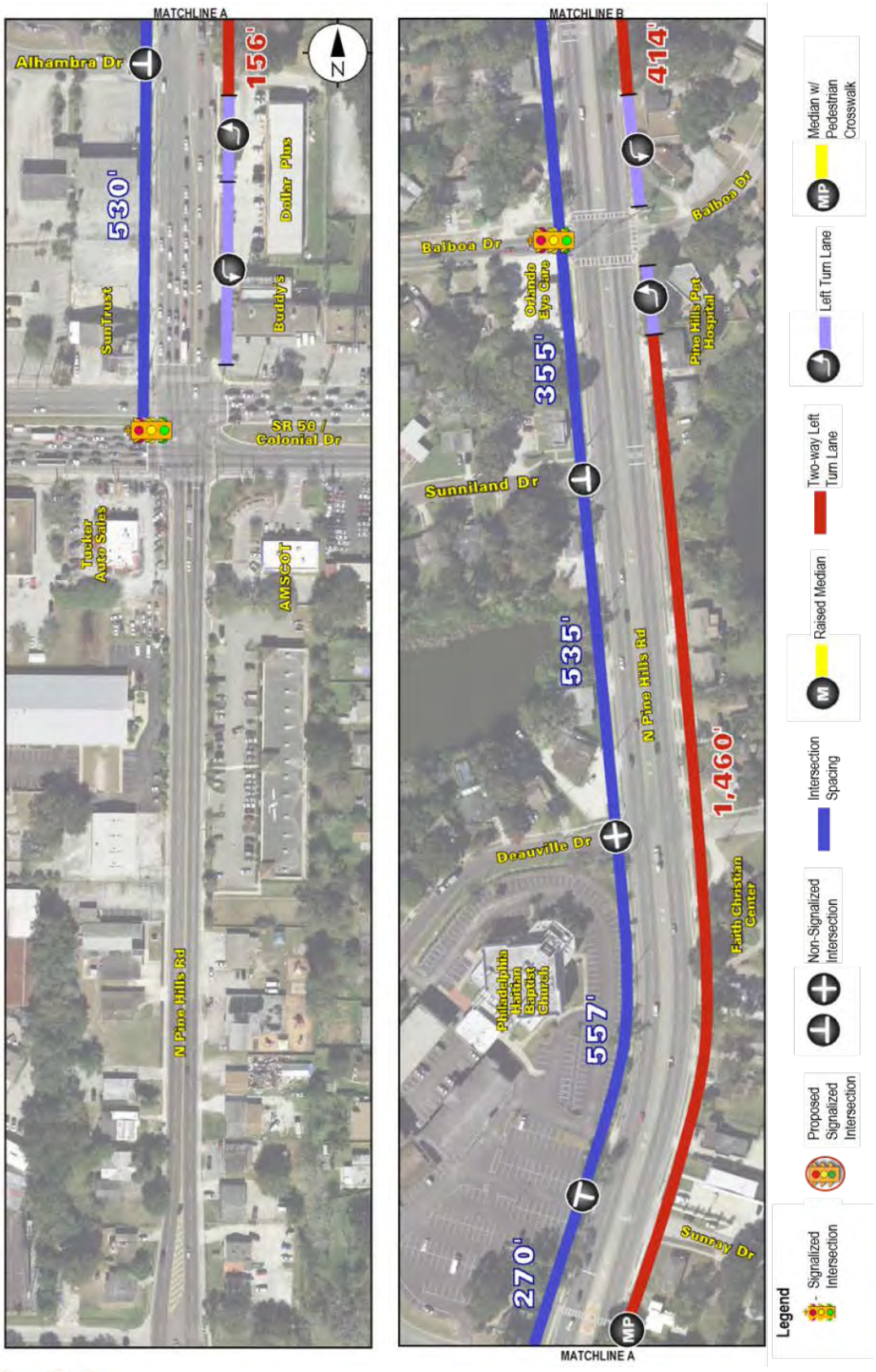


Figure 1.2 (continued): Existing Intersection and Median Spacing

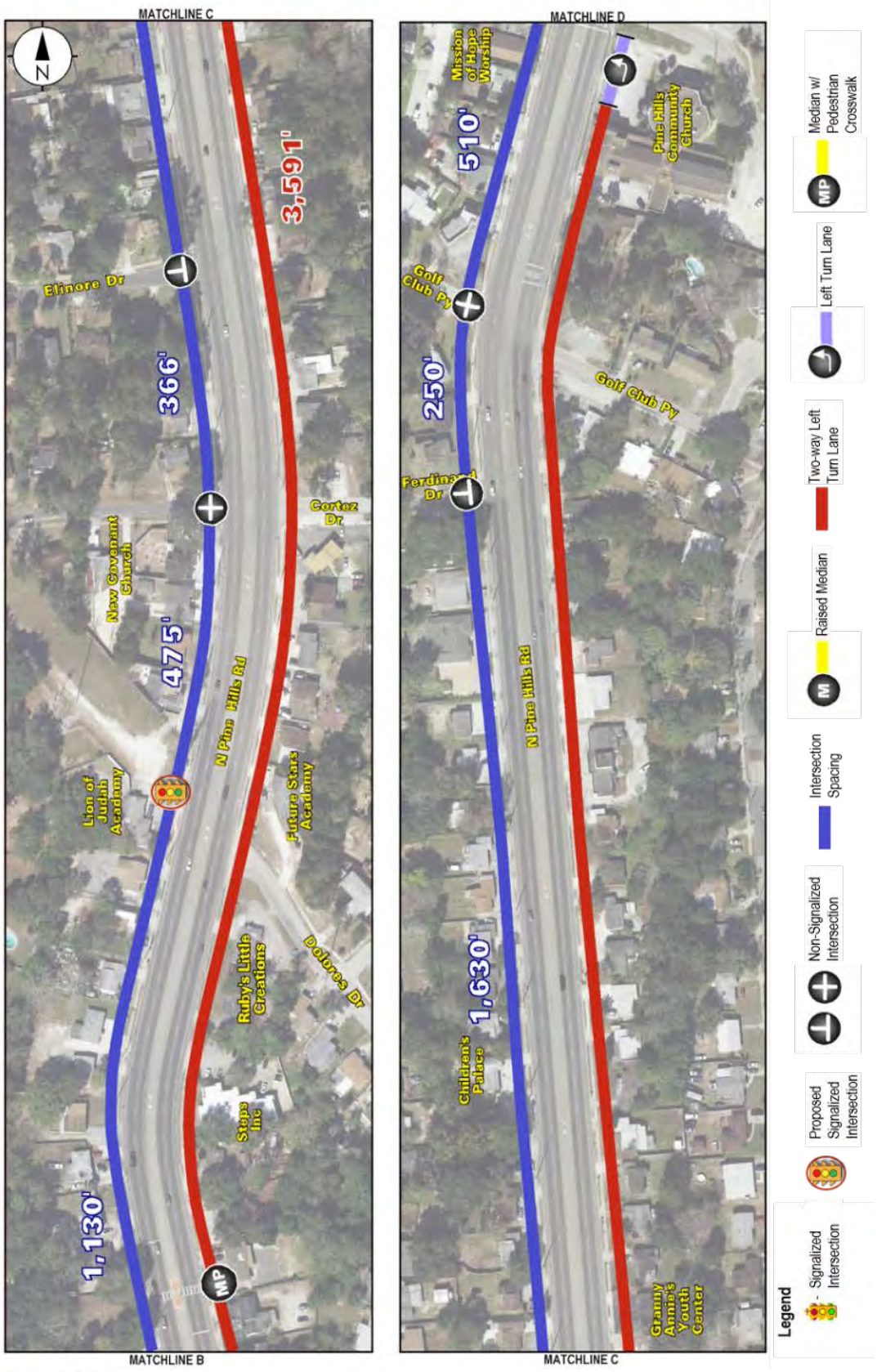


Figure 1.2 (continued): Existing Intersection and Median Spacing

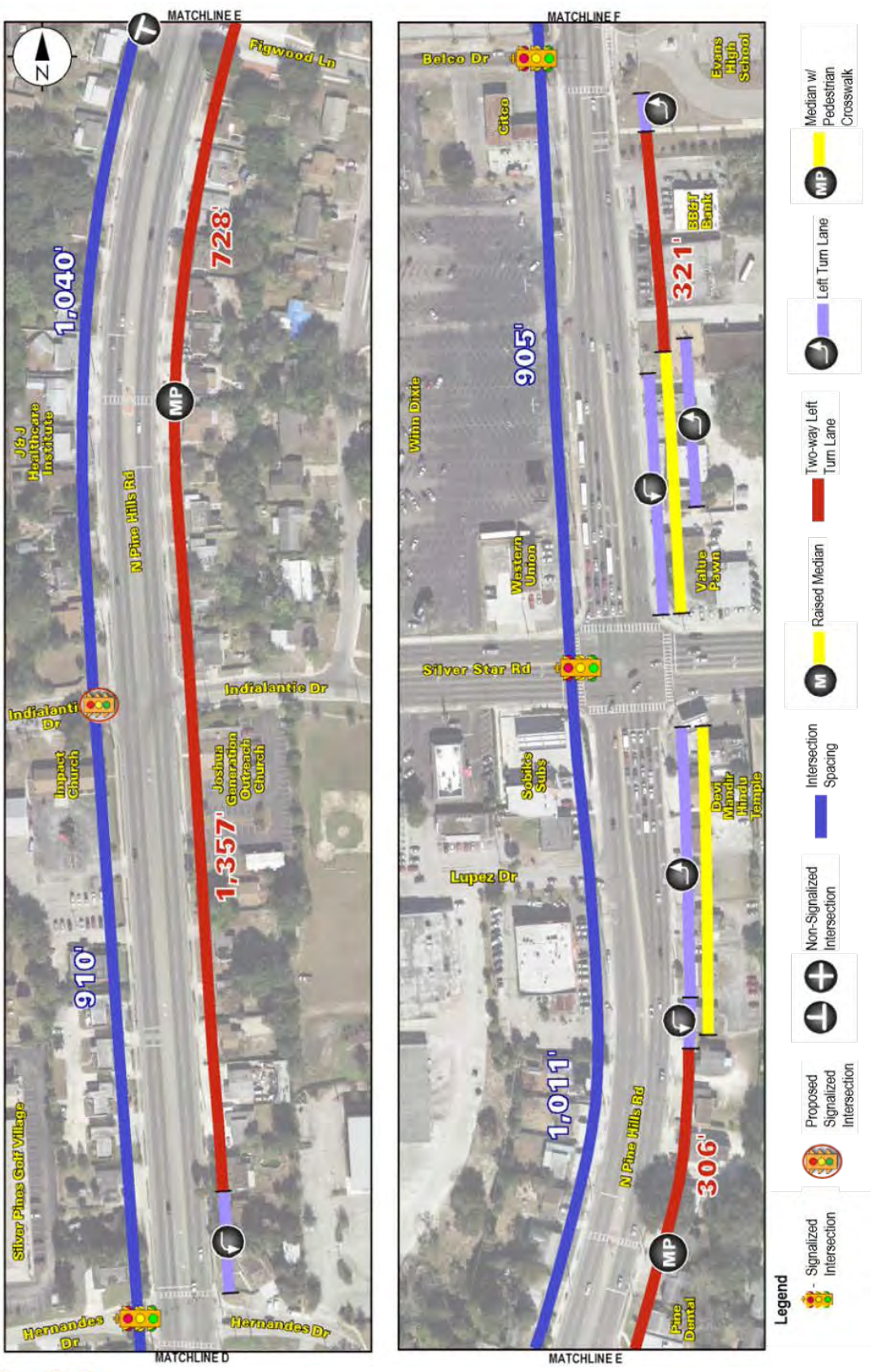


Figure 1.2 (continued): Existing Intersection and Median Spacing

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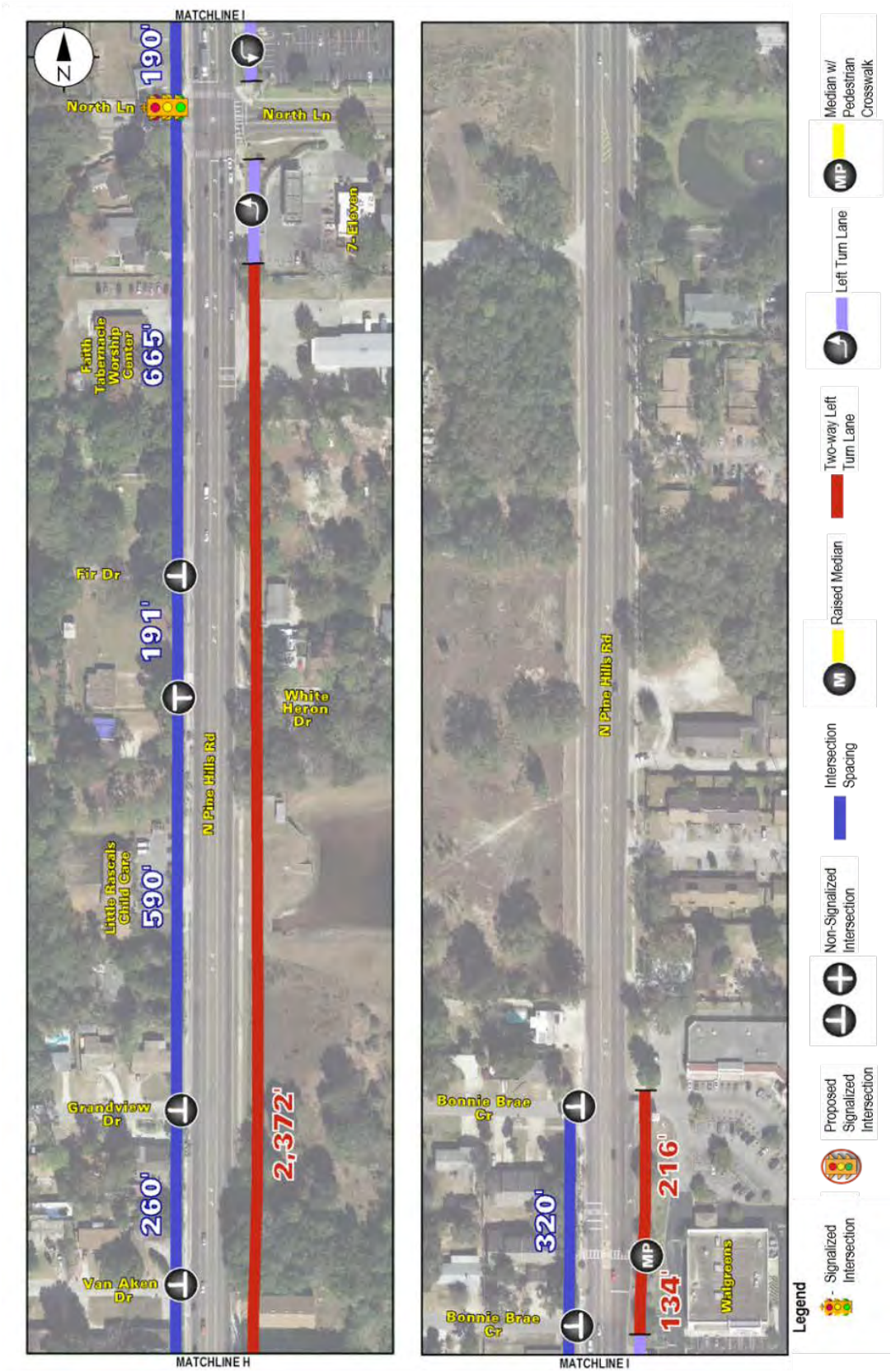


2. Proposed Access Management Plan

A full access management review was performed to determine appropriate median opening types and placement along the Pine Hills Road corridor, as well as directional left-turn locations. The existing corridor configuration (five lanes, with two lanes in each direction and a two-way center turn lane) currently allows unrestricted access to side streets and driveways along the corridor, with the exception of dedicated left-turn lanes at the eight existing signalized intersections shown below. In addition, new signals are also planned at Dolores Drive and at Indialantic Drive.

- Colonial Drive (SR 50)
- Balboa Drive
- Hernandes Drive
- Silver Star Road (SR 438)
- Belco Drive
- Londonderry Boulevard
- Indian Hill Road
- North Lane

Figure 2.1: Proposed Typical Section: Colonial Drive to Silver Star Road

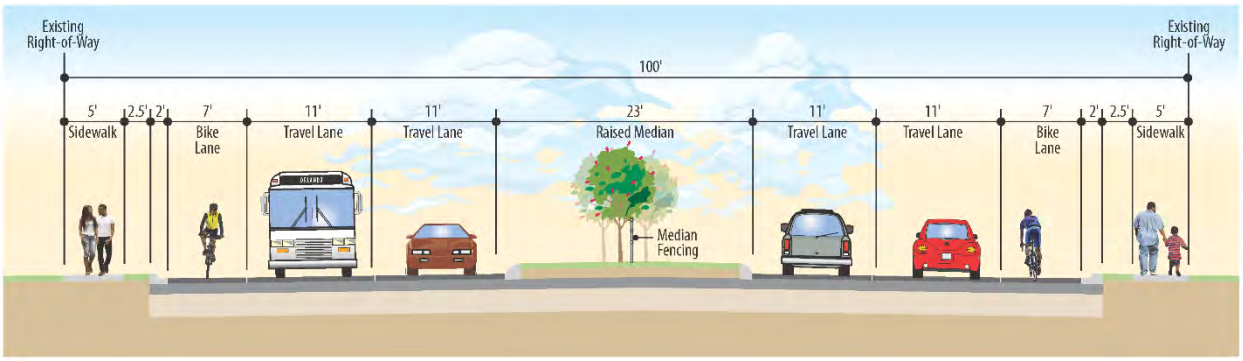
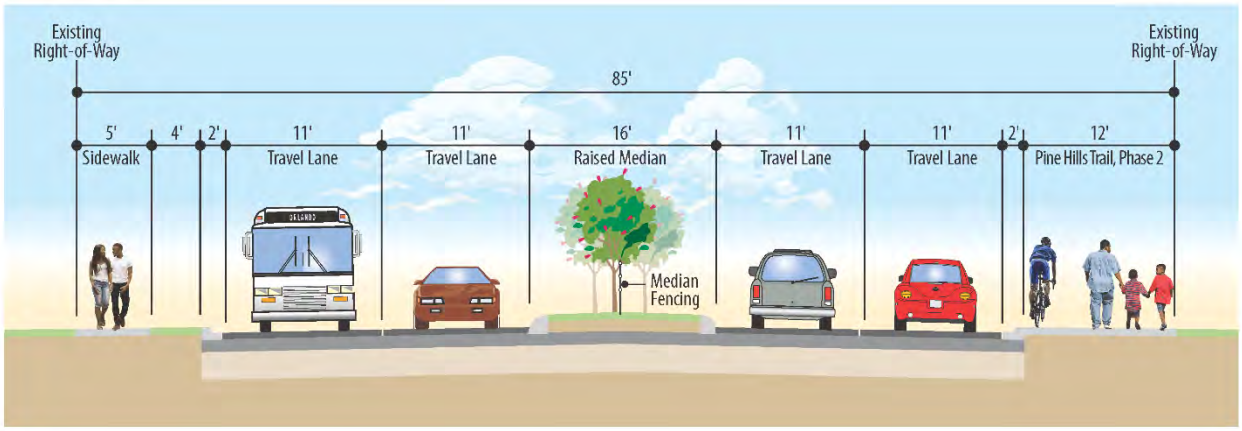


Figure 2.2: Proposed Typical Section: Silver Star Road to Bonnie Brae Circle



The proposed access management plan would limit access by incorporating a raised median throughout the length of the study corridor. Figures 2.1 and 2.2 illustrate the proposed typical cross sections for the proposed plan, which includes two travel lanes in each direction, separated by a raised median with dedicated left-turn lanes. These improvements would reduce the number of conflict points especially at driveways.

Two different access management classes are proposed for Pine Hills Road through the study area (see Table 2.1). South of Belco Drive, Pine Hills Road is characterized by numerous side streets and small businesses that have been converted from original residential properties fronting Pine Hills Road to commercial usages. For this section of Pine Hills Road, Class 7 is proposed since it provides greater control of access than the current undivided roadway, yet it would be the least restrictive and would continue to provide a high level of access to properties.

For the section of Pine Hills Road north of Belco Drive, Class 5 is proposed since there are fewer businesses that front Pine Hills Road through this area and thus a higher level of controlled access can be prescribed, as summarized in Table 2.1.

Table 2.1: Proposed Access Management Classifications and Posted Speeds

Roadway	Limits	Proposed Access Class	Posted Speed
Pine Hills Road	Colonial Drive (SR 50) to Belco Drive	5	40 mph
Pine Hills Road	Belco Drive to Bonnie Brae Circle	7	40 mph

Figure 2.3 shows the spacing of the intersection and median openings (including provisions for U-turn movements) based on the proposed access management plan. The intersection treatments and types of median openings were determined as described below for the access management improvements for Pine Hills Road.

South Segment (Class 7) – Colonial Drive to Belco Drive

- All signalized intersections (Colonial Drive, Balboa Drive, Hernandes Drive, Silver Star Road, and Belco Drive) received full openings since signals are already in place at these locations and their installations have likely been justified by previous engineering studies substantiating higher traffic usage and demands. In addition, since the County has recently approved signal installations at Dolores Drive and at Indialantic Drive, these intersections will also receive full openings.
- Additional full openings have been provided at Deauville Drive, Cortez Drive, Ferdinand Drive, and Figwood Lane because of the relatively heavy traffic demands at these intersections and the need to provide access to local neighborhoods.
- Directional openings have been provided at Alhambra Drive and Elinor Drive to provide local traffic movements.
- Four intersections will have only right in, right out access – Sunray Drive, Sunniland Drive, Golf Club Parkway, and Lupez Drive. Providing access to these intersections would not meet the spacing guidelines as noted in Table 1.1. Traffic demands at these locations are also relatively light.

North Segment (Class 5) – Belco Drive to North Lane

- For reasons similar to the south segment, full openings have been provided at all signalized intersections – Londonderry Boulevard, Indian Hill Drive, and North Lane. No other full openings were provided either due to the FDOT guidelines or low traffic demands.
- Directional openings have been provided at Champagne Circle, Van Aken Drive, and White Heron Drive due to either relatively high traffic counts or the need to serve adjacent neighborhoods.
- The remainder of the intersections in the north segment would have right in, right out operations. Generally, these streets have relatively low traffic volumes or do not meet the spacing guidelines noted in Table 1.1. To improve access to/from these locations, the nearby full and directional intersections will have flares or bulb outs constructed in the outside curbs to allow most vehicles to perform U-turn maneuvers. These improvements are needed in the north segment of this project since the width of Pine Hills Road is not sufficient to allow U-turns to be fully completed within the existing street section.

Figure 2.3: Build Alternative – Raised Median Concept

Figure 2.3 (continued): Build Alternative - Raised Median Concept

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Figure 2.3 (continued): Build Alternative - Raised Median Concept

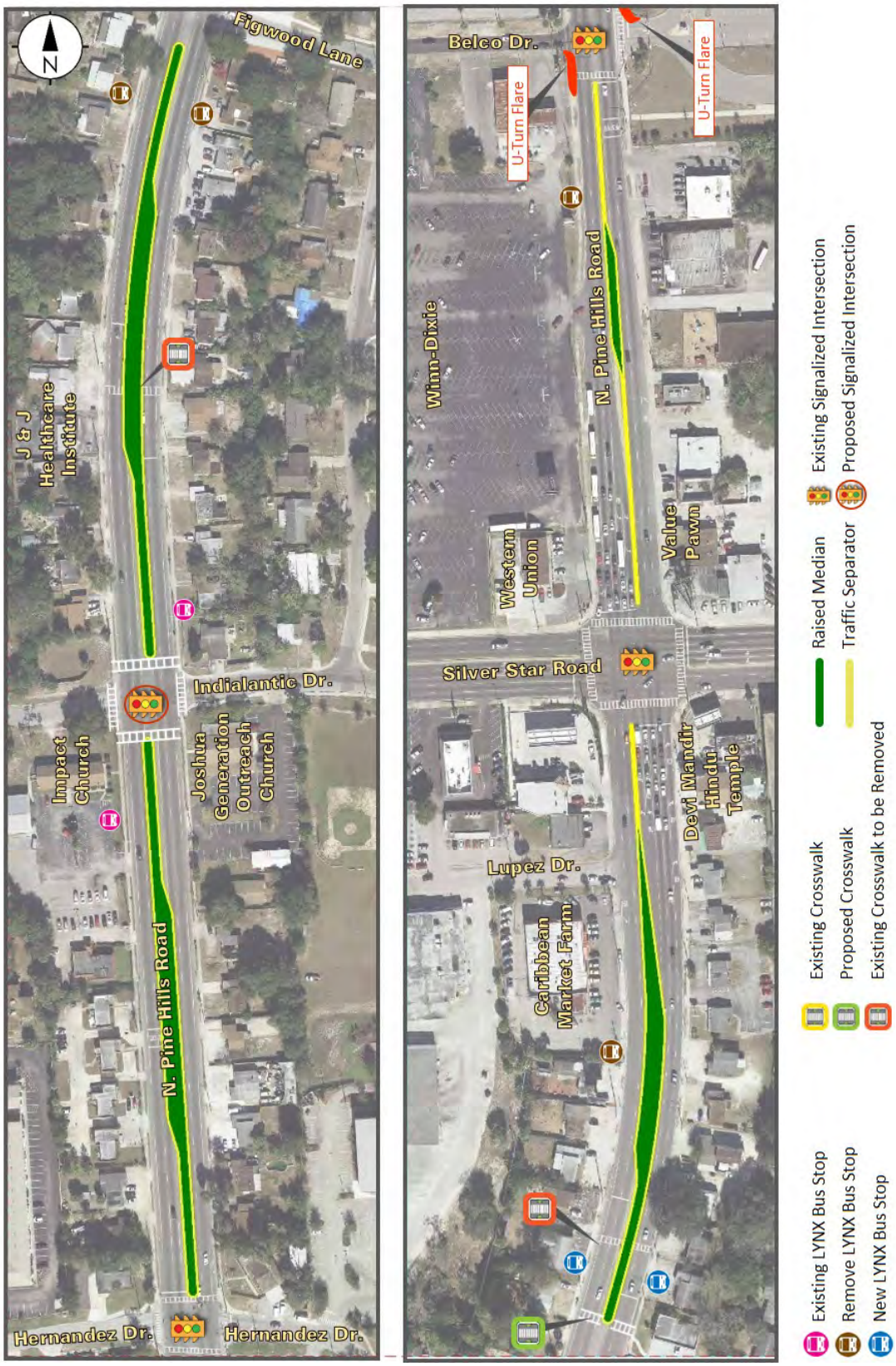

Figure 2.3 (continued): Build Alternative - Raised Median Concept

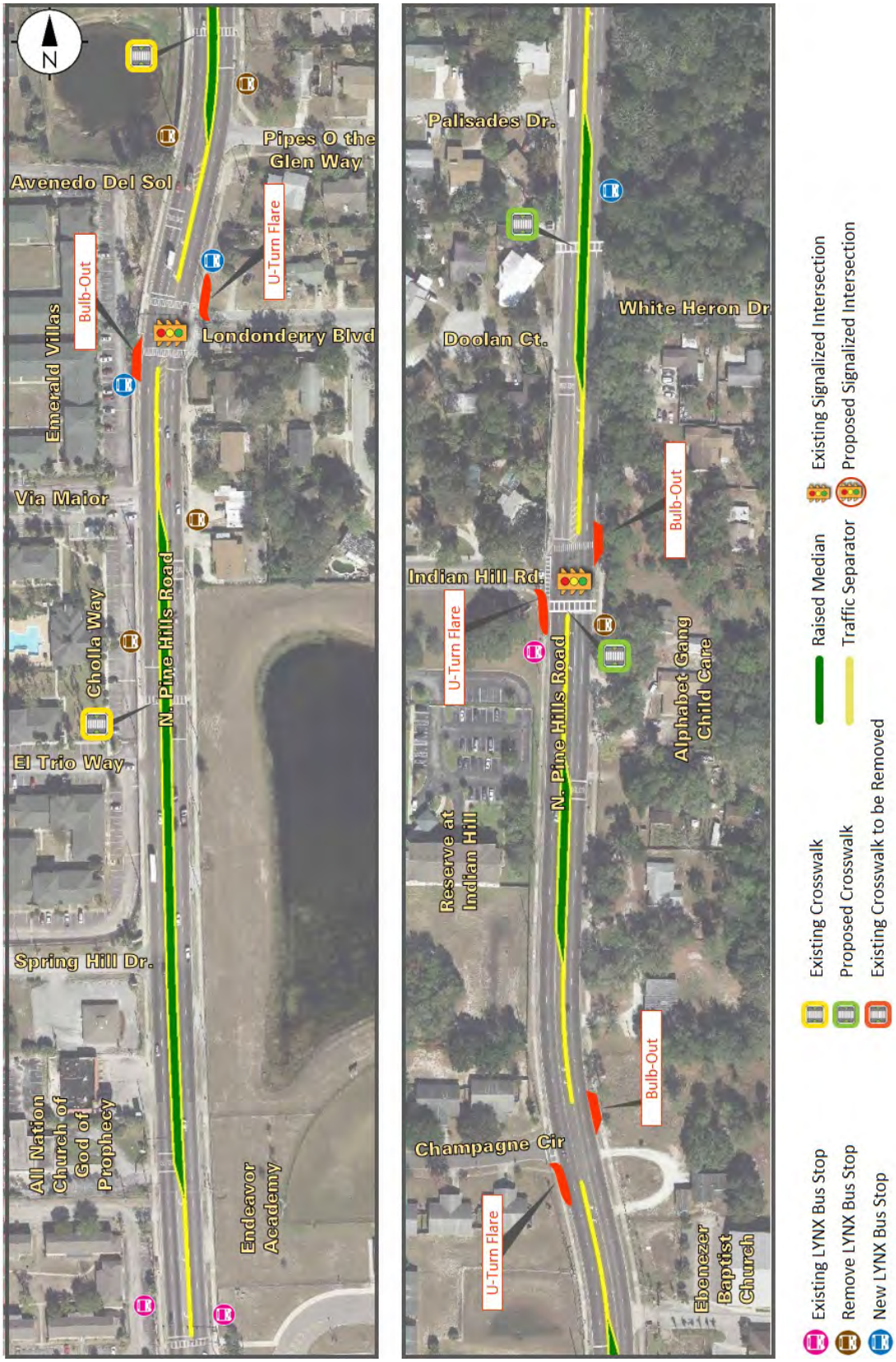

Figure 2.3 (continued): Build Alternative - Raised Median Concept