NOVEMBER 2014

Orange Avenue

CORRIDOR PLANNING STUDY

FROM SAND LAKE ROAD (SR 482)
TO HOFFNER AVENUE

Final 11.20.2014

Orange County, Florida
Roadway ID's 75040000 (MP 7.649 to 9.344)
& 75040101 (MP 0.643 to 1.175)
FM Number: 410735-1-12-07

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1
GOALS & BACKGROUND

1 GOALS & BACKGROUND

The Orange Avenue Corridor Planning Study was initiated by the Florida Department of Transportation (FDOT) in partnership with Orange County as part of an initiative to establish livable and walkable multi-modal urban thoroughfares utilizing a context-sensitive approach. This corridor was selected as one of two sections of Orange Avenue to advance the FDOT's multi-modal corridor planning initiative. The County and local stakeholders desire for improved multimodal connections around the study corridor to improve overall mobility, safety, and livability, especially as the roadway supports access to the future SunRail station.

This study builds on the associated Transit Oriented Development (TOD) planning already completed by the County for the Sand Lake Road SunRail station and supports the Federal Housing and Urban Development (HUD) grant received by the region to enhance for Sustainable Communities planning efforts surrounding the station area. The community was previously engaged in planning for the Sand Lake Road SunRail station TOD through partnership with community stakeholders and the cities which are served by Orange Avenue, including the Cities of Belle Isle, Edgewood, Orlando, and the Pine Castle neighborhood association.

This study is focused on identifying a range of multi-modal solutions to improve mobility and advance the long-term vision for the study corridor. The result of this study is a Corridor Management Plan outlining long-term strategies that guide future development within the corridor, including proposed TOD around the station. The plan also includes specific improvements that can be advanced near-term though local agency participation and/or by FDOT as 3-R (Resurfacing, Restoration and Rehabilitation) projects, safety enhancements or push-button projects. Special consideration is given to improve connectivity to the SunRail station area and future TOD.

STUDY AREA DESCRIPTION

Within the project limits, the Orange Avenue Corridor has two distinct segments: (1) from Sand Lake Road (milepost 7.649) to Lancaster Road (MP 8.682) which has a rural five-lane cross-section and (2) from Lancaster Road to Hoffner Avenue (MP 9.344) which is an urban cross-section in a one-way pair configuration for the majority of the segment. The roadway splits into the one-way pair configuration near Prince Street (MP 8.830) with the southbound direction maintaining the Orange Avenue naming while the northbound direction is referred to as Hansel Avenue. Within the one-way pair, the project limits at the south end are Hansel Avenue milepost 8.830 and Orange Avenue milepost 1.175. At the north end of the project the limits are: Hansel Avenue milepost 9.344 and Orange Avenue milepost 0.643).

Fourteen intersecting east-west roadways were included in the analysis due to their role in serving the local community or providing regional connections. The study intersections for the project are outlined below.

Hansel Avenue

- Wallace Street (unsignalized);
- Fairlane Avenue (signalized);
- Oak Ridge Road (signalized); and
- Hoffner Avenue (signalized).

Orange Avenue

- Sand Lake Road (signalized);
- Office Court (unsignalized);
- Perkins Road (unsignalized);
- Nela Avenue/Glenrose Road (signalized);
- Lancaster Road (signalized);
- Prince Street (unsignalized);
- Wallace Street (unsignalized);
- Fairlane Avenue (unsignalized);
- Oak Ridge Road (signalized); and
- Hoffner Avenue (signalized).

Figure 1 displays the Orange Avenue study corridor (Corridor) in relation to the Sand Lake Road SunRail station, major east-west facilities and surrounding municipalities. SR 528, which crosses Orange Avenue south of the study area, is the only highway located in the vicinity of the project. Sand Lake Road (SR 482) is the only state designated facility that intersects with Orange Avenue within the study limits. Perkins Road, Nela Avenue, Lancaster Road, Fairlane Avenue, Oak Ridge Road and Hoffner Avenue are all major collectors that extend east or west from Orange Avenue into the surrounding communities. The City of Edgewood borders the northern boundary of the project and unincorporated Orange County surrounds the south, east and west sides of the corridor. The City of Belle Isle is located approximately ¼ mile east of Orange Avenue and extends from Sand Lake Road to Hoffner Avenue.

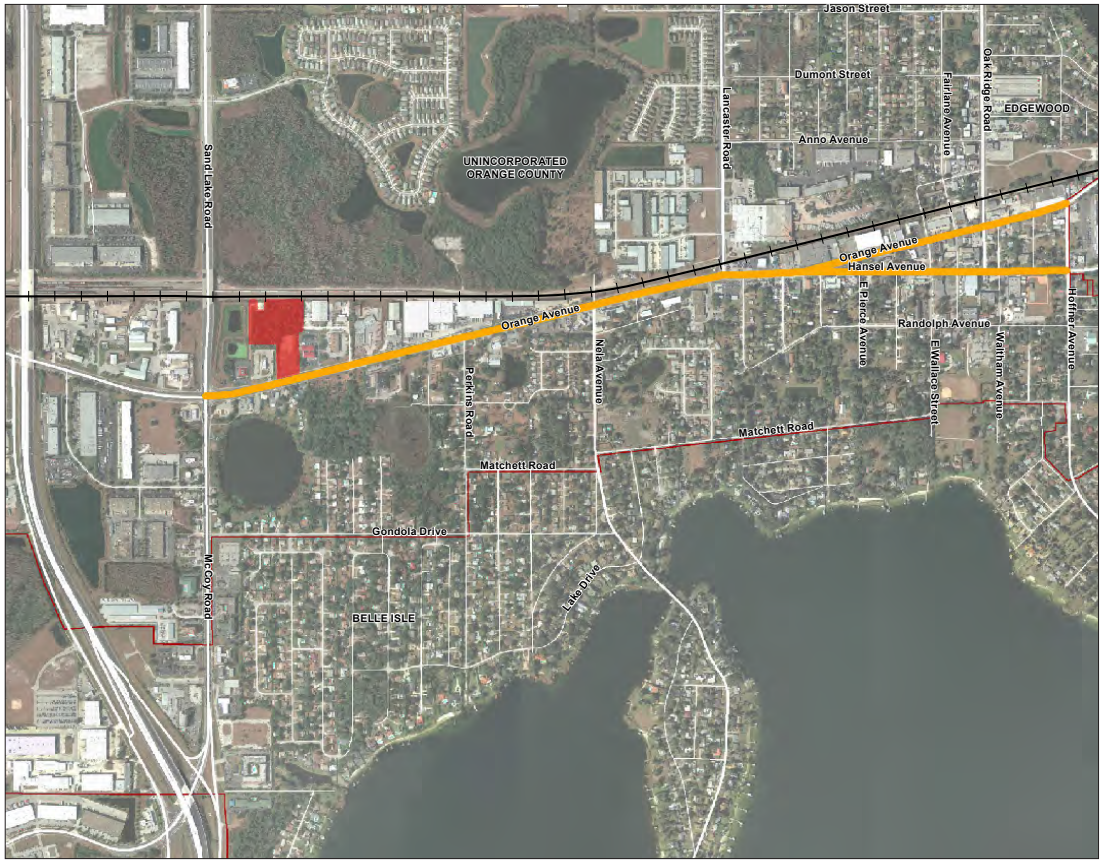


Figure 1 | Basemap

Legend

- SunRail Station Site
- Municipal Boundaries
- Orange Avenue Corridor Study Area

REGIONAL ROADWAY NETWORK

As displayed in Figure 2, the Orange Avenue study corridor is located in unincorporated Orange County just south of the City of Edgewood and just west of the City of Belle Isle. SR 528, SR 91 (Florida's Turnpike), SR 408 and I-4/SR 400 are the highways located within a five mile radius of the study corridor. South Orange Blossom Trail and SR 15/Conway Road are the closest parallel north-south arterials but are approximately two miles east and west of Orange Avenue. Hoffner Avenue provides the only arterial connection to SR 15/Conway Road to the east whereas Sand Lake Road, Lancaster Road and Oak Ridge Road provide connections to Orange Blossom Trail to the west. The lack of a parallel north-south roadway network limits the options for north-south vehicular travel through this general area of Orange County.

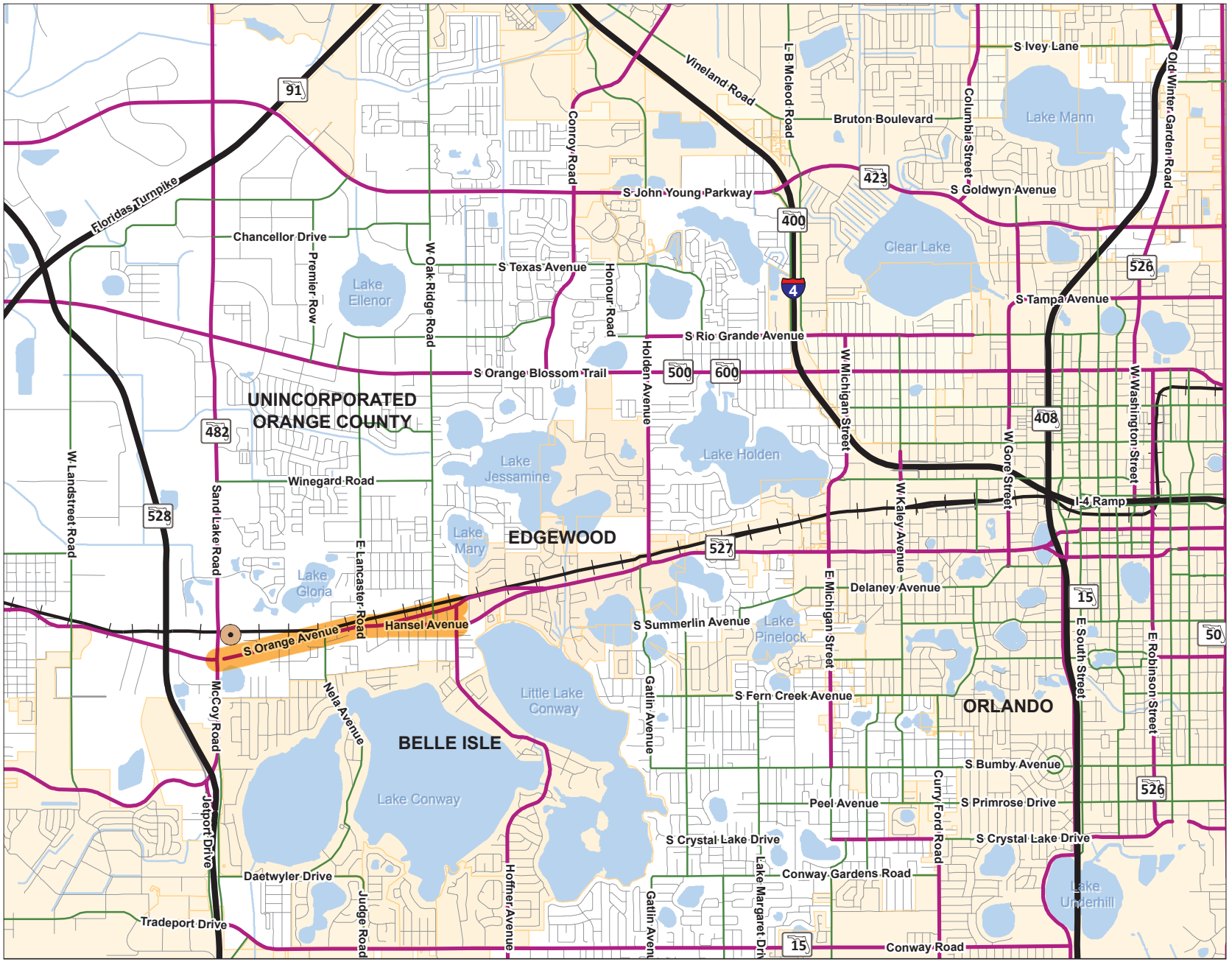


Figure 2 | Regional Roadway Network

Legend

- Highway
- Arterial
- Collector
- Local Road
- Orange Avenue Corridor Study Area
- SunRail Station Site

2
EXISTING & PLANNED FUTURE CONDITIONS

2 EXISTING & PLANNED FUTURE CONDITIONS

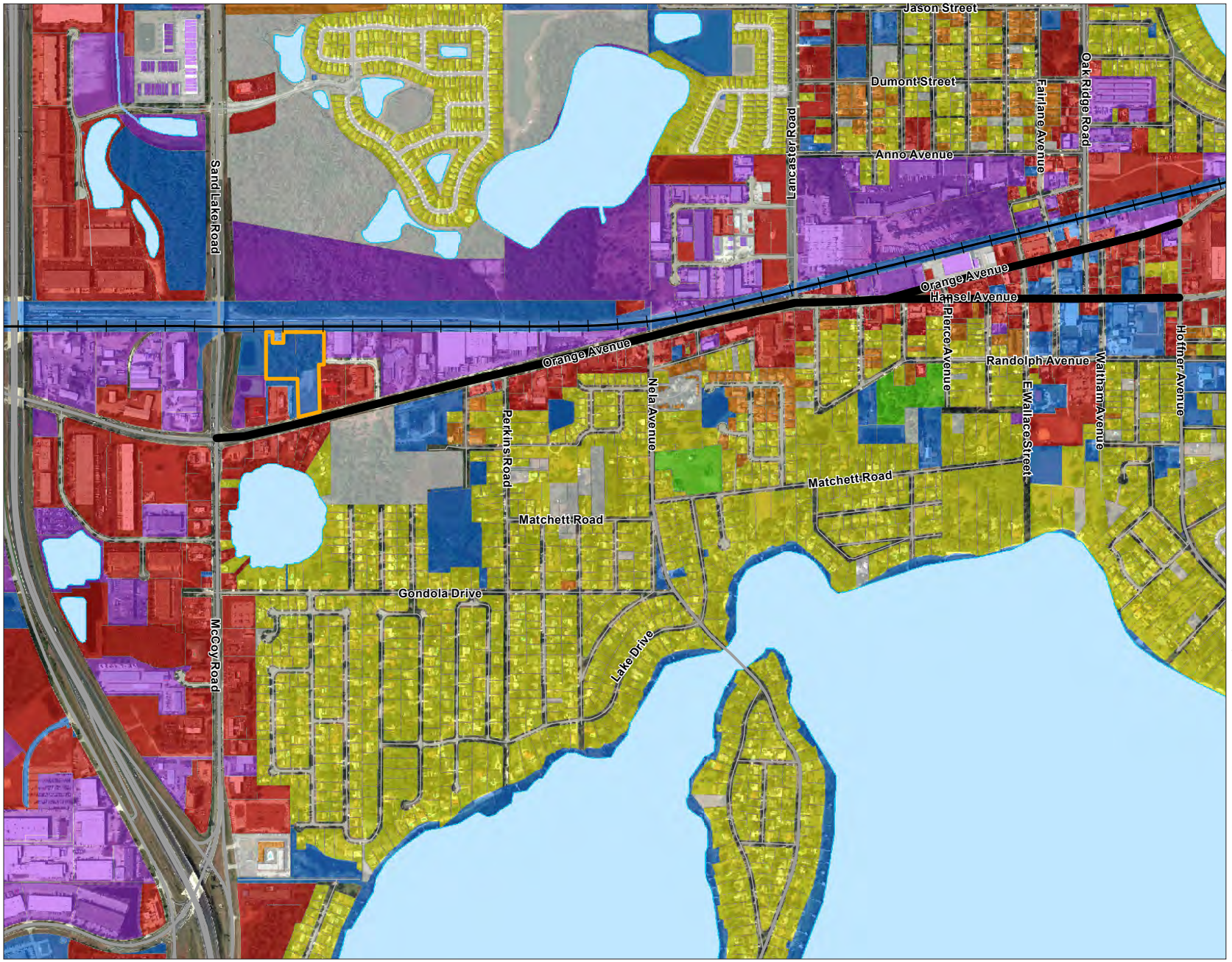
This section of the report discusses the existing and future conditions of the Orange Avenue Corridor. The study team collected background data and information from previous planning efforts. This information was synthesized to identify existing and future land use and transportation patterns along the corridor. A field review was performed to confirm land use conditions, understand multi-modal travel conditions, verify roadway cross section elements and key corridor intersections. A multi-modal safety analysis was also conducted to understand historical crash data, especially as it relates to crashes involving pedestrians and bicyclists. Finally, an existing conditions traffic analysis was performed to understand challenges and potential multi-modal solutions at key corridor intersections.

LAND USE CHARACTERISTICS

Understanding the existing and future planned land uses along the corridor provides further insight into how travel patterns might change along the corridor and how the corridor and surrounding transportation network can support these future travel needs.

EXISTING LAND USE

Figure 3 shows that the existing land use in the study area is comprised of commercial uses, light industrial uses, and residential single-family and multi-family uses.



Source: Orange County Property Appraiser, 2012

Figure 3 | Existing Land Use

Legend

- SunRail Station Site
- Recreational
- Vacant
- Commercial
- Industrial
- Institutional
- Single-Family Residential
- Multi-Family Residential

COMMERCIAL, INDUSTRIAL, AND INSTITUTIONAL LAND USES

The employment generating commercial, industrial, and institutional land uses are concentrated along the arterials, Sand Lake Road and Orange Avenue.

COMMERCIAL USES

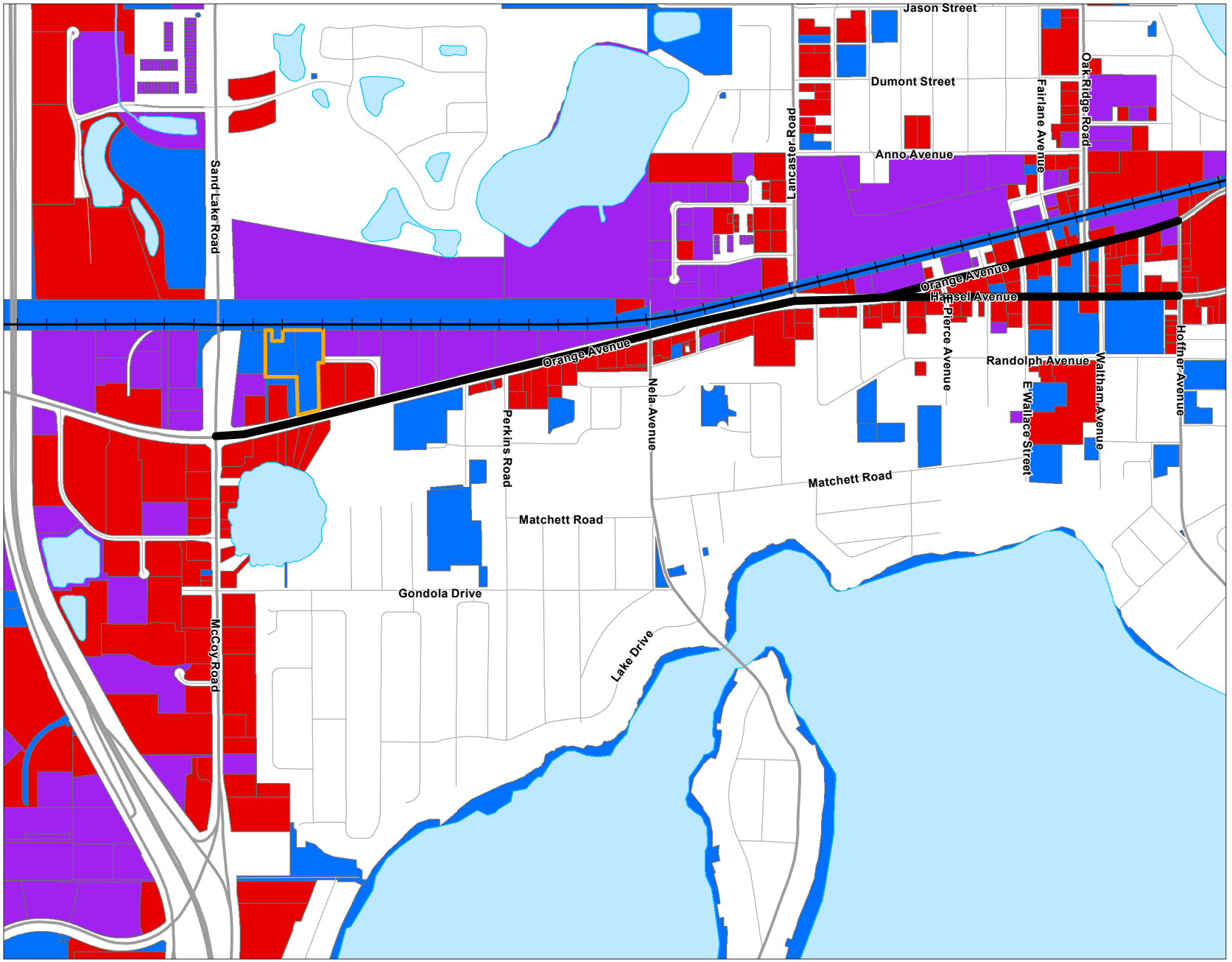
The commercial uses that front Orange Avenue within the study area include offices, restaurants, and a variety of other small commercial businesses such as a lumber-yard, gas station, bank, sign shop, furniture store, and gymnastics studio. Active commercial uses are generally smaller-scale retailers in stand-alone or small strip retail buildings with auto-oriented sites that provide surface parking lots along the roadway and buildings set-back to the rear of the property. Several under-utilized properties within the study area are currently being operated as used-car lots.

INDUSTRIAL USES

Within the study area, industrial uses are primarily located along the west side of Orange Avenue adjacent to the railroad tracks. The area west of Orange Avenue between Office Court and Nela Avenue is entirely comprised of light industrial and warehousing uses. This area represents all of the active industrial uses prevalent in the study area. Along the west side of Orange Avenue between Hoffner Avenue and Oak Ridge Road is the former site of a ski-boat manufacturing facility, which is currently vacant. The other properties zoned for industrial uses between Lancaster Road and Oak Ridge Road are currently being used for commercial activities including a former industrial building being used for a furniture gallery and thrift store. Portions of vacant land designated as industrial to the west of the railroad tracks is not expected to be developed due to a system of wetlands and floodplains.

INSTITUTIONAL USES

Institutional uses are dispersed throughout the study area and include the future site of the SunRail Station. Other institutional uses within the study area include elementary schools, a middle school, a post office, and several religious institutions. Figure 4 displays the commercial, industrial and institutional land uses in the Orange Avenue study area.



Source: Orange County Property Appraiser, 2012

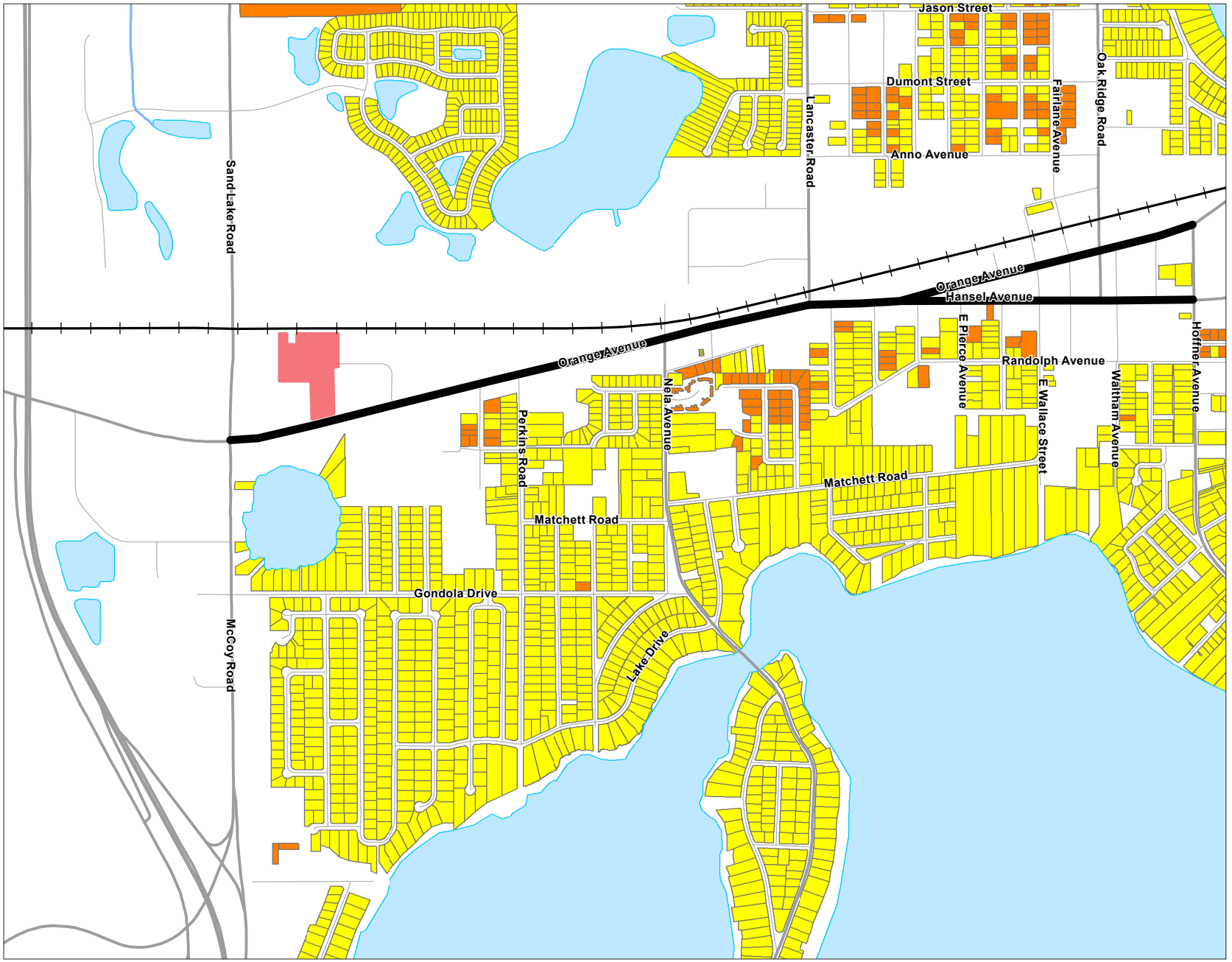
Figure 4 | Commercial, Industrial and Institutional Land Uses

Legend

- SunRail Station Site
- Commercial
- Industrial
- Institutional

RESIDENTIAL LAND USE

Behind the first layer of parcels lining Orange Avenue are residential neighborhoods comprised of mostly single-family houses. Neighborhoods range from some that have relatively connected local streets and others that have sparser street network. Additionally, the area west of Orange Avenue has some lower income housing and includes more multi-family housing in the form of apartments. There are no residential land uses south of the study corridor between Sand Lake Road and SR 528. Figure 5 displays the residential land uses within the study area.



Source: Orange County Property Appraiser, 2012

Figure 5 | Residential Land Use

Legend

- SunRail Station Site
- Single-Family Residential
- Multi-Family Residential

VACANT AND UNDERUTILIZED PARCELS

Figure 6 illustrates the vacant and underutilized parcels in the study area. Underutilized parcels reflect those in which the value of the improvements on the land (such as the building) is worth 40 percent or less of the total value of the property (land plus improvements), as assessed by the tax appraiser. Many of the underutilized parcels are residential or industrial. Some of the vacant parcels shown in Figure 6 may remain vacant, as they are occupied by floodplains and wetlands.

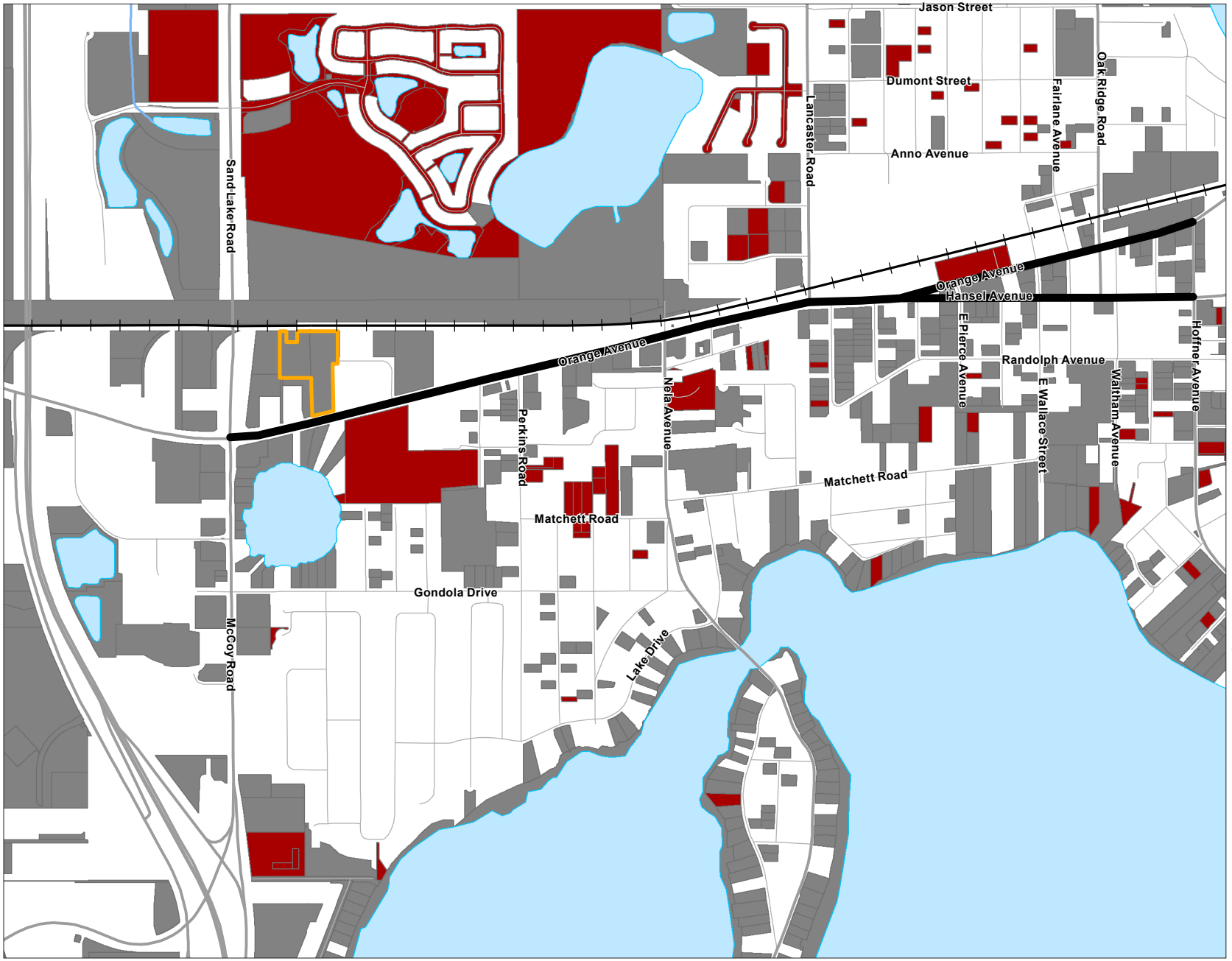


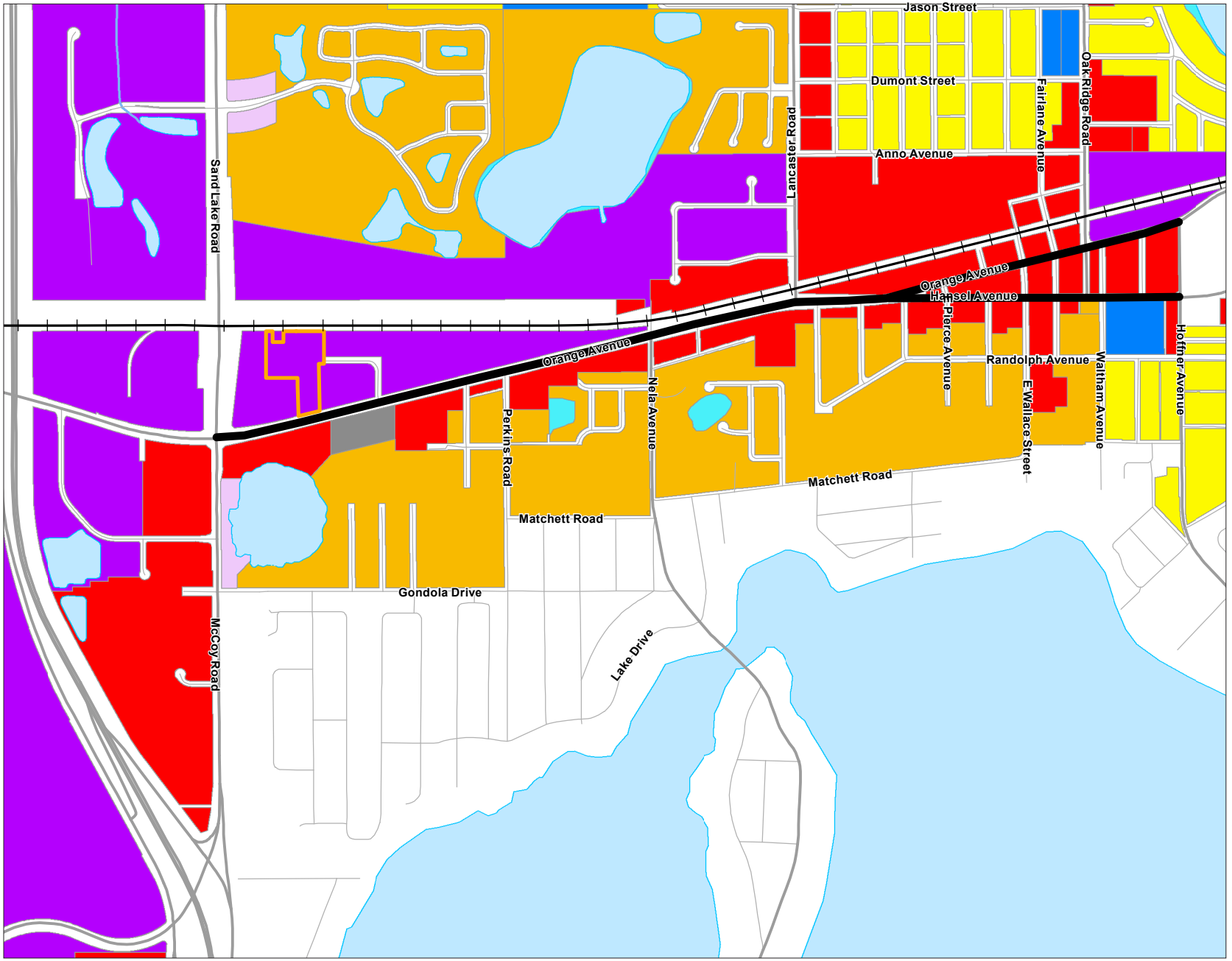
Figure 6 | Vacant and Underutilized Parcels

Legend

- SunRail Station Site
- Vacant Parcels
- Underutilized Parcels

FUTURE LAND USE

The future land uses, displayed on Figure 7 are generally consistent with the existing land uses with the exception of a significant amount of multi-family residential to the east and west of Orange Avenue where single family residential is prevalent now. Industrial use is limited to the areas in the southwest section of the study area, while commercial uses are generally limited to the east and northern areas of Orange Avenue. The future land use map does not suggest and area that would have a mix of uses associated with developments around transit.



Source: Orange County

Figure 7 | Future Land Use

Legend

- SunRail Station Site
- Office
- Planned Development
- Commercial
- Industrial
- Institutional
- Single-Family Residential
- Multi-Family Residential

TRANSPORTATION CHARACTERISTICS

This section summarizes the existing and planned multi-modal transportation conditions, and potential opportunities for change along the Orange Avenue Corridor, including bicycling and pedestrian facilities, transit, vehicular traffic, and roadway conditions. Figure 8 displays the data sources for Figures 9 through Figure 14.

Figure 8 | Sources for Existing Roadway Conditions Figures

Figure	Source	Year of Data
9 – Bicycle and Pedestrian Facilities	Field Observations	2013
11 – Existing Transit Facilities	LYNX	2013
12– Bus Travel Speed and Ridership – Route 11	Figure Generated from LYNX Data	2012
13 – Bus Travel Speed and Ridership – Route 18	Figure Generated from LYNX Data	2012
14 – Additional Future Transit	LYNX	2013
15 – Existing Typical Cross Sections	Google Earth Street View and FDOT Straight Line Diagrams	2012

BICYCLE AND PEDESTRIAN FACILITIES

Figure 9 displays the existing bicycle and pedestrian facilities for the Orange Avenue study corridor and the surrounding areas. The sidewalk and bicycle lane facilities were both field verified and reviewed using aerial imagery.

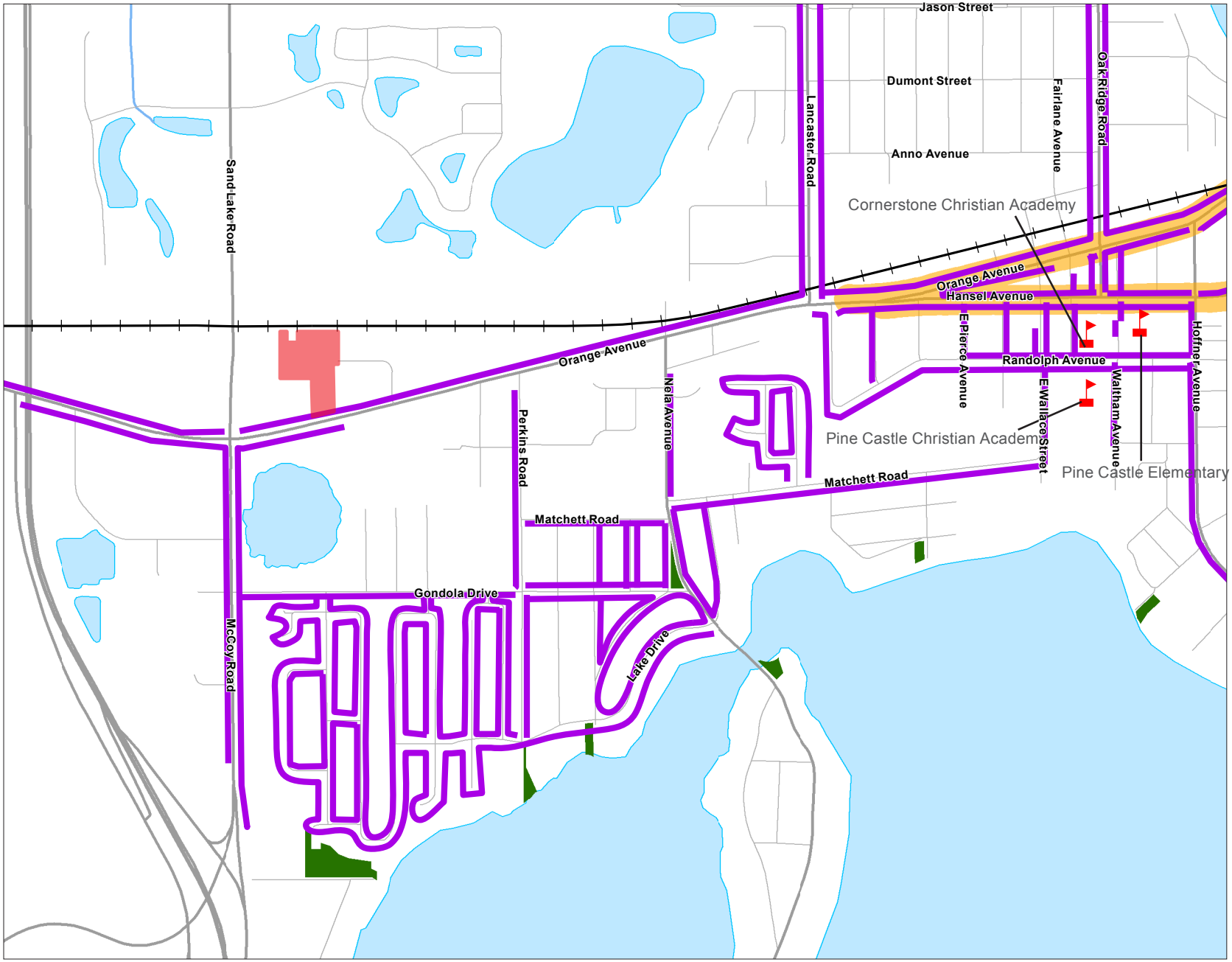


Figure 9 | Bicycle and Pedestrian Facilities

Legend

- SunRail Station Site
- Bicycle Lane
- Park
- School
- Sidewalk

ORANGE AVENUE – SAND LAKE TO LANCASTER

In the Southern portion of the study area, paved shoulders, four feet in width, are present along Orange Avenue between Sand Lake Road and Lancaster Road. However, the existing paved shoulder is not sufficient for accommodating cyclists due to grass overgrowing the lane (which reduces the effective bike lane width) combined with a narrow 10 foot adjacent vehicle travel lane, relatively high existing vehicle speeds, and presence of large vehicles (trucks, buses, landscaping trailers, etc). Sidewalks are present along the west side of Orange Avenue. The east side of Orange Avenue generally has no sidewalk. Small sections of non-contiguous sidewalk exist on the east side including: approximately 1,000 feet of sidewalk north of Sand Lake Road and non-continuous segments of sidewalk between Nela Avenue and Lancaster Road., There are opportunities to further increase the sidewalk connectivity of the study area by constructing continuous sidewalk along the eastern side of Orange Avenue.

ORANGE AVENUE/HANSEL AVENUE - LANCASTER ROAD TO HOFFNER AVENUE

Within the northern portion of the study area, bicycle lanes are present in both directions along the one-way pair of Orange Avenue/ Hansel Avenue. Sidewalks are also generally present on both sides of the road. Sidewalks are generally continuous. However, there are small sections where sidewalks are missing across a few parcels with wide driveways. Portions of the sidewalks in the northern portion of the study area also require maintenance or replacement. Maintenance needs were documented as part of the field reviews and provided to appropriate FDOT maintenance staff for implementation.

INTERSECTING ROADWAY PEDESTRIAN AND BICYCLE FACILITIES

For roadways that intersect with Orange Avenue within the study area, there are limited pedestrian and bicycle facilities.

- Sand Lake Road has no dedicated bike lane; however, it does provide a paved should for cyclist use. Shoulder widths vary from approximately four to ten feet in the vicinity of Orange Avenue. Sidewalk is provided along Sand Lake Road to the east of Orange Avenue. No sidewalk is present to the west of Orange Avenue.
- No bicycle facilities are located along Hoffner Avenue, Oak Ridge Road or Lancaster Road. Sidewalk is provided along both sides of Oak Ridge Road and Lancaster Road. Sidewalk is provided along portions of Hoffner Avenue; however, it is not continuous.

Within the vicinity of the one-way pair in the northern portion of the corridor, limited sidewalks exist along the cross streets which connect Orange Avenue and Hansel Avenue. Improving and adding sidewalks along these connecting streets would help provide better network walking access to the three schools east of Hansel Avenue.

CROSSING ORANGE AVENUE

In the southern portion of the corridor, between Sand Lake Road and Lancaster Road, there are currently three opportunities to cross Orange Avenue: (1) at Sand Lake Road, at Glenrose Road and at Lancaster Road. This results in a ¾ mile length of Orange Avenue that provides no marked pedestrian crossing.

North of Lancaster Road, the next crossing opportunity is at Fairlane Avenue, approximately ½ mile to the north. Marked Crossings at Oak Ridge Road and Hoffner Avenue provide spacing of approximately 250 feet and 850 feet, respectively, between crossing opportunities at the northern limits of the study area.

Several bus stops are currently located at midblock locations or at intersections without marked crosswalks across Orange Avenue. The study team observed pedestrians crossing at unmarked locations along Orange Avenue after getting off at a bus stop at various points along the corridor. Due to the high traffic volumes, it was difficult to cross the entire street at once, and most would seek refuge in the two-way left-turn lane and wait for an opportunity to cross.

Figure 10 | Pedestrian Attempting to Cross Orange Avenue near Perkins Road

TRANSIT FACILITIES

EXISTING TRANSIT

As displayed in Figure 11, the study area is currently served by seven LYNX bus routes. Routes 11, 18 and the Orange Avenue Circulator traverse the entire north-south length of the Orange Avenue corridor. Routes 42 and 111 travel east-west and serve Sand Lake Road. Route 7 travels east-west along Oak Ridge Road, north along Hansel Avenue from Oak Ridge Road and south along Orange Avenue to Oak Ridge Road. The OIA to Disney Connector travels along SR 528 from Orlando International Airport to Walt Disney World Resort. Every transit route except the OIA to Disney Connector connects to the SunRail Station when SunRail is operating.

The majority of bus stops lack significant amenities. Only four of the stops in the study area have shelters. Shelters are preferable due to the high temperatures and frequent showers experienced in Florida throughout much of the year. Many of the bus stops do have benches, but some lack any amenities at all, including a paved area space to stand that is not obstructing the sidewalk. Even though the transit system does not have premium facilities, the addition of the SunRail Station and Commuter Rail service will encourage transit riders to begin using all modes of transit that serve the area and improvements of the corridor's transit facilities can likely expand SunRail's potential service reach.

LYNX Automatic Passenger Count (APC) data was obtained for the time period of September 16 through November 6, 2012. This data consisted of total boardings and alightings over the time period noted above for each bus stop along the study corridor for transit routes 7, 11 and 18. Also included in the data was the exact time each bus stopped at any particular bus stop. Figure 12 displays the bus travel speed and ridership for Route 11 and Figure 13 displays the bus travel speed and ridership for Route 18. Data was not summarized for Route 7 because this route only serves a small section of the study area north of Oak Ridge Road. As can be seen in both figures, the highest ridership stops are located near the Sand Lake Road SunRail station, at Oak Ridge Avenue, and at Hoffner Avenue. For both routes, buses tended to travel faster between Wallace Street and Office Court (just north of Sand Lake Road).

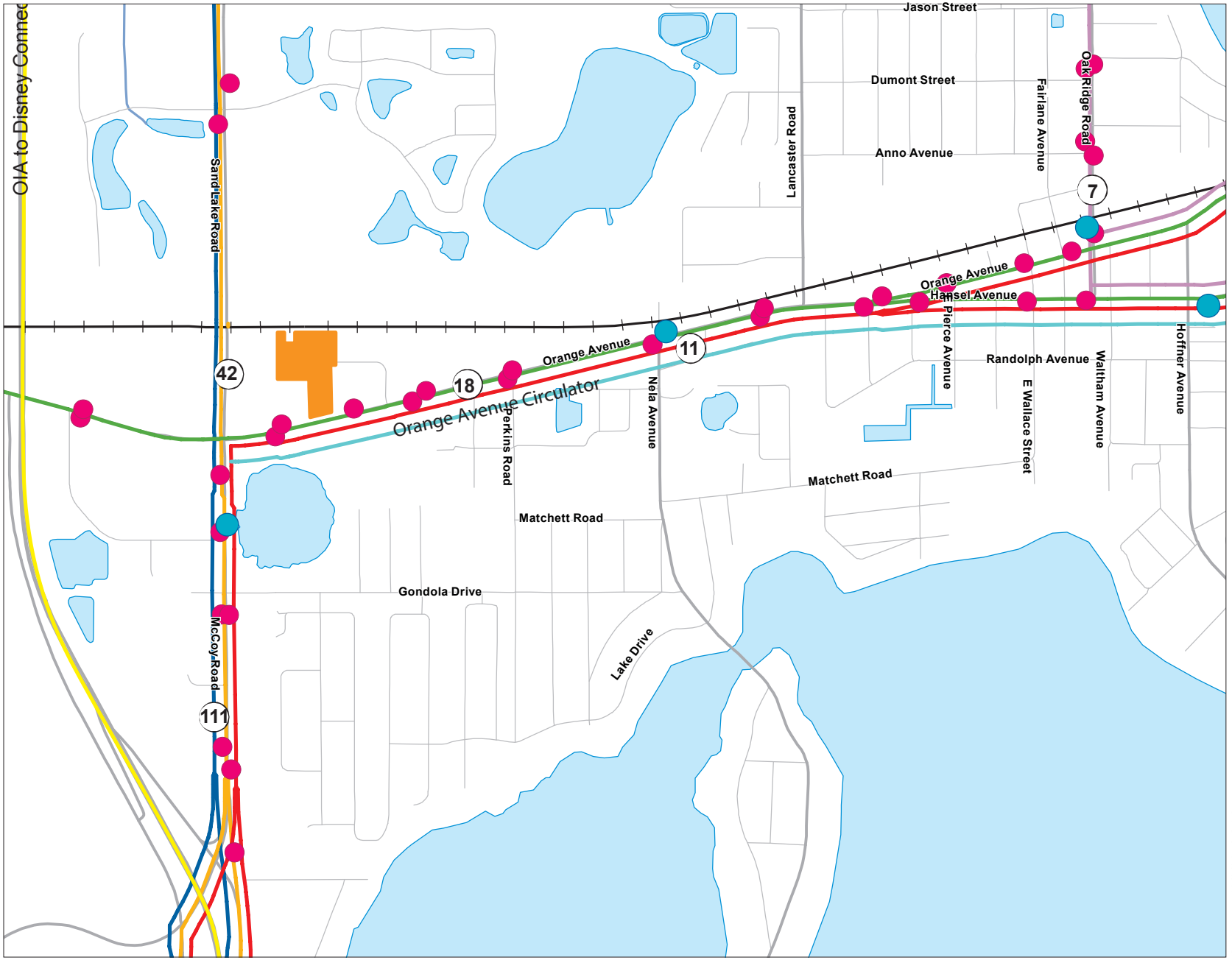
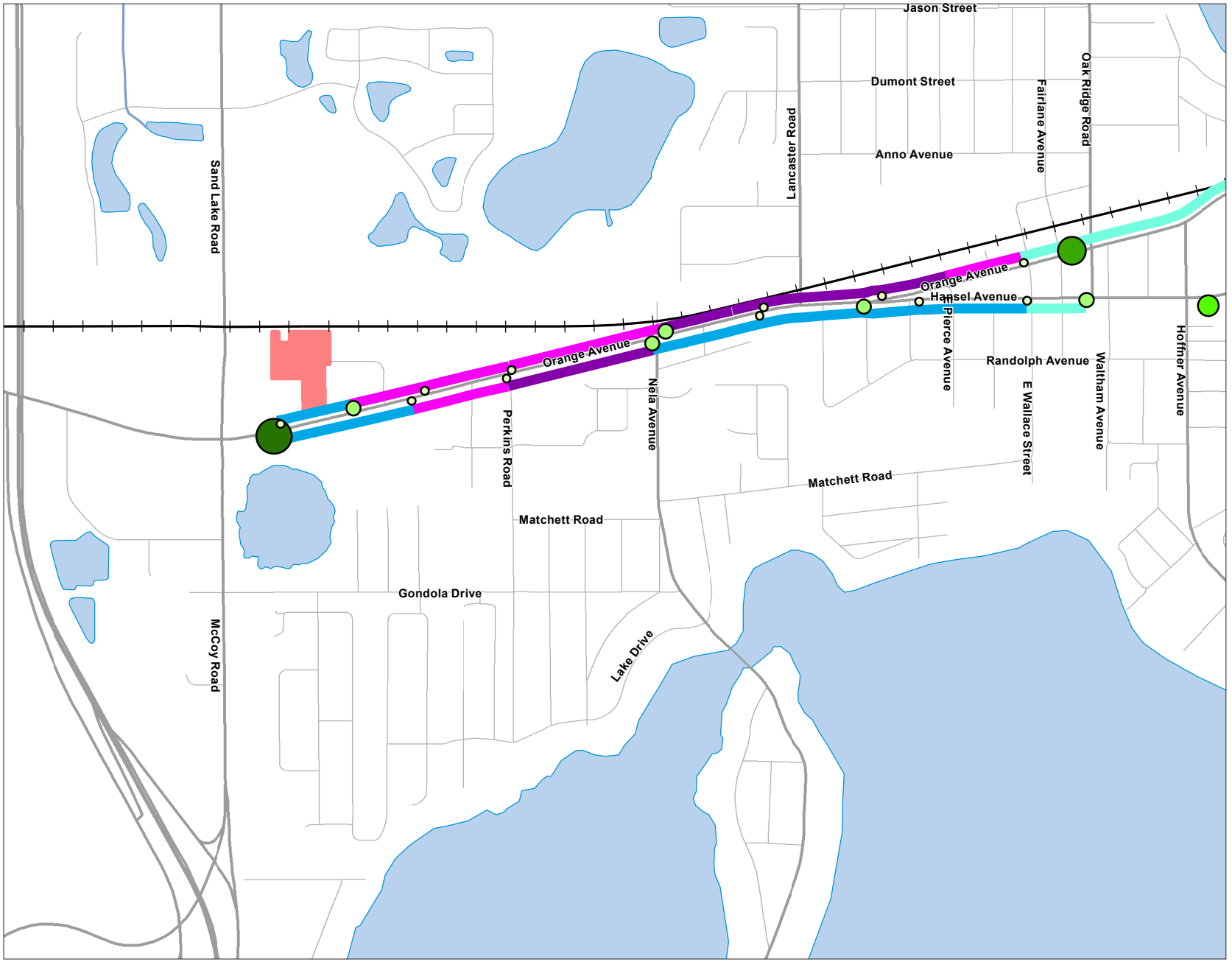


Figure 11 | Existing Transit System

Legend

- SunRail Station Site
- Bus Stop
- Bus Shelter
- Orange Ave Circulator
- OIA to Disney Connector
- Route 18
- Route 42
- Route 111
- Route 11
- Route 7



Source: LYNX, 2012

Figure 12 | Bus Travel Speed and Ridership – Route 11

Legend

- SunRail Station Site
- < 26 MPH
- 26 MPH to 30 MPH
- > 30 MPH to 33 MPH
- > 33 MPH

Total Boardings + Alightings in Study Period*

- ≤ 25
- 26 - 50
- 51 - 75
- 76 - 100
- > 100

*Data collected over 52 days between 9/16/12 and 11/6/12

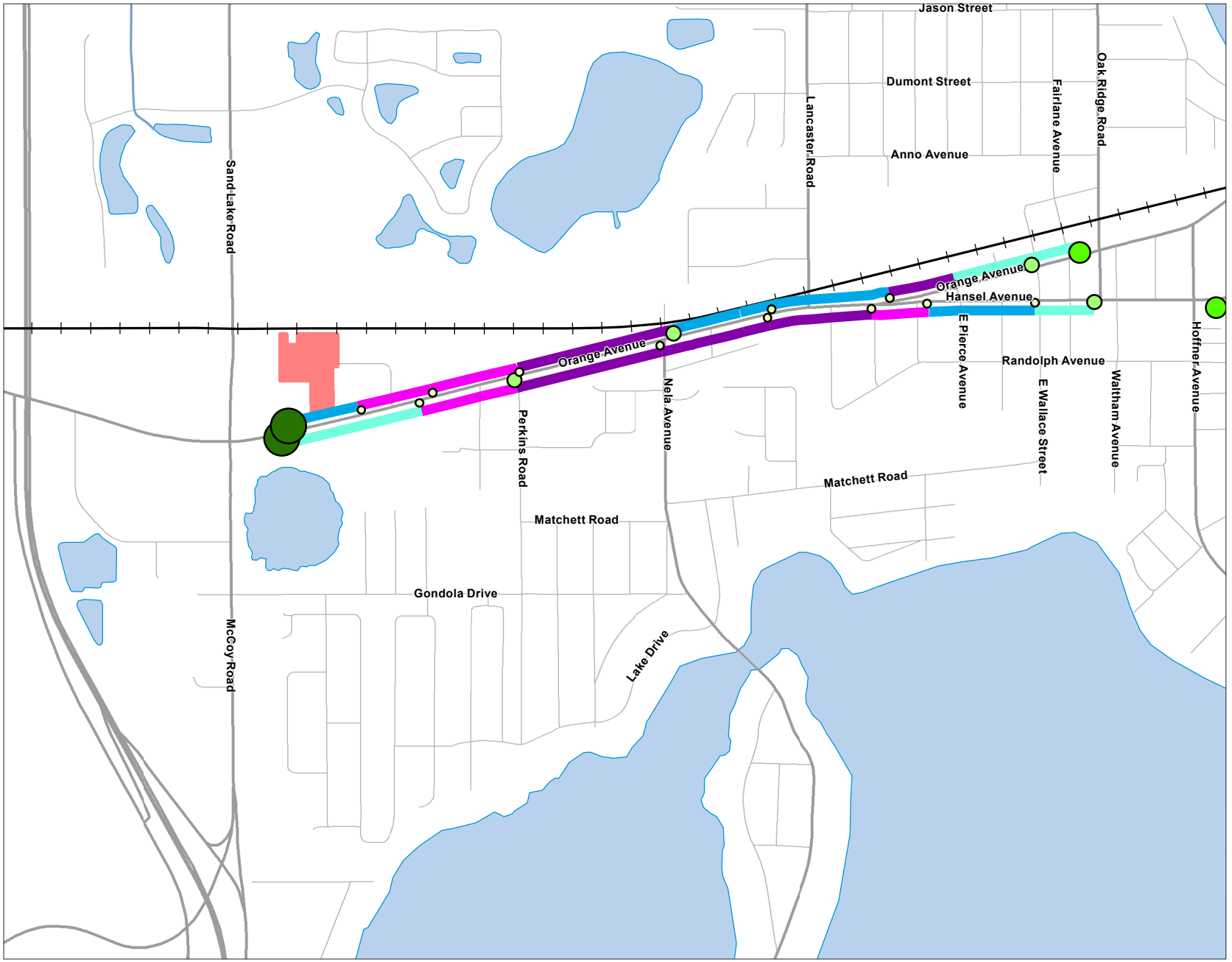


Figure 13 | Bus Travel Speed and Ridership – Route 18

Legend

- SunRail Station Site
- < 25 MPH
- 25 MPH to 30 MPH
- > 30 MPH to 33 MPH
- > 33 MPH

Total Boardings + Alightings in Study Period*

- ≤ 50
- 51 - 100
- 101 - 200
- > 100
- > 200

*Data collected over 52 days between 9/16/12 and 11/6/12

FUTURE TRANSIT

Phase 1 of the SunRail project was completed in Spring of 2014 and is currently operational. Orange and Osceola Counties, in coordination with FDOT District 5 and MetroPlan Orlando, also began the Orlando International Airport (OIA) Connector Refresh Alternatives Analysis which will identify a light rail corridor between OIA and the attractions near I-4. If the OIA Connector were to travel along Sand Lake Road, a station is being considered near the SunRail site to provide a key transfer point to SunRail. LYNX has also identified additional short-term transit changes that could provide connectivity to SunRail from the Kissimmee area. This transit route would only be in place until SunRail Phase 2 is completed in 2016. These future transit alternatives are displayed in Figure 14.

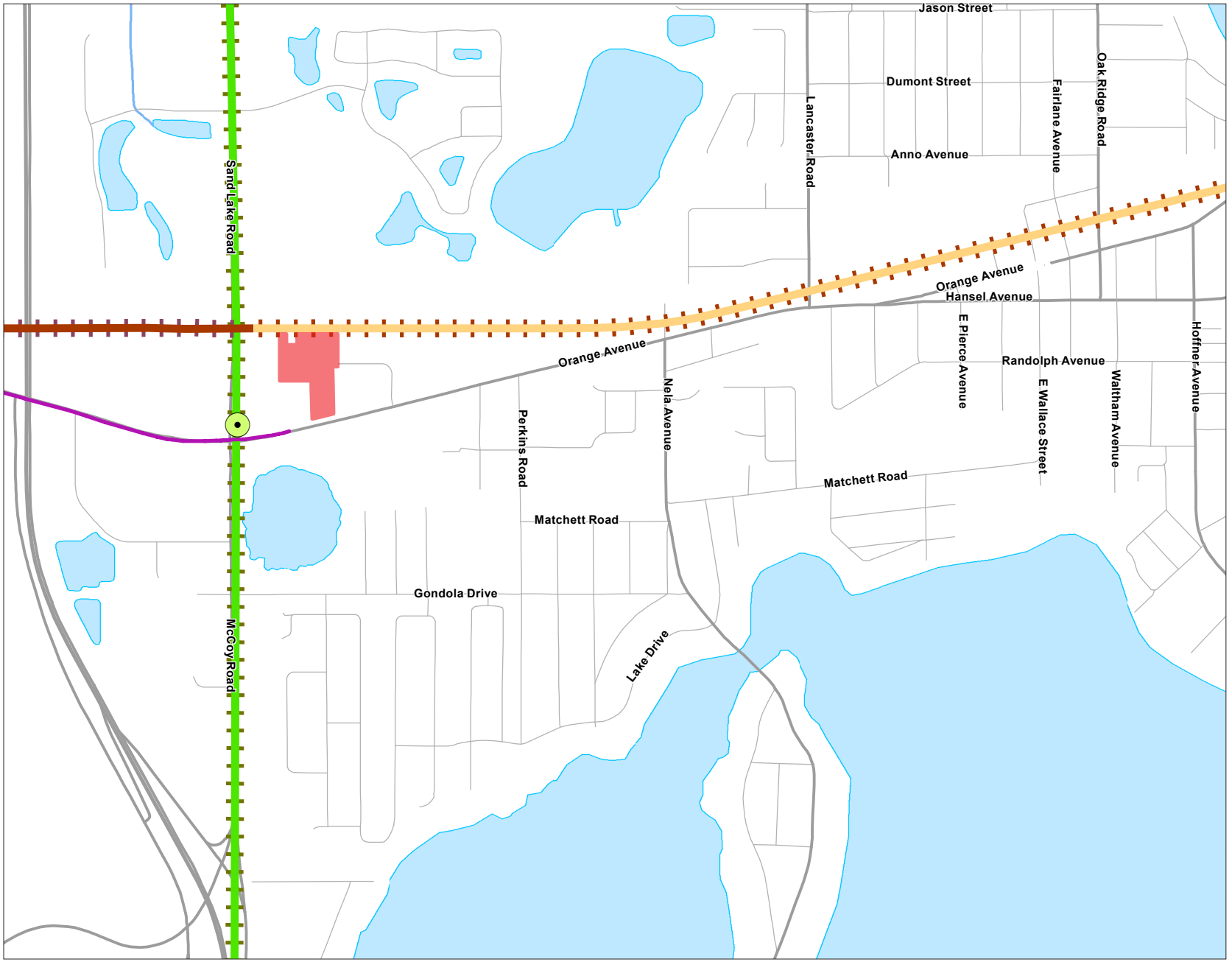


Figure 14 | Additional Future Transit

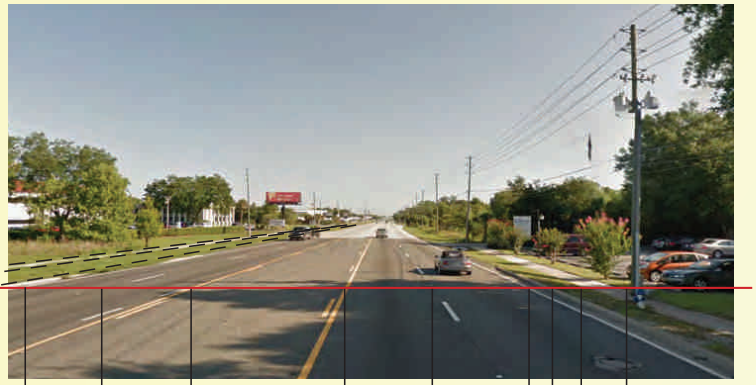
Legend

- SunRail Phase 1
- SunRail Phase 2
- Previously Designated OIA Connector Light Rail
- Express Service Bus Line to Kissimmee
- Potential OIA Connector Light Rail Station
- SunRail Station Site

EXISTING ROADWAY TYPICAL SECTIONS

The study team reviewed straight line diagrams from FDOT, combined with field observations, to identify typical sections within the study area of Orange Avenue. Figure 15 displays the various typical sections along the Orange Avenue study corridor. The curb to curb (or paved shoulder to paved shoulder) dimensions were obtained from FDOT straight line diagrams, whereas the dimensions outside of the curb or paved shoulder was obtained from aerial imagery. The total width dimension displayed in the typical sections reflect the width of the constructed facilities from back of sidewalk to back of sidewalk (where sidewalk is present). ROW information obtained from FDOT is presented in the following section. FDOT straight line diagrams can be found in Appendix A.

Area 1 | Orange Avenue looking north near Office Court



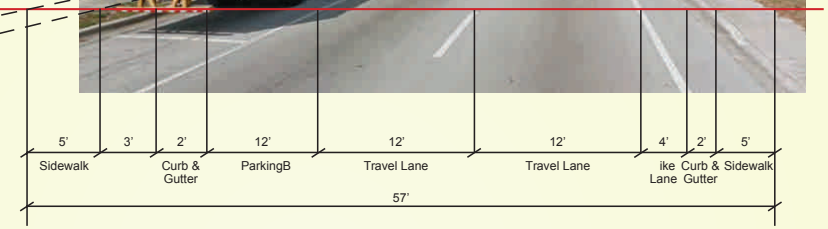
Area 3| Hansel Avenue looking north near Fillmore Avenue

Area 2 | Orange Avenue looking north near Royal Palm Avenue

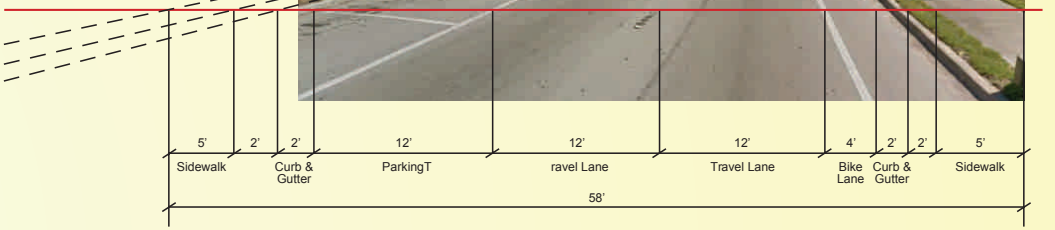
Area 4| Hansel Avenue looking north near Wilkes Avenue

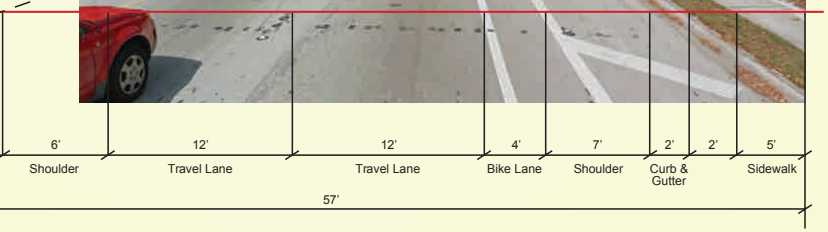
Note: All distances shown are approximate.
Sources: Straight Line Diagram and Google Earth Measurements, Images - Google 2011

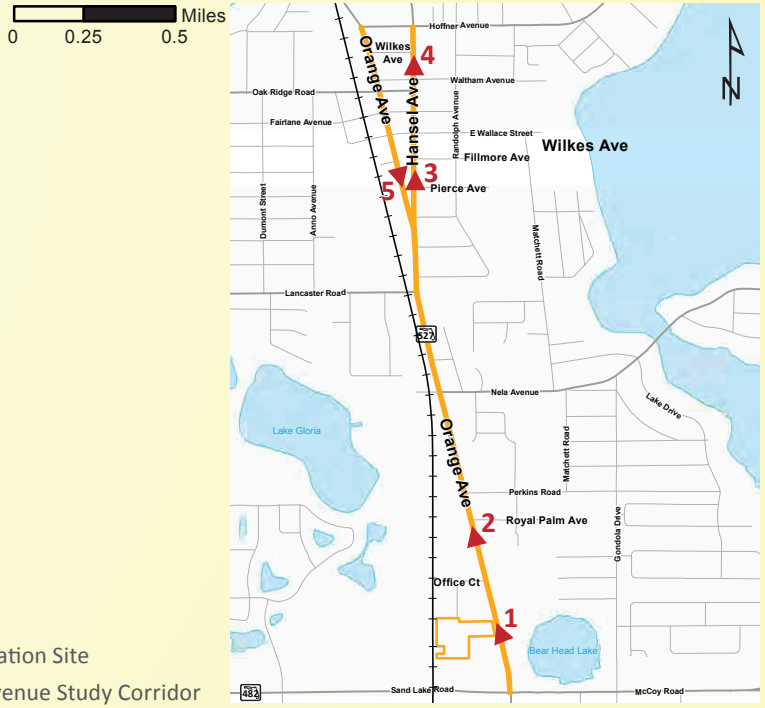
Figure 15 | Existing Typical Sections



Area 5 | Orange Avenue looking south near Pierce Avenue







Legend

- SunRail Station Site
- Orange Avenue Study Corridor

RIGHT-OF-WAY

The study team compiled available Right-of-Way (ROW) information from FDOT staff for the study corridor. The ROW maps were created in 1958 with various parcel additions or revisions occurring over the last 40 years. Figures 16. 17, and 18 display the approximate ROW widths at various locations along the corridor. The ROW widths shown in Figures 17 and 18 are narrower since they reflect the segments within the one-way pair which only has two travel lanes in each direction. ROW approximations displayed in Figures 16, 17, and 18 are estimates based upon best available information. FDOT ROW maps are located in Appendix B.

As displayed in Figure 16, an approximate ROW width of 110 feet is available along Orange Avenue for the southern portion of the study area between Sand Lake Road and Perkins Avenue. The FDOT ROW maps did not reference consistent ROW widths between Perkins Road and Lancaster Road but measurements from the field review and aerial imagery displayed an approximate ROW width between 110 feet and 120 feet. These measurements were taken between the back of the sidewalk on the western side of the roadway to the midpoint of the recoverable terrain on the east side of the roadway. Within the vicinity of Lancaster Road through Buchanon Avenue, the right-of-way width along Orange Avenue decreases to approximately 80 feet before transitioning into the one-way pair. Figures 17 and 18 display the ROW widths for Orange Avenue and Hansel Avenue within the one-way pair, which is approximately 60 feet.

Location	Approximate ROW (feet)	Existing Travel Lanes + TWLTL (feet)	Difference between ROW and Travel Lanes (feet)	Curb to Curb (feet)[1]	Difference between ROW and Curb to Curb (feet)
Sand Lake Road to Perkins Avenue	110	50	60	No Curb	N/A
Lancaster Road to Buchanon Avenue	80	50	30	60	20
Just N of Buchanon Avenue	80	50	30	65	15

[1] Width obtained from FDOT Straight Line Diagrams. Does not include curb and gutter.

Figure 16 | ROW for Orange Avenue from Sand Lake Road to Buchanon Avenue

Location	Approximate ROW (feet)	Existing Travel Lanes + TWLTL (feet)	Difference between ROW and Travel Lanes (feet)	Curb to Curb (feet)[1]	Difference between ROW and Curb to Curb (feet)
Just N of Oak Ridge Road	60	40[2]	20	40	20
Just N of Wilkes Avenue	60	24	36	40	20
At Hoffner Avenue	60	36[2]	24	40	20

[1] Width obtained from FDOT Straight Line Diagrams. Does not include curb and gutter.
[2] Width includes turn lanes.

Figure 17 | ROW for Orange Avenue from Buchanon Avenue to Hoffner Avenue

Location	Approximate ROW (feet)	Existing Travel Lanes + TWLTL (feet)	Difference between ROW and Travel Lanes (feet)	Curb to Curb (feet)[1]	Difference between ROW and Curb to Curb (feet)
Just N of Prince Street	60	24	36	40	20
At Wallace Street	60	24	36	40	20
At Hoffner Avenue	60	24	36	40[2]	20

[1] Width obtained from FDOT Straight Line Diagrams. Does not include curb and gutter.
[2] FDOT Straight Line Diagram displays 48'. Width has been modified to reflect observations from field review and aerial measurements.

Figure 18 | ROW for Hansel Avenue from Buchanon Avenue to Hoffner Avenue

VEHICULAR TRAFFIC CONDITIONS

This section documents the existing traffic conditions of Orange Avenue. This information will help frame the range of potential multi-modal solutions by providing a better understanding the existing corridor and potential. The operational analysis was done with the following data sources:

INTERSECTION TURNING MOVEMENT COUNTS

Intersection turning movement counts were provided by GMB Engineers and Planners, Inc. The study intersections were counted in two groups. The location of the turning movement counts for the study intersections is shown in Figure 19. The AM counts were conducted between 7:00 and 9:00 and the PM counts were conducted between 2:00 and 6:00. Raw turning movement counts are included in Appendix C. Below are the intersections and the dates they were counted:

OCTOBER 24 & 25, 2012

- Orange Avenue and Nela Avenue/Glenrose Road;
- Orange Avenue and Lancaster Road;
- Orange Avenue and Fairlane Avenue;
- Hansel Avenue and Fairlane Avenue;
- Orange Avenue and Oak Ridge Road;
- Hansel Avenue and Oak Ridge Road;
- Orange Avenue and Hoffner Avenue; and
- Hansel Avenue and Hoffner Avenue.

DECEMBER 11 & 14, 2012

- Orange Avenue and Sand Lake Road;
- Orange Avenue and Office Court;
- Orange Avenue and Perkins Road;
- Orange Avenue and Prince Street;
- Orange Avenue and Wallace Street; and
- Hansel Avenue and Wallace Street.

VEHICLE CLASSIFICATION COUNTS

Vehicle classification counts were also provided by GMB Engineers and Planners, Inc. Like the turning movement counts, the vehicle class counts were also conducted in two groups. The first group of counts was conducted over a seven day period, September 24 to September 30 of 2012, at the following three locations:

- Orange Avenue north of Lancaster Road;
- Orange Avenue north of Oak Ridge Road; and
- Hansel Avenue north of Oak Ridge Road.

The second group of counts was conducted over a 72-hour period from December 18 to December 20, 2012 at the following four locations:

- Orange Avenue between Parkline Boulevard and Sand Lake Road;
- Orange Avenue between Andy Street and Lancaster Road;
- Orange Avenue north of Hoffner Avenue; and
- Hansel Avenue north of Hoffner Avenue.

The location of the vehicle classification counts is displayed on Figure 19. Raw vehicle classification counts are included in Appendix C.

The vehicle classification counts, collected in 2012 along Orange Avenue and Hansel Avenue, were compared against the 2011 Florida Traffic Information (FTI) Annual Average Daily Traffic (AADT) map for reasonableness. The vehicle classification counts showed a slightly higher AADT than the 2011 FTI but were reasonable based on the AADT trends for the corridor. Figure 20 displays the 2011 FTI AADT for the study facility along with a few crossing roadways in the study area.

SIGNAL TIMING PLANS

Signal timing plans were obtained from Orange County and the City of Belle Isle. The City of Belle Isle operates and maintains two signals in the study corridor: Hansel Avenue/Oak Ridge Road and Hansel Avenue/ Fairlane Avenue. Orange County operates and maintains the rest of the signals within the study area. The signal timing plans obtained for the study are included in Appendix C.

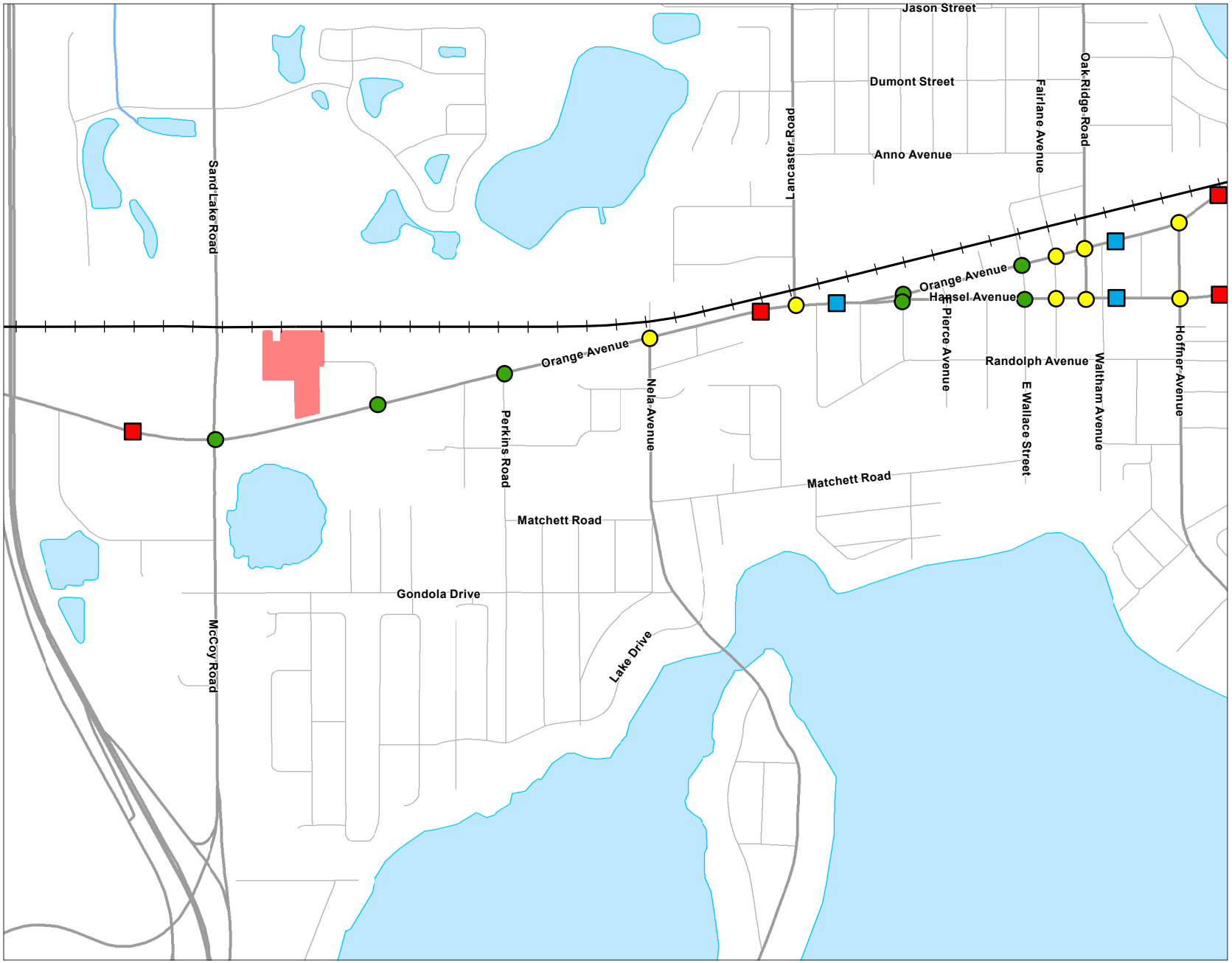


Figure 19 | Data Collection Locations

Legend

- SunRail Station Site
- 72 Hour Tube Count, December 2012
- 7 Day Tube Count, September 2012
- AM and PM Turning Movement Count, December 2012
- AM and PM Turning Movement Count, October2012

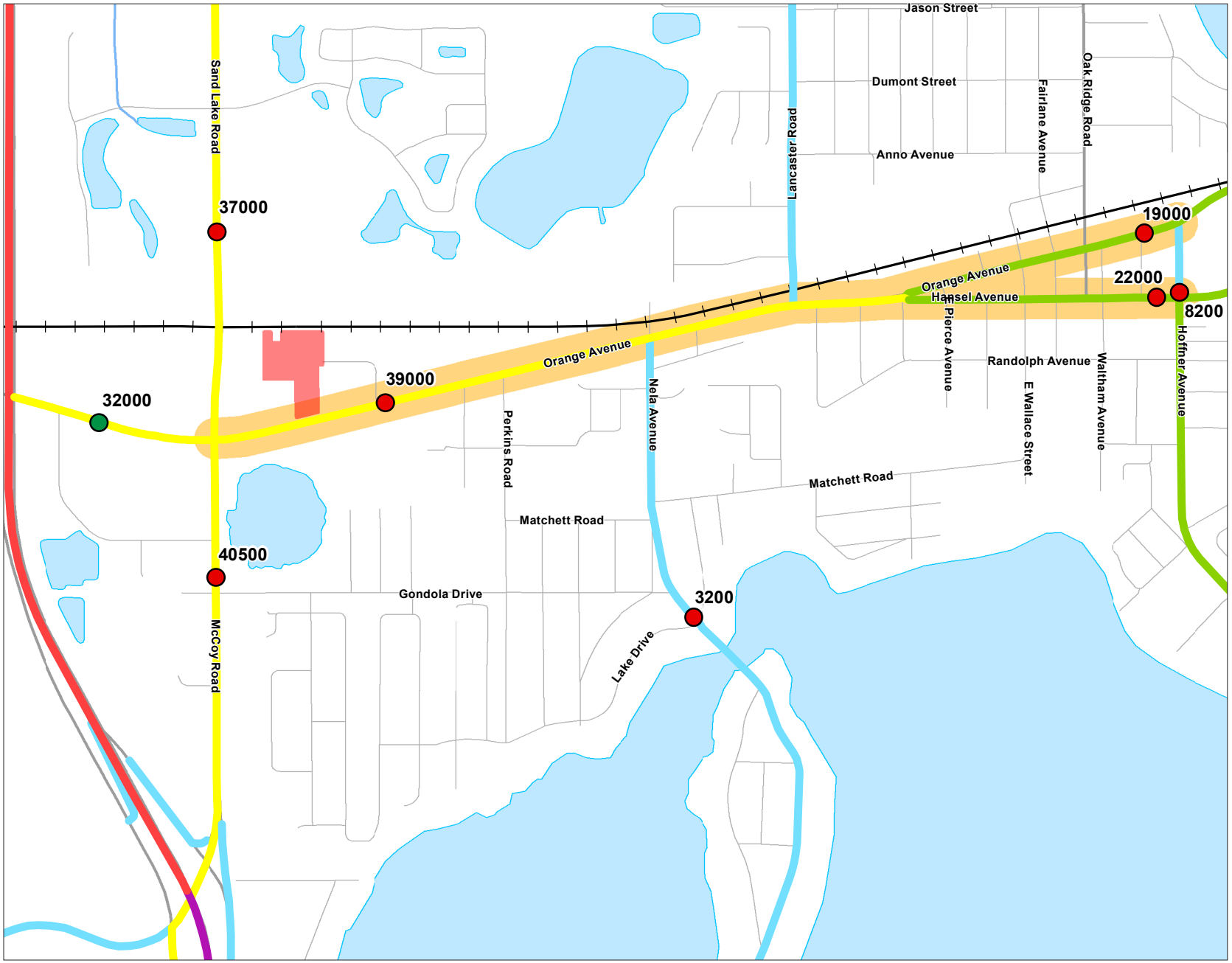


Figure 20 | Annual Average Daily Traffic

Legend

- SunRail Station Site
- < 15,000
- 15,001 - 30,000
- 30,001 - 50,000
- 50,001 - 70,000
- 70,001 - 110,000
- Portable Traffic Monitoring Site
- Calculated from 24 Hour Tube Count

INTERSECTION TRAFFIC OPERATIONS ANALYSIS

Analysis of existing traffic operations was conducted on the following intersections:

ORANGE AVENUE

- Sand Lake Road (signalized);
- Office Court (unsignalized);
- Perkins Road (unsignalized);
- Nela Avenue/Glenrose Road (signalized);
- Lancaster Road (signalized);
- Prince Street (unsignalized);
- Wallace Street (unsignalized);
- Fairlane Avenue (unsignalized);
- Oak Ridge Road (signalized); and
- Hoffner Avenue (signalized).

HANSEL AVENUE

- Wallace Street (unsignalized);
- Fairlane Avenue (signalized);
- Oak Ridge Road (signalized); and
- Hoffner Avenue (signalized).

The existing lane configurations along with intersection control type used for the analysis are illustrated in Figure 21.

The weekday AM and PM peak hours were found to occur from 7:15 to 8:15 AM and 4:30 to 5:30 PM. Minor manual adjustments were made to the AM and PM peak hour turning movement volumes at select locations to reconcile for different intersection count dates and verify reasonable volume differences between intersection approach and departure volumes. The turning movement volumes were also adjusted to account for seasonal variations with a seasonal factor developed by FDOT. Existing weekday AM and PM peak hour turning movement volumes are summarized in Figure 22 and Figure 23. Traffic volume adjustments and seasonal factor documentation is included in Appendix D.

The results of the analysis for the existing year 2012 AM and PM peak hour intersection operating conditions are summarized in Figure 22 and Figure 23. Operational analysis output worksheets are provided in Appendix D. The operations analysis identified the following key findings for the existing 2012 peak hour conditions:

- The majority of the signalized intersections within the study area operate acceptably under peak hour conditions with overall level-of-service (LOS) of “C” or better during both the AM and PM peak hours.

- Orange Avenue at Sand Lake Road (intersection 14) is operating at an overall LOS E in both the AM and PM peak hours with a delay greater than 65 seconds. The overall intersection is effectively “at-capacity” during peak hours based upon existing volume conditions. In the AM peak hour, the eastbound left, northbound through and southbound left all operate at LOS “F” under existing conditions. In the PM peak hour, the through and left-turn movements on each of the approaches are estimated to operate at LOS “E” or “F” under existing conditions.

- For the unsignalized intersections within the corridor, the mainline (Orange Avenue) through movements are uncontrolled and operate at LOS “A”. The level of service identified in Figures 22 and 23 reflects the critical minor street movements, which is stop controlled. The following stop controlled minor street approaches were identified to have failing level-of-service under existing conditions: Hansel Avenue/ Wallace Street (AM peak), Orange Avenue/Fairlane Avenue (PM Peak), Hansel Avenue/Wallace Street (PM Peak), and Orange Avenue/Prince Street (PM peak).

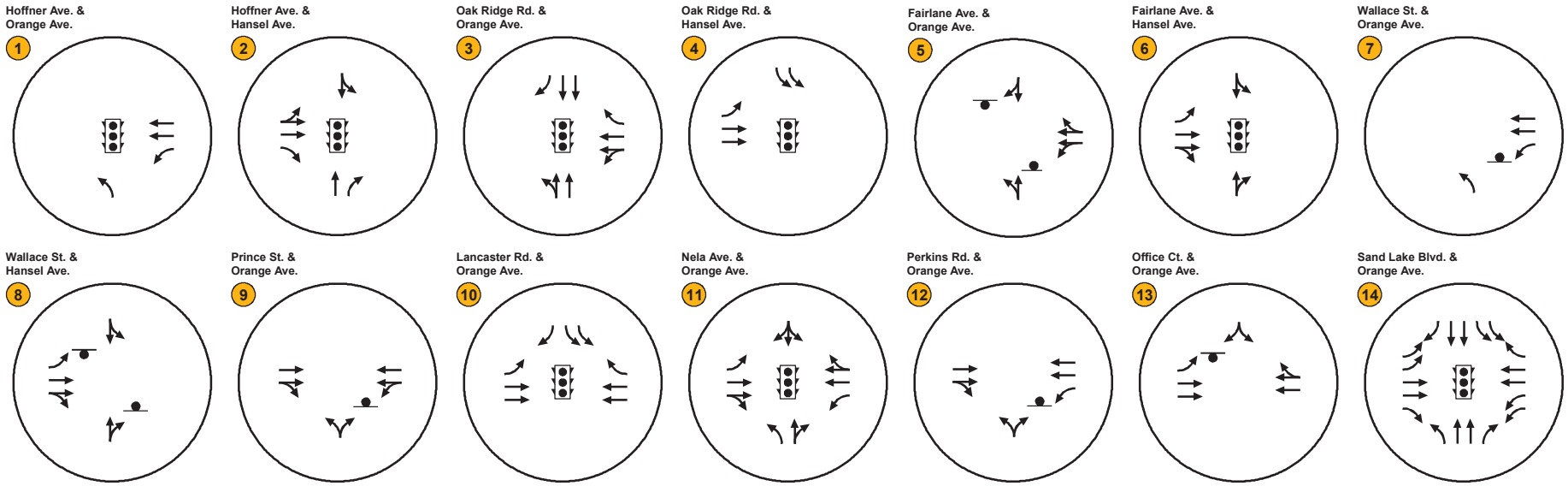


Figure 21 | Lane Configurations and Traffic Control

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

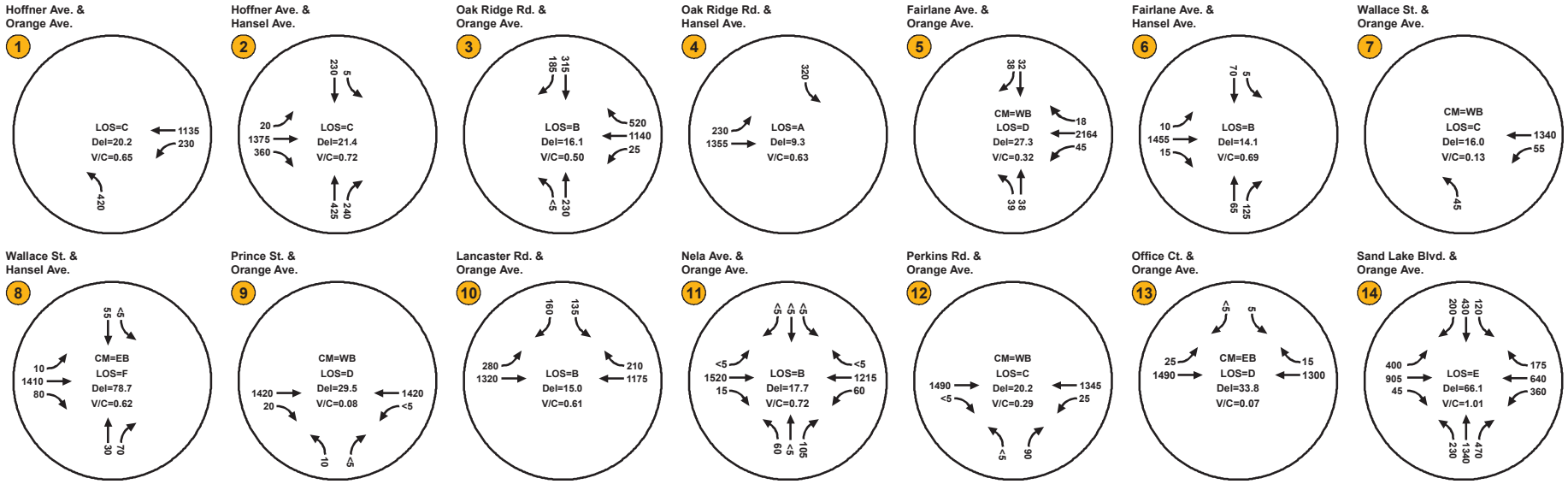


Figure 22 | AM Peak Hour Traffic Volumes with LOS

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

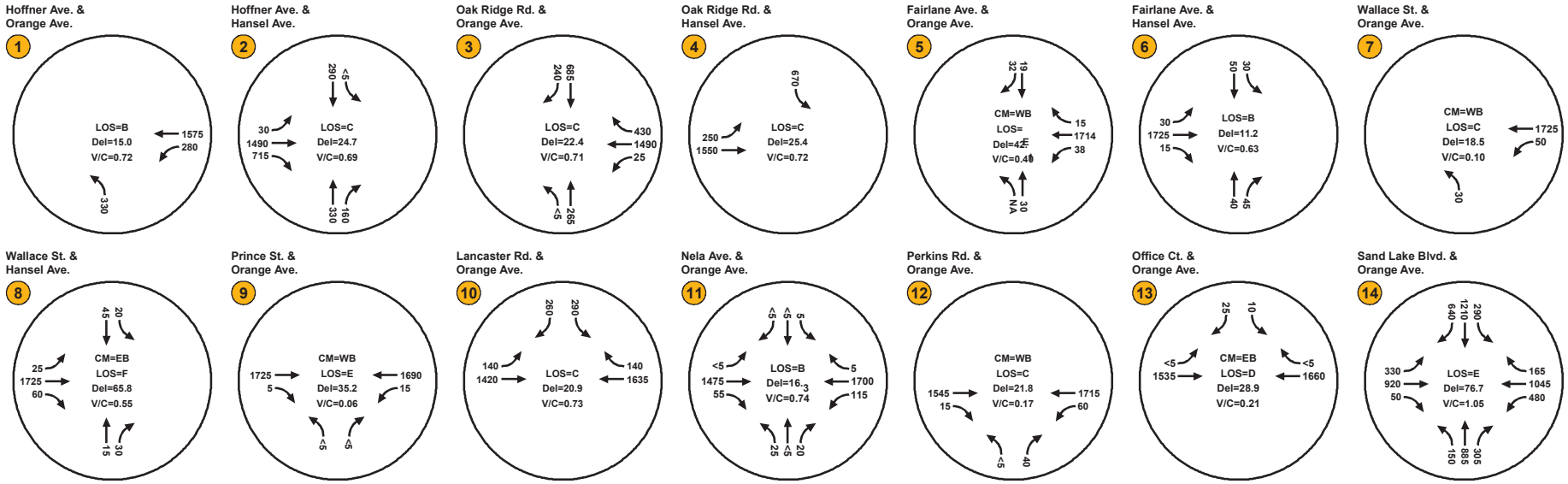


Figure 23 | PM Peak Hour Traffic Volumes with LOS

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

FIELD REVIEW OBSERVATIONS

Field Reviews were conducted during the morning (8:00 to 10:00) and afternoon (4:30 to 6:00) peak periods on February 12, 2013 to better understand traffic operations and field-verify roadway characteristics.

MORNING PEAK PERIOD

ORANGE AVENUE AND SAND LAKE ROAD INTERSECTION

- Heaviest movement observed was northbound through. Movement was observed to queue as far south as SR 528 during multiple cycles.
- All right turn lanes are channelized. To cross the intersection as a pedestrian, you must first cross the channelized right turn lane, which is an unsignalized crosswalk, in order to reach the signalized crosswalk.

ORANGE AVENUE BETWEEN HOFFNER AVENUE AND FAIRLANE AVENUE

- Multiple vehicles observed driving in striped out (painted) areas on either side of road.

Figure 24 | Looking Southbound at Orange Avenue and Sand Lake Road

Figure 25 | Northeast Corner Pedestrian Crosswalk

Figure 26 | Striped Areas along Orange Avenue Near Hoffner Avenue

HANSEL AVENUE AND HOFFNER AVENUE INTERSECTION

- Intersection operations are heavily influenced by nearby school traffic for Cornerstone Charter Academy and Pine Castle Elementary School.
- Westbound approach - Long queue observed, which may be further influence by the school zone along Hoffner Avenue which slows the traffic approaching the intersection.
- Northbound through movement – Long queue due to school zone along Hansel Avenue. Police officers were present near Pine Castle Elementary School at the intersection of Hansel Ave/Waltham Avenue The police officers would stop northbound traffic to let vehicles exit the school at Waltham Avenue after dropping students off. This would cause disruption in platoon progression leading to queuing at Hoffner Avenue.

Figure 27 | Westbound Approach at Hansel Avenue and Hoffner Avenue

Figure 28 | Hansel Avenue Northbound Queue at Hoffner Avenue

AFTERNOON PEAK PERIOD

ORANGE AVENUE AND SAND LAKE ROAD INTERSECTION

- The northbound through volume was heavy, as with the morning peak. However, the northbound left-turn queue appeared to be fully served during most cycles.
- The southbound through volume back of queue was approximately half-mile north of Sand Lake Road (near Perkins Road). Previous reports suggested that southbound vehicles used the center two-way-left-turn lane to bypass the southbound through queue and access the left-turn lanes at the Sand Lake Road intersection; however, no vehicles were observed making this maneuver during the field observation. The southbound left turn storage was full but all queued vehicles appeared to be served during most cycles.
- In a few instances, the eastbound movements were observed queuing back to the eastern edge of the Sand Lake Road bridge which crosses over the railroad tracks. However, queues were generally fully served for most cycles.
- The westbound approach was observed to consistently queue back to the next closest intersection to the east, Gondola Drive. The queues were observed to not be fully served during most cycles, which resulted in residual queue buildup.

Figure 29 | Southbound Queue Spillback to CKS Packing, Inc. (Near Perkins Road)

Figure 30 | Looking North at the Southbound Approach of Sand Lake Road

Figure 31 | Looking East at the Westbound Approach of Sand Lake Road

ORANGE AVENUE/HANSEL AVENUE AND OAK RIDGE ROAD INTERSECTION

- The eastbound movements at Orange Avenue and Oak Ridge Road were observed to queue through the railroad tracks (approximately 300 to 500 feet west of the tracks).
- Due to the one-way pair configuration of Orange Avenue and Hansel Avenue, all of the vehicles traveling eastbound through the Orange Avenue intersection must make a left turn at Hansel Avenue. Two eastbound left-turn lanes are provided at the intersection of Hansel Avenue/Oak Ridge Road. Many of the vehicles which used the outside eastbound left-turn lane at Hansel Avenue/Oak Ridge Road were observed to then make a right- turn movement onto Hoffner Avenue at the next downstream signalized intersection. Because of the signal timing, the platoon of vehicles turning left from Oak Ridge Rd and desiring to turn right at Hoffner Avenue were typically stopped at a red light which caused the northbound right-turn queue to spill back into the northbound through lanes which increased queue lengths along Hansel Avenue. It was observed that the northbound Hansel Avenue traffic was impeded by queue spillback during some cycles.
- For vehicles making the northbound through movement along Hansel Avenue, relatively few vehicles were observed to turn onto Hoffner Avenue at the next signalized intersection. The majority of vehicles continued as northbound through vehicles.

Figure 32 | Looking South – Queue Spillback from Right Turn Lane at Hansel Avenue and Hoffner Avenue

Figure 33 | Looking North – Queue Spillback from Right Turn Lane at Hansel Avenue and Hoffner Avenue

SAFETY ANALYSIS

Crash data for the most recent five year period (2007-2011) was obtained from the FDOT Crash Analysis Reporting (CAR) system for the study corridor. The following is a summary of the crash data for the study segments of the Orange Avenue corridor:

- 420 crashes occurred within the study limits during the five-year (2007-2011) analysis period.
- There were 3 fatal crashes resulting in 3 fatalities, 172 injury crashes (41% of all crashes) resulting in 242 injuries, and 245 property damage only (PDO) crashes (58% of all crashes).
- Rear-end (32%) and angle (31%) were the predominant crash types along the corridor.
- There were 6 pedestrian crashes, 2 being fatal.
- There were 8 bicycle crashes.
- Approximately 33% of the crashes occurred in dark, dusk or dawn lighting conditions.

Figure 34 displays the location of all crashes for the Orange Avenue study corridor. As can be seen on Figure 34, the intersection of Orange Avenue with Sand Lake Road experienced the most crashes over the five year study period with 110. The intersection of Orange Avenue with Lancaster Road and Hansel Avenue with Hoffner Avenue each experienced between 41 and 50 crashes during the study period. The segment of Orange Avenue between Sand Lake Road and Office Court experienced 12 crashes, the most of any segment along the corridor. Appendix E includes detailed analysis of each of these intersections and also contains the raw CAR system data for the corridor.

Figure 35 displays the location of the pedestrian and bicycle related crashes along the corridor. Eight of the 14 crashes involving pedestrians and bicyclists occurred at study intersections throughout the corridor. Five of the crashes were reported between Sand Lake Road and Office Court, one being a pedestrian fatality and the others resulting in injury. Based on the coded crash data and police reports, details and the full reports on the pedestrian and bicycle related crashes as well as the vehicular fatal crashes are provided in Appendix E.

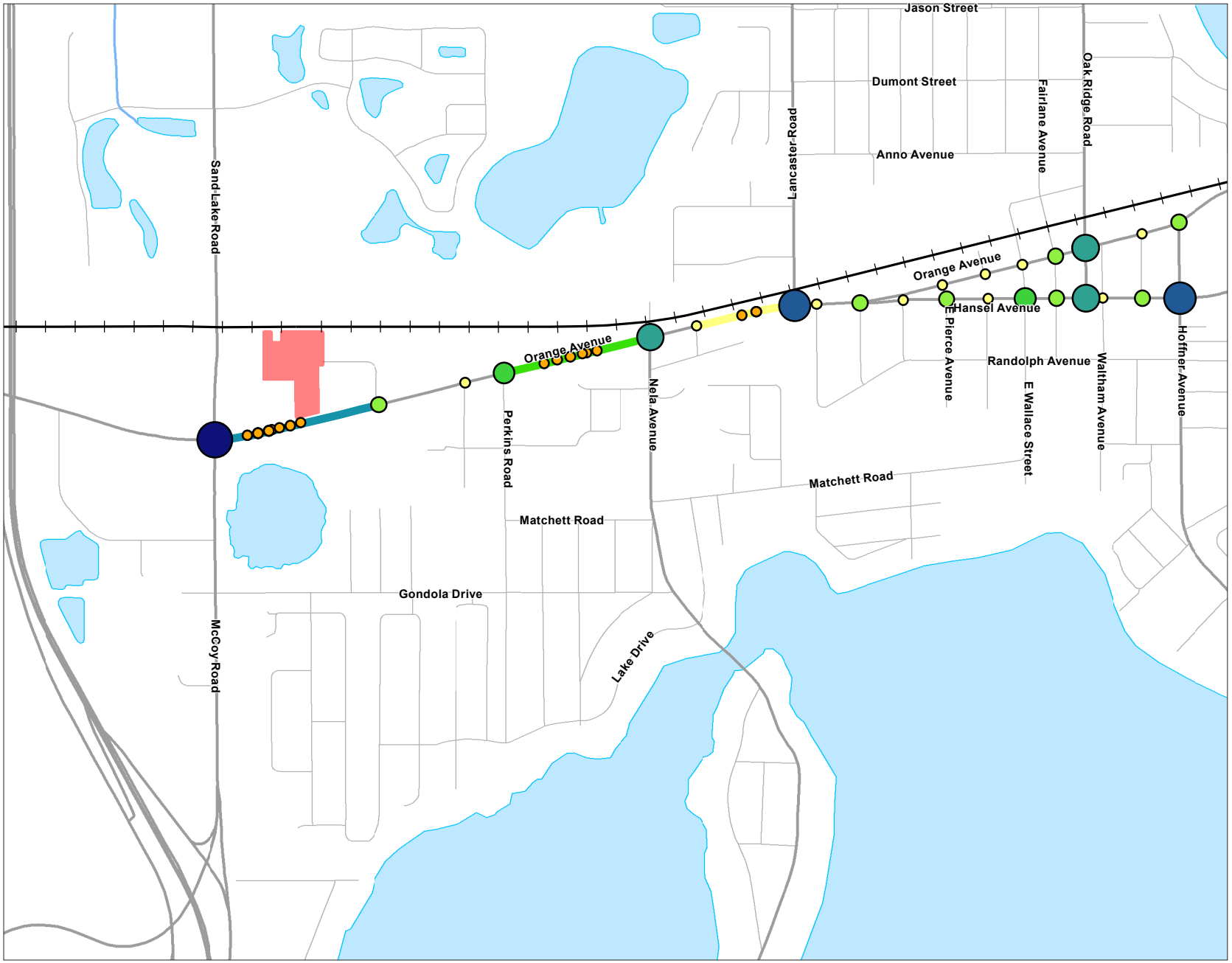


Figure 34 | Crash Map (2007 – 2011)

Legend

Intersection Crashes

- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 40
- 41 - 50
- 110

Segment Crashes

- 1
- 3
- 6
- 12

SunRail Station Site

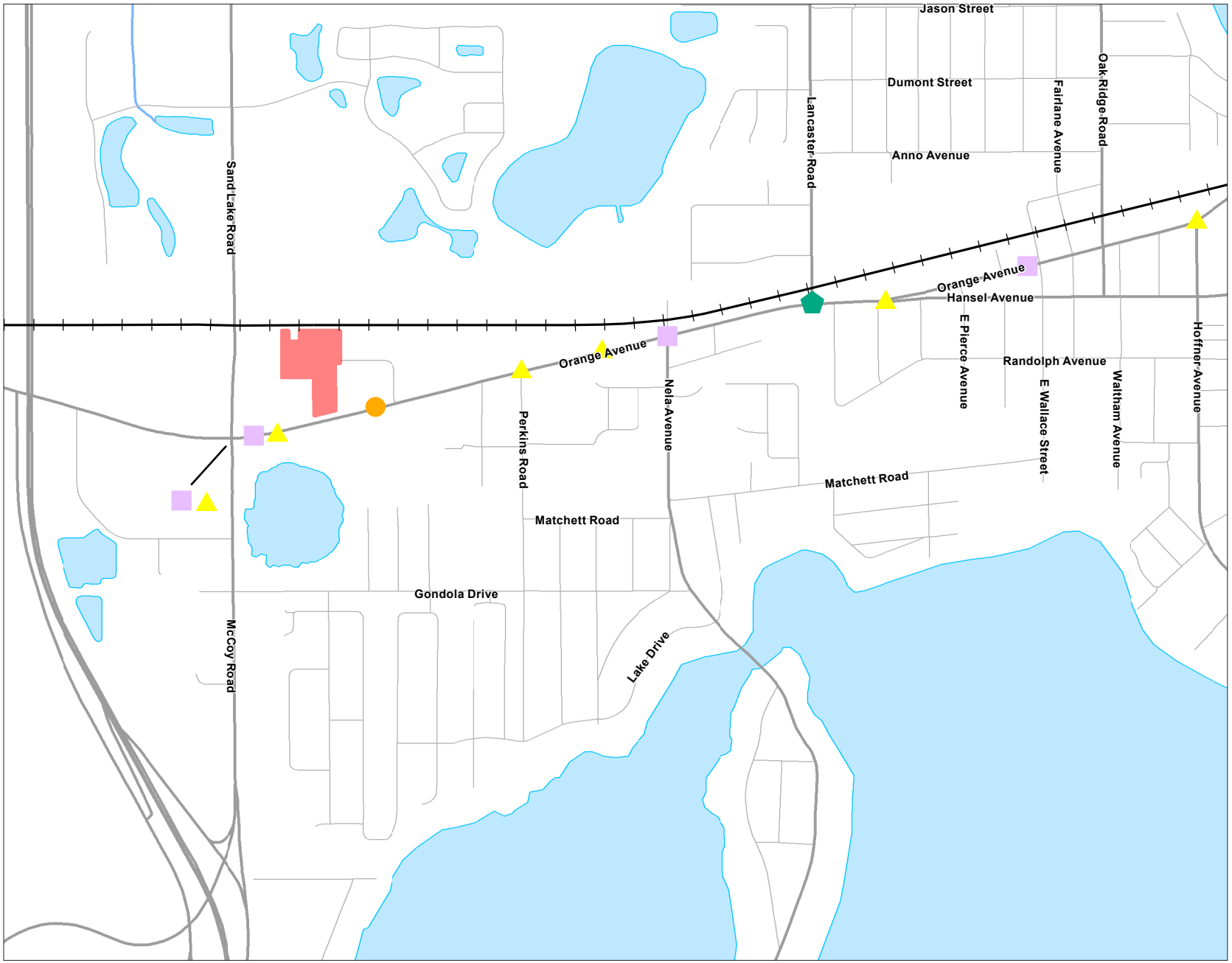


Figure 35 | Pedestrian and Bicycle Crashes (2007 – 2011)

Legend

Pedestrian and Bicycle Crashes

- Pedestrian Fatality
- Pedestrian Injury
- Bicycle Crash (No Injury)
- Bicycle Injury
- SunRail Station Site

3
EXISTING NEEDS & OPPORTUNITIES

3 EXISTING NEEDS & OPPORTUNITIES

STAKEHOLDER INPUT

One-on-one interviews were conducted with key area stakeholders to understand the issues and opportunities that need to be considered throughout the study. Together with the data and information collected and analyzed, this input will be the basis for developing alternative strategies for the corridor.

The interviews were conducted on January 31, 2013 at the Belle Isle City Hall Chamber, prior to the first Project Visioning Team Meeting and the Public Workshop. A total of seven interviews were held representing the following organizations:

- LYNX
- Orange County
- City of Orlando
- City of Belle Isle
- City of Edgewood
- Pine Castle Safe Communities Preservation Association (PCSCPA)
- Ardaman & Associates (Local Business)

The interviews were informal in nature, where stakeholders were asked a few questions, but conversations were mostly free-flowing. The intent was to learn as much about the corridor from the users of Orange Avenue as possible. Some of these questions were:

- WHAT AGENCY/ORGANIZATION DO YOU REPRESENT AND WHAT IS YOUR INTEREST ON ORANGE AVENUE?
- WHAT IS YOUR SENSE OF THE MULTI-MODAL TRAVEL ALONG ORANGE AVENUE? WHERE ARE PEOPLE COMING FROM AND GOING TO? HAS THIS CHANGED IN THE LAST FEW YEARS?
- WHO ARE USING TRANSIT? WHO ARE BICYCLING OR WALKING?
- WHERE ARE THE AREAS THAT YOU SEE THE MOST CURRENT TRANSIT/ PEDESTRIAN/BIKE USE? WHERE DO SEE THIS USE INCREASING IN THE FUTURE?
- WHAT ARE THE CURRENT ACTIVITIES IN YOUR PROPERTY/ORGANIZATION THAT CAN BENEFIT FROM IMPROVED TRANSIT/PEDESTRIAN/BIKE INVESTMENT?
- WHAT FUTURE PLANS DO YOU HAVE FOR YOUR PROPERTY/AGENCY THAT CAN BENEFIT FROM IMPROVED TRANSIT/PEDESTRIAN/ BIKE INVESTMENT? CAN YOU SHARE A COPY OF THE PLANS?
- WHAT OTHER ISSUES/CHALLENGES DO WE NEED TO ADDRESS TO ENCOURAGE BETTER MULTI-MODAL MOBILITY AND ACCESS? ARE THESE ISSUES/ OPPORTUNITIES SPECIFIC TO CERTAIN AREAS/SEGMENTS/INTERSECTIONS?
- ARE YOU AWARE OF OTHER PLANS/PROGRAMS/FUNDING THAT CAN SUPPORT MULTI-MODAL MOBILITY ALONG ORANGE AVENUE?

Interview notes were documented on base maps and participants were encouraged to write and draw comments on the maps. The following are a summary of key points, issues, and opportunities gleaned from the interviews.

SUMMARY OF ISSUES AND OPPORTUNITIES

Together with findings from the existing conditions section, the following key issues and opportunities are outlined. These issues and opportunities form the basis for the goals and objectives, and purpose and needs for the study. Alternative solutions developed in the later phases will be developed to address these issues and capitalize on these opportunities.

LAND USE ISSUES AND OPPORTUNITIES

- A large section of the corridor has existing land uses (highway commercial, industrial) that generally do not support walking, bicycling and transit use. However, some portions of the corridor call for short-term targeted improvements: educational node at the northern end, Sand Lake Road station area and the hospital/employment node just north of the study area.
- There are a number of vacant and underutilized parcels that present opportunity for future TOD around SunRail.
- There are individual efforts to facilitate land uses that are more supportive of multi-modal transportation (Sand Lake station area plan, FDOT TOD facilitation efforts, City of Orlando's corridor study and LYMMO expansion, City of Edgewood's sign ordinance, City of Belle Isle's desire for way finding and streetscape, etc.). However, these efforts are not coordinated as a corridor, and some are in the more modest planning phases and not yet advanced to the implementation stages.
- The Sand Lake Road Station Area Plan lays out a potential TOD development scenario. The plan has been reviewed and approved by the County. The County is working on advancing the next steps of re-zoning and working with property owners to facilitate TOD, in partnership with FDOT.
- Modest land use changes outside of the station areas are also currently occurring and are expected to continue. For instance, Select Specialty Hospital located just north of Gem Street is increasing their existing 180-staff facility to add 70 more employees and more parking. Orlando Clinical Research Center located just north of the northern split of Orange Avenue has approximately 70 employees are also making changes and adding parking. These health care related industries generally tend to have employees that rely on transit.
- Orange Avenue is considered Pine Castle's "main street" and the heart of the Community is between Hoffner Avenue and Nela Avenue along Orange Avenue. There is an opportunity to enhance the corridor's sense of place, walkability, and economic development potential. Stakeholders desire for the corridor to have less of a highway commercial feel, slower speeds, more streetscape treatments, and façade improvements along Orange Avenue.
- The northern end of the study corridor has a concentration of educational and community facilities including Cornerstone Charter Academy, Pine Castle Elementary School, and Pine Castle Christian Academy. These uses are attractors and generators of pedestrian/bike traffic and sidewalk connectivity and safe crossing opportunities in this area are especially important.
- Some stakeholders desire to see gateway treatments and improved signage along Orange Avenue especially to direct users to the SunRail Station and at key intersections like Hoffner Avenue, Nela Avenue, Perkins Road, and Sand Lake Road.

TRANSIT-SPECIFIC ISSUES & OPPORTUNITIES

- The Sand Lake Road SunRail station is the end-of-the-line station for SunRail's first phase. Connectivity via all modes is critical to support the station but also SunRail's overall ridership.
- LYNX has experienced consistent increase in bus ridership over the years. The introduction of SunRail will likely support this transit ridership growth but transit's success relies on effective walking and bicycling connectivity.
- Aside from automobile access, LYNX is already working with FDOT to ensure bus connections to the Sand Lake Road station are efficient. The four existing transit routes, two along Orange Avenue (Link 11 and 18) and two along Sand Lake Road (42 and 111) will all stop at the future SunRail station. A future route, Link 18L will start at the SunRail station and continue south into Osceola County and serve as interim express connection to the south side of the region. This route would be discontinued once the southern section of SunRail is built.

- Of critical importance is to ensure that operational efficiencies are maximized for these connecting bus routes. The signal at office court will help provide efficient access for buses accessing the station. Opportunities for operational improvements such as transit signal priority (TSP) and queue jumps should also be explored along Orange Avenue and Sand Lake Road. Potential additional station access points along Orange Avenue and Sand Lake Road should also be added where feasible.
- Orange Avenue is one of LYNX's 22 transit emphasis corridors throughout the region. The long-term addition of premium transit along the corridor is part of LYNX's strategic master plan.
- An urban cross-section (with curb/gutter and sidewalk) will enhance transit service along the corridor as the Americans for Disabilities Act (ADA) required landing pad can be right behind the curb if curb is present. A rural cross section presents more challenges to constructing an appropriate landing pad for a bus stop.

PEDESTRIAN/BICYCLING MOBILITY ISSUES AND OPPORTUNITIES

- There is a need and a desire for improved pedestrian, bicycling, and transit connectivity (especially connecting to SunRail) from a majority of stakeholders. Walking and bicycling along and across the corridor are perceived to be unsafe and inconvenient.
- There are opportunities to improve existing sidewalk and bike lane connectivity, have wider sidewalks, more crossing opportunities, more pedestrian-level lighting, and enhance ADA accessibility throughout corridor. Bike lanes are present in the northern one-way pair section of the corridor but no bike facilities are present from approximately Sand Lake Road to Lancaster Road. Sidewalk is present throughout most of the corridor with the exception of a ¾ mile long gap on the east side of the roadway between the location of the SunRail station and Lancaster Road.
- This area has a higher need for mobility and access for the elderly population. The study should look at ADA accessibility for the area.
- Vehicle speeds are a concern for pedestrian safety on the northern end (near the one-way pair).

OVERALL TRANSPORTATION ISSUES AND OPPORTUNITIES

- Very few regional roadways provide parallel north-south capacity that can provide relief for Orange Avenue. The corridor is expected to carry considerable traffic into the future.
- This section of Orange Avenue provides a regional function as it connects to Sand Lake Road/ SR 528 and to the airport. However, with the future station and TOD potential, residents and businesses also see Orange Avenue as needing increased local access and increased need for other modes to get to local destinations (restaurants, shops, etc.).
- Various sections of the corridor require different approaches and have different opportunities to improving multi-modal transportation. Some sections will benefit more from access management, some sections benefit from cross-section changes, some require organizing streetscape and on-street parking, and still others may require signal coordination and sidewalk improvements.
- The corridor experiences congestion during the peak periods, generally towards the southern end near Sand Lake Road. The intersection of Sand Lake Road/Orange Avenue is operating at LOS E in both the AM and PM with a delay greater than 65 seconds and a volume to capacity ratio greater than 1.
- A number of stakeholders see an opportunity for better access management along the southern section of the corridor where the two-way left turn lane can be converted to a median. Some stakeholders notice that drivers will use the two-way left turn lane to pass other drivers when congestion occurs. More coordination and detailed analysis would be needed to understand the potential impacts of access management on commercial properties.
- Some stakeholders would like to evaluate the potential for additional signals along Orange Avenue to support future TOD at the SunRail station (Office Court, Royal Palm Avenue).

- There are opportunities for signal re-timing to improve operational efficiency. Past re-timing efforts have helped eased congestion.
- The limited street network and the one-way configuration in the corridor's northern section creates a stacking issue where the northbound traffic turning right at Hoffner Avenue queues into the through lanes along Orange Avenue
- Overall truck traffic along the corridor is around 5 percent of the daily volume. However, existing businesses that have warehousing and industrial functions do have truck traffic throughout the day.
- Connections to the east side (City of Belle Isle) and to the west side (Lake Gloria neighborhood) are also desirable but challenges exist because of existing residential neighborhoods and wetlands. A potential parallel north-south connection from Office Court to Perkins Avenue or Royal Palm Avenue was explored as part of the station area plan.

OTHER ISSUES & OPPORTUNITIES

- There are a number of on-going projects and studies by the City of Orlando in the section of Orange Avenue north of the Study Area. This presents opportunities to build on the ongoing efforts to improve transit and pedestrian/bicycling mobility to continue south to the study corridor. These projects include the proposed LYMMO expansion to connect to SoDo (South Downtown), ITS efforts in Downtown (as far south as Michigan Avenue,
- Orange Avenue has many concerned stakeholders that desire for improvements to the Corridor's aesthetics. One group is the PCSCPA which can apply for and facilitate grants for community improvements such as streetscape improvements, façade treatments, etc. Groups such as the PCSPA can be an important partner to the County and FDOT as the agencies advance strategies coming out of this Study. (The Pine Castle Community extends as far west as Orange Blossom Trail, has a southern extent of Sand Lake Road With over 4,800 homes, and 20,000 residents the community was characterized as having a mix of retirees and working class.)
- Some stakeholders expressed the desire to see improvements along the entire length of Orange Avenue from Sand Lake Road to Downtown instead of just evaluating pieces of the corridor i.e. Orange Avenue to Hoffner Avenue

4
FUTURE TRAFFIC NEEDS ASSESSMENT & POTENTIAL STRATEGIES

4 FUTURE TRAFFIC NEEDS ASSESSMENT & POTENTIAL STRATEGIES

Following the evaluation of existing corridor conditions, the Study Team analyzed the future needs of the corridor, including a no-build and build future conditions traffic operations assessment. The future conditions assessment included evaluations of mid-year (2020) and future year (2030) traffic conditions for the Orange Avenue corridor and intersections. The remainder of this section provides a summary of the future conditions evaluation. The complete Future Traffic Conditions Memorandum can be found in Appendix F, which documents the volume projection methodology, future traffic volumes, and future operating conditions of signalized and unsignalized intersections along the corridor.

NO-BUILD FUTURE CONDITIONS ASSESSMENT

A No-Build future conditions assessment was performed in order to identify possible future operational needs over the short and long term.

METHODOLOGY

The year 2020 and 2030 traffic projections are comprised of background traffic growth, trips to/from the Sand Lake Road SunRail Station, and the trips to/from the planned Transit-Oriented Development (TOD) around the station. The methodologies for projecting background growth between years 2020 and 2030 considers transit service as well as the potential maturity of the planned TOD development around the SunRail station in each time period.[1]

The 2020 background volumes were developed by applying annual growth rates to the existing traffic volumes at each intersection. Annual growth rates were determined by comparing the OUATS model growth to the historical growth for the study roadways. Estimated SunRail and TOD generated trips were added to the background traffic to identify expected total 2020 vehicular volumes. Appendix F provides additional information on development of background growth rates for the roadways within the study area as well as assumptions for TOD and SunRail trips. To forecast the 2030 background volumes, a lower K-factor value of 7.5 percent was applied to reflect additional planned transit service along the Orange Avenue corridor and increased mode split to the various transit options (SunRail, Lynx Bus, and potential additional premium transit service). This results in a more modest background traffic volume increase, with the planned TOD development having a greater impact in volume growth on Orange Avenue within the immediate vicinity of the TOD project in the year 2020 to 2030 timeframe.

1 The methodologies were developed in coordination with the County and were applied by the County's consultant, GMB Engineers and Planners, Inc. (GMB), to project the traffic volumes at the intersections along Orange Avenue from Sand Lake Road to Lancaster Road.

NO-BUILD FUTURE CONDITIONS TRAFFIC ANALYSIS

Figure 36 and Figure 37 display the 2020 AM and PM volumes, LOS, V/C, and delay for all intersections within the study area. Appendix F contains the software output worksheets for the 2020 AM and PM peak hour analysis. The results from the 2020 AM and PM peak-hour no-build intersection operational analysis are as follows:

- Orange Avenue at Sand Lake Road is the only signalized intersection within the study area anticipated to not provide sufficient capacity or operate at an acceptable level of service. This intersection operates at level of service (LOS) F with a delay greater than 80 seconds and an overall intersection volume-to-capacity (V/C) ratio greater than 1.10 in both peak hours.

- The following stop-controlled intersections have the eastbound and/or westbound side-street approaches operating at LOS F under peak hour conditions:
  - Hansel Avenue at Wallace Street (AM and PM Peak Hour)
  - Orange Avenue at Fairlane Avenue (PM Peak Hour)
- All other study intersections are estimated to operate acceptably in the 2020 AM and PM peak hours.

Figure 38 and Figure 39 display the 2030 AM and PM volumes, LOS, V/C, and delay for all intersections within the study area. Appendix F contains the software output worksheets for the 2030 AM and PM peak hour analysis. The results from the 2030 AM and PM peak-hour no-build intersection operational analysis are as follows:

- Similar to the 2020 analysis, Orange Avenue at Sand Lake Road is the only signalized intersection within the study area anticipated to not provide sufficient capacity or operate acceptably in year 2030. This intersection is estimated to operate at LOS F with a delay greater than 105 seconds and a V/C ratio greater than 1.20 in both peak hours.
- The following stop-controlled intersections have the eastbound and/or westbound side-street approaches operating at LOS F under peak hour conditions:
  - Orange Avenue at Fairlane Avenue (AM and PM Peak Hour)
  - Hansel Avenue at Wallace Street (AM and PM Peak Hour)
  - Orange Avenue at Prince Street (AM and PM Peak Hour)
  - Orange Avenue at Perkins Road (AM and PM Peak Hour)
- All other study intersections are estimated to operate acceptably in the 2030 AM and PM peak hours.

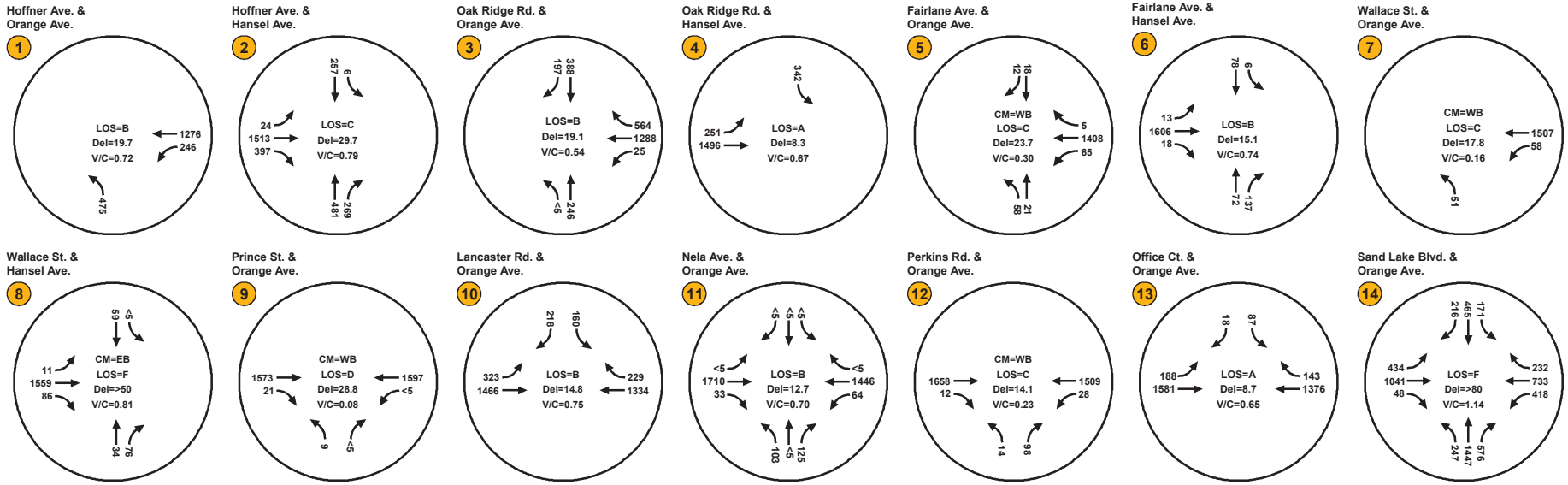


Figure 36 | No-Build 2020 AM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

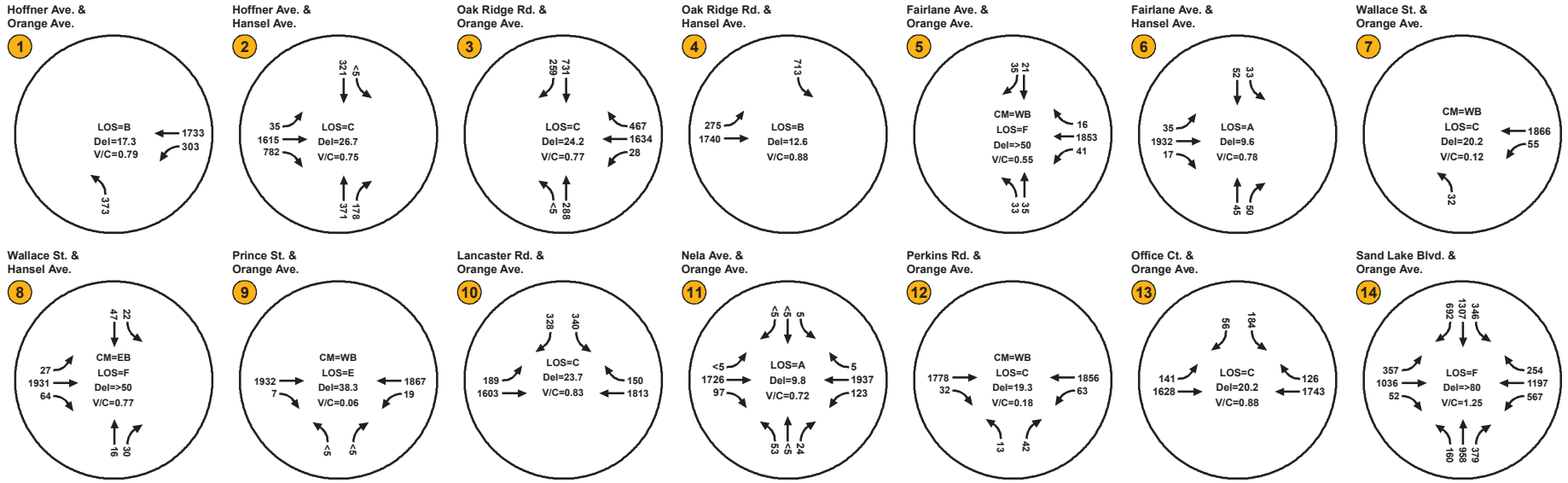


Figure 37 | No-Build 2020 PM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

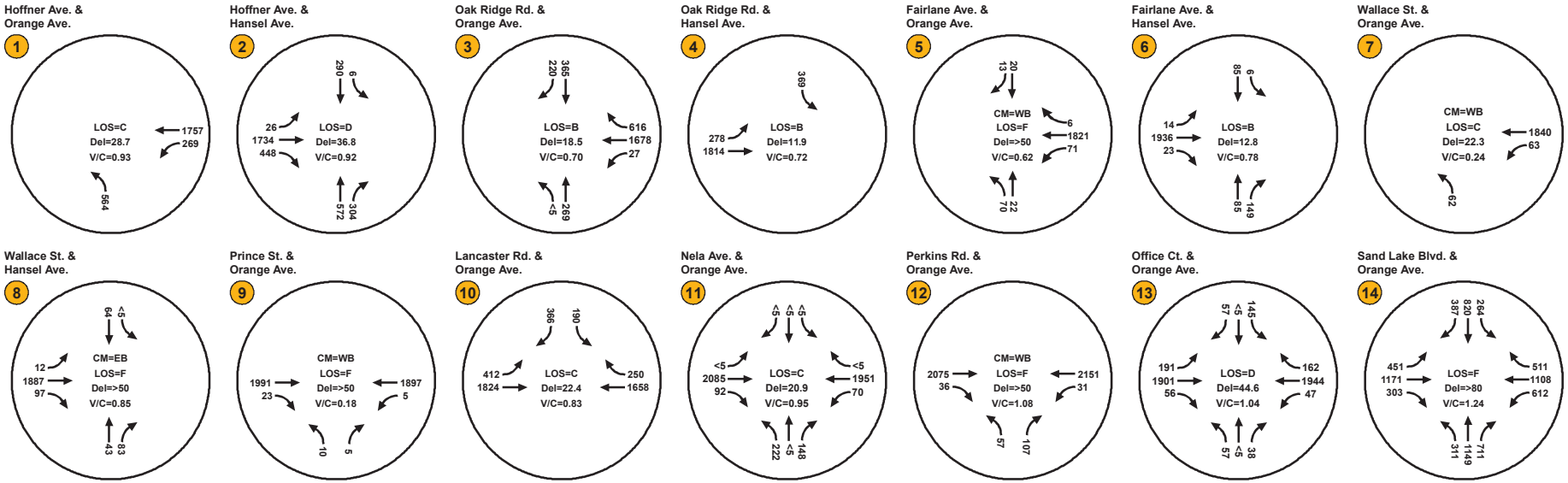


Figure 38 | No-Build 2030 AM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

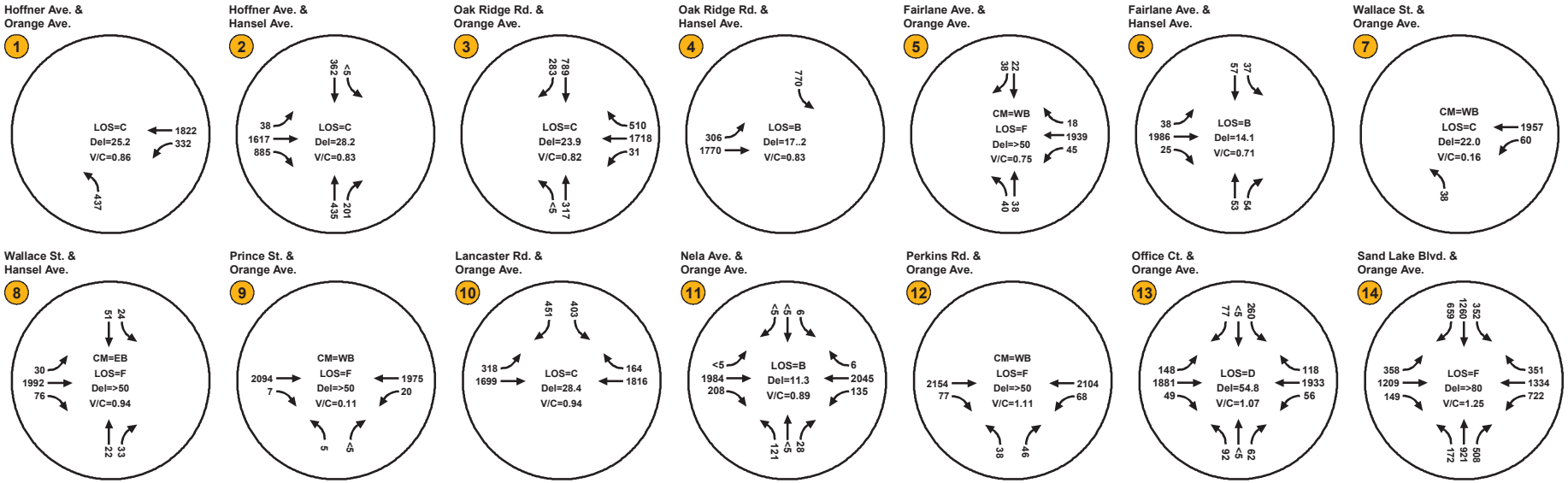


Figure 39 | No-Build 2030 PM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

BUILD FUTURE CONDITIONS ASSESSMENT

As noted previously, this intersection does not operate at an acceptable LOS in the future year 2020 or 2030 peak hour no-build scenarios, as well as under the existing conditions. Options for increasing intersection capacity were presented and discussed with the Stakeholders throughout the study. The following summarizes the results of the discussions:

OPERATIONAL NEEDS AND POTENTIAL MITIGATION STRATEGIES

1. ORANGE AVENUE AT SAND LAKE ROAD

As noted previously, this intersection does not operate at an acceptable LOS in the future year 2020 or 2030 peak hour no-build scenarios, as well as under the existing conditions. Options for increasing intersection capacity were presented and discussed with the Stakeholders throughout the study. The following summarizes the results of the discussions:

- Additional Vehicular Capacity: The addition of through lanes and/or turn lanes could provide some improvement in traffic operations at the intersection. However, the additional lanes are expected to provide a relatively low incremental benefit in comparison to the potential impacts. The additional lanes would result in substantial impacts to adjacent properties and impacts to pedestrian and bicycling accessibility at this intersection. Adding turn lanes would increase the already lengthy (170 feet on average) crossing distance for pedestrians, and impact the overall walkability of the intersection. ROW impacts and the proximity of the bridge over the railroad tracks on the west leg of the intersection also limit the feasibility of adding lanes to the existing at-grade intersection.

- Enhancing Street Network: The lack of parallel roadway network around the study area results in relatively few network links carrying most of the regional traffic in the area, and results in high volumes at key intersections like Sand Lake Road/Orange Avenue. Because of the physical constraints within the region (lakes, the railroad, and the existing land development pattern), Sand Lake Road and Orange Avenue service both regional traffic (coming to and from SR 528, for instance) and local traffic (with both destinations and origins along the corridor). West of Sand Lake Road, the next parallel road (Winegard Road) that connects to another non-local Road (Lancaster Road) is 1.2 miles away, while on the eastern side, some connectivity is present but is mostly in the form of residential local streets. The study team explored several potential new roadway network connections including the addition of a new intersection along Sand Lake Road west of Orange Avenue that would provide direct access (likely right-in/right-out) to the Sand Lake Road Station. Through discussions with FDOT and Orange County stakeholders, these ideas were considered longer-term options, and can be revisited when the TOD concept around the Sand Lake Road station advances. These network ideas are not included in the future condition scenarios at this time.

- OIA Connector Alignments: The Orlando International Airport (OIA) Connector, a premium transit project connecting OIA to multiple tourist destinations along International Drive, has a potential alignment which passes through the Orange Avenue/Sand Lake Road intersection which could change the geometry and character of the intersection and the areas around it.

Due to the factors identified above, particularly the uncertainty regarding the impacts of the potential OIA Connector, FDOT and the Orange County stakeholders decided that no additional through or turn lanes would be advanced at this time. Strategies for the Orange Avenue/Sand Lake Road intersection should be revisited once the OIA Connector alignment has been decided.

Although no vehicular capacity improvements are being considered at this time for the Orange Avenue/Sand Lake Road intersection, multi-modal mobility concerns are still important to address. The study team recommends removing the channelization for the right turn lanes on all approaches at the intersection to bring the right-turns under signal control, as further discussed in Section 5. The removal of the channelization and free-flow operation of the right turn lanes was incorporated into the Build conditions analysis.

2. ORANGE AVENUE AT PERKINS ROAD

The westbound movements of the unsignalized intersection at Orange Avenue and Perkins Road do not operate at an acceptable LOS in the 2030 AM and PM peak hours. A signal warrant analysis was performed but was not supported by the future turning volumes at the intersection. The operational benefits of adding an exclusive westbound right turn lane was also reviewed and the results are summarized below:

- In the AM peak hour, the total approach delay decreased from 150.1 seconds to 66.7 seconds.
- In the PM peak hour, the total approach delay decreased from 229.5 seconds to 142.6 seconds.

Even though adding an exclusive right turn lane yielded improvement in total approach delay, the LOS for the approach remains at F. At this time, the recommendation is to monitor the intersection in the future for possible signal implementation or turn lane additions. No strategies to improve the LOS at this intersection were incorporated into the Build Conditions analysis.

3. ORANGE AVENUE AT PRINCE STREET, HANSEL AVENUE AT WALLACE STREET, AND ORANGE AVENUE AT FAIRLANE AVENUE

As noted previously, the eastbound and westbound movements at these three unsignalized intersections were identified as providing a LOS "F" operations for the stop-controlled side street approaches during the peak hours. High mainline volumes result in the reduced capacities and undesirable delay for the stop controlled side-streets, despite the fact that side street volumes at these locations are relatively low. A signal warrant analysis was performed but was not supported by the future turning volumes at any of the intersections. Addition of turn lanes were considered but are not recommended due to possible ROW constraints which exist on the minor streets. No strategies to improve the LOS at this intersection were incorporated into the Build conditions analysis.

4. ORANGE AVENUE AT OFFICE COURT

In the future condition, Orange Avenue at Office Court will operate as a signalized intersection. With the signal in place, the intersection is expected to operate at LOS D or better in all future condition 2020 and 2030 AM and PM scenarios. Even though the LOS for the intersection is D in the 2030 PM scenario, the intersection delay is approaching the threshold between LOS D and LOS E. In order to improve the LOS in the 2030 condition, exclusive eastbound and westbound left turn lanes were added at the intersection. With the exclusive left turn lanes, the total intersection delay decreased by approximately 10 seconds in the AM peak hour and approximately 20 seconds in the PM peak hour. Timing for addition of the minor street left-turn lanes is expected to be largely driven by timing of the TOD implementation.

5. MEDIAN MODIFICATIONS NORTH OF THE ORANGE AVENUE/SAND LAKE ROAD INTERSECTION

Median modifications are proposed north of the Sand Lake Road/Orange Avenue intersection (discussed in more detail in Section 5). Because of these changes, left turning vehicles from the minor roadways and driveways had to be redistributed to either the southbound left turn at Sand Lake Road or the northbound left-turn at Office Court. Appendix G provides the redistribution of the turning vehicles between Sand Lake Road and Office Court based on the future driveway configuration.

BUILD CONDITIONS TRAFFIC ANALYSIS

Figure 40 and Figure 41 display the 2020 AM and PM volumes, LOS, V/C, and delay for all intersections within the study area. Figure 42 and Figure 43 display the 2030 AM and PM volumes, LOS, V/C, and delay for all intersections within the study area. Appendix G contains the software output worksheets for the 2020 and 2030 AM and PM peak hour build conditions analysis.

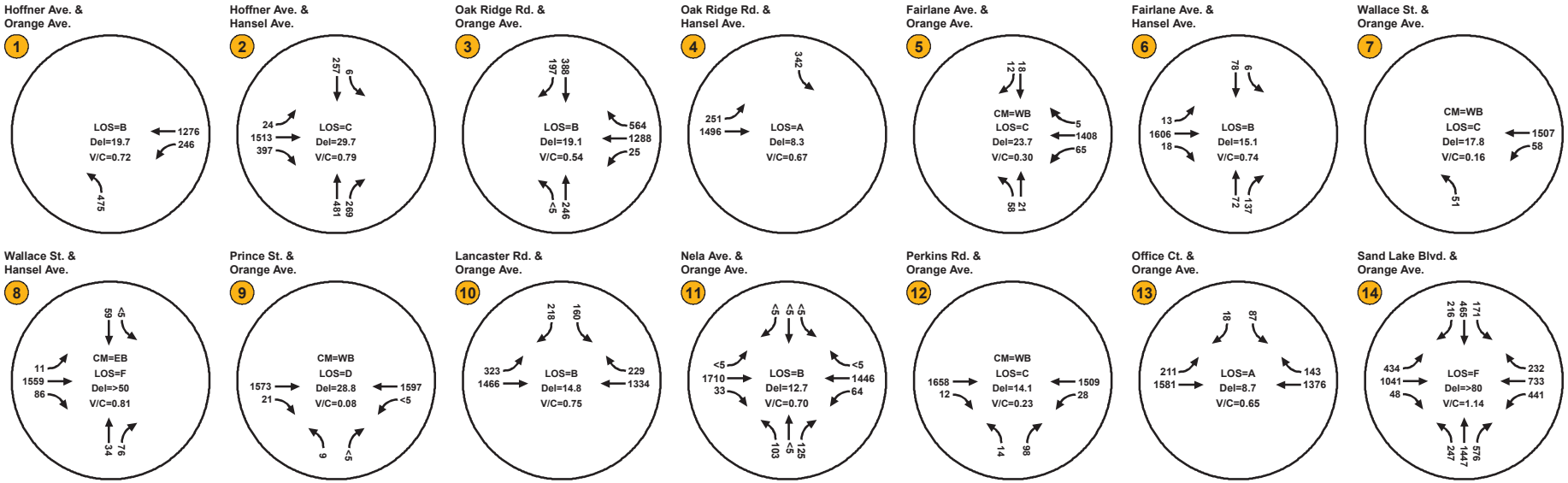


Figure 40 | Build 2020 AM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

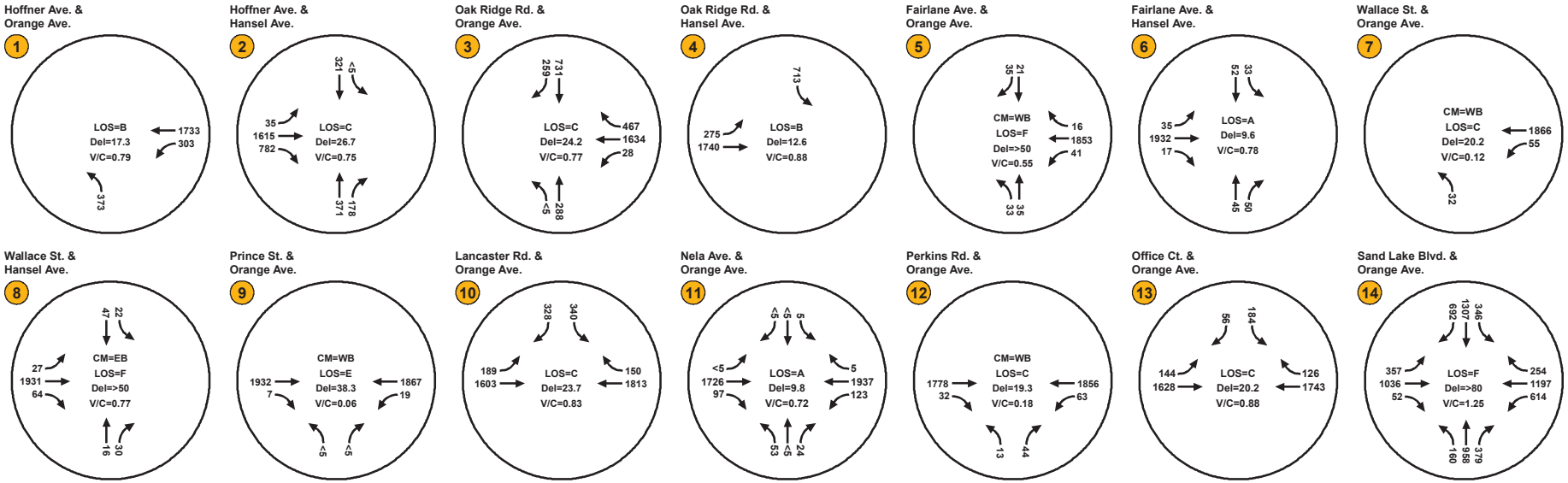


Figure 41 | Build 2020 PM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

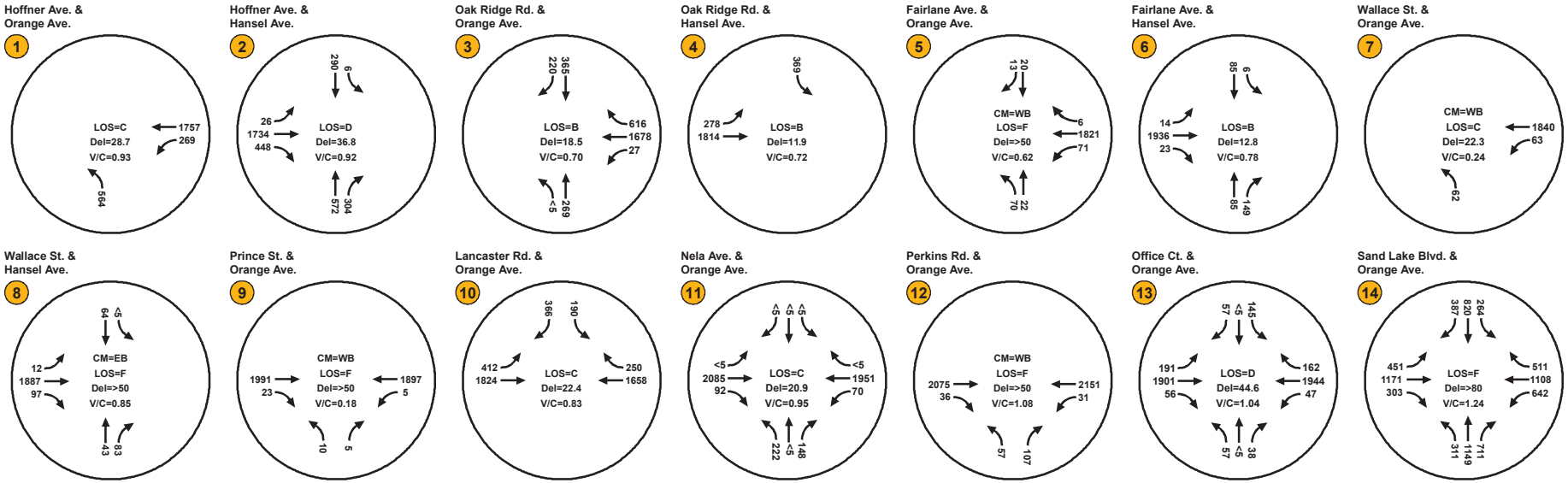


Figure 42 | Build 2030 AM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

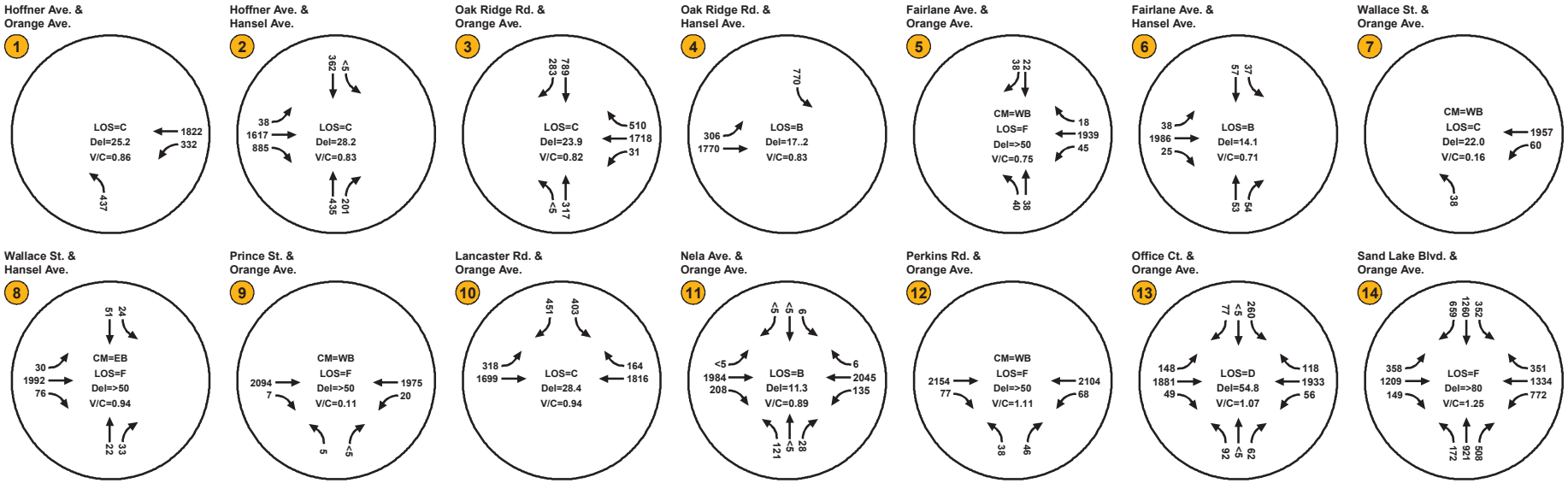


Figure 43 | Build 2030 PM Volumes, LOS, V/C and Delay

Legend

- SunRail Station Site
- # Intersection
- Orange Avenue Corridor Study Area

5
POTENTIAL MULTIMODAL STRATEGIES

5 POTENTIAL MULTIMODAL STRATEGIES

The Orange Avenue Corridor Planning Study Phase 1 aims at improving the corridor for all modes, including pedestrians, bicyclists, transit users, and vehicles. Sections 1 through 4 of the report summarized the existing and future land use and transportation conditions of the study corridor. This analysis set the foundation for various strategies that will address the multimodal needs of the corridor, including potential cross section changes, and spot location improvements. Many of these strategies will help to enhance overall pedestrian and bicycle mobility along the Corridor, and will specifically improve multimodal access to Sand Lake Road Station and expand the reach of SunRail. All these changes will help support the community's redevelopment and TOD goals for Orange Avenue.

The potential strategies discussed in this section were presented to the public at the September 12, 2013 public meeting. The community-supported alternatives were further refined to incorporate public input and more technical analysis. These were then presented to the FDOT Traffic Operations and Roadway Design Departments. Two rounds of FDOT refinements occurred; one in the fall of 2013 and the second in the winter of 2014. The potential strategies incorporate refinements based on FDOT input and this section describes the final recommendations for the Orange Avenue Study Corridor.

The recommendations presented in this section are organized as follows (See Figure 44):

- Southern Portion – Sand Lake Road to Lancaster Road
- Northern Portion – Lancaster Road to Hoffner Avenue
- Corridor-Wide Strategies

The strategies include the following:

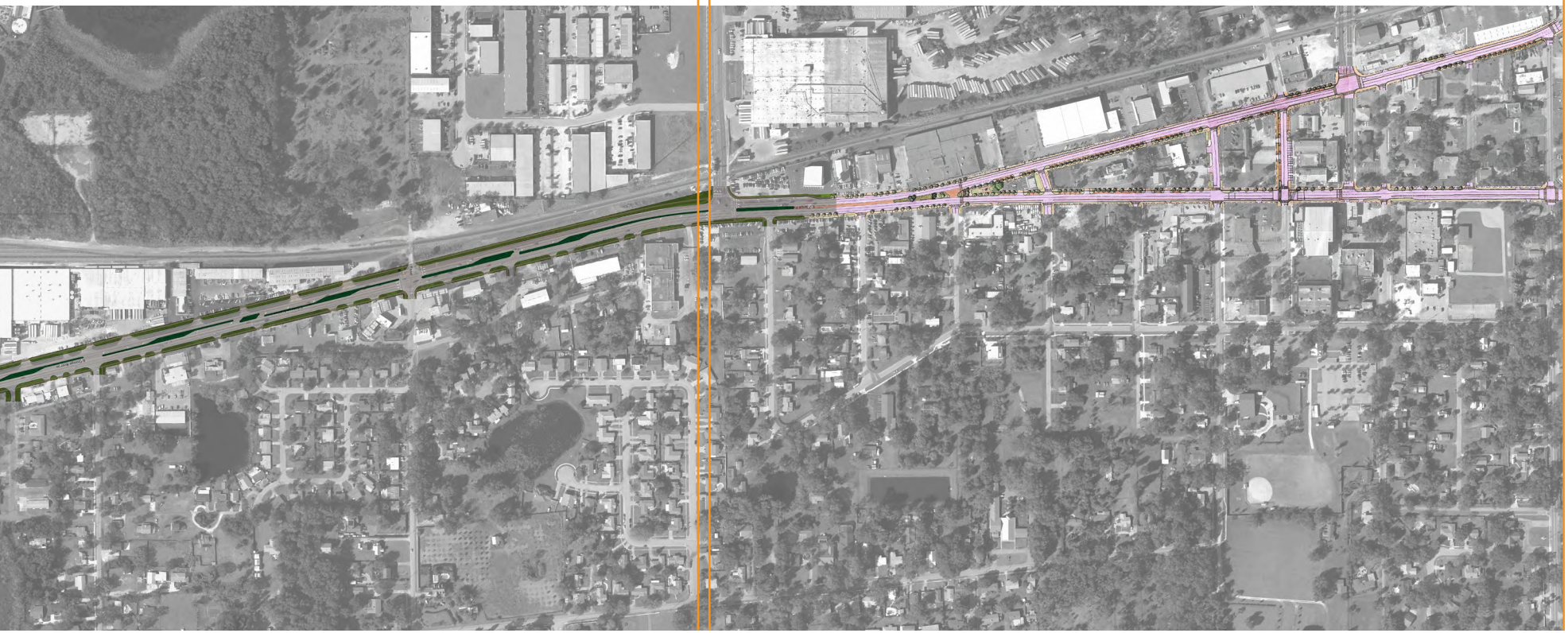
1. Cross section changes: apply to specific sections of the corridor, generally determined the each segment's context
2. Access management changes
3. Location-specific Improvements: intersection improvements, new crossings, and sidewalk enhancements, etc.
4. Transit Improvements
5. Streetscaping Improvements: apply to entire Corridor

Figures 45 and 56 illustrate an overview of the Southern Section and Northern Section recommendations, respectively. The pages that follow discuss the details of each recommendation.

Figure 44 | Southern and Northern Sections of the Study Corridor

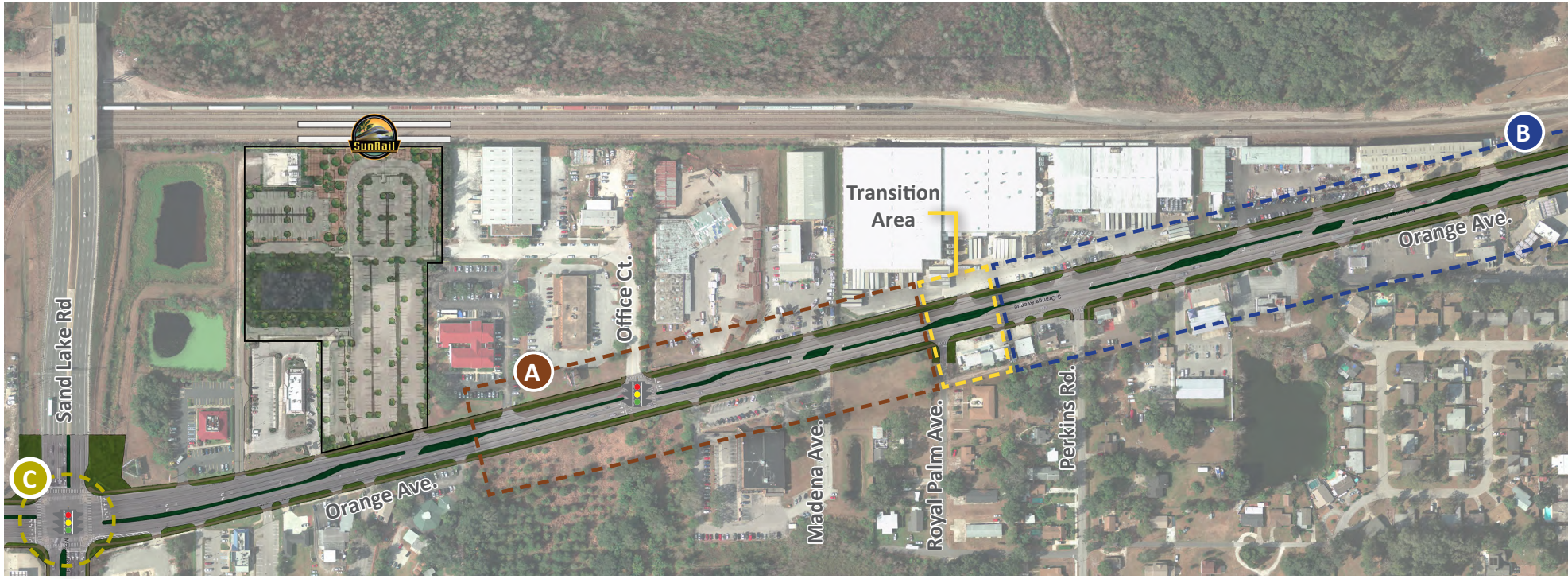
SOUTHERN PORTION

NORTHERN PORTION



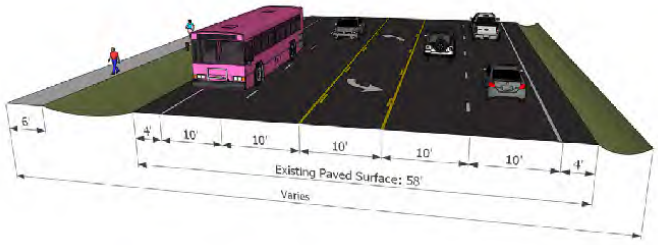

S Orange Avenue

SOUTHERN PORTION

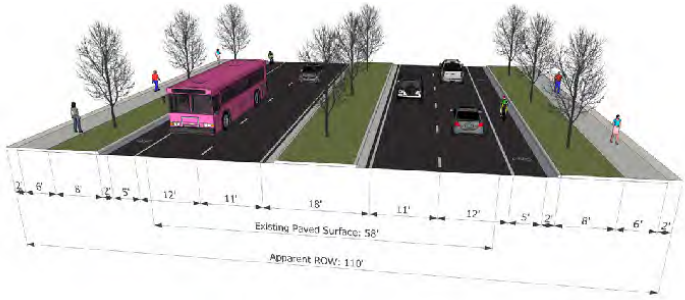


Study Corridor between Sand Lake Road and Lancaster Road

A Recommended Typical Section for Orange Avenue from South of Office Court to Royal Palm Avenue



Existing Typical Section
Open Drainage and Five-Lane Section



Four Lane Divided with Curb and Provision for On-Street Parking

- Add 18-foot raised median
- Add bicycle lanes
- Add sidewalk on east side
- Allows for future on-street parking to be added to both sides of roadway

** Proposed typical sections subject to change pending further project development.*

Figure 45 | Orange Avenue Southern Section Improvements Summary

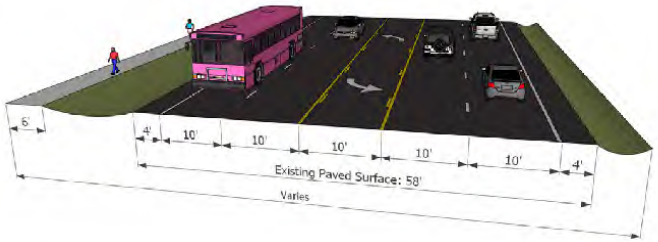
Corridor-Wide Access Management Improvements

- Provides reduction in vehicular conflicts corridor-wide
- Assumes signalized intersections at Office Court and Nela Avenue
- Full median access at Perkins Road for truck accommodations
- Provides opportunities for landscaping enhancements in the median
- At the SunRail Station, a directional median opening is provided between Sand Lake Road and Office Court.

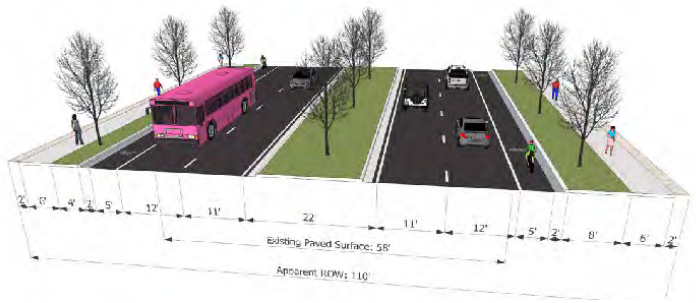
Corridor-Wide Multimodal Improvements

- New bike lanes on both sides of Orange Avenue
- Improve sidewalk on west side of roadway
- Add sidewalk on east side of roadway
- Add crosswalks across Orange Avenue at Office Court to improve pedestrian connectivity and access to SunRail Station in conjunction with future signal

B Recommended Typical Section for Orange Avenue from Royal Palm Avenue to Lancaster Road



Existing Typical Section
Open Drainage and Five-Lane Section



Four Lane Divided with Curb and Wider Median

- Add 22-foot raised median, providing better U-turn capabilities for vehicles
- Add bicycle lanes
- Add sidewalk on east side
- Allows for future on-street parking to be added to the east side of roadway

** Proposed typical sections subject to change pending further project development.*

C Orange Avenue/Sand Lake Road Pedestrian Mobility Improvements

- Eliminate channelized right turn lanes and bring right turn movements under signal control
  - Shortens pedestrian crossing times across every leg of intersection
  - Improve pedestrian safety by eliminating conflicts created by existing right turn channelization

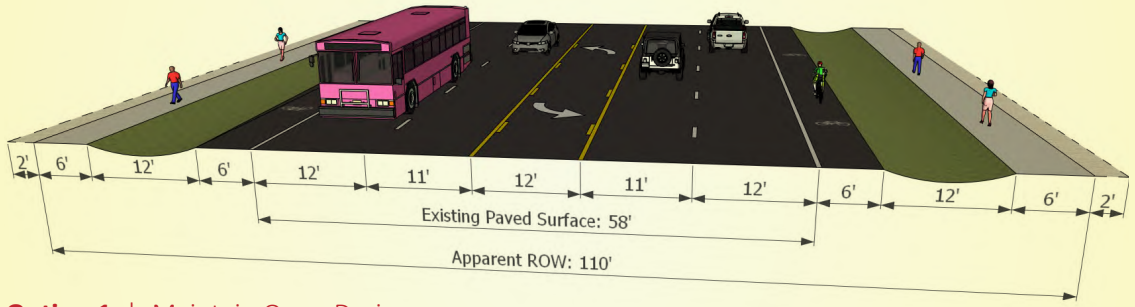
CROSS SECTION CHANGES

With the portion of the study corridor from Sand Lake Road to Lancaster Road, the existing roadway currently has a rural/ suburban typical section with open drainage, a narrow paved shoulder, continuous sidewalk only on the west side of the roadway, and a center two-way left-turn lane. The existing typical section is generally characterized by narrow travel lane widths (approximately 10 foot lanes) and a four foot paved shoulder that is partially overgrown by vegetation.

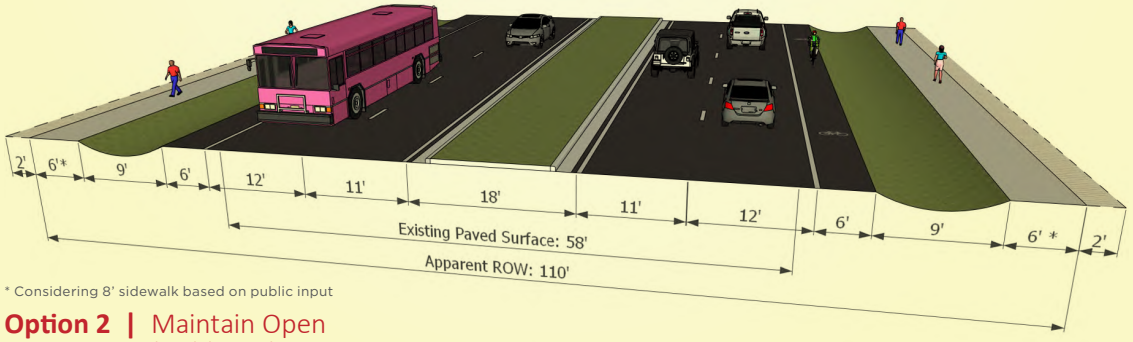
In order to improve operating conditions for all modes, a variety of different cross-section alternatives were developed. The proposed typical section options are developed based on the segments existing and future transportation and land use contexts. The options included maintaining the existing open drainage and two-way left-turn lane as well as options for converting to an "urban" typical section with curb and gutter and a raised median. Orange Avenue in the northern portion of the study area (Lancaster Road to Hoffner Avenue) already has an urban typical section. Therefore, implementing an urban typical section down to Sand Lake Road would provide continuity with the rest of the corridor to the north while also improving conditions for non-auto modes. In general, five-foot bike lanes will be added along the entire length of the Orange Avenue corridor. Where no sidewalk exists (on the east side of the roadway), the proposed typical sections also include adding a six-foot sidewalk.

Five options were initially developed and presented to the public for feedback. These five options are illustrated Figure 46. Based on the feedback from the public meeting, a concept including curb and gutter, bike lanes, and a raised median was preferred. Stakeholders also expressed preference for the accommodation of on-street parking especially as land uses change to more transit-oriented development (TOD) patterns.

Figure 46 | Initial Cross Section Changes considered for the Southern Section

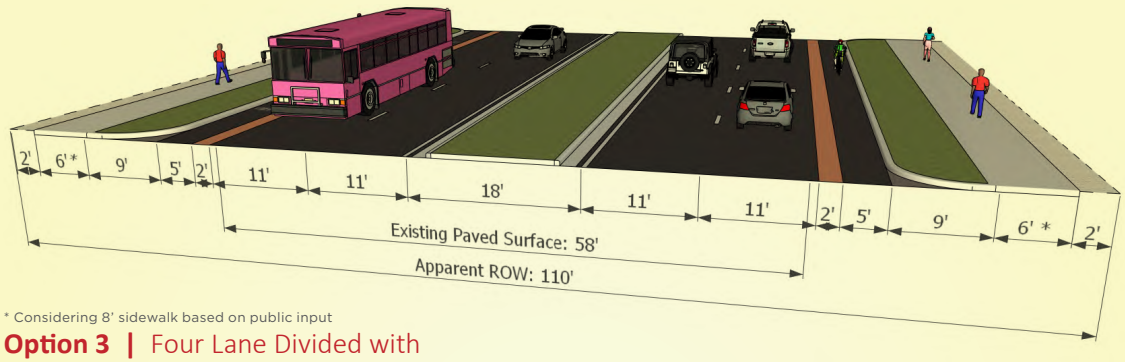


Option 1 | Maintain Open Drainage and Five-Lane Section



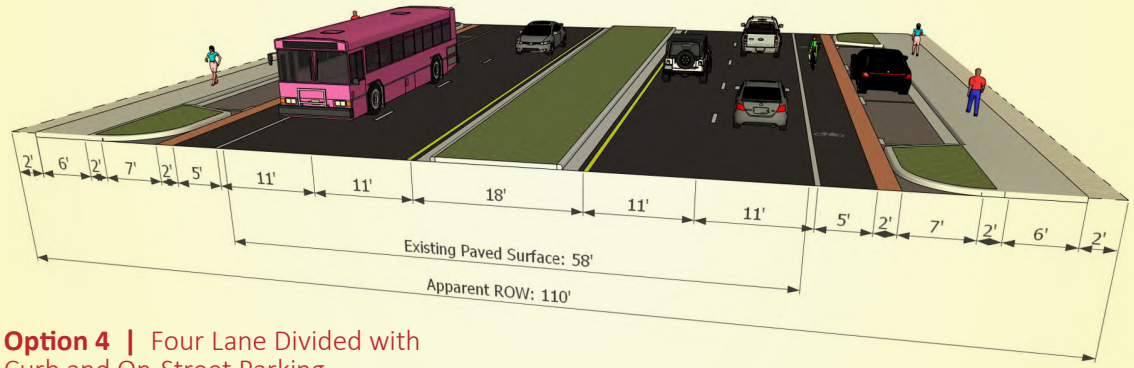
* Considering 8' sidewalk based on public input

Option 2 | Maintain Open Drainage and Add Median

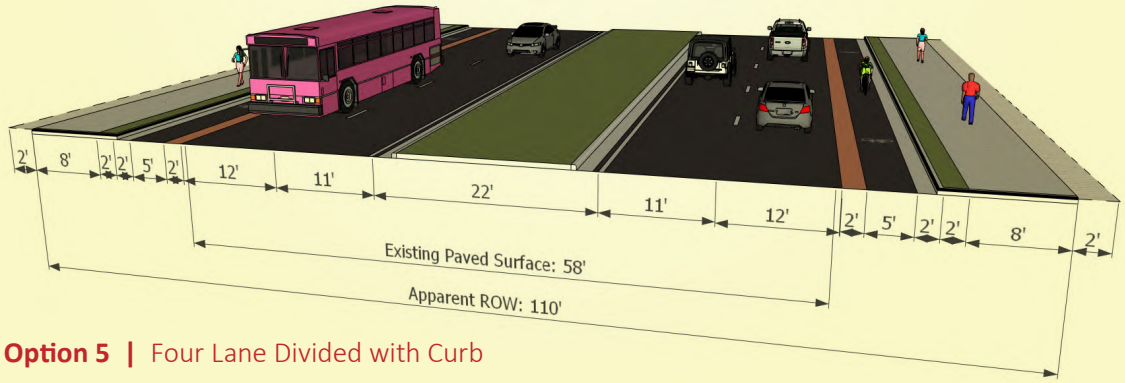


* Considering 8' sidewalk based on public input

Option 3 | Four Lane Divided with Curb and No On-Street Parking



Option 4 | Four Lane Divided with Curb and On-Street Parking



Option 5 | Four Lane Divided with Curb

Based upon stakeholder input and follow-up coordination with FDOT staff, the typical sections were further refined. The process resulted in two different typical sections: (1) a typical section with an 18-foot median is proposed to run from approximately 500' south of Office Court and extend to Royal Palm Avenue and (2) a typical section with a 22-foot median that will span from Royal Palm Avenue to Lancaster Road. The wider 22-foot median is needed in the vicinity of Perkins Road to allow for a full median opening to be maintained. A transition between the 18-foot to 22-foot median will occur in the vicinity of Royal Palm Avenue.

The intersection of Orange Avenue at Perkins Road is not expected to meet warrants for signalization in the near-term. With an unsignalized configuration in the opening year, a 22-foot minimum median is necessary to accommodate vehicles making a through or left-turn movement from the minor street in two stages. Use of a narrower median width would necessitate implementation of a directional median opening (which would restrict minor street through and left-turn movements) at Perkins Road until a traffic signal is warranted based upon volume growth from area redevelopment. A full median opening is desired at Perkins to accommodate existing Industrial uses and corresponding truck traffic.

Adjacent to the SunRail Station, the 18 foot median preserves space on both sides of the roadway to allow for future consideration of on-street parking. North of Royal Palm Avenue, the 22-foot median is achieved by

A Note on On-Street Parking

Incorporating on-street parking into the typical section was preferred because on-street parking can help support multimodal mobility and access to the TOD envisioned through this section of Orange Avenue. On-street parking supports retail uses and creates an additional buffer between sidewalks and the travel lane. When used, on-street parking also introduces additional "friction" along the roadway that help calms traffic. However, because development patterns and land uses do not currently support or require on-street parking, the proposed cross section includes a grass buffer area between the sidewalk and the travel lane. This area can be converted to on-street parking where needed and as redevelopment occurs.

reducing the width of the landscape buffer on the west side of Orange Avenue. Therefore, future consideration of on-street parking would only be preserved on the east side of Orange Avenue between Royal Palm Avenue and Lancaster Road. However, a portion of this segment of Orange Avenue runs immediately adjacent to the railroad line and reduces the potential need for on street parking on the west side of the roadway.

Figures 47 and 49 display the two recommended typical sections for the southern portion of Orange Avenue. Figure 45 displays the location of where these typical sections would be applied along the corridor. While the typical sections presented in Figures 47 and 49 represent the recommended configuration for the corridor based upon previous public and stakeholder input, an alternative typical section illustrated in Figure 48 is also recommended to be carried forward for further evaluation. This typical section represents the use of a 22-foot median width for the segment from south of Office Court to Lancaster Road. While either of the typical section options will accommodate passenger vehicle u-turns, the 22-foot median width is desirable for ease of u-turn movements. The 22-foot median width also allows for improved vehicle channelization at directional median openings.

To achieve the wider median shown in Figure 48, the typical section in Figure 47 was modified to remove a foot from the outside travel lane in each direction and a foot from the landscape buffer on each side. The resulting landscape width of 7 feet plus the gutter pan width would result in a parking space width of 8.5 feet from face of curb to the edge of the bike lane if on-street parking is added in the future. While this meets the FDOT Plans Preparation Manual requirement for a minimum of 8 feet of parking space width, it does not provide as much buffer between the car doors and bike lane as is provided in the typical section shown in Figure 47. However, it does maintain future consideration for on-street parking on both sides of Orange Avenue.

Proceeding forward, the magnitude of change to the Orange Avenue cross-section between Sand Lake Road and Lancaster Road is expected to require some form of environmental study prior to design. Within the segment from south of Office Court to Royal Palm Avenue, this study recommends the use of the typical section illustrated in Figure 47 (with an 18-foot median). However, the typical section should be further reviewed as part of the environmental study based upon drainage implications and other factors.

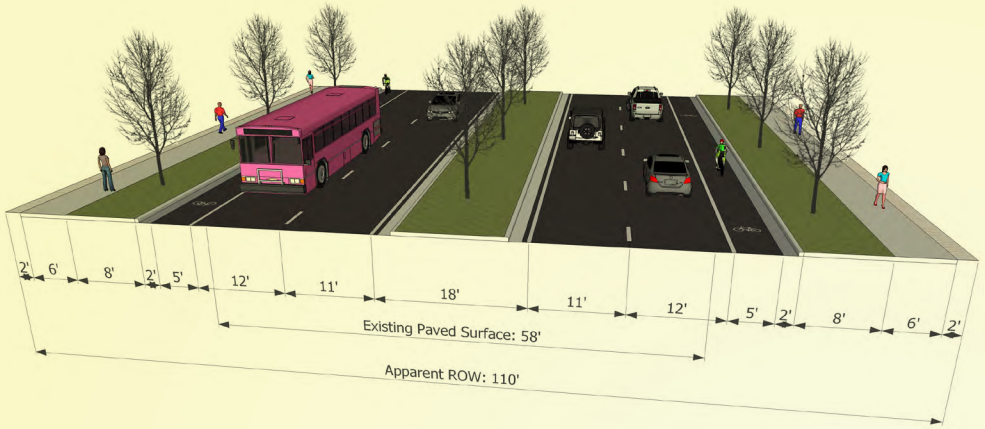


Figure 47 | Recommended Typical Section – South of Office Court to Royal Palm Avenue

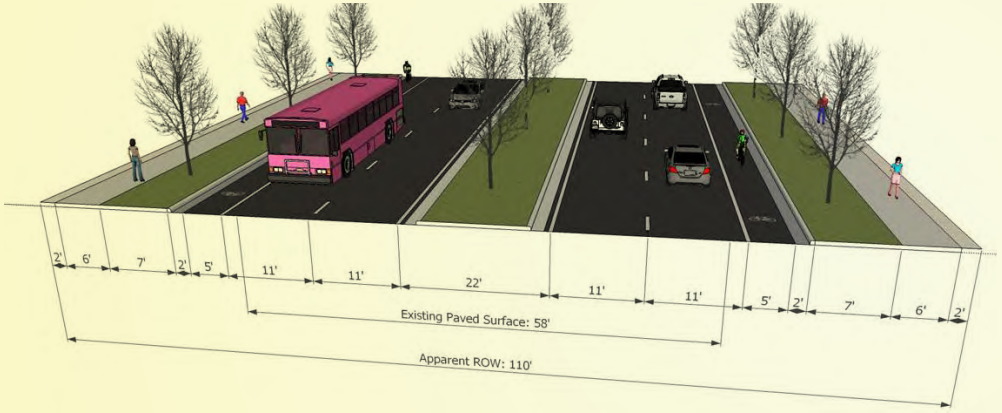


Figure 48 | Alternative Typical Section – South of Office Court to Royal Palm Avenue

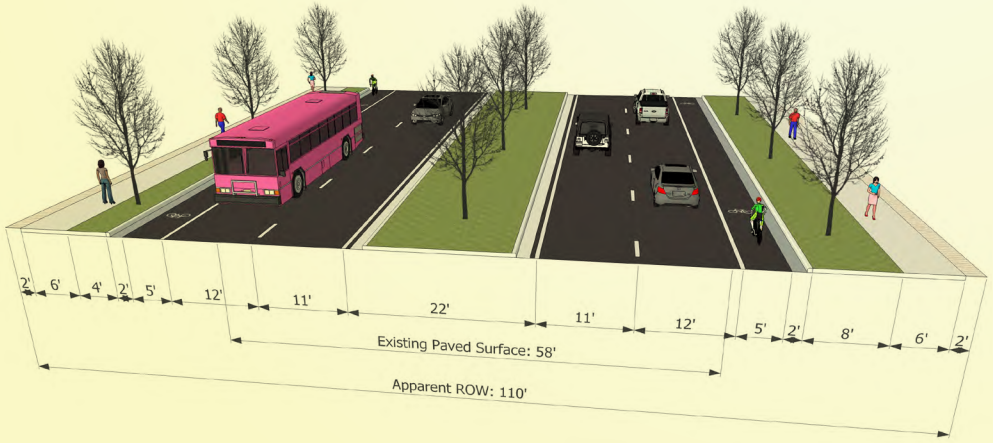


Figure 49 | Recommended Typical Section – Perkins Road to Lancaster Road

ACCESS MANAGEMENT IMPROVEMENTS

Where medians are proposed to replace TWLTL, access management becomes a critical component of the Corridor's enhancement. The implementation of a median greatly reduces the number of potential vehicle conflict points. Figure 50 below shows the potential conflict points on a four-lane undivided facility versus a four lane divided facility.

As part of this planning study, the following assumptions were applied for identification of an initial access management concept with implementation of a raised median between Sand Lake Road and Lancaster Road.

- Nela Avenue would remain a signalized intersection and Office Court would become a signalized intersection in the future.
- The full median opening at Perkins Road would remain to facilitate truck operations to the existing industrial uses.
- All other median openings would be directional openings that would allow left-turns from the major roadway but would prohibit minor-street left and through movements. Minor street vehicles desiring to make these movements would instead turn right followed but a u-turn at the next downstream median opening.
- Directional and full median openings would comply with State access management spacing standards (Florida Administrative Rule 14-97).

Figure 45 displays the conceptual plan view of the corridor and possible access management configuration (placement of directional median openings). The concept shown is subject to additional refinement based on further stakeholder engagement and technical analysis, and the final access management plan will be recommended in later phases of project development.

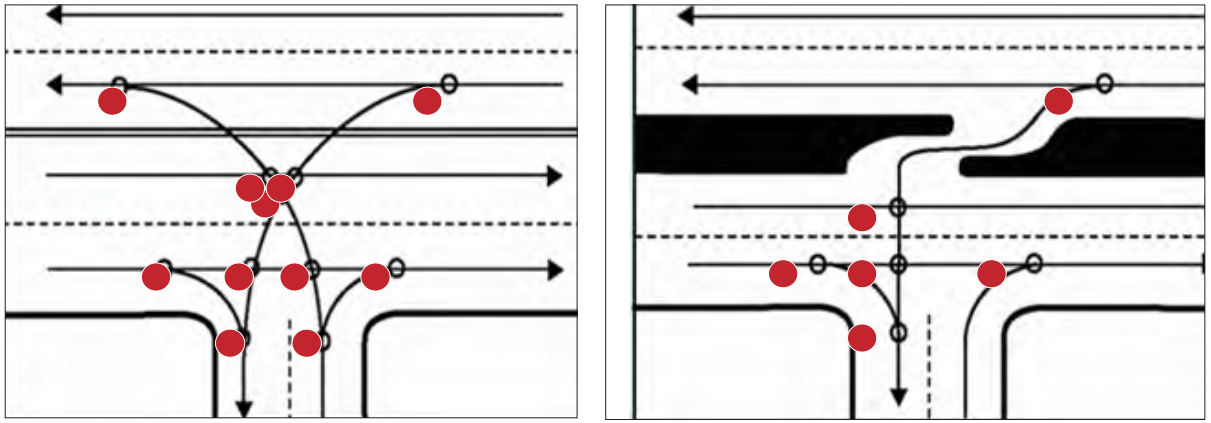


Figure 50 | Conflict Points 4-Lane Undivided vs 4-Lane Divided

LOCATION SPECIFIC IMPROVEMENTS

SAND LAKE ROAD PEDESTRIAN IMPROVEMENTS

ISSUE

All of the right turn lanes at the intersection of Sand Lake Road and Orange Avenue are currently channelized. Channelized right turn lanes provide vehicles with a free-flowing lane (not controlled by signals or stop signs) with which to make right turns. This creates a conflict between pedestrians and vehicles where pedestrian often having to wait for gaps in traffic while vehicles can travel at a high speed and unimpeded. Although the channelized right turn lanes at this intersection have pedestrian crosswalks, studies have shown that yielding compliance among drivers is low.[1] Many vehicle-pedestrian crashes occur while vehicles are making these unimpeded right turns.

At this intersection, the free-flow channelized right turn lanes present challenges for pedestrians due to the uncontrolled conditions. Push buttons for activating the crosswalks across Orange Avenue or Sand Lake Road are located in the "pork chop" islands. To access the push button on these islands, the pedestrian must cross the free-flowing right turn lane. With the high vehicle volumes and speeds, and driver attention being diverted away from the pedestrian, field observations noted low vehicle yielding rates.

1 National Research Council. NCHRP Report 674: Crossing Solutions at Roundabouts and Channelized Right Turn Lanes for Pedestrians with Vision Disabilities. Washington, DC. 2011

POTENTIAL SOLUTIONS

Options considered as part of the study included: signalization of the existing channelized right-turn lane, implementation of Rectangular Rapid Flashing Beacons (RRFB) in conjunction with the existing channelized turn lane, and removal of the channelization to instead bring the right-turn lanes into the intersection.

- Signalizing the existing channelized right-turn bypass lane would provide a controlled crossing of the channelized right turn lanes. However, it could have a negative impact of actually increasing delay for pedestrians. It could take up to three full signal cycles for a pedestrian to cross the street (one cycle to cross the near side channelized turn lane, one cycle to cross the major roadway, and one cycle to cross the channelized turn lane on the far side of the intersection). Signalizing the existing crossing would also require additional infrastructure including the potential for new signal poles and mast arms. It is also expected to have a slight reduction in intersection operational performance.
- Use of RRFBs with the existing channelized right-turn lane would make the pedestrian crossing more conspicuous to drivers and promote increased yield rates to pedestrians. However, this measure does not provide a controlled crossing and does not guarantee that vehicles will yield to pedestrians. Additionally, the RRFB is typically reserved for mid-block locations and it is unclear whether the proximity to the signalized intersection at Orange Ave/ Sand Lake Rd would meet the criteria for FHWA's interim approval of the RRFB device.
- Removing the right-turn channelization and bringing the right-turn lanes into the signalized intersection provides the benefit of a controlled pedestrian crossing while also minimizing pedestrian delay by allowing pedestrians to cross the roadway within one cycle. It does result in a tradeoff of increasing the crossing distance for a pedestrian, but reduces the overall crossing time since it would not take multiple signal cycles cross the entire roadway. It is also expected to have a slight reduction in intersection vehicular operation performance.

Figure 51 | Potential Solutions at the Sand Lake Road/ Orange Ave Intersection

Based upon a review of the possible options and coordination with FDOT staff, the project team recommends removal of the channelized right-turn lanes to improve pedestrian accommodation. While this option does impact intersection operational performance, the impact is expected to be relatively minor for the northbound, eastbound, and westbound

approaches. The northbound and eastbound channelized right-turn lanes are yield controlled (instead of free flow) and the westbound channelized right-turn lane is frequently blocked during the peak hours by westbound through vehicle queues which limits the capacity of the free flow lane. Removal of the free-flow operations for the southbound right-turn movement will increase vehicle queues and delay to the intersection which will increase vehicle queuing on the southbound approach.

The OIA Connector Study was underway concurrent with this planning study and was considering the Sand Lake Road corridor was one option for a future premium transit connection to Orlando International Airport. No final decisions had been made on the route alignment or transit technology (bus rapid transit, light rail, etc.) at the time of this study. Therefore, implementation of the channelized right-turn lane removal will require further coordination with the OIA Connector project once that project reaches completion.

EXTENSION OF RAISED TRAFFIC SEPARATOR AT SAND LAKE ROAD

ISSUE

As seen in Figure 52, there is a two-way left turn lane adjacent to the median on the north side of the Orange Avenue/Sand Lake Road intersection. This unique configuration results in an undesirable condition where full access is provided though the dual southbound left turn lane at the intersection. Vehicles attempting to make a left turn out of the Denny's and McDonald's restaurants must find gaps in the southbound through traffic queue, which can limit sight distance for conflicting vehicles. Additionally, residents voiced concerns about vehicles regularly using the two-way left turn lane to bypass the southbound through queue to reach the southbound left turn lanes.

POTENTIAL SOLUTION

In order to address this, a short-term improvement is extending the existing concrete traffic separator north and providing a raised median to eliminate the two-way left turn lane between Sand Lake Road and Lancaster Road, as seen in Figure 53. This will help prevent drivers from using the turn lane to bypass the queue at the intersection while still allowing for access to the SunRail station and other uses on the west side of the road. This is compatible with the ultimate corridor recommendations which involved implementation of a raised median from Sand Lake Road to Lancaster Road.

Figure 52 | Existing Roadway Configuration North of Sand Lake Road Intersection

Figure 53 | Proposed Roadway Configuration North of Sand Lake Road Intersection

SAND LAKE ROAD AND OFFICE COURT INTERSECTION

ISSUE

Office Court is the main access point into the Sand Lake Road SunRail Station. A signal will be installed and will operate under flashing yellow condition in the interim period, until the full signalization is warranted. The plans for this intersection do not include crosswalks across the north and south (Orange Avenue) legs of the intersection.

POTENTIAL SOLUTION

The recommendation is to install crosswalks across Orange Avenue once the full signalization at Office Court is warranted.

Figure 54 | Install Crosswalks at the intersection of Office Court and Orange Avenue

TRANSIT IMPROVEMENTS

During stakeholder interviews, the study team met with LYNX to discuss the opportunities and challenges facing bus service along the Orange Avenue Corridor. LYNX staff identified implementation of an urban typical section along the corridor and queue jumps at the Orange Avenue/Sand Lake Road intersection as two possible opportunity areas to review and consider during this study. Also discussed was the opportunity to enhance amenities at bus stops throughout the corridor. As part of the public involvement for the project, public comments identified a desire for consideration of dedicated bus pullouts. This study reviews the planning level feasibility of pull outs, queue jumps, and bus stop amenities along the corridor. The study also reviewed the possibility of relocating three bus stops based on future roadway network and connection to the SunRail Station area.

REFINE BUS STOP LOCATIONS

ISSUE

Bus stop locations should be positioned to create the greatest level of access along the corridor as well as consider potential locations where pedestrians might cross the street as a result of the stop location. Ideal locations for stops include major existing or potential future transit generators or destinations such as hospitals, schools, and retail and entertainment destinations, among others. When possible, transit stops should be placed near signalized intersections or mid-block pedestrian crossings to ensure ease and safety for access and transfers. With this information in mind, an analysis of the transit stops along the corridor was completed to determine if the any bus stop locations should be modified to enable better transit access. This analysis included a consideration of the ridership (number of boardings and alightings) at each stop, the surrounding land uses, and the locations of crosswalks (existing and proposed).

POTENTIAL SOLUTION

The following potential bus stop location changes were identified in the table on the next page and shown in Figure 55.

ENHANCE BUS STOP AMENITIES

ISSUE

The majority of the bus stops along the Study Corridor do not have shelters, and some have no amenities at all (i.e. benches, trash cans, etc.). Transit amenities are important in attracting choice riders, as these riders make the decision to ride transit based on convenience and comfort. Seating is considered a basic element needed, and transit shelters are ideal to protect riders from the sun, heat, and rain typical in Central Florida.

POTENTIAL SOLUTION

Existing transit ridership does not currently justify the improved level of amenity at a majority of the stops within the study area (LYNX's current standard targets a shelter for stops that have over 100 combined boardings and alightings per day). As the corridor continues to evolve and with the introduction of SunRail, private and public infrastructure investments should incorporate addition of transit shelters and amenities at key transit attractors and generators.

Stop Name	Proposed	Location	Distance from Current Stop
3036	Northwest Corner of Office Court Intersection	350’ South	Offices at Office Court, Post Office
3159	Southeast Corner of Office Court Intersection	300’ South	Offices at Office Court, Post Office
3033	Northwest Corner of Lancaster Road Intersection	400’ North	Businesses S of Lancaster Rd

Figure 55 | Potential Changes to Bus Stop Locations

Legend

- Existing Transit Stop
- Proposed Transit Stop

Note on Queue Jump Lanes at the Intersection of Sand Lake Road

During the course of the stakeholder engagement, the idea of installing queue jumps at Sand Lake Road and Orange Avenue was discussed to mitigate the impacts of traffic on bus reliability.

Queue jumps provide preference to buses at intersections by providing an additional travel lane on the approach to a signalized intersection that is restricted to transit vehicles. The queue jump is operated on a phase separate from the rest of the signal, allowing the transit vehicles to pass through the intersection and not conflict with vehicles traveling in the same direction. Vehicles in the queue jump are able to bypass queued traffic (hence the name queue jump) at an intersection, thus reducing the delay of transit vehicles through heavily congested intersections.

Queue jumps work well in specific situations: the intersection should be congested, there should not be high volumes of right turning vehicles, and there should be enough buses running per hour to keep the queue jump occupied at most times to dissuade others from using it improperly. In the case of Orange Avenue, a queue jump may be beneficial if transit service increases in the future (currently, three buses per hour operate on Orange Avenue through this intersection).

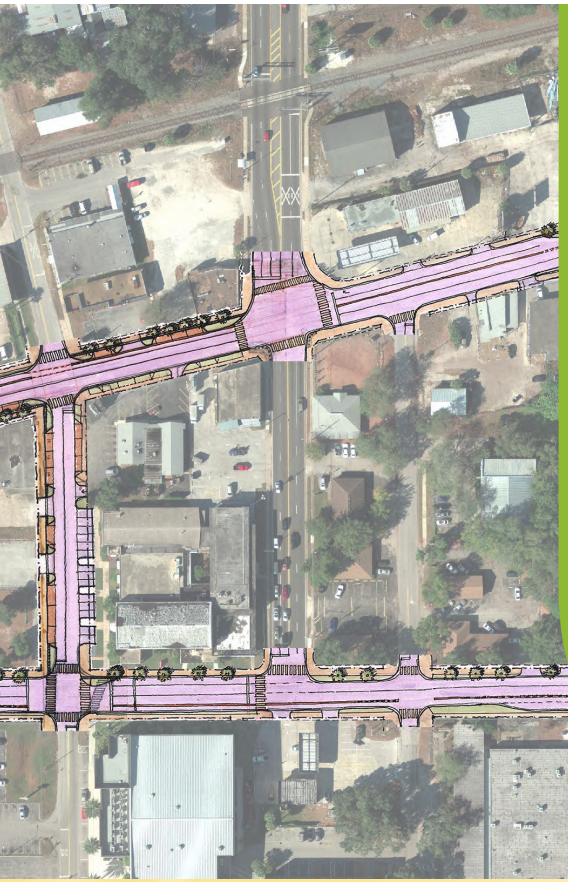
Based on site constraints and uncertainty regarding the possible impacts to the intersection from the OIA Connector, a queue jump lane was not advanced as part of this study. Future evaluation of a queue jump lane should consider the potential alignment of the OIA Connector and the high volumes of southbound through and southbound right turning vehicles as part of a more detailed cost/benefit analysis.

Note on Bus Pull Outs

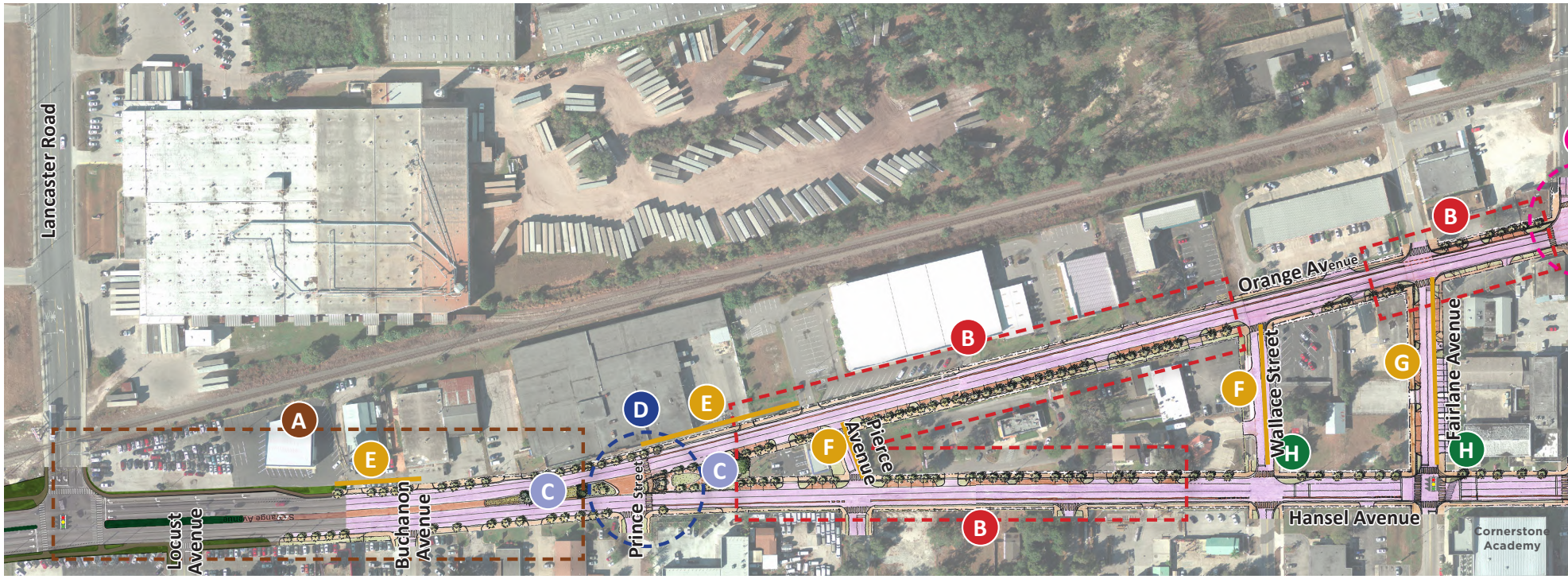
Bus pull outs are typically used to provide a designated space for buses to pick up and drop off passengers that is out of the way of traffic. By removing the bus from the through lane, it can help to improve traffic flow. This treatment is appropriate in congested locations with high levels of transit usage. However, the pull outs also present a challenge to buses by requiring them to merge back into traffic after using the bus stop, which can cause delay to the bus when other drivers do not yield to the bus. Although many cities have yield to bus laws, compliance and enforcement are commonly low.

On the Orange Avenue corridor, the corridor currently has an average of three buses per hour in each direction (Link 11 runs every 30 minutes and Link 18 runs every hour). However, because of the relatively low ridership (discussed in Chapter 1), it is unlikely that the advantages of bus pull outs would outweigh the potential challenges. The two bus stops (which are on Orange Avenue in front of the SunRail station) with the highest ridership have been or will be planned shortly to be relocated directly at the Sand Lake SunRail Station.


S Orange Avenue

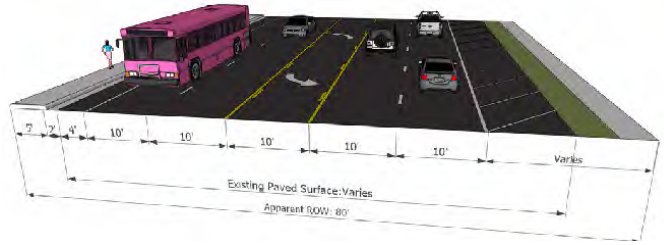


NORTHERN PORTION

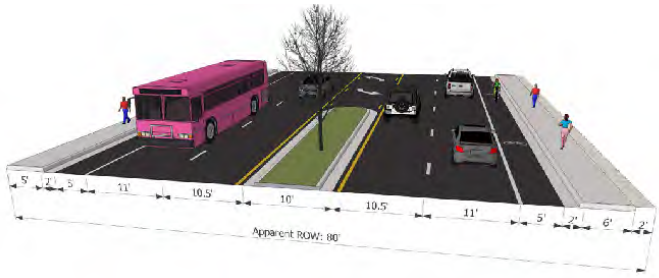


Lancaster Road to Hoffner Avenue

A Recommended Typical Section for Orange Avenue from Lancaster Road to Prince Street



Existing Typical Section

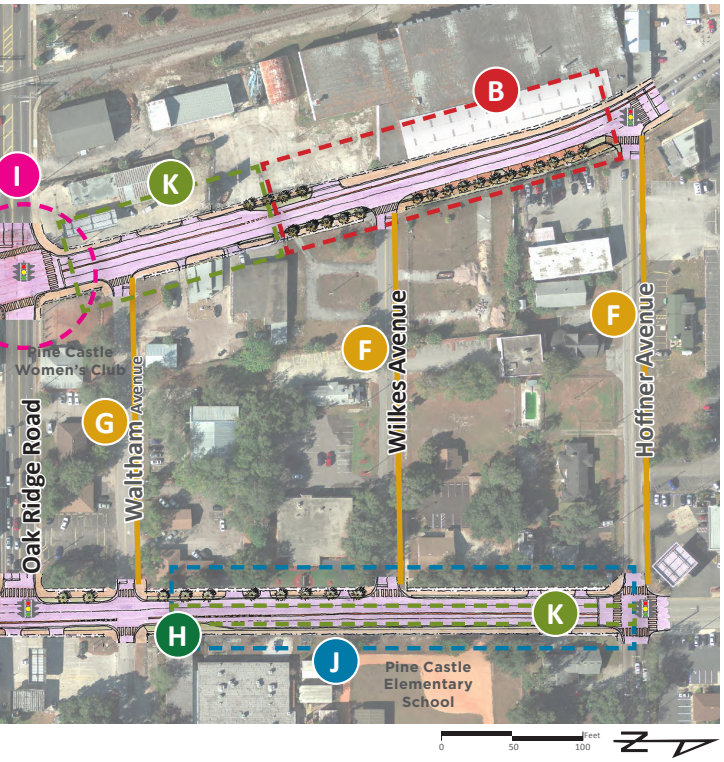


Four Lane Divided

- Add raised traffic separator from Lancaster Road to approximately 150 feet north of intersection
- Add bicycle lanes
- Add curb and gutter to portions missing from east side of roadway

Typical section subject to change pending further project development.

Figure 56 | Orange Avenue Northern Section Improvements Summary



C Widen Median

- Improve channelization compared to existing configuration
- Potential addition of landscaping

D Potential Pedestrian Crossing

- Further evaluate one potential pedestrian crossing between Prince Street and Pierce Avenue (crossing shown at Prince St. for illustrative purposes only). Further study would identify specific location, corresponding signing/markings, and other applicable crossing treatments.

E Sidewalk Enhancements along Orange Avenue

- Replace sidewalks in poor condition

F Sidewalk Enhancements along Local Streets

- Add sidewalks to both sides of the street
- Improvements to non-state facilities will be the responsibility of Orange County

G Sidewalk Enhancements along Local Streets

- Fill in gaps in existing sidewalks
- Improvements to non-state facilities will be the responsibility of Orange County

H Add Bulb-Outs

- Reduce pedestrian crossing distance
- Better define on-street parking
- Reduce opportunities for tractor trailer truck parking

I Orange Avenue/Oak Ridge Road Intersection Improvements

- Adjustments to markings on eastbound approach to improve vehicle alignment (Implemented by FDOT in January 2014)
- Reduce curb radius in the southeast corner

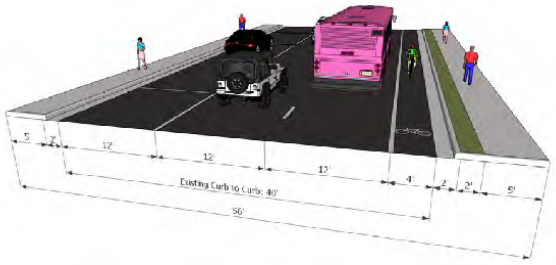
J Extension of Northbound Right Turn Lane

- Extends vehicle storage for high volume right turn movements
- Will help prevent right turning vehicles from blocking through lanes

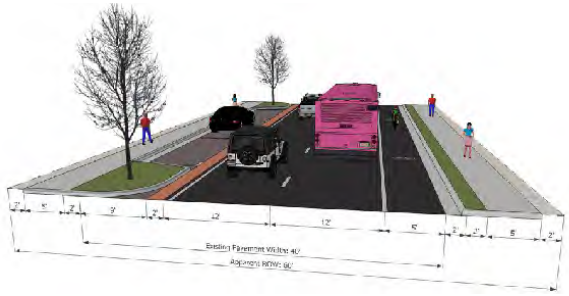
K Green Lanes for Bicycles

- Improves awareness of bicycle/ vehicle conflict points
- Use of this treatment is contingent upon outcome of FDOT green lanes pilot study

B Recommended Typical Section for Orange Avenue/ Hansel Avenue from Prince Street to Hoffner Avenue



Existing Typical Section



One-Way, Enhancing Areas with On-Street Parking
- Add bulb outs to define and organize on-street parking
- Widen existing bike lane
- Buffer between on-street parking and travel lanes

Typical section subject to change pending further project development.

CROSS SECTION CHANGES

Within the northern portion of the study corridor from Lancaster Road to Hoffner Avenue, the majority of the existing roadway currently has an urban typical section with existing curb and gutter and two travel lanes in each direction. Portions of the corridor also have on-street parking. Marked bike lanes, and sidewalk on both sides of the roadway are provided along the majority of Orange Avenue between Lancaster Road and Hoffner Avenue. However, there are portions of the corridor where sidewalk repair/replacement is needed. A small segment of Orange Avenue near Lancaster Road is also currently missing curb and gutter, as well as sidewalk, on the east side of the roadway. Several possible scenarios were explored within the northern portion of the study corridor to evaluate opportunities to better define on-street parking, deter overnight tractor-trailer parking, reduce pedestrian crossing distances, encourage slower vehicle speeds, and provide opportunities for enhanced landscaping/streetscaping. The discussion that follows outlines the various typical section alternatives that were considered.

LANCASTER ROAD TO PRINCE STREET

Immediately north of Lancaster Road, to Prince Street, the existing roadway features two travel lanes in each direction and a center two-way left-turn lane. Sidewalks, marked bike lanes, and curb and gutter are present on the west side of Orange Avenue. The east side of Orange Avenue has no marked bike lane and incomplete sidewalks. The portion of Orange Avenue from Lancaster to Buchanon Avenue also has portions with a paved shoulder (no curb and gutter) as shown in Figure 15 and Figure 56.

The recommended typical section includes the addition of a marked bike lane, curb and gutter, and a new sidewalk constructed along the east side of Orange Avenue as illustrated in Figure 57. The improvements would also include the addition of a raised median in the immediate vicinity of the Orange Avenue/Lancaster Road intersection that transitions back to the existing two-way left-turn lane north of Locust Avenue. The raised median would provide improved access management in the vicinity of the traffic signal at Lancaster Road. Residents along Locust Avenue would continue to maintain right-in/right-out access onto Orange Avenue. Network connectivity allows for residents along Locust Avenue to make left-turns onto Orange Avenue via Buchanon Avenue.

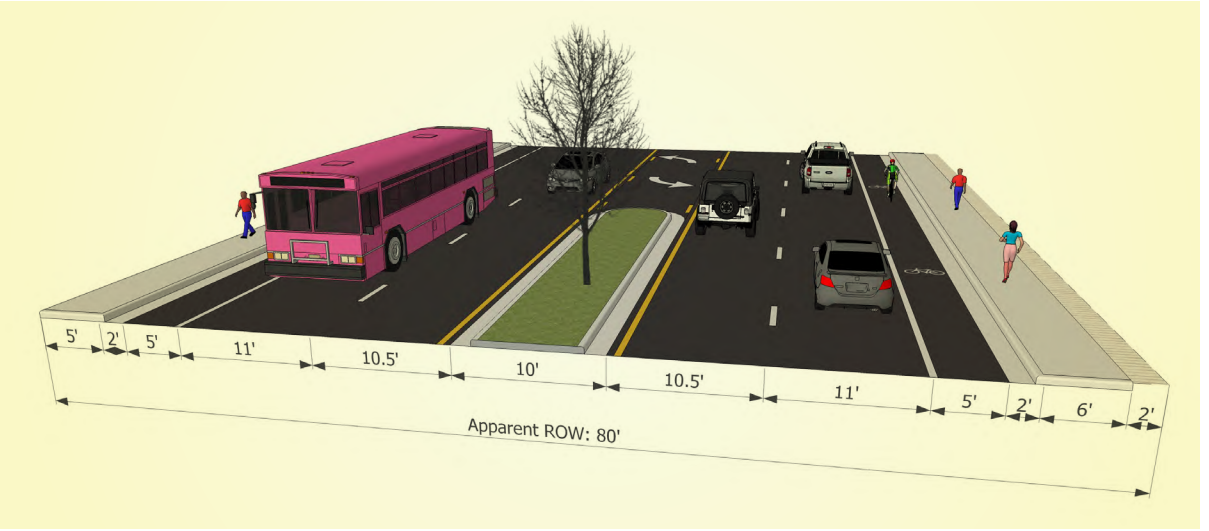
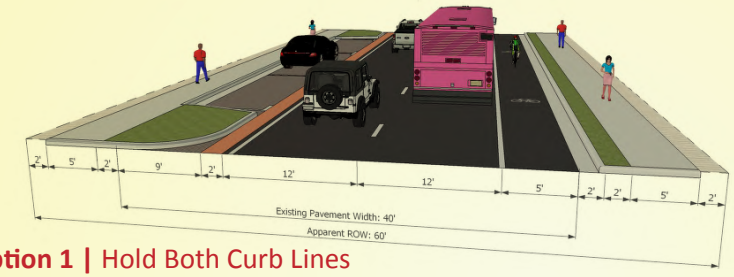


Figure 57 | Typical Section Proposed - Lancaster Road to Prince Street

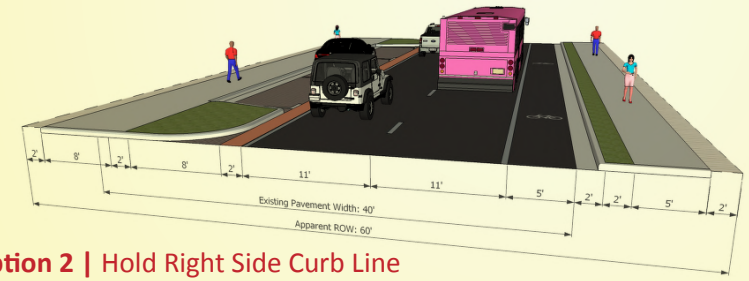
PRINCE STREET TO HOFFNER AVENUE

Within the one-way pair between Prince Street and Hoffner Avenue, the existing urban typical section features two travel lanes in each direction along with an extra lane that is intermittently used for on-street parking, a turn-lane, or is simply hatched out. As illustrated in Figure 15 and Figure 56, a marked bike lane, sidewalks on both sides of the roadway, and curb and gutter are all currently present within this portion of Orange Avenue. Adjacent to areas with on existing on-street parking the study team evaluated possible enhancements to try to achieved one or more of the following objectives: discourage long-term tractor-trailer truck parking, better define the on-street parking areas to avoid sight distance obstructions or visibility of pedestrians, reduce the pedestrian crossing distance, widen the existing bike lanes, or widen the sidewalk adjacent to the on-street parking. Curb extensions (also called bulb outs) are one strategy that was incorporated into the conceptual typical sections to address some of these objectives. A bulb out extends the sidewalk into the parking lane to narrow the roadway and provide additional pedestrian space at intersections, midblock crossings, and transit stops. The bulb-out can also help organize on-street parking; whereas a striped out no-parking area cannot, a bulb-out prevents a vehicle from illegally parking too close to an intersection and obstructing sight distance. The spacing of the bulb-outs can also be established to prevent tractor-trailer truck parking. The main benefit of curb extensions is that they reduce the pedestrian crossing distance, thus reducing exposure to vehicles. They also improve visibility between pedestrians and motorists by allowing pedestrians to approach the edge of the parking lane without entering the roadway to better see oncoming vehicles. Regarding transit, curb extensions provide additional waiting space for riders that can be used for additional amenities such as benches or shelters. Finally, they can help to reduce vehicle turn speeds by physically and visually narrowing the roadway.

The recommended option, illustrated as Option 1 in Figure 58 holds both existing curb lines and adjusts the width of the on-street parking space to incorporate a defined buffer from the adjacent travel lane as well as to increase the width of the bike lane from 4 to 5 feet in the areas adjacent to the on-street parking. The project team also considered a second option, illustrated in Figure 58, which would hold the curbline on the right-side of the roadway, adjust the travel lane width from 12 feet to 11 feet, an move the left-side curbline in order to provide a wider sidewalk adjacent to the on-street parking. However, the simpler lower-cost improvement Option 1 that maintained the existing curblines was more strongly supported in the public meetings.



Option 1 | Hold Both Curb Lines



Option 2 | Hold Right Side Curb Line

Figure 58 | Typical Section Proposed - Prince Street to Hoffner Street

LOCATION SPECIFIC IMPROVEMENTS

WIDEN THE MEDIAN BETWEEN SOUTH OF PRINCE STREET AND PIERCE AVENUE

ISSUE

Speeding along the one-way pair section of the Corridor has been cited as a concern by stakeholders. Also, the Pine Castle neighborhood has expressed interest in better branding the community and improving aesthetics along the Corridor. There is currently a median extending from south of Prince Street to Pierce Avenue, which is close to the heart of the Pine Castle neighborhood and is not currently being utilized. This is also the beginning of the divergence of Orange Avenue into a one-way pair. Adjacent to the median is up to 12 feet of pavement that is currently striped out. This extra pavement results in an unnecessarily wide roadway that lacks channelization for drivers and does nothing to discourage speeding. The extra striped out pavement is also a missed opportunity for additional space for community enhancement.

POTENTIAL SOLUTION

Widening the median in this area would help to provide improved channelization, reduce the width of the cross-section, promote slower speeds, and improve opportunities for aesthetic enhancement. As seen as Recommendation C on Figure 56 and in Figure 59, the median would be widened in the areas just north and south of Prince Street. This plan would allow the area, which is currently not utilized, to become a potential community amenity. A small park might be an amenity that could be further explored to provide a gateway feature as well as providing a helpful pedestrian refuge for those crossing Orange Avenue and Hansel Avenue. As a gateway feature for the Pine Castle neighborhood, the widened median would help to visually reinforce to drivers that they are traveling within a community rather than on a high-speed facility.

MID-BLOCK CROSSING AT PRINCE STREET

ISSUE

Stakeholders expressed the need for more and improved crossing opportunities along Orange Avenue. There are currently no marked pedestrian crosswalks across Orange Avenue in the approximately half-mile stretch between Lancaster Road and Fairlane Avenue. Because of this, there is no marked pedestrian access to businesses within the center of the one-way pair south of Fairlane Avenue. This leaves pedestrians with the option of either traveling up to one mile just to reach a marked crossing or jaywalking to access businesses in the center of the pair.

POTENTIAL SOLUTION

A new marked pedestrian crossing between Lancaster Road and Fairlane Avenue could help improve pedestrian connectivity. Two potential crossing locations have been identified: at Prince Street or at Pierce Avenue (See Figure 59). A further stand-alone study is recommended based upon the procedures outlined in FDOT's Traffic Engineering Manual. As part of this study the crossing location, corresponding signing and markings, street lighting, and other applicable crossing treatments (e.g.. possible use of pedestrian actuated rectangular rapid flashing beacons) would be further defined. The following information outlines considerations for each of the potential locations:

- The concept shown at the September 2013 public meeting was a crossing on the north side of the Prince Street Intersection, which utilizes the median to provide a two-stage crossing and pedestrian refuge. The Prince Street location coincides with the end of the one-way pair. This location provides an opportunity for incorporating a landscape feature for the Pine Castle neighborhood that will help to visually reinforce to drivers that they are operating within a community rather than a higher-speed facility. Crossing pedestrians at this feature location may provide benefits in terms of driver's attention to their environment. This location is also centrally located between the signals at Lancaster Road and Fairlane Avenue. A northbound bus stop is located on Hansel Avenue near Prince Street to support pedestrian connectivity to transit.
- An alternative location would be to provide the crossing at Pierce Avenue. This location is more within the one-way pair rather than at the end of it. This location would provide a crossing more centrally located to nearby business, such as the existing Dunkin Donuts, which is a desired destination for nearby residents on the east side of Hansel Avenue. A southbound bus stop is located along Orange Avenue near Pierce Avenue to support pedestrian connectivity to transit.

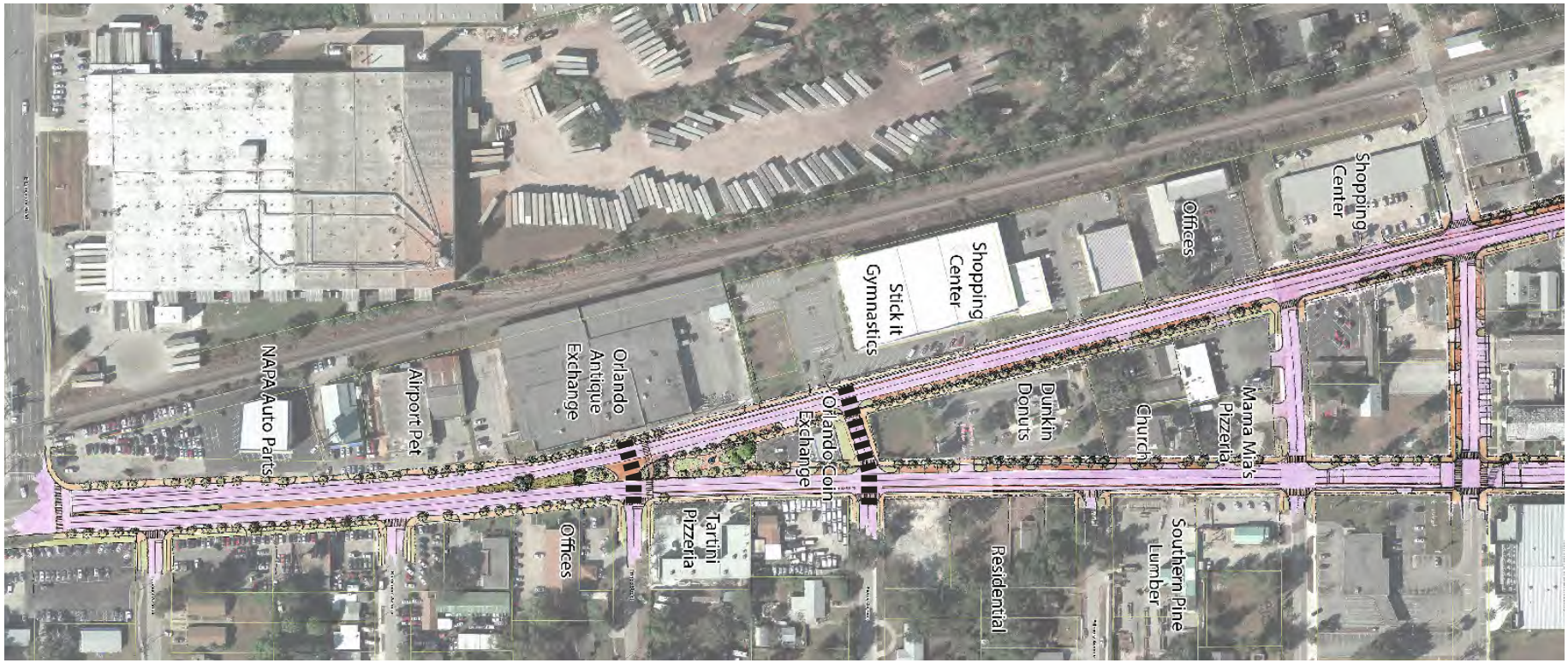


Figure 59 | Proposed Mid-Block Crossings and Median Widening

Figure 60 | Existing Conditions along the Corridor Near Prince Street

Both locations provide a refuge within the one-way pair to simplify the pedestrian crossing activity into two stages, each stage requiring the pedestrian to cross two travel lanes. At the identified crossing locations, the following pedestrian productions and attractions were identified based upon stakeholder input:

- Residential on east side of Hansel Avenue to Dunkin Donuts (within one-way pair)
- The Tartini Pizzeria & Spaghetteria parking lot fills up regularly and patrons park on the west side and walk across Orange Avenue to the restaurant.
- Stick-It Gymnastics on the west side of Orange Avenue has patrons coming from the residential uses on the east side of Hansel.
- Multiple retail and office uses on the west side of Orange Avenue (Sign Factory Printing, DesignersWest furniture and finishes, Orlando Antique Exchange, etc.) that would have improved access to Dunkin Donuts, Pizzeria restaurants, and Bank of America.

INTERSECTION CHANGES AT OAK RIDGE ROAD/ ORANGE AVENUE

ISSUE

The eastbound lanes of this intersection do not align with the receiving lanes along Oak Ridge Road. Instead, the outside lane of the eastbound approach is aligned with the building on the southeast corner of the intersection. Stakeholders shared that the building has been struck by vehicles traveling east on Oak Ridge Road on multiple occasions. The Orange Avenue at Oak Ridge Road intersection is a high-crash location within the study limits, including 31 total crashes between years 2007 to 2011. This included 11 injury crashes and 20 PDO crashes.

The intersection also has large curb radii encouraging faster vehicle turning movements. In the southeast quadrant, the right turning movement to Oak Ridge Road will not occur and a large turning radius is, in fact, not necessary. The large radius creates a longer crossing distance for pedestrians and more potential for vehicular and pedestrian conflicts. The building placement and the large curb radius provide limited sidewalk space for pedestrians between the building and the roadway.

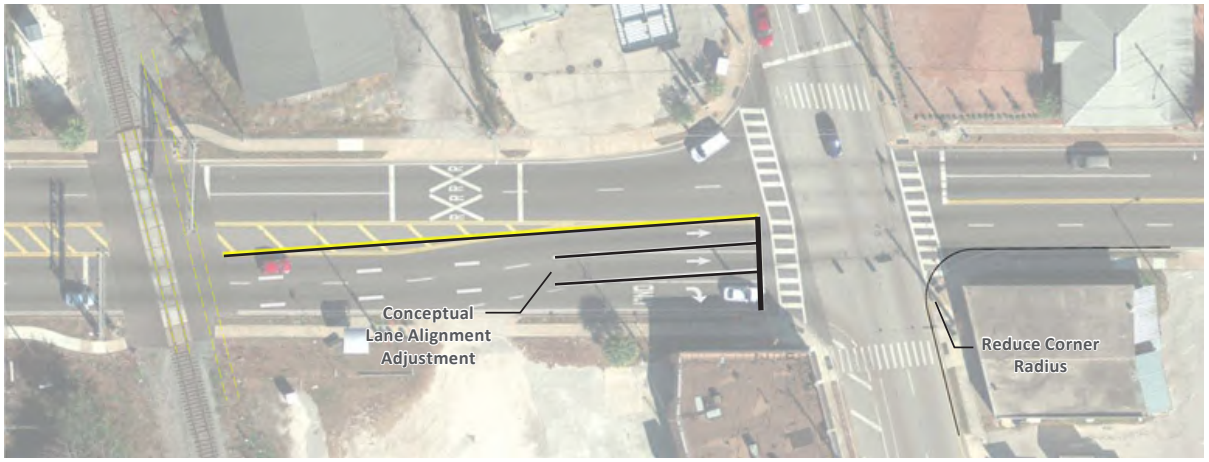


Figure 61 | Eastbound Lane Skew across Orange Avenue/ Oak Ridge Road Intersection and Potential Solution

POTENTIAL SOLUTION

Based upon input received from initial stakeholder discussions, FDOT has advanced a stand-alone project at this location to better align the eastbound travel lanes through the intersection. Figure 61 provides a conceptual illustration of the lane re-alignment on the eastbound intersection approach. This improvement was implemented by FDOT in January 2014.

Additional opportunity exists for further intersection enhancement by reconstructing the corner curb in the southeast quadrant to have a tighter radius. This radius can be as small as 10 feet.[1] This will increase the buffer distance to the adjacent building, increase the pedestrian space at the intersection, and reduce the intersection crossing distance.

1 The NACTO Urban Street Design Guide suggests radius of 10 feet or less for urban streets that prioritize walking and bicycling. The Guide cites some cities have radii as small as two feet on downtown streets.

EXTENSION OF RIGHT TURN LANE AT HANSEL AVENUE/ HOFFNER AVENUE

ISSUE

In the existing PM peak hour, 715 vehicles are turning right onto Hoffner Avenue from Hansel Avenue. In additional traffic circulation around the adjacent schools influences the operations of the right-turn lane. The resulting queue causes vehicles to spill out of the right turn lane and into the outside through lane on northbound Hansel Avenue.

POTENTIAL SOLUTION

Extending the northbound right turn lane by approximately 200 to 300 feet could accommodate the longer queue and help to prevent vehicles from impeding the northbound through traffic along Hansel Avenue. This would also involve a lane shift starting just north of the Hansel Avenue/Oak Ridge Road intersection to accommodate for the longer right turn lane.

SIDEWALK ENHANCEMENTS ALONG CROSS STREETS

ISSUE

Several of the streets connecting Orange Avenue to Hansel Avenue in the one-way pair have no sidewalks or disconnected sidewalks. These streets include Pierce Avenue, Wallace Street, and Fairlane Avenue. Because of the missing and broken sidewalks, pedestrians walk in the grass, dirt, or street. This area has several retail and commercial uses, as well as the three neighborhood schools along the east side of Hansel Avenue.

POTENTIAL SOLUTION

Filling in the sidewalk gaps and constructing new sidewalks where they are missing will provide the minimum level of accommodation for pedestrians, better connecting the schools, retail, and other uses to the rest of the neighborhoods on either side of the Corridor.

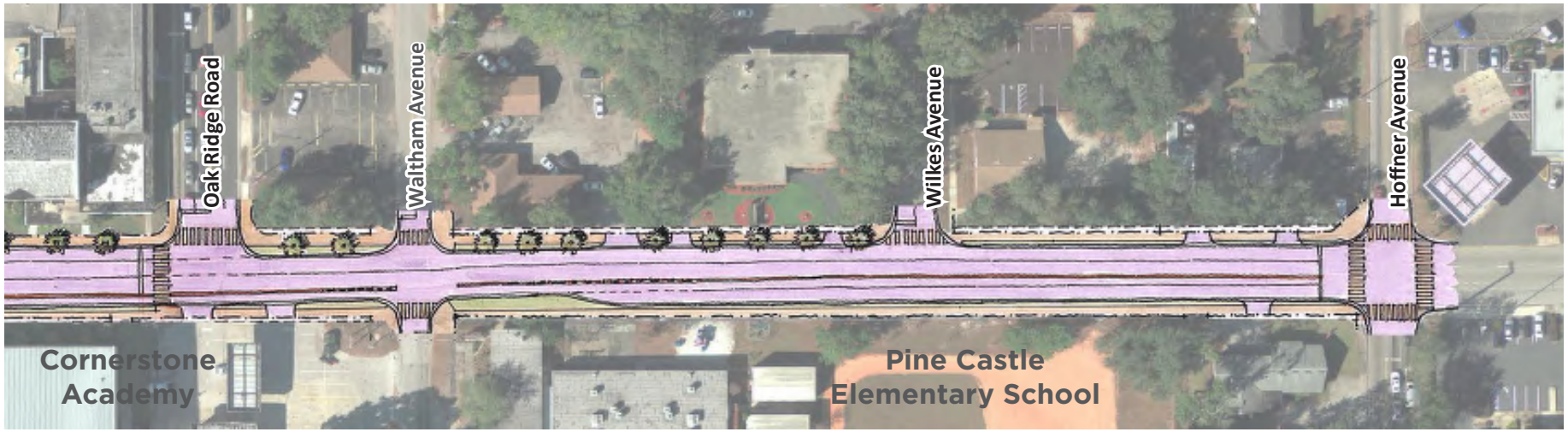


Figure 62 | Extension of Right Turn Lane at Hansel Avenue/Hoffner Avenue

GREEN LANES FOR BICYCLES

ISSUE

Pedestrians and bicyclists are exposed to the greatest risk in locations where they cross paths with vehicles. These areas include driveways, intersections, and for bicyclists, turn lanes. Along Orange Avenue, there are several locations where bicyclists cross paths with vehicles merging into right turn lanes.

POTENTIAL SOLUTION

The pavement within the designated bicycle lanes can be painted green to increase the visibility of the bicycle lane and reinforce priority for bicyclists in these conflict areas. Green lanes are most effective when they are only used where the path of bicyclists crosses the path of other road users and where those users should yield to bicyclists. Such areas include locations where the bike lane crosses an exclusive right turn lane, a channelized free-flow right turn lane, a high number of driveways, or when lanes are added or dropped. Green lanes are proposed to alleviate these issues in several locations along the corridor, as shown as Recommendation K on Figure 56. This includes the long key-hole bicycle lane that would result from the proposed extension of the northbound right-turn lane at the Hansel Avenue/Hoffner Avenue intersection.

Green lanes are proposed to alleviate these issues in several locations along the corridor, as shown as Recommendation K on Figure 56. Green lane treatments have proven to be an effective tool to call attention to bicyclists on the road, and are one of the preferred treatments proposed by industry leading

Figure 63 | Examples of Green Lanes for Bicycles

guidance in areas where increased attention is desired.[2] For example, the NYCDOT evaluated solid green bicycle lanes and found that the green paint treatment resulted in fewer instances of drivers encroaching on the bike lane by driving on the bike boundary line. [3]

An FDOT green lane pilot project is currently underway on SR 404/Pineda Causeway in Brevard County. Therefore, the use of the proposed green lanes for Orange Avenue should be re-assessed based on the results of the pilot project.

2 National Association of City Transportation Officials (NACTO). Urban Bikeway Design Guide. Washington, DC. 2011.

3 New York City Department of Transportation (NYCDOT). Evaluation of Solid Green Bicycle Lanes, to Increase Compliance and Bicycle Safety, New York, NY. 2011.

DRIVEWAY CONSOLIDATION

ISSUE

Some parcels along the corridor have multiple, wide, and/or unused driveways. These areas can encourage fast turning movements into and out of adjacent properties, or unnecessarily increase bicyclists' and pedestrians' exposure to potential vehicular conflicts.

POTENTIAL SOLUTION

As properties along the corridor redevelop, the property access points should be reviewed for potential driveway consolidation and refinements. Narrowing the width and reducing the number of curb cuts can reduce the number and severity of crashes with non-motorized travelers.

Existing

Proposed

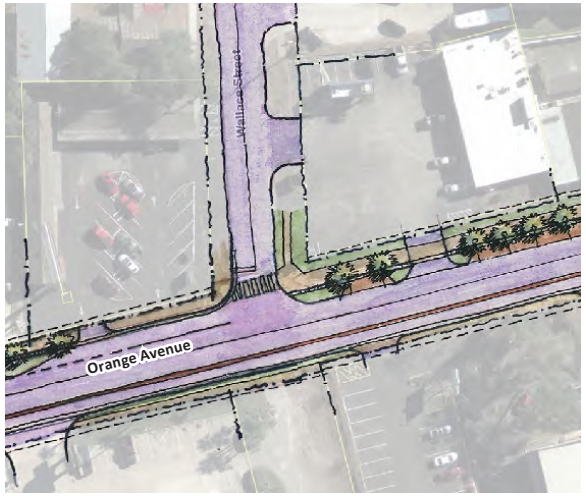


Figure 64 | Potential Driveway Consolidation/ Refinements along the Corridor (Example along the Corridor at Wallace Street)

NEW CROSSWALKS

ISSUE

Marked crosswalks do not exist across side streets where they intersect Orange Avenue. While pedestrians can legally cross at any leg of any intersection unless it is marked otherwise, painted crosswalks help to convey pedestrian priority to both drivers and walkers while reinforcing the pedestrian right of way.

POTENTIAL SOLUTION

Marked crosswalks are recommended to be provided across the minor street legs at every unsignalized intersection with Orange Avenue or Hansel Avenue. These crosswalks will help to reinforce pedestrian priority traveling north-south along Orange Avenue and Hansel Avenue to important destinations throughout the corridor, such as SunRail and key community venues, such as schools.

Existing

Proposed

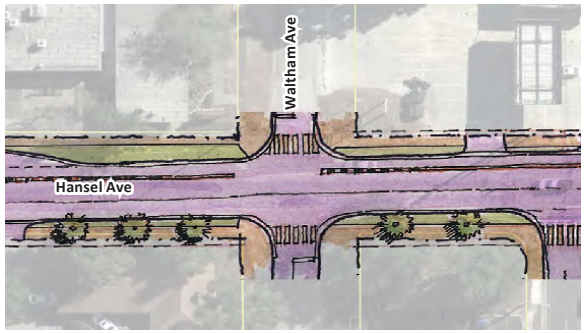


Figure 65 | Opportunities for New Crosswalks along the Corridor (Example at Waltham Street)

CORRIDOR WIDE

STREETSCAPE IMPROVEMENTS

IMPROVE LIGHTING AND AESTHETICS ALONG THE CORRIDOR

ISSUE

In various public workshops, the community brought up the lack of lighting along the Corridor as an issue. Pedestrians and bicyclists feel less safe walking or bicycling along a corridor that is not well lit because they are unable to see obstacles, and vehicles are less likely to see bicycles and pedestrians as well. Additionally, corridor residents expressed a desire for improved pedestrian amenities and recognizable and organized corridor streetscaping/aesthetics.

POTENTIAL SOLUTION

In order to address this issue, a stand-alone Lighting Justification Study is recommended to be performed based upon the procedure outlined in the FDOT Manual on Uniform Traffic Studies.

- Street Lighting is intended to illuminate the width of a corridor. Typically, these light posts are tall with cobra-style arms to illuminate across the greatest distance. This design focuses the greatest level of illumination over the street and does not typically address lighting for the sidewalks. The scale of these light poles, typically higher, conveys a more open roadway and higher-traffic speed environment. This type of lighting is most appropriately used on highways where vehicular traffic is the only mode encouraged.
- Pedestrian Lighting is intended to illuminate the pedestrian realm, and is typically mounted 12 – 14 feet above the sidewalk, a scale more appropriate to a pedestrian or bicyclist. They can be decorative and help to convey the "sense of place" or "branding" of the corridor community. Because pedestrian-scale lighting is smaller in nature than traditional cobra-style lighting, it helps to convey to the driver that they have entered a lower-speed, multimodal area.

A possible solution for this corridor would be to use a combination of street lighting and pedestrian lighting. One design allows for street lighting with pedestrian scale lighting attached to it. However, because the spacing standards for cobra-style street lighting are farther apart than would be required to properly illuminate the pedestrian realm, intermediate pedestrian lighting should be added between the cobra-style lighting. Appropriate spacing depends on the type of lighting used.

Further coordination will be needed with the FDOT in the next phase of project development to incorporate lighting design as part of cross section changes.

Figure 66 | Cobra-Style Street Lighting

Figure 67 | Pedestrian Style Lighting

LANDSCAPE TREATMENTS ALONG THE CORRIDOR

ISSUE

The Orange Avenue corridor currently lacks vegetation and street trees throughout most of the study area. Street trees are an important component to support the walkable urban corridor vision of Orange Avenue. They help create a sense of enclosure along the road (sometimes referred to as a "street wall"), narrowing a driver's field of vision and thus encouraging lower vehicle speeds. This is critically important as land development has not yet transitioned to more urban patterns (smaller setbacks from the street). If placed between the road and the sidewalk, they can help provide a physical and visual buffer between pedestrians and vehicles. Finally, street trees provide shade making it more pleasant to walk on hot, sunny days. Other landscaping elements, such as groundcover and shrubs, can be used to add to the streetscape as well enhance the corridor aesthetics. Shrubs can also be placed in between the pedestrian facilities and the road to provide an added buffer between pedestrians and the roadway.

POTENTIAL SOLUTION

It is recommended that a streetscaping plan be developed and implemented along the corridor so that a consistent look can be achieved while creating the benefit of a more pedestrian and bicycling-friendly environment. It is critical to coordinate the streetscape plan among the various jurisdictions to identify the maintaining agency and the appropriate plant types for the available level of maintenance that is expected to be provided. One idea is to develop a memorandum of understanding among the different jurisdictions on streetscape design and standards. Streetscaping has already been completed along other portions of the Orange Avenue corridor. These areas include SoDo, Ivanhoe Village, and Winter Park. Figure 68 and Figure 69 display examples of streetscaping implemented on other FDOT facilities.

Landscape treatments should consider Crime Prevention Through Environmental Design (CPTED).

Figure 68 | Landscaping on State Road 17/92

Figure 69 | Landscaping on State Road 434

6
ACTION PLAN & CONCLUSION

6
ACTION PLAN & CONCLUSION

The Orange Avenue Corridor Study is the first phase of a multi-part process of improving multi-modal mobility and access along the Corridor. To realize the full vision multimodal vision for Orange Avenue, will entail continued coordination among FDOT and other partner agencies. Already, Orange County, together with partner agencies is currently advancing several concepts from this planning study through concept development. The following describes the broad principles and steps needed to advance the Corridor Vision.

CREATING A LIVABLE CORRIDOR

FDOT supports the region's desire to collectively leverage public and private investments to foster transit ridership growth. Transit investments should, in turn, support each community's economic development goals. This corridor study, together with the SunRail Station Area Plan, sets out short and long-term opportunities for improving multi-modal connectivity between transit and transit-supportive land uses and enabling the synergistic relationship between land use and transit. More importantly, at the very basic level, the action items outlined by the report call for investments to make the Orange Avenue Corridor more walkable, bikeable, and livable for Corridor residents.

PARTNERSHIP TOWARDS A MULTIMODAL CORRIDOR

Because of the intrinsic linkage between land use, transportation, and transit decisions, FDOT cannot accomplish the actions outlined in this report alone. While Orange Avenue is a state roadway, MetroPlan sets the regional priorities related to transportation investments and Orange County and the Cities of Belle Isle and Edgewood determine land use policies and regulations. The actions call for combined and proactive efforts of FDOT, MetroPlan Orlando, LYNX, and all the local jurisdictions.

FDOT anticipates that this report will lead to continued future dialogues among the partner agencies and community stakeholders, as the Corridor continues to evolve.

LEVERAGING ONGOING AND FUTURE OPPORTUNITIES

FDOT recognizes that some of strategies called for by the study involves a long-term view, and their feasibility anticipates significant changes to the land use and transportation contexts. As private development opportunities and other public infrastructure projects continue to occur, the Corridor Study can act as a framework plan to incrementally guide private and public initiatives along the Corridor. The idea is to leverage any and all ongoing development and infrastructure opportunities to support the Corridor vision. The proposed strategies described in Section 5 are summarized in the following action plan.

Strategies	Action Items that Support Strategies	Time Frame*	Responsible Agencies
Cross Section Changes			
Cross Section Implementation	Continue to coordinate with FDOT, MetroPlan Orlando, Orange County, and all partner agencies to advance cross section changes to the next phase (concept development/project development, design, and construction)	Mid	FDOT, MetroPlan Orlando, Orange County
	Incorporate elements of cross section changes along Orange Avenue as part of routine maintenance (filling in sidewalk and bike lane gaps and restriping where possible)	Short	FDOT, Orange County
	Implement cross-section changes through coordination with private redevelopment/ development(i.e. easements to allow for wider sidewalks, driveway consolidation to allow for continuous sidewalks)	Short to Mid	FDOT, Orange County
	After SunRail's opening and as the corridor redevelops, evaluate signal feasibility at Perkins Road	Mid	FDOT, Orange County
Coordinate Land Use and Transportation Investments to Support Desired Corridor Character	Refine land use policies to encourage and support development patterns aligned with TOD vision and ultimate cross sections (i.e. urban pattern of site design/lot layout, reduced and shared parking requirements, cross-access easements, provision for non-auto modes, etc.)	Short to Mid	Orange County
Access Management			
Access Management Plan	Work with businesses and stakeholders to finalize the corridor-wide access management plan	Short	FDOT, Orange County
	Implement access management best practices as corridor redevelops (cross-access easements, driveway right-sizing/consolidation)	Short to Mid	FDOT, Orange County
Location-Specific Improvements			
Sand Lake Road Pedestrian Improvements	Advance preferred alternative to concept development and succeeding phases	Short	FDOT
Extension of Raised Traffic Separator at Sand Lake Road	Advance preferred alternative to concept development and succeeding phases	Short	FDOT
Office Court Crosswalks	Install crosswalks when signal is installed at Office Court	Immediate	
Pine Castle Gateway and Median Improvements	Advance preferred alternative to concept development and succeeding phases	Mid	FDOT
	Work with the surrounding communities to explore funding options for the planning, construction, and maintenance of a small park and gateway feature at the median	Mid	FDOT, Orange County, Pine Castle Neighborhood
Marked Crossing at Prince or Pierce Street	Perform stand along study to advance preferred alternative to concept development and succeeding phases	Short	FDOT
Oak Ridge Road/Orange Avenue Intersection Changes	Currently in design by FDOT	Immediate	FDOT
Hansel/Hoffner Avenue Right Turn Lane Extension	Further explore the lengthening of the right turn lane and lane shift in a design study that can be brought to implementation	Mid	FDOT

* **Immediate** = Begin Today **Short** = 0 to 3 years **Mid** = 3 to 5 years **Long** = More than 5 years

Strategies	Action Items that Support Strategies	Time Frame*	Responsible Agencies
Multimodal Improvements			
Sidewalk Enhancements Program and Policy	Incorporate sidewalk enhancements into capital improvement programs, and/or seek funding to implement sidewalk enhancements	Short to Mid	Orange County
	Incorporate guidelines that accommodate walking and bicycling for all new streets in local land development regulations	Mid	Orange County
	Enact policies that allow for alternative traffic impact mitigation strategies that include paying for pedestrian and bicycle improvements	Mid	Orange County
Curb Extensions	As cross section improvements are implemented, work with FDOT to further refine and confirm the locations of curb extensions throughout the corridor	Mid	FDOT, Orange County
Green Lanes	Monitor the FDOT green lane pilot project in Brevard County as well as the implementation of green lanes across the state and country and advance green lanes along the corridor based on the pilot program results	Mid	FDOT
Sidewalk Enhancements Infrastructure	Fill in sidewalk gaps through regular maintenance and other projects or as land uses redevelop	Short	FDOT, Orange County
	Coordinate with local businesses and explore retrofitting of existing driveways prior to or as part of corridor access management study and to allow for cross-access easements driveway right-sizing	Mid	Orange County, FDOT
	Evaluate access needs and develop a phased implementation plan for managed access, incorporating strategies such as driveway consolidation, cross access easements, etc.	Mid	FDOT, Orange County
New Crosswalks	Install crosswalks and ADA ramps along the east and west legs of each unsignalized intersection as part of routine maintenance projects	Short	FDOT
	Explore feasibility of additional new crosswalks across Orange Avenue in the vicinity of the planned TOD as the Corridor redevelops and pedestrian activity increases	Mid to Long	FDOT
Streetscape Improvements			
Lighting Treatments	Complete a lighting study along the corridor assessing pedestrian and street lighting	Short	FDOT
	Implement lighting improvements	Mid	FDOT
Landscape Treatments	Work with communities to develop and adopt a unified streetscaping plan and accompanying memorandum of understanding for the Orange Avenue Corridor	Mid	FDOT, Municipalities
	Develop and implement policies requiring new streetscaping standards as properties redevelop	Mid	Orange County
	Consider alternative traffic impact mitigation strategies that include paying for streetscaping and lighting improvements	Mid	Orange County

* **Immediate** = Begin Today **Short** = 0 to 3 years **Mid** = 3 to 5 years **Long** = More than 5 years

Strategies	Action Items that Support Strategies	Time Frame*	Responsible Agencies
Transit Improvements			
Transit Facilities	As SunRail is implemented and corridor transit use changes, evaluate corridor transit service improvement through the installation of transit shelters, the improvement of access to (or removal of) stops that are difficult to access, and the installation of benches and other amenities	Short to Mid	LYNX
	Relocate bus stops as proposed	Short	LYNX
Queue Jumps	Monitor transit service and pursue further studies regarding feasibility of queue jumps at Sand Lake Road as transit use increases and the OIA Connector Study is complete	Mid to Long	LYNX

*** Immediate** = Begin Today **Short** = 0 to 3 years **Mid** = 3 to 5 years **Long** = More than 5 years