Meeting of the Bicycle and Pedestrian Advisory Committee  
Wednesday, October 11, 2017, 5:30 p.m.  
County Center, 18th Floor – Plan Hillsborough Committee Room

I. Call to Order and Introductions  

II. Public Comment - 3 minutes per speaker, please  

III. Approval of Minutes – August 9, 2017 and July Retreat Notes  

IV. Action Items  

A. FDOT Work Program Highlights (FDOT Representative)  
B. Kennedy Blvd. and Hillsborough Ave. Multimodal Safety Reviews (Johnny Wong, MPO Staff)  
C. Brandon Centers and Corridors Pilot Study (Sarah McKinley, MPO Staff)  

V. Status Reports  

A. FDOT Complete Streets Implementation (Chris Speese, FDOT Staff)  
B. Tampa Bay Next Update (FDOT Representative)  
C. Walk-Bike-Transit LOS (Sarah McKinley, MPO Staff)  
D. Developing BPAC Position Statements (Wade Reynolds, MPO Staff)  

VI. Old Business & New Business  

A. BPAC Attendance  

VII. Adjournment  

VIII. Addendum  

A. MPO Committee Report  
B. Article – Survey of USF Area  
C. Florida Outdoor Recreation Factoids  
D. Florida Automated Vehicle Summit Announcement  
E. Florida Avenue at Waters Fact Sheet  
F. US 41 Fact Sheet  
G. FY17 Tiger Grant Solicitation Announcement  
H. Atlanta Food Forest  
I. Howard Frankland Bridge Fact Sheet October 1  
J. News Release – RTFP Top Projects  
K. Article – County Update on Citrus Park Drive
NEXT MEETING – November 8, 2017

The full agenda packet is available on the MPO’s website, www.planhillsborough.org, or by calling (813) 272-5940.

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I. CALL TO ORDER

Chair Patrick Thorpe called the meeting to order at 5:30 pm and the meeting was held in the Plan Hillsborough Committee Room of the County Center Building.


Others present: Wade Reynolds, MPO Staff; Sharon Snyder, TPC Staff; Daniel Lauricello, DOT; Jim Hartnett; Chris Keller, Tindale-Oliver; Michael Schwaid; John Kubicki, Sprinkle Consulting; Deputy Shook, Hillsborough County Sheriff’s Office; Danielle Joyce, GPI; Sally Thompson; Jennifer Bartlett; Chris Fellerhoff; Jose Salaza

II. PUBLIC COMMENT

Mr. Michael Schwaid spoke on four issues. The first was the rough railroad crossing on South Himes Avenue, near the Selmon Expressway. Mr. Schwaid would like to see signage advising drivers to watch for bicyclists. Mr. Thornton suggested contacting FDOT to fix this crossing. Next, he spoke about the continuous problem of broken glass on the east side of the Courtney Campbell Causeway. The addition of trash cans along the Causeway has not made a difference. Then he discussed the debris (gravel, palm fronds and glass) in the bike lanes in Northwest County. Lastly, he asked about the status of the Upper Tampa Bay trail extension.

III. APPROVAL OF MINUTES

Motion: Approval of May 10, 2017 minutes (Monk - Shirk). The motion passed unanimously.

IV. ACTION ITEMS

A. Dale Mabry Highway Pedestrian Crossing Study and Spruce Street Walk Bike Improvements (Chris Keller, Oliver-Tindale, and Danielle Joyce, Greenman-Pedersen, Inc.)

Mr. Keller explained the purpose of the study was to develop and assess the feasibility of various alternatives that will connect the existing section of the I-275 trail, which currently terminates at Church Street, along the north side of I-275, across Dale Mabry, to the MPO’s proposed Trail alignment along the south side of I-275 starting at Himes Avenue. The approximate study area for this component of the project extends along the entire I-275 right-of-
way from Cypress Street to Himes Avenue. The project also studied and identified conceptual bicycle and pedestrian safety and mobility improvements at the intersection of Spruce Street and Dale Mabry Highway, as well as walk/bike improvement concepts along Spruce Street from Dale Mabry Highway to Rome Avenue. He explained the feasibility analysis explored opportunities to enhance the pedestrian and bicycle environment along Spruce Street while respecting and preserving the existing fabric of the residential neighborhoods along the corridor.

Mr. Keller conducted a comprehensive review of existing conditions, identified opportunities to enhance the pedestrian and bicycle environment and identified challenges to implementation. Some of the opportunities include signage, lighting, shared lane markings, sidewalk connections, enhanced/wider sidewalks, and intersection enhancements.

Ms. Joyce began the Dale Mabry Pedestrian overpass study by reviewing the existing trail and MPO’s proposed trail. She reviewed the travel demand in this interchange and the factors impacting the three alternatives. Ms. Joyce discussed the evaluation factors and the costs involved for each of the three solutions. Alternative B is the recommended choice for extending the trail as it is complementary to I-275, aesthetically pleasing, has a low stormwater impact, fewer expected delays and unlikely opposition. To connect the trails, there are at-grade improvements that need to be completed, including installing sidewalks along Church Street, a mid-block crossing at Laurel, widening the sidewalk along West Laurel, installing way finding signs, and advanced crosswalks at several locations. Ms. Joyce also reviewed some renderings of the overpass and trails.

A discussion ensued regarding how bicyclists will get from the trail to the stores north of the interstate, concern about drivers not coming to a complete stop when making the right turn onto the I-275 on-ramp and adding some comfort techniques to the trail and the crossings. The Chair acknowledged his appreciation for their work on the analysis.

**Motion:** Recommend approval by the MPO Board. Monk-Watson. The motion passed unanimously.

### V. STATUS REPORTS

#### A. Hillsborough Air Quality Update (Alain Watson, Hillsborough EPC)

Mr. Watson presented the Hillsborough Air Quality Update. Air quality is monitored at twelve air monitoring stations around the County, measuring principal pollutants from the transportation sector. Ozone is the primary pollutant of concern for transportation. Long term emissions are trending down and continue to decrease. Mr. Watson explained the Munro Street Air Monitoring Station began measuring highway pollution in 2014 due to federal requirements to monitor air quality in the near-road environment and the monitor sits next to the highest traveled roadway segment. He reviewed the near-road site data collected for a three-day period in June, which reflected hourly peaks occurring at rush hour. He also discussed outside influences such as wildfires, which result in exacerbated ozone concentrations and consecutive days of high ozone levels. Mr. Watson explained the consequences of nonattainment and how federally supported highway and transit projects may be affected. He also reviewed critical sites ozone design value.

There were discussions regarding lead contamination in the air and in the soil, if the EPA looks at cause and effects, how other Counties compare to Hillsborough County, and if the EPC has any recommendations to correct air quality issues.
B. Old Tampa Bay Water Quality Report (Daniel Lauricello, FDOT)
Mr. Lauricello presented the Old Tampa Bay Water Quality Improvement Project, which is located west of Ben T. Davis Beach on the Courtney Campbell Causeway. The area north of the causeway has poor water quality which has translated to sparse and low-quality sea grasses. Causeways have been shown to negatively impact the natural circulation pattern. The proposed project will construct a 229-foot bridge, maintaining the existing travel lanes and trail, and will restore circulation patterns and improve water quality. Part of FDOT’s mission is to preserve the quality of our environment and communities. This project potentially will not only meet their water quality requirements for future projects but will exceed what traditional stormwater approaches do.

Mr. Lauricello explained that Old Tampa Bay is impaired for Nitrogen, which requires stormwater treatment that does not increase levels of nitrogen discharged. Beginning in the 1950’s, water quality in the Bay began to decline to a level that impacted fishing. A restoration plan for the entire bay was developed, implementing multiple data collection activities including circulation patterns and seagrass mapping. Causeway impacts include reduced flushing rates, increase susceptibility to water quality problems and altered salinities. Removal or modification of the causeway can bring about ecological benefits.

Mr. Lauricello reviewed some examples of completed causeway modification projects in North America and Florida. He also reviewed the persistence of seagrass over time, the pattern of seagrass species distribution and the potential benefits of restored tidal influences.

Project goals include meeting the Department’s mission, reducing project footprints, reducing impacts to communities, enhancing overall watershed water quality, meeting the stormwater treatment criteria and mitigating future seagrass impacts. State funds for construction have been secured and permit reviews are underway. FDOT has received advanced authorization from the Coast Guard and are in the procurement phase of securing a contractor. Construction is anticipated to start in the Fall of 2017.

A discussion ensued regarding clearance under the bridge, the need to maintain the trail to the north and the channel that leads up the Reserves, if a study has been done on fish migration, how long construction is anticipated to take, and how this project will positively affect water quality. A member expressed concern of additional water pollution during construction.

C. 2045 Plan: Issues for Exploration (Wade Reynolds, MPO Staff):
Mr. Reynolds presented the 2045 Long Range Transportation. He explained the Long Range Plan conveys our priorities for federal and state funding to Washington DC and Tallahassee and how the Plan fits with other efforts. He reviewed population growth and transportation trends through 2040 countywide. Growth scenarios for 2045 include population and jobs and will be a tri-county coordination. Mr. Reynolds explained how needs are identified and the implications for connected and automated vehicles, as well as shared ride services.

Mr. Reynolds reviewed the key drivers of change, new federal requirements and described the performance outcomes with current funding. He also reported Hillsborough County has budgeted $812 million in new funding to help with repaving, intersection traffic, sidewalks and other safety features. State and federal funding forecasts are provided by FDOT. Local funding forecasts by MPO and existing sources will be projected to 2045. He reviewed existing and potential new funding sources, which include a $0.05 gas tax and a $0.01 sales tax.
Mr. Reynolds explained the results of a 2012 phone survey asking about support for funding sources. The only two options showing over 50% support were the half cent sales tax and an increase of $50/year for property taxes. He explained this process will be coordinated regionally. Tampa Bay TMA’s role was discussed and the two parts of the schedule were reviewed. The review and adoption phase is October through December 2019.

There were discussions regarding the huge growth in congestion, the need for transit, concerns with a transit feasibility study, the need for an alternate plan to move forward, adding transit supply to the transportation trends chart, how the Committee can work with the MPO Board to make biking and walking options a priority, what we want for our community, and making sure this Committee’s priorities are in the plan.

Motion: Mr. Shirk made a motion to request the MPO to add fixed guideway transit to the travel demand model. Mr. Collins suggested Ms. McKinley present to the Committee what inputs are in the travel demand model and how the numbers came to be. Motion was dismissed.

VI. OLD BUSINESS & NEW BUSINESS
A. Adding Greenways & Trails to the BPAC (Wade Reynolds, MPO Staff)
Mr. Reynolds explained there have been discussions about combining the Hillsborough County and City of Tampa’s Greenways and Trails Committees with BPAC. Ms. Price discussed how the City adopted a greenways and trails master plan in 2001 and established a Citizens Advisory Committee. She stated the City and County have met together for the last six years and she feels they need to work together as the City and County trails often run into each other. Mr. Thornton also explained some decisions made by BPAC are not filtering down to the two Greenways & Trails Committees. If these groups are combined, he wants to focus on both on road and off-road trails as they provide some of the safest modes of transportation. He feels by partnering together with neighboring Counties, Central Florida could receive more State money. Mr. Jackmon explained the County’s Committee started in 1995 and is struggling with an identity and purpose. He stated trails planning is transferring to Public Works, and they would like to keep the Committee active and increase responsibilities. Ms. Thompson, Chair of the City’s Greenways Committee, stated the difference between the two Committees is the City works at the direction of the MPO. Last year’s study by Tindale-Oliver combined the two Committees, but since then, they have been struggling with not having quorums. They have discussed how they can be most effective and have discussed folding the City’s Committee into BPAC, leaving the County Committee to continue as is.

Mr. Reynolds urged the Committees to continue talking so they can move forward. Ms. Thompson stated the County’s Legal Department felt there are some issues with combining the groups. She feels the County, especially Commissioner Kemp, is very interested in reactivating their Greenways & Trails Committee. Ms. Thompson inform the members of the next City of Tampa Greenways & Trails Committee meeting on Thursday, August 17th, at 6:00 p.m. at the Seminole Garden Center. She encouraged all to attend and she is excited that the Hillsborough County and Transportation are getting so involved. Mr. Thornton stated the State has money for trails but there needs to be a great plan to get the money here. The Committees need to use the advocacy of BPAC to “bring home the money”.

B. Letter from FDOT on Bike Lane Maintenance
C. Letter from FDOT on US92 PD&E Study
Mr. Reynolds discussed the two letters from FDOT. FDOT requested the trail along US92 be added to the Greenways & Trails map. Mr. Thornton asked Mr. Chilson if the County is
comfortable adding. Mr. Chilson explained Public Works will need to make that decision as they will be responsible for maintaining it even though it is a State road. Mr. Reynolds stated maintenance of trails is an ongoing discussion with FDOT.

Mr. Reynolds reminded the members of the discussion at last month’s retreat regarding the Chair, Mr. Thorpe, lobbying Commissioners and MPO Board members individually, on BPAC issues. Mr. Thorpe stated he will lobby three key issues to ensure these issues are not overlooked in long reports. This will be a Chair responsibility going forward.

Motion: Mr. Monk made a motion to have the Chair lobby for the Committee. It was seconded by Mr. Shirk. The motion passed unanimously.

There was a brief discussion about what other Committees do and how the lobbying will be handled. Mr. Monk asked if there is a Health Department representative on other Committees? Ms. Nguyen responded she is on the School Transportation Working Group (STWG) and the Technical Advisory Committee (TAC) and the Health Department’s Senior Leader for Community Health sits on the Transportation Disadvantaged Coordinating Board (TCDB).

Mr. Thornton would also like to partner with other advocacy groups, such as Walk Bike Tampa Bay, to approach the elected officials.

Mr. Reynolds also asked members to review the draft copy of the Multimodal Level of Service report distributed at the meeting and provided him with comments on the report.

**VII. ADJOURNMENT**

There being no further business, the meeting was adjourned at 7:55 pm.
MPO Bicycle and Pedestrian Advisory Committee Retreat - July 25, 2017

**In Attendance:**

Wade Reynolds  
Michele Ogilvie  
Patrick Thorpe  
Jonathon Forbes  
Richard Ranck  
Richard Sanders  
Allison Nguyen  
Karla Price  
Mara Latorre  
Faye Miller  
Calvin Thornton  
Tony Monk  
Jason Jackman  
Jose Salazar

**Accomplishments:**

40th St. Road Diet  
Plant City Walk Bike Plan  
Plant City Ride With Mayor  
Bullard Bridge Bike Lane Painting  
Florida/Tampa Mid-Block Crossings  
Intersection Painting – Louisiana and Rivershore  
South Coast Greenway Funding  
Maydell Bridge Funding  
Bypass Canal Funding  
Fowler Ave. Buffered Bike Lanes  
TBX Pause and additional Outreach  
USF and Tampa Bicycle Friendly Awards – Bronze and Silver  
USF Coast Bike Share  
Tampa Bike Friendly Business Designation (top # of businesses in state (or nation?))  
Plant City and Temple Terrace Vision Zero Resolutions

**Next 12 Months:**

Two Pedestrian Only Focused BPAC Meetings  
Make Places for People a priority over LOS, Speed, Etc.  
Hillsborough County Roundabouts (2 Planned, get details from Richard S.)  
Increased Bike Parking for New Development (and Reduced Car Parking?)  
Define Vision for City and County (LRTP?)  
Balancing Residential/Commercial/Retail Uses to Reduce Driving  
Pedestrian/Bicycle Connectivity to HART
Consistency in Safety and Crossings (Equity and Connected, Comfortable, Safe)
Help Change Cultural Mindset/Mentality to Advocate and Influence
Additional Open Streets/Cyclovia Events, Neighborhood Festivals (7/4), Hillsborough County Mini-grant
More Community/Neighborhood Art and Intersection Painting Events
BPAC Support for UTBT Gap
More Land Use Discussion
Hillsborough MPO
Metropolitan Planning for Transportation

Board & Committee Agenda Item

**Agenda Item**
FDOT Annual Work Program Highlights

**Presenter**
FDOT Representative

**Summary**
The Florida Department of Transportation (FDOT) has developed their annual budget for transportation projects. This budget, known as the Work Program, covers the upcoming fiscal year as well as anticipated project funding for the four following years. The work program being presented is for Fiscal Years 2018/19 – 2022/23.

Per federal rules and state statutes, the programming of federal funds for transportation projects is to be consistent with priorities adopted by the MPO. The MPO adopted the attached list of project priorities, which were used by FDOT in developing this work program.

For this status report, FDOT will highlight projects receiving funding in Hillsborough County. The work program will be presented to the MPO’s advisory committees in October. FDOT has provided multiple ways to provide comments:

- FDOT staff will hold an Open House Monday, October 23, 2017 from 9am to 6pm at the District 7 Headquarters (11201 N McKinley Dr, Tampa 33612);

- FDOT will post the Work Program online for public comment ([www.D7WPPH.com](http://www.D7WPPH.com)) October 23 – November 6, 2017.

The public is encouraged to participate and provide comments.

Staff will draft a letter of comments for the MPO to consider at their November 8, 2017 meeting.

**Recommended Action**
Provide comments or concerns to the MPO in the form of a motion.

**Prepared By**
Sarah McKinley, MPO Staff

**Attachments**
- Hillsborough MPO List of Priority Projects
• The Tentative Five-Year Work Program Highlight presentation will be provided at committee meetings and a link will be provided on the MPO website: [http://www.planhillsborough.org/transportation-improvement-program-tip/](http://www.planhillsborough.org/transportation-improvement-program-tip/)
<table>
<thead>
<tr>
<th>Priority</th>
<th>FPN</th>
<th>2040 LRTP Reference</th>
<th>Project Limits</th>
<th>Project Description</th>
<th>Project Sponsor</th>
<th>Project Status / Request</th>
<th>Suggested Funding Type</th>
<th>Prioritization Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>439336 2, 439336 3</td>
<td>Figure 5-6</td>
<td>Metropolitan Transportation Planning</td>
<td>Systems &amp; Corridor Planning</td>
<td>MPO</td>
<td>Ongoing planning need: $600,000 per year for LRTP development, Planning Studies, and Regional Travel Surveys</td>
<td>SU</td>
<td>$600k per year FY19-23</td>
</tr>
<tr>
<td>2</td>
<td>414963 2</td>
<td></td>
<td>Maintain Current Bus Service</td>
<td>Transit State of Good Repair</td>
<td>HART</td>
<td>CNG Bus Replacement, $4Million added in FY22, $4M recommended for FY23, $28M requested by HART</td>
<td>SU, FTA</td>
<td>Listed based on HART’s priority setting</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Busch Blvd (Dale Mabry to 56th)</td>
<td>Walk/Bike Safety</td>
<td>Hillsborough MPO/FDOT</td>
<td>Multimodal Safety Improvements, Mid-block crossings, cost estimates to be provided by FDOT</td>
<td>SU, HSIP</td>
<td>2040 Illustrative Safety Project; 1,304 total crashes, 141 bike/ped</td>
</tr>
<tr>
<td>4</td>
<td>437641 1</td>
<td></td>
<td>Hillsborough Ave (Memorial Hwy/Sheldon Rd to Himes Ave)</td>
<td>Walk/Bike Safety</td>
<td>Hillsborough MPO/FDOT</td>
<td>Construction of access management (vehicular safety) improvements is programmed in FY 20. Additional funding may be needed to construct walk/bike safety improvements in the same year. Cost estimates to be provided summer 2017 thru a joint FDOT-MPO study.</td>
<td>SU, HSIP</td>
<td>2040 Illustrative Safety Project; 890 total crashes, 45 bike/ped</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>Florida Ave/Tampa St (Tyler St to Hanna Ave)</td>
<td>Walk/Bike Safety</td>
<td>Hillsborough MPO/FDOT</td>
<td>Currently part of the “Heights Multimodal Plan”, funded in FY22, PD&amp;E requested prior to TBX Segments 6 &amp; 7 design completion, advance to FY18.</td>
<td>SU, HSIP</td>
<td>2040 Illustrative Safety Project; 732 total crashes, 63 bike/ped</td>
</tr>
</tbody>
</table>

*Project in neighboring county, reflected as a Transportation Management Area priority

Denotes new project

Adopted: June 13, 2017

Page 1

Printed: 6/29/2017

Hillsborough MPO List of Priority Projects
FY2018/2019-2022/2023 Transportation Improvement Program

Table 2: CANDIDATES FOR NEW FUNDING

Goals by 2040

* Resurface major roads every 14-17 years, local roads every 20-25 years
* Replace buses every 10-12 years
* Replace deficient bridges

Imagine 2040 Plan
Funding Level ($m)
Federal Metro 0.62 Funds

Goals by 2040
* Reduce crashes 21-50%, to levels comparable to peer cities
* Protect low-lying major roads from flooding, cutting recovery time in half

Imagine 2040 Plan
Funding Levels:
Status Quo: $70M Needed to Reach Goals: $98M

Preserve the System

Reduce Crashes & Vulnerability

Imagine 2040 Plan Funding Level ($m)
Number of total crashes and bike/ped crashes, 2012 - 2016

SU, FTA

SU, HSIP
## Table 2: CANDIDATES FOR NEW FUNDING

<table>
<thead>
<tr>
<th>Project Limits</th>
<th>Project Description</th>
<th>Project Sponsor</th>
<th>Project Status / Request</th>
<th>Suggested Funding Type</th>
<th>Prioritization Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floribaska Ave (Tampa St to Nebraska)</td>
<td>Walk/Bike Safety</td>
<td>Tampa</td>
<td>Added $78k for design in FY21 &amp; 22, $441,000 needed for construction, request to advance in work program</td>
<td>SU</td>
<td>424 total crashes, 18 bike/ped</td>
</tr>
<tr>
<td>Kennedy Blvd (Westshore to Brevard)</td>
<td>Walk/Bike Safety</td>
<td>Hillsborough MPO/FDOT</td>
<td>Construction of access management (vehicular safety) improvements is programmed in FY 20. Additional funding may be needed to construct walk/bike safety improvements in the same year. Cost estimates to be provided summer 2017 thru a joint FDOT-MPO study.</td>
<td>SU, HSIP, Urban Corridor Improvement, RRR</td>
<td>2040 Illustrative Safety Project; 361 total crashes, 10 bike/ped</td>
</tr>
<tr>
<td>Channelside Dr (Meridian to Adamo)</td>
<td>Complete Street Enhancements</td>
<td>Port Authority</td>
<td>City conducting design study of Channelside Dr from Kennedy Blvd to Cumberland Dr</td>
<td>To Be Determined</td>
<td>156 total crashes, 11 bike/ped</td>
</tr>
<tr>
<td>Green Spine: Phases 3a, 3b, 2a, and 3c</td>
<td>Walk Bike Emphasis Corridor</td>
<td>Tampa Priority #3</td>
<td></td>
<td>TA, SUNTrail</td>
<td>2040 Illustrative Safety Project; 115 total crashes; 1 bike/ped</td>
</tr>
<tr>
<td>Tomlin Middle School</td>
<td>Walk/Bike Safety</td>
<td>Plant City</td>
<td>$254,560 requested for design &amp; construction, various locations, ROW and estimates needed</td>
<td>TA, SR2S</td>
<td>40 total crashes; 4 bike/ped; Safe Routes to School</td>
</tr>
<tr>
<td>Morris Bridge Rd Bike Lanes/Paved Shoulders, Davis to Fletcher</td>
<td>Walk/Bike Safety</td>
<td>FDOT/Temple Terrace Priority #2</td>
<td>Fowler to Fletcher: design FY18, cst FY20/21 (TA funds); Davis Rd to Fowler: design FY18, cst FY21 (safety funds)</td>
<td>TA, HSIP</td>
<td>36 total crashes; 2 bike/ped</td>
</tr>
<tr>
<td>Bullard Pkwy/Temple Terrace Hwy from Glen Arven Ave to 78th St</td>
<td>Complete Street Enhancements</td>
<td>Temple Terrace Priority #4</td>
<td>MPO study on going</td>
<td>To Be Determined</td>
<td>Segment part of a 2040 Illustrative Safety Project; 43 total crashes, 0 bike/ ped</td>
</tr>
<tr>
<td>George Rd Complete Street</td>
<td>Design: $367,000 (preliminary estimate)</td>
<td>Hillsborough MPO</td>
<td>Segment 1: $1.1M (Town ‘n’ Country Greenway to Clifton St) Segment 2: $2.1M (Clifton St to Memorial Hwy) Segment 3: $1M (Memorial Hwy to U-Path) Request for Design funding</td>
<td>SU, TA, HSIP</td>
<td>34 total crashes, 0 bike/ped</td>
</tr>
<tr>
<td>Marshall Middle School</td>
<td>Walk/Bike Safety</td>
<td>Plant City</td>
<td>$494,600 requested for design &amp; construction, various locations, ROW and estimates needed</td>
<td>TA, SR2S</td>
<td>11 total crashes, 1 bike/ ped; Safe Routes to School</td>
</tr>
<tr>
<td>Columbus Dr/17th/18th/19th 2-way conversion</td>
<td>Complete Street Enhancements</td>
<td>Hillsborough MPO</td>
<td>2-way conversion, $1.6 million needed for signals, signing, and marking</td>
<td>SU</td>
<td>6 total crashes, 1 bike/ped</td>
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<tr>
<td>Stormwater improvements and pavement rehabilitation at HART admin and maintenance facility</td>
<td>Vulnerability Reduction</td>
<td>HART Priority #4</td>
<td>$3.5 million</td>
<td>FTA</td>
<td>Listed based on HART’s priority setting</td>
</tr>
</tbody>
</table>

* Project in neighboring county, reflected as a Transportation Management Area priority

Denotes new project

Adopted: June 13, 2017
### Table 2: CANDIDATES FOR NEW FUNDING

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<th>2040 LRTP Reference</th>
<th>Project Limits</th>
<th>Project Description</th>
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<th>Project Status / Request</th>
<th>Suggested Funding Type</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Manage Congestion for Drivers &amp; Shippers</strong>&lt;br&gt;Goals by 2040&lt;br&gt;* Traffic flow 17% better on non-freeways with ATMS and 640 intersections improved&lt;br&gt;* Traffic flow 10% better on freeways Plus truck quick fixes &amp; RR overpasses</td>
<td>17</td>
<td>Minimize Traffic</td>
<td>US41 (Pendola Point/Madison Ave)</td>
<td>Intersection Improvements</td>
<td>Port Authority/ FDOT (tent.)</td>
<td>Added $694k for design in FY21 &amp; 22, funding needed to add EB left turn lane &amp; NB entrance lane</td>
<td>SIS</td>
<td>3.934 PIT, low TT reliability</td>
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<tr>
<td></td>
<td>18</td>
<td>Minimize Traffic</td>
<td>Gibsonton Dr at I-75</td>
<td>Interchange Improvements</td>
<td>FDOT</td>
<td>Added $694k for design in FY21 &amp; 22, funding needed to add EB left turn lane &amp; NB entrance lane</td>
<td>SU, SIS</td>
<td>2040 Priority freeway needing CM impr - 1.58 V/C peak period 2040 Priority art needing CM impr - 1.00 peak period V/C</td>
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<tr>
<td></td>
<td>19</td>
<td>Minimize Traffic</td>
<td>Alexander St at SR 39</td>
<td>Intersection Improvements</td>
<td>Plant City Priority #3</td>
<td>Added $101k for design in FY21 &amp; 22, $2M needed for construction</td>
<td>SU</td>
<td>2040 Priority Art needing CM impr - 0.73 V/C peak period</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Minimize Traffic</td>
<td>Alexander St at Jim Johnson Rd</td>
<td>Intersection Improvements</td>
<td>Plant City Priority #7</td>
<td>Added $101k for design in FY21 &amp; 22, $2M needed for construction</td>
<td>SU</td>
<td>2040 Priority Art needing CM impr - 0.81 V/C peak period</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Minimize Traffic</td>
<td>S Park Rd at Coronet Rd</td>
<td>Intersection Improvements</td>
<td>Plant City Priority #8</td>
<td>Added $101k for design in FY21 &amp; 22, $2M needed for construction</td>
<td>SU</td>
<td>Other major arterial - 1.61 V/C peak period</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td></td>
<td>9996</td>
<td>Davis Rd Ext (Harney Rd to Maislin Dr)</td>
<td>New 2LU Rd Temple Terrace Priority #1</td>
<td>Partially funded with $1M special appropriation, $3M from Hills. Co. $3.8M total needed</td>
<td>SU</td>
<td>Alleviates US 301/Harney Rd intersection</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Minimize Traffic</td>
<td>Fiber Optic Ring between Jurisdictions</td>
<td>ATM - Signalization</td>
<td>HART Priority #10</td>
<td>$460,000</td>
<td>R-TIEs, FTA, SU</td>
<td>Listed based on HART’s priority setting</td>
</tr>
<tr>
<td><strong>Real Choices When Not Driving</strong>&lt;br&gt;Goals by 2040&lt;br&gt;* Wide paved trails &amp; sidepaths within walking distance of 1/4 of residents&lt;br&gt;* Frequent bus service within walking distance of nearly half of people &amp; jobs&lt;br&gt;* Outside bus service area, Sunshine Line services grow with senior population growth</td>
<td>24</td>
<td>Real Choices</td>
<td>EAST-WEST METRORAPID</td>
<td>New Expanded Transit Service</td>
<td>HART Priority #9</td>
<td>$30 million needed for construction, Added $2.5M for PD&amp;E FY18</td>
<td>DDR, FTA</td>
<td>2040 Investment Level 1 - density rating 5</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Real Choices</td>
<td>HART Airporter (Express bus from Downtown Tampa, TIA, and St. Pete)</td>
<td></td>
<td>Paratransit</td>
<td>Hillsborough MPO</td>
<td>$3M annually, add to Emerging SIS</td>
<td>Service Development, Urban Corridor Improvement</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>Real Choices</td>
<td>Sunshine Line Capital Costs</td>
<td></td>
<td>Transit</td>
<td>Sunshine Line</td>
<td>$92,104 capital costs (increase fleet to 72 small buses), needs verification from Hillsborough County</td>
<td>SU</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>Real Choices</td>
<td>I-275 Greenway Extension from W of Dale Mabry to MacFarlane Park (Dale Mabry Pedestrian Overpass)</td>
<td></td>
<td>Multi-Use Trail</td>
<td>Hillsborough MPO/FDOT (tent.)</td>
<td>MPO feasibility study of pedestrian overpass on going, request for Design $350K, could be part of Supplemental EIS and included as part of Tampa Bay Next</td>
<td>SUNTrail</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>Real Choices</td>
<td>Gandy Bridge Trail (Hillsborough County line to Westshore Blvd)</td>
<td></td>
<td>Multi-Use Trail</td>
<td>FDOT &amp; MPO</td>
<td>PD&amp;E study for Hillsborough Portion</td>
<td></td>
</tr>
</tbody>
</table>

* Project in neighboring county, reflected as a Transportation Management Area priority

Denotes new project

Imagine 2040 Plan Funding Levels:<br>Status Quo: $14M Needed to Reach Goals: $53M

2040 forecasted Planning Time Index (PTI) travel time reliability

Density rating based on number of jobs and residents within a 1/4 of a mile of a bus route or trail facility in 2040
## Table 2: CANDIDATES FOR NEW FUNDING

<table>
<thead>
<tr>
<th>2017 Priority</th>
<th>FPN</th>
<th>2040 LRTP Reference</th>
<th>Project Limits</th>
<th>Project Description</th>
<th>Project Sponsor</th>
<th>Project Status / Request</th>
<th>Suggested Funding Type</th>
<th>Prioritization Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>Real Choices</td>
<td>South Tampa Greenway (Manhattan Ave to Picnic Island Park)</td>
<td>Multi-Use Trail</td>
<td>Tampa Priority #12</td>
<td>$550,000 requested for PD&amp;E ($1,800,000 total cost estimate), Need agreement with MacDill AFB for ROW use for 25 years post-construction</td>
<td>Prioritized by CCC; TA application needs additional info</td>
<td>2040 Investment Level 1 - density rating 5</td>
<td></td>
</tr>
</tbody>
</table>
| 30            | Real Choices | GreenARTery Walk/Bike Loop | Multi-Use Trail | Tampa | * Segment D - Park Dr (22nd St Park to Sulpher Spring Park) $39,800  
* Segment E - E River Shore Dr (Sulpher Spring Park/Florida Ave to Sligh Ave/Lowry Park) $225,400 | | TA | 2040 Investment Level 1 - density rating 4 |
| 31            | Real Choices | Tampa Bypass Canal Trail (34th St to Bruce B. Downs) | Multi-Use Trail | County/Temple Terrace Priority | HC needs maintenance agreement w/ SWFWMD; Added $751k for PD&E In FY18, $379k for design in FY20, Segment/Phasing to come from PD&E, Total cost $6.5M | TA, SUNTrail Connecting, SU | 2040 Investment Level 2 - density rating 3 |
| 32            | Real Choices | West River Gwy (Bayshore Blvd to MLK Recreation Complex) | Multi-Use Trail | Tampa Priority #11 | $132,000 requested for Design ($982,000 total cost estimate); Waiting for verification of ownership of ROW | TA | 2040 Investment Level 2 - density rating 3 |
| 33            | Real Choices | South Coast Gwy (Phases I and III-VI) | Multi-Use Trail | County | Funding needed for PD&E and Design for Ph III-IV; SUNTrail application submitted for Maydell Bridge over Palm River. Added $2.4M for CST of Ph 1A in FY21 | TA, SUNTrail | 2040 Investment Level 2 - density rating 3 |
| 34            | Real Choices | UPPER TAMPA BAY TRAIL (UTBT) PHASE IV-A and IV-B | Multi-Use Trail | County | $2,582,000 to construct A  
$1,562,000 to construct B  
Alignment to be determined by County | Prioritized by CCC; Elig & Feas for TA | 2040 Investment Level 3 - density rating 1 |
| 35            | Real Choices | Selmon Greenway Next Phases - SR 60 between 19th St & Channelside Dr, extension to Nuccio Pkwy | Multi-Use Trail | THEA | Phase 2. $214,338 - Construct Connection to Nuccio Pkwy  
Phase 3. $138,614 - Safety & Sec Signage | TA | 2040 existing trail - density rating 1 |
| 36            | Real Choices | Shared-Use path to connect Temple Terrace to USF | Multi-Use Trail | Temple Terrace Priority #3 | MPO feasibility study FY18 | To Be Determined | 2040 Investment Level 2 - density rating 2 |
| 37            | Real Choices | Light Vehicle/footbridge over Hillsborough River at Whiteway Dr | Multi-Use Trail | Temple Terrace Priority #6 | TA Application needed | TA | 2040 Investment Level 2 - density rating 2 |
| 38            | Real Choices | York Street (Channelside Drive to Ybor Channel, on Port Property) | Complete Street Enhancements | Port Authority | $1.3 million for conversion to pedestrian promenade | To Be Determined | 0 total crashes, on Port property |
| 39            | Real Choices | McIntosh Tract Trail | Off-Road Bicycle Trail | Plant City | $105,500 needed for des & const; Review/revise in Plant City Walk-Bike Plan (MPO study on going) | Not eligible for TA | n/a |

* Project in neighboring county, reflected as a Transportation Management Area priority

Denotes new project
### Major Investments for Economic Growth

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<thead>
<tr>
<th>2017 Priority</th>
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<th>2040 LRTP Reference</th>
<th>Project Limits</th>
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<th>Prioritization Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>415348 1</td>
<td>83</td>
<td>Westshore Regional Intermodal Center (Regional Transit Catalyst Project)</td>
<td>Intermodal Center</td>
<td>FDOT</td>
<td>Funding is requested for reconstruction of two interchanges, I-275/SR 60 and I-275/I-4; interstate modernization including technology; reevaluation of Tampa Interstate Study EIS; and for locational studies for transit centers in the Gateway and Fletcher/Fowler areas. Environmental impact studies are underway, and construction is funded for the Howard Frankland Bridge replacement.</td>
<td>SIS; FDOT transit programs; prioritized by TMA</td>
<td>2040 job density and forecasted traffic congestion volume/capacity ratio (V/C)</td>
</tr>
<tr>
<td>61</td>
<td>437804 1</td>
<td>60</td>
<td>Modern Streetcar Extension (Regional Transit Catalyst Project)</td>
<td>Transit Connection</td>
<td>FDOT</td>
<td>Regional Transit Catalyst Project(s) which may include: a. Central Avenue BRT, St. Petersburg downtown to beaches; b. Westshore Multimodal Center with fixed guideway connections to downtowns and airports; c. Further development of the Regional Transit Feasibility Plan; d. Regional Express Bus - opportunities include SR 60/Gulf-to-Bay Blvd, the Veterans Ewy/Suncoast Pkwy, the Gandy/Selmon Ewy corridor, the SR 54/56 corridor, and as a part of Tampa Bay Next; and expansion of regional farebox system to adjoining counties; e. Elevated transit in the SR 60 corridor – pilot project from downtown Clearwater to Clearwater Beach.</td>
<td>SIS, FDOT transit programs; prioritized by TMA</td>
<td>ROW acquired in FY2016</td>
</tr>
<tr>
<td>40</td>
<td>412531 2</td>
<td>1002, 1099</td>
<td>I-275 at SR 60 Interchange (TBX Sec. 9)</td>
<td>Modify Interchange</td>
<td>FDOT</td>
<td>Funding is requested for reconstruction of two interchanges, I-275/SR 60 and I-275/I-4; interstate modernization including technology; reevaluation of Tampa Interstate Study EIS; and for locational studies for transit centers in the Gateway and Fletcher/Fowler areas. Environmental impact studies are underway, and construction is funded for the Howard Frankland Bridge replacement.</td>
<td>SIS; prioritized by TMA</td>
<td>2040 job density and forecasted traffic congestion volume/capacity ratio (V/C)</td>
</tr>
<tr>
<td></td>
<td>434045 2</td>
<td>1003</td>
<td>I-275 (Lois to Willow) (TBX Sec. 5)</td>
<td>Modify Interchange</td>
<td>FDOT</td>
<td>Funding is requested for reconstruction of two interchanges, I-275/SR 60 and I-275/I-4; interstate modernization including technology; reevaluation of Tampa Interstate Study EIS; and for locational studies for transit centers in the Gateway and Fletcher/Fowler areas. Environmental impact studies are underway, and construction is funded for the Howard Frankland Bridge replacement.</td>
<td>SIS; prioritized by TMA</td>
<td>2040 job density and forecasted traffic congestion volume/capacity ratio (V/C)</td>
</tr>
<tr>
<td></td>
<td>n/a*</td>
<td>1005</td>
<td>I-275 at I-4 (Downtown Interchange) (TBX Sec. 6)</td>
<td>Modify Interchange</td>
<td>FDOT</td>
<td>Funding is requested for reconstruction of two interchanges, I-275/SR 60 and I-275/I-4; interstate modernization including technology; reevaluation of Tampa Interstate Study EIS; and for locational studies for transit centers in the Gateway and Fletcher/Fowler areas. Environmental impact studies are underway, and construction is funded for the Howard Frankland Bridge replacement.</td>
<td>SIS; prioritized by TMA</td>
<td>2040 job density and forecasted traffic congestion volume/capacity ratio (V/C)</td>
</tr>
<tr>
<td></td>
<td>431746 1</td>
<td>1008</td>
<td>I-4 (Selmon Connector to E of Branch Forbes) (TBX Sec. 8)</td>
<td>Express toll lanes with with Exp. Bus</td>
<td>FDOT</td>
<td>Funding is requested for reconstruction of two interchanges, I-275/SR 60 and I-275/I-4; interstate modernization including technology; reevaluation of Tampa Interstate Study EIS; and for locational studies for transit centers in the Gateway and Fletcher/Fowler areas. Environmental impact studies are underway, and construction is funded for the Howard Frankland Bridge replacement.</td>
<td>SIS; prioritized by TMA</td>
<td>2040 job density and forecasted traffic congestion volume/capacity ratio (V/C)</td>
</tr>
</tbody>
</table>

* Project in neighboring county, reflected as a Transportation Management Area priority

* Denotes new project

Reference: Table 2: CANDIDATES FOR NEW FUNDING

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<tr>
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<th>Suggested Funding Type</th>
<th>Prioritization Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Minimize Traffic</td>
<td>Big Bend Rd at I-75</td>
<td>Interchange Improvements</td>
<td>FDOT/County</td>
<td>County requested $47.8M for additional improvements, IOAR underway</td>
<td>2040 Priority freeway needing CM impr - 1.58 V/C peak period Other major art - 1.20 peak period V/C</td>
<td>SU, TRIP, SIS, prioritized by TMA</td>
<td></td>
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<tr>
<td>44</td>
<td>Real Choices</td>
<td>Regional Farebox Rev. Collection &amp; Inter-Jurisdictional Mobility (Flamingo)</td>
<td>Regional Transit Fare Collection</td>
<td>HART Priority #7</td>
<td>Partially funded; balance of $8.9M needed (New Request is for $3.5M for fareboxes, HART upgrades)</td>
<td>TRIP, TIGER, FDOT transit; prioritized by TMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Real Choices</td>
<td>Waterborne Transit - High Speed Ferry</td>
<td>Commuter Transit</td>
<td>Hillsborough County</td>
<td>Funding is requested for regional waterborne transportation priority projects, which could include the Cross-Bay Ferry, waterborne service from south Hillsborough County to MacDill Air Force Base, and other regional projects.</td>
<td>SIS, FDOT transit programs; prioritized by TMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Need beyond 2040</td>
<td>US41 (Madison to Denver S)</td>
<td>Widen 4 to 6 lanes</td>
<td>Port Authority Request</td>
<td>This segment is considered to be policy constrained in the Hillsborough County Comprehensive Plan an would require and amendment to the plan.</td>
<td>SIS 1.89 V/C peak period, 3.934 PTI, low TT reliability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Minimize Traffic</td>
<td>US 41 at 50th St CSX Grade Separated Interchange/Rail Overpass South of Causeway Blvd and at Causeway Blvd</td>
<td>Grade Separated Intersection</td>
<td>FDOT</td>
<td>Port Tampa Bay request' Added $1.5M for PD&amp;E FY18, $5.4M for design FY19 &amp; 20, $15M for ROW FY22, CSTM $52.5M in FY26</td>
<td>2040 Priority Art needing CM impr - 1.70 V/C peak period, Delay reduction/mi = 1668</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>1043</td>
<td>US 92 (US 301/-4 to CR 579 (MANGO RD)</td>
<td>Widen 2 lanes to 4 lanes divided</td>
<td>FDOT</td>
<td>PD&amp;E added $1.25M in FY17</td>
<td>SIS, Other Arterials Delay reduction/mi = 57; 2040 jobs/mi = 1760</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>1045</td>
<td>US 92 from Park Rd to Polk County</td>
<td>Widen to 4LD</td>
<td>FDOT; Plant City Priority #4</td>
<td>PD&amp;E added: $1.8M in FY17</td>
<td>SIS, Other Arterials Delay reduction/mi = 119; 2040 jobs/mi = 568</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>E+C map</td>
<td>W Sam Allen Rd (N Alexander St to SR 39)</td>
<td>Widen to 4LD</td>
<td>Plant City Priority #2</td>
<td>$7.12M for Construction</td>
<td>SU Closest segment Forbes to Alex delay reduction/mi = 31 2040 jobs/mi = 57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>1038, 1040</td>
<td>Sam Allen Rd (Park Rd to Polk County)</td>
<td>New 4 Lane roadway</td>
<td>Plant City Priority #6</td>
<td>MPO Alignment Study underway; $4.5M request for PD&amp;E</td>
<td>SU Delay reduction/mi = 189 &amp; 20; 2040 jobs/mi = 240 &amp; 101</td>
<td></td>
<td></td>
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<tr>
<td>52</td>
<td>Minimize Traffic</td>
<td>US 41 at SR 60</td>
<td>Grade Separated Intersection</td>
<td>FDOT (tent.)</td>
<td>Port Tampa Bay request</td>
<td>Other Arterials US41 from Causeway to CSX Intm delay reduction/mi = 1668 SR 60 from 50th to US301 PTI = 3.933</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Minimize Traffic</td>
<td>US 41 at CSX 'A' Line to CSX 'S' Line</td>
<td>Grade Separated Intersection</td>
<td>FDOT (tent.)</td>
<td>Port Tampa Bay request</td>
<td>Other Arterials US41 from Causeway to CSX Intm delay reduction/mi = 1668</td>
<td></td>
<td></td>
</tr>
</tbody>
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Hillsborough MPO List of Priority Projects

FY2018/2019-2022/2023 Transportation Improvement Program

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<tbody>
<tr>
<td>54</td>
<td></td>
<td>Need beyond 2040</td>
<td>Rice Rd (Coronet Rd to Polk County)</td>
<td>New 2LU Rd</td>
<td>Plant City Priority #5</td>
<td>MPO Alignment Study underway; $3.757M requested for PD&amp;E</td>
<td>SU</td>
<td>Longer range need .12 V/C in 2018 E+C</td>
</tr>
<tr>
<td>55</td>
<td></td>
<td>Real Choices</td>
<td>Expansion of existing or construction of new maintenance facility</td>
<td>Transit</td>
<td>HART Priority #8</td>
<td>$16.5 million, MPO Feasibility Study on going</td>
<td></td>
<td>Listed based on HART’s priority setting</td>
</tr>
<tr>
<td>56</td>
<td></td>
<td>Need beyond 2040</td>
<td>Causeway Blvd (US 41 to US 301)</td>
<td>Operational Improvements</td>
<td>Port Authority/ FDOT (tent.)</td>
<td></td>
<td></td>
<td>Longer Range Need</td>
</tr>
<tr>
<td>57</td>
<td></td>
<td>Madison Ave (Falkenberg Rd to US 301)</td>
<td>Widen from 2 to 4 lanes</td>
<td>Port Authority/ FDOT (tent.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td></td>
<td>McKay Street (Channelside Drive to Ybor Channel, on Port Property)</td>
<td>Realignment of roadway</td>
<td>Port Authority</td>
<td>$1,600,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>Channelside Lane (McKay St to York St, on Port Property)</td>
<td>New 2 lane road</td>
<td>Port Authority</td>
<td>$3,100,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>Central Street (Cumberland Dr to Whiting St, on Port Property)</td>
<td>New 4 Lane roadway</td>
<td>Port Authority</td>
<td>$1,100,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td></td>
<td>Port Redwing Rail (on Port Property)</td>
<td>New rail line to Port Redwing</td>
<td>Port Authority/ FDOT (tent.)</td>
<td>$2,000,000</td>
<td></td>
<td></td>
<td>FDOT Intermodal, SIS</td>
</tr>
<tr>
<td>62</td>
<td></td>
<td>Port Redwing Access Road (Port Redwing to US41, on Port Property)</td>
<td>New 2 lane access road</td>
<td>Port Authority/ FDOT (tent.)</td>
<td>$2,000,000</td>
<td></td>
<td></td>
<td>FDOT Intermodal, SIS</td>
</tr>
<tr>
<td>63</td>
<td></td>
<td>Guy N. Verger flyover spanning CSX’s cargo artery north of GATX Dr (on Port Property)</td>
<td>Grade Separated Intersection</td>
<td>Port Authority/ FDOT (tent.)</td>
<td>$18,000,000</td>
<td></td>
<td></td>
<td>FDOT Intermodal, SIS</td>
</tr>
<tr>
<td>64</td>
<td></td>
<td>East Cargo Yard Access Road (US41 to Access Rd)</td>
<td>Widen from 2 to 4 lanes</td>
<td>Port Authority/ FDOT (tent.)</td>
<td>$2,000,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Denotes new project
Agenda Item
Kennedy Blvd & Hillsborough Ave Multimodal Safety Reviews

Presenter
Chris Keller, MPO Consultant (Tindale Oliver)

Summary
The purpose of these studies was to identify and evaluate potential safety improvements to the SR60 and SR580 corridors. The multimodal review of Kennedy Blvd from Westshore Blvd to the Hillsborough River identifies opportunities to augment an existing access management/resurfacing project with design and operational practices consistent with FHWA’s Pedestrian Safety Design Best Practices and FDOT’s Complete Streets Implementation Manual.

The multimodal review of Hillsborough Ave from Memorial Hwy to Himes Ave provides a feasibility review of recommendations identified in several existing MPO walk/bike and trail plans. A technical memorandum has been developed to provide conceptual drawings of recommendations.

Recommended Action
Approve the recommendations of the Kennedy Blvd & Hillsborough Ave Multimodal Safety Reviews.

Prepared By
Johnny Wong, PhD, MPO Staff

Attachments
- Kennedy Blvd Multimodal Safety Review DRAFT REPORT; and,
- Hillsborough Ave Multimodal Safety Review DRAFT Recommendations.
SR 60/Kennedy Boulevard Multimodal Safety Review

Draft October 2017

Completed as a Collaborative Effort For:

Florida Department of Transportation, District Seven
11201 North Malcom McKinley Drive
Tampa, FL 33612
Contract Number: C-9o45
FM Number: 254553-1-32-94
Task Authorization: #27

Hillsborough County Metropolitan Planning Organization
601 East Kennedy Boulevard, 18th Floor
Tampa, FL 33601
Task Authorization: TOA – 03

Prepared By:

Tindale Oliver
1000 North Ashley Drive, Suite 400
Tampa, FL 33602

October 2017
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- Traffic Volumes ............................................................................................................................................................................................................. 3
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Introduction

The SR 60/Kennedy Boulevard Multimodal Safety Review was conducted as a joint effort between the Florida Department of Transportation (FDOT) District Seven and the Hillsborough Metropolitan Planning Organization (MPO) to augment the recently-completed Kennedy Boulevard Access Management Study. This review effort was intended to identify opportunities to implement design and operation best practices to improve pedestrian and bicycle safety and comfort along Kennedy Boulevard. To accomplish this goal, the review incorporated tools that are consistent with both the Federal Highway Administration’s (FHWA) Pedestrian Safety Design Best Practices and FDOT’s emerging guidance on implementing Complete Streets. Although pedestrian and bicycle improvements are the primary focus of this review, the ultimate goal is to improve the safety, comfort, and livability of all roadway users along the Kennedy Boulevard corridor. As stated in FDOT’s Draft Complete Streets Handbook:

“A transportation system based on Complete Streets principles can help to promote safety, quality of life, and economic development.”

Study Area

The study area for the Kennedy Boulevard Multimodal Safety Review runs approximately 3.8 miles along Kennedy Boulevard from Westshore Boulevard to the Hillsborough River. Often referred to as the “gateway” to Tampa, the study corridor connects the Westshore business district to downtown and serves as one of Tampa’s primary commercial corridors. Along the eastern end of the corridor is the University of Tampa, which has an enrollment of more than 8,000 students. The review primarily focused on Kennedy Boulevard but looked at opportunities to enhance the pedestrian and bicycle environment north and south of Kennedy Boulevard. Figure 1 shows the study corridor extent and the general study area.
Background Data

This section provides an overview of mobility data, information, and a summary of existing conditions along the Kennedy Boulevard corridor, as well as highlights from the recently completed SR 60 Access Management Safety Study.

Access Management Safety Study

This multimodal safety review is intended to complement the Kennedy Boulevard Access Management Safety Study, which covered Kennedy Boulevard from Westshore Boulevard to Brevard Avenue and evaluated 51 median openings that include 11 signalized intersections, 38 full median openings, and 2 directional median openings. The goal of the study was to reduce collisions at median openings, especially right-angle and left-turn collisions which resulted in fatalities and serious injuries. The stated objectives of study included the following:

- Enhance access management along the corridor to reduce conflicts and right-angle/left-turn collisions at unsignalized median opening locations.
- Seek opportunities to enhance safety and operations for pedestrians, bicyclists, and motorists traveling the corridor.
- Improve traffic operations along the corridor through the implementation of recommended access management improvements.

Study Recommendations

The Access Management Safety Study developed recommended actions for each of the 51 median openings along the corridor. Of the 51 median openings, 43 (84%) were recommended as candidates for median opening modifications, including:

- Extension or construction of left-turn storage lane (20 median openings)
- Conversion of full median openings to directional median openings (8 median openings)
- Closure of median openings (14 median openings)
- Installation of new traffic signal (1 median opening, Rome Avenue)

Included with these recommendations was a list of pedestrian and bicycle recommendations designed to provide increase safety and connectivity throughout the corridor, some of which are listed below. Appendix A of this document includes a copy of the recommendation pages from the completed Kennedy Boulevard Access Management Safety Study.

- Consider providing raised medians between Habana Avenue and Tampania Avenue
- Provide east-west pedestrian signals at Willow Avenue
- Evaluate feasibility of a southbound right-turn lane with channelization island on North Boulevard Street
- Conduct pedestrian counts
- Review existing lighting
- Provide R10-15 signage
- Consider high-emphasis crosswalks at all marked crossings, including side streets
- Consider reviewing corridor cycle lengths and splits
- Consider installing pedestrian signal feedback indicators
- Consider constructing traffic signal at Rome Avenue
- Evaluate feasibility of signalized crossing at Henderson Boulevard (west of the intersection)
- Evaluate feasibility of crossing between Habana Avenue and Tampania Avenue
- Consider using flashing yellow left-turn arrows and changing phasing by time-of-day based on actuation
- Consider “Share the Road” signage
- Explore opportunities to widen the sidewalk through redevelopment

Existing Conditions
The Access Management Safety Study was used, in large part, to establish the existing conditions along Kennedy Boulevard. In some cases, however, additional data was collected or updated to establish the existing conditions for Kennedy Boulevard. The following is a summary of the existing conditions along the Kennedy Boulevard corridor.

Number of Travel Lanes
Kennedy Boulevard is a 6-lane divided roadway from Westshore Boulevard to Church Avenue, just west of Dale Mabry Highway. Kennedy Boulevard from Church Avenue to the Hillsborough River is a 4-lane divided roadway.

Typical Cross-Sections
As with the number of travel lanes, the typical cross-section along Kennedy Boulevard varies as one moves along the corridor. Documenting the typical sections helps to provide a clearer understanding of how the existing right-of-way along the corridor is used and defined. Appendix B contains illustrations of the existing typical cross-sections along Kennedy Boulevard.

Traffic Volumes
Traffic counts along Kennedy Boulevard were evaluated using available traffic count data from FDOT’s Transportation Statistics Office (TSO). Figure 2 and Table 1 provide a summary of the annual average daily traffic (AADT) and directional volumes for the seven count stations along the Kennedy Boulevard corridor. Not surprisingly, the 6-lane segment of Kennedy Boulevard east of Westshore Boulevard has the highest daily traffic volume, with an AADT of 41,500; the lowest daily traffic volume along the corridor is the 4-lane segment west of Henderson Boulevard, with an AADT of 30,000.

Table 1: Annual Average Daily Traffic Volumes (2016)

<table>
<thead>
<tr>
<th>Location (Kennedy Boulevard)</th>
<th>Average Daily Traffic</th>
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<tbody>
<tr>
<td></td>
<td>Eastbound</td>
</tr>
<tr>
<td>E of Westshore Blvd</td>
<td>21,000</td>
</tr>
<tr>
<td>W of Dale Mabry Hwy</td>
<td>16,000</td>
</tr>
<tr>
<td>E of Dale Mabry Hwy</td>
<td>14,500</td>
</tr>
<tr>
<td>W of Henderson Blvd</td>
<td>14,000</td>
</tr>
<tr>
<td>E of Henderson Blvd</td>
<td>18,500</td>
</tr>
<tr>
<td>W of Willow Ave</td>
<td>15,500</td>
</tr>
<tr>
<td>E of Hillsborough River</td>
<td>14,000</td>
</tr>
</tbody>
</table>

Data Source: FDOT TSO 2016 Historical AADT Report
In addition to existing AADTs, historical traffic volumes along the corridor were evaluated. In evaluating the historical counts, it was observed that for six of the seven count stations, the existing 2016 AADTs are lower than the previous year’s volumes and, in some instances, the decreases in traffic volumes are significant. Compared to 2015 counts, the decrease in 2016 AADT is appreciable along the 6-lane segments, where there is a 13.5% decrease in volume east of Westshore Boulevard and a 22.7% decrease west of Dale Mabry Highway. Although it is not unusual to see variation in traffic volumes over time, it is unusual to witness such a dramatic change throughout a corridor over a one-year timeframe. Decreased traffic volume may be attributable to the completion of construction on I-275, as drivers that were using Kennedy Boulevard to avoid construction returned to the interstate upon completion. Still there are concerns over the validity of the 2016 traffic counts. Appendix C contains a summary of the historical traffic counts along Kennedy Boulevard.

Appendix C also contains a summary of the 24-hour traffic patterns along Kennedy Boulevard. Included in the daily traffic evaluation are graphs depicting total hourly traffic, hourly directional traffic, and 15-minute directional traffic volumes. Due to the concerns over the validity of the 2016 traffic counts, the 2015 daily traffic counts/patterns (where available) are shown along with the 2016 counts.

Signalized Intersections and Crossing Opportunities

There are 12 existing signalized intersections and 2 signalized pedestrian crossings that provide protected crossing opportunities along the Kennedy Boulevard corridor. As a result of the Access Management Study, signalization is planned for the intersection of Kennedy Boulevard and Rome Avenue. Figure 3 shows the existing and planned signalized intersections and crossing opportunities along the corridor. Currently, the average distance between signalized intersections/controlled crossings along Kennedy Boulevard is approximately 1,600 feet; the greatest distance between crossing opportunities is approximately 2,970 feet between Westshore Boulevard and Lois Avenue; and the shortest distance between crossings is between UT Poe Parkway and Hyde Park Avenue, at approximately 330 feet.
Figure 2: Annual Average Daily Traffic Volumes (2016)

Figure 3: Existing and Planned Crossing Opportunities
Transit Service

Transit service along Kennedy Boulevard is provided by Hillsborough Area Regional Transit (HART) Route 30. Route 30 currently provides 30-minute frequencies for approximately 20 hours per weekday and 18 hours on the weekends along Kennedy Boulevard. Although directly serving Kennedy Boulevard, Route 30 also provides a connection between downtown Tampa, the Westshore Business District, and Tampa International Airport. Route 36, which travels along Dale Mabry Highway, crosses Kennedy Boulevard and provides service to the corridor by the way of transfers. Figure 4 shows the route alignments for Routes 30 and 36 through the study area along with the location and ridership numbers for the bus stops along the corridor. As shown in Figure 4, the 10 bus stops near the intersection of Kennedy Boulevard and Dale Mabry Highway have the highest concentrations of transit activity along the corridor, with approximately 300 transit riders boarding or alighting a bus on an average weekday. It is assumed that a significant proportion of the ridership at this intersection is transfer activity between Routes 30 and 36. Although the area of Kennedy Boulevard and Dale Mabry Highway has the highest concentration of transit activity, the two busiest stops in terms of ridership are located at the intersection of Kennedy Boulevard and Oregon Avenue, which has a combined average daily ridership of approximately 120 people.

Block Density

Block density is the number of blocks within a given area. This measure can be used as a proxy for block size, intersection density, and street network connectivity. A higher block density typically indicates greater walkability and network connectivity, while smaller blocks and more frequent intersections may provide roadway users with increased route options to travel within that area. Figure 5 shows the block density along the Kennedy Boulevard corridor. Generally, a measure of 50 blocks per square mile is considered to be an acceptable level of density to provide options for walking and biking trips. As shown on the following page, nearly the entire corridor has a block density greater than 50 blocks per square mile.

The University of Tampa campus is shown to have a block density of less than 50 blocks per square mile, and is highly-walkable and well-connected. Because many of the streets and walkways on campus are private, however, there were not included in the block density evaluation.
Figure 4: Transit Service and Stop Ridership

Density of Blocks per Square Mile

Figure 5: Blocks per Square Mile
**Existing Land Use**

The existing land uses within the corridor study area were plotted to better understand the make-up and diversity of uses within the corridor. As shown in Figure 6, the majority of the existing land uses fronting Kennedy Boulevard fall within the Commercial land use category, which includes retail, office, and restaurants. Toward the eastern end of the corridor, much of the land use is classified as Institutional, which is mostly the University of Tampa.

Although not prominent in Figure 6, a notable characteristic of the commercial properties fronting Kennedy Boulevard is that they are relatively small in size; the average size for a commercial property along Kennedy Boulevard is less than 0.5 acres, and many of them have a relatively shallow depth of less than 150 feet. The number of commercial properties (200+) and the relatively small parcel sizes result in a high number of access points (driveways) along Kennedy Boulevard and make larger-scale redevelopment along the corridor more challenging.

Not reflected in the current existing land use map is the proposed Lafayette Place development located at the eastern end of the corridor on the south side of Kennedy Boulevard between Plant Avenue and the River. Lafayette Place is proposed to include nearly 1.8 million square feet of offices, hotel, multifamily housing, parking, stores, restaurants, bars, and boat slips.

![Figure 6: Existing Land Use](image-url)
**Crash History**

A three-year crash history (2013–2015) within the corridor was analyzed. During the three-year period, there were 758 reported crashes. Figure 7 shows the annual distribution of total crashes within the corridor. In addition to total crashes, the number and location of severe injury (fatal and incapacitating injury) crashes, pedestrian and bicycle crashes, and angle and left-turn crashes were analyzed. Figures 8–10 show the annual distribution of severe injury, pedestrian and bicycle, and angle and left-turn crashes along Kennedy Boulevard.

The distribution and frequencies of crashes by intersection are shown in Figures 11–14. As shown in Figure 11, the intersections with the highest frequencies of total crashes are:

- Kennedy Boulevard at Dale Mabry Highway – 88 total crashes
- Kennedy Boulevard at Westshore Boulevard – 55 total crashes
- Kennedy Boulevard at MacDill Ave – 50 total crashes

![Figure 7: Annual Distribution of Total Crashes](source: Crash Analysis Reporting System (CARS) extract)

![Figure 8: Annual Distribution of Severe Injury Crashes](source: Crash Analysis Reporting System (CARS) extract)
Figure 9: Annual Distribution of Pedestrian and Bicycle Crashes

Figure 10: Annual Distribution of Angle and Left-Turn Crashes

Total Crash Intersection Summary (2013 - 2015)

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 25
- 26 - 35
- > 35 (max. 88)

Figure 11: Total Crashes by Intersection
Figure 12: Severe Injury Crashes

Figure 13: Pedestrian and Bicycle Crashes
Figure 14: Angle and Left-Turn Crashes

Roadway Lighting

Roadway lighting plays an important role in creating a safe environment for all roadway users. Between 2013 and 2015 27% of the total crashes and 43% of the pedestrian and bicycle crashes occurred at night. Historically, roadway lighting has been focused on providing adequate lighting levels for motorists, but recently there has been more emphasis on using roadway lighting as a safety tool for non-motorists. Examples of this can be seen in the placement of roadway lighting. Traditionally, lighting at intersections has placed the luminaires directly over the intersection, pointing toward the middle of the intersection; more recently, there has been an emphasis on placing luminaires on the approach to the intersection in front of crosswalks, which improves driver visibility of pedestrians within the crosswalks. An inventory of the location of existing lighting structures near the signalized intersections along Kennedy Boulevard was conducted as part of this study effort; Appendix D of this document provides the results of the lighting inventory review.

Driveways

According to the American Association of State Highway and Transportation Officials (AASHTO), a driveway is defined as an access constructed within the public right-of-way, connecting the public roadway with adjacent property. Simply put, driveways physically connect the roadway to the properties along it. The design and location of driveways are based on multiple considerations, but ultimately, driveways need to provide safe entry and exit from a site, minimize impacts on traffic, and provide a clear and safe environment for all roadway users.

The impacts that driveways can have on the pedestrian and bicycle environment along a roadway have been well-documented. Driveways create inconsistencies in the walking/biking environment and increase the number of potential conflict points between pedestrians/bicyclists and motor vehicles. Furthermore, the physical design of a driveway can have a significant impact on the safety and
level of comfort for pedestrians/bicyclists along a roadway. Understanding the role that driveway design, location, and frequency have on pedestrian and bicycle safety and mobility is essential when trying to develop a quality multimodal environment.

Currently, there are nearly 250 existing driveways along Kennedy Boulevard between Westshore Boulevard and the Hillsborough River (Figure 15), equating to an average of about 66 driveways per mile. Directionally, there are approximately 31 driveways per mile along the north side of Kennedy Boulevard and 34 along the south side of Kennedy Boulevard. Although the size/width of each driveway varies, based on the per-mile driveway count, there is, on average, a driveway approximately every 160 feet along both sides of Kennedy Boulevard.

**Signage**

Signage plays an important role in the transportation environment. Signs provide roadway users with information, regulate proper use, and provide warnings. Signs can be used to alert motorists to the likely presence of pedestrians and bicyclists, increasing the likelihood that they will react and behave appropriately. A review of the existing signs specifically related to pedestrians and bicyclists (e.g., “Turning Vehicles Yield to Pedestrians” and “Share the Roadway”) along Kennedy Boulevard were inventoried. The following is a list of existing pedestrian and bicycle related signs and their locations along the corridor.

- **R10-15/”Right Turning Drivers Yield to Pedestrians”**:
  - Eastbound and Westbound Kennedy Boulevard at Westshore Boulevard
  - Northbound Westshore Boulevard at Kennedy Boulevard (older version)
  - Southbound Armenia Avenue at Kennedy Boulevard
  - Northbound Howard Avenue at Kennedy Boulevard

---

**Existing Driveways**

[Driveway locations diagram]

**Figure 15: Existing Driveway Locations**
Existing Overlay Districts

The City of Tampa has established overlay districts to allow for the application of specific regulations to distinct geographic areas. These districts can be used as instruments for protecting the character of a specific area and to encourage development and development patterns that are compatible and complementary to the existing character of the area. There are two established overlay districts along the Kennedy Boulevard corridor—the Kennedy Boulevard Corridor District and the Westshore Overlay District. Figure 16 shows the extent of these districts along the corridor.

Although they address different topics, both overlay districts along the corridor recognize the importance and significance of Kennedy Boulevard from an economic, social, and mobility standpoint and that the corridor serves as a gateway between two of the city’s most prominent employment centers. The following provides an overview of how both overlay districts address transportation, specifically pedestrian and bicycle mobility.

Kennedy Boulevard Corridor District

The Kennedy Boulevard Corridor District overlay establishes design standards that are intended to promote development that creates a sense of interest through a physically-attractive, functionally-integrated environment. Since much of the Kennedy Boulevard corridor is built-out, the overlay district’s design standards focus primarily on redevelopment, infill development, major renovations, and major additions. In addition to promoting development that is compatible and architecturally and aesthetically pleasing, the overlay provides provisions that establish pedestrian and transit-friendly design standards for the corridor. Some of the specifications from the overlay district design standards are provided on the following page.

Figure 16: Existing Overlay Districts

Overlay Districts

- Kennedy Boulevard Corridor
- Westshore

Figure 16: Existing Overlay Districts
Each application for new construction and/or major renovation shall comply with all applicable overlay district and underlying district standards. (Sec. 27-243(c)).

Minimum public sidewalk width shall be ten (10) feet adjacent to Kennedy Boulevard right-of-way. (Sec. 27.243(f)(1))

Light poles shall stand approximately thirteen (13) feet in height, as measured from finished grade, and shall be designed to provide safe pedestrian scale lighting. (Sec. 27.243(f)(3)(d))

Onsite pedestrian circulation shall be provided between tenants and/or structures, for properties with multiple structures, through the use of a sidewalk, or other suitable ADA compliant, pedestrian conveyance. (Sec. 27-243(e)(3)(f))

Vehicle access and flow shall be designed to have minimal impact on pedestrian circulation, and there must be continuity of sidewalk materials across the mouth of all curb cuts. (Sec. 27-243(e)(4)(a))

In all cases, efforts should be made to provide vehicular access that promotes safe pedestrian movement along Kennedy Boulevard. (Sec.27-243(e)(4)(b)(2))

**Westshore Overlay District**

Similar to the Kennedy Boulevard Corridor District overlay, the Westshore Overlay District establishes design standards to guide future development and provides parameters to ensure the implementation of compatible architectural elements and create appealing business, commercial, and residential development environments. The Westshore Overlay District also establishes standards to improve mobility and the aesthetics of all roadways while also enhancing the overall public realm with specialty hardscapes, landscaping, and buffering.

The overlay’s guidance recognizes that enhanced pedestrian connections will assist in characterizing the district as a significant economic activity area and, therefore, includes design standards and strategies to improve pedestrian mobility throughout the district. Many of the design standards and strategies established by the overlay are outlined in the Westshore Pedestrian Plan. The guiding principles of the Westshore Pedestrian Plan are as follows:

- Enhance the visibility and accessibility of the pedestrian, bicycle, and transit network to improve safety.
- Create roadways that equally serve pedestrians, bicyclists, transit users, and motorists.
- Mitigate traffic congestion and expand travel choices for all ages and abilities by making walking, biking, and transit more comfortable, accessible, and reliable modes of travel.
- Provide seamless connections between complementary uses (i.e., offices, hotels, retail, residences, schools, etc.).
- Connect and integrate pedestrian and bicycle facilities with transit, adjacent land uses, and activity centers.

Recognizing that the streets within the greater Westshore District are not the same nor serve the same users, the Pedestrian Plan and overlay identify four distinct street types, and establish specific land development and land/street design regulations to improve and strengthen the pedestrian environment. Kennedy Boulevard is identified as a “regional corridor,” which is defined as follows:

*Designed for high-speed travel across the region, Regional Corridors serve as important entry gateways into the Greater Westshore Area. These corridors contain significant office and commercial development, thereby containing a high amount of associated pedestrian traffic. Regional Corridors must allow direct vehicular access into*
the Greater Westshore Area while providing safe pedestrian connections between land uses.

The following highlights some of the specific overlay design standards related to the pedestrian environment:

- The overlay establishes a minimum public sidewalk width of 10 feet and states that this minimum width, along with the required adjacent buffer trees, be provided regardless of the width of the public right-of-way. Development applicants may elect to either install the sidewalk and provide an easement to the city, dedicate such an area to the city along with applicable multi-modal transportation impact fee credits, or if approved pay an applicable in-lieu fee. (Sec. 27-238)(Table 238.2c)

- All buildings shall have pedestrian access oriented toward the public sidewalk adjacent to the street. (Sec. 27-238(g)(4)(o))

- Small Public Open Space areas measuring twenty (20) feet by twenty (20) feet shall be provided at the following intersection corners:
  - Northeast and southwest corners of Kennedy Boulevard at Grady Avenue and Manhattan Avenue. (Sec. 27-238(g)(4)(t)(2)(iii))

- Large Public Open Space areas measuring forty (40) feet by forty (40) feet shall be provided at the following intersection corners:
  - Northwest and southeast corners of Westshore Boulevard and Kennedy Boulevard. (Sec. 27-238(g)(4)(t)(3)(i))

- Requests for additional curb cuts, for existing development, will only be considered in instances of public safety issues. (Sec. 27-238(i))

- Vehicle access shall have minimal impacts on pedestrian circulation. Sidewalk paving must continue across the mouth of all curb cuts... (Sec. 27-238(g)(5)(b))

- Light poles and fixtures within the Kennedy Boulevard corridor shall follow the street lighting standards set forth in section 27-243 (Kennedy Boulevard Corridor District). (Sec. 27.238(g)(3)(d))
Recent and Planned Roadway Projects

The constraining nature of the built environment along Kennedy Boulevard means that major roadway projects (e.g., widening or major reconstruction) are unlikely and that the best opportunity for roadway improvements along the corridor are through maintenance-type projects such as roadway resurfacing and through safety enhancements. Kennedy Boulevard between Church Street and Henderson Boulevard recently was resurfaced in 2015. A resurfacing project from Brevard Avenue across the Hillsborough River is scheduled to begin in late 2017, and will include the addition of shared lane markings along Kennedy Boulevard. Finally, there is a planned/unfunded resurfacing project along Kennedy Boulevard between Henderson Boulevard and Brevard Avenue. Figure 17 shows the extent of the recently-completed and planned resurfacing projects along Kennedy Boulevard.

Figure 17: Recently-Completed and Planned Resurfacing Projects
Multimodal Safety Review

The purpose of the Kennedy Boulevard Multimodal Safety Review is to identify opportunities to improve pedestrian and bicycle safety and comfort along the SR 60/Kennedy Boulevard corridor. The previously-completed SR 60 Access Management Safety Study made several recommendations to improve pedestrian and bicycle safety/comfort along Kennedy Boulevard. It is important to note that this multimodal safety review supports the pedestrian and bicycle safety recommendations from the Access Management Safety Study and that a large part of this review is aimed at supporting and strengthening those recommendations.

The identified opportunities to improve pedestrian and bicycle safety and comfort have been divided into two sections:

- **Systemic Strategies** – potential improvements and/or strategies that could be applied throughout the corridor, where feasible, or may be incorporated into future projects along the corridor.
- **Site-Specific Strategies** – potential improvements at specific locations along the corridor.

Systemic Strategies

**Roadway Lighting**

As stated in the previous section, there has been an increased emphasis on the importance of roadway lighting as an effective safety tool for improving conditions for all roadway users. Both FDOT and the City of Tampa are working on improving roadway lighting with a strategic emphasis on improving signalized intersection lighting. The FDOT recently adopted new standards for intersection lighting design (Figure 18) and illuminance levels for urban roadways with an elevated pedestrian crash risk. The intersection of Kennedy Boulevard and Dale Mabry Highway has been identified in FDOT’s list of priority lighting enhancement intersections. Although Kennedy Boulevard is not currently identified as a priority lighting enhancement corridor, opportunities to enhance lighting along Kennedy Boulevard and at signalized intersections should continue to be identified.
In addition to supporting the enhancement of roadway and intersection lighting along Kennedy Boulevard, continuing efforts to provide pedestrian-scale lighting along Kennedy Boulevard, in line with the streetscape plan, will help improve lighting conditions for all users.

**Crosswalk Enhancement**

Crosswalks are a vital part of the pedestrian network, they define designated crossing areas for pedestrians and help alert drivers to the likelihood of pedestrians. Marked and well-distinguished crosswalks help discourage drivers from encroaching on the crosswalk area and can help pedestrians assert their right-of-way. A variety of crosswalk treatments exist within the Kennedy Boulevard corridor, ensuring that these crosswalks are well-maintained and highly-visible helps to establish a safer and more comfortable walking environment along the corridor.

This review supports the Access Management Safety Study’s recommendation of considering high-emphasis crosswalk markings at all marked crossings, including side streets, but also recognizes the local desire for decorative (stamped asphalt) markings, and FDOT’s preference for using standard crosswalk markings along roadways at non-intersection locations. The recently-improved crosswalks at Kennedy Boulevard and North/South Boulevard are a good example of how high-emphasis and decorative crosswalk markings can be incorporated together to provide a well-distinguished and highly-visible crosswalk. There are currently marked crosswalks at all of the intersections and side streets along Kennedy Boulevard, and continued coordination between the City of Tampa and FDOT will ensure that these crosswalks are well-maintained and will help in identifying opportunities to enhance existing crosswalk markings.

**Driveway Design and Frequency**

AASHTO states that driveways should be considered as intersections and should be designed to minimize conflicts with the roadway and sidewalk. All driveways should be designed to safely accommodate pedestrians, bicyclists, and vehicles, but in urban areas with heavier pedestrian and bicycle traffic, it is even more critical to design and locate driveways in a manner to reduce potential conflicts.

While driveways should be designed to improve the visibility and safety of pedestrians and bicyclists, the frequency with which driveways line the corridor is equally significant. As noted, there are nearly 250 driveways/curb cuts along Kennedy Boulevard. The *FDOT Driveway Information Guide* states that every driveway creates potential conflicts and that reducing the number of driveways reduces the number of pedestrian/vehicle conflict points.

An initial step in reducing the number of curb cuts along Kennedy Boulevard is to explore elimination of unused or abandoned driveways, which could dramatically improve the walking and biking environment by providing more uniform and consistent sidewalk facilities throughout the corridor. Both FDOT and the City of Tampa have processes in place to identify and eliminate unused/abandoned driveways, the following is a summary of the current processes:

- **FDOT** – If FDOT has determined a driveway to be an abandoned connection and is not in compliance with current design standards, and no additional right-of-way is required, FDOT will provide a written letter to the property owner in advance of roadway work that there is an intention to close the identified driveway. The property owner then has 21 days to request an administrative hearing before the action becomes effective and final. This process is further defined in
Chapter 14.96.015 of the Florida Administrative Code which states: Where connections are to be modified as part of a Department construction project, and the Department is not planning to acquire any portion of the property for the project, the Department will provide notice and opportunity for an administrative proceeding pursuant to Rule 14-96.0011, F.A.C., and Chapter 120, F.S. For purposes of paragraph 14-96.011(1)(d), F.A.C., construction plans for a Department project signed, sealed, and dated by a Professional Engineer registered in the State of Florida shall substantiate a connection’s non-conformance with Department standards or potential safety or operational problems, and a separate engineering study shall not be required.

- City of Tampa – Section 22-318 of the City’s Code of Ordinance addresses the process for dealing with abandoned driveways and states: At any time an existing driveway is abandoned or use of such driveway is discontinued, it shall be the responsibility of the owner of the property formerly accessed by such driveway to restore the public right-of-way to its original condition. Determination of original condition shall be made by the city transportation manager.

More information on the location of potentially unused driveways is provided in the Site-Specific Strategies section.

Other strategies to reduce the number of curb cuts along Kennedy Boulevard are to encourage shared driveways, provide cross-access between properties to minimize the number of driveways and provide better access for drivers, and to encourage the placement of driveways along side streets. An example of a shared access point and the use of side-street access can be found on the south side of Kennedy Boulevard between Rome Avenue and Dakota Avenue. The often-competing businesses of Dunkin’ Donuts and Starbucks share a single access point along Kennedy Boulevard, provide cross-access between properties, and use access points along both Rome Avenue and Dakota Avenue. Encouraging shared driveways, cross-access, and side-street access will help to improve walking and bicycling conditions along Kennedy Boulevard by reducing the number of duplicative driveways.

**Enhancing the Pedestrian Environment**

The Access Management Safety Study recommended exploring opportunities to widen the sidewalk through redevelopment. As previously discussed, both the Westshore Overlay District and the Kennedy Boulevard Overlay have established a process to provide wider sidewalks along Kennedy Boulevard through redevelopment. One drawback to the current process is that relying on redevelopment has led to a patchwork of improved sidewalks along the corridor. While continuing to support the current processes established by the overlay districts, any opportunities to advance the enhancement of sidewalks along the corridor should be encouraged and explored.

Additionally, supporting strategies to develop a more livable street environment will improve the safety and comfort for pedestrians along Kennedy Boulevard. These strategies include better managing speeds, increased crossing opportunities, enhanced crossings at existing intersections, and improved lighting.

**Enhancing the Bicycling Environment**

Similar to the approach for improving the pedestrian environment, supporting strategies to develop a more livable street will improve the safety and comfort for bicyclists along Kennedy Boulevard. Providing a dedicated bicycle facility along Kennedy Boulevard would
be ideal, and yet due to the current physical constraints along the majority of the corridor, doing so would most likely require a significant investment involving the purchasing of right-of-way, major roadway reconstruction, or both. These constraints currently make providing a dedicated bicycle facility along Kennedy Boulevard challenging, complex, and most likely cost prohibitive.

A dedicated bicycle facility along Kennedy Boulevard is therefore unlikely, but there are still opportunities to improve the bicycling environment within the Kennedy Boulevard corridor. This section looks at two approaches for accommodating bicyclists within the Kennedy Boulevard corridor. One is to identify strategies that can enhance bicycling directly along Kennedy Boulevard and the other is to identify strategies and opportunities to enhance bicycling along parallel streets within the larger “corridor” area.

Before exploring strategies and opportunities to enhance bicycling within the Kennedy Boulevard corridor, it is important to recognize that there are important differences among bicyclists’ attitudes and comfort while riding a bicycle in different situations and contexts. In 2006, Portland (Oregon) bike chief Roger Geller categorized the city’s cycling population into four kinds of riders based on their comfort levels in a variety of cycling environments, as follows:

- **“Strong and Fearless”** – bicyclists who will ride their bike anywhere regardless of roadway conditions or presence of facilities.
- **“Enthused and Confident”** – bicyclists who are comfortable sharing the roadway with automobile traffic, but often prefer to do so within a dedicated facility such as a marked bike lane. Many in this group may already be riding their bikes for transportation purposes.
- **“Interested by Concerned”** – people who enjoy riding a bicycle and may already ride for recreational purposes but are often discouraged from riding more regularly by roadway conditions and/or lack of “comfortable” facilities.
- **“No Way No How”** – people who either have no interest in riding a bike or are unable to do so because of physical limitations.

In 2016, Jennifer Dill and Nathan McNeil of Portland State University conducted a national study to determine how riders across America fit into these four typologies. Figure 19 shows a breakdown of their findings.

![Figure 19: Four Types of Cyclists](image)

Data Source: Dill & McNeil, 2016

As shown, the majority of bicyclists can be categorized within the “Interested but Concerned” category—people who like to ride a bike and often do so for recreational purposes but often do not feel...
comfortable riding along busy roadways without some level of protection. Figure 20 shows the responses of the “Interested but Concerned” group on their level of comfort on different facilities and roadway types. Data from respondents shows there is a higher level of comfort with lower-stress facilities such as trails and bike boulevards, and zero percent said that they would be “very comfortable” riding along a major roadway with just a striped bike lane. This suggests that providing more separation between bicyclists and motor vehicles may increase bicycling within this group, which could significantly increase the overall number of bicyclists.

Irrespective of whether there is a dedicated bicycle facility along Kennedy Boulevard, promoting a more livable street environment with calmer traffic and wider sidewalks will help to provide a safer and more comfortable bicycling environment. More direct enhancements to the bicycling environment could be the use of signage such as a R4-11 sign (“Bicycles May Use Full Lane”) (Figure 21) or a W11-1 (bicycle image) warning sign along with a W16-1P sign (“Share the Road”) (Figure 22), both of which could be used to alert drivers to the potential presence of bicycles and to empower bicyclists to use the full travel lane. If traffic speeds could be reduced enough to lower the posted speed limit to 35 mph, then shared lane markings could be installed along Kennedy Boulevard. The upcoming resurfacing project from Brevard Avenue across the Hillsborough River will include shared lane markings, but until then, bicyclists along Kennedy Boulevard will either need to ride within the travel lane or use the sidewalks.

Data Source: Dill & McNeil, 2016

**Figure 20:** “Interested but Concerned” Group Level of Comfort on Different Bicycle Facilities

One thing to note about this research and its finding is that these are general groupings and that the differences among these groups are not discrete. It is also important to recognize that these types are defined primarily by comfort level bicycling in different environments, not by their current bicycling behavior. One of the takeaways of understanding the different type of bicyclists and encouraging bicycling is that bicycle infrastructure needs to correspond to the desired comfort level of those using the facilities. Making bicycling more attractive is as much about recognizing the comfort levels and environments of different users as it is about providing infrastructure.
bicyclists recognize that they have the responsibility to yield to pedestrians, and in some instances, may actually be a safer option. This is particularly true for bicyclists who are uncomfortable riding in mixed traffic. Riding along a sidewalk, however, is not always the safest option for bicyclists. When riding on a sidewalk, bicyclists often become invisible to motor vehicle drivers, especially at driveways and on side streets while riding opposite the direction of traffic. One option to help remind bicyclists of potential dangers while riding on the sidewalk is to explore the possibility of placing bicycle warning signs on the back of existing traffic signs. Figure 23 is an example of signage from Toronto that warns both bicyclists and pedestrians to be vigilant of turning vehicles and reminds bicyclists to yield to pedestrians along the sidewalk.

The following options for improving the bicycle environment along Kennedy Boulevard require adopting a systems view of the corridor, where there are opportunities to create very safe bicycle facilities along parallel streets. Facilities along parallel streets may not directly serve the businesses along Kennedy Boulevard and should not be considered substitutes for facilities along Kennedy Boulevard, they
can be useful and should be considered part of the overall network. The following highlights some options for east-west bicycle travel along streets parallel to Kennedy Boulevard. Additionally, Figure 24 visually represents how parallel routes could be used to accommodate east-west bicycle travel through the corridor:

- **Cass Street** – Located about one-third of a mile north of Kennedy Boulevard. Plans are underway to complete a two-way cycle track along Cass Street between Howard Avenue and the Hillsborough River (the “Green Spine”), which will connect to the existing facility along Cass Street in downtown and eventually extend into Ybor City. Once the cycle track along Cass Street is complete, it could serve as an alternative east-west connection into/from downtown on the eastern end of the Kennedy Boulevard corridor.

- **Gray Street** – A local, primarily residential, street located approximately one-quarter mile north of Kennedy Boulevard that runs uninterrupted from Westshore Boulevard to Rome Avenue. Parts of Gray Street recently were vacated to accommodate parking at the recently-constructed NoHo Flats development east of Rome Avenue. The street has signalized crossings at Westshore Boulevard and Dale Mabry Highway, runs adjacent to the new Jewish Community Center between Armenia Avenue and Howard Avenue, and has speed tables west of Himes Avenue. These characteristics make it an ideal candidate for consideration as a bicycle boulevard (lower volume streets designed to promote and prioritize bicycling).

- **North A Street** – Located one block (approx. 300 ft) north of Kennedy Boulevard, North A Street is a local, primarily residential street that currently provides bicyclists with a lower-stress alternative to riding on Kennedy Boulevard.

Crossing enhancements at key intersections along North A Street could make this an even more attractive option for bicyclists traveling within the corridor. The street could also be considered as a potential bicycle boulevard candidate.

- **Cleveland Street** – Varying throughout the corridor, Cleveland Street is located approximately 500–600 feet south of Kennedy Boulevard. Between Armenia Avenue and the Hillsborough River, it is a one-way (westbound) street with a mix of office/commercial and residential uses that recently was reconfigured to include a buffered westbound bicycle lane. West of Armenia Avenue, it is a two-way, primarily residential, local street that could be considered a potential bicycle boulevard candidate.

- **Platt Street** – Located approximately 500 feet south of Cleveland Street and 1,000 feet south of Kennedy Boulevard. Platt Street is a one-way (eastbound) street that together with Cleveland Street forms a one-way pair. As with Cleveland Street, between Armenia Avenue and the Hillsborough River, Platt Street has a mix of office/commercial and residential uses and was recently reconfigured to include a buffered eastbound bicycle lane. The combination of buffered bicycle lanes on both Cleveland Street and Platt Street provides bicyclists within the Kennedy Boulevard corridor with an alternative east-west travel route between Armenia Avenue and downtown Tampa.

- **Azeele Street** – Located approximately one-quarter mile south of Kennedy Boulevard. Between Westshore Boulevard and Dale Mabry Highway, Azeele Street is a 2-lane street that is primarily fronted with single-family residences. Between Dale Mabry Highway and Armenia Avenue, it is a 4-lane undivided roadway with a mix of residential uses and some
Between Armenia Avenue and Fremont Avenue, it returns to a 2-lane street with a mix of residential uses. Traffic counts from 2011 suggest that the total traffic volumes might be accommodated within a 2-lane divided cross-section. Further evaluation would be needed to determine the feasibility of a lane elimination along Azeele Street, but if a lane elimination is determined to be feasible it may be useful to provide an enhanced bicycle facility along Azeele Street which could include bicycle boulevard treatments and/or buffered/protected bicycle lanes, or some combination of both.

In the absence of being able to provide a dedicated bicycle facility along Kennedy Boulevard, improvements to the bicycling environment can be accomplished by continuing to support strategies that make Kennedy Boulevard a more livable street, such as speed management, enhanced lighting, well-designed driveways, and wider sidewalks. If posted speed limits can be reduced to 35 mph or less, shared lane markings should be considered. Until posted speeds are reduced, signage such as R4-11 (“Bicycles May Use Full Lane”) should be considered to encourage bicyclists to use the full lane, thereby discouraging unsafe within-lane passing; encourage drivers to change lanes to pass a bicyclist; and warn drivers that bicyclists may be using the full lane.

In combination with improvements along Kennedy Boulevard, improvements to the bicycling environment along parallel streets could include evaluating bicycle boulevard opportunities north along Gray Street and North A Street, and south along Azeele Street and Cleveland Street. Additionally, identifying opportunities to enhance north-south connections could lead to improved connectivity within the Kennedy Boulevard corridor and would encourage more people to choose bicycling as a more frequent mode of transportation.

Figure 24: Potential East-West Bicycle Network Connections
Speed Management Strategies

Speed plays a critical role in the cause and severity of crashes, and there is a direct correlation among higher speeds, crash risk, and injury severity. Speed is also a factor in determining crash risk and overall comfort for all modes of a street, especially along urban corridors such as Kennedy Boulevard. Managing travel speeds can help make a street feel like a part of the city rather than an incongruous thoroughfare.

While speed reduction cannot be achieved simply by reducing the posted speed limit, there are a variety of speed management strategies which may bring speeds to a more “livable” level. There are two approaches to managing speed—changing the physical design of the roadway and/or changing people’s psychological perceptions and responses to the roadway.

Changing a street’s design changes people’s behavior. Street design has traditionally been based on highway design principles that accommodate higher speeds and are forgiving to driver error. Designing for higher speeds often means including mandated design features like larger curb radii, wider travel lane widths, and clear zones. These features have many positive benefits on highways intended to move a large number of fast-moving vehicles, but in complex urban environments with multiple users traveling at various speeds, they often create a less-than-favorable environment, especially for non-motorized users.

The conventional highway design practice for establishing posted speed limits involves establishing a roadway design speed based on existing observed (85th percentile) speeds along a roadway. The design speed is then used to determine the various design features of the roadway. An alternative approach to establishing posted speed is to set the design speed and design features based on a target speed—the speed intended for drivers to travel—rather than observed operating speeds. Target speed should be determined based on the context of the street and consistent with the existing/desired level of multimodal activity to provide mobility for motor vehicles and a safe environment for non-motorized users.

Using target speed to establish a roadway’s design speed can result in greater flexibility in implementing speed management strategies. Popular design strategies used to manage traffic speeds, change driver behavior, and improve the quality of the non-motorized environment include narrower lane widths, roadside landscaping, and extending curbs. Exploring strategies to manage speeds and create a safer and more livable environment along Kennedy Boulevard should be supported and implemented where feasible.

Signal Timing and Spacing

Although often invisible to the public, traffic signal cycle lengths have a significant impact on the quality of the urban environment, and consequently, the opportunities for non-motorized users to operate safely along a corridor. Long signal cycles compounded over multiple intersections can make crossing a street or walking even a short distance prohibitive and frustrating. This discourages walking altogether and makes streets act as barriers which separate destinations, rather than routes that link them together. Conversely, it is also important to recognize that although reduced traffic signal cycle lengths can improve walkability, they also can lead to increased delay and congestion for motor vehicles. One option for balancing the needs of pedestrians and motor vehicles is to adjust traffic signal cycle lengths by time of day to account for fluctuations in vehicle and pedestrian volumes.
Traffic signal spacing, or the distance between crossing opportunities, similarly impacts the connectivity and walkability of an area. Reducing the distance between traffic signals can help to create a connected network of routes that provide all users with more opportunities and choices. As with signal cycles, however, it is important to recognize that decreasing the distance between traffic signals can impact the flow of motorized traffic and possibly lead to increases in certain types of crashes, particularly rear-end crashes. Finding a traffic signal spacing that balances mobility for pedestrians and motorized vehicles which does not severely impact either can help to create and strengthen a network that provides opportunity to all roadway users. A potential signal spacing goal for the Kennedy Boulevard corridor could be ¼-mile signal spacing between Westshore Boulevard and Armenia Avenue and ⅛-mile spacing between Armenia Avenue and the Hillsborough River.

Site-Specific Strategies

This section focuses on potential pedestrian and bicycle improvements at specific locations along the corridor. It is important to note that the enhancements identified in this section represent potential opportunities and are not necessarily recommendations; rather, they are suggestions for further consideration. It should be understood that, in many instances, the identified enhancements will require additional evaluation, analysis, and/or engineering design to determine the full feasibility of each potential enhancement.

Site-specific enhancements are identified along the following nine Kennedy Boulevard segments:

- Westshore Boulevard to Manhattan Avenue
- Manhattan Avenue to Hale Avenue
- Hale Avenue to Sterling Avenue
- Sterling Avenue to Bradford Avenue
- Bradford Avenue to Habana Avenue
- Habana Avenue to Westland Avenue
- Westland Avenue to Oregon Avenue
- Oregon Avenue to Fielding Avenue
- Fielding Avenue to Hillsborough River
Kennedy Boulevard from Westshore Boulevard to Manhattan Avenue

**Figure 25:** #4 and #5, Kennedy Blvd at Westshore Blvd

**Figure 26:** #3, Existing R10-15 Sign, Westshore Blvd at Kennedy Blvd
<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SB Westshore Blvd at Kennedy Blvd</td>
<td>Consider installing R10-15 (“Right-Turn Yield to Pedestrians”) sign.</td>
</tr>
<tr>
<td>2</td>
<td>EB Kennedy Blvd at Westshore Blvd</td>
<td>Consider relocating the existing R10-15 sign from right-turn channelization island to curb approx. 25 ft west of existing crosswalk.</td>
</tr>
<tr>
<td>3</td>
<td>NB Westshore Blvd at Kennedy Blvd</td>
<td>Consider upgrading existing “Right-Turn Yield to Pedestrians” sign with new R10-15 sign.</td>
</tr>
<tr>
<td>4</td>
<td>NW Quadrant of Kennedy Blvd and Westshore Blvd</td>
<td>Consider reducing curb radius within northwest quadrant, which will shorten pedestrian crossing distances, reduce turning vehicle speeds, and provide more room for pedestrians at intersection.</td>
</tr>
<tr>
<td>5</td>
<td>SE Quadrant of Kennedy Blvd and Westshore Blvd</td>
<td>Consider reducing curb radius within southeast quadrant, which will shorten the pedestrian crossing distances, reduce turning vehicle speeds, and provide more room for pedestrians at intersection.</td>
</tr>
<tr>
<td>6</td>
<td>EB Kennedy Blvd approaching Westshore Blvd</td>
<td>Consider installing overhead luminaire along south side of Kennedy Blvd on EB approach to Westshore Blvd; determine if existing concrete signal support could accommodate additional luminaire.</td>
</tr>
<tr>
<td>7</td>
<td>NB Westshore Blvd approaching Kennedy Blvd</td>
<td>Consider installing overhead luminaire along east side of Westshore Blvd south of Kennedy Blvd.</td>
</tr>
<tr>
<td>8</td>
<td>WB Kennedy Blvd approaching Westshore Blvd</td>
<td>Consider installing overhead luminaire along north side of Kennedy Blvd east of Westshore Blvd.</td>
</tr>
<tr>
<td>9</td>
<td>EB Kennedy Blvd east of Westshore Blvd</td>
<td>Consider installing R4-11 (“Bicycles May Use Full Lane”) sign or W11-1 + W16-1P (“Share the Road” plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>10</td>
<td>Kennedy Blvd between Renellie Dr and Trask St</td>
<td>Potential unused driveway along south side of Kennedy Blvd between GoGo Greek Grill and Stonegate Bank.</td>
</tr>
<tr>
<td>11</td>
<td>Kennedy Blvd near Lauber Wy (between Hesperides St and Manhattan Ave)</td>
<td>Evaluate pedestrian crossing potential (pedestrian hybrid beacon); median at Lauber Way recommended for closing per Access Management Safety Study. Alternatively, evaluate traffic signal feasibility at Kennedy Blvd and Hesperides St or Kennedy Blvd at Manhattan Ave.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Manhattan Avenue to Hale Avenue

Figure 27: #15, Kennedy Blvd at Lois Ave Concept

Figure 28: Kennedy Blvd at Lois Ave, Looking West
### Table 3: Kennedy Boulevard, Manhattan Avenue to Hale Avenue Site-Specific Strategies

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>WB Kennedy Blvd west of Lois Ave</td>
<td>Consider installing R4-11 (“Bicycles May Use Full Lane”) sign or W11-1 + W16-1P (“Share the Road” with bicycle image) sign assembly.</td>
</tr>
<tr>
<td>13</td>
<td>WB Kennedy Blvd at Lois Ave</td>
<td>Consider installing R10-15 (“Right-Turn Yield to Pedestrians”) sign on all intersection approaches.</td>
</tr>
<tr>
<td>14</td>
<td>Lois Ave at Kennedy Blvd</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>15</td>
<td>Kennedy Blvd at Lois Ave</td>
<td>Consider reducing curb radius within northwest quadrant, which will shorten pedestrian crossing distances, reduce turning vehicle speeds, and provide more room for pedestrians at intersection. Additionally, consider realigning/straightening crosswalk across northern leg of intersection.</td>
</tr>
<tr>
<td>16</td>
<td>EB Kennedy Blvd east of Lois Ave</td>
<td>Consider installing R4-11 (“Bicycles May Use Full Lane”) sign or the W11-1 + W16-1P (“Share the Road” plus bicycles image) sign assembly.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Hale Avenue to Sterling Avenue

Figure 29: #17, Kennedy Blvd at Grady Ave Concept

Figure 30: #23, Kennedy Blvd at Dale Mabry Hwy Concept
### Table 4: Kennedy Boulevard, Hale Avenue to Sterling Avenue Site-Specific Strategies

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Kennedy Blvd at Grady Ave, SE quadrant</td>
<td>Consider extending curb within painted gore area (currently has kwik kerb); drainage inlet within gore area impacts to drainage, will need to be evaluated.</td>
</tr>
<tr>
<td>18</td>
<td>Kennedy Blvd at Grady Ave</td>
<td>Evaluate traffic signal warrants; closest signalized intersections are Lois Ave (1,350 ft to west) and Dale Mabry Hwy (1,350 ft to east).</td>
</tr>
<tr>
<td>19</td>
<td>Kennedy Blvd between Grady Ave and Church Ave</td>
<td>Potential unused driveway along south side of Kennedy Blvd; Kuhn Automotive Group driveway closest to Grady Ave—consider contacting business to determine if posts located in driveway are mounted or are removable, determine if driveway currently being used.</td>
</tr>
<tr>
<td>20</td>
<td>WB Kennedy Blvd west of Dale Mabry Hwy</td>
<td>Consider installing R4-11 (&quot;Bicycles May Use Full Lane&quot;) sign or W11-1 + W16-1P (&quot;Share the Road&quot; plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>21</td>
<td>Kennedy Blvd at Dale Mabry Hwy</td>
<td>Consider installing R10-15 (&quot;Right-Turn Yield to Pedestrians&quot;) sign on all intersection approaches.</td>
</tr>
<tr>
<td>22</td>
<td>Kennedy Blvd at Dale Mabry Hwy</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>23</td>
<td>Kennedy Blvd at Dale Mabry Hwy, NE Quadrant</td>
<td>Consider reducing curb radius within NE quadrant (approx. 30’ ft radius), which will shorten pedestrian crossing distances, reduce vehicle turning speeds, and provide pedestrians with enhanced waiting area.</td>
</tr>
<tr>
<td>24</td>
<td>EB Kennedy Blvd east of Dale Mabry Hwy</td>
<td>Consider installing R4-11 (&quot;Bicycles May Use Full Lane&quot;) sign or W11-1 + W16-1P (&quot;Share the Road&quot; plus bicycle image) sign assembly.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Sterling Avenue to Bradford Avenue

Figure 31: Kennedy Blvd at Himes Ave, Looking East

Figure 32: Kennedy Blvd at Beverly Ave, Looking North
### Table 5: Kennedy Boulevard, Sterling Avenue to Bradford Avenue Site-Specific Strategies

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
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<tbody>
<tr>
<td>25</td>
<td>Kennedy Blvd at Himes Ave</td>
<td>Consider installing R10-15 (&quot;Right-Turn Yield to Pedestrians&quot;) sign on all intersection approaches.</td>
</tr>
<tr>
<td>26</td>
<td>Kennedy Blvd at Himes Ave</td>
<td>Consider enhancing intersection lighting by installing overhead street light luminaires on all intersection approaches as indicated by typical urban signalized intersection lighting design (PPM Fig. 7.3.4).</td>
</tr>
<tr>
<td>27</td>
<td>Kennedy Blvd at Himes Ave</td>
<td>Potential unused driveway along north side of Kennedy Blvd east of Himes Ave; Club ENVY driveway closest to Himes Ave; bus stop and third-party bench located near/within driveway; consider contacting business to determine if driveway is used.</td>
</tr>
<tr>
<td>28</td>
<td>Kennedy Blvd near Beverly Ave</td>
<td>Consider evaluating installation of pedestrian crossing (pedestrian hybrid beacon) in vicinity of Kennedy Blvd at Beverly Ave; Access Management Safety Study recommends closing of median at Beverly Ave.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Bradford Avenue to Habana Avenue

Figure 33: #30, Kennedy Blvd at Henderson Blvd Concept

Figure 34: Existing Mid-Block Crossing, Kennedy Blvd between Gomez Ave and Bungalow Park Ave, Looking Southeast
## Table 6: Kennedy Boulevard, Bradford Avenue to Habana Avenue Site-Specific Strategies

<table>
<thead>
<tr>
<th>ID</th>
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<th>Suggestions for Consideration</th>
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<tr>
<td>29</td>
<td>EB Kennedy Blvd west of Henderson Blvd</td>
<td>Consider installing R10-15 (&quot;Right-Turn Yield to Pedestrians&quot;) sign.</td>
</tr>
<tr>
<td>30</td>
<td>Kennedy Blvd at Henderson Blvd</td>
<td>Consider evaluating feasibility of pedestrian crossing (pedestrian signal) along western leg of intersection. In addition to evaluating crossing demand, evaluate impacts to WB traffic; consider as two-stage crossing, could help to reduce impacts to traffic flow. Identified in Access Management Safety Study.</td>
</tr>
<tr>
<td>31</td>
<td>WB Kennedy Blvd west of MacDill Ave</td>
<td>Consider installing R4-11 (&quot;Bicycles May Use Full Lane&quot;) sign or W11-1 + W16-1P (&quot;Share the Road&quot; plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>32</td>
<td>Kennedy Blvd at MacDill Ave</td>
<td>Consider installing R10-15 (&quot;Right-Turn Yield to Pedestrians&quot;) sign on all intersection approaches.</td>
</tr>
<tr>
<td>33</td>
<td>Kennedy Blvd at MacDill Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>34</td>
<td>EB Kennedy Blvd east of MacDill Ave</td>
<td>Consider installing R4-11 (&quot;Bicycles May Use Full Lane&quot;) sign or W11-1 + W16-1P (&quot;Share the Road&quot; plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>35</td>
<td>Kennedy Blvd between Gomez Ave and Bungalow Park Ave</td>
<td>Consider evaluating crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>36</td>
<td>Kennedy Blvd at Habana Ave</td>
<td>Unused driveway on north side of Kennedy Blvd west of Habana Ave; consider removing curb cut and provide level sidewalk through this section.</td>
</tr>
<tr>
<td>37</td>
<td>Kennedy Blvd at Habana Ave</td>
<td>Consider evaluating traffic signal warrants; Access Management Safety Study recommends leaving this intersection open. Closest signalized intersections/crossings are MacDill Ave (1,330 ft) and the mid-block crossing between Gomez Ave and Bungalow Park Ave (525 ft) to west and Armenia Avenue (1,320 ft) to east.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Habana Avenue to Westland Avenue

Figure 35: #41, Kennedy Blvd at Armenia Ave Concept

Figure 36: #45, Kennedy Blvd at Howard Ave Concept
Table 7: Kennedy Boulevard, Habana Avenue to Westland Avenue Site-Specific Strategies

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Kennedy Blvd at Arrawana Ave</td>
<td>Potential unused driveway along south side of Kennedy Blvd west of Arrawana Ave (in front of Miguelito’s); existing landscaping partially blocking existing curb cut; consider contacting business and removing existing curb cut.</td>
</tr>
<tr>
<td>39</td>
<td>WB Kennedy Blvd west of Armenia Ave</td>
<td>Consider installing R4-11 (&quot;Bicycles May Use Full Lane&quot;) sign or W11-1 + W16-1P (&quot;Share the Road” plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>40</td>
<td>EB Kennedy Blvd at Armenia Ave</td>
<td>Consider installing R10-15 (&quot;Right-Turn Yield to Pedestrians&quot;) sign.</td>
</tr>
<tr>
<td>41</td>
<td>Kennedy Blvd at Armenia Ave</td>
<td>Consider constructing curb extensions within southeast and southwest quadrants of intersection along Armenia Ave using existing painted gore area south of intersection.</td>
</tr>
<tr>
<td>42</td>
<td>Kennedy Blvd at Armenia Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>43</td>
<td>Kennedy Blvd between Armenia Ave and Moody Ave</td>
<td>Potential unused driveway along south side of Kennedy Blvd; in front of Kennedy Club is fence/wall and landscaping blocking driveway; consider contacting owner and removing existing curb cut.</td>
</tr>
<tr>
<td>44</td>
<td>WB Kennedy Blvd at Howard Ave</td>
<td>Consider installing R10-15 (&quot;Right-Turn Yield to Pedestrians&quot;) sign.</td>
</tr>
<tr>
<td>45</td>
<td>NW quadrant of Howard Ave at Kennedy Blvd</td>
<td>Consider constructing curb extension within northwest quadrant along Howard Ave within existing painted gore area.</td>
</tr>
<tr>
<td>46</td>
<td>EB Kennedy Blvd east of Howard Ave</td>
<td>Consider installing R4-11 (&quot;Bicycles May Use Full Lane&quot;) sign or W11-1 + W16-1P (Share the Road plus bicycle image) sign assembly.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Westland Avenue to Oregon Avenue

Figure 37: Kennedy Blvd at Albany Ave, Looking South

Figure 38: Kennedy Blvd east of Rome Ave, Looking West
### Table 8: Kennedy Boulevard, Westland Avenue to Oregon Avenue Site-Specific Strategies

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Kennedy Blvd at Albany Ave</td>
<td>Consider evaluating traffic signal warrants; Access Management Safety Study proposes converting intersection into directional median opening. Closest signalized intersections/crossings are Howard Ave (665 ft) to west and Willow Ave (2,660 ft) to east; however, planned signal for Rome Ave 1,330 ft east of Albany Ave. Alternatively, consider evaluating for pedestrian crossing with pedestrian hybrid beacon.</td>
</tr>
<tr>
<td>48</td>
<td>Kennedy Blvd at Fremont Ave</td>
<td>Vacant property with two driveways along north side of Kennedy Blvd west of Fremont Ave; consider monitoring site for development and potential to eliminate/consolidate driveways.</td>
</tr>
<tr>
<td>49</td>
<td>Kennedy Blvd at Fremont Ave</td>
<td>Consider evaluating traffic signal warrants; Access Management Safety Study proposes converting intersection into directional median opening. Closest signalized intersections/crossings are Howard Ave (1,335 ft) to west and Willow Ave (1,990 ft) to east; however, planned signal for Rome Ave 665 ft east of Fremont Ave. Alternatively, consider evaluating for pedestrian crossing with pedestrian hybrid beacon.</td>
</tr>
<tr>
<td>50</td>
<td>Kennedy Blvd at Rome Ave</td>
<td>Potential unused driveway along north side of Kennedy Blvd west of Rome Ave; consider monitoring current self-storage development to determine if existing curb cut will be eliminated.</td>
</tr>
<tr>
<td>51</td>
<td>Kennedy Blvd at Oregon Ave</td>
<td>Consider evaluating traffic signal warrants; Access Management Safety Study proposes leaving intersection as full median opening. Closest signalized intersections/crossings are Howard Ave (2,660 ft) to west and Willow Ave (665 ft) to east; however, planned signal for Rome Ave 665 ft west of Oregon Ave. Alternatively, consider evaluating for pedestrian crossing with pedestrian hybrid beacon.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Oregon Avenue to Fielding Avenue

Figure 39: Kennedy Blvd at Fielding Ave, Looking East

Figure 40: Missing Pedestrian Signal, Kennedy Blvd at Willow Ave, Looking East
Table 9: Kennedy Boulevard, Oregon Avenue to Fielding Avenue Site-Specific Strategies

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>Kennedy Blvd between Oregon Ave and Willow Ave</td>
<td>Potential unused driveways along north side of Kennedy Blvd; site currently used as parking lot and access to site from Kennedy Blvd fenced off. Consider monitoring site for redevelopment and eliminate driveways as necessary.</td>
</tr>
<tr>
<td>53</td>
<td>WB Kennedy Blvd west of Willow Ave</td>
<td>Consider installing R4-11 (“Bicycles May Use Full Lane”) sign or W11-1 + W16-1P (“Share the Road” plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>54</td>
<td>Kennedy Blvd at Willow Ave</td>
<td>As identified in Access Management Safety Study, consider providing pedestrian signal for east-west crossing along north and south legs of intersection.</td>
</tr>
<tr>
<td>55</td>
<td>Kennedy Blvd at Willow Ave</td>
<td>Consider installing R10-15 (“Right-Turn Yield to Pedestrians”) sign on all intersection approaches.</td>
</tr>
<tr>
<td>56</td>
<td>Kennedy Blvd at Willow Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>57</td>
<td>EB Kennedy Blvd east of Willow Ave</td>
<td>Consider installing R4-11 (“Bicycles May Use Full Lane”) sign or W11-1 + W16-1P (“Share the Road” plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>58</td>
<td>Kennedy Blvd at N Delaware Ave</td>
<td>Consider evaluating feasibility of mid-block pedestrian crossing in vicinity of Kennedy Blvd and N Delaware Ave.</td>
</tr>
<tr>
<td>59</td>
<td>Kennedy Blvd at Edison Ave</td>
<td>Potential unused driveway along north side of Kennedy Blvd east of Edison Ave; driveway in front of Outpost blocked-off to allow for additional parking; consider contacting business and eliminating existing curb cut.</td>
</tr>
<tr>
<td>60</td>
<td>Kennedy Blvd west of N Boulevard St</td>
<td>Consider reconstructing alley crossing along north side of Kennedy Blvd; pavement currently broken and poses trip hazard.</td>
</tr>
<tr>
<td>61</td>
<td>Kennedy Blvd at N/S Boulevard St</td>
<td>Consider installing R10-15 (“Right-Turn Yield to Pedestrians”) sign on all intersection approaches.</td>
</tr>
<tr>
<td>62</td>
<td>Kennedy Blvd at N Boulevard St</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>63</td>
<td>EB Kennedy Blvd east of S Boulevard St</td>
<td>Consider installing R4-11 (“Bicycles May Use Full Lane”) sign or W11-1 + W16-1P (“Share the Road” plus bicycle image) sign assembly.</td>
</tr>
</tbody>
</table>
Kennedy Boulevard from Fielding Avenue to Hillsborough River

Figure 41: #67, Kennedy Blvd at Grand Central Ave Concept

Figure 42: Kennedy Blvd at UT Poe Pkwy, Looking West
<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>WB Kennedy Blvd west of Brevard Ave</td>
<td>Consider installing R4-11 (“Bicycles May Use Full Lane”) sign or W11-1 + W16-1P (“Share the Road” plus bicycle image) sign assembly.</td>
</tr>
<tr>
<td>65</td>
<td>SB Brevard Ave at Kennedy Blvd</td>
<td>Consider installing R10-15 (“Right-Turn Yield to Pedestrians”) signs on WB and SB intersection approaches.</td>
</tr>
<tr>
<td>66</td>
<td>Brevard Ave at Kennedy Blvd</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>67</td>
<td>Kennedy Blvd at Grand Central Ave</td>
<td>Consider providing marked crossing (including pedestrian ramps) across Grand Central Ave to continue sidewalk and accommodate east-west pedestrian traffic along south side of Kennedy Blvd.</td>
</tr>
<tr>
<td>68</td>
<td>Kennedy Blvd at UT Poe Pkwy</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
</tr>
<tr>
<td>69</td>
<td>WB Kennedy Blvd at University Dr</td>
<td>Consider installing R10-15 (“Right-Turn Yield to Pedestrians”) sign.</td>
</tr>
<tr>
<td>70</td>
<td>Kennedy Blvd at Hyde Park Ave</td>
<td>Consider installing R10-15 (“Right-Turn Yield to Pedestrians”) sign on EB and NB intersection approaches.</td>
</tr>
<tr>
<td>71</td>
<td>Kennedy Blvd at Hyde Park Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure appropriate illumination being provided.</td>
</tr>
<tr>
<td>72</td>
<td>Kennedy Blvd at Plant Ave and Parker St</td>
<td>Continue to monitor planning and development of proposed Lafayette Place mixed-use development; continue coordination to identify signal/crossing opportunities as development progresses.</td>
</tr>
<tr>
<td>73</td>
<td>Kennedy Blvd at Hillsborough River</td>
<td>Consider alternative options of crossing under Kennedy Blvd bridge along west bank of Hillsborough River to accommodate north-south pedestrian/bicycle movement to/from Plant Park/University of Tampa and proposed Lafayette Place mixed-use development.</td>
</tr>
</tbody>
</table>
Feasibility Review and Cost Estimates

Feasibility Review

For the site-specific strategies, a review of project feasibility was conducted with a goal to identify potential fatal flaws or challenges that would make the suggested enhancements unfeasible (physically or fiscally) or significantly increase the complexity and/or cost to complete the enhancement. Appendix E contains a detailed summary of the feasibility review.

Although a feasibility review was conducted to identify fatal flaws that would prohibit the type of enhancements being suggested, it is recommended that necessary engineering, survey, and/or design work be completed prior to commencing construction on any of the identified enhancements. Unless otherwise noted, most of the enhancements identified as part of this review were developed to avoid major right-of-way impacts and avoid/minimize major reconstruction of the roadway, curb, and drainage structures.

Cost Estimates

Planning-level cost estimates for the identified enhancements were developed to provide general guidance of the level of investment needed to implement the enhancements. The cost estimates were developed using a mix of generic cost estimates that were applied to the identified enhancements and do include general percentage assumptions beyond base item/construction costs for costs associated with maintenance of traffic, mobilization, engineering design, construction, engineering, and inspection (CEI), and project unknowns.

In total, the identified site-specific enhancements have a cost estimate of approximately $4 million. Again, these are planning-level estimates for implementing the identified site-specific enhancements and do not include costs associated with additional evaluation/analysis that would be required to advance the identified enhancements. The cost estimates for the site-specific enhancements are included in Appendix E along with the project feasibility review notes.
Future Considerations

According to 2016 data from FDOT count stations 105141 (41,500 ADT) and 105140 (34,000 ADT), counts for the existing 6-lane segment of Kennedy Boulevard suggest that six travel lanes are needed to accommodate daily traffic. The observed daily traffic patterns and evaluation of peak-hour to daily ADT ratio (approximately 7.9% and 7.6%, respectively) and directional factor (approximately 57% for both locations) suggest that there may be excess capacity throughout the majority of the day along this segment (also true for 2015 traffic count data). Although it is beyond the scope of this study to conduct an operational traffic analysis along the corridor, given these noted observations, it may be worth conducting follow-up efforts that evaluate and consider options such as off-peak, on-street parking or other strategies, including the possibility of business access transit (BAT) lanes, to reduce pedestrian exposure and slow traffic when the full capacity of the 6-lane roadway may be unnecessary to meet the hourly travel demand. Figures 43 and 44 illustrate the existing directional hourly traffic volume counts along the 6-lane segments of Kennedy Boulevard, along with the directional traffic volumes. The figures show the generalized directional peak-hour LOS “D” values based on 2012 FDOT Q/LOS Handbook tables for both a 6-lane and 4-lane divided roadway.

Additionally, as improvements are made to the SR 60 and I-275 interchange west of the study corridor and to I-275 between Westshore and Downtown, it may become more attractive to many to use the interstate corridor and not Kennedy Boulevard for longer-haul trips. If improvements to the SR 60 and I-275 interchange and to I-275 as a whole decrease the demand for traffic along Kennedy Boulevard, consideration of a permanent lane elimination on the 6-lane section of Kennedy Boulevard may be warranted.

Figure 43: Hourly Directional Traffic Volumes, Kennedy Blvd East of Westshore Blvd

Source: FDOT Florida Traffic Online Synopsis Reports, 2015, Site 105141; 2012 FDOT Q/LOS Generalized Tables (Table 7)

Figure 44: Hourly Directional Traffic Volumes, Kennedy Blvd West of Dale Mabry Highway

Source: FDOT Florida Traffic Online Synopsis Reports, 2015, Site 105140; 2012 FDOT Q/LOS Generalized Tables (Table 7)
Appendix A: Kennedy Boulevard Access Management Safety Study Recommendations
Summary
Kennedy Boulevard Access Management Safety Study Recommendations Summary

From Section 4.7 (Recommendations) of the State Road 60 (Kennedy Boulevard) Access Management Safety Study:

Tables 4-9 and 4-10 provide a color-coded summary of the existing conditions at each median opening using the previously described criteria. The recommendation for a median opening improvement was based on a detailed analysis of all of these factors, as well as any traffic operational issues noted during the qualitative assessments. Unsignalized median openings with two (2) or more correctable collisions per year (Yellow) and deficient median opening spacing in both directions (Red) typically represent the greatest safety concerns. Conceptual plans provided in Appendix D include aerial views of the entire study area and identify the proposed improvement recommendations for each median opening.

Of the 24 total signalized and unsignalized median openings analyzed in Segment One, 22 (92%) are recommended as candidates for median opening improvement (Reference Table 4-9). Of the 27 total signalized and unsignalized median openings analyzed in Segment Two, 21 (78%) are recommended as candidates for median opening improvement (Reference Table 4-10). Overall, 43 (84%) of the 51 total unsignalized median openings have been recommended as candidates for median opening improvement.

The analysis of the 40 unsignalized median openings has considered the advantages and disadvantages of channelizing the traffic. In general, the advantages and disadvantages are as follows:

- The median opening modifications proposed will increase the travel distance for some minor truck turning movements and may affect the accustomed access patterns for large service vehicles.
- The overall total delay to vehicles using the median openings is not expected to change substantially.
- The median opening improvements are anticipated to significantly reduce the number of conflict points for turning vehicles and, as a result, should improve the overall safety of the corridor.
- Implementation of the recommended median opening improvements will bring increased conformance to the FDOT Access Management standards.
- Signalized intersections have a greater overall collision experience, primarily due to the heavier volumes at these locations. However, right-angle collisions should be reduced at signalized intersections. Although red-light running is a common enforcement problem, left-turn collisions can frequently be mitigated by signal phasing changes.

The median opening improvements, as proposed throughout the study corridor, will have a minimal impact on existing truck traffic. Of the 40 existing unsignalized median openings, 14 (35%) are recommended for closure. This will require trucks to be re-routed and travel farther; however, truck traffic should be adequately accommodated with the number of proposed directional openings and the proposed lengthening of the existing left-turn lanes / construction of new left-turn lanes.
Of the recommended modifications at signalized and unsignalized median openings, many can be considered short-term improvements. These include:

- Performing a corridor lighting study to determine the lighting level along the corridor and upgrading illumination where needed.
- Installing R10-15 signage for left and right turns off Armenia Avenue and Howard Avenue.
- Considering high emphasis crosswalks at all marked crossings, signals and side streets.
- FDOT conducting counts to determine where midblock warrants are met and conducting a signal warrant study for Rome Avenue.
- Reviewing the corridor cycle lengths, phasing and splits to reduce wait times and increase pedestrian compliance.
- Conducting a traffic signal timing study at Henderson Boulevard and reviewing the feasibility of a signalized crossing here.
- Considering “Share the Road” signage.
- Lengthening the westbound left-turn lane at Manhattan Avenue to 285 feet.
- Lengthening the eastbound left-turn lane at Hubert Avenue to 285 feet and the westbound left-turn lane to 180 feet.
- Lengthening the eastbound left-turn lane at Lois Avenue to 400 feet.
- Lengthening the westbound left-turn lane at Dale Mabry Highway to 390 feet.
- Adjusting the eastbound and westbound left-turn lanes at Sterling Avenue to 200 feet.
- Lengthening the eastbound left-turn lane at Himes Avenue to 350 feet and lengthening the westbound left-turn lane to 300 feet.
- Lengthening the eastbound left-turn lane at Glen Avenue to 255 feet.
- Modifying striping to reflect a two-way left-turn lane from Bungalow Park Avenue to Armenia Avenue.
- Reconstructing the raised island on the west leg of Armenia Avenue.
- Installing a modified raised median on the east leg of Albany Avenue.
- Installing a modified raised median on the east leg of Freemont Avenue.
- Lengthening westbound left-turn lane at Oregon Avenue to 255 feet.

The remaining recommendations at median openings shown in Table 4-9 and Table 4-10 are mid-term improvements that should be considered as additions to the FDOT’s 5-Year Work Program.
Table 4-9: Segment One Median Opening Improvement Recommendation Summary

<table>
<thead>
<tr>
<th>Median Opening ID</th>
<th>Mile Post</th>
<th>Median Opening Type (Full, Directional, Signal)</th>
<th>Median Opening / Intersection</th>
<th>Collision Criterion</th>
<th>Median Spacing Criterion</th>
<th>Left-Turn Storage Criterion</th>
<th>Median Opening Improvement Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-A</td>
<td>1.608</td>
<td>Signalized</td>
<td>Westshore Boulevard</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen westbound overall dual left-turn length to 760 feet.</td>
</tr>
<tr>
<td>1-B</td>
<td>1.671</td>
<td>Full</td>
<td>S Renelle Drive</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-C</td>
<td>1.739</td>
<td>Full</td>
<td>Trask Street</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen westbound left-turn lane to 285 feet.</td>
</tr>
<tr>
<td>1-D</td>
<td>1.795</td>
<td>Full</td>
<td>Cooper Place</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-E</td>
<td>1.859</td>
<td>Full</td>
<td>Hesperides Street</td>
<td></td>
<td></td>
<td></td>
<td>Covert to bi-directional median opening. Lengthen eastbound and westbound left-turn lanes to 285 feet.</td>
</tr>
<tr>
<td>1-F</td>
<td>1.922</td>
<td>W/B In - E/B Out</td>
<td>Lauber Way</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-G</td>
<td>1.984</td>
<td>Full</td>
<td>Manhattan Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound and westbound left-turn lanes to 285 feet.</td>
</tr>
<tr>
<td>1-H</td>
<td>2.109</td>
<td>Full</td>
<td>Hubert Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound left-turn lane to 285 feet. Lengthen westbound left-turn lane to 180 feet.</td>
</tr>
<tr>
<td>1-I</td>
<td>2.234</td>
<td>Signalized</td>
<td>Lois Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound left-turn lane to 400 feet. Lengthen westbound left-turn lane to 285 feet.</td>
</tr>
<tr>
<td>1-J</td>
<td>2.296</td>
<td>Full</td>
<td>Krental Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-K</td>
<td>2.359</td>
<td>Full</td>
<td>Clark Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Covert to bi-directional median opening. Lengthen eastbound and westbound left-turn lanes to 250 feet.</td>
</tr>
<tr>
<td>1-L</td>
<td>2.422</td>
<td>Full</td>
<td>Hale Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-M</td>
<td>2.488</td>
<td>Full</td>
<td>Grady Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound left-turn lane to 285 feet.</td>
</tr>
<tr>
<td>1-N</td>
<td>2.616</td>
<td>E/B Directional</td>
<td>Church Avenue</td>
<td></td>
<td></td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>1-O</td>
<td>2.748</td>
<td>Signalized</td>
<td>Dale Mabry Highway</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen westbound left-turn lane to 390 feet.</td>
</tr>
<tr>
<td>Median Opening ID</td>
<td>Mile Post</td>
<td>Median Opening Type (Full, Directional, Signal)</td>
<td>Median Opening / Intersection</td>
<td>Collision Criterion</td>
<td>Median Spacing Criterion</td>
<td>Left-Turn Storage Criterion</td>
<td>Median Opening Improvement Recommendations</td>
</tr>
<tr>
<td>-------------------</td>
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<td>-----------------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------</td>
<td>-------------------------</td>
<td>---------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1-P</td>
<td>2.874</td>
<td>Full</td>
<td>Sterling Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Convert to bi-directional median opening. Adjust eastbound and westbound left-turn lanes to 200 feet.</td>
</tr>
<tr>
<td>1-Q</td>
<td>2.999</td>
<td>Signalized</td>
<td>Himes Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound left-turn lane to 350 feet. Lengthen westbound left-turn lane to 300 feet.</td>
</tr>
<tr>
<td>1-R</td>
<td>3.127</td>
<td>Full</td>
<td>Glen Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound left-turn lane to 255 feet. Construct a westbound left-turn lane 200 feet in length.</td>
</tr>
<tr>
<td>1-S</td>
<td>3.193</td>
<td>Full</td>
<td>Beverly Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-T</td>
<td>3.255</td>
<td>Full</td>
<td>Lincoln Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound and westbound left-turn lanes to 255 feet.</td>
</tr>
<tr>
<td>1-U</td>
<td>3.318</td>
<td>Full</td>
<td>Bradford Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-V</td>
<td>3.362</td>
<td>Signalized</td>
<td>Henderson Boulevard</td>
<td></td>
<td></td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>1-W</td>
<td>1.047</td>
<td>Full</td>
<td>Woodlynne Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening.</td>
</tr>
<tr>
<td>1-X</td>
<td>1.110</td>
<td>Signalized</td>
<td>MacDill Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen westbound left-turn lane to 200 feet.</td>
</tr>
</tbody>
</table>

**COLOR LEGEND:**
- Low Priority unsignalized median opening based on criterion metrics
- Medium Priority unsignalized median opening based on criterion metrics
- High Priority unsignalized median opening based on criterion metrics
- Signalized Intersection
<table>
<thead>
<tr>
<th>Median Opening ID</th>
<th>Mile Post</th>
<th>Median Opening Type (Full, Directional, Signal)</th>
<th>Median Opening / Intersection</th>
<th>Collision Criterion</th>
<th>Median Spacing Criterion</th>
<th>Left-Turn Storage Criterion</th>
<th>Median Opening Improvement Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-A</td>
<td>1.173</td>
<td>Full</td>
<td>New Jersey Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Convert to westbound directional median opening. Install modified raised median 18” wide on east leg of intersection extending to Gomez Avenue</td>
</tr>
<tr>
<td>2-B</td>
<td>1.235</td>
<td>Full</td>
<td>Gomez Avenue</td>
<td></td>
<td></td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>2-C</td>
<td>1.299</td>
<td>Full</td>
<td>Bungalow Park Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Modify striping to reflect a two-way left-turn lane from Bungalow Park Avenue to Armenia Avenue</td>
</tr>
<tr>
<td>2-D</td>
<td>1.362</td>
<td>Full</td>
<td>Habana Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Modify striping to reflect a two-way left-turn lane from Bungalow Park Avenue to Armenia Avenue</td>
</tr>
<tr>
<td>2-E</td>
<td>1.445</td>
<td>Full</td>
<td>Arrawana Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Modify striping to reflect a two-way left-turn lane from Bungalow Park Avenue to Armenia Avenue</td>
</tr>
<tr>
<td>2-F</td>
<td>1.528</td>
<td>Full</td>
<td>Tampania Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Modify striping to reflect a two-way left-turn lane from Bungalow Park Avenue to Armenia Avenue</td>
</tr>
<tr>
<td>2-G</td>
<td>1.612</td>
<td>Signalized</td>
<td>Armenia Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Reconstruct raised island on west leg of intersection. Lengthen westbound left-turn lane to 255 feet.</td>
</tr>
<tr>
<td>2-H</td>
<td>1.672</td>
<td>Full</td>
<td>Moody Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening</td>
</tr>
<tr>
<td>2-I</td>
<td>1.736</td>
<td>Signalized</td>
<td>Howard Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Lengthen eastbound left-turn lane to 255 feet.</td>
</tr>
<tr>
<td>2-J</td>
<td>1.798</td>
<td>Full</td>
<td>Westland Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Close median opening</td>
</tr>
<tr>
<td>2-K</td>
<td>1.862</td>
<td>Full</td>
<td>Albany Avenue</td>
<td></td>
<td></td>
<td></td>
<td>Convert to bi-directional median opening. Lengthen eastbound left-turn lane to 255 feet.</td>
</tr>
<tr>
<td>2-L</td>
<td>1.926</td>
<td>Full</td>
<td>Melville Avenue</td>
<td></td>
<td></td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Median Opening ID</td>
<td>Mile Post</td>
<td>Median Opening Type (Full, Directional, Signal)</td>
<td>Median Opening / Intersection</td>
<td>Collision Criterion</td>
<td>Median Spacing Criterion</td>
<td>Left-Turn Storage Criterion</td>
<td>Median Opening Improvement Recommendations</td>
</tr>
<tr>
<td>-------------------</td>
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<td>-----------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>2-M</td>
<td>1.988</td>
<td>Full</td>
<td>Freemont Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Convert to bi-directional median opening.</td>
</tr>
<tr>
<td>2-N</td>
<td>2.053</td>
<td>Full</td>
<td>Packwood Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>No Change</td>
</tr>
<tr>
<td>2-O</td>
<td>2.117</td>
<td>Full</td>
<td>Rome Avenue</td>
<td>Green, Yellow</td>
<td>Red</td>
<td>Red</td>
<td>Construct traffic signal per FDOT Traffic Operations internal recommendations. Lengthen westbound left-turn lane to 200 feet.</td>
</tr>
<tr>
<td>2-P</td>
<td>2.178</td>
<td>Full</td>
<td>S Dakota Avenue</td>
<td>Yellow</td>
<td>Red</td>
<td>Red</td>
<td>Convert to westbound directional median opening. Construct westbound left-turn lane 125 feet in length.</td>
</tr>
<tr>
<td>2-Q</td>
<td>2.241</td>
<td>Full</td>
<td>Oregon Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Lengthen eastbound left-turn lane to 160 feet. Lengthen westbound left-turn lane to 255 feet.</td>
</tr>
<tr>
<td>2-R</td>
<td>2.299</td>
<td>Full</td>
<td>S Orleans Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Close median opening</td>
</tr>
<tr>
<td>2-S</td>
<td>2.371</td>
<td>Signalized</td>
<td>Willow Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Lengthen eastbound and westbound left-turn lanes to 280 feet.</td>
</tr>
<tr>
<td>2-T</td>
<td>2.431</td>
<td>Full</td>
<td>S Newport Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Close median opening</td>
</tr>
<tr>
<td>2-U</td>
<td>2.494</td>
<td>Full</td>
<td>S Delaware Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>No Change</td>
</tr>
<tr>
<td>2-V</td>
<td>2.522</td>
<td>Full</td>
<td>N Delaware Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>No Change</td>
</tr>
<tr>
<td>2-W</td>
<td>2.559</td>
<td>Full</td>
<td>S Edison Avenue</td>
<td>Green, Red</td>
<td>Red</td>
<td>Red</td>
<td>Close median opening</td>
</tr>
<tr>
<td>2-X</td>
<td>2.572</td>
<td>Full</td>
<td>N Edison Avenue</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Close median opening</td>
</tr>
<tr>
<td>2-Y</td>
<td>2.622</td>
<td>Signalized</td>
<td>N Boulevard</td>
<td>Green</td>
<td>Red</td>
<td>Red</td>
<td>Lengthen eastbound left-turn lane to 300 feet.</td>
</tr>
</tbody>
</table>
During the crash review, four locations along the corridor were identified of particular interest.

- There were 10 pedestrian/bicycle crashes between Habana Avenue and Tampania Avenue
- There were 3 crashes at Armenia Avenue, all of which involved southbound right turning vehicles
- There were two crashes involving southbound left-turning vehicles at Rome Avenue
- There were four pedestrian/bicycle crashes at or in the vicinity of Willow Avenue

As nearly half of the crashes are focused at these key locations, they will be the focus of the recommendations.

- Consider providing a raised median for pedestrian refuge between Habana Avenue and Arawana Avenue and between Arawana Avenue and Tampania Avenue.

**COLOR LEGEND:**

- Low Priority unsignalized median opening based on criterion metrics
- Medium Priority unsignalized median opening based on criterion metrics
- High Priority unsignalized median opening based on criterion metrics
- Signalized Intersection

---

**From Section 3.3 (Location Specific Pedestrian/Bicycle Recommendations) of the State Road 60 (Kennedy Boulevard) Access Management Safety Study:**
At Armenia Avenue and Howard Avenue, install R10-15 signage for the left and right turns off Armenia Avenue and Howard Avenue.

At Willow Avenue, there are no pedestrian features for the east/west pedestrian crossings. This may be due to the railroad through the intersection. However, consider providing these facilities and coordinating with the railroad. Also coordinate this with the City of Tampa, as a Willow Avenue project is currently under design.

North Boulevard experiences significant pedestrian activity when the University of Tampa is in session. Often, this foot traffic is on the west leg of the intersection and results in significant delay for southbound right turning vehicles. Review the feasibility of developing a dedicated southbound right-turn lane with a channelized island (large enough to serve as pedestrian refuge). This improvement would be both a capacity and safety benefit.

Recommend FDOT conduct counts to determine where midblock warrants are met and also if Rome meets signalization warrants.

**From Section 4.7 (Area-Wide Pedestrian/Bicycle Recommendations) of the State Road 60 (Kennedy Boulevard) Access Management Safety Study:**

Review the existing lighting levels. If they are deficient, consider upgrades to the corridor and intersection lighting.

- Due to the high pedestrian volumes throughout, consider high emphasis crosswalks at all marked crossings, signals and sidestreets.
- Implement the R10-15 signage at signalized intersections.
- Consider installing feedback lights on pedestrian signals that light up when the phase has been activated to communicate to the pedestrian that the pedestrian phase will soon transition to “walk”
- Consider reviewing the corridor cycle lengths and splits. Shorter cycle lengths reduce wait times and increase pedestrian compliance.

**Other Suggestions for Consideration (potentially outside of the scope of this analysis)**

- Consider the feasibility of constructing a traffic signal at Rome Avenue.
- Review the feasibility of a signalized crossing at Henderson Boulevard. This would likely be best placed on the west leg. Prior to consideration, a traffic signal timing study would need to be conducted.
- Due to the high volumes of pedestrians between Habana Avenue and Tampania Avenue, suggest a study to determine if a HAWK or RRFB would be an appropriate application in conjunction with raised median refuge.
- For all left turn movements from Kennedy Boulevard, consider deployment of a flashing yellow arrow. Consider manipulating the phasing by time-of-day based on pedestrian actuation.
- As this is a high speed corridor, and ROW constrained, bike lanes and/or Sharrows are not likely to be the preferred treatment. Consider “Share the Road” signage.
- With any redevelopment, seek opportunities to widen the existing sidewalk and remove utility obstructions (see the development in front of the UT facilities).
➢ Rome Avenue/Wal-Mart Considerations
   o Review the feasibility of converting the Wal-Mart driveway to a westbound directional median opening.
   o If Rome Avenue is signalized, accommodate pedestrian crossings with intersection lighting.
   o If Rome Avenue is not signalized AND Wal-Mart is converted to directional, look for an opportunity to create a midblock crossing near Wal-Mart (signalized or not)
Appendix B: Kennedy Boulevard Typical Cross Sections
1. Kennedy Boulevard, From Westshore Boulevard to Manhattan Avenue

![Diagram of Kennedy Boulevard, From Westshore Boulevard to Manhattan Avenue]

*Actual conditions may vary, cross section is representative of the typical observed condition; measurements derived from aerial imagery review*

2. Kennedy Boulevard, From Manhattan Avenue to Church Avenue

![Diagram of Kennedy Boulevard, From Manhattan Avenue to Church Avenue]

*Actual conditions may vary, cross section is representative of the typical observed condition; measurements derived from aerial imagery review*
3. Kennedy Boulevard, From Dale Mabry Highway to MacDill Avenue

4. Kennedy Boulevard, From MacDill Avenue to Tampania Avenue
5. Kennedy Boulevard, From Tampania Avenue to Brevard Avenue

Actual conditions may vary, cross section is representative of the typical observed condition; measurements derived from aerial imagery review
Appendix C: Kennedy Boulevard Daily Traffic Count Data
1. Kennedy Boulevard, East of Westshore Boulevard, Count Station: 5141

*Data Source: FDOT Transportation Statistics Office, Historical AADT Report and Synopsis Report*

**Historical AADT**

2016 Daily Traffic, Count Dates: 10/11/16 – 10/12/16

*Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts*

**2016 Hourly Traffic Volumes**

**2016 Hourly Directional Traffic Volumes**

**2016 15-Minute Directional Traffic Volumes**

*Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts*

2015 Hourly Traffic Volumes

2015 Hourly Directional Traffic Volumes

2015 15-Minute Directional Traffic Volumes
2. Kennedy Boulevard, West of Dale Mabry Highway, Count Station: 5140

Data Source: FDOT Transportation Statistics Office, Historical AADT Report and Synopsis Report

Historical AADT


Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

2016 Hourly Traffic Volumes

2016 15-Minute Directional Traffic Volumes

Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

2015 Hourly Traffic Volumes

2015 Hourly Directional Traffic Volumes

2015 15-Minute Directional Traffic Volumes
3. Kennedy Boulevard, East of Dale Mabry Highway, Count Station: 5139

*Data Source: FDOT Transportation Statistics Office, Historical AADT Report and Synopsis Report*

**Historical AADT**

![Graph of Historical AADT](image1)

**2016 Daily Traffic, Count Dates: 9/26/16 – 9/27/16**

*Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts*

![Graph of 2016 Daily Traffic](image2)

**2016 Hourly Traffic Volumes**

![Graph of 2016 Hourly Traffic Volumes](image3)

**2016 15-Minute Directional Traffic Volumes**

![Graph of 2016 15-Minute Directional Traffic Volumes](image4)

Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

2015 Hourly Traffic Volumes

2015 Hourly Directional Traffic Volumes

2015 15-Minute Directional Traffic Volumes
4. Kennedy Boulevard, West of Henderson Boulevard, Count Station: 5138

Data Source: FDOT Transportation Statistics Office, Historical AADT Report and Synopsis Report

Historical AADT

![Historical AADT Graph]


Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

2016 Hourly Traffic Volumes

![2016 Hourly Traffic Volumes Graph]

2016 15-Minute Directional Traffic Volumes

![2016 15-Minute Directional Traffic Volumes Graph]

Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

2015 Hourly Traffic Volumes

2015 Hourly Directional Traffic Volumes

2015 15-Minute Directional Traffic Volumes
5. Kennedy Boulevard, East of Henderson Boulevard, Count Station: 5355

Data Source: FDOT Transportation Statistics Office, Historical AADT Report and Synopsis Report

Historical AADT

2016 Daily Traffic, Count Dates: 10/11/16 – 10/12/16

Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

2016 Hourly Traffic Volumes

2016 15-Minute Directional Traffic Volumes
6. Kennedy Boulevard, West of Willow Avenue, Count Station: 5136

*Data Source: FDOT Transportation Statistics Office, Historical AADT Report and Synopsis Report*

**Historical AADT**

![Graph showing historical AADT data with years 2007 to 2016 and AADT values ranging from 30,000 to 50,000.]

**2016 Daily Traffic, Count Dates: 10/17/16 – 10/18/16**

*Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts*

![2016 Hourly Traffic Volumes graph with data spanning from 0 to 3,000.]

**2016 Hourly Directional Traffic Volumes**

![Graph showing 2016 hourly directional traffic volumes with data for eastbound and westbound traffic.]

**2016 15-Minute Directional Traffic Volumes**

![Graph showing 2016 15-minute directional traffic volumes with data for eastbound and westbound traffic.]

Kennedy Boulevard Multimodal Safety Review

Appendix C: Traffic Count Data

Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

2015 Hourly Traffic Volumes

2015 Hourly Directional Traffic Volumes

2015 15-Minute Directional Traffic Volumes
7. Kennedy Boulevard, East of Hillsborough River Bridge, Count Station: 0029

Data Source: FDOT Transportation Statistics Office, Historical AADT Report and Synopsis Report

Historical AADT

Hourly Directional Traffic Volumes

15-Minute Directional Traffic Volumes

Daily Traffic, Count Dates: 10/4/16 – 10/5/16

Daily traffic counts derived from the average of the Synopsis Report two-day traffic counts

Hourly Traffic Volumes

2-Way Volume
Appendix D: Kennedy Boulevard Existing Intersection Lighting Layout
1. Kennedy Boulevard at Westshore Boulevard

Existing Street Light
2. Kennedy Boulevard at Lois Avenue

![Image of Kennedy Boulevard at Lois Avenue with existing street lights marked]
3. Kennedy Boulevard at Dale Mabry Highway
4. Kennedy Boulevard at Himes Avenue

Existing Street Light
5. Kennedy Boulevard at Henderson Boulevard

Existing Street Light
6. Kennedy Boulevard at MacDill Avenue
7. Kennedy Boulevard at Pedestrian Crossing between Gomez Avenue and Bungalow Park Avenue
8. Kennedy Boulevard at Armenia Avenue

Existing Street Light
9. Kennedy Boulevard at Howard Avenue
10. Kennedy Boulevard at Willow Avenue
11. Kennedy Boulevard at North Boulevard

![Intersection Lighting Layout]

*Existing Street Light*
12. Kennedy Boulevard at Brevard Avenue
13. Kennedy Boulevard at UT Poe Parkway Pedestrian Crossing
14. Kennedy Boulevard at Hyde Park Avenue
Appendix E: Kennedy Boulevard Site Specific Enhancements Feasibility Review and Cost Estimates
## Kennedy Boulevard Site Specific Enhancements Feasibility Review and Cost Estimates

<table>
<thead>
<tr>
<th>ID</th>
<th>Location</th>
<th>Suggestions for Consideration</th>
<th>Feasibility Notes</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SB Westshore Blvd at Kennedy Blvd</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>2</td>
<td>EB Kennedy Blvd at Westshore Blvd</td>
<td>Consider relocating the existing R10-15 sign from right-turn channelization island to curb approx. 25' west of existing crosswalk.</td>
<td>Sign is difficult to see in its current location, moving it to the west before the turn should help in warning drivers in advance of the crosswalk.</td>
<td>$200</td>
</tr>
<tr>
<td>3</td>
<td>NB Westshore Blvd at Kennedy Blvd</td>
<td>Consider upgrading existing right-turn yield to pedestrian sign with new R10-15 sign.</td>
<td>Current sign is outdated, replace with new sign at existing location.</td>
<td>$700</td>
</tr>
<tr>
<td>4</td>
<td>NW Quadrant of Kennedy Blvd and Westshore Blvd</td>
<td>Consider reducing the curb radius within the northwest quadrant; reducing the curb radius will shorten the pedestrian crossing distances, reduce turning vehicle speeds, and will provide more room for pedestrians at the intersection.</td>
<td>There is a drainage inlet along the west side of Kennedy Blvd north of Westshore Blvd, reducing the turning radius to 30' and extending the curb may impact drainage to this inlet, further evaluation of drainage impacts are needed.</td>
<td>$25,000</td>
</tr>
<tr>
<td>5</td>
<td>SE Quadrant of Kennedy Blvd and Westshore Blvd</td>
<td>Consider reducing the curb radius within the southeast quadrant; reducing the curb radius will shorten the pedestrian crossing distances, reduce turning vehicle speeds, and will provide more room for pedestrians at the intersection.</td>
<td>There is a drainage inlet located along the curb in the intersection. Extending the curb would impact drainage at this location, further evaluation is needed to determine the level of impact. Additionally, the gas station driveways along Westshore Blvd and Kennedy Blvd are located close to the intersection, while it appears that they could be left intact, further evaluation is needed to determine if extending the curb would impact the existing driveways.</td>
<td>$25,000</td>
</tr>
<tr>
<td>6</td>
<td>EB Kennedy Blvd approaching Westshore Blvd</td>
<td>Consider installing an overhead luminaire along the south side of Kennedy Blvd on the eastbound approach to Westshore Blvd; determine if the existing concrete signal support could accommodate an additional luminaire.</td>
<td>Further evaluation is needed to determine if the existing concrete signal support pole could accommodate an additional street light luminaire. If it cannot support an additional luminaire consider placing light structure directly west of the existing signal support pole. Alternatively, consider replacing the existing diagonal span traffic signal support with a mast-arm support structure that can accommodate intersection lighting in accordance with PPM Chapter 7.3. Crash history indicates that approximately 22% of the crashes at this intersection occurred at night.</td>
<td>$11,000</td>
</tr>
<tr>
<td>7</td>
<td>NB Westshore Blvd approaching Kennedy Blvd</td>
<td>Consider installing an overhead luminaire along the east side of Westshore Blvd south of Kennedy Blvd.</td>
<td>Limited right-of-way; if the curb is extended (see #5) there may be adequate room for the installation of a light pole and luminaire. Alternatively, consider replacing the existing diagonal span traffic signal support with a mast-arm support structure that can accommodate overhead street lighting in accordance to PPM Chapter 7.3. Crash history</td>
<td>$11,000</td>
</tr>
<tr>
<td>ID</td>
<td>Location</td>
<td>Suggestions for Consideration</td>
<td>Feasibility Notes</td>
<td>Cost Estimate</td>
</tr>
<tr>
<td>----</td>
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<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>8</td>
<td>WB Kennedy Blvd approaching Westshore Blvd</td>
<td>Consider installing an overhead luminaire along the north side of Kennedy Blvd east of Westshore Blvd.</td>
<td>Indicates that approximately 22% of the crashes at this intersection occurred at night.</td>
<td>$11,000</td>
</tr>
<tr>
<td>9</td>
<td>EB Kennedy Blvd east of Westshore Blvd</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>May require an easement from the adjacent property, there is a light pole located approximately 170 feet east of the proposed location. Alternatively, consider replacing the existing diagonal span traffic signal support with a mast-arm support structure that can accommodate overhead street lighting in accordance to PPM Chapter 7.3. Crash history indicates that approximately 22% of the crashes at this intersection occurred at night.</td>
<td>$700</td>
</tr>
<tr>
<td>10</td>
<td>Kennedy Blvd between Renellie Dr and Trask St</td>
<td>Potential unused driveway along the south side of Kennedy Blvd between the GoGo Greek Grill and the Stonegate Bank.</td>
<td>A wall has been constructed across the majority of this driveway, consider contacting business and modifying/removing the existing curb-cut</td>
<td>$5,500</td>
</tr>
<tr>
<td>11</td>
<td>Kennedy Blvd near Lauber Way (between Hesperides St and Manhattan Ave)</td>
<td>Evaluate pedestrian crossing potential (pedestrian hybrid beacon); the median at Lauber Way is recommended for closing per the access management safety study. Alternatively, evaluate traffic signal feasibility at Kennedy Blvd and Hesperides St or Kennedy Blvd at Manhattan Ave.</td>
<td>Conduct pedestrian volume counts and/or perform data collection to support the evaluation of a pedestrian crossing and/or traffic signal warrant. Access management safety study recommends eliminating the existing landscaped median, consider reevaluating the length of the westbound left-turn lane for Hesperides St to determine if part of the median can be retained and used if a pedestrian crossing is deemed feasible. Consider monitoring this intersection for future crossing opportunities if it does not currently meet crossing warrants.</td>
<td>$150,000</td>
</tr>
<tr>
<td>12</td>
<td>WB Kennedy Blvd west of Lois Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>13</td>
<td>WB Kennedy Blvd at Lois Ave</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign on all intersection approaches.</td>
<td>NA</td>
<td>$2,800</td>
</tr>
<tr>
<td>14</td>
<td>Lois Ave at Kennedy Blvd</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>Crash history indicates that approximately 41% of the crashes at this intersection occurred at night. Consider installing an overhead luminaire on the west side of Lois Ave north of Kennedy Blvd; there is currently limited right-of-way, if the curb is extended (see #15) there may be adequate room for the installation of a light pole and luminaire. Also, consider installing an overhead luminaire on the east side of Lois Ave south</td>
<td>$22,000</td>
</tr>
<tr>
<td>ID</td>
<td>Location</td>
<td>Suggestions for Consideration</td>
<td>Feasibility Notes</td>
<td>Cost Estimate</td>
</tr>
<tr>
<td>----</td>
<td>----------</td>
<td>-------------------------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>15</td>
<td>Kennedy Blvd at Lois Ave</td>
<td>Consider reducing the curb radius within the northwest quadrant; reducing the curb radius will shorten the pedestrian crossing distances, reduce turning vehicle speeds, and will provide more room for pedestrians at the intersection. Additionally consider realigning/straightening the crosswalk across the northern leg of the intersection.</td>
<td>There is an existing drainage inlet along Lois Ave on the curb, located directly north of the existing crosswalk. Extending the curb will impact drainage, additional evaluation is needed to determine the level of impact and the feasibility of extending the curb. Reducing the curb radius to 30’ should still allow larger vehicles to make the southbound right-turn onto Kennedy Blvd, they may need to utilize the inside travel lanes of Kennedy Blvd, but based on initial evaluation it appears that they will still be accommodated.</td>
<td>$25,000</td>
</tr>
<tr>
<td>16</td>
<td>EB Kennedy Blvd east of Lois Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>17</td>
<td>Kennedy Blvd at Grady Ave, SE quadrant</td>
<td>Consider extending the curb within the painted gore area (currently has kwik kerb); there is a drainage inlet within the gore area therefore impacts to drainage will need to be evaluated.</td>
<td>Further evaluation is needed to determine the full drainage impacts associated with extending the curb at this location.</td>
<td>$20,000</td>
</tr>
<tr>
<td>18</td>
<td>Kennedy Blvd at Grady Ave</td>
<td>Evaluate traffic signal warrants; closest signalized intersections are Lois Ave (1,350’ to the west) and Dale Mabry Hwy (1,350’ to the east).</td>
<td>Turning movement data collected as part of the access management safety study indicates a fairly high volume of westbound left-turning vehicles, consider conducting additional data collection to support a full traffic signal warrant analysis to determine the feasibility of a traffic signal at this location. If this intersection does not currently meet traffic signal warrants consider monitoring for future consideration.</td>
<td>$450,000</td>
</tr>
<tr>
<td>19</td>
<td>Kennedy Blvd between Grady Ave and Church Ave</td>
<td>Potential unused driveway along the south side of Kennedy Blvd; Kuhn Automotive Group driveway closest to Grady Ave, consider contacting business to see if the post located in the driveway are mounted or are removable and determine if the driveway is currently being utilized.</td>
<td>NA</td>
<td>$5,000</td>
</tr>
<tr>
<td>20</td>
<td>WB Kennedy Blvd west of Dale Mabry Hwy</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>21</td>
<td>Kennedy Blvd at Dale Mabry Hwy</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign on all intersection approaches.</td>
<td>NA</td>
<td>$2,800</td>
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<td>ID</td>
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<td>Feasibility Notes</td>
<td>Cost Estimate</td>
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<tr>
<td>22</td>
<td>Kennedy Blvd at Dale Mabry Hwy</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>This intersection has been identified by FDOT for intersection lighting improvements. Crash history indicates that approximately 38% of the crashes at this intersection occurred at night.</td>
<td>$ -</td>
</tr>
<tr>
<td>23</td>
<td>Kennedy Blvd at Dale Mabry Hwy, NE Quadrant</td>
<td>Consider reducing the curb radius within the NE quadrant (approx. 30’ radius); reducing the curb radius will shorten pedestrian crossing distances, reduce vehicle turning speeds, and provide pedestrians with an enhanced waiting area.</td>
<td>Reducing the curb radius within the northeast quadrant would benefit pedestrians by reducing crossing distances (approximately 15' for east-west crossings and 10' for north-south crossings), which limits exposure and reduces the amount of time needed to traverse the intersection. Initial analysis indicates that larger vehicles would still be accommodated with a 30’ radius, they may need to utilize the inside travel lanes of Dale Mabry Hwy, but will still be able to navigate the intersection.</td>
<td>$30,000</td>
</tr>
<tr>
<td>24</td>
<td>EB Kennedy Blvd east of Dale Mabry Hwy</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>25</td>
<td>Kennedy Blvd at Himes Ave</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign on all intersection approaches.</td>
<td>NA</td>
<td>$2,800</td>
</tr>
<tr>
<td>26</td>
<td>Kennedy Blvd at Himes Ave</td>
<td>Consider enhancing intersection lighting by installing overhead street light luminaires on all intersection approaches as indicated by the typical urban signalized intersection lighting design (PPM Fig. 7.3.4).</td>
<td>Crash history indicates that approximately 30% of the crashes at this intersection occurred at night. Consider repositioning the existing luminaires (on the existing poles) on the eastbound and westbound approaches so that they are positioned over Kennedy Blvd.</td>
<td>$44,000</td>
</tr>
<tr>
<td>27</td>
<td>Kennedy Blvd at Himes Ave</td>
<td>Potential unused driveway along the north side of Kennedy Blvd east of Himes Ave; Club ENVY driveway closest to Himes Ave, there is a bus stop and third party bench located near/within the driveway, consider contacting the business to see if driveway is used.</td>
<td>NA</td>
<td>$3,000</td>
</tr>
<tr>
<td>28</td>
<td>Kennedy Blvd near Beverly Ave</td>
<td>Consider evaluating the installation of a pedestrian crossing (pedestrian hybrid beacon) in the vicinity of Kennedy Blvd at Beverly Ave; the access management safety study recommends the closing of the median at Beverly Ave.</td>
<td>Conduct pedestrian volume counts to determine if a marked mid-block crossing is warranted near this location. If a mid-block crossing is not currently warranted consider monitoring this location for future consideration.</td>
<td>$150,000</td>
</tr>
<tr>
<td>29</td>
<td>EB Kennedy Blvd west of Henderson Blvd</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>30</td>
<td>Kennedy Blvd at Henderson Blvd</td>
<td>Consider evaluating the feasibility of a pedestrian crossing (pedestrian signal) along the western leg</td>
<td>As mentioned in the access management safety study; prior to further consideration a traffic signal study should be completed to evaluate the</td>
<td>$250,000</td>
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<td>Feasibility Notes</td>
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<tr>
<td>31</td>
<td>WB Kennedy Blvd west of MacDill Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>32</td>
<td>Kennedy Blvd at MacDill Ave</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign on all intersection approaches.</td>
<td>NA</td>
<td>$2,800</td>
</tr>
<tr>
<td>33</td>
<td>Kennedy Blvd at MacDill Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>Crash history indicates that approximately 24% of the crashes at this intersection occurred at night. There are currently no overhead street light luminaires located within 100' of the intersection on all approaches. Consider enhancing intersection lighting by installing overhead street light luminaires on all intersection approaches as indicated by the PPM typical urban signalize intersection lighting design example in Fig. 7.3.4.</td>
<td>$44,000</td>
</tr>
<tr>
<td>34</td>
<td>EB Kennedy Blvd east of MacDill Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>35</td>
<td>Kennedy Blvd between Gomez Ave and Bungalow Park Ave</td>
<td>Consider evaluating crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>Consider installing overhead street light luminaires on both the eastbound and westbound approached to the existing crossing. Additionally, the existing concrete signal support poles and signal control cabinet are located within the sidewalk, reducing the effective width of the sidewalk at this location; consider exploring opportunities in the future to relocate these from the middle of the sidewalk to the back of the sidewalk (may require an easement from the adjacent properties).</td>
<td>$22,000</td>
</tr>
<tr>
<td>36</td>
<td>Kennedy Blvd at Habana Ave</td>
<td>Unused driveway on the north side of Kennedy Blvd west of Habana Ave; consider removing curb-cut and provide level sidewalk through this section.</td>
<td>NA</td>
<td>$5,400</td>
</tr>
<tr>
<td>37</td>
<td>Kennedy Blvd at Habana Ave</td>
<td>Consider evaluating traffic signal warrants; the access management safety study recommends leaving this intersection open. The closest signalized intersections/crossings are MacDill Ave.</td>
<td>Consider conducting necessary traffic data collection and performing a traffic signal warrant study to determine if traffic signal is warranted at this location. Alternatively consider the installation of a pedestrian crossing near this intersection. If this location does not currently meet traffic signal warrants.</td>
<td>$450,000</td>
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<td>Feasibility Notes</td>
<td>Cost Estimate</td>
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<tr>
<td>38</td>
<td>Kennedy Blvd at Arrawana Ave</td>
<td>(1,330’) and the mid-block crossing between Gomez Ave and Bungalow Park Ave (525’) to the west, and Armenia Avenue (1,320’) to the east.</td>
<td>or pedestrian crossing warrants consider monitoring the intersection for future consideration.</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>WB Kennedy Blvd west of Armenia Ave</td>
<td>Potential unused driveway along the south side of Kennedy Blvd west of Arrawana Ave (in front of Migueltito's); existing landscaping is partially blocking the existing curb-cut, consider contacting business and removing the existing curb-cut.</td>
<td>NA</td>
<td>$4,000</td>
</tr>
<tr>
<td>40</td>
<td>EB Kennedy Blvd at Armenia Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>41</td>
<td>Kennedy Blvd at Armenia Ave</td>
<td>Consider constructing curb extensions within the southeast and southwest quadrants of the intersection along Armenia Ave, utilizing the existing painted gore area south of the intersection.</td>
<td>Evaluate impacts to drainage; there are drainage inlets within both the southeast and southwest quadrants that would be impacted by the installation of curb extensions.</td>
<td>$40,000</td>
</tr>
<tr>
<td>42</td>
<td>Kennedy Blvd at Armenia Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>Crash history indicates that approximately 33% of the crashes at this intersection occurred at night. Consider placing an overhead street light luminaire on the north side of Kennedy Blvd adjacent to the intersection on the westbound approach, also consider installing a luminaire to illuminate the crosswalk on the south leg of the intersection.</td>
<td>$22,000</td>
</tr>
<tr>
<td>43</td>
<td>Kennedy Blvd between Armenia Ave and Moody Ave</td>
<td>Potential unused driveway along the south side of Kennedy Blvd, in front of the Kennedy Club, there is a fence/wall and landscaping that is blocking the driveway; consider contacting owner and removing the existing curb-cut.</td>
<td>Access to the property has been blocked by a fence and landscaping, there are access points along Moody Ave. Consider contacting property owner about removing the curb-cut during the planned resurfacing project.</td>
<td>$16,000</td>
</tr>
<tr>
<td>44</td>
<td>WB Kennedy Blvd at Howard Ave</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>45</td>
<td>NW Quadrant of Howard Ave at Kennedy Blvd</td>
<td>Consider constructing a curb extension within the northwest quadrant along Howard Ave within the existing painted gore area.</td>
<td>Even though there are no drainage inlets in the vicinity of the intersection evaluate impacts to drainage from extending the curb; there is evidence of ponding (sand and debris) within the crosswalks and the pedestrian ramp. Extending the curb within this quadrant would shorten pedestrian crossing.</td>
<td>$20,000</td>
</tr>
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<td>Feasibility Notes</td>
<td>Cost Estimate</td>
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<tr>
<td>46</td>
<td>EB Kennedy Blvd east of Howard Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>distance across Howard Ave and would provide a more comfortable waiting area for pedestrians.</td>
<td>$700</td>
</tr>
<tr>
<td>47</td>
<td>Kennedy Blvd at Albany Ave</td>
<td>Consider evaluating traffic signal warrants; the access management safety study proposes converting this intersection into a directional median opening. The closest signalized intersections/crossings are Howard Ave (665’) to the west and Willow Ave (2,660’) to the east; however there is a planned signal for Rome Ave 1,330’ east of Albany Ave. Alternatively, consider evaluating for a pedestrian crossing with pedestrian hybrid beacon.</td>
<td>The access management safety study recommends converting this intersection into a directional median opening. Data collected during the access management safety study efforts indicate moderate levels of pedestrian/bicycle and turning movement activity. If this location does not currently meet traffic signal and/or pedestrian crossing warrants, consider leaving this intersection as a full median opening and re-evaluating for signalization as redevelopment north and south of Kennedy Blvd continues to increase the demand for crossing Kennedy Blvd.</td>
<td>$450,000</td>
</tr>
<tr>
<td>48</td>
<td>Kennedy Blvd at Fremont Ave</td>
<td>Vacant property with two driveways along the north side of Kennedy Blvd west of Fremont Ave; consider monitoring the site for development and potential to eliminate/consolidate driveways.</td>
<td>NA</td>
<td>$ -</td>
</tr>
<tr>
<td>49</td>
<td>Kennedy Blvd at Fremont Ave</td>
<td>Consider evaluating traffic signal warrants; the access management safety study proposes converting this intersection into a directional median opening. The closest signalized intersections/crossings are Howard Ave (1,335’) to the west and Willow Ave (1,990’) to the east; however there is a planned signal for Rome Ave 665’ east of Fremont Ave. Alternatively, consider evaluating for a pedestrian crossing with pedestrian hybrid beacon.</td>
<td>The access management safety study recommends converting this intersection to a directional median opening. According to data collected through the access management safety study effort there appears to be moderate pedestrian and bicycle activity and traffic movement volumes at this intersection. Additional traffic data collection is needed to conduct traffic signal warrant analysis. If traffic signal warrants are not currently met, consider monitoring this location for future signal consideration, especially when the property to the northwest of the intersection is redeveloped.</td>
<td>$450,000</td>
</tr>
<tr>
<td>50</td>
<td>Kennedy Blvd at Rome Ave</td>
<td>Potential unused driveway along the north side of Kennedy Blvd west of Rome Ave; consider monitoring the current self-storage development to see if existing curb-cut will be eliminated.</td>
<td>NA</td>
<td>$ -</td>
</tr>
<tr>
<td>51</td>
<td>Kennedy Blvd at Oregon Ave</td>
<td>Consider evaluating traffic signal warrants; the access management safety study proposes</td>
<td>The access management safety study recommends leaving this intersection as a full median opening. According to data collected through the access</td>
<td>$450,000</td>
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<td>Location</td>
<td>Suggestions for Consideration</td>
<td>Feasibility Notes</td>
<td>Cost Estimate</td>
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<tr>
<td>52</td>
<td>Kennedy Blvd between Oregon Ave and Willow Ave</td>
<td>Leaving this intersection as a full median opening. The closest signalized intersections/crossings are Howard Ave (2,660’) to the west and Willow Ave (665’) to the east, however there is a planned signal for Rome Ave 665’ west of Oregon Ave. Alternatively, consider evaluating for a pedestrian crossing with pedestrian hybrid beacon.</td>
<td>Management safety study effort there appears to be moderate pedestrian and bicycle activity near this intersection and fairly significant turning movement volumes. Addition traffic data collection is needed to conduct traffic signal warrant analysis. If traffic signal warrants are not currently met, consider monitoring this location for future signal consideration, especially when the property to the northeast of the intersection is redeveloped.</td>
<td>NA</td>
</tr>
<tr>
<td>53</td>
<td>WB Kennedy Blvd west of Willow Ave</td>
<td>Potential unused driveways along the north side of Kennedy Blvd; the site is currently used as a parking lot and access to the site from Kennedy Blvd has been fenced off. Consider monitoring the site for redevelopment and eliminate driveways as necessary.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>54</td>
<td>Kennedy Blvd at Willow Ave</td>
<td>As identified in the access management safety study, consider providing pedestrian signal for the east-west crossing along the north and south legs of the intersection.</td>
<td>Most likely will require coordination with the railroad (CSX), also coordinate with the City of Tampa for opportunities to incorporate improvements to any planned enhancements along Willow Ave.</td>
<td>$3,000</td>
</tr>
<tr>
<td>55</td>
<td>Kennedy Blvd at Willow Ave</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) Sign on all intersection approaches.</td>
<td>NA</td>
<td>$2,800</td>
</tr>
<tr>
<td>56</td>
<td>Kennedy Blvd at Willow Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>Crash history indicates that approximately 35% of the crashes occurred at night. Consider installing an overhead street light luminaire along the south side of Kennedy Blvd (eastbound approach) adjacent to the intersection of Willow Ave and along Willow Ave on the southbound approach to Kennedy Blvd.</td>
<td>$22,000</td>
</tr>
<tr>
<td>57</td>
<td>EB Kennedy Blvd east of Willow Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>58</td>
<td>Kennedy Blvd at N Delaware Ave</td>
<td>Consider evaluating the feasibility of a mid-block pedestrian crossing in the vicinity of Kennedy Blvd and N Delaware Ave.</td>
<td>The access management safety study recommended leaving this intersection as a full median opening and also identified this location as a high pedestrian activity area, with 52 pedestrians during the PM peak, of which 41 were crossing Kennedy Blvd. Consider conducting a 3-day pedestrian volume count in the vicinity of this intersection, if pedestrian</td>
<td>$80,000</td>
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<td>59</td>
<td>Kennedy Blvd at Edison Ave</td>
<td>Potential unused driveway along the north side of Kennedy Blvd east of Edison Ave; driveway in front of the Outpost is blocked-off to allow for additional parking, consider contacting the business and eliminating the existing curb-cut.</td>
<td>Existing driveway is not currently being used and is partially blocked by landscaping and by parking stops.</td>
<td>$17,000</td>
</tr>
<tr>
<td>60</td>
<td>Kennedy Blvd west of North Boulevard</td>
<td>Consider reconstructing the alley crossing along the north side of Kennedy Blvd; pavement is currently broken and poses as a trip hazard.</td>
<td>Reconstruct the alley opening to provide an accessible pathway along Kennedy Blvd.</td>
<td>$3,000</td>
</tr>
<tr>
<td>61</td>
<td>Kennedy Blvd at North/South Boulevard</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign on all intersection approaches.</td>
<td>NA</td>
<td>$2,800</td>
</tr>
<tr>
<td>62</td>
<td>Kennedy Blvd at North Boulevard</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>Crash history review indicates that approximately 52% of the crashes at this intersection occurred at night. Consider installing an overhead street light luminaire along Kennedy Blvd on the westbound approach to North Boulevard, along North Boulevard on the southbound approach to Kennedy Blvd, and along South Boulevard on the northbound approach to Kennedy Blvd.</td>
<td>$33,000</td>
</tr>
<tr>
<td>63</td>
<td>EB Kennedy Blvd east of South Boulevard</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>64</td>
<td>WB Kennedy Blvd west of Brevard Ave</td>
<td>Consider installing R4-11 (Bicycles May Use Full Lane) sign or the W11-1 + W16-1P (Share the Road with Bicycles) sign assembly.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>65</td>
<td>SB Brevard Ave at Kennedy Blvd</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) signs on the westbound and southbound intersection approaches.</td>
<td>NA</td>
<td>$1,400</td>
</tr>
<tr>
<td>66</td>
<td>Brevard Ave at Kennedy Blvd</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>According to the crash history review all of the crashes at this intersection (during the analysis period) occurred at night. Consider installing an overhead street light luminaire on the west side of Brevard Ave on the southbound approach to Kennedy Blvd.</td>
<td>$11,000</td>
</tr>
<tr>
<td>67</td>
<td>Kennedy Blvd at Grand Central Ave</td>
<td>Consider providing a marked crossing (including pedestrian ramps) across Grand Central Ave to continue the sidewalk and accommodate east-west pedestrian traffic.</td>
<td>The existing sidewalk along the south side of Kennedy Blvd currently continues along Grand Central Ave and does not currently have a clearly defined path to continue along Kennedy Blvd. Consider placing a marked</td>
<td>$5,200</td>
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<td>68</td>
<td>Kennedy Blvd at UT Poe Pkwy</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>Evaluating placing an overhead street light luminaire on the north side of Kennedy Blvd on the westbound approach to the existing crossing at UT Poe Pkwy.</td>
<td>$11,000</td>
</tr>
<tr>
<td>69</td>
<td>WB Kennedy Blvd at University Drive</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign.</td>
<td>NA</td>
<td>$700</td>
</tr>
<tr>
<td>70</td>
<td>Kennedy Blvd at Hyde Park Ave</td>
<td>Consider installing R10-15 (Right-Turn Yield to Pedestrians) sign on the eastbound and northbound intersection approaches.</td>
<td>NA</td>
<td>$1,400</td>
</tr>
<tr>
<td>71</td>
<td>Kennedy Blvd at Hyde Park Ave</td>
<td>Consider evaluating intersection and crosswalk lighting levels to ensure that appropriate illumination is being provided.</td>
<td>According to the crash history review, approximately 21% of the crashes at this intersection occurred at night. Consider installing an overhead street light luminaire within the southwest quadrant of the intersection.</td>
<td>$11,000</td>
</tr>
<tr>
<td>72</td>
<td>Kennedy Blvd at Plant Ave and Parker St</td>
<td>Continue to monitor the planning and development of the proposed Lafayette Place mixed-use development; continue coordination to identify signal/crossing opportunities as this development progresses.</td>
<td>The proposed Lafayette Place redevelopment is for approximately 1.7 million square feet of residential, hotel, office, and retail uses with parking well in excess of requirements.</td>
<td>$450,000</td>
</tr>
<tr>
<td>73</td>
<td>Kennedy Blvd at Hillsborough River</td>
<td>Consider alternative options of crossing under the Kennedy Blvd bridge along the west bank of the Hillsborough River to accommodate north-south pedestrian/bicycle movement to/from Plant Park/University of Tampa and the proposed Lafayette Place mixed-use development.</td>
<td>Study feasibility of and develop a plan/vision for a west river trail crossing, similar to how the Riverwalk traverses under the bridges on the east side of the river. Consider how this could be tied into the Lafayette Place redevelopment plan.</td>
<td>$150,000</td>
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1. EXECUTIVE SUMMARY

1.1 Project Overview

The Brandon Corridors and Mixed-Use Centers Pilot Project is a joint effort of the Hillsborough County Metropolitan Planning Organization (MPO) and the Hillsborough County City-County Planning Commission (Planning Commission). The project was undertaken to develop strategies to better coordinate land use and transportation planning along major corridors within the Brandon Study Area, as well as to serve as a test case for application in other areas of the County.

This Executive Summary provides an overview of findings from the project. Included in this report is information on market conditions, land use, and redevelopment potential in the study area; summaries of assessments of transportation and transit service; a vision for land use and development within designated mixed-use activity centers and corridor segments; and recommendations for improving mobility and guiding future land use. The report also includes an overview of the public participation efforts undertaken throughout the study.

As shown in Figure 1, the pilot project focuses on Brandon and surrounding areas in eastern Hillsborough County. The study area is a three-mile by six-mile area east of Interstate 75 (I-75) between State Road 60 (SR 60)/Brandon Boulevard and Bloomingdale Avenue. The eastern limit of the study area is Dover Road/Little Road.

Eight technical memorandums included as appendices to this report provide the entire analysis and evaluation completed as part of the project.

Figure 1. Study Area Regional Context Map
1.2 Key Findings

As documented in the technical memorandum included as appendices to this summary report, the project addressed a wide range of issues and opportunities related to land use, market and development potential, transit, transportation, and mobility. Key findings from include the following:

- Changing conditions—demographics, travel patterns, market forces, regional development patterns, and consumer behavior—are influencing Brandon’s attractiveness as a place to live, visit, and do business.

- A significant number of trips along east-west roadways originate in communities to the south or east of the study area and are destined for one of four regional employment destinations in Hillsborough County. Over fifty percent of the morning commute trips passing through the study area are destined for Downtown Tampa or Westshore.

- The study area has a number of mobility challenges, including significant capacity issues on the three major east-west corridors (SR 60/Brandon Boulevard, Lumsden Road, and Bloomingdale Avenue), vehicular and pedestrian safety concerns, inadequate bicycle and pedestrian connectivity, and a limited and inadequate secondary roadway network.

- The pattern of disconnected, single use, auto-oriented strip commercial development creates significant challenges. The absence of connections between parcels forces auto trips onto the arterial network, there is little potential for internal trip capture or vehicle mile travel reduction, pedestrian and transit accessibility to and between destinations is especially poor, and such forms of development are difficult to serve by transit.

- Opportunities for transformational change in the pattern and character of development are restricted due to the lack of large tracts of land available for development or redevelopment.

- Only a few pockets within the study area have activity densities (residential population and employment) high enough to be considered transit supportive, although projections show that additional areas in the western portion of the study area will achieve transit-supportive activity densities by 2040.

1.3 Summary of Policies & Strategies

The project team’s assessment of existing land uses; the form, character, and pattern of development; market potentials for housing and commercial development; and the performance of transportation and transit networks revealed significant challenges facing the community. To address these challenges and take full advantage of the area’s powerful locational advantages and unique character, a series of interrelated land use, transportation, and transit concepts were defined and tested. These concepts, designed to promote investment and reinvestment, ease congestion, improve access and mobility, and provide safer, more convenient connections between destinations, are described below:

- Based on an evaluation of existing plans, land use and market conditions, and stakeholder and public input, a vision map was created identifying areas with the potential to evolve into more connected, pedestrian-friendly, mixed use destinations.

- To achieve this vision for a development pattern organized around accessible mixed-use activity centers, modifications will be required to the Comprehensive Plan and future land use to achieve the vision desired development pattern. Based on the 2014 Strip Commercial and Mixed-Use Development in Hillsborough County report, a typology of mixed-use activity center and corridor segments should be established and applied to the identified centers in the study area. Preliminary Comprehensive Plan language and development standards have been developed and could be adopted to establish objectives and policies to guide in the planning and regulation of development.
in areas designated as mixed-use activity centers and corridor segments.

- To support the desired development pattern, mobility challenges in the study area should be addressed through a series of interrelated improvements and initiatives, as follows:
  - Capacity improvements along Lumsden Road can improve peak period travel through the study area but will require significant right-of-way to accommodate additional lanes, a landscape median, and improved bicycle and pedestrian accommodations. Further evaluation of the capacity of connecting roadways will also be required.
  - Implementing reversible-lane operations on all or portions of Bloomingdale Avenue is technically feasible and could improve peak period travel but such an improvement would also result in longer travel times for local trips, restrictions on left turns to access businesses and neighborhoods, and the loss of potential for pedestrian refuges at key cross roads. Alternative treatments may offer benefits but with substantially less impact. Strategic operational and intersection improvements along with improved cross parcel connectivity could help relieve peak period congestion.
  - Concepts for the introduction of a roundabout at Lithia Pinecrest Road/Bryan Road appear to be unjustified based on a traffic analysis completed for the project. The introduction of a one-way pair for Lithia Pinecrest Road and Bryan Road south of SR 60 also appears unwarranted as it would not relieve congestion at SR 60 intersections.
  - Rights-of-way should continue to be reserved for the completion of new and expanded secondary roadway connections and intersection improvements throughout the study area. As a complementary strategy, cross-parcel connections to link private development should be a non-negotiable requirement for both new development and redevelopment. Unless parallel roadway improvements and cross-parcel connections are constructed, local, short distance trips will continue to be pushed to congested arterials and intersections.
  - The results of a preliminary assessment of potential regional express bus or BRT service connecting Brandon to regional employment destinations were positive. Based on the number and type of trips that currently occur from and through the study area, a hybrid form of bus service connecting Brandon to Downtown Tampa and Westshore appears supportable. Such a service has the potential to support long distance trips for commuters during peak periods and provide better short distance connections between existing activity centers along the SR 60 and Oakfield Drive corridors. HART’s current efforts to realign local and express bus service in Brandon should provide test cases for implementation of enhanced transit service between the study area and regional destinations.
  - The results of an evaluation of circulator service connecting destinations in the west end of the study area were less conclusive. The generally auto-oriented pattern of development and low densities and intensities present challenges for the introduction of a fixed-route, fixed schedule circulator service. In addition, the success of HART’s recently initiated HyperLINK service suggests a more flexible type of on demand, first-mile/last-mile service may provide the best option for serving short distance trips in the area.
2. CONDITIONS & CHALLENGES

2.1 Market Conditions

Understanding current and future market conditions is an important factor in assessing the potential for development or redevelopment in the Brandon Study Area. To evaluate development potential, a market analysis was undertaken for the project (see Technical Memo 2: Market Analysis). This analysis includes preparation of a demographic and economic profile of the area, an analysis of market drivers for new investment; and an estimate of the market potential for commercial ‘workplace’ uses (e.g., general and medical office), supporting retail and services, lodging/hospitality, and residential uses. Some key findings include:

- **Housing.** In 2015, the study area and adjacent area had 77,340 residents in 30,700 households, which represents about 6 percent of Hillsborough County residents. Half of the 33,300 housing units are owner-occupied, 42 percent are renter occupied and 8 percent are vacant. Housing types are typical of suburban areas: 51 percent are single-family detached homes, 33 percent are multi-family units, and 8 percent are townhomes. Demand for housing is anticipated to be driven by fast growing cohorts, including households with children, first time home buyers (persons aged 25-34) and empty nesters (persons aged 55+). An anticipated 2,400 units would be required through 2025 to meet the demand. The analysis reveals continued demand for multi-family, townhomes, and smaller footprint detached units.

- **Office.** The office market in Brandon is generally healthy, with approximately 2.5 Million square feet of general and medical office space in 414 buildings. One-fifth of this space has been delivered since 2006 and one-third is medical office. The majority of office space is in small, multi-tenant buildings. The larger footprint corporate offices are located west of I-75 near Falkenburg Road and US 301. The demand for additional office to 2025 will be constrained by the availability of sites. The area east of I-75 study area has few sites available for large floor plate office. Based on current vacancy and employment forecasts from the Florida Department of Economic Opportunity for 2015-2023, the net demand for new medical and professional office space in greater Brandon is estimated to be approximately 300,000 square feet by 2023 in mix of smaller buildings under development and new office on infill sites.

- **Retail.** Brandon is a regional retail destination, in large part due to the location of Westfield Brandon Town Center Mall and the significant amount of additional surrounding retail, food service, and consumer service businesses. The study area and adjacent area has approximately 9.3 million square feet of retail uses in 450 centers and buildings. About one million of this space was developed in the past 10 years. With only three percent that is vacant, it is considered full occupancy. While the study area only has about 6 percent of the county’s population, it has about 16 percent of the retail square footage. The average annual absorption of 80,000 square feet is likely to decline due to lack of available sites. The area has limited opportunities for new grocery anchored strip centers. Recent and near-term activity will likely focus on the reuse and repositioning of vacant space (i.e., Walmart, Albertsons, Kash & Karry, etc.) The longer term potential for retail uses lies primarily in the redevelopment of larger underutilized centers.

- **Lodging.** The study area and adjacent area, including the area west of I-75, currently has 2,100 lodging units in 20 properties. The area’s lodging units have experienced a significant improvement in performance since 2010, with high occupancy rates (78.2% in 2015). This indicates good potential for new investment. Demand within the next 10 years, indicates the potential for one new limited service or boutique hotel along I-75 or within mixed use concept. Additionally, there is potential demand for extended stay concept near Brandon Regional Hospital.
2.2 Land Use & Redevelopment

As described in Technical Memo 1: Land Use Pattern Maps and Summary, the majority of the study area is developed, with only 7.5 percent of the study area currently classified as vacant. Residential land uses, primarily single-family residences, make up over half of the study area. Several areas of multi-family residential are located throughout the western portion of the study area. Commercial land uses are concentrated along the SR 60/Brandon Boulevard, Causeway Boulevard/Lumsden Road, and Bloomingdale Avenue corridors. Westfield Brandon Town Center Mall, Brandon Main Street, and Brandon Regional Hospital Area and other existing centers are located at key intersections along these primary corridors.

The form of development within the study area is reflective of a low intensity, auto-oriented area with low average floor area ratios (FARs) and low residential densities. The eastern half of the study area has lower development intensity and is characterized by older, larger lot single-family residences interspersed with single-family residential subdivisions built in the 1990s and 2000s. The western half of the study area is more commercial in nature with several big-box and auto-oriented developments and multi-family residential developments built in the last 30 years.

Several community plans and the future land use designations for the study area indicate the desire for higher density/intensity and mixed-use land use categories in the western half of the study area and lower density residential land use categories in the eastern half. The Hillsborough County Areawide Vision Map calls for more intensive development in the western half of the study area. The area between I-75 and Parsons Avenue along SR 60 is envisioned for High Intensity Urban uses. Further east along SR 60, south of Brandon Parkway, and sections of Bloomingdale Avenue area categorized as Urban or High Intensity Suburban. The remaining area within the study area is classified as Established.

An analysis of the development and redevelopment potential was conducted (see Technical Memo 4: Development and Redevelopment Potential Assessment). As described in that memo, the study area is approaching build out, with a limited number of unconstrained vacant sites available for development. Using Hillsborough County Property Appraiser data regarding land use, recent construction, development intensity, value, and environmental constraints, the study team assessed development and redevelopment potential for 26,728 parcels (14,069 acres) within the study area and parcels immediately adjacent on the north side of SR 60/Brandon Boulevard and south side of Bloomingdale Avenue. The assessment revealed that unconstrained land with development or redevelopment potential within the evaluation area includes 1,355 parcels (2,629 acres). The majority of these identified parcels are less than five acres in size. The vast majority of these smaller parcels are not located along arterials or within or adjacent to existing commercial centers or corridors. A few existing larger scale commercial buildings that are currently vacant and potentially available for reuse or redevelopment are located within the study area.

2.3 Transportation & Transit

The Brandon Study Area is well connected to key destinations within Hillsborough County and the larger Tampa Bay region. The study area is also located just a few miles south of the I-75 and I-4 interchange and has the eastern entry/exit point to the Selmon Expressway express lanes off Brandon Parkway near the Westfield Brandon Town Center Mall. The study area itself has several regional destinations that attract visitors from other areas within Hillsborough County. The study area’s primary east-west major corridors provide access from greater Brandon to regional destinations to the north, west, and south.

An evaluation of the study area transportation network’s existing conditions and planned improvements within the study area and
SUMMARY REPORT

adjacent areas identified several key mobility challenges affecting the
future of the Brandon Area. The complete analysis of the transportation
network is provided in Technical Memo 3: Network Evaluation and
Planned Improvements. The existing transit network and potential
improvements are discussed in Technical Memo 7: Transit Service
Evaluation. Other mobility improvements can be found in Technical
Memo 8: Mobility Option Improvements Evaluation. Key findings
include the following:

- **Major Corridor Capacity.** Major arterial corridors in the
  study area are operating below acceptable levels of service,
  with future Levels of Service projected to be F for Lumsden
  Road, Lithia Pinecrest Road, Durant Road, and sections of SR 60
  and Bloomingdale Ave. These corridors carry significant peak
  hour commute trips with origins and destinations both within
  and outside the study area. Although traffic operations, access
  management, and transit service improvements have been
  completed in recent years, the potential to drastically increase
  arterial capacity to serve peak hour travel demand is limited
  due partly to right-of-way and development-related constraints.
  Issues with congestion and capacity constraints are highlighted in
  several studies, including the Imagine 2040 LRTP and the SR 60
  Compatibility Study.

- **Travel Safety.** Travel safety has been identified as a significant
  problem in the study area, with specific road segments defined
  as top severe injury or high frequency crash intersections
  and corridors by the Hillsborough MPO. Most of SR 60 and
  a significant segment of Bloomingdale Avenue have been
  identified as high frequency crash corridors. Addressing corridor
  safety was a specific focus of the SR 60 Compatibility Study. The
  study offered a range of recommendations to address safety,
  including recommendations for travel speed reduction, lane
  width reduction, intersection improvement, sign and signal
  enhancements, pedestrian and bicycle facility improvement, and
  parallel road network development.

- **Secondary Network Connectivity.** The absence of a
  secondary network of interconnected collector streets contributes
to congestion on the arterial network. Virtually all east-west
  trips are forced onto three arterials, thus contributing to arterial
  segment and intersection congestion. Although capacity
  improvements are proposed on east-west arterials, no major
  projects are programmed to increase east-west capacity off the
  arterial network.

- **Pedestrian and Bicyclist Facilities.** Although the study
  area includes bicycle and pedestrian facilities, including a fairly
  continuous sidewalk network along the arterial road network, the
  predominant development pattern is auto-oriented with limited
  pedestrian and bicycle connections among destinations and
  across private properties. In addition, many of the pedestrian and
  bicycle accommodations in the study area were designed to meet
  outdated or minimum standards, and therefore do not always
  provide for high levels of user comfort.

- **Transit Service.** The western half of the study area is fairly
  well served by transit, including service by local and express bus
  routes, HARTFlex service, HyperLINK service, and a bus transfer
  facility on the Westfield Brandon Town Center Mall property.
  Several express routes serve the northern and eastern extents
  of the study area and are supported by park-and-ride lots to
  intercept commuters moving to and through the area from
  residential areas to the east and south. HART’s Mission MAX
  2017 service changes will reduce the number of routes within the
  study area and shorten many of the routes, but express service
  to key employment destinations including Downtown Tampa,
  Westshore, and MacDill AFB will increase and the HyperLINK
  pilot program will continue to provide the needed first mile/
last mile connections within the most developed portions of the
  study area. The proposed changes will address many of the
  existing service inefficiencies, but several challenges will remain
  unaddressed. These include the frequency of service, the location
  of park-and-ride and transfer facilities, and the high number
  of transfers required to connect local and express routes. In
  addition, existing land use densities and intensities are relatively
low across the study area, which creates a challenge for the introduction of more robust transit service.

3. PUBLIC PARTICIPATION

Several hundred residents, business owners and other interested persons have lent their time, energy and thoughts in shaping this study. The public provided their collective voice by attending meetings, answering surveys, and engaging staff and each other through social media.

Four public meetings were held: two focused on the business community and two focused on the community at-large. These meetings included a presentation and question and answer session and were concluded in an open house setting that allowed attendees to discuss concerns or ask questions of the project team in one-on-one settings.

Two meetings held on December 5, 2016 introduced the study and its overarching concepts while providing the initial findings from the land use and marketing analysis. Two meetings held on May 17, 2017 presented the study findings to date, reviewed the survey findings, and sought input on the transportation and land use issues that affect the study area.

An electronic survey was developed and distributed to community stakeholders and posted on the Plan Hillsborough website. The survey results helped the study team to identify appropriate development patterns and rank mobility concerns in the study area as seen by the public. This survey was distributed to dozens of neighborhood and business organizations and mentioned by local media outlets. The survey included several hundred respondents.

4. PROJECT RECOMMENDATIONS

4.1 Vision & Policy Framework

A preliminary vision for the Brandon Study Area was created, including the identification of future mixed-use activity centers, policy framework for centers and corridor segments, and recommendations for implementation. Complete details on the mixed-use activity centers and policy recommendations is provided in Technical Memo 5: Mixed-Use Activity Center Designation & Policy Framework.

VISION MAPPING & CENTER DEFINITION

A preliminary vision map was created to illustrate the preferred pattern of development for Greater Brandon’s commercial districts and corridors. The vision map, defining the location and extent of potential mixed-use activity centers, was prepared based on an assessment of land use patterns and development forms, an evaluation of development and redevelopment potential, and a review of policies and strategies in the Hillsborough County Comprehensive Plan, Brandon Community Plan, Brandon Main Street Community Plan, Brandon Boulevard (SR 60) Compatibility Study, and Hillsborough County’s Land Development Code (LDC) SR 60 Brandon Boulevard Overlay and Restricted Business Professional Office (R-BPO) overlay districts.

The preliminary vision map defines ten areas with the greatest potential to develop or redevelop as mixed-use activity centers. These centers, located at major crossroads, serve as regional or community
destinations for retail, professional service, personal service, office, and medical uses. Several also have higher intensity multi-family uses.

As shown in Figure 2, the places defined as potential mixed-use activity centers are as follows:

- Westfield Brandon Town Center Mall/Regency Park;
- Brandon Main Street/Oakfield Drive Corridor;
- Brandon Hospital District;
- Valrico Center;
- Causeway Boulevard/Lumsden Road;
- Lumsden Road & Kings Avenue;
- Bloomingdale Avenue - West End;
- Bloomingdale Avenue & Providence Avenue (Winthrop);
- Bloomingdale Avenue & Bell Shoals Road; and
- Bloomingdale Avenue & Lithia Pinecrest Road.

The mixed-use activity centers shown on the preliminary vision map were identified as places with the potential to address challenges associated with conventional forms of auto-oriented development, including traffic congestion, poor pedestrian safety and circulation, lack of street and drive connectivity, and long-term competitiveness in the face of changing demographics, travel patterns, market forces, and consumer behavior. More urban, mixed-use centers can be designed to increase internal trip capture, create “park-once” environments and reduced parking demand and allow for cross-parcel circulation off the arterial and collector network. Benefits of such patterns and forms of development include reductions in vehicle miles traveled, lower greenhouse gas emissions, increased support for enhanced transit service, and expanded opportunities for active transportation and safer pedestrian travel.

The preliminary vision map was reviewed with staff, key stakeholders, and the general public through an online survey conducted in early 2017 and a series of workshops held in March 2017.

**CENTER TYPOLOGIES & POLICY FRAMEWORK**

To characterize the preferred intensity, form, and character of development for the mixed-use activity centers, the study team established center typologies that build on the place types presented in the 2014 Strip Commercial and Mixed-use Development in Hillsborough County report.

A preliminary goal, objective, and policies were developed to provide guidance in the planning and regulation of development and redevelopment in the designated mixed-use activity centers and corridor segments. In these areas, projects could follow an optional development approval process to achieve higher intensities, a broader range of uses, and gain access to other incentives.

A summary of the mixed-use activity center designations is shown in Figure 3. The mapped centers and corridor segment designation for each of the ten mixed-use activity centers within the study area is shown in Figure 4. The policy framework is described below and summarized in Table 1.

**GOALS & OBJECTIVES**

The following land use and development goal, objective, and policies provide guidance for new Comprehensive Plan provisions for development within designated centers and corridor segments.

**Goal.** Development along arterial corridors should be planned and designed to create safe, sustainable, connected, and competitive destinations. Mixed-use activity centers along corridors shall be planned to support a mix of complimentary land uses, provide
Figure 2. Preliminary Vision Map - Future Mixed-use Activity Centers
COMPACT URBAN CENTERS
More like a Traditional Downtown or Main Street. High development intensity. Connected, mixed-use, walkable, and transit supportive.

CONNECTED SUBURBAN CENTERS

MODERN SUBURBAN CENTERS
Primarily auto-oriented, planned shopping areas, residential complexes, and office parks.

Intensity & Mix Of Use
Urban Forms & Patterns of Development
Pedestrian Access & Circulation
Interconnected Streets & Drives
Enhanced Transit Service

MORE

LESS

CORRIDOR SEGMENTS
Primarily auto-oriented, but with good pedestrian and vehicular connections between destinations.
Figure 4.  Mixed-use Activity Centers & Corridor Segments
## Table 1. Mixed-use Activity Centers & Corridor Segments Development Objective Matrix

<table>
<thead>
<tr>
<th>Center/Corridor</th>
<th>Development Intensity*</th>
<th>Land Uses**</th>
<th>Urban Form</th>
<th>Connectivity</th>
<th>Incentives***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Urban Centers</td>
<td>Potential for intensities above adopted plan category.</td>
<td>Employment, housing, shopping, civic, and entertainment uses.</td>
<td>Buildings oriented to streets and public spaces. Parking located to rear or side of buildings.</td>
<td>Interconnected network of multi-modal streets. Provisions for enhanced transit service.</td>
<td>Potential for higher development intensity, parking reductions, and enhanced economic development assistance (e.g., tax incentives, redevelopment grants and loans, fee reduction, and off-site infrastructure improvements).</td>
</tr>
<tr>
<td>Modern Suburban Centers</td>
<td>As permitted by adopted plan category.</td>
<td>As permitted by adopted plan category.</td>
<td>Buildings oriented to drives and front parking.</td>
<td>Improved pedestrian accommodations and vehicular cross-parcel access.</td>
<td>Potential for limited economic development assistance.</td>
</tr>
<tr>
<td>Corridor Segments</td>
<td>As permitted by adopted plan category.</td>
<td>As permitted by adopted plan category with allowances for residential.</td>
<td>Buildings oriented to streets and drives. Limited front parking permitted.</td>
<td>Cross-parcel, multi-modal connections to adjacent sites.</td>
<td>Potential for increased residential density for projects with enhanced connectivity and pedestrian accommodations.</td>
</tr>
</tbody>
</table>

Notes:

(*) For development intensity in Compact Urban Centers and Connected Suburban Centers, residential density should be guided by FAR. Development of lower intensity should be permitted so long as development plans indicate phasing to achieve intensity within the target ranges.

(**) A broader range of uses may be permitted under adopted plan category for Compact Urban Centers and Connected Suburban Centers.

(***) Receiving incentives is contingent upon meeting development design standards. The Comprehensive Plan may provide for other incentives not shown in this table.
interconnected networks of public streets and drives, safely accommodate pedestrian travel along streets and within and across separate parcels, and support existing and planned transit service.

Objective. Mixed-use activity centers and corridor segments shall be developed and redeveloped as one of the following:

- **Compact Urban Centers** shall be those areas designated for commercial and mixed-use development and organized in a traditional urban pattern with building fronts aligned along streets and public spaces and private parking and service areas located mid-block and to the rear of buildings. These are areas with existing or future potential to support enhanced transit service, and therefore should be planned and designed for higher densities and intensities of development and more pedestrian-friendly streets and streetscapes.

- **Connected Suburban Centers** shall be those areas designated for commercial and mixed-use development at or near arterial intersections organized around an interconnected network of streets and drives with provisions for cross parcel circulation, connections to streets and drives on surrounding properties, and accommodations for safe, convenient pedestrian travel.

- **Modern Suburban Centers** shall be those areas designated as appropriate for relatively isolated single use planned developments, including regional office parks, shopping malls, and planned residential neighborhoods. Travel within these centers is accommodated by auto-oriented streets with sparse connections to surrounding street networks and limited access to surrounding arterials and collectors.

- **Corridor Segments** shall be those areas located between centers on arterial roadways with neighborhood and community serving uses including commercial office, multi-family, and residential support uses. Building within these areas are generally served by side and rear yard parking areas accessed from side streets with shared access drives providing for internal connections among adjacent uses.

Policy. Properties in the identified **Compact Urban Centers** may receive additional density, intensity and incentives beyond those established in the adopted Future Land Use category, if they develop consistent with the criteria below:

- **Development Intensity.** The target development intensity shall be between 1.0 and 2.5 FAR. Residential density should be guided by FAR. Development of lower intensity may be permitted so long as development plans indicate phasing to achieve intensity within the target range.

- **Land Use Mix.** A variety of employment, housing, shopping, civic, and entertainment uses are permitted consistent with use allowances under the RMU and UMU categories. Conventional single use auto-oriented development types, including office parks, campuses, apartment complexes, and shopping centers are generally not permitted unless configured in more urban patterns.

- **Street Network and Block Structure.** Streets and drives shall be arranged in a network and provide for multi-modal travel, enhancing neighborhood character, safety, walkability, and transit potential. Streets and drives shall connect to the existing and future street network in adjoining areas except where blocked by physical constraints such as canals, expressways, railroads, wetlands, etc. Streets and drives shall be configured to form a continuous block structure with individual development blocks generally rectilinear in shape with small block sizes to enhance pedestrian environments.

- **Pedestrian Accommodation.** Walking and bicycling along arterial frontages are accommodated on a network of sidewalks and paths separated from arterial traffic by landscape areas or other forms of physical separation. Protected and well-marked
pedestrian pathways are provided to allow safe access across parking areas and between public sidewalks, existing and planned transit stops, and primary building entries.

- **Building Orientation.** Building shall be aligned along streets, drives, and public spaces with entries directly accessible from public sidewalks or from courtyards, squares, and plazas connecting to public sidewalks.

- **Public Space.** Publicly-accessible outdoor spaces shall be configured as a series of central gathering spaces and smaller scale squares and plazas designed with a mix of hardscape and landscape areas to support public gathering, special events, and activities.

- **Parking.** Parking shall be provided on-street and in surface and structured parking areas located mid-block and to the rear of principal buildings. Public alleys and private access drives shall provide access to parking in mid-block locations.

- **Incentives.** Create incentives to encourage retrofit, redevelopment, and intensification that furthers the objective of creating mixed-use, walkable, and transit-supportive destinations with more multi-modal, land-efficient, and fiscally-beneficial forms and patterns of development. Higher development intensities and parking reductions may be permitted for projects with enhanced transit service and use mixes and intensities resulting in the potential for internal trip capture and reduction of trips on the arterial road network.

**Policy.** Properties in the identified **Connected Suburban Centers** may receive additional density, intensity and incentives beyond those established in the adopted Future Land Use category, if they develop consistent with the criteria below:

- **Development Intensity.** The target development intensity shall be between 0.25 and 1.5 FAR. Residential density should be guided by FAR. Development of lower intensity may be permitted so long as development plans indicate phasing to achieve intensity within the target range.

- **Land Use Mix.** A variety of employment, housing, shopping, civic, and entertainment uses are permitted consistent with use allowances under the CMU category. Conventional single use development types, including office parks, campuses, shopping malls are permitted if configured in more urban than suburban formats. Auto-oriented uses, including uses with drive-through facilities, are permitted, but shall be configured to minimize the impact of vehicle use areas on pedestrian ways, open spaces, and streetscapes.

- **Street Network and Block Structure.** Streets and drives shall be arranged in a network spaced at approximately quarter-mile intervals. Most shall be designed as complete streets that accommodate walking, bicycling, and transit. Streets and drives shall connect to the existing and future street network in adjoining areas except where blocked by physical constraints such as canals, expressways, railroads, wetlands, etc. Streets and drives are configured to form a reasonably continuous block structure, although blocks may be irregular in shape and larger than traditional city blocks to accommodate mid-block surface parking.

- **Pedestrian Accommodation.** Walking and bicycling along arterial frontages are accommodated on a network of sidewalks and paths separated from arterial traffic by landscape areas or other forms of physical separation. Protected and well-marked pedestrian pathways are provided to allow safe access between public sidewalks, existing and planned transit stops, and primary building entries; across parking areas; between uses on adjacent parcels.

- **Building Orientation.** Building shall be aligned along or perpendicular to streets, drives, and public spaces with most entries accessible from public sidewalks or from courtyards, squares, and plazas connecting to public sidewalks.

- **Public Space.** Publicly-accessible outdoor spaces, including parks, squares, and plazas, are larger and spaced farther apart than in compact urban centers.
Parking. Parking shall be provided on-street and in surface and structured parking areas located in side and rear yard locations. Front parking and vehicular circulation are discouraged, especially along primary streets and drives.

Incentives. Create incentives to encourage retrofit, redevelopment, and intensification that furthers the goals of creating employment-intensive, mixed-use, walkable, and transit-supportive destinations with more multi-modal, land-efficient, and fiscally-beneficial forms and patterns of development. Higher development intensities and parking reductions may be permitted for projects with enhanced transit service and use mixes and intensities resulting in the potential for internal trip capture and reduction of trips on the arterial road network.

Policy. Properties in the identified Modern Suburban Centers may receive incentives beyond those established in the adopted Future Land Use category, if they develop consistent with the criteria below:

- Development Intensity. Development density and intensity shall be as provided in underlying future land use categories with no potential for increases, unless otherwise provided in the Comprehensive Plan.
- Land Use Mix. Uses shall be provided consistent with underlying future land use categories with the potential for the additional of housing in areas designated for conventional single use development, including office parks, campuses, and shopping centers. Auto-oriented uses, including uses with drive-through facilities, are permitted but shall be configured to minimize the impact of vehicle use areas on pedestrian ways, open spaces, and streetscapes.
- Street Network and Block Structure. Street and drives shall be arranged in a loose network with primary connections to the local street network designed to accommodate walking and bicycling. Development patterns organized around a network of streets and blocks are preferred over conventional campus style patterns although blocks may be irregular in shape and larger than in other types of centers.
- Pedestrian Accommodation. Protected and well-marked pedestrian pathways are provided to allow safe access between public sidewalks, existing and planned transit stops, and primary building entries; and across parking areas.

Parking. Parking shall be provided in surface and structured parking areas located generally in side and rear yard locations. Front parking and vehicular circulation are discouraged, especially along surrounding arterials and along primary streets and drives connecting to surrounding arterials.

Incentives. Create incentives for employment intensive uses meeting existing and future standards for high wage jobs.

Policy. Commercial and mixed-use areas along arterials segments not designated as one of the three mixed-use activity center types shall be designated Corridor Segments and developed and improved consistent with the following:

- Development Intensity. Development density and intensity shall be as provided in underlying future land use categories with higher density for residential uses within proximity to Compact Urban Centers or Connected Suburban Centers and as otherwise provided in the Comprehensive Plan.
- Land Use Mix. Land uses shall be multi-family residential, civic, and professional office, personal services, and other neighborhood supportive uses with low trip generation characteristics.
- Street Network and Block Pattern. Street and drive connections take place on arterials spaced at ¼-mile to ½-mile intervals.
- Pedestrian Accommodation. Walking and bicycling along the arterial are accommodated on a network of sidewalks and paths separated from arterial traffic by landscape areas or other forms of physical separation. Protected and well-marked pedestrian pathways are provided to allow safe access between public sidewalks, existing and planned transit stops, and primary building entries; across parking areas; between uses on adjacent...
4.2 Mobility Improvement Options

ROADWAY OPTIONS

As previously outlined, the Brandon Study Area has a number of mobility challenges, including significant capacity issues on the three east-west corridors (SR 60, Lumsden Road, and Bloomingdale Avenue), safety, bicycle and pedestrian connectivity, and a limited secondary roadway network. To address these deficiencies, issues and challenges, a number of roadway improvement options were evaluated to assess their feasibility for implementation within the study area. The complete analysis is provided in Technical Memo 8: Mobility Improvement Option Evaluation.

Bloomingdale Avenue Reversible Lane Concept

Following a preliminary screening, two reversible lane configurations were developed for Bloomingdale Avenue between US 301 and Lithia Pinecrest Road (see Figure 5).

- A 3/2 configuration (3 lanes in peak direction, 2 lanes in off-peak direction) that would eliminate the left turns from Bloomingdale Avenue and require median u-turns (MUTs) on intersecting roadways, and
- A 3/1 twoway left turn lane (TWLTL)/1 configuration (3 lanes in peak direction, a two-way left-turn lane, and 1 lane in off-peak direction) that would reduce the off peak directional traffic to a single lane, but maintain the TWLTL on Bloomingdale Avenue.

The evaluation revealed that while both options improve travel time or capacity for peak hour directional traffic, each have significant impacts on the network. While there would be travel time savings for westbound traffic on Bloomingdale Avenue in the AM peak hour in the 3/2 configuration, the overall network-wide travel times would increase. This configuration would require MUT intersections, or a similar treatment, to facilitate the prohibited left turn movements. The loss of the TWLTL would impact the ability of traffic to safely turn onto Bloomingdale Avenue from mid-block locations.

For the 3/1 TWLTL/1 configuration, the analysis shows that the v/c ratio for eastbound traffic on Bloomingdale in the AM peak hour would increase to nearly 60 percent over capacity due to the loss of one travel lane. Dual left turns from cross streets would need to be eliminated onto Bloomingdale Avenue and many mid-block locations or unsignalized intersections may need to be evaluated for right-in/right-out configurations.

In addition to the two reversible lanes configurations that were considered, other improvement options including innovative intersection concept and minor timing and turn bay improvements at signalized intersections, were evaluated for implementation. Given the significant access impacts that would be required for implementation of a reversible lane configuration, this improvement option may not be the most effective or feasible option. Based on the qualitative and quantitative analysis, Bloomingdale Avenue may be a good candidate as a MUT corridor. Intersections could be analyzed on a case by case basis for MUTs and other innovative treatments as funding becomes
Figure 5. Bloomingdale Avenue Reversible Lane Configuration Concepts

**3/2 Reversible Lane Configuration**

**AM Peak Period**
3 westbound lanes, 2 eastbound lanes, no left turn lane

**Off Peak Period**
2 westbound lanes, 2 eastbound lanes, two-way left turn lane

**PM Peak Period**
2 westbound lanes, 3 eastbound lanes, no left turn lane

**3/1 TWLTL/1 Reversible Lane Configuration**

**AM Peak Period**
3 westbound lanes, 1 eastbound lane, two-way left turn lane

**Off Peak Period**
2 westbound lanes, 2 eastbound lanes, two-way left turn lane

**PM Peak Period**
1 westbound lane, 3 eastbound lanes, two-way left turn lane
available.

**Lithia Pinecrest Road/Bryan Road Roundabout Concept**

The Lithia Pinecrest Road/Bryan Road intersection was analyzed under its existing configuration and as a roundabout intersection. Several roundabout configurations were considered. While the two-lane roundabouts operated acceptably, they showed geometric complications due to the skew angle of the intersection. Since this intersection is currently not showing safety concerns or major operational deficiencies, it is recommended that congestion continue to be monitored before improvements are further considered. The most beneficial improvement options appear to include widening through the intersection with a zipper-style merge or a split tee configuration.

**Lithia Pinecrest Road-Bryan Road One-Way Pair at SR 60**

In addition to the roundabout analysis at the Lithia Pinecrest Road/Bryan Road intersection, the study team evaluated an option to convert segments of Lithia Pinecrest Road (northwest leg of the Lithia Pinecrest Road/Bryan Road intersection) and Bryan Road (north leg of the Lithia Pinecrest Road/Bryan Road intersection) to a one-way pair in order to mitigate the existing congestion.

The two-way pair analysis for the SR 60 intersections with Bryan Road and Lithia Pinecrest Road revealed that no clear pattern of improvement was identified. A roundabout at the Lithia Pinecrest Road/Bryan Road intersection does not show acceptable operations in conjunction with the more viable one-way pair option, Option 2 with Lithia Pinecrest Road in the northwestbound direction and Bryan Road in the southbound direction. Other improvement options may include implementing innovative intersection concepts by reducing signals to two- or three-phase timing schemes, widening SR 60 in the bottleneck area from Kings Avenue to Bryan Road-Kingsway Road, a reversible lane in the SR 60 bottleneck area, and/or extending S Montclair Avenue south to connect with Lithia Pinecrest Road.

**Lumsden Road Widening Concept**

The feasibility of widening and completing multimodal improvements along the 1.5-mile segment of Lumsden Road between Kings Avenue and Lithia Pinecrest Road was also evaluated as part of the study. To address capacity issues along this segment, the project explored the impacts of expanding the roadway from a four-lane divided roadway with a median to a six-lane divided roadway with a center median and turn lanes and a 12-foot-wide multi-use path on the north side. Accommodating the improvements requires significant right-of-way acquisition, resulting in right-of-way acquisition costs of almost $25 million, nearly double the estimated cost of construction of $13.5 million.

To maximize the benefits of adding capacity on this segment of Lumsden Road, further evaluation of traffic capacity and intersection operations to the west, east, and south of corridor should be completed. Even with existing planned improvements to the Lithia Pinecrest Road/Lumsden Road intersection and planned capacity improvements along Lithia Pinecrest to the south, roadways feeding into Lumsden Road may draw higher volumes and experience higher levels of congestion than are currently projected.

In assessing overall network capacity, the Lumsden improvements, in combination with the 4-laning of Lithia Pinecrest to the south, would result in improved projected volume-to-capacity ratios for Lumsden Road and Lithia Pinecrest Road as well the improved projected volume-to-capacity ratios for the segments of Kings Avenue and Providence Road north of Bloomingdale and Bell Shoals Road to South of Bloomingdale Avenue. The planned improvements, however, would result in higher projected volume-to-capacity ratios along segments of Lumsden Road and the Brandon Parkway to the west and along Bloomingdale Avenue west of Bell Shoals.
TRANSIT OPTIONS

Based on the evaluation of existing transit service, analysis of travel patterns within and passing through the study area, the review of BRT/express service accommodation along the SR 60, and the potential for a fixed route, fixed schedule circulator presented Technical Memo 7: Transit Service Evaluation, the following general recommendations for further study and evaluation are offered for consideration.

BRT/Express Bus Service Potential

Based on the high number of trips between Brandon and Downtown Tampa and between Brandon and Westshore during peak periods, some enhanced transit serving Brandon and Brandon area commuters warrants further study. The implementation of BRT/express bus service between Brandon and Marion Transit Center appears to have the potential to provide a time-competitive service meeting the needs of both daily commuters traveling to Downtown Tampa and Brandon travelers moving between areas with existing and planned transit-supportive densities and intensities. Such a service could maintain relatively high average travel speeds and levels-of-service by operating with limited stops and running in exclusive or shared guideways in Brandon, along the Selmon Expressway between Brandon and Downtown Tampa, and potentially along I-275 in express lanes between Downtown Tampa and Westshore.

A potential express bus service could operate during peak AM and PM periods between the study area and Downtown and/or Westshore, and connect to an all-day BRT service that operates within the study area. Implementation of the proposed HART 60LX and 360LX express bus routes would provide the first step in providing this type of service to the study area. Future enhancements or extensions to these routes, or the enhancement of local routes, such as Route 46, could provide the next steps.

BRT/Express Bus Accommodation along SR 60/Oakfield Drive Corridor

Based on the findings detailed in Section 3 of this document, implementation of BRT/express service along SR 60 presents several challenges. Given existing and projected levels of congestion, the current pedestrian condition, and safety concerns, operations in mixed traffic along SR 60 presents a significant constraint for BRT/express bus operations, impacting route performance in terms of travel time, level of service, and pedestrian safety and accessibility. For these reasons, Oakfield Drive would appear to be a more appropriate roadway to introduce enhanced service.

Should further evaluation of BRT/express bus service along the SR 60 corridor be undertaken, the following strategies should be carefully evaluated to determine their effectiveness in delivering an attractive alternative to single-occupancy vehicle travel for both commuter and activity center to activity center travel:

- Provision of exclusive guideway and shared guideway operations along SR 60;
- Consolidation of existing bus service in the corridor and the reduction in number of stops;
- Use of parallel corridors such as Oakfield Drive;
- Use of innovative strategies to mitigate the effects of corridor congestion, including implementation of transit signal priority operations at key intersections and the use of queue jumps at intersections; and
- Improvement of pedestrian accommodations, including sidewalks, crosswalks, and cross-parcel pedestrian ways, linking potential station and stops to nearby destinations.

Over time, policy implementation and investments should be aligned to transform SR 60, Oakfield Drive, and the local street network into a multimodal network providing more safe and direct connections.
between local destinations and improved facilities for transit patrons, bicyclists, and pedestrians. Potential new BRT/express service as well as supportive circulator and on-demand services should be designed to foster the redevelopment of places into more walkable, mixed-use environments and better serve both local and regional travel demand.

**Brandon Circulator Service**

The cost-effectiveness and performance of circulator services evaluated as part of the project could provide a fixed-route option that connects places with more transit-supportive characteristics and could foster their development as more walkable mixed-use environments. A new circulator service could also provide transfer opportunities to existing bus routes and to a potential new BRT/express service between Brandon and Downtown Tampa.

Four different circulator options were developed and evaluated, and one option was identified as a feasible alignment, which could be further evaluated against the performance and cost-effectiveness of the newly implemented HART HyperLINK pilot program. Information on ridership and performance for the HyperLINK service is still unknown, and how this type of first-mile/last-mile service fills the gap in service for areas that lack access to existing bus routes should be compared to how a fixed-route service could benefit the study area once more information becomes available. Operating concepts for a fixed route, fixed schedule circulator service should be developed and evaluated to ensure the highest levels of cost effectiveness and mobility improvement are achieved. Additionally, changes to the HyperLINK service that could support a fixed-route circulator service could also be evaluated.

**MOBILITY SCENARIO TESTING**

In addition to the mobility improvement options described above, a number of other improvements were considered and evaluated as part of the mobility scenario development and testing that was conducted as part of this study. The mobility scenario traffic modeling evaluated the performance of these improvements.

Seven different scenarios were developed to evaluate the potential of different mobility improvement options. In addition to a No Build option that included just the improvements proposed as part of the LRTP, the scenarios include different combinations of improvements including the introduction of a reversible lane on Bloomingdale Avenue, widening of Lumsden Road, Lithia Pinecrest Road, and John Moore Road, addition of a BRT dedicated guideway on SR 60/Oakfield Road, and construction of a new 2-lane east-west roadway between Providence Lakes Road and Brooker Road.

The analysis of each scenario included an evaluation of the anticipated 2040 traffic volumes and roadway capacity for the roadway network in the Brandon Study Area and adjacent areas. The results of the scenario testing, including a summary table and graphics showing the volume to capacity performance for major roadways in the study area during the AM and PM peak period is provided in Technical Memo 8: Mobility Improvement Option Evaluation.

Based on the results of the analysis, each scenario delivers at least modest improvements in peak period travel over the baseline No Build (2040) scenario. Based on a system-wide comparison, Scenario 7, which offers the greatest increases in capacity, sees highest improvements in v/c ratios on the network roadways. Scenario 5, which only provides a new east-west connection through the central portion of the study area, also offers high levels of improvement on other east-west corridors. However, this scenario does result in an increase along Gornto Lake Road south of Lumsden Road.
5. POTENTIAL NEXT STEPS

A number of projects and initiatives could be undertaken to advance some or all of the recommendations developed through this project. In future phases of work, efforts could focus on assessing redevelopment and infill opportunities, preparing fiscally sustainable development scenario(s), evaluating of economic benefits and fiscal impacts of potential investments, changing to incentives and regulations, and identifying infrastructure and development financing partnerships. Table 2 offers a list of potential projects and initiatives.

These projects and initiatives should be evaluated for incorporation in the work programs of the Hillsborough County MPO and the Planning Commission, as well as the work programs of partner agencies including Hillsborough County, HART, and FDOT District 7.

Table 2. Brandon Corridors & Mixed-use Centers Potential Next Steps

<table>
<thead>
<tr>
<th>Land Use &amp; Development</th>
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<tbody>
<tr>
<td>Designation of Mixed Use Activity Centers and Corridor Segments</td>
<td>Comprehensive Plan amendments to incorporate goals, policies, and strategies for the definition of Mixed Use Activity Centers and Corridor Segments.</td>
</tr>
<tr>
<td>Development Standards for Centers &amp; Corridor Segments</td>
<td>Development standards applicable to projects seeking approval under the optional center and corridor segment provisions of the amended Comprehensive Plan.</td>
</tr>
<tr>
<td>Context Classification Mapping</td>
<td>In partnership with FDOT District 7, prepare maps indicating the limits of context classifications for areas along SR 60. The context classifications should be address planning recommendations in the Pilot Project and subsequently reflected in amendments to the land use element of the Comprehensive Plan and County land development code.</td>
</tr>
<tr>
<td>Center Reinvestment Incentives</td>
<td>Incentives to promote redevelopment and reinvestment that meets intensity, use mix, form, mobility, and other objectives for areas designated as Compact Urban and Connected Suburban Centers.</td>
</tr>
<tr>
<td>Cross-Parcel Connection Standards Review</td>
<td>Land Development Code requirements for cross parcel connections and ensure such requirements are enforced through relevant processes.</td>
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### Roadway Capacity & Multimodal Improvements

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<tr>
<td>Center Mobility Strategies and Funding</td>
<td>Development of conceptual plans, models or cross sections, as applicable, for mobility enhancements in areas designated as Compact Urban and Connected Suburban centers.</td>
</tr>
<tr>
<td>Bloomingdale Intersection Improvement Study</td>
<td>Evaluation of traffic operations at key intersections to address capacity and operational issues. Completion of performance and cost assessments of innovative alternatives identified in the project, including displaced lefts and signalized u-turns. Identification of pedestrian safety and transit accommodation improvements.</td>
</tr>
<tr>
<td>East-West Corridor Evaluation</td>
<td>Evaluation to identify potential corridors for the construction of a 2-lane roadway or roadway segments between and parallel to east-west corridors.</td>
</tr>
<tr>
<td>Project Title</td>
<td>Description</td>
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<td>----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>US 301/I-75 Interchange Assessment</td>
<td>Traffic evaluation and design concepts for safety and capacity improvements at the US 301, Bloomingdale Avenue, and I-75 interchange area in partnership with FDOT District 7.</td>
</tr>
<tr>
<td>SR 60 Pedestrian Safety Study</td>
<td>Safety Assessment Reports for SR 60 from I-75 to Valrico Road focused on improving safety for pedestrian moving along and crossing the corridor in partnership with FDOT District 7.</td>
</tr>
<tr>
<td>Lumsden Road Widening &amp; Bicycle and Pedestrian Accommodations</td>
<td>PD&amp;E study to assess the benefits and costs of widening Lumsden Road from Kings Avenue to Lithia Pinecrest Road. Study should include development of concepts to improve pedestrian and bicycle travel along and across the corridor.</td>
</tr>
<tr>
<td>Lithia Pinecrest Road Widening &amp; Bicycle and Pedestrian Accommodations</td>
<td>PD&amp;E Study to assess the benefits and costs of widening of Lithia Pinecrest from Lumsden Road to Bloomindale Avenue. Study should include development of concepts to improve pedestrian and bicycle travel along and across the corridor.</td>
</tr>
<tr>
<td>Roadway Capacity Evaluation &amp; Improvement Planning for Areas to the South</td>
<td>Roadway capacity evaluations for major roadways to the south and south east of the study area. Assessment of capacity needs based on project build-out of future land uses with a focus on defining long term needs and protecting rights-of-way for future roadway corridor and intersection capacity improvements. Definition and programming of interim and ultimate improvements to I-75 interchanges serving rapidly growing communities to the south and southeast of the study area in partnership with FDOT District 7.</td>
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<td>and South East of the Study Area</td>
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<tr>
<td>Transit Improvements</td>
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<tr>
<td>Brandon-Downtown-Westshore Enhanced Transit/BRT</td>
<td>Preparation of concepts for the implementation of enhanced transit or BRT service connecting Brandon to Downtown Tampa and potentially to Westshore in partnership with HART. Ensure such service extends eastward to Parsons Avenue and includes an evaluation of service along Oakfield Drive.</td>
</tr>
<tr>
<td>Brandon Intermodal Center Evaluation</td>
<td>Work with FDOT District 7 to assess the potential for locating a new Intermodal Center in the proximity of the intersection of Lakewood Drive and Brandon Parkway in partnership with HART and FDOT D7. The assessment could possibly be completed as an addendum to the Intermodal Center assessment currently underway for the Gateway area in Pinellas County and the Westshore and Downtown areas in the City of Tampa.</td>
</tr>
<tr>
<td>Transit Accessibility Assessment</td>
<td>Assessment of pedestrian and bicycle accommodations in proximity to existing transit stops in the study area with priorities for improvement based on pedestrian and bicycle safety, planned transit levels of service, center definition, and destination densities and intensities. Complete in partnership with HART and FDOT District 7.</td>
</tr>
<tr>
<td>HyperLINK Ongoing Evaluation</td>
<td>Monitor and report on the effectiveness of HyperLINK in meeting the community’s need for first mile/last mile mobility services. In partnership with HART, compare the cost and effectiveness of HyperLINK against potential fixed route, fixed schedule circulator service.</td>
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6. APPENDICES

- Technical Memo 1: Land Use Pattern Maps & Summary
- Technical Memo 2: Market Analysis
- Technical Memo 3: Network Evaluation & Planned Improvements
- Technical Memo 5: Mixed-use Activity Center Designation & Policy Framework
- Technical Memo 6: Socio-economic Data Modification Recommendations
- Technical Memo 7: Transit Service Evaluation
- Technical Memo 8: Mobility Improvement Option Evaluation
Agenda Item
FDOT Complete Streets Implementation

Presenter
Stephen Benson, FDOT staff

Summary
FDOT’s goal is to implement a policy that promotes safety, quality of life, and economic development in Florida. Complete Streets serve the transportation needs of users of all ages and abilities, including those walking, bicyclists, transit riders, motorists, and freight handlers. Complete Streets are context sensitive, and the approach provides transportation system design that considers local land development patterns. A transportation system based on Complete Streets principles can help to promote safety, quality of life, and economic development.

In response to the Complete Streets Policy, the recently released Complete Streets Handbook and the FDOT Design Manual (2018) have been developed to provide guidance to planners and engineers in putting the “right street in the right place.” Over the next year, District staff is working to incorporate this approach into existing procedures and project development activities. This presentation is an update on these efforts and discussion on FDOT’s approach to complete streets on the state highway system.

Recommended Action
None. For information only.

Prepared By
Gena Torres, MPO staff

Attachments
Complete Streets Implementation Brochure
WHAT IS THE ROLE OF LOCAL PARTNERS?

A network of Complete Streets cannot be built entirely within the state roadway system and solely within FDOT’s right of way. Transportation system and development pattern (such as land use, development density and intensity, building design, and site layout) are inextricably linked, and both have an effect on travel choices and mobility. A robust, connected roadway network provides options for the movement of people and goods and is the foundation for safe and comfortable travel for pedestrians, bicyclists, and transit riders.

Local governments and metropolitan planning organizations (MPOs) are responsible for land use and transportation planning to create supportive infrastructure and development patterns that match community goals and visions. Comprehensive plans, subarea plans, and land development regulations are some of the documents that will be reviewed to determine future visions and other land use-related items in evaluating context classification.

FDOT will apply criteria and standards based on the context classification. There is no separate FDOT funding category or FDOT funding source specifically for Complete Streets. The right place.

WHAT IS FDOT’S APPROACH TO COMPLETE STREETS?

In September 2014, the Florida Department of Transportation (FDOT) adopted the Statewide Complete Streets Policy (Topic No. 000-625-017-a). The policy captures three core concepts in its approach to Complete Streets:

- Complete Streets serve the transportation needs of transportation system users of all ages and abilities, including pedestrians, bicyclists, transit riders, motorists, and freight handlers.
- Complete Streets are context sensitive, and the approach provides transportation system design that considers local land development patterns.
- A transportation system based on Complete Streets principles can help to promote safety, quality of life, and economic development.

Implementing Complete Streets is an FDOT department-wide priority. The Complete Streets approach builds on flexibility and innovation in roadway planning and design to put the right street in the right place.

WHAT IS IN THE COMPLETE STREETS HANDBOOK?

The Complete Streets Handbook describes how FDOT will apply context-based planning and design to non-limited access state roadway projects. It introduces the FDOT context classification system used in the FDOT Design Manual (FDM) to support the safety, comfort, and mobility of all users.

EXECUTIVE SUMMARY

Provides an overview of FDOT’s Complete Streets approach and principles

CHAPTER 1

Describes the roles of FDOT and local and regional partners in implementing Complete Streets

CHAPTER 2

Defines context classifications that will inform planning and design decisions for Complete Streets

CHAPTER 3

Describes how context classifications will be determined for different types of FDOT projects

CHAPTER 4

Outlines roadway design considerations to support Complete Streets

The FDOT Complete Streets approach is based on the following principles:

- Safety First
- Invest In Existing and Emerging Communities
- Enhance System Performance
- Enhance All Modes
- Connect Community Centers
- Create Quality Places
- Support the Context

WHERE CAN I FIND MORE RESOURCES?

WWW.FLCOMPLETESTREETS.COM

DeWayne Carver, AICP
State Complete Streets Program Manager
(850) 414 4322
dewayne.carver@dot.state.fl.us

The right street in the right place.
WHAT IS FDOT CONTEXT CLASSIFICATION?

The FDOT context classification system broadly identifies the various built environments existing in Florida. The context classification of a roadway will inform FDOT’s planning, Project Development and Environment (PD&E), design, construction, and maintenance approaches to ensure that state roadways are supportive of safe and comfortable travel for their anticipated users. Identifying the context classification is a preliminary step in planning and design, as different context classifications will have different design criteria.

**FDOT CONTEXT CLASSIFICATIONS**

- **C1-Natural**: Lands preserved in a natural or wilderness condition, including lands unsuitable for settlement due to natural conditions.
- **C2-Rural**: Sparsely settled lands; may include agricultural land, grassland, woodland, and wetlands.
- **C2T-Rural Town**: Small concentrations of developed areas immediately surrounded by rural and natural areas, includes many Historic towns.
- **C3R-Suburban Residential**: Mostly residential uses within large blocks and a disconnected or sparse roadway network.
- **C3G-Suburban Commercial**: Most non-residential uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network. May extend long distances. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway.
- **C4-Urban General**: Mix of uses set within small blocks with a well-connected roadway network. Typically concentrated around a few blocks and identified as part of a civic or economic center of a community, town, or city.
- **C5-Urban Center**: Service centers within large urbanized areas (population >1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network.
- **C6-Urban Core**: Areas with the highest densities and building heights, and within FDOT classified Large Urbanized Areas (population >1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network.

**CONTEXT CLASSIFICATION AND TRANSPORTATION CHARACTERISTICS**

- **Roadway Users**
- **Regional and Local Travel Demand**
- **Challenges and Opportunities of Each Roadway User**

The context classification of a roadway, together with its transportation characteristics, will provide information about who the users are along the roadway, the regional and local travel demand of the roadway, and the challenges and opportunities of each roadway user.

**WHAT IS THE FDOT PROCESS FOR IMPLEMENTING CONTEXT CLASSIFICATION?**

Complete Streets are not a specific type of project, but rather an approach to ensure projects are pursued based on their contexts. This means that a Complete Streets approach will be implemented consistently for all non-limited access projects — from capital projects qualifying for Efficient Transportation Decision Making process (ETDM) screening to Resurfacing, Restoration and Rehabilitation (RRR), traffic operations, and safety projects.

All FDOT projects on non-limited-access roadways require the evaluation and documentation of context classification early in the life of a project, as follows:

- **For Non-Qualifying Projects** (projects that do not go through ETDM screening): The context classification will be determined during the work program development cycle and prior to the development of the design scope of work.
- **For Qualifying Projects** (projects that go through ETDM screening): The context classification will be provided in the Preliminary Environmental Determination (PED) in ETDM screening.
Board & Committee Agenda Item

Agenda Item
Tampa Bay Next Update

Presenter
FDOT District 7 Representative

Summary
At its June 13, 2017 public hearing to adopt an annual update of the Transportation Improvement Program, the MPO Board restated its request to FDOT for continued quarterly updates about Tampa Bay Next.

Specifically, the board requested updates on:

- Mitigation efforts for the neighborhoods;
- Community engagement;
- Status of the PD&E [environmental impact studies];
- Options for premium transit;
- Efforts to report on the human impact of the projects; and
- Continuing the reevaluation process on the different segments.

A representative of FDOT District 7 will provide a briefing. The latest Tampa Bay Next newsletter is attached.

Recommended Action
None; for information

Prepared By
Beth Alden, AICP

Attachments
Tampa Bay Next “Next Steps Newsletter,” July 2017
What is Tampa Bay Next?

Tampa Bay Next is a program to modernize Tampa Bay’s transportation infrastructure and prepare for the future.

The Program Includes:

- Interstate Modernization
- Transit
- Bike/Pedestrian Facilities
- Complete Streets
- Transportation Innovation
- Freight Mobility

Tampa Bay Next Priorities:

- Move people and goods safely and efficiently
- Build a comprehensive regional transportation system
- Create meaningful opportunities for public input
- Balance regional needs with community concerns
- Commit to sustainable infrastructure decisions

FDOT Hosts Series of Community Working Groups

Tampa Bay Next is a program to modernize Tampa Bay’s transportation infrastructure and prepare for the future. Tampa Bay Next is also a process of Florida Department of Transportation (FDOT) working with the community to determine the right set of transportation solutions.

In May, FDOT launched the Community Working Groups program with a kickoff event at the Bryan Glazer Family Jewish Community Center. Moderated by Collaborative Labs, the event was a major step in a new direction as we seek community-based input to guide us through decisions in the planning process. At the meeting, the community discussed the ideal future of regional transportation which included ideas related to safety, multi-modal opportunities, technology and funding sources.

Since that meeting, the Community Working Groups have initiated their quarterly sessions. See the upcoming events for a list of meeting dates and times.

In addition to the working groups, FDOT is going into the community, meeting people in locations where they gather, places like weekend markets, public parks, food truck events and more.

“We hope the community feels encouraged by our new direction. We are serious about gathering input as we develop a plan that will reflect the values of our community while solving our interstate congestion problems.” – Ed McKinney, Planning and Environmental Administrator, FDOT District Seven

For more information on the Community Working Groups, please continue to check the website: TampaBayNext.com/get-involved/

If you are unable to attend a working group meeting, please consider visiting the website to share your input: TampaBayNext.com/contact-us/

FDOT will host local and regional opportunities to participate in developing meaningful transportation solutions.

For more project specific information and to get involved:

TampaBayNext.com | TampaBayNext@dot.state.fl.us | (813) 975-NEXT | f TampaBayNext | @TampaBayNext

Note: Persons who require special accommodations under the Americans with Disabilities Act or persons who require translation services (free of charge) should contact Chris Speese, Public Involvement Coordinator, at (813) 975-6405, (800) 226-7220 or email: christopher.speese@dot.state.fl.us at least seven (7) days prior to a meeting.

Comuníquese con nosotros: Nos importa mucho la opinión del público sobre el proyecto. Si tiene preguntas o comentarios, o simplemente desea más información, por favor comuníquese con nosotros. Nuestra representante en español es: Megan Olivera, (407) 709-9840, Megan.Olivera@QCAusa.com.
Upcoming Events

Thursday, July 13:
Pinellas County Community Working Group (5:30-7:30 p.m.),
Collaborative Labs – St. Petersburg College – The EpiCenter,
13805 58th Street N, Clearwater, FL 33760

Saturday, July 15:
Hillsborough County Neighborhoods Conference
(8:00 a.m.-2:30 p.m.), Sheraton East Hotel,
10221 Princess Palm Avenue, Tampa, FL 33610

Thursday, July 20:
North and West Hillsborough Community Working Group
(5:30-7:30 p.m.), University Area Community Development
Corporation, 14013 N 22nd St, Tampa, FL 33613

Friday, July 22:
St. Petersburg Saturday Market (9:00 a.m.-1:00 p.m.), Williams Park,
350 2nd Ave N, St. Petersburg, FL 33701

Please visit the website for up to date event information: TampaBayNext.com/get-involved/
Would you like FDOT to present information at your community or neighborhood event? Please email us at TampaBayNext@dot.state.fl.us

What’s Going to Happen with Community Initiated Concepts?

Participation at Community Working Groups, public workshops, and feedback through the website are great ways to share your ideas with the Florida Department of Transportation (FDOT). As ideas are generated by the public, FDOT will begin to evaluate those ideas and report back to the public. FDOT wants this to be a collaborative process, working with agency partners, stakeholders, and the community to find the right set of transportation solutions.

The National Environmental Policy Act (NEPA) is the federal process to assess environmental effects of proposed alternatives prior to making decisions. Some elements considered during the process include the ability to handle travel demand, aesthetics, air quality, economic development, environmental justice, historical properties and districts, neighborhoods, noise, parks and recreation, safety, and more. FDOT and the Federal Highway Administration (FHWA) will work together to provide opportunities for public involvement to review the proposed alternatives and their potential environmental effects.

Preparing a Supplemental Environmental Impact Statement (SEIS) is a rigorous evaluation process. FDOT plans to spend at least two years on this SEIS. The first public workshops will be held in October 2017, and we have ongoing community events and online opportunities to provide input into the process. If you would like to know more about the SEIS process and how to contribute ideas, please contact TampaBayNext@dot.state.fl.us.
Board & Committee Agenda Item

Agenda Item
Multi-Modal Level of Service White Paper – Draft

Presenter
Sarah McKinley, MPO Staff

Summary
In April, the MPO initiated a task to evaluate the existing Multi-Modal Level of Service (MMLOS) methodology used by the MPO as well as research other best practices that evaluate the LOS rating for bicyclist, pedestrians and transit. The MPO historically applies FDOT’s Level of Service Handbook methodology to planning efforts throughout the MPO. However, there is a desire from the MPO to better understand methodologies applied in other cities, specifically for evaluating how a facility is serving the safety and comfort of pedestrians, bicyclists and transit.

This is an initial task to investigate best practices in other cities, including interviews and a literature review, and a white paper. We are seeking feedback from the MPO’s Committees on the draft white paper. This task could lead to further analysis to revise the methodology that the MPO uses to determine MMLOS, including new criteria and revisions to existing criteria.

Recommended Action
No action, information only

Prepared By
Sarah McKinley, MPO Staff

Attachments
Multi-Modal Level of Service White Paper – Draft
TOOLS FOR EVALUATING LEVEL & QUALITY OF SERVICE FOR ALL MODES: A LITERATURE REVIEW

Hillsborough County, Florida

August 2017
TOOLS FOR EVALUATING LEVEL & QUALITY OF SERVICE FOR ALL MODES: A LITERATURE REVIEW

Hillsborough County, Florida

Prepared For:  
Hillsborough MPO  
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Project No. 19020.02

August 2017
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APPENDICES

Appendix A Interview Notes
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GLOSSARY

BEQI – Bicycle Environmental Quality Index
BLOS – Bicycle Level of Service
BNA – Bicycle Network Analysis
CDOT – Charlotte Department of Transportation
FDOT – Florida Department of Transportation
FHWA – Federal Highway Administration
HART – Hillsborough Area Regional Transit Authority
HCM – Highway Capacity Manual
HMPO – Hillsborough Metropolitan Planning Organization
LOS – Level of Service
LTS – Level of Traffic Stress
MMLOS – Multimodal Level of Service
NACTO – National Association of City Transportation Officials
OSM – OpenStreetMap
PEQI – Pedestrian Environmental Quality Index
PLOS – Pedestrian Level of Service
Q/LOS – Quality/Level of Service
SANDAG - San Diego Association of Governments
TCQSM – Transit Capacity and Quality of Service Manual
TLOS – Transit Level of Service
USDG – Urban Street Design Guide
VMT – Vehicle Miles Traveled
INTRODUCTION

The Hillsborough Metropolitan Planning Organization (HMPO) in Hillsborough County, Florida initiated this white paper with the objectives of (1) reviewing HMPO’s current multimodal level of service (MMLOS) methodology and (2) conducting a review of best practices in applying MMLOS calculations and criteria. This white paper is composed of four parts: (1) a summary of HMPO’s current methodology and how it is applied, (2) a literature review on best practices, (3) a summary of interviews conducted with subject matter experts, and (4) a review of the challenges and opportunities of the various methodologies explored in the paper.

EXISTING METHODOLOGY

Background

HMPO currently uses a multimodal transportation database to store countywide highway performance data. The database is linked to the HMPO’s mapping system via linear referencing. In 2012, HMPO began incorporating MMLOS data into the database, using data collected from previous MMLOS studies. The purpose of this effort was to create a single-source database that could be updated and used for future countywide MMLOS calculations.

Three methodologies for calculating MMLOS were explored at the time:

1. **HMPO’s MMLOS Microsoft Excel Spreadsheets** — This was the most comprehensive of the three methods and relied on the widest set of roadway attributes, above those required by the Florida Department of Transportation (FDOT). The spreadsheets were developed over time and were used for various bicycle and pedestrian studies. The level of detail included in the spreadsheets varied because individual study requirements, including data collection efforts, were not consistent. The HMPO wanted to compare the level of detail required for the spreadsheets, relative to the data required for FDOT’s Q/LOS and ARTPLAN analysis, described next.

2. **The Florida Department of Transportation’s (FDOT) 2009 Highway Quality Level of Service (Q/LOS) Manual** — This was the most simplified methodology explored and relied on lookup tables and performance attributes found in the Q/LOS Handbook. The Handbook provides level of service (LOS) measures, thresholds, and estimation methodologies for the auto, transit, bicycle, and pedestrian modes. It was designed for use in generalized planning and conceptual planning, and refers users to *Highway Capacity Manual* (HCM) methodologies when more detailed operational analysis is required. The auto LOS is not comparable with the bicycle LOS (BLOS) and pedestrian LOS (PLOS) scales because they are based on different dimensions of perceived and measured traveler satisfaction.

3. **FDOT’s ARTPLAN** — The ARTPLAN software is a part of the LOSPLAN 2009 software package which is produced by the University of Florida for FDOT. HMPO’s spreadsheet formulations and the 2009 ARTPLAN software have very similar origins in their MMLOS calculations, but the ARTPLAN software uses more generic assumptions for some of the calculation data items and
highway attributes. The software allows inputs to be entered on a corridor basis and reports the three MMLOS values for a corridor or its subsections.

HMPO decided that the data collection required for calculating MMLOS using the FDOT ARTPLAN software was sufficient for its needs. Therefore, the database was designed to be able to collect, update, and maintain the data necessary to conduct the ARTPLAN analysis for BLOS and PLOS.

Transit LOS (TLOS) differs from BLOS and PLOS calculations in that it relies mainly on transit service levels and not on highway characteristics. HMPO uses a version of the TLOS calculation that is based on roadway corridors with frequent routes and long spans of service. The TLOS values are based on the individual route frequencies and not the total number of routes on a given roadway segment. The operating characteristics come from the Hillsborough Area Regional Transit Authority (HART) in a spreadsheet format that documents the latest routes and operating attributes. This approach is different from the ARTPLAN methodology, which uses the combined number of transit trips on the road segment based on the frequency and hours of transit service of all routes on the segment. HMPO decided to use its route-based method and not the ARTPLAN segment-based methodology. However, new structures for the ARTPLAN TLOS method were provided for future development if HMPO ever decided that the ARTPLAN method should be used.

Current Analysis Procedures

Bicycle Level of Service (BLOS)

The BLOS model in ARTPLAN uses five variables:

- Average effective width of the outside through lane,
- Motorized vehicle volumes,
- Motorized vehicle speeds,
- Heavy vehicle (truck) volumes, and
- Pavement condition.

Average effective width is largely determined by the width of the outside travel lane and striping for bicyclists, but also includes other factors such as the effects of on-street parking and drainage grates. Each of the variables is weighted by coefficients derived from a stepwise regression, modeling each factor’s importance. A numerical LOS score is determined and stratified to a LOS letter result. While the determination of automobile LOS in the HCM is typically based on one service measure (e.g., average travel speed), BLOS is based on multiple factors.

Pedestrian Level of Service (PLOS)

The PLOS model in ARTPLAN uses four variables:

- Existence of a sidewalk,
Tools for Evaluating Level & Quality of Service for All Modes: A Literature Review

August 2017

- Lateral separation of pedestrians from motorized vehicles,
- Motorized vehicle volumes, and
- Motorized vehicle speeds.

Each of the variables is weighted by its relative importance, determined from a regression model. A numerical LOS score is determined along with the corresponding LOS letter. Thus, like the bicycle LOS approach (but unlike the automobile approach), PLOS is determined based on multiple factors.

**Transit Level of Service (TLOS)**

TLOS uses the *Transit Capacity and Quality of Service Manual* (TCQSM), 2nd edition’s table for urban scheduled transit service based on adjusted service frequency. The adjusted service frequency is a weighted average of bus frequency along a facility, accounting for routes that may only serve a portion of the facility. The adjusted service frequency is converted to an average headway and assigned a letter (A–F).

**Assessment of Current Methodology**

The current methodology allows for project-level comparisons across multiple modes. It allows engineers and planners to evaluate the effects of different roadway cross-sections and intersection configurations across various modes and user groups. The methodology is data-intensive; however, the ARTPLAN software provides an easy-to-use format for calculating vehicular and multimodal LOS.

HMPO’s primary concern with the existing methodology is that is does not reflect the current perception of multimodal users. For example, the current methodology would assign a letter grade “C” to a roadway with a five-foot paved shoulder, indicating an acceptable LOS, regardless of the number of travel lanes, vehicle volumes, or vehicle speeds. However, a recent study conducted by FDOT District 5 showed that with the presence of a conventional on-street bike lane, more than 80% of bicyclists observed still chose to ride on the sidewalk. This result suggests a mismatch with the way multimodal quality of service is being evaluated and the way the users of the roadway system prefer to travel.

The current methodology is limited in its application. It focuses on segment LOS, or travel parallel to motorized vehicle traffic, and does not take into account intersection conditions. It also does not account for innovations in multimodal infrastructure. The City of Tampa has worked diligently to implement the City’s first cycle track on Cass Street downtown and has striped green bicycle lanes in spot locations. The added benefit to users provided by these treatments cannot be captured by the current methodology.
LITERATURE REVIEW

A literature review of a range of methodologies that evaluate LOS and other performance metrics for non-automobile modes was completed to develop a baseline understanding of best practices. A summary of the documents reviewed, the authors, and the key takeaways from each of the documents is provided in Table 1.

Table 1: Summary of Documents Reviewed for Literature Review

<table>
<thead>
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<th>Document</th>
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<th>Authors/Institute</th>
<th>Key Takeaways</th>
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| The Highway Capacity Manual's Method for Calculating Bicycle and Pedestrian Levels of Service: the Ultimate White Paper | 2014 | University of California, Los Angeles - Lewis Center for Regional Policy Studies and Institute of Transportation Studies Herbie Hu and Robin Liggett | • Reviews the BLOS and PLOS components of MMLOS.  
• The HCM models are based on studies of participants in Florida and with limited testing outside of Florida.  
• The HCM models were constructed based on variables known to influence walking and bicycle at the time and do not account for the full range of variables and innovation currently of interest to planners.  
• Review of PLOS:  
  o *Intersection score* – number of lanes crossed as greatest contribution, followed by vehicle speed and volume; less sensitive to pedestrian delay and refuge islands  
  o *Link score* – width of walking area, separation from vehicles, and vehicle volumes play largest role; insensitive to sidewalk quality, lighting, and sidewalk width beyond 10’  
• Review of BLOS:  
  o *Intersection score* – function of roadway width and type of bicycle facility; insensitive to innovative treatments (i.e. bike boxes)  
  o *Link score* – influenced by vehicle volumes (particularly trucks), vehicle speeds, and type of bicycle facility; insensitive to innovative treatments (i.e., green paint) and bicycle crowding  
• It is possible to validate PLOS and BLOS and include sensitivity to innovative treatments. The authors argue this effort would be resource-intensive and there may be other metrics and policies that have replaced the need for such a detailed evaluation. |
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<th>Key Takeaways</th>
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| NCHRP 616: Multimodal Level of Service Analysis for Urban Streets | 2008 | Transportation Research Board Richard Dowling, David Reinke, Aimee Flannery, Paul Ryus, Mark Vandehey, Theo Petritsch, Bruce Landis, Nagui Rounphail, and James Bonneson | • Used video labs in four metropolitan areas to have participants rate their satisfaction with the driving, walking, and bicycling conditions shown in the videos. Developed regression models to predict participants’ average rating based on the conditions the participants observed (e.g., traffic volumes, facility characteristics)  
• Video lab approach was not applicable for transit; instead, documented relationships between ridership and service quality were used primarily to develop the transit model  
• The models were tested for reasonableness and refined through a series of workshops/field tests with local, regional, and state transportation agency staff in 10 metropolitan areas across the U.S.  
• Models predict LOS for the automobile, transit, bicycle, and pedestrian modes on urban arterials and collectors.  
  o Auto – Use stops per mile and average speed as the primary variables  
  o Transit – Primary variables are bus headways, perceived travel time, and the pedestrian LOS score  
  o Bicycle – Weighted combination of the cyclist’s experience at intersections and on street segments  
  o Pedestrian – Function of segment and intersection level of service and mid-block crossing difficulty  
• Addresses nine limitations of the HCM 2000 methodology.  
• The uniform definition of LOS used in the models provides a consistent basis for comparing levels of service across modes.  
• Research led to the bicycle, pedestrian, transit, and automobile perception methods in the HCM 2010. |
• The Quality of Service Concepts chapter reviews factors that have been demonstrated to influence transit passengers’ perceptions of transit service quality.  
• The Quality of Service Methods chapter presents computational methods for evaluating transit availability (frequency, hours of service, service coverage) and comfort and convenience (on-board crowding, reliability, relative transit/auto travel times).  
• Mode-specific chapters present methods for evaluating transit operations. For example, the bus methodologies focus on bus capacity, speed, and reliability to evaluate bus performance. |
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| MTI Report 11-19: Low-Stress Bicycling and Network Connectivity | 2012 | Mineta Transportation Institute, San Jose State University Maaza C. Mekuria, Ph.D., PE, PTOE, Peter G. Furth, Ph.D., and Hilary Nixon, Ph.D. | • A spreadsheet for forecasting bus speeds is available online. It requires a myriad of input data, including:
  - Average dwell time (can be input directly or estimated based on passenger volumes, fare collection method[s], and bus characteristics)
  - Coefficient of variation of dwell times
  - Design failure rate (percent of time a bus arrives to find all stopping positions already occupied)
  - Average green-to-cycle length ratio of the downstream signal (if present)
  - Traffic signal cycle length
  - Bus stopping position (in/out of the travel lane)
  - Bus stop location (near-side, far-side, mid-block influenced by nearby signals, mid-block not influenced by nearby signals)
  - Number of loading areas (number of buses that can stop simultaneously)
  - Area type (e.g., metro CBD)
  - Curb lane volume
  - Right-turn volume
  - Pedestrian volume conflicting with right turns
  - Scheduled buses per hour
  - Average bus stop spacing
  - Number of traffic signals relative to number of bus stops (more/same or fewer)
  - Bus facility type (e.g., mixed traffic, bus lane with right turns allowed)
  - Maximum bus running speed between stops (typically the speed limit)
  - Skip-stop operation (yes/no), plus data on the stopping pattern if “yes”

• The primary challenge of the TCQSM is deciding which of its performance measures and methods are most applicable to a given analysis. |
### Key Takeaways

- LTS is rated from "LTS 1," which is a level that most children can tolerate, to "LTS 4," which is a level that may only be tolerable by strong and fearless cyclist in rare cases. A more detailed summary of LTS 1 through 4 conditions is provided below:
  - LTS 1 – This condition presents little traffic stress and demands little attention from bicyclist. Bicyclists are either physically separated from traffic, have a dedicated space next to slow-moving traffic, or operate in mixed traffic where speed differentials are minimal. Intersections are easy to approach and cross.
  - LTS 2 – This condition presents little traffic stress. While comfortable for most adults, it requires a little more attention than expected from children. This condition can include separated bike facilities, bike lanes with adequate clearance from the travel lane and parking lane, and mixed traffic with low speed differentials.
  - LTS 3 – This condition has higher traffic stress than LTS 2 (i.e., higher traffic speeds and volumes), but is substantially less than a multilane roadway. This condition can also include bike lanes that are next to moderate-speed traffic.
  - LTS 4 – A condition that is typically experienced in mixed traffic on multilane roadways. LTS 4 includes all level of traffic stress above LTS 3.

- Components that affect the LTS score are largely based on traffic speed, traffic volume, number of travel lanes, the presence of parking, and whether a separated bike lane is present.

- Traffic stress for segments is determined based on 3 classes of bikeways: separated bikeways, bike lanes, and mixed traffic:
  - Physically separated bike lanes are LTS 1. These include cycle tracks, shared use paths, trails, and other bicycle-only facilities separated from traffic. LTS 1 does not include sidewalks unless they have been designated for bicycle use.
  - A bike lane’s LTS varies based on street width, bike lane width, traffic speed, and bike lane blockage. The metric with the lowest LTS ranking governs the link’s LTS.
  - Sometimes it is known that a bike lane or cycle track is blocked on a regular basis due to loading activities, double parking, etc. In these cases, the segment is LTS 3.
  - The greatest factors influencing LTS in mixed-traffic operations are the number of travel lanes and the speed limit or observed speeds. Streets that are under 3 lanes and have a speed limit of 25 mph are LTS 1 (if the streets do not have a marked center line or are classified as residential) or LTS 2.

- Similar to the segment analysis, intersection approaches can be scored based on the right turn condition (with or without a pocket bike lane) and the crossing condition (based on

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- origin and destination.
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| peopleforbikes, Bicycle Network Analysis                                | 2017  | peopleforbikes    | • The Bicycle Network Analysis (BNA) Score is a methodology recently developed by peopleforbikes as a way to measure how well the existing bicycle network connects people with places they want to go.  
• The methodology combines a simplified Level of Traffic Stress (LTS) analysis with US Census data to understand how the low-stress network connects residents, jobs, and community.  
• In the simplified LTS analysis, the methodology distills streets down to “low” or “high” stress based on bicycle facility type (cycle track, buffered bike lane, bike lane, shared traffic), the number of travel lanes, speed and street width.  
• Census blocks receive a score out of 100 based on their connectivity to streets determined to be “low” stress, normalized by the population in that census block.  
• The spreadsheet tool developed to complete these calculations is publically available.  
• Peopleforbikes has also created an online mapping tool that has mapped this information and calculated the BNA score for most cities. |

Traffic speed, the number of travel lanes, and whether the intersection is signalized with the presence of a median  
• Previous research in Vancouver, B.C. found that 75 percent of bicycle trips were within 10 percent of the shortest trip distance and 90 percent of bicycle trips were within 25 percent of the shortest trip. This finding indicates that many bicyclists are willing accept up to a 25 percent detour to have a low-stress experience.  
• The LTS methodology also allows practitioners to evaluate overall network connectivity.  
• The paper also explores measures for connectivity and, specifically, the fraction of trips that can be made by bicycle without exceeding a given level of traffic stress or requiring an excessive detour.
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| Network Connectivity for Low-Stress Bicycling | 2013 | TRB Annual Meeting, 2013 Peter G. Furth, Ph.D. and Maaza C. Mekuria, Ph.D., PE, PTOE | - A research white paper on the LTS methodology, developed to measure the level of traffic stress perceived by most riders based on traffic speed and number of travel lanes.  
- The LTS methodology is more meaningful to planners and citizens because Bicycle Level of Service models and the Bicycle Compatibility Index are “black boxes” in the sense that developing a classification requires complex calculations.  
- The LTS calculation is determined based on characteristics such as traffic speed, number of travel lanes, bike lane width, and parking lane presence through various tables. These tables provide an LTS rating, based on the characteristics. The LTS for a given intersection, approach, and/or segment is governed by the worst (highest) LTS rating in the tables. For instance, if a segment is determined to be LTS 3 based on one characteristic, but is LTS 1 or 2 based on another characteristic, the segment rating is LTS 3.  
- Bicyclists are willing to accept up to a 25 percent detour for longer trips, and up to a 33 percent detour for shorter trips, to have a less stressful experience.  
- Many networks develop “low stress islands,” where barriers break up segments of the network that are otherwise considered low stress. There are three main kinds of barriers:  
  - Linear features that require grade-separated crossings, such as freeways, railroads, and creeks.  
  - Multiline, high-speed arterial streets.  
  - Breaks in the street grid, such as cul-de-sacs.  
- A measure of connectivity is important to assess how well the network serves most of the population. Connectivity can be measured by taking the number of trips between an origin and destination that can be made by bicycle at a given LTS (for instance, LTS 2), with limited detours, and dividing the result by the total number of trips. The answer provides the fraction of trips that can be made by bicycle.  
- A case study at San Jose State University demonstrated how the areas accessible via low-stress trips can be mapped. Mapping connectivity allows planners to identify key corridors and connections where improvements can unlock low-stress islands. |
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| Exploration and Implications of Multimodal Street Performance Metrics: What’s a Passing Grade? | 2014 | University of California Transportation Center Madeline Brozen, Herbie Huff, Robin Liggett, Rui Wang, and Michael Smart | • Reviewed four multimodal methodologies: Fort Collins, San Francisco Bicycle Environmental Quality Index (BEQI) and Pedestrian Environmental Quality Index (PEQI), Charlotte BLOS/PLOS, and HCM 2010 MMLOS  
• The Fort Collins methodology assumes infrastructure is built to city-specific design criteria and is therefore difficult to apply elsewhere.  
• Charlotte and San Francisco place more emphasis on safety and less on walkability.  
• The HCM 2010 and BEQI/PEQI measures appeal to a more universal approach, where Charlotte BLOS/PLOS is more location-specific.  
• Authors argue a single-grade letter score depicts misleading views of bicycle and pedestrian experiences. The letter does not always correspond to users’ experience on the street and limits the public’s ability to engage in discussion about roadway performance.  
• If an agency’s goal is to improve traveler satisfaction across all modes, HCM 2010 would be the best choice.  
• Improved safety or geometric design would be better evaluated through the Charlotte BLOS/PLOS.  
• BEQI/PEQI and Charlotte LOS are relatively easy tools to use for calculating current and potential LOS.  
• HCM is the most difficult tool to use and has little ability to account for small infrastructure improvements. |
SUMMARY OF INTERVIEWS

To provide depth to the literature review, interviews were conducted with subject matter experts from two cities, the City of Charlotte and the San Diego Association of Governments (SANDAG), as well as from the Federal Highway Administration (FHWA). A summary of the themes identified through the interviews is outlined in Table 2, below. The detailed interview notes can be found in Appendix A.

Table 2: Subject Matter Expert Interview Summary

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<th>Agency</th>
<th>Person(s) Interviewed, Position</th>
<th>Themes</th>
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<tr>
<td>Charlotte Department of Transportation</td>
<td>Scott Curry, Pedestrian Coordinator</td>
<td>• The City developed the P/BLOS methodology to evaluate how intersections were serving pedestrians and bicycles.</td>
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<tr>
<td>Charlotte, NC</td>
<td>Tracy Newsome, Ph.D. Transportation Planner</td>
<td>• The methodology has been applied to every signalized intersection in the City and the City has a database of the LOS for all intersections.</td>
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<td>• P/BLOS is used, along with congestion and safety measures, to inform small-area planning efforts and to identify priority intersection locations for improvements.</td>
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<td>• The City developed and adopted the Urban Street Design Guide (USDG). This provides specific street design guidance based on the “place” of the street.</td>
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<tr>
<td>SANDAG</td>
<td>Mike Calandra, Senior Transportation Modeler</td>
<td>• SANDAG uses an activity-based model to evaluate changes in mode split resulting from various changes to auto, transit, and bicycle infrastructure.</td>
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<tr>
<td>San Diego, CA</td>
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<td>• They’ve found that adding/removing bicycle links has a greater impact on mode choice than changing the type of bicycle facility.</td>
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<td>• They do not yet have the ability to evaluate pedestrian infrastructure and cannot assign bicycle and pedestrian trips at the link level.</td>
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<td>• SANDAG reports vehicle miles traveled (VMT) for every project and can track VMT by origin and destination pairs.</td>
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<td>• Adding active transportation links in the model is a way to mitigate VMT. The model can evaluate the varied effects of bicycle infrastructure in urban and rural contexts.</td>
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<td>Agency</td>
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| FHWA National | Dan Goodman, Office of Human Environment Livability Team              | • When evaluating trade-offs between modes, there will always be a comparison to traditional LOS. It is important to understand the limitations of LOS and have a more holistic understanding of everything that goes into the planning process.  
• The P/BLOS components of MMLOS are helpful inputs. The BLOS methodology is not refined enough for today’s condition and does not include recent innovations, such as cycle tracks. It can be hard to move the needle for P/BLOS. Widening the sidewalk, for example, shows little benefit in the analysis.  
• A new tool was recently created to limit the time and expense of performing system-wide LTS analysis. |
METHODOLOGIES

This section summarizes the findings from the literature review of each methodology. Each subsection below outlines the methodology, provides example applications, and identifies the data requirements for applying the methodology as well as the challenges and opportunities within those applications.

Multimodal Level of Service (MMLOS)

Overview

The 2010 Highway Capacity Manual (HCM) introduced MMLOS analysis for urban streets. The HCM MMLOS analysis provides a LOS model for each of the four modes (automobile, transit, bicycle, and pedestrian) for arterial and collector roadways. The LOS measures are based on traveler perceptions. The pedestrian, bicycle, and automobile equations were developed based on participant-rated conditions of over 90 typical segments. The transit model was based on traveler response data to changes in transit service quality. For example, when service frequency or travel time is improved, ridership increases. All four models incorporate multiple service quality factors as inputs, as opposed to relying solely on delay.

This paper focuses on the MMLOS procedures found in the 2010 HCM. The HCM 6th Edition: A Guide for Multimodal Mobility was updated to reflect the Transit Capacity and Quality of Service Manual, 3rd ed., and minor changes were made to BLOS and PLOS. The sources reviewed centered on the 2010 HCM and there has not yet been a comprehensive evaluation of the refinements made to MMLOS in the 6th Edition of the HCM.

Application

The MMLOS method defines the following terms:

- Intersection — Signal, roundabout, or stop-controlled
- Link — Portion of the street between two signalized intersections
- Segment — Combination of a link and its downstream signalized intersection
- Facility — Two or more consecutive segments

The pedestrian and bicycle modes can be evaluated at the intersection, link, segment, and facility level. Vehicular LOS can be evaluated at the intersection, segment, and facility level. The transit LOS model is limited to segment and facility operations. The LOS thresholds are the same for all modes. They were designed so the modal LOS scores can be directly compared to each other and to reflect similar average traveler satisfaction across modes. The HCM also provides LOS methods for off-street pedestrian and bicycle facilities, including walkways offset more than 35 feet from the street, pedestrian-only streets, stairways, and shared-use paths (HCM 2010).
Table 3 summarizes the key factors for each mode and their effect on LOS. A (+) indicates that a higher value for that variable positively impacts LOS. A (-) indicates that a higher value negatively impacts LOS.

Table 3: Key Factors of HCM MMLOS

<table>
<thead>
<tr>
<th>Pedestrians</th>
<th>Bicyclists</th>
<th>Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Link LOS</strong></td>
<td><strong>Segment LOS</strong></td>
<td></td>
</tr>
<tr>
<td>Outside travel lane width (+)</td>
<td>Volume and measured speed of traffic in outside travel lane (-)</td>
<td>Service frequency (+)</td>
</tr>
<tr>
<td>Bicycle lane/shoulder width (+)</td>
<td>Heavy vehicle percentage (-)</td>
<td>Bus travel speed (+)</td>
</tr>
<tr>
<td>Buffer presence (e.g., on-street parking, street trees) (+)</td>
<td>Pavement condition (+)</td>
<td>Bus stop amenities (+)</td>
</tr>
<tr>
<td>Sidewalk presence and width (+)</td>
<td>Bicycle lane presence (+)</td>
<td>Pedestrian link LOS (+)</td>
</tr>
<tr>
<td>Volume and measured speed of vehicle traffic in outside travel lane (-)</td>
<td>Bicycle lane, shoulder, and outside lane widths (+)</td>
<td>Excess wait time due to late bus arrival (-)</td>
</tr>
<tr>
<td>On-street parking utilization (-)</td>
<td></td>
<td>On-board crowding (-)</td>
</tr>
<tr>
<td><strong>Intersection LOS</strong></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Permitted left turn and right-turn-on-red volumes (-)</td>
<td>Width of lanes (+)</td>
<td></td>
</tr>
<tr>
<td>Cross-street motor vehicle volumes and speeds (-)</td>
<td>Cross-street width (-)</td>
<td></td>
</tr>
<tr>
<td>Crossing length (-)</td>
<td>Motor vehicle traffic volume in the outside lane (-)</td>
<td></td>
</tr>
<tr>
<td>Average pedestrian delay (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right-turn channelizing island presence (+)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(+): Higher value has positive impact to LOS  
(-): Higher value has negative impact to LOS

At the project level, practitioners can use the HCM MMLOS to evaluate the tradeoffs of various street designs in terms of their effects on the auto driver’s, transit passenger’s, bicyclist’s, and pedestrian’s perceptions of the quality of service provided by the street. The individual mode scores can be used to understand the degree to which an urban street meets the needs of all users and the effect various alternatives have on the level of service. This analysis can be conducted for an entire network of streets and used to prioritize transit, bicycle, and pedestrian improvements.1

### Data Needs

**Table 4** summarizes the data required, by mode, for the MMLOS evaluation. This evaluation is the most data-intensive of the methodologies considered, but agencies can rely on default values for many of the inputs to reduce the data requirements. NCHRP Report 825 provides guidance on when to use default values and gives suggested values. Relevant excerpts from the report are provided in Appendix B. Software, such as ARTPLAN, is also available to assist with data entry and computation.

**Table 4: MMLOS Data Needs**

<table>
<thead>
<tr>
<th>Pedestrians</th>
<th>Bicyclists</th>
<th>Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment LOS</td>
<td>Segment LOS</td>
<td>Segment LOS</td>
</tr>
<tr>
<td>– Segment length</td>
<td>– Segment length</td>
<td>– Segment length</td>
</tr>
<tr>
<td>– Vehicle speed</td>
<td>– Vehicle speed</td>
<td>– Vehicle speed</td>
</tr>
<tr>
<td>– Vehicle flow rate</td>
<td>– Vehicle flow rate</td>
<td>– Excess wait time</td>
</tr>
<tr>
<td>– Number of through lanes</td>
<td>– Number of through lanes</td>
<td>– Passenger trip length</td>
</tr>
<tr>
<td>– Width of outside through lane</td>
<td>– Width of outside through lane</td>
<td>– Transit frequency</td>
</tr>
<tr>
<td>– Width of bicycle lane</td>
<td>– Width of bicycle lane</td>
<td>– Passenger load factor</td>
</tr>
<tr>
<td>– Width of paved outside shoulder</td>
<td>– Width of paved outside shoulder</td>
<td>– Area type (major metro area CBD or other)</td>
</tr>
<tr>
<td>– Median type and curb presence</td>
<td>– Median type and curb presence</td>
<td>– Proportion of stops with shelters</td>
</tr>
<tr>
<td>– Pedestrian flow rate</td>
<td>– Pedestrian flow rate</td>
<td>– Proportion of stops with benches</td>
</tr>
<tr>
<td>– Proportion of on-street parking occupied</td>
<td>– Proportion of on-street parking occupied</td>
<td>– Pedestrian link LOS score</td>
</tr>
<tr>
<td>– Downstream intersection width</td>
<td>– Number of access points</td>
<td>–</td>
</tr>
<tr>
<td>– Presence of sidewalk</td>
<td>– Pavement condition</td>
<td>–</td>
</tr>
<tr>
<td>– Total walkway width</td>
<td>– Bicycle delay</td>
<td>–</td>
</tr>
<tr>
<td>– Effective width of fixed objects</td>
<td>– Bicycle LOS score for intersection</td>
<td>–</td>
</tr>
<tr>
<td>– Buffer width</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>– Spacing of objects in buffer</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>– Distance to nearest signal-controlled crossing</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>– Legality of midblock pedestrian crossing</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>– Percent of sidewalk adjacent to window,</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>Pedestrians</td>
<td>Bicyclists</td>
<td>Transit</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>building, or fence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Pedestrian delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Pedestrian LOS score for intersection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intersection LOS

All intersections:
– Vehicle flow rate
– Number of lanes
– Number of right-turn islands
– Pedestrian flow rate
– Crosswalk length
– Crosswalk width

Signalized:
– Total walkway width
– Corner radius
– Right-turn-on-red flow rate
– Permitted left-turn flow rate
– Midblock 85th percentile speed
– Signal timing (walk, pedestrian clear, rest in walk, cycle length, yellow change, red clearance, duration of phase serving pedestrians)
– Present of pedestrian signal heads

Two-Way Stop Controlled:
– Presence of raised median
  Rate at which motorists yield to pedestrians
– Degree of pedestrian platooning

<table>
<thead>
<tr>
<th>Pedestrians</th>
<th>Bicyclists</th>
<th>Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Vehicle flow rate</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>– Number of lanes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Width of outside through lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Width of bicycle lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Width of paved outside shoulder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Bicycle flow rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Proportion of on-street parking occupied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Street width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Signal timing (cycle length, yellow change, red clearance, duration of phase serving bicyclists)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*No methodology for two-way stop controlled intersections
Challenges

A key challenge to applying HCM MMLOS is that it is data intensive and can be difficult to use. Because of its wide use, however, there are existing software packages, such as ARTPLAN, which can aid in the evaluation process.

MMLOS has limited ability to account for small infrastructure improvements.

The PLOS does not currently take into account presence of lighting, the condition of the sidewalk, and sidewalk widths greater than 10 feet.

At a link level, the HCM BLOS is most sensitive to heavy vehicle volumes, degree of separation from motorized vehicle traffic, and the presence of on-street parking. It is relatively insensitive to overall traffic volumes and speeds and does not directly incorporate the number of travel lanes, other than to determine the traffic volume in the lane closest to bicyclists. At a facility level, a large constant in the equation makes it difficult to achieve a letter grade above C for any facility. This makes it difficult to use facility LOS to document improvements to bicycle service when upgrading an on-street facility to a separated facility. The constant in the facility equation and the size of the range for each LOS letter at the link level were modified in the HCM 6th Edition to address these concerns. BLOS does not take into account innovative bicycle treatments that were not widely used in the U.S. at the time of the research, such as bicycle boxes, colored paint, bicycle signals, and cycle tracks.

Opportunities

MMLOS incorporates operational characteristics to a greater degree than other methodologies explored. Some of the heaviest weighted variables in the MMLOS calculations include heavy vehicle (truck) volumes and percentage of on-street parking.

Of the methods explored, HCM MMLOS is the best suited for comparisons across modes. The method was developed specifically to allow comparisons of different allocations of the street right-of-way between travel modes. The model can be adapted to and validated for local conditions to improve its validity and to calibrate the level of service scores to local experience and perception. This effort is resource and time intensive, but can address several of the challenges mentioned, such as including additional factors into the PLOS and recalibrating the bicycle score to reflect the current users’ perceptions.

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2 Madeline Brozen et al., “Exploration and Implications of Multimodal Street Performance Metrics: What’s a Passing Grade?” University of California Transportation Center, 2014.
Transit Capacity & Quality of Service Manual

Overview

The TCQSM is a comprehensive reference work for public transit practitioners. The TCQSM differs from the other methodologies explored here because of its emphasis on defining and describing quality of service concepts, including summarizing research about which quality of service factors are most important to transit riders. This makes the TCQSM an essential resource to refer to when considering changes to evaluation methodologies, or when seeking solutions to capacity or quality of service challenges. The TCQSM describes best practices and methodologies for evaluating transit operations and quality of service.

Quality of service is perceived differently by different types of users. Transit passengers, transit agency staff, motorists, community members, and decision-makers all have differing opinions on the goals and roles of transit service. The TCQSM defines quality of service from the passenger point-of-view, but also describes the implications of different service levels from the transit provider point-of-view. The quality of service that passengers might consider to be optimal may not be cost-effective for a provider to offer; therefore, transit providers must balance quality of service, agency resources, and agency goals when designing and operating service.

The TCQSM identifies two main areas that influence transit quality of service: availability and comfort and convenience. The first two editions of the TCQSM measured quality of service using LOS letters, similar to the HCM, but the third edition dropped the letters in favor of presenting ranges of conditions where passengers experience a similar quality of service, with the number of levels not limited to six to match the standard A–F LOS lettering system. Changes in performance can be described in terms of how many levels that conditions changed relative to the base condition.

The TCQSM subdivides availability into temporal availability (frequency, how often service is provided, and hours of service, how long service is provided) and spatial availability (measured by the system’s coverage of areas capable of supporting fixed-route bus service at a minimum 60-minute headway). These availability factors are generally set by transit agency policy and therefore cannot be forecast in the way, for example, traveler delay can be forecast based on a set of future conditions.

The TCQSM measures comfort and convenience through a combination of measures of on-board crowding, relative auto and transit travel time, and reliability. The first two measures lend themselves to forecasting, but quantitative methods for forecasting transit reliability have yet to be developed. The TCQSM acknowledges that other factors, such as driver friendliness and passenger perceptions of safety and security, also influence passenger ratings of quality of service, but cannot be forecast and are difficult to quantify except through passenger satisfaction surveys.
The TCQSM also presents the transit component of the HCM MMLOS method (described above), for use in comparing transit quality of service on a roadway to the quality of service provided to other travel modes on the roadway, and for users who desire a traditional LOS letter result.

The TCQSM provides methods for evaluating the operations of various transit modes, particularly their speed and capacity. These are intended primarily for use by transit agencies in planning their service and for transit and transportation planning agencies to evaluate the effects of transit-supportive roadway infrastructure. To the degree that transit speed is affected by service or infrastructure changes, some measures of passenger quality of service will also change.

Application and Data Needs

Evaluating the quality of service for existing conditions is straightforward for the frequency, level of service, and transit speed measures, simply requiring access to transit schedules. Measuring service coverage requires use of GIS software, but the necessary data should be readily available to any MPO. Passenger load and service reliability measures may be available from on-board passenger counters and automatic vehicle location equipment, if the transit agency archives these data; otherwise, a special data collection effort is required. Point-to-point auto speeds require modeling data, archived travel time data, or special data collection efforts. As noted above, forecasting future conditions generally requires making assumptions about future transit service, along with forecasting future ridership and transit speeds.

A spreadsheet for forecasting bus speeds is available online. It requires the following input data:

- For the critical bus stop on the facility (typically, the bus stop with the highest passenger volumes):
  - Average dwell time (can be input directly or estimated based on passenger volumes, fare collection method[s], and bus characteristics)
  - Coefficient of variation of dwell times
  - Design failure rate (percent of time a bus arrives to find all stopping positions already occupied)
  - Average green-to-cycle length ratio of the downstream signal (if present)
  - Traffic signal cycle length
  - Bus stopping position (in/out of the travel lane)
  - Bus stop location (near-side, far-side, mid-block influenced by nearby signals, mid-block not influenced by nearby signals)
  - Number of loading areas (number of buses that can stop simultaneously)
  - Area type (e.g., metro CBD)
  - Curb lane volume
  - Right-turn volume
• Pedestrian volume conflicting with right turns
  ▪ For the facility:
    • Scheduled buses per hour
    • Average bus stop spacing
    • Number of traffic signals relative to number of bus stops (more/same or fewer)
    • Bus facility type (e.g., mixed traffic, bus lane with right turns allowed)
    • Maximum bus running speed between stops (typically the speed limit)
    • Skip-stop operation (yes/no), plus data on the stopping pattern if “yes”

**Challenges**

The primary challenge of the TCQSM is deciding which of its performance measures and methods are most applicable to a given analysis. The TCQSM’s philosophy has been to present multiple measures, each of which can be directly measurable in the field, in contrast to the HCM’s approach of selecting one measure as the best measure of quality of service. However, the TCQSM approach can create issues in presenting results, in that up to six QOS results can be reported, rather than one. In response to user requests for a single measure of transit LOS, the TCQSM 3rd Edition also presents the transit element of the HCM’s MMLOS measure, which incorporates multiple factors, but produces an index value that cannot be directly measured in the field.

**Opportunities**

The comprehensive nature of the TCQSM makes it an excellent reference document, and an important tool for gaining a detailed understanding of transit quality and operations concepts with which to evaluate potential systems of performance evaluation.

**Level of Traffic Stress (LTS) Analysis**

**Overview**

The Level of Traffic Stress (LTS) methodology is used to predict how bicyclists will experience the road. Unlike the Bicycle Level of Service methodology, the LTS methodology takes into account the user tolerance for different types of facilities and traffic conditions, in which there are certain conditions that must be met for biking to be accessible to the mainstream public. The methodology uses a weighted compilation of traffic volume, traffic speed, number of travel lanes, roadway and lane width and presence of parking to determine an LTS classification of 1 through 4. “The *Level of traffic stress 1 (LTS 1) is meant to be a level that most children can tolerate; LTS 2, the level that will be tolerated by the mainstream adult population; LTS 3, the level tolerated by American cyclists who*
are “enthused and confident” but still prefer having their own dedicated space for riding; and LTS 4, a level tolerated only by those characterized as “strong and fearless.”

The methodology is anchored by LTS 2, which mimics Dutch standards for acceptable bicycle conditions. This standard has been proven to be acceptable to most vulnerable users, and a robust network of LTS 1 and 2 facilities can serve most of the population.

The methodology classifies bicycle facilities into 3 types: (1) physically separated bicycle facilities, (2) bicycle lanes, and (3) streets with mixed traffic. The most intensive part of the analysis is assigning an LTS to streets with mixed traffic. Table 5 classifies street LTS based on two main data points: street width and speed.

Table 5: Criteria for Level of Traffic Stress in Mixed Traffic

<table>
<thead>
<tr>
<th>Speed Limit</th>
<th>2-3 lanes</th>
<th>4-5 lanes</th>
<th>6+ lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25 mph</td>
<td>LTS 1 or 2*</td>
<td>LTS 3</td>
<td>LTS 4</td>
</tr>
<tr>
<td>30 mph</td>
<td>LTS 2 or 3*</td>
<td>LTS 4</td>
<td>LTS 4</td>
</tr>
<tr>
<td>35+ mph</td>
<td>LTS 4</td>
<td>LTS 4</td>
<td>LTS 4</td>
</tr>
</tbody>
</table>

*Note: Use lower value for streets without marked centerlines or classified as residential and with fewer than 3 lanes; use higher values otherwise.

(Source; Table 4 from MTI, P. 21)

While the LTS methodology takes into account roadway and traffic characteristics, which are central aspects that affect a person’s decision to bike, it does not take into account other stressors, such as pavement quality, crime, noise, and aesthetics.

Applications

The LTS methodology has been applied in several cities and counties to evaluate their systems and to develop either design guidance for projects or specific plans for projects and improvements. Montgomery County, MD developed a bicycle planning guide based on the LTS methodology. It used basic concepts of speed and traffic volumes to provide guidance on an appropriate bicycle facility that would meet most of the population’s needs to bike based on the street context. The planning guide provided a case example in Bethesda, MD where the LTS methodology was used to evaluate the entire network and prioritize improvements to “unlock” the low-stress network.

The LTS methodology is best applied using link and intersection data within GIS. A GIS shapefile that has any combination of speed, volumes, number of lanes, and presence of parking can be used to map the LTS score for streets. This allows practitioners to easily evaluate the network and identify

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projects that would have the highest return in terms of “unlocking” low-stress islands of streets that already exist in the network.

The LTS can also evaluate the “connectivity” of the network by calculating the percentage of low-stress islands that are connected to each other via a low-stress facility.

**Data Needs**

**Table 6** below summarizes the data used in the LTS methodology and how it is used to “inform” the LTS score.

**Table 6: LTS Data Inputs**

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Recommended or Required?</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Traffic Volume</td>
<td>Required</td>
<td>This informs how much traffic exposure the bicyclist experiences.</td>
</tr>
<tr>
<td>Speed</td>
<td>Required (Observed speeds recommended when possible)</td>
<td>Speed provides a measure of the comfort a bicyclist experience when a vehicle passes in mixed traffic. Traffic speeds that exceed 30 mph are less tolerable by the majority of the population.</td>
</tr>
<tr>
<td>Number of Travel Lanes</td>
<td>Recommended</td>
<td>Number of travel lanes is a good indicator of traffic volumes when volume data are not available. The number of travel lanes and ADT can also highlight cases in the network where streets that are one-lane but experience 8,000+ ADT can move the needle from an LTS 1 or 2 to LTS 3. Although the street is one-lane and low speed, the peak-hour experience of having a steady stream of cars pass a bicyclist exceeds the majority of the population’s traffic stress tolerance.</td>
</tr>
<tr>
<td>Presence of Parking</td>
<td>Recommended</td>
<td>The presence of parking is particularly needed for LTS 3 and 4 streets to determine an appropriate bicycle facility. In most conditions a bike lane is not acceptable between a parking lane and a travel lane.</td>
</tr>
<tr>
<td>Presence of a Bicycle Facility (and Type)</td>
<td>Required</td>
<td>The existing bicycle network is necessary to understand whether the road is stressful for bicyclist. The roadway characteristics can indicate an LTS 4 but the presence of a separated facility would classify that same corridor as an LTS 1. A cycle track, sidepath, or any facility physically separated from traffic and requires minimal attention from bicyclist would be rated an LTS 1. A local street with low traffic volumes and traffic speeds below 25 mph and a bike lane adjacent to the curb (no parking) would be an LTS 2 or 3, while a condition with no bicycle facility present or a facility that encourages mixing with traffic speeds over 30 mph would be an LTS 4.</td>
</tr>
</tbody>
</table>

**Challenges**

The LTS methodology requires relatively simple and available data points. The methodology application is usually in a mapping format in GIS. Developing a data set that has all the required and
recommended data points in a link and intersection data set that can be mapped in GIS can be time consuming and expensive.

The methodology also heavily depends on speed data. In many cases, posted speed limits are more readily available than observed speeds. This can create misleading LTS scores, as posted speeds can be regularly exceeded by the daily traffic. In these cases, the results of the methodology usually require a higher quality “truth vetting” process with local stakeholders and practitioners.

**Opportunities**

The LTS methodology is a well digested methodology that provides a representation of the comfort of a bicycle and roadway network for bicyclist in the context of the majority of the population. It is also a methodology that steers the planning and design process from implementing bicycle facilities that “fit” in the right-of-way to context-appropriate design based on the traffic stress of the street.

Despite what can be an intense effort to compile data into a GIS format for mapping, the ability to map scores and use the LTS to look at overall connectivity in a network is helpful to practitioners as they focus and prioritize projects. This allows for practitioners to identify projects that leverage existing low stress streets and implement high-return facilities.

**Bicycle Network Analysis (BNA) Score**

**Overview**

The Bicycle Network Analysis (BNA) Score is a methodology that was recently developed by peopleforbikes as a way to measure how well the existing bicycle network connects people with places they want to go. The methodology combines a modified LTS approach with U.S. Census data and OpenStreetMap (OSM). The methodology compiles employment and household data to evaluate how the low-stress network is serving trips.

The methodology identifies census tracts that are accessible via the low-stress network within a 10-minute biking trip and assuming no more than a 25 percent route diversion. The total number of destinations accessible on the low-stress network compared with the total number of destinations that are within biking distance regardless of whether they are accessible via the low-stress network is calculated to understand the ratio of destinations accessible on the low stress bike network to those not accessible on the low stress bike network.

The methodology also takes into account types of destinations and assigns points on a scale of 0–100 for each destination type based on the number of destinations available on the low-stress network, as well as the ratio of low-stress destinations to all destinations within biking distance.
The BNA’s six scoring categories are:

- People
- Opportunity
- Core Services
- Recreation
- Retail
- Transit

Where there are mixed destination types, the category score is combined for both category place types. Weights for each destination type are used to represent their relative importance within the category. For census blocks where a destination type is not reachable by either high- or low-stress means, that destination type is excluded from the calculations. For example, the Opportunity score within a city with no institute of higher education is produced by excluding the Higher Education destination type so the score is unaffected by its absence5.

The methodology uses weighted scores for each category to calculate one overall score. The weights of these score categories are provided in the table below. Once the weighted scores are compiled, they are normalized by the population to develop a score of 1 to 100.

**Table 7: Scoring Category and Corresponding Weight**

<table>
<thead>
<tr>
<th>Scoring Category</th>
<th>Weight</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>15</td>
<td>Population</td>
</tr>
<tr>
<td>Opportunity</td>
<td>20</td>
<td>Employment, K-12 education, Technical/vocational school, Higher education</td>
</tr>
<tr>
<td>Core Services</td>
<td>20</td>
<td>Doctor offices/clinics, Dentist offices, Hospitals, Pharmacies, Supermarkets, Social services</td>
</tr>
<tr>
<td>Recreation</td>
<td>15</td>
<td>Parks, Recreational trails, Community centers</td>
</tr>
<tr>
<td>Retail</td>
<td>15</td>
<td>Retail shopping</td>
</tr>
<tr>
<td>Transit</td>
<td>15</td>
<td>Stations/transit centers</td>
</tr>
</tbody>
</table>

**Application**

The BNA score methodology is very new as it was only released in the past 6 months by peopleforbikes. The most relevant application has been a web-based tool that has calculated
several cities’ overall BNA score. A screenshot of the LTS map and BNA score (out of 100) for Tampa, FL is provided in Figure 1.

![Figure 1: BNA Score and mapping for Tampa, FL from Peopleforbikes Web Tool, 2017](image)

**Data Needs**

The BNA score combines the LTS analysis with publically available US census data. The more precise and accurate the data in the LTS analysis, the more likely the BNA score reflects reality. In the web tool, the BNA depends on OSM data, which tags segments and intersections with key data points that the analysis then streamlines into a “High” or “Low” stress rating. For instance, the presence of a cycle track indicates a low stress segment while any condition where bikes mix with traffic over 20 mph is a high stress segments. A summary of how facilities at the segment and intersection level are scored as “High” or “Low” is provided in Table 8 and 9. The only exception to these tables is in the case where a segment is classified as “residential” or “unclassified” in OSM. Almost all these cases include mixed traffic conditions where the segment is considered low stress as long as the speeds are less than 30 mph. The only cases where the segment would be high stress is in two cases where the speed limit is 25 mph and (1) there is one travel lane, parking on one side of the street, and the road width is less than or equal to 18 feet, or (2) there is one travel lane with parking on both sides of the street and the road width is less than or equal to 26 feet.

5 Website: [https://bna.peopleforbikes.org/#/methodology](https://bna.peopleforbikes.org/#/methodology), 2017
Table 8: Segment Stress Based on Bicycle Facility and Roadway Characteristics

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Speed (mph)</th>
<th>Number of Lanes</th>
<th>Parking</th>
<th>Facility Width</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle track</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Buffered bike lane</td>
<td>&gt; 35</td>
<td>&gt; 1</td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>&gt; 1</td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>Yes</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>&gt; 1</td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>&lt;= 25</td>
<td></td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Bike lane without parking</td>
<td>&gt; 30</td>
<td></td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>25-30</td>
<td>&gt; 1</td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>&lt;= 20</td>
<td>&gt; 2</td>
<td></td>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;= 2</td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Bike lane with parking</td>
<td></td>
<td></td>
<td></td>
<td>&gt;= 15 ft</td>
<td>Treat as buffered lane</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13-14 ft</td>
<td>Treat as bike lane without parking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt; 13 ft</td>
<td>Treat as shared lane</td>
</tr>
<tr>
<td>Shared lane</td>
<td>&lt;= 20</td>
<td>1</td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;= 1</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 20</td>
<td>High</td>
</tr>
</tbody>
</table>
### Table 9: Intersection Stress Based on Bicycle Facility and Roadway Characteristics

<table>
<thead>
<tr>
<th>Intersection Control</th>
<th>Number of Crossing Lanes</th>
<th>Crossing Speed Limit</th>
<th>Median Island</th>
<th>Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>None/yield to cross traffic</td>
<td>&gt; 4</td>
<td>&gt; 30</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;= 25</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>&gt; 30</td>
<td>Yes</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;= 30</td>
<td>Yes</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>RRFB</td>
<td>&gt; 4</td>
<td>&gt;= 40</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>35</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;= 30</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>&gt; 35</td>
<td>Yes</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;= 35</td>
<td>Yes</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Signalized, HAWK, four-way stop, or priority based on class</td>
<td></td>
<td></td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

US census data are used to evaluate how well the LTS network connects places and people at the census tract level. The census tract data applied include:

- Population
- Employment
- K-12 education
- Technical/vocational schools
- Higher education
- Doctor offices/clinics
- Dentist offices
- Hospitals
- Pharmacies
- Supermarkets
- Social services
- Parks
- Recreational trails
- Community centers
- Retail shopping
- Stations/transit centers

The required US census data are available online by downloading the census tract GIS shapefiles.

**Challenges**

The BNA score is a new application; therefore, challenges and opportunities are still being identified and confirmed. The most apparent challenge is the street data set that informs the LTS in the web-based tool uses a flexible data set, OSM, which anyone can contribute to, introducing biases. While OSM is free, publically available, and fairly good for some cities, for many others it is non-existent or incomplete, limiting the jurisdictions that can use the web-based tool.

The BNA score also evaluates connectivity based on a 10-minute bicycle trip. Research has shown that people on bikes are usually willing to travel up to 3 miles by bike, which exceeds the 10-minute trip threshold. This also does not show a high return for a longer, high-quality facility that connects two major destinations that are more than 10 minutes apart. The BNA score, for instance, would show that a separated facility on a long bridge does not have a high impact on the connection between two communities on either side of the bridge if it is longer than a 10-minute trip by bicycle. The analysis also does not consider some recreational trips, such as connectivity to nightlife. Lastly, the methodology is limited to network applications versus a specific corridor or project.

**Opportunities**

The BNA score is the first bicycle planning methodology to incorporate land use and destinations into the planning process in a computational way. The methodology evaluates the network and streets based on how well people are connected to places and opportunities. This gives a fairly comprehensive look at how well the overall network is serving its adjacent land uses and helps practitioners identify and prioritize improvements that will serve those needs.

**Charlotte’s Pedestrian/Bike LOS (PLOS and BLOS)**

**Overview**

The Charlotte Department of Transportation (CDOT) developed a methodology to evaluate the level of service for pedestrians and bicyclists at intersections based on design features. The key design features considered include crossing distance, roadway space allocation to crosswalks, bike lanes, sidewalks, medians, corner radius, and traffic signal characteristics. The methodology provides a point rating based on certain design elements. Design elements that are less comfortable for bicyclists and pedestrians receive lower points, and in some cases negative points, while design elements that are favorable for bicycles and pedestrians receive more points. The sources for each category are compiled into one final score. The methodology provides a range of points for LOS A through F, and the
A pedestrian intersection is assigned a P/BLOS letter based on where its composite score falls in the pre-determined ranges.

**Application**

CDOT has applied this methodology as part of their small-area planning efforts and intersection prioritization processes. The City calculates P/BLOS for all signalized intersections in the City to assist in evaluating whether the intersection design features are serving the basic needs of pedestrians and bicyclists. At the moment, CDOT uses a spreadsheet tool to calculate the P/BLOS for every signalized intersection in the City.

**Data Needs**

The data for the P/BLOS calculations can be extrapolated from as-built plans, Google Earth measurements, and field measurements and observations.

The data required to calculate the PLOS include:

- The number of travel lanes to cross and the presence and width of a median refuge.
- Pedestrian signal phase that conflicts with a left turn or right turn.
- Pedestrian signal display details, such as whether a pedestrian signal is present and if so whether there is a leading pedestrian interval, a countdown display, and whether the Flash Down Walk/Countdown phase accommodates a walking speed of less than or equal to 3.5 ft./sec.
- Corner radius or the characteristics of a pedestrian refuge, when present.
- Presence of a NO RIGHT TURN ON RED sign.
- Crosswalk type, such as raised crosswalks, high visibility (zebra stripe), or low visibility (only two parallel lines), and crosswalk presence.

The data required to calculate the BLOS includes:

- Presence of a bike lane on the approach.
- Traffic speeds on the approach.
- Left-turn signal phasing.
- Stop bar location.
- Right-turn conflict and whether right turns are permitted on red.
- Number of travel lanes a bicyclist must cross.

The CDOT developed tables where scores were assigned based on the relative characteristics of each of these data points. The scores are combined for one total score and the methodology provides a corresponding LOS with each score.
**Challenges**

The methodology provides an objective measure to help understand the tradeoffs of a project against traditional vehicle measures (e.g., volume/capacity ratio), but the P/BLOS cannot be compared directly to auto LOS. The P/BLOS methodology assesses design features that affect comfort and safety, while the automobile LOS assesses delay, a measure of convenience. This makes it difficult to use the methodology to determine the trade-offs for different design decisions since the results of the metrics do not use the same scale. For instance, an auto LOS C is typically considered an acceptable performance for an urban intersection. However, a LOS C for the P/BLOS does not always translate to a design condition that most of the population will tolerate.

For instance, the BLOS methodology would assign LOS D to an approach with a 12-foot shared travel lane, a speed of 35 mph, a protected opposing left turn, right-turns on red, and 4 travel lanes to cross. Recent research has shown that this condition would not be tolerable for most of the population to ride a bike.

**Opportunities**

The methodology allows practitioners to assess how certain improvements will affect pedestrian and bicycle level of comfort on a project and intersection level. Practitioners can evaluate which design elements will have the highest impact, and the magnitude of points allocated seems to correlate with the magnitude of impact the treatments will have relative to each other. For instance, for PLOS, the scoring gives three times as many points for reducing left- and right-turn conflicts as implementing textured or high-visibility crosswalks.
CONCLUSION

This white paper has summarized five methodologies that can be used to quantify multimodal experiences along and across roadways. Some of the methodologies explored, such as the HCM MMLOS, provide a way to compare all four modes; while, other methodologies, such as the LTS, are tailored for one mode. Likewise, some methodologies can be applied at the project level to evaluate trade-offs, while others focus more on network-level evaluation to aid in project identification and prioritization. Table summarizes the mode, analysis level, and application for each methodology explored and provides an overview of the data needs and relative difficulty of application.

Table 10: Summary of Multimodal Methodology Applications

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Mode</th>
<th>Analysis Level</th>
<th>Data Needs</th>
<th>Difficulty</th>
<th>Application (Project or Network Level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCM Multi-Modal Level Of Service (MMLOS)</td>
<td>○</td>
<td>•</td>
<td>High*</td>
<td>High</td>
<td>Project or Network</td>
</tr>
<tr>
<td>Level of Traffic Stress (LTS)</td>
<td>○</td>
<td>•</td>
<td>High</td>
<td>High</td>
<td>Project or Network</td>
</tr>
<tr>
<td>Bicycle Network Analysis (BNA) Score</td>
<td>•</td>
<td>•</td>
<td>Low</td>
<td>Low</td>
<td>Network</td>
</tr>
<tr>
<td>Transit Capacity &amp; Quality of Service Manual (TCQSM)</td>
<td>○</td>
<td>•</td>
<td>Varies</td>
<td>Varies</td>
<td>Varies</td>
</tr>
<tr>
<td>Charlotte PLOS and BLOS</td>
<td>•</td>
<td>•</td>
<td>Low</td>
<td>Low</td>
<td>Project or Network</td>
</tr>
</tbody>
</table>

*Agencies can rely on default values for many inputs to reduce the data requirements.
REFERENCES

Brozen, Madeline et al. “Exploration and Implications of Multimodal Street Performance Metrics: What’s a Passing Grade?” University of California Transportation Center. 2014.


Website: https://bna.peopleforbikes.org/#/methodology, 2017
Appendix A  Interview Notes
Tracy Newsome is a transportation planner with the Charlotte Department of Transportation (CDOT). She was one of the main authors of the City’s Urban Street Design Guidelines (USDG), which were developed in the mid-2000s. The P/BLOS methodology came from the USDG. She is heavily involved in policy development, area plans, and implementation of the capital program.

Scott Curry is an urban design and Pedestrian Program Manager for CDOT. He is responsible for the walkability initiative and manages the pedestrian program – funding from city council to build crosswalks and sidewalks.

1. **What is your agency’s role in project development and decisions regarding modal trade-offs within projects? How is funding allocated to the projects you develop and manage?**

   - CDOT handle many types of projects within city limits and works with the state on state maintained roadways.
   - CDOT performs a lot of the modeling work for the CRTPO and works with them on the LRTP get projects on the priority list.
   - There are a lot of different funding sources and programs.
     - CDOT has a history of putting forth bonds and getting them approved by the public.
     - CDOT has spent about $450M of city funds on complete streets improvements.
     - The pedestrian program gets about $7.5M every year from bonds, which come out every two years.
   - CDOT tries to be opportunistic and always looks for opportunities to partner to get more projects done and done more quickly.

2. **What is the planning and design process for capital projects? How do you determine modal priority within a project?**

   - At least one representative from planning and design is on every CDOT project.
   - The USDG contains a six step planning and design process and the P/BLOS methodology. CDOT has used this process for the last 10 years.
   - Now, the idea of complete streets and modal trade-offs is institutionalized. The process is so ingrained; engineers and planners have the same expectations. Trade-off discussions don’t need to happen explicitly anymore. There is still a trade-off discussion that uses some form of the 6-step process (such as surrounding land use and constructability). There is a systematic and purposeful discussion on what needs to happen on every project.
   - CDOT tries to get a minimal level of pedestrian and bicycle facility in every widening project. Retrofits are more difficult but there is still an expectation CDOT will try to incorporate ped/bike facilities.
CDOT has a street classification system (boulevards, avenues, parkways, etc.) and within those classifications there are different expectations for what ped and bike infrastructure should look like. For examples, if something is designated as a main street, the pedestrian is the priority. As you move toward a parkway, the auto is more emphasized.

- The classification is a human-based assessment that relies on data (GIS, volume, lanes, bike/ped LOS when available).
- CDOT developed a classification for each street on the thoroughfare plan. They take advantage of ongoing/upcoming studies to update the initial classification and do more detailed planning and design.

3. **What tools do you use to evaluate how well the network is serving pedestrians, bicycles and/or transit? What criteria/methodology is used to determine the LOS for each mode?**
   - At the beginning of every project, they start with USDG and goals for the project.
   - CDOT does not use BLOS and PLOS on every project. It is a tool they use to support decisions. It was used more when USDG and complete streets were newer.

4. **How has the Pedestrian LOS methodology affected project decisions and selection (both negative and positive)?**
   - CDOT maintains B/PLOS and uses the data to describe existing conditions when doing an area plan. CDOT analyzes P/BLOS for signalized intersections as part of area plans. There is a spreadsheet to help with calculation. BLOS/PLOS is then used to prioritize which intersections need to make their way to a project. CDOT looks at congestion, safety, PLOS, BLOS, and multimodal connectivity to rank intersection projects.

5. **How does the City’s Pedestrian LOS methodology take into account intersection capacity?**
   - Every project still looks at vehicular capacity and a v/c ratio. The majority of residence are still using automobile to get around.
   - CDOT has done 30 road diets in the city. They started with the ‘easier’ ones. There are no set thresholds on when to consider road diets, but the accepted volumes are marching higher now that they’ve picked off the low hanging fruit.
   - CDOT has found a sliding scale for acceptance of congestion on different types of facilities. Residents expect speeds to be slower on main streets.
   - CDOT has started looking at the length of the peak hour to see how long congestion is lasting and has found that residents can accept a longer peak hour in some cases.
   - There is more congestion on suburban roads where this is not as much network.

6. **How long have you been using your current process? What is attractive or compelling about the process you currently use to evaluate projects and/or the transportation network? Does the process have any shortcomings?**
   - CDOT has been using the USDG for the past 10 years and has gotten some great projects.
   - The process was based on assumption that we were not going to make things worse for motorists, only better for cyclists. There are cases where the community is asking for things that are not an option. CDOT has reached a point where the improvements needed to increase capacity are not palatable to the community and they are needing to make more tradeoffs between vehicular and bike/ped.
• There is a healthy tension between staff focused on different modes.
• Some projects have accepted higher congestion for short periods or certain circumstances
• CDOT sometimes has a harder time having the trade-off conversation on NCDOT roads.
1. What is your agency’s role in project development and decisions regarding modal trade-offs within projects? How is funding allocated to the projects you develop and manage?

- FHWA’s role is in the planning process. They provide guidance and setup the conditions for a good planning process. One outcome of a good planning process is a way to prioritize projects. FHWA shares information on methodologies so agencies can create good project prioritization.
- A lot of prioritization happens for the Transportation Alternatives Program (TAP). FHWA sets up the rules of the game and makes sure everyone follows them.
- FHWA recently published guidebook for bike/ped performance measures. Those measures could be used for project prioritization. The guidebook links measures with a community’s goals. For each measure, there are examples of how to track the measure.
- NCDOT has done some good prioritization work.
- NCHRP research project 07-17 provides guidance on project selection and prioritization.

2. What has the Multi-Modal Network study FHWA is leading revealed to date? Are there any common themes of where cities are struggling and succeeding in terms of evaluating multi-modal projects?

- Dan will send a literature review from the network work done in Baltimore. The report will be published in the fall.

3. How are cities considering trade-offs for projects between different modes? How does vehicle capacity factor into those considerations?

- There will always be a comparison to traditional LOS. Folks are acknowledging that vehicular LOS can be a helpful input into the planning process but we need to understand what it is, and is not, telling us. We can’t use it to extrapolate everything in the system. We need other things to get a holistic understanding of everything that goes into the planning process.
- Dan will share a white paper on this topic if it’s public.

4. Have you ever applied the HCM’s MMLOS methodology to evaluate projects or the transportation network? If so, what were its strengths? What were its shortcomings?

- MMLOS and P/BLOS are helpful inputs. A lot of people are using them and they are informing things in a helpful way.
- BLOS is based on research that was done quite a while ago in Florida. It was done on field analysis. At that point, no one was building separate bike lanes and cycle tracks. The methodology is not refined enough for today’s conditions.
- It is hard to move the needle for P/BLOS. Widening the sidewalk, for examples, shows little benefit in the analysis.
5. Have you ever applied the Level of Traffic Stress methodology to projects or to evaluate the network? If so, what were its strengths? What were its shortcomings?
   - There was a white paper published last month on low stress network for bikes.
   - Martha/Kyle developed an algorithm to measure low stress connectivity. An agency inputs open street map data into the tool and it measures connectivity for the community. The output is only as good as the data going in. The current methodology can be expensive and time consuming to run all the data and keep it up to date. This tool may be a way to get around that.

   Recommendation for follow-up discussions: Colorado DOT (Betsy Jacobson), Washington DOT, Minneapolis MPO and Philadelphia MPO.
Hillsborough MPO MMLOS White Paper: Sister MPO Interview

Agency: SANDAG
Interview Attendees: Mike Calandra (SANDAG), Sarah McKinley (Hillsborough MPO), Caitlin Doolin (KAI), and Jennifer Musselman (KAI)
Date: 7/11/17

Questions:

1. Please describe your role within SANDAG.

   Mike Calandra is a travel demand modeler and model application specialist with SANDAG. He runs the model for SANDAG plan updates and to support local jurisdictions and consultants in their planning efforts.

   SANDAG has a service bureau that is the consulting arm and allows us to contract to external partners. SANDAG has 19 member agencies. The service bureau is on standby to help any of the member agencies. For local jurisdictions the work is usually city/community wide or for a corridor. On the private side, projects are usually for a specific site.

2. What type of methodologies do you apply when modelling? Have you ever applied the HCM’s MMLOS methodology to evaluate projects or the transportation network? If so, what were its strengths? What were its shortcomings?

   SANDAG uses an activity based model. Mike uses the model to perform network and land use analysis. SANDAG can do custom scenarios in one or both areas. Mike recommended taking an incremental approach and change one thing at a time. Network changes are usually highway or arterial related and can be transit related.

   Modeling the active transportation network is a new paradigm. The model currently does not have ped/bike assignments. When they change the active transportation network changes can’t be seen on a link level but can be seen in overall mode choice. The active network focuses on bicycle classifications. Changes in classification have small changes in mode choice output. Adding/removing bicycle links have a larger impact on the mode choice. A similar analysis does not yet exist for pedestrian infrastructure.

   Active transportation modeling is best applied at the community or city level where there are more opportunities to change the network and see changes in the results. The model is used for both needs identification and project identification. The city can use the model to prioritize infrastructure within the community. At the regional level, SANDAG uses the model to prioritize highway/arterial, transit, and active projects.

   SANDAG uses the model and HCM procedures to find capacity on highways and arterials. Consultants may use model outputs to perform their own MMLOS calculation, but SANDAG does not do the calculations.
3. How long have you been using your current process? What is attractive or compelling about the process you currently use to evaluate projects and/or the transportation network? Does the process have any shortcomings?

The biggest issue with model calibration is the amount of data required. There is lack of information on arterials. For freeways, Caltrans has a performance monitoring system that continuously collects volume and speed data. For transit, SANDAG has a count system and is moving toward APC data. Arterials are under the jurisdiction of each city. Some cities have not done traffic counts for 10+ years.

4. Is SANDAG exploring use of performance measures beyond LOS?

The State of California removed LOS from legislature and replaced it with VMT. There are no guidelines on how to do it just yet, and every jurisdiction is doing it a little bit differently. SANDAG is starting to report VMT for every project. They have the ability to use the model to pull the VMT apart by origins and destinations. Adding active transportation links in the model is a way to mitigate VMT. There is no one size fits all approach for the VMT trade-off of bicycle infrastructure. In the activity based model, adding a bike facility in an urban or rural context will have different effects on VMT.
Planning and Preliminary Engineering Applications Guide to the Highway Capacity Manual

Richard Dowling
Paul Ryus
Bastian Schroeder
Kittelston & Associates, Inc.
Portland, Oregon

Michael Kyte
University of Idaho
Moscow, Idaho

F. Thomas Creasey
STANTEC
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Ali Hajbabaie
ITRE at N.C. State University
Raleigh, North Carolina

Danica Rhoades
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Boise, Idaho

Subscriber Categories
Planning and Forecasting

Research sponsored by the American Association of State Highway and Transportation Officials in cooperation with the Federal Highway Administration
F. Default Values to Reduce Data Needs

1. Overview

Many HCM computational methods require a number of input parameters. For a detailed operations analysis, this can be an advantage, as the performance measure output by the method reflects many different factors that can influence the result. However, for planning and preliminary engineering analyses, the number of inputs can pose a challenge. The desired information may not yet be known, the level of effort required to gather the data may be out of proportion to the aims of the analysis, or a combination of these and other considerations can make it difficult to supply a particular input value.

One solution to applying HCM methods to planning and preliminary engineering analyses is to substitute default values for those inputs that cannot be measured directly. Using default values instead of field-measured values may introduce some error into the analysis results, but other data used for planning analyses (particularly forecast demand volumes) may have much greater uncertainties associated with their values and, consequently, much greater impact on the results. Furthermore, the goal of these types of analyses is not to make final decisions about roadway design and control elements, but rather to identify potential problems or to screen large numbers of alternatives; in these cases, precise results are neither required nor expected.

It is important to recognize that HCM input data have a hierarchy that varies according to the context of the planning and preliminary engineering application: There are applications where certain input data can be and must be measured. (These data are identified as “required inputs” in subsequent sections.) There are planning and preliminary engineering applications where certain input data can and should be estimated sensibly based on local and planned conditions; Section F4 addresses this situation. Finally, as discussed in Section F2, there are applications where certain data need not be measured and a general default value can be used instead. Parts 2 and 3 of the Guide provide simple default values for analysis situations where the analyst has deemed a locally measured value is not necessary.

This section provides guidance on applying default values to HCM methods and on developing local default values to use in place of the HCM’s national defaults.

2. When to Consider Default Values

The decision to use a default value in place of a field-measured value should consider a number of factors, including:

- **The intended use of the analysis results.** In general, the less precisely that analysis results will be presented (e.g., under, near, or over capacity versus a particular LOS versus a specific travel speed estimate), the more amenable the analysis is to using default values, or tools based
3. Sources of Default Values

Once a decision has been made to use a default value for a particular methodological input, there are several potential sources for obtaining a default value. These are, in descending order of desirability according to the HCM (2000):

- **Measure a similar facility in the area.** This option is most applicable when facilities that have not yet been built are being analyzed and the scope of the analysis does not require measuring a large number of facilities.
- **Local policies and standards.** State and local transportation agencies’ traffic forecasting guidelines may specify, or set limits on, default values to assume. Similarly, these agencies’ roadway design standards will specify design values (e.g., lane widths) for new or upgraded roadways.
- **Local default values.** When available, local default values will tend to be closer to actual values than the HCM’s national defaults. Heavy vehicle percentage, for example, has been shown to vary widely by state and facility type (Zegeer et al. 2008). The next subsection provides guidance on developing local default values.
- **HCM default values.** If none of the above options are feasible, then the HCM’s national default values can be applied.

4. Developing Local Default Values

*This section is adapted from HCM (2016), Chapter 6, Appendix A.*

Local defaults provide input values for HCM methods that are typical of local conditions. They are developed by conducting field measurements in the geographic area where the values...
will be applied, during the same time periods that will be used for analysis, typically weekday peak periods. For inputs related to traffic flow and demand, the peak 15-minute period is recommended as the basis for computing default values because this time period is most commonly used by the HCM’s methodologies.

When an input parameter can significantly influence the analysis results, it is recommended that multiple default values be developed for different facility types, area types, or other factors as appropriate, as doing so can help reduce the range of observed values associated with a given default and thus the error inherent in applying the default. The $K$- and $D$-factors used to convert AADT volumes to directional analysis hour volumes are two such parameters. For urban streets, other sensitive parameters include peak hour factor, traffic signal density, and percent heavy vehicles. For freeways and highways, sensitive parameters include free-flow speed and peak hour factor.

5. References


K. Urban Streets

1. Overview

Any street or roadway with signalized intersections, stop-controlled intersections, or roundabouts that are spaced no farther than 2 miles apart can be evaluated using the HCM methodology for urban streets and the procedures described in this section.

The planning methods for urban streets focus on facility-level analysis, segment-level analysis, and intersection-level analysis. Facility-level performance is estimated by summing the segment (between intersections) and intersection performance results.

Interchange ramp terminals are a special case of intersection at the foot of freeway on- and off-ramps. They are addressed in HCM Chapter 23. The uneven nature of lane demands and the tight spacing between signals within a freeway interchange result in conditions that are not typical of an urban street.

An urban street segment is a segment of roadway bounded by controlled intersections at either end that require the street’s traffic to slow or stop. An urban street facility is a set of contiguous urban street segments. The control delay at the downstream intersection defining a segment is included in the segment travel time. Exhibit 43 shows the relationship between an urban street facility, an urban street segment, and an intersection, as well as the segment travel time and intersection control delay.

The exhibit shows only one direction of a typical bi-directional urban street analysis.

2. Applications

The procedures in this chapter are designed to support the following planning and preliminary engineering analyses:

- Development of an urban street corridor improvement plan
- Feasibility studies of
  - Road diets,
  - Complete streets,
  - Capacity improvements,
  - Signal timing improvements,
  - Transit priority timing, and
- Land development traffic impact studies.
3. Analysis Methods Overview

Urban street performance can be directly measured in the field or it can be estimated in great detail using microsimulation. However, the resource requirements of both of these methods render them generally impractical for most planning and preliminary engineering applications.

The HCM provides a less resource-intensive approach to estimating urban street performance; however, it also is generally impractical to use the HCM with 100% field-measured inputs for many planning and preliminary engineering analyses.

As shown by the unshaded boxes in Exhibit 44, this section presents two medium-level methods for evaluating urban street performance, as well as a high-level screening and scoping method that can be used to focus the analysis on only those locations and time periods requiring investigation.

The HCM facility, segment, and intersection analysis methods (covered in HCM Chapters 16 to 23) provide a good basis for estimating urban street performance under many conditions. However, these methods are complex and specialized software is required to implement them. Consequently, a simplified HCM facility analysis method is presented in this section to reduce the number of computations and to enable programming of the method in a static spreadsheet, without requiring writing macros to implement it.

![Exhibit 44. Analysis options for urban streets.](image)
Because all of these methods still require a fair amount of data and computations, this chapter also provides a high-level service volume and volume-to-capacity ratio screening method for quickly identifying which portions of the street will require more detailed analysis (to properly account for the spillover effects of congestion), and to quickly compare improvement alternatives according to the capacity they provide.

4. Scoping and Screening

**Generalized Service Volume Tables**

Whether or not a more detailed urban street facility analysis is needed can be determined by comparing the counted or forecasted daily or peak hour traffic volumes for the urban street segments between each controlled intersection to the values given the service volume tables presented later in this subsection. If all of the segment volumes fall in the LOS E range or better, there will not be congestion spillover requiring a full facility analysis to better quantify the facility’s performance. One can then use the HCM intersection and segment analysis procedures with defaults for some of the inputs to evaluate the performance of each segment and intersection.

The service volumes can also be used to quickly determine the geographic and temporal extent of the urban street facility that will require analysis. If the counted or forecasted volumes for a segment fall within the agency’s target LOS standard, then the segment and its associated downstream intersection can be excluded from a more detailed analysis.

**HCM Daily Service Volume Table**

HCM Exhibit 16-16 (adapted below as Exhibit 45) provides approximate maximum two-way AADT volumes that can be accommodated by an urban street at a given LOS for two posted speed limits under very specific assumptions of signal timing, signal spacing, access point (unsignalized driveway) spacing, and access point volumes. The service volumes are highly sensitive to the selected assumptions.

**Alternative Daily and Peak Hour Service Volume Table**

Exhibit 46 provides maximum service volumes (both two-way AADT and peak hour peak direction) that can be accommodated by an urban street under differing assumptions regarding signal timing, signal spacing, and facility length. The values in this table are expressed on a per-lane basis. For example, a six-lane urban street (three lanes each direction) can carry between 52,200 (8,700 × 6 lanes) and 81,600 AADT (13,600 × 6 lanes) at LOS E, depending on the posted speed limit, signal spacing, and traffic signal cycle length. The LOS E service volume is generally also the through capacity at the critical signal on the facility; however, in some situations (as noted in the chart), this volume may be lower than the capacity.

**Intersection Volume-to-Capacity Ratio Checks**

The problem with screening at the facility level is that it is possible for the service volume check to show LOS E for the facility when the capacity of one or more intersections along the street has already been exceeded. This condition is especially likely when the signals are widely spaced (i.e., more than one-quarter mile apart). Thus, an intersection volume-to-capacity (v/c) ratio check is recommended to supplement the overall facility service volume screening.

The intersection v/c ratios are computed and screened using the methods described in the intersection sections of this Guide (Section L for signalized intersections, Section M for stop-controlled intersections, and Section N for roundabouts). The v/c ratios may be used for study
scoping purposes to identify those intersections requiring more detailed analysis. They may also be used to quickly screen capacity-related improvement alternatives.

Any segment that exceeds the capacity of the downstream intersection will have queuing that may impact upstream segments and reduce downstream demands. In such a situation, a full urban street facility analysis using a method capable of accurately identifying queue spillbacks is required to ascertain the performance of the urban street. The facility analysis can be performed using the HCM method with defaults, described later in this section. In cases of severe congestion, a microsimulation analysis may be required to accurately assess queue spillback effects.

The analyst may also use the intersection demand-to-capacity (d/c) ratios for each segment to quickly screen various capacity improvement options. Exhibit 47 shows the planning capacities per通过 lane that may be used to screen for signalized intersection capacity problems. The options can then be quickly ranked according to their forecasted d/c ratios for the critical segments of the urban street.

| K-Factor | D-Factor | Two-Lane Streets | | Four-Lane Streets | | Six-Lane Streets |
|---|---|---|---|---|---|
| | | LOS C | LOS D | LOS E | LOS C | LOS D | LOS E | LOS C | LOS D | LOS E |
| 0.09 | 0.55 | 1,700 | 11,800 | 17,800 | 2,200 | 24,700 | 35,800 | 2,600 | 38,700 | 54,000 |
| 0.09 | 0.60 | 1,600 | 10,800 | 16,400 | 2,000 | 22,700 | 32,800 | 2,400 | 35,600 | 49,500 |
| 0.10 | 0.55 | 1,600 | 10,700 | 16,100 | 2,000 | 22,300 | 32,200 | 2,400 | 34,900 | 48,600 |
| 0.10 | 0.60 | 1,400 | 9,800 | 14,700 | 1,800 | 20,400 | 29,500 | 2,200 | 32,000 | 44,500 |
| 0.11 | 0.55 | 1,400 | 9,700 | 14,600 | 1,800 | 20,300 | 29,300 | 2,100 | 31,700 | 44,100 |
| 0.11 | 0.60 | 1,300 | 8,900 | 13,400 | 1,700 | 18,600 | 26,900 | 2,000 | 29,100 | 40,500 |

| Posted Speed Limit | | | | | |
|---|---|---|---|---|
| 0.09 | 0.55 | 7,700 | 15,900 | 18,300 | 16,500 | 33,600 | 36,800 | 25,400 | 51,700 | 55,300 |
| 0.09 | 0.60 | 7,100 | 14,500 | 16,800 | 15,100 | 30,800 | 33,700 | 23,400 | 47,400 | 50,700 |
| 0.10 | 0.55 | 7,000 | 14,300 | 16,500 | 14,900 | 30,200 | 33,100 | 23,000 | 46,500 | 49,700 |
| 0.10 | 0.60 | 6,400 | 13,100 | 15,100 | 13,600 | 27,700 | 30,300 | 21,000 | 42,700 | 45,600 |
| 0.11 | 0.55 | 6,300 | 13,000 | 15,000 | 13,500 | 27,500 | 30,100 | 20,900 | 42,300 | 45,200 |
| 0.11 | 0.60 | 5,800 | 11,900 | 13,800 | 12,400 | 25,200 | 27,600 | 19,100 | 38,800 | 41,500 |

Source: Adapted from HCM (2016), Exhibit 16-16.

Notes: Entries are maximum vehicle volumes per lane that can be accommodated at stated LOS.

AADT = annual average daily traffic. AADT per lane is two-way AADT divided by the sum of lanes in both directions.

This table is built on the following assumptions:
- No roundabouts or all-way STOP-controlled intersections along the facility.
- No on-street parking and no restrictive median.
- Coordinated, semi-actuated traffic signals, with some progression provided in the analysis direction (i.e., arrival type 4).
- 120-second traffic signal cycle lengths, protected left-turn phases provided for the major street, and the weighted average g/C ratio (i.e., ratio of effective green time for the through movement in the analysis direction to the cycle length) = 0.45.
- Exclusive left-turn lanes with adequate queue storage are provided at traffic signals and no exclusive right-turn lanes are provided.
- 2-mile facility length.
- At each traffic signal, 10% of traffic on the major street turns left and 10% turns right.
- Peak hour factor = 0.92 and the base saturation flow rate = 1,900 pc/h/ln.
- Additional assumptions for 30-mph facilities: signal spacing = 1,050 ft and 20 access points/mi.
- Additional assumptions for 45-mph facilities: signal spacing = 1,500 ft and 10 access points/mi.
**Exhibit 46. Daily and peak hour service volume and capacity table for four-lane urban streets.**

<table>
<thead>
<tr>
<th>Speed Limit (mph)</th>
<th>Signal Spacing (ft)</th>
<th>Cycle Length (s)</th>
<th>Peak Hour Peak Direction (veh/h/ln)</th>
<th>AADT (2-way veh/day/ln)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>LOS C</td>
<td>LOS D</td>
</tr>
<tr>
<td>25</td>
<td>660</td>
<td>90</td>
<td>630</td>
<td>840</td>
</tr>
<tr>
<td>25</td>
<td>1,320</td>
<td>120</td>
<td>1,000</td>
<td>1,100</td>
</tr>
<tr>
<td>35</td>
<td>1,320</td>
<td>120</td>
<td>820</td>
<td>1,040</td>
</tr>
<tr>
<td>35</td>
<td>2,640</td>
<td>180</td>
<td>1,300</td>
<td>1,360</td>
</tr>
<tr>
<td>45</td>
<td>1,320</td>
<td>180*</td>
<td>630</td>
<td>1,180</td>
</tr>
<tr>
<td>45</td>
<td>2,640</td>
<td>180</td>
<td>1,220</td>
<td>1,320</td>
</tr>
<tr>
<td>55</td>
<td>2,640</td>
<td>180</td>
<td>1,240</td>
<td>1,320</td>
</tr>
<tr>
<td>55</td>
<td>5,280</td>
<td>180</td>
<td>1,340</td>
<td>1,430</td>
</tr>
<tr>
<td>55</td>
<td>10,560</td>
<td>180</td>
<td>1,470</td>
<td>1,470</td>
</tr>
</tbody>
</table>

Notes: *The LOS F speed threshold is reached before the through movement volume-to-capacity (v/c) ratio reaches 1.00. In all other cases, the v/c ratio limit of 1.00 for LOS F controls.

Entries are maximum vehicle volumes per lane that can be accommodated at stated LOS.

AADT = annual average daily traffic. AADT per lane is two-way AADT divided by the sum of lanes in both directions.

This table is built on the following assumptions:

- Four-lane facility (two lanes in each direction).
- No roundabouts or all-way STOP-controlled intersections along the facility.
- No on-street parking and no restrictive median.
- Coordinated, semi-actuated traffic signals, with some progression provided in the analysis direction (i.e., arrival type 4).
- Protected left-turn phases provided for the major street, and the weighted average g/C ratio (i.e., ratio of effective green time for the through movement in the analysis direction to the cycle length) = 0.45.
- Exclusive left-turn lanes with adequate queue storage are provided at traffic signals and no exclusive right-turn lanes are provided.
- At each traffic signal, 10% of traffic on the major street turns left and 10% turns right.
- Peak hour factor = 1.00 and base saturation flow rate = 1,900 pc/h/ln.
- The facility is exactly two segments long with exactly three signals, so a facility with 1,320 feet (0.25 mile) between signals is 2,640 feet long.
- Two access points between each traffic signal, regardless of signal spacing. Each access point has two lanes in and two lanes out, with a peak hour volume of 180 veh/h turning into each driveway and 180 veh/h turning out of each driveway.
- K-factor (ratio of weekday peak hour two-way traffic to AADT) = 0.09 and D-factor (proportion of peak hour traffic in the peak direction) = 0.60. For other K- and D-values, multiply AADTs by the assumed factor values (i.e., 0.09 and 0.60) and divide by the desired values.

**Exhibit 47. Signal approach through movement capacities per lane.**

<table>
<thead>
<tr>
<th>Saturation Flow Rate (veh/h/ln)</th>
<th>Through Movement g/C 0.40</th>
<th>Through Movement g/C 0.45</th>
<th>Through Movement g/C 0.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,500</td>
<td>600</td>
<td>675</td>
<td>750</td>
</tr>
<tr>
<td>1,600</td>
<td>640</td>
<td>720</td>
<td>800</td>
</tr>
<tr>
<td>1,700</td>
<td>680</td>
<td>765</td>
<td>850</td>
</tr>
<tr>
<td>1,800</td>
<td>720</td>
<td>810</td>
<td>900</td>
</tr>
<tr>
<td>1,900</td>
<td>760</td>
<td>855</td>
<td>950</td>
</tr>
</tbody>
</table>

Notes: Entries are through vehicles per hour per through lane.

If exclusive turn lanes are present on the signal approach, then the total approach volumes used to screen for capacity problems should be reduced by the number of turning vehicles. A default value of 20% turns (10% lefts, 10% rights) may be used if both exclusive left- and right-turn lanes are present.

Saturation flow rates, in vehicles per hour of green per lane, are effective rates after adjustments for heavy vehicles, turns, peak hour factor, and other factors affecting saturation flow.

$g/C$ = ratio of effective green time to traffic signal cycle length.
**Sensitivity of Predicted Urban Street Speeds**

Analysts should be aware of the following sensitivities of the HCM urban street estimation method:

- The HCM-predicted average speeds under low-flow conditions may be higher or lower than the posted speed limit, depending on the posted speed limit and the signal spacing.
- For through movement v/c ratios below 1.00, average speeds are much more sensitive to changes in v/c ratios than are freeways and highways. For freeways and multilane highways, the speed–flow curve is relatively flat until the v/c ratio at the bottleneck exceeds 1.00. For urban streets, the speed–flow curve drops comparatively rapidly with increasing v/c ratios, even when the v/c ratio is significantly below 1.00.
- As demand increases on an urban street (but is still below a v/c of 1.00), there comes a point in the HCM method where the additional through traffic on the urban street at the unsignalized driveways (access points) can be significantly delayed by the driveways, thereby significantly reducing the predicted speed.
- The HCM-estimated speed ceases to be sensitive to increases in demand once the v/c ratios on the upstream signal approaches feeding the downstream link reach 1.00. Further increases in demand are stored on the upstream signal approaches. The HCM speed estimation method for urban streets does not currently add in the delay to vehicles stored on the upstream signal approaches. For this reason, the HCM arterial method cannot be currently relied upon for speed prediction when the demands on the upstream signal approaches exceed a v/c of 1.00.

5. **Employing the HCM Method with Defaults**

The HCM facility analysis method is described in HCM Chapter 16 and draws from the segment analysis method in HCM Chapter 18. Urban street reliability analysis is described in HCM Chapter 17. Exhibit 48 lists the data needed to evaluate the full range of performance measures for planning-level urban street analysis. Individual performance measures may require only a subset of these inputs.

The estimation of free-flow speeds using the HCM Chapter 17 method requires information on the posted speed limit, median type, presence of a curb, the number of access points per mile, the number of through lanes, and signal spacing.

Urban street capacity, which is determined by the through capacities of the controlled intersections, requires intersection control data, intersection demands, intersection lane geometry, and the analysis period length.

Average speed, motorized vehicle LOS, and multimodal LOS require the intersection capacities and free-flow speed plus additional data on segment lengths, demands, and lanes.

Queues are estimated based on the intersection control, demand, and geometric data.

Reliability analysis requires all the data required to estimate average speed, plus additional information on demand variability, incident frequencies and duration, weather, and work zones.

6. **Simplified HCM Segment Analysis Method**

This simplified urban street segment analysis method assumes that the segments between intersections have no access points between the intersection boundaries and that there are no turning movements at the intersection. All intersections are assumed to be signalized. The method does not consider the effects of a median. Exhibit 49 provides a flow diagram showing the analysis steps for the method.
### Exhibit 48. Required data for urban street analysis with the HCM.

<table>
<thead>
<tr>
<th>Input Data (units)</th>
<th>FFS</th>
<th>Cap</th>
<th>Spd</th>
<th>LOS</th>
<th>MMLOS</th>
<th>Que</th>
<th>Rel</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posted speed limit (mph)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Median type</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Curb presence</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Access points per mile</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Number of through lanes</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Segment length (mi)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Directional demand (veh/h)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Percentage trucks (%)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Intersection control data</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>See Section L, M, or N</td>
<td></td>
</tr>
<tr>
<td>Intersection demands</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>See Section L, M, or N</td>
<td></td>
</tr>
<tr>
<td>Intersection geometry</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>See Section L, M, or N</td>
<td></td>
</tr>
<tr>
<td>Analysis period length (h)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>0.25 h</td>
<td></td>
</tr>
<tr>
<td>Seasonal demand variation</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>HCM Exhibits 17-5 through 17-7</td>
<td></td>
</tr>
<tr>
<td>Crash rate (crashes/yr)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
<td></td>
</tr>
<tr>
<td>Incident frequency, duration</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>HCM Exhibits 17-9 through 17-12</td>
<td></td>
</tr>
<tr>
<td>Local weather history</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>HCM Volume 4</td>
<td></td>
</tr>
<tr>
<td>Work zone probability</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>Optional</td>
<td></td>
</tr>
</tbody>
</table>

Notes: See appropriate sections in text for definitions of the required input data.

Data required for intersection analysis is not shown here. See Section L (signalized intersections), M (stop-controlled intersections), or N (roundabouts) as appropriate.

FFS = free-flow speed (default = speed limit plus 5 mph), Cap = capacity (veh/h/ln), Spd = average speed (mph), LOS = auto level of service, MMLOS = multimodal LOS (pedestrian, bicycle, transit), Que = queue (vehicles), and Rel = travel time reliability (multiple measures).

### Exhibit 49. Simplified urban street segment analysis method steps.

![Simplified urban street segment analysis method steps diagram](image)
Input Requirements

The method requires data for four input parameters:

1. The through movement volume along the segment \( v_m \) (veh/h),
2. The number of through lanes on the segment \( N_{TH} \),
3. The segment length \( L \) (ft), and
4. The posted speed limit \( S_p \) (mph).

Default values are assumed for five other input parameters:

- Through movement saturation flow rate \( s = 1,900 \text{ veh/h/ln} \),
- Effective green ratio \( g/C = 0.45 \),
- Traffic signal cycle length \( C = 120 \text{ s} \),
- Progression quality along the segment = average, and
- Analysis period duration \( T = 0.25 \text{ h} \).

As a default, the cycle length is assumed to be 120 seconds and the \( g/C \) ratio is assumed to be 0.45. The latter value assumes that the green time is evenly divided between the north–south and east–west intersection approaches and that lost time accounts for ten percent of the cycle length. The analyst can and should override these defaults based on local knowledge (such as coordination plans). The quality of progression is assumed to be average (random arrivals), but the analyst can also select good (if there is some degree of coordination between the two signalized intersections) or poor (if there is poor coordination between the intersections).

Step 1: Calculate Running Time

The running time \( t_R \) is calculated as follows:

\[
t_R = \frac{3,600 \times L}{5,280 \times (S_p + \text{UserAdj})}
\]

Equation 58

where

- \( t_R \) = running time excluding intersection delays (s),
- \( S_p \) = posted speed limit (mph),
- UserAdj = user-selected adjustment (mph) to reflect the difference between the facility’s posted speed limit and the free-flow speed (default = 5 mph), and
- \( L \) = segment length (ft).

The default value for UserAdj assumes that the facility’s free-flow speed between controlled intersections is 5 mph greater than the posted speed limit. The analyst may wish to choose an alternative assumption to better reflect local conditions.

Step 2: Calculate the Capacity of the Downstream Intersection

The capacity of the downstream intersection is calculated as follows:

\[
c = \frac{g/C \times N_{TH} \times s}{120}
\]

Equation 59

where

- \( c \) = capacity of the downstream intersection (veh/h),
- \( g/C \) = effective green ratio for the through movement (default = 0.45) (unitless),
- \( N_{TH} \) = number of through lanes on the segment.
$N_{TH} =$ number of through lanes, and
$s =$ saturation flow rate for the through movement (veh/h/ln).

**Step 3: Calculate the Volume-to-Capacity Ratio**

The volume-to-capacity ratio for the through movement $X$ is calculated as follows:

$$X = \frac{v_m}{c}$$

where

- $X =$ volume-to-capacity ratio for the through movement (unitless),
- $v_m =$ through movement volume along the segment (veh/h), and
- $c =$ capacity of the downstream intersection (veh/h).

**Step 4: Calculate the Control Delay**

The control delay $d$ in seconds per vehicle is determined either from the signalized intersection planning method (see Sections L5) or calculated as described herein.

The uniform delay $d_1$ is calculated using Equation 61.

$$d_1 = \frac{0.5C(1-g/C)^2}{1-[\min(1,X)(g/C)]}$$

where

- $d_1 =$ uniform delay for through vehicles (s/veh),
- $C =$ traffic signal cycle length (s),
- $g/C =$ effective green ratio for the through movement (unitless), and
- $X =$ volume-to-capacity ratio for the through movement (unitless).

The incremental delay $d_2$ is calculated as follows:

$$d_2 = 225 \left( X - 1 + \sqrt{(X - 1)^2 + \frac{16X}{cN_{TH}}} \right)$$

where

- $d_2 =$ incremental delay for through vehicles (s/veh),
- $X =$ volume-to-capacity ratio for the through movement (unitless),
- $c =$ capacity of the downstream intersection (veh/h), and
- $N_{TH} =$ number of through lanes.

The average control delay $d$ for through vehicles is calculated using Equation 63.

$$d = d_1 + d_2$$

where

- $d =$ average control delay for through vehicles (s/veh),
- $d_1 =$ uniform delay for through vehicles (s/veh),
- $PF =$ progression factor reflecting the quality of signal progression (unitless) from Exhibit 50, and
- $d_2 =$ incremental delay for through vehicles (s/veh).
Step 5: Calculate the Average Travel Speed and Determine Level of Service

The average travel time on the segment $T_T$ is calculated using Equation 64.

$$T_T = t_R + d$$

where

- $T_T =$ average through movement travel time (s),
- $t_R =$ running time (s), and
- $d =$ average control delay for through vehicles (s/veh).

The average travel speed on the segment $S_{T_{avg}}$ is calculated using Equation 65.

$$S_{T_{avg}} = \frac{3,600 \times L}{5,280 \times T_T}$$

where

- $S_{T_{avg}} =$ average travel speed for the through movement (mph),
- $L =$ segment length (ft), and
- $T_T =$ average though movement travel time (s).

A spreadsheet-based computational engine has been developed for use in computing each of the data elements. Worksheets for completing the calculations are provided in Exhibit 51.

Once the average speed is estimated, the level of service is looked up in Exhibit 52.

Extension to Oversaturated Conditions

Cases in which demand exceeds capacity are common in urban street networks, particularly when considering future planning scenarios. This condition is considered to be sustained when demand exceeds capacity over an entire analysis period, not just for one or two signal cycles. The condition is illustrated in Exhibit 53, where the arrival volume $v_1$ during the analysis period $t_1$ exceeds the capacity $c$ for the downstream intersection approach. During the second analysis period $t_2$, the arrival volume $v_2$ is sufficiently low such that the queue that formed during $t_1$ clears before the end of $t_2$. The area between the demand line and the capacity line represents the overflow delay experienced by all vehicles arriving during these two analysis periods. Each of the two analysis periods shown in Exhibit 53 represents a number of signal cycles.

In contrast, the delay resulting from the failure of an individual cycle (“the occasional overflow queue at the end of the green interval”) is accounted for by the $d_1$ term of the delay equation for signalized intersections and urban street segments. This condition is illustrated in Exhibit 54 where a queue exists for two cycles, but clears in the third cycle. The non-zero slope of the departure
Exhibit 51. Simplified urban street method worksheets.

### Simplified Urban Street Method, Input Data Worksheet

<table>
<thead>
<tr>
<th>Input Data</th>
<th>Direction 1 (EB/NB)</th>
<th>Direction 2 (WB/SB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through movement volume (v_{in}) (veh/h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of through lanes (N_{TH})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segment length (L) (ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posted speed limit (S_p) (mph)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Through move saturation flow rate (s) (veh/h/ln) (default = 1,900)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective green ratio (g/C) (default = 0.45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle length (C) (s) (default = 120)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progression quality (good, average, poor) (default = average)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis period (T) (h) (default = 0.25)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Simplified Urban Street Method, Calculation Worksheet

**Step 1. Running Time**

Running time (s): \(t_R = \frac{3,600 \times L}{5.280 \times (S_p + \text{UserAd})}\)

**Step 2. Capacity**

Capacity (veh/h): \(c = \frac{g/C \times N_{TH} \times s}{1}\)

**Step 3. Volume-to-Capacity Ratio**

Volume-to-capacity ratio: \(X = \frac{v_{in}}{c}\)

**Step 4. Control Delay**

Uniform delay (s): \(d_1 = \frac{0.5c(1 - g/C)^2}{1 - [\text{min}(1.0/X(1-g/C))]}\)

Incremental delay (s): \(d_2 = 225 \sqrt{(X - 1)^2 + \frac{16X}{cN_{TH}}}\)

Progression factor \(PF\): 0.70 (good), 1.00 (average), 1.25 (poor)

Control delay (s): \(d = d_1PF + d_2\)

**Step 5. Average Travel Speed**

Travel time (s): \(T_T = t_R + d\)

Travel speed (mph): \(S_{T,seg} = \frac{3,600 \times L}{5.280 \times T_T}\)

Note: EB = eastbound, NB = northbound, WB = westbound, SB = southbound.

Exhibit 52. Urban street LOS average speed thresholds.

<table>
<thead>
<tr>
<th>LOS</th>
<th>Base Free-Flow Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55</td>
</tr>
<tr>
<td>A</td>
<td>&gt;44</td>
</tr>
<tr>
<td>B</td>
<td>&gt;37</td>
</tr>
<tr>
<td>C</td>
<td>&gt;28</td>
</tr>
<tr>
<td>D</td>
<td>&gt;22</td>
</tr>
<tr>
<td>E</td>
<td>&gt;17</td>
</tr>
<tr>
<td>F</td>
<td>≤17</td>
</tr>
</tbody>
</table>


Notes: Entries are minimum average travel speeds (mph) for a given LOS.

The base free-flow speed is estimated as described in HCM Chapter 18, page 18-28, or can be approximated by adding 5 mph (or other appropriate adjustment) to the posted speed limit.

\(v/c = \text{volume-to-capacity ratio for the through movement in the analysis direction at the boundary intersection.}\)
line during the green interval is equal to the saturation flow rate. The slope of the capacity line is the product of the saturation flow rate and the green ratio. The condition shown in Exhibit 54 is not considered to be sustained oversaturation and is therefore not addressed by the method described in this section.

**Overview of the Method**

The urban street segment planning method for oversaturated conditions predicts the overflow delay that results when the demand volume on an urban street segment exceeds its capacity. The method also predicts the v/c ratio for the first analysis period. The method considers only the

**Exhibit 53.** Overflow delay when demand exceeds capacity over the analysis period.

**Exhibit 54.** Delay resulting when demand is less than capacity over the analysis period.
through traffic on the segment. The method considers a queue that may exist at the beginning of the analysis period, the queue that exists at the end of the analysis period, and the time that it takes for this queue to clear during a second analysis period. The framework for determining the effect of oversaturation in the urban street segment is shown in Exhibit 55.

**Limitations of the Method**

The method does not consider mid-section movements or turning movements at the downstream intersection. The method does not consider the operational impacts of the queue spillback that result from the oversaturated conditions. The method can be used to analyze oversaturated conditions that result from demand exceeding capacity during several analysis periods. However, during the final analysis period, the demand must be such that the queue clears during this period.

**Input Data Requirements**

The input data requirements for the method include the following nine parameters:

- Arrival volumes $v_1$ and $v_2$ (veh/h) for the through movement at the downstream intersection during analysis period 1 (the period of oversaturation) and analysis period 2 (the period when the queue clears);
- Analysis period duration $T$ (h);
- Segment length $L$ (ft);
- Initial queue $Q_0$ (veh) existing at the beginning of analysis period 1 for the through movement at the downstream intersection;
- Number of through lanes in the segment $N_{th}$;
- Saturation flow rate $s$ for the downstream signalized intersection (veh/h/ln); and
- Cycle length $C$ (s) and effective green ratio $g/C$ at the downstream signalized intersection.

Default values are assumed for four of these parameters:

- $T = 0.25$ h,
- $s = 1,900$ veh/h/ln,
- $C = 120$ s, and
- $g/C = 0.45$.

**Computational Steps**

The planning method for urban street segments during periods of oversaturation is a simplified version of the operational analysis method for urban street segments for oversaturated

---

**Exhibit 55. Oversaturated urban street segment planning method analysis framework.**
conditions described in HCM Chapter 30. The method includes nine steps, shown in Exhibit 56 and described below.

**Step 1: Calculate Queue Storage Capacity**

The queue storage capacity $Q_{cap}$ is the number of vehicles that can be stored in the segment, assuming an average vehicle length of 25 ft. The queue storage capacity is calculated as follows:

$$Q_{cap} = \frac{N_{TH} L}{25} \quad \text{Equation 66}$$

where

- $Q_{cap} =$ queue storage capacity (veh),
- $N_{TH} =$ number of through lanes in the subject direction, and
- $L =$ segment length (ft).

**Step 2: Calculate Available Queue Storage**

This step calculates the available queue storage $Q_a$ in the segment during analysis period 1 after accounting for any initial queue $Q_0$ that is present at the beginning of the analysis period. The available queue storage is calculated using Equation 67.

$$Q_a = Q_{cap} - Q_0 \quad \text{Equation 67}$$

where

- $Q_a =$ available queue storage capacity (veh) during analysis period 1,
- $Q_{cap} =$ queue storage capacity (veh), and
- $Q_0 =$ initial queue (veh) at the beginning of analysis period 1.
The available queue storage $Q_a$ is compared to the estimated maximum queue (computed later) to identify queue overflow problems.

**Step 3: Calculate Through Movement Capacity**

Equation 68 is used to calculate the capacity of the through movement $c_{TH}$ at the downstream signalized intersection.

$$c_{TH} = N_{TH} \left( \frac{g}{C} \right)$$  \hspace{1cm} \text{Equation 68}$$

where

- $c_{TH}$ = through movement capacity at the downstream signal (veh/h),
- $s$ = saturation flow rate for the through movement (veh/h),
- $g$ = effective green time for the through movement (s), and
- $C$ = traffic signal cycle length (s).

**Step 4: Calculate Volume-to-Capacity Ratio**

The volume-to-capacity ratio $X$ for the segment during analysis period 1 is calculated as follows:

$$X = \frac{v_1}{c_{TH}}$$  \hspace{1cm} \text{Equation 69}$$

where

- $X$ = volume-to-capacity ratio for the through movement (unitless),
- $v_1$ = arrival volume (veh/h) during analysis period 1, and
- $c_{TH}$ = through movement capacity at the downstream signal (veh/h).

**Step 5: Calculate Rate of Queue Growth**

This step calculates the rate of queue growth $r_{qg}$ during analysis period 1. If the through movement arrival volume $v_1$ is less than the capacity, no queue forms and this method is not needed. Equation 70 is used to calculate the rate of queue growth.

$$r_{qg} = v_1 - c_{TH} \geq 0.0$$  \hspace{1cm} \text{Equation 70}$$

where

- $r_{qg}$ = rate of queue growth (veh/h) during analysis period 1,
- $v_1$ = arrival volume (veh/h) during analysis period 1, and
- $c_{TH}$ = through movement capacity at the downstream signal (veh/h).

**Step 6: Calculate Queue Length**

The length of the queue $Q_{max}$ at the end of analysis period 1 is determined as follows:

$$Q_{max} = r_{qg} t_1$$  \hspace{1cm} \text{Equation 71}$$

where

- $Q_{max}$ = queue length (veh) at the end of analysis period 1,
- $r_{qg}$ = rate of queue growth (veh/h) during analysis period 1, and
- $t_1$ = duration of analysis period 1 (h).
**Step 7: Calculate Queue Clearance Rate**

The rate of queue clearance $r_{qc}$ during analysis period 2 is calculated as follows:

$$r_{qc} = c_{TH} - v_2$$  \hspace{1cm} \text{Equation 72}

where

- $r_{qc}$ = rate of queue clearance (veh/h) during analysis period 2,
- $c_{TH}$ = through movement capacity at the downstream signal (veh/h), and
- $v_2$ = arrival volume (veh/h) during analysis period 2.

**Step 8: Calculate Queue Clearance Time**

The time for the queue to clear depends on the length of the queue at the end of analysis period 1, the arrival volume during analysis period 2, and the capacity of the through movement for the downstream intersection. If the queue does not clear before the end of analysis period 2, the volumes during subsequent analysis periods must be considered and the queue clearance time calculation must be modified to account for this result. The queue clearance time $t_c$ is calculated using Equation 73.

$$t_c = \frac{r_{rg}t_1}{r_{qc}} + \frac{Q_{max}}{c_{TH} - v_2}$$  \hspace{1cm} \text{Equation 73}

where

- $t_c$ = queue clearance time (h),
- $r_{rg}$ = rate of queue growth (veh/h) during analysis period 1,
- $t_1$ = duration of analysis period 1 (h),
- $r_{qc}$ = rate of queue clearance (veh/h) during analysis period 2,
- $Q_{max}$ = queue length (veh) at the end of analysis period 1,
- $c_{TH}$ = through movement capacity at the downstream signal (veh/h), and
- $v_2$ = arrival volume (veh/h) during analysis period 2.

**Step 9: Calculate Oversaturated Delay**

The final step calculates the delay resulting from oversaturation $d_{sat}$. Exhibit 57 shows the queue accumulation polygon for oversaturated conditions in which a queue grows during analysis period 1 and clears during analysis period 2. The area of the polygon that is formed by these conditions is the delay resulting from the oversaturated conditions. The average delay per vehicle is calculated as follows:

$$d_{sat} = \frac{0.5(Q_{max} - Q_0)t_1 + 0.5v_1t_cQ_{max}}{v_1t_1 + v_2t_c}$$  \hspace{1cm} \text{Equation 74}

where

- $d_{sat}$ = delay resulting from oversaturation (s/veh),
- $Q_{max}$ = queue length at the end of analysis period 1 (veh),
- $Q_0$ = initial queue (veh) at the beginning of analysis period 1,
- $t_1$ = duration of analysis period 1 (h),
- $t_c$ = queue clearance time (h),
- $v_1$ = arrival volume (veh/h) during analysis period 1, and
- $v_2$ = arrival volume (veh/h) during analysis period 2.
Computational Tools

A spreadsheet has been developed for use in calculating each of the data elements. A worksheet for completing the calculations is provided as Exhibit 58.

7. Reliability Analysis

HCM Chapter 17 describes a method for estimating urban street reliability that is sensitive to demand variations, weather, incidents, and work zones. The Florida DOT has also developed a method for estimating reliability for urban streets (Elefteriadou et al. 2013). Both methods are data- and computationally intensive, requiring custom software to implement. As such, neither method is readily adaptable to a planning and preliminary application that could be programmed in a simple, static spreadsheet. Analysts wishing to perform a reliability analysis of urban streets should consult these sources.

8. Multimodal LOS

Bicycle, Pedestrian, and Transit LOS

The HCM provides methods for evaluating bicycle, pedestrian, and transit LOS on urban streets, which are described in Section O4.

Truck LOS

The HCM does not provide a truck LOS method. However, the truck LOS estimation procedure described in Section P can be used to estimate truck LOS for urban streets.

9. Example

Case Study 2 (Section U) provides an example application of the screening and simplified analysis methods described in this section.
### Exhibit 58. Oversaturated urban street segment planning method worksheet.

<table>
<thead>
<tr>
<th>Oversaturated Urban Street Segment Planning Method, Input Data Worksheet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Data</strong></td>
</tr>
<tr>
<td>Arrival volume, time period 1 $v_1$ (veh/h)</td>
</tr>
<tr>
<td>Arrival volume, time period 2 $v_2$ (veh/h)</td>
</tr>
<tr>
<td>Analysis period duration $T$ (h)</td>
</tr>
<tr>
<td>Segment length $L$ (ft)</td>
</tr>
<tr>
<td>Initial queue $Q_0$ (veh)</td>
</tr>
<tr>
<td>Number of through lanes $N_{TH}$</td>
</tr>
<tr>
<td>Through movement saturation flow rate $s$ (veh/h/in)</td>
</tr>
<tr>
<td>Effective green ratio $g/C$</td>
</tr>
<tr>
<td>Cycle length $C$ (s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oversaturated Urban Street Segment Planning Method, Calculation Worksheet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Queue Storage Capacity (veh)</strong></td>
</tr>
<tr>
<td>$Q_{cap} = \frac{N_{TH}L}{25}$</td>
</tr>
<tr>
<td><strong>Step 2: Available Queue Storage (veh)</strong></td>
</tr>
<tr>
<td>$Q_a = Q_{cap} - Q_0$</td>
</tr>
<tr>
<td><strong>Step 3: Capacity of Through Movement (veh/h)</strong></td>
</tr>
<tr>
<td>$c_{TH} = N_{TH}S \left(\frac{g}{C}\right)$</td>
</tr>
<tr>
<td><strong>Step 4: Volume-to-Capacity Ratio</strong></td>
</tr>
<tr>
<td>$X = \frac{v_1}{c_{TH}}$</td>
</tr>
<tr>
<td><strong>Step 5: Rate of Queue Growth (veh/h)</strong></td>
</tr>
<tr>
<td>$r_{qg} = v_1 - c_{TH} \geq 0.0$</td>
</tr>
<tr>
<td><strong>Step 6: Length of Queue (veh)</strong></td>
</tr>
<tr>
<td>$Q_{max} = r_{qg}t_1$</td>
</tr>
<tr>
<td><strong>Step 7: Rate of Queue Clearance (veh/h)</strong></td>
</tr>
<tr>
<td>$r_{qc} = c_{TH} - v_2$</td>
</tr>
<tr>
<td><strong>Step 8: Time of Queue Clearance (h)</strong></td>
</tr>
<tr>
<td>$t_c = \frac{r_{qg}t_1}{r_{qc}} = \frac{Q_{max}}{c_{TH} - v_2}$</td>
</tr>
<tr>
<td><strong>Step 9: Oversaturation Delay (s)</strong></td>
</tr>
<tr>
<td>$d_{sat} = \frac{0.5(Q_{max} - Q_0)t_1 + 0.5t_cQ_{max}}{v_1t_1 + v_2t_c}$</td>
</tr>
</tbody>
</table>

### 10. References


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O. Pedestrians, Bicyclists, and Public Transit

1. Overview

In addition to providing performance measures and computational methods for the motorized vehicle mode, the HCM also provides a variety of measures for pedestrians and bicycles on various types of on- and off-street facilities. The HCM also provides a transit LOS measure for evaluating on-street public transit service in a multimodal context. A sister publication, the *Transit Capacity and Quality of Service Manual (TCQSM)* (Kittelson & Associates et al. 2013), provides a variety of performance measures, computational methods, and spreadsheet tools to evaluate the capacity, speed, reliability, and quality of service of on- and off-street transit service.

The HCM’s pedestrian and bicycle performance measures focus on (1) the impacts of other facility users on pedestrians and bicyclists and (2) facility design and operation features under the control of a transportation agency. However, some analyses may also be interested in the effects of urban design on pedestrians’ and bicyclists’ potential comfort and enjoyment while using a facility. In those cases, additional measures, such as the Walkability Index (Hall 2010) or the Bicycle Environment Quality Index (San Francisco Department of Public Health 2009), could be appropriate.

This section is organized by HCM system element, providing guidance on applying the HCM and TCQSM’s pedestrian, bicycle, and transit methods to a planning and preliminary engineering study. As research has not yet been conducted to quantify the pedestrian and bicycle experience for all types of HCM system elements, not every mode is addressed in every subsection below.

2. Freeways

Pedestrians and Bicycles

In most cases, pedestrians and bicycles are prohibited on freeways; therefore, the operations and quality of service of these modes on freeways is not assessed. In some cases, a multiple-use path is provided within the freeway facility, with a barrier separating non-motorized and motorized traffic. In these situations, the pedestrian and bicycle facility should be analyzed as an off-street pathway (see Section O8). In situations where bicycles are allowed on freeway shoulders, the HCM provides no guidance on evaluating performance. It is not recommended to use the HCM’s multilane highway method for bicycles to evaluate bicycle quality of service on freeway shoulders, as the method was developed from urban street and suburban multilane highway data and has not been calibrated to freeway environments.
Transit

Buses operating on freeways in level terrain will generally operate at the same speed as other vehicular traffic, although buses designed to primarily operate on urban streets may not have the power to travel at higher freeway speeds (e.g., over 55 mph). In addition, buses designed to primarily operate on urban streets may have poor performance on steep grades—particularly when fully loaded with passengers—and are recommended to be evaluated as a truck in these cases. Buses designed for freeway travel (i.e., motor coaches designed for long-distance trips) generally do not experience these issues.

When bus routes stop along a freeway facility (e.g., at a stop or station in the freeway median or within a freeway interchange), the TCQSM can be consulted for guidance on estimating the delay associated with each stop. The TCQSM can also be consulted for performance measures for rail transit operating within a freeway right-of-way.

In general, buses operating on freeway facilities will experience the same conditions as other vehicles in the general purpose or managed lanes (where applicable) and could be assigned the same LOS as for motorized vehicle traffic generally. Alternatively, where buses stop along the freeway facility to serve passengers, the transit LOS measure for urban streets described in Section O4 could be applied to the stops along the freeway facility, with appropriate adjustments to the assumed average passenger trip length and baseline travel time rate, and considering the pedestrian LOS of the access route to the stop.

3. Multilane and Two-Lane Highways

Pedestrians

When pedestrian facilities exist along a multilane highway (e.g., a sidewalk along a multilane highway in a suburban area), the facility can be analyzed as an urban street pedestrian facility (see Section O4). However, if the pedestrian facility is separated from a multilane or two-lane highway by a barrier, or is generally located more than 35 feet away from the travel lanes, it should be analyzed as an off-street facility (see Section O8). Lower-speed two-lane highways (posted speeds of 45 mph or less) can be evaluated using the urban street pedestrian method (Section O4), whether or not a sidewalk exists. However, the HCM’s urban street pedestrian method is not calibrated for, and not recommended for use with, higher speed two-lane highways or multilane highways lacking sidewalks or sidepaths.

Bicycles

HCM Chapter 15 provides a method for evaluating bicyclist perceptions of quality of service along multilane and two-lane highways. The method generates a bicycle LOS score, which can be translated into a bicycle LOS letter or used on its own. Exhibit 97 lists the required data for this method and provides suggested default values.

Of the inputs listed in Exhibit 97, the LOS result is highly sensitive to shoulder width and heavy vehicle percentage and is somewhat sensitive to lane width and pavement condition (particularly very poor pavement).

The calculation of the bicycle LOS score is readily performed by hand, following the steps given in HCM Chapter 15, or can be easily set up in a spreadsheet.

Transit

The guidance presented above for transit operating on freeways (Section O2) is also applicable to multilane and two-lane highways.
4. Urban Streets

Pedestrians

The HCM provides three pedestrian performance measures for urban street segments and facilities: space (reflecting the density of pedestrians on a sidewalk); speed (reflecting intersection delays); and a pedestrian LOS score (reflecting pedestrian comfort with the walking environment).

Exhibit 98 lists the data required for these measures and provides suggested default values.

Calculating the pedestrian LOS score requires a number of inputs. Most of these can be defaulted, and the ones that cannot be defaulted are used by the urban street motorized vehicle LOS method. Given that different pedestrian design standards are typically used for different combinations of roadway functional classifications and area types, it is recommended that analysts develop sets of default values covering the most common combinations for their study area, based on typical local conditions or design standards.

Pedestrian space and speed are sensitive to effective sidewalk width, representing the portion of the sidewalk that is actually used by pedestrians. Common effective width reductions are 1.5 feet adjacent to the curb and 2.0 feet adjacent to a building face; Exhibits 24-8 and 24-9 in HCM Chapter 24, Off-Street Pedestrian and Bicycle Facilities, provide effective width reductions for many other types of objects (e.g., street trees, street light poles, bus stop shelters, café tables). The effective width used for analysis purposes should be based on the narrowest point of the sidewalk from an effective width standpoint. As the types of objects that create effective width reductions will vary depending on the sidewalk design (e.g., use of landscape buffers, street tree presence) and the adjacent land uses, it is recommended that analysts develop a set of local effective width default values that cover the most common situations.

The HCM provides a pedestrian LOS score (and associated LOS letter) for urban street links (between signalized intersections), segments (a link plus the downstream intersection), and facilities (multiple contiguous segments) that relates to pedestrian perceptions of quality of service for each element. The pedestrian LOS score uses the same scale as related bicycle and transit LOS scores for urban streets, and a related urban street automobile traveler perception score, which allows for multimodal analyses in which the relative quality of service of each travel mode can be evaluated and compared. At present, at a facility level, the HCM methodology only evaluates signalized urban streets, and not streets with all-way stops, roundabouts, or interchanges. However, the link methodology can be used to evaluate pedestrian facilities along any urban street section between intersections.

Exhibit 97. Required data for multilane and two-lane highway bicycle analysis.

<table>
<thead>
<tr>
<th>Input Data (units)</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed limit (mph)</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Directional automobile demand (veh/h)*</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Number of directional lanes</td>
<td>1 (two-lane highway), 2 (multilane highway)</td>
</tr>
<tr>
<td>Lane width (ft)*</td>
<td>12</td>
</tr>
<tr>
<td>Shoulder width (ft)*</td>
<td>6</td>
</tr>
<tr>
<td>Pavement condition rating (FHWA 5-point scale)</td>
<td>3.5 (good)</td>
</tr>
<tr>
<td>Percentage heavy vehicles (decimal)*</td>
<td>0.06**</td>
</tr>
<tr>
<td>Peak hour factor (decimal)*</td>
<td>0.88</td>
</tr>
<tr>
<td>Percent of segment with occupied on-highway parking</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Notes: See HCM Chapter 15 for definitions of the required input data.

*Also used by the multilane or two-lane highway LOS methods for motorized vehicles.

**HCM Chapter 26 provides state-specific default values.
As noted above, the pedestrian LOS methodology requires a number of input values, but most of these can be defaulted, particularly when local default values have been established for different combinations of roadway functional class and area type. The calculations can be performed by hand or (preferably when large numbers of segments will be evaluated) incorporated into a spreadsheet.

Equations in HCM Chapter 18, Urban Street Segments, are used to calculate a link LOS score. This score can be converted to a LOS letter and reported by itself, if the purpose of the analysis is to evaluate the pedestrian environment between intersections. Otherwise, the analyst can proceed to calculate a segment LOS score.

The segment LOS score combines the link LOS score and the signalized intersection LOS score (see Section O5), weighting the two scores by the relative amounts of time that pedestrians experience each element. It is calculated using HCM Equation 18-39. A roadway crossing difficulty factor also enters into this equation. This factor incorporates the lesser of the delays pedestrians experience when (1) trying to cross the street at an unsignalized midblock location (if legal), or (2) walking to the nearest traffic signal, crossing the street, and walking back on the other side of the street. The segment LOS score can be converted to a LOS letter and reported by itself (using HCM Exhibit 18-2), if the purpose of the analysis is to evaluate the pedestrian environment.
along a street segment, including intersection and street crossing effects. Otherwise, the analyst can proceed to calculate a facility LOS score.

The facility LOS score is calculated similarly to the segment LOS score, weighting the LOS scores of the individual links and signalized intersections that form the facility by the relative amounts of time that pedestrians experience each element. It is calculated using Equation 16-7 in HCM Chapter 16, Urban Street Facilities.

**Planning Procedure for Estimating Pedestrian LOS**

When pedestrian crowding and delays at signals are not a concern, then this procedure (adapted from the HCM segment method) can be used to quickly evaluate the pedestrian LOS for stretches of urban streets between signalized intersections. Signalized intersection effects, pedestrian density, and midblock roadway crossing difficulty are not considered in this procedure. For high pedestrian volume locations (over 1,000 pedestrians per hour), the HCM procedure for evaluating pedestrian space should be used.

The pedestrian segment LOS is determined by the perceived separation between pedestrians and vehicle traffic:

- Higher traffic speeds and higher traffic volumes reduce the perceived separation,
- Physical barriers and parked cars between motorized vehicle traffic and the pedestrians increase the perceived separation, and
- Sidewalks wider than 10 feet do not further increase the perceived separation.

The segment pedestrian LOS is calculated as follows:

\[
PLOS = -1.2276 \ln \left( f_{LV} \times W_T + 0.5 \times W_i + 0.5 \times \%OSP + f \times W_b + f_{SW} \times W_S \right) \\
+ \frac{0.0091V}{4N} + (0.0004 \times SPD^2) + 6.0468
\]

Equation 148

where

- \(PLOS\) = pedestrian level of service score for a segment (unitless),
- \(\ln\) = natural logarithm,
- \(f_{LV}\) = low volume factor (unitless) = 1.00 if \(V > 160\) veh/h and \((2.00 - 0.005V)\) otherwise,
- \(W_T\) = distance from the inner edge of the outside lane to the curb (ft) (see Exhibit 99),
- \(W_i\) = distance from the outer edge of the outside lane to the curb (ft) (see Exhibit 99).

**Exhibit 99. Measurement of widths for pedestrian LOS analysis.**
Vertical objects at least 3 feet tall, such as street trees, bollards, or concrete barriers, that are sufficiently dense to be perceived as a barrier are treated as barriers for the purposes of determining the buffer area coefficient \(f_b\).

The furnishings zone portion of a sidewalk (e.g., the area with street furniture, planters, and tree wells), such as often found in central business districts with wide sidewalks, is treated as part of the buffer strip width \(W_b\). In these cases, the portion of the sidewalk allocated to pedestrian circulation would be used to determine the sidewalk width \(W_{SW}\).

The pedestrian LOS method has not been designed or tested for application to rural highways and other roads where a sidewalk is not present and the traffic volumes are low but the speeds are high.

The PLOS score value is converted into a LOS letter using Exhibit 100.

Special Cases

This section gives guidance on the analysis of special cases.

Treatment of Sections with Significant Grades. The pedestrian LOS equations are designed for essentially flat grades (grades of under 2% of any length). For steeper grades, the analyst should consider applying an adjustment to the LOS estimation procedure to account for the negative impact of both upgrades and downgrades on pedestrian quality of service. This adjustment probably should be sensitive both to the steepness of the grade and its length. However, research available at the time this Guide was produced did not provide a basis for computing such an adjustment. The precise adjustment is left to the discretion of the analyst.

Pedestrian LOS and ADA Compliance. The Americans with Disabilities Act (ADA) sets various accessibility requirements for public facilities, including sidewalks on public streets. The United States Access Board (www.access-board.gov) has developed specific accessibility guidelines that apply to sidewalks and pedestrian paths.

Because pedestrian LOS is defined to reflect the average perceptions of the public, it is not designed to specifically reflect the perspectives of any particular subgroup of the public. Thus, the analyst

| Exhibit 100. Level of service, pedestrians on urban streets. |
|-----------------|-----------------|
| **PLOS Score**  | **LOS**         |
| ≤1.50           | A               |
| >1.50–2.50      | B               |
| >2.50–3.50      | C               |
| >3.50–4.50      | D               |
| >4.50–5.50      | E               |
| >5.50           | F               |

Source: Adapted from HCM (2016), Exhibit 18-2.
should use caution if applying the pedestrian LOS methodology to facilities that are not ADA com-
pliant. Pedestrian LOS is not designed to reflect ADA compliance or non-compliance, and therefore
should not be considered a substitute for an ADA compliance assessment of a pedestrian facility.

**Treatment of Street Sections with a Parallel Multiuse Path.** Pedestrian LOS for urban
streets applies to sidewalks and sidepaths located within 35 feet of the street (i.e., the distance
within which research has demonstrated that vehicular traffic influences pedestrians’ percep-
tions of quality of service). When a pedestrian pathway is located parallel to the street, but more
than 35 feet from the street, it should be evaluated as an off-street pathway (see Section 08).

**Treatment of Streets with Sidewalk on Only One Side.** The pedestrian LOS analysis for
both sides of the street proceeds normally. On one side, the sidewalk is evaluated. On the other
side, the pedestrian LOS is evaluated using a sidewalk width of 0 feet.

**Treatment of Discontinuous Sidewalks.** Segments with relatively long gaps (over 100 feet)
in the sidewalk should be split into sub-segments and the LOS for each evaluated separately.

The pedestrian LOS methodology is not designed to take into account the impact of short
gaps in sidewalk (under 100 feet). Until such a methodology becomes available, short gaps may
be neglected in the pedestrian LOS calculation. However, the analyst should report the fact that
there are gaps in the sidewalk in addition to reporting the LOS grade.

**Treatment of One-Way Traffic Streets.** The pedestrian LOS analysis proceeds normally for
both sides of the street, even when it is one-way. Note, however, that the lane and shoulder width
for the left-hand lane are used for the sidewalk on the left-hand side of the street.

**Treatment of Streets with Pedestrian Prohibitions or Sidewalk Closures.** If pedestrians
are prohibited from walking along the street by local ordinance or a permanent sidewalk closure,
then the pedestrian LOS is F. No pedestrian LOS computations are performed.

**Treatment of Streets with Frontage Roads.** In some cases a jurisdiction will provide front-
age roads to an urban street. There will usually be no sidewalks along the urban street, but there
will be sidewalks along the outside edge of each frontage road.

If the analyst has information indicating that pedestrians walk along the urban street without
the sidewalks, then the pedestrian LOS analysis should be performed for the urban street. If the
analyst has information indicating that pedestrians walk exclusively along the frontage roads,
then the pedestrian LOS analysis should be performed for the frontage roads.

**Treatment of Pedestrian Overcrossings.** The pedestrian LOS methodology is not designed
to account for pedestrian bridges, either across the urban street or along the urban street.

**Treatment of Railroad Crossings.** The pedestrian LOS methodology is not designed to
account for the impacts on pedestrian LOS of railroad crossings with frequent train traffic.

**Treatment of Unpaved Paths/Sidewalks.** The pedestrian LOS methodology is not designed
to account for unpaved paths in the urban street right-of-way. The analyst should use local
knowledge about the climate and the seasonal walkability of unpaved surfaces to determine
whether an unpaved surface can be considered as almost as good as a paved sidewalk for the
purpose of the pedestrian LOS computation. Otherwise the unpaved path should be considered
the same as no sidewalk for the purpose of pedestrian LOS computation.

**Treatment of Major Driveways.** The HCM pedestrian LOS method and the planning pro-
cedure presented here are not designed to address the impacts of high-volume driveways on the
pedestrian experience.
Bicycles

The HCM provides two bicycle performance measures for urban street segments and facilities: average travel speed (reflecting intersection delays) and a bicycle LOS score (reflecting bicyclist comfort with the bicycling environment). Exhibit 101 lists the data required for these measures and provides suggested default values.

As can be seen in Exhibit 101, calculating the bicycle LOS score requires a number of inputs. Most of these can be defaulted, and the ones that cannot be defaulted are used by the urban street motorized vehicle or pedestrian LOS methods. Given that different bicycle design standards are typically used for different combinations of roadway functional classifications and area types, it is recommended that analysts develop sets of default values covering the most common combinations for their study area, based on typical local conditions or design standards.

**Bicycle LOS Score**

The HCM provides a bicycle LOS score (and associated LOS letter) for urban street links (between signalized intersections), segments (a link plus the downstream intersection), and facilities (multiple contiguous segments) that relates to bicyclist perceptions of quality of service for each element. The bicycle LOS score uses the same scale as related pedestrian and transit LOS scores, and a related urban street automobile traveler perception score, which allows for multimodal analyses in which the relative quality of service of each travel mode can be evaluated and compared. At present, at a facility level, the HCM methodology only evaluates signalized urban streets and not streets with all-way stops, roundabouts, or interchanges. However, the link methodology can be used to evaluate bicycle facilities along any urban street section between intersections.

**Exhibit 101. Required data for urban street bicycle analysis.**

<table>
<thead>
<tr>
<th>Input Data (units)</th>
<th>For SPD</th>
<th>For BLOS</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle running speed (mph)</td>
<td>•</td>
<td></td>
<td>See Section O5 or use 10 (CBD), 22 (suburban)</td>
</tr>
<tr>
<td>Signalized intersection delay (s)</td>
<td>•</td>
<td>•</td>
<td>See Section O5 or use 10 (CBD), 22 (suburban)</td>
</tr>
<tr>
<td>Segment length (ft)*</td>
<td>•</td>
<td>•</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Bicycle lane width (ft)**</td>
<td>•</td>
<td></td>
<td>5 (if provided)</td>
</tr>
<tr>
<td>Outside lane width (ft)**</td>
<td>•</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Shoulder/parking lane width (ft)**</td>
<td>•</td>
<td></td>
<td>0 (curb and gutter only) 8 (parking lane provided)</td>
</tr>
<tr>
<td>Percentage of segment with occupied on-street parking (percent)**</td>
<td>•</td>
<td></td>
<td>0 (no parking lane) 50 (parking lane provided)</td>
</tr>
<tr>
<td>Pavement condition rating (1–5)</td>
<td>•</td>
<td></td>
<td>3.5 (good)</td>
</tr>
<tr>
<td>Curb presence (yes/no)**</td>
<td>•</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Median type (divided/undivided)**</td>
<td>•</td>
<td></td>
<td>Undivided</td>
</tr>
<tr>
<td>Number of travel lanes*</td>
<td>•</td>
<td></td>
<td>Must be provided</td>
</tr>
<tr>
<td>Directional vehicle volume (veh/h)*</td>
<td>•</td>
<td></td>
<td>Must be provided</td>
</tr>
<tr>
<td>Vehicle running speed (mph)*</td>
<td>•</td>
<td></td>
<td>See Section K6 or use the posted speed</td>
</tr>
<tr>
<td>Percentage heavy vehicles (%)</td>
<td>•</td>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>Access points on the right side (points/mi)</td>
<td>•</td>
<td></td>
<td>17 (urban arterial), 10.5 (suburban arterial), 30.5 (urban collector), 24 (suburban collector)</td>
</tr>
<tr>
<td>Intersection bicycle LOS score (unitless)</td>
<td>•</td>
<td></td>
<td>Calculated, see Section O5</td>
</tr>
</tbody>
</table>

Notes: See HCM Chapter 18 for definitions of the required input data.

SPD = speed, BLOS = bicycle level of service, CBD = central business district.

*Input data used by or calculation output from the HCM urban street motorized vehicle LOS method.

**Input data used by the HCM urban street pedestrian LOS method.
As noted, the bicycle LOS methodology requires a number of input values, but most of these can be defaulted, particularly when local default values have been established for different combinations of roadway functional class and area type. The calculations can be performed by hand or (preferably when large numbers of segments will be evaluated) incorporated into a spreadsheet.

Equations 18-41 through 18-44 in HCM Chapter 18, Urban Street Segments, are used to calculate a link LOS score. This score can be converted to a LOS letter and reported by itself, if the purpose of the analysis is to evaluate the bicycling environment between intersections. Otherwise, the analyst can proceed to calculate a segment LOS score.

The segment LOS score combines the link LOS score and the signalized intersection LOS score (see Section O5), weighting the two scores by the relative amounts of time that bicyclists experience each element. It is calculated using HCM Equation 18-46. The number of access points per mile on the right side of the road (e.g., driveways, unsignalized cross-streets) also enters into this equation as a factor that causes discomfort to bicyclists. The segment LOS score can be converted to a LOS letter and reported by itself (using HCM Exhibit 18-3), if the purpose of the analysis is to evaluate the bicycling environment along a street segment, including intersection and access point effects. Otherwise, the analyst can proceed to calculate a facility LOS score.

The facility LOS score is calculated similarly to the segment LOS score, weighting the LOS scores of the individual links and signalized intersections that form the facility by the relative amounts of time that bicyclists experience each element. It is calculated using Equation 16-10 in HCM Chapter 16, Urban Street Facilities.

Planning Procedure for Evaluating Bicycle LOS

If bicyclist perceptions of signalized intersections are not a significant concern, the following planning method (adapting the HCM segment LOS method) can be used to quickly assess bicycle LOS for a street. The segment bicycle LOS is calculated according to the following equation:

\[
BLOS = 0.507 \ln \left( \frac{V}{4N} \right) + (0.199 \times f_s \times [1 + 0.1038HV]^2) \\
+ \left( 7.066 \times \left( \frac{1}{PC} \right)^2 \right) - (0.005 \times W_p) + 0.760
\]

Equation 149

where

- \( BLOS \) = bicycle level of service score for a segment (unitless),
- \( \ln \) = natural logarithm,
- \( V \) = directional volume of vehicles in the direction closest to bicyclists (veh/h),
- \( N \) = number of through lanes of traffic in the direction closest to bicyclists,
- \( f_s \) = effective speed factor (unitless) = \((1.1199 \times \ln[5 - 20]) + 0.8103,\)
- \( HV \) = proportion of heavy vehicles in the motorized vehicle volume (%),
- \( PC \) = pavement condition rating, using FHWA’s five-point scale (1 = poor, 5 = excellent),
- \( W_e \) = average effective width of the outside through lane (ft) = \( W_v - (0.1 \times %OSP) \) if \( W_v < 4 \) and \( W_v + W_l - (0.2 \times %OSP) \) otherwise, with a minimum value of 0,
- \( W_v \) = effective width of the outside through lane as a function of traffic volume (ft) = \( W_f \) if \( V > 160 \) veh/h or the street is divided, and \( W_f \times (2 - 0.005V) \) otherwise,
- \( %OSP \) = percent of segment with occupied on-street parking (percent),
- \( W_p \) = width of the bicycle lane and paved shoulder (ft); a parking lane can only be counted as shoulder if 0% occupied (see Exhibit 102) and the gutter width is not included, and
$W_T = \text{width of the outside through lane, bicycle lane if present, and paved shoulder if present (ft); a parking lane can only be counted as shoulder if 0}\% \text{ occupied (see Exhibit 102) and the gutter width is not included.}$

If the traffic volume $V$ is less than 200 veh/h, the value of $HV$ must be less than or equal to 50\% to avoid unrealistically poor LOS results for the combination of low volume and high percentage of heavy vehicles.

Note that this method does not account for bicycle-to-bicycle interference and should not be used where bicycle flows are expected to be high enough that significant bicycle-to-bicycle interference occurs.

The bicycle LOS score is converted into a letter using Exhibit 103.

**Simplifications from the HCM**

The HCM method for estimating bicycle level of service for urban streets is documented in HCM Chapters 16 (Urban Street Facilities), 18 (Urban Street Segments), and 19 (Signalized Intersections). This Guide makes the following simplifications to the HCM method to improve its utility for planning applications:

- Intersection analysis and facility analysis are excluded,
- Estimation of bicycle speeds and delays is excluded,

---

**Exhibit 102. Widths used in bicycle LOS analysis.**

**Exhibit 103. Level of service, bicycles on urban streets.**

<table>
<thead>
<tr>
<th>BLOS Score</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤1.50</td>
<td>A</td>
</tr>
<tr>
<td>&gt;1.50–2.50</td>
<td>B</td>
</tr>
<tr>
<td>&gt;2.50–3.50</td>
<td>C</td>
</tr>
<tr>
<td>&gt;3.50–4.50</td>
<td>D</td>
</tr>
<tr>
<td>&gt;4.50–5.50</td>
<td>E</td>
</tr>
<tr>
<td>&gt;5.50</td>
<td>F</td>
</tr>
</tbody>
</table>

Source: Adapted from HCM (2016), Exhibit 18-3.
• Bicycle link LOS is used to characterize the segment (intersection plus link), and
• No provision is made for characterizing overall facility bicycle LOS.

For these features, the analyst must apply the HCM method as described in the HCM, applying default values as needed.

**Special Cases**

This section explains the evaluation of bicycle LOS for special cases.

**Treatment of Sections with Significant Grades.** The bicycle LOS equations are designed for essentially flat grades (grades of under 2% of any length). For steeper grades, the analyst should consider applying an adjustment to the LOS estimation procedure to account for the negative impact of both upgrades and downgrades on bicycle LOS. This adjustment probably should be sensitive both to the steepness of the grade and its length. However, research available at the time of production of this Guide did not provide a basis for computing such an adjustment. It is left to the discretion of the analyst.

**Treatment of Sections with Parallel Multiuse Path.** The bicycle LOS is computed separately for bicycles using the street and for bicycles using the parallel path. The bicycle LOS for the path is computed using the off-street path procedures described in Section O8.

**Treatment of Bus Lanes, Bus Streets, and High Bus Volumes.** The bicycle LOS methodology is not designed to adequately represent bicyclist perceptions of quality of service when they are operating on streets with frequent bus service with bus stops requiring bicyclists to move left to pass stopped buses. The analyst may choose to impose a weighting factor on the bus volume to better reflect the greater impact of the stopping buses on bicyclist LOS. The weighting factor would be at the analyst’s discretion.

**Treatment of Railroad Crossings and In-Street Tracks.** The LOS methodology is not designed to account for the impacts of railroad crossings and the presence of tracks in the street (which may constitute a crash risk for bicyclists traveling parallel to the tracks) on bicycle LOS. The analyst may choose to adjust the pavement condition factor to a lower value to reflect the impacts of parallel in-pavement tracks and railroad crossings on bicycle LOS.

**Transit**

The HCM provides a transit LOS score for urban streets that reflects passenger comfort as they walk to a bus stop, wait for a bus, and ride on the bus. In addition, the TCQSM (Kittelson & Associates et al. 2013) provides the most up-to-date methods for calculating bus capacities and estimating average bus speeds on urban streets. Exhibit 104 lists the data required for these measures and suggests default values.

The HCM’s transit LOS measure can be used to evaluate fixed-route transit service (e.g., bus, streetcar) that operates on the street and makes periodic stops to serve passengers. The TCQSM (Kittelson & Associates et al. 2013) can be used to evaluate the quality of service provided by other transit modes that travel within, above, or below the street right-of-way.

**Bus Capacity**

Bus capacity on an urban street is usually controlled by the capacity of the bus stops to accept and discharge buses. Bus capacity reflects the number of buses per hour that can serve the critical bus stop along a facility, at a desired level of reliability. The critical bus stop is typically the bus stop with the highest dwell time (i.e., serves the greatest number of passengers),
but a lower-passenger-volume stop with short green times for buses or that experiences high right-turning traffic volumes can also be the critical stop. Bus capacity is calculated using Equation 150 and Equation 151, adapted from the TCQSM:

\[
B = N_d f_{bh} \frac{3,600 (g / C)}{t_t + t_d (g / C) + Zc \cdot t_d} \tag{Equation 150}
\]

\[
f_{bh} = 1 - f_i \left( \frac{V_d}{c_d} \right) \tag{Equation 151}
\]

where

- \( B \) = bus capacity (bus/h),
- \( N_d \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- 3,600 = number of seconds in 1 hour,
- \( f_i \) = design failure rate (%)
- \( g/C \) = coefficient of variation of dwell times (decimal)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
- \( f_{bh} \) = traffic blockage adjustment factor (decimal),
- \( f_i \) = design failure rate (%)
- \( t_t \) = dwell time at critical stop (s)
- \( t_d \) = average dwell time along facility (s)
- \( Zc \) = number of loading areas at critical stop
- \( t \) = clearance time at critical stop (s)
- \( V_d \) = through traffic g/C ratio at critical stop (decimal) *
- \( c_d \) = curb lane v/c ratio at critical stop's intersection (decimal) *
- \( C \) = bus capacity (bus/h),
- \( N _ {el} \) = number of effective loading areas at a bus stop, from Exhibit 105,
Exhibit 105.  Efficiency of multiple loading areas at bus stops.

<table>
<thead>
<tr>
<th>Number of Physical Loading Areas</th>
<th>Bus Stop Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Online</td>
</tr>
<tr>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>1.75</td>
</tr>
<tr>
<td>3</td>
<td>2.45</td>
</tr>
<tr>
<td>4</td>
<td>2.65</td>
</tr>
<tr>
<td>5</td>
<td>2.75</td>
</tr>
</tbody>
</table>

Source: Adapted from TCQSM (Kittelson & Associates et al., 2013), Exhibit 6-63.
Note: Values are numbers of effective loading areas for a given number of physical loading areas.

$g/C = \text{ratio of effective green time to total traffic signal cycle length (decimal)},$
$t_c = \text{clearance time (s)},$
$\bar{t_d} = \text{average (mean) dwell time (s)},$
$Z = \text{standard normal variable corresponding to a desired failure rate, from Exhibit 106},$
$c_v = \text{coefficient of variation of dwell times (decimal)},$
$f_l = \text{bus stop location factor (decimal), from Exhibit 107},$
$v_{cl} = \text{curb lane traffic volume at intersection (veh/h), and}$
$c_{cl} = \text{curb lane capacity at intersection (veh/h)}.$

When more than one bus can use the critical bus stop at a time (i.e., more than one loading area is provided), the bus stop’s capacity will be greater than if only one loading area was provided. Exhibit 105 gives the number of effective loading areas for a given number of physical loading areas, for both online stops (buses stop in the travel lane) and offline stops (buses stop out of the travel lane).

Exhibit 106 provides values for $Z$, the standard normal variable, for different design failure rates—the percentage of time that a bus should arrive at a bus stop only to have to wait for other buses to finish serving their passengers before space opens up for the arriving bus to enter the stop. Capacity is maximized when a queue of buses exists to move into a bus stop as soon as other buses leave, but this situation causes significant bus delays and schedule reliability problems. Therefore, a lower design rate is normally used as an input for determining a design capacity, balancing capacity with operational reliability. However, the TCQSM’s method for estimating

Exhibit 106.  Values of $Z$ associated with given failure rates.

<table>
<thead>
<tr>
<th>Design Failure Rate</th>
<th>$Z$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0%</td>
<td>2.330</td>
</tr>
<tr>
<td>2.5%</td>
<td>1.960</td>
</tr>
<tr>
<td>5.0%</td>
<td>1.645</td>
</tr>
<tr>
<td>7.5%</td>
<td>1.440</td>
</tr>
<tr>
<td>10.0%</td>
<td>1.280</td>
</tr>
<tr>
<td>15.0%</td>
<td>1.040</td>
</tr>
<tr>
<td>20.0%</td>
<td>0.840</td>
</tr>
<tr>
<td>25.0%</td>
<td>0.675</td>
</tr>
</tbody>
</table>

Source: Adapted from TCQSM (Kittelson & Associates et al., 2013), Exhibit 6-56.
Bus Speed

Two options are provided for planning-level estimates of bus speeds along urban streets:

1. If only a planning estimate of bus speeds is desired, then Option 1 can be followed. This option requires less data and is faster to calculate. It accounts for traffic and traffic signal delays in a generalized way.

2. If it is desired to estimate both automobile and bus speeds, then Option 2 can be followed. This option applies the same basic method used for automobiles, but makes adjustments to reflect (a) overlapping signal delay time and bus dwell time to serve passengers, (b) bus delays waiting to re-enter the traffic stream, and (c) bus congestion at bus stops when more than half of the facility’s bus capacity is being used.

Option 1: Generalized Bus Speed Method. This option is based on the TCQSM’s bus speed estimation method. In this option, bus speeds are calculated in four steps. First, an unimpeded bus speed is calibrated to maximum capacity and therefore uses a 25% (maximum practical) failure rate in its calculation.

The location of the critical bus stop relative to the nearest intersection and the ability of buses to avoid right-turning traffic also influence capacity. Exhibit 107 gives values for the bus stop location factor $f_l$ used in Equation 151.

The curb lane capacity can be estimated using the procedure given in Section L4 or estimated from Exhibit 108, for a given combination of $g/C$ ratio (effective green time divided by the traffic signal cycle length) and conflicting pedestrian volume for right turns.
bus travel time rate, in minutes per mile, is calculated for the condition in which a bus moves along a street without traffic or traffic signal delays, with the only source of delay being stops to serve passengers. Second, additional delays due to traffic and traffic signals are estimated. Third, the bus travel time rate is converted to an equivalent speed. Finally, the speed is reduced to reflect the effects of bus congestion.

**Step 1: Unimpeded Bus Travel Time Rate.** The unimpeded bus travel time rate is based on the posted speed, the number of stops per mile, the average dwell time per stop, and typical bus acceleration and deceleration rates. It is based on the delay experienced with each bus stop (deceleration, dwell time, and acceleration) and the time spent traveling at the bus’s running speed (typically the posted speed) between stops. It is calculated using Equation 152 through Equation 157:

\[
t_u = \frac{t_r + N_s(t_d + t_{acc} + t_{dec})}{60}
\]

Equation 152

\[
t_r = \frac{L_{un}}{1.47v_{run}}
\]

Equation 153

\[
L_{un} = 5,280 - N_sL_{ad} \geq 0
\]

Equation 154

\[
L_{ad} = 0.5at_{dec} + 0.5dt_{dec}^2
\]

Equation 155

\[
t_{acc} = \frac{1.47v_{run}}{a}
\]

Equation 156

\[
t_{dec} = \frac{1.47v_{run}}{d}
\]

Equation 157

where

- \( t_u \) = unimpeded running time rate (min/mi),
- \( t_r \) = time spent at running speed (s/mi),
- \( N_s \) = average stop spacing (stops/mi),
- \( t_d \) = average dwell time of all stops within the section (s/stop),
- \( t_{acc} \) = acceleration time per stop (s/stop),
- \( t_{dec} \) = deceleration time per stop (s/stop),
- 60 = number of seconds per minute,
- \( L_{un} \) = distance traveled at running speed per mile (ft/mile),
- 1.47 = conversion factor (5,280 ft/mi/3,600 s/h),
- \( v_{run} \) = bus running speed on the facility (typically the posted speed) (mph),
- \( L_{ad} \) = distance traveled at less than running speed per stop (ft/stop),
- \( a \) = average bus acceleration rate to running speed (ft/s²), and
- \( d \) = average bus deceleration rate from running speed (ft/s²).

If the calculated length traveled at running speed in Equation 155 is less than zero, the bus cannot accelerate to the input running speed before it must begin decelerating to the next stop. In this case, the calculation sequence must be performed again with a lower running speed selected. The maximum speed that can be reached before the bus has to begin decelerating again can be computed using Equation 158 and Equation 159; however, the analyst may wish to choose a lower speed to reflect that bus drivers will typically cruise at a constant speed for some distance between stops, rather than decelerating immediately after accelerating.
Equation 158

\[ t_{acc,dc} = \frac{5,280/N_s}{0.5a + \frac{a^2}{d}} \]

Equation 159

\[ v_{max} = \frac{a \times t_{acc,dc}}{1.47} \]

where

\[ t_{acc,dc} = \text{distance-constrained acceleration time (s)}, \]
\[ N_s = \text{average stop spacing (stops/mi)}, \]
\[ a = \text{bus acceleration rate (ft/s}^2), \]
\[ d = \text{bus deceleration rate (ft/s}^2), \]
\[ v_{max} = \text{maximum speed achievable between stops (mph)}. \]

**Step 2: Additional Bus Travel Time Delays.** Next, additional bus travel time delays \( t_l \) (in minutes per mile) are estimated directly from Exhibit 109, using the bus facility type, traffic signal progression quality, and area type as inputs.

**Step 3: Base Bus Speed.** The unimpeded bus travel time rate from Step 1 and the additional bus travel time delays from Step 2 are added together to obtain a base bus travel time rate \( t_r \), which is then converted into a base bus speed \( S_b \):

\[ t_r = t_u + t_l \]

Equation 160

\[ S_b = \frac{60}{t_r} \]

Equation 161

where

\[ t_r = \text{base bus running time rate (min/mi)}, \]
\[ t_u = \text{unimpeded running time rate (min/mi)}, \]
\[ t_l = \text{additional running time losses (min/mi)}, \]
\[ 60 = \text{number of minutes in an hour}, \]
\[ S_b = \text{base bus speed (mph)}. \]

**Step 4: Average Bus Speed.** When at least half of a facility’s maximum bus capacity is scheduled, bus congestion at bus stops reduces bus speeds below the base speed calculated in Step 3. The amount of this speed reduction is given by the bus–bus interference factor \( f_{bb} \), which can be

---

Exhibit 109. Estimated bus running time losses on urban streets \( t_l \) (min/mi).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Bus Lane</th>
<th>Bus Lane, No Right Turns</th>
<th>Bus Lane With Right-Turn Delays</th>
<th>Bus Lanes Blocked by Traffic</th>
<th>Mixed Traffic Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CENTRAL BUSINESS DISTRICT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical</td>
<td></td>
<td>1.2</td>
<td>2.0</td>
<td>2.5–3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Signals set for buses</td>
<td></td>
<td>0.6</td>
<td>1.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signals more frequent than bus stops</td>
<td></td>
<td>1.75</td>
<td>2.75</td>
<td>3.25</td>
<td>3.75</td>
</tr>
<tr>
<td><strong>ARTERIAL ROADWAYS OUTSIDE THE CBD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical</td>
<td></td>
<td>0.7</td>
<td></td>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

Source: Adapted from TCQSM (Kittelson & Associates et al., 2013), Exhibit 6-73.
estimated from Exhibit 110. The input to this exhibit is the bus volume–to–maximum capacity ratio, where maximum bus capacity is estimated by using a 25% failure rate in Exhibit 106 when determining the value of the standard normal variable $Z$ used in the bus capacity equation (Equation 150). Under typical conditions and if bus stops can only serve one bus at a time (i.e., one loading area per stop), at least 10–15 buses per hour need to be scheduled before bus speeds are affected.

Equation 162 is used to estimate the average bus speed on the urban street facility.

$$S_{bus} = S_b f_{bb}$$  \hspace{1cm} \text{Equation 162}$$

where

- $S_{bus} =$ average bus speed along facility (mph),
- $S_b =$ base bus speed (mph), and
- $f_{bb} =$ bus–bus interference factor (decimal).

**Option 2: Modified Auto Speed Method.** This option modifies the auto speed estimation method for urban street segments with signalized intersections (see Section K6) to reflect additional delays experienced by buses and to account for potentially overlapping traffic signal delay and dwell time delay.

The auto equation for estimating segment travel time is modified as follows for buses:

$$T_{i, bus} = \frac{5,280 FFS}{3,600 L_i} + d + d_{mb} + d_{bs}$$  \hspace{1cm} \text{Equation 163}$$

where

- $T_{i, bus} =$ base bus travel time for segment $i$ (s),
- $FFS =$ midblock free-flow speed (mph),
- 5,280 = number of feet per mile,
- 3,600 = number of seconds per hour,
- $L_i =$ distance from upstream intersection stop bar to downstream intersection stop bar for segment $i$ (ft),
- $d =$ average control delay (s),
- $d_{mb} =$ midblock bottleneck delay (if any) (s), and
- $d_{bs} =$ total bus stop delay in the segment (s).
Total bus stop delay in the segment is calculated as follows:

\[ d_{bs} = N_s (t_{dt} + t_{acc} + t_{dec} + t_{re}) \]

Equation 164

where

- \( d_{bs} \) = total bus stop delay in the segment (s),
- \( N_s \) = number of bus stops in the segment (stops),
- \( t_{dt} \) = average dwell time per stop (s/stop),
- \( t_{acc} \) = bus acceleration time per stop (s/stop),
- \( t_{dec} \) = bus deceleration time per stop (s/stop),
- \( t_{re} \) = average re-entry delay per stop (s/stop) = \( t_{cl} - 10 \), and
- \( t_{cl} \) = average clearance time per stop (s/stop).

When applying Equation 164, the number of bus stops in the segment includes all mid-block stops and any bus stop associated with the downstream intersection (even if far-side and technically located in the next segment). Similarly, any bus stop associated with the upstream intersection is excluded from the count of bus stops.

Average bus speed in the segment is calculated as follows:

\[ S_{i,\text{bus}} = \frac{3,600 L_i}{5,280 T_{i,\text{bus}}} f_{ib} \]

Equation 165

where

- \( S_{i,\text{bus}} \) = average bus speed for segment \( i \) including all delays (mph),
- \( L_i \) = distance from upstream intersection stop bar to downstream intersection stop bar for segment \( i \) (ft),
- \( T_{i,\text{bus}} \) = base bus travel time for segment \( i \) (s), and
- \( f_{ib} \) = bus–bus interference factor (decimal) from Exhibit 110.

Average facility bus speed is calculated as follows:

\[ S_{\text{bus}} = \frac{3,600 \sum L_i}{5,280 \sum T_{i,\text{bus}}} \]

Equation 166

where

- \( S_{\text{bus}} \) = average bus speed along facility (mph),
- \( L_i \) = distance from upstream intersection stop bar to downstream intersection stop bar for segment \( i \) (ft),
- 5,280 = number of feet per mile,
- 3,600 = number of seconds per hour,
- \( T_{i,\text{bus}} \) = base bus travel time for segment \( i \) (s).

**Transit LOS Score**

The HCM provides a transit LOS score (and associated LOS letter) for urban street segments (a link plus the downstream intersection) and facilities (multiple contiguous segments). The segment score relates to transit passengers’ experiences walking to or from bus stops in the segment, waiting for buses at bus stops in the segment, and riding on buses within the segment. The transit LOS score uses the same scale as related pedestrian and bicycle LOS scores, and a related auto traveler perception score, allowing for multimodal analyses in which the relative quality of service of each travel mode can be evaluated and compared to each other. The calculations
can be performed by hand or (preferably when large numbers of segments will be evaluated) incorporated into a spreadsheet.

HCM Equations 18-56 through 18-63 are used to calculate a link LOS score. This score can be converted to a LOS letter and reported by itself (using HCM Exhibit 18-3), if the purpose of the analysis is to evaluate transit conditions within a segment. Otherwise, a facility score is calculated by weighting the LOS scores of the individual segments that form the facility by the relative length of each segment. It is calculated using HCM Equation 16-13.

The transit LOS score is particularly sensitive to the bus frequency provided as an input, and is somewhat sensitive to the average bus speed and passenger load factor provided as inputs.

The HCM transit LOS score computations can be applied without change using defaults as needed. Alternatively, the transit LOS score computation steps shown below provide a few simplifications on the HCM procedure for planning applications.

\[
TLOS = 6.0 - (1.50 \times s_{w-r}) + (0.15 \times PLOS)
\]

\[\text{Equation 167}\]

where

\[
TLOS = \text{transit LOS score (unitless)},
\]

\[
s_{w-r} = \text{transit wait and ride score (unitless)}, \quad \text{and}
\]

\[
PLOS = \text{pedestrian LOS score (unitless)}.
\]

The computed transit LOS score is converted to an LOS letter using the equivalencies given in Exhibit 111.

**Pedestrian LOS Estimation.** The pedestrian LOS score for the urban street is estimated using the pedestrian LOS model described earlier in this section. Better PLOS values (i.e., LOS A-C) improve the TLOS score relative to what it would be if only transit factors were considered, while worse PLOS values (i.e., LOS D-F) reduce the TLOS score.

**Transit Wait-Ride Score Estimation.** The transit wait–ride score is a function of a bus headway factor \(f_h\) that reflects the multiplicative change in ridership along a route at a given headway, relative to the ridership at 60-minute headways, and a perceived travel time factor \(f_{prr}\) that reflects the multiplicative change in ridership along a route at a given perceived travel time rate (PTTR), relative to the ridership at a baseline travel time rate (BTTR). The suggested baseline travel time rate is 4 min/mi (15 mph), except in the central business districts of metropolitan areas with over 5 million population, in which case it is 6 min/mi (10 mph). (These values can be adjusted by the analyst to reflect local passenger expectations of travel speeds.) Equation 168 shows the calculation of the transit wait-ride score.

---

**Exhibit 111. Level of service, transit on urban streets.**

<table>
<thead>
<tr>
<th>TLOS Score</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤2.00</td>
<td>A</td>
</tr>
<tr>
<td>&gt;2.00–2.75</td>
<td>B</td>
</tr>
<tr>
<td>&gt;2.75–3.50</td>
<td>C</td>
</tr>
<tr>
<td>&gt;3.50–4.25</td>
<td>D</td>
</tr>
<tr>
<td>&gt;4.25–5.00</td>
<td>E</td>
</tr>
<tr>
<td>&gt;5.00</td>
<td>F</td>
</tr>
</tbody>
</table>

Source: Adapted from HCM (2016), Exhibit 18-3.

---
Planning and Preliminary Engineering Applications Guide to the Highway Capacity Manual

\[ s_{w-r} = f_h \times f_{ptt} \]  
\phantom{=} \text{Equation 168}

where

\[ s_{w-r} = \text{transit wait–ride score (unitless)}, \]
\[ f_h = \text{headway factor (unitless), and} \]
\[ f_{ptt} = \text{perceived travel time factor (unitless)}. \]

The headway factor calculation incorporates assumed ridership elasticities that relate the percentage change in ridership to the percentage change in bus headways. Only the buses and bus routes that actually stop to pick up or drop off passengers within the study section of the street should be included in determining the average bus headway on the street. Express bus service without at least one bus stop on the street would be excluded. Equation 169 is used to calculate the headway factor.

\[ f_h = 4 \times \exp(-0.0239h) \]  
\phantom{=} \text{Equation 169}

where

\[ f_h = \text{headway factor (unitless), and} \]
\[ h = \text{average number of minutes between buses}. \]

**Perceived Travel Time Factor.** The perceived travel time factor calculation incorporates assumed ridership elasticities that relate the percentage change in ridership to the percentage change in the perceived travel time rate. The perceived travel time rate, in turn, is a function of actual bus speeds (travel time rates) and factors that have been found to make the time spent waiting for or riding on the bus seem longer than the actual time. These factors include late bus arrivals; provision of shelters, benches, or both at bus stops; and crowding on board the bus. The perceived travel time factor is calculated using Equation 170 through Equation 172.

\[ f_{ptt} = \left( \frac{(e-1)BTTR - (e+1)PTTR}{(e-1)PTTR - (e+1)BTTR} \right) \]  
\phantom{=} \text{Equation 170}

\[ PTTR = (a_1 \times IVTTR) + (a_2 \times EWTR) - ATR \]  
\phantom{=} \text{Equation 171}

\[ IVTTR = \frac{60}{s_{bus}} \]  
\phantom{=} \text{Equation 172}

where

\[ f_{ptt} = \text{perceived travel time factor (unitless)}, \]
\[ e = \text{ridership elasticity with respect to changes in the travel time rate (unitless), default } = -0.40, \]
\[ BTTR = \text{baseline travel time rate (min/mi), default } = 6 \text{ for the central business district of metropolitan areas with populations of 5 million or greater, and 4 otherwise,} \]
\[ PTTR = \text{perceived travel time rate (min/mi),} \]
\[ a_1 = \text{travel time perception coefficient for passenger load (unitless) } = 1.00 \text{ when 80\% or fewer of seats are occupied, 1.19 when all seats are occupied, and 1.42 with a standing load equal to 25\% of the seating capacity; HCM Equation 18-59 can also be used,} \]
\[ IVTTR = \text{in-vehicle travel time rate (min/mi),} \]
\[ a_2 = \text{travel time perception coefficient for excess wait time (unitless), default } = 2.0, \]
\[ EWTR = \text{excess wait time rate (min/mi) } = \text{(average wait for buses beyond the scheduled arrival time)/(average passenger trip length), default } = 0.8, \text{ and} \]}
\[ ATR = \text{amenity time rate (min/mi)} = \frac{\text{(perceived wait time reduction due to bus stop amenities)}}{\text{(average passenger trip length)}}; \text{default} = 0.1 \text{ (bench provided), 0.3 (shelter only), and 0.4 (shelter and bench).} \]

When field measurement of average bus speeds along the street is not feasible, the in-vehicle travel time rate can be estimated from the bus schedule as the travel time between timepoints on either side of the study section, divided by the on-street distance between the timepoints. The bus speed estimation procedure presented earlier can also be used.

The excess wait time is the average difference between the scheduled and actual arrival times for buses at the timepoint prior to the study section. For example, if buses arrive 3 minutes behind schedule on average at the timepoint, the excess wait time is 3 minutes. An early arrival at the timepoint without a corresponding early departure is treated as 0 minutes of excess wait time, but an early arrival combined with an early departure is counted as being one headway late.

**Special Cases.** This section gives guidance on the analysis of special cases.

**Gaps in Transit Service.** The portions of street where there is no transit service should be split into their own segments for the purpose of transit LOS analysis (if not already split for other reasons). The transit LOS should be set at F for these segments. The rest of the transit LOS analysis proceeds normally, with the overall transit LOS being a length-weighted average including the segments with no transit service.

**No Through Transit Service for the Full Length of the Study Facility.** The TLOS score is measured on a segment-by-segment basis and reflects in part actions that a roadway agency can take to improve bus speeds. It also reflects the amount of bus service provided within a given segment. It can be compared on a segment-by-segment basis to the LOS scores available for other travel modes, reflecting the quality of service provided within that segment. In this respect, it does not measure origin–destination service quality for transit passengers. Therefore, by default, no adjustment is made to the score if passengers would need to transfer from one route to another to make a complete trip through the study facility.

However, if the analyst is interested in measuring origin–destination service quality along a facility, one option would be to calculate the TLOS score as described above, but (1) double the assumed average trip length to reflect the linked (i.e., involving a transfer) trip, and (2) add a perceived transfer time rate equal to the average transfer time multiplied by a perceived waiting time factor (suggested default = 2) and divided by the average trip length.

**Single-Direction Transit Service on a Two-Way Street.** The direction of travel for which there is no transit service is assigned transit LOS F. The other direction of travel is evaluated normally.

**Bus Lanes and Bus Streets.** The methodologies are not specifically designed to handle bus streets and bus lanes, but with some judicious adjustments, they can be adapted to these special situations.

In the case of bus streets, the auto LOS is, by definition, LOS F (since autos cannot access this street). The transit, bicycle, and pedestrian LOS are computed normally, with transit vehicles being the only motorized vehicles on the street.

In the case of bus lanes, the auto, transit, bicycle, and pedestrian LOS analyses proceed normally. The only difference is that only transit vehicles (and carpools, if allowed) are assigned to the bus lane.
Simplifications from the HCM

The HCM method for estimating transit level of service for urban streets is documented in HCM Chapters 16 (Urban Street Facilities), 18 (Urban Street Segments), and 19 (Signalized Intersections). The transit LOS method presented above makes the following simplifications to the HCM method to improve its utility for planning applications:

- Bus running speeds are based solely on bus acceleration and deceleration characteristics rather than on motor vehicle running speeds (which are discounted in the HCM for midblock interference along the street segment).
- Bus stop delay is not adjusted for the location of the bus stop (e.g., near-side or far-side).
- Bus stop re-entry delay is not computed.
- Default values are provided for the $a_1$ passenger load travel time perception factor in lieu of the HCM equation that uses the exact passenger load as an input.
- A default value of 3 minutes excess wait time was used in lieu of computing it from on-time arrival statistics.

To take full advantage of these features the analyst must apply the HCM method as described in HCM Chapter 18, applying defaults as needed.

5. Signalized Intersections

Pedestrians

The HCM provides two pedestrian performance measures suitable for planning analyses of signalized intersections: average pedestrian delay and a pedestrian LOS score that reflects pedestrian comfort while crossing an intersection. Exhibit 112 lists the data required for these measures.

Exhibit 112. Required data for signalized intersection pedestrian analysis.

<table>
<thead>
<tr>
<th>Input Data (units)</th>
<th>Used By</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic signal cycle length (s)*</td>
<td>•</td>
<td>60 (CBD), 120 (suburban)</td>
</tr>
<tr>
<td>Major street walk time (s)</td>
<td>•</td>
<td>See Section L or use 19 (CBD), 31 (suburban), 7 (minimum)</td>
</tr>
<tr>
<td>Minor street walk time (s)</td>
<td>•</td>
<td>See Section L or use 19 (CBD), 7 (suburban), 7 (minimum)</td>
</tr>
<tr>
<td>Number of lanes crossed on minor street crosswalk*</td>
<td>•</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Number of channelizing islands crossed on minor street crosswalk</td>
<td>•</td>
<td>0</td>
</tr>
<tr>
<td>15-minute volume on major street (veh)*</td>
<td>•</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Number of major street through lanes in the direction of travel*</td>
<td>•</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Mid-block 85th percentile speed on major street (mph)</td>
<td>•</td>
<td>Posted speed limit</td>
</tr>
<tr>
<td>Right-turn on red flow rate over the minor street crosswalk (veh/h)</td>
<td>•</td>
<td>0 (right turns on red prohibited)</td>
</tr>
<tr>
<td>Permitted left-turn volume over the minor street crosswalk (veh/h)</td>
<td>•</td>
<td>0 (protected left-turn phasing)</td>
</tr>
</tbody>
</table>

Notes: See HCM Chapter 19 for definitions of the required input data.

**DEL = delay, PLOS = pedestrian level of service, CBD = central business district.**

*Input data used by or calculation output from the HCM urban street automobile LOS method.
sures and provides suggested default values. The HCM also provides calculation methods for assessing intersection corner circulation area and crosswalk circulation area, but these typically require more detailed data than would be available for a planning analysis.

**Pedestrian Delay**

Average pedestrian delay for a given signalized crosswalk is calculated as follows:

\[ d_p = \frac{(C - g_{\text{walk}})^2}{2C} \]

Equation 173

where

- \( d_p \) = average pedestrian delay (s),
- \( C \) = cycle length (s), and
- \( g_{\text{walk}} \) = effective walk time for the crosswalk (s).

**Pedestrian LOS Score**

The HCM provides a method (Equations 19-71 through 19-76 in Chapter 19, Signalized Intersections) for calculating a pedestrian LOS score (and associated LOS letter using HCM Exhibit 19-9) for signalized intersections. This score can be used on its own or integrated into the urban street pedestrian LOS procedures. Most of the method’s inputs are required by the auto LOS method for signalized intersections or can be defaulted. An exception is the right-turn-on-red flow rate over the crosswalk being analyzed. The LOS score is sensitive to this input and a wide range of values are possible. The HCM recommends developing local default values for this variable for use in planning analyses.

**Bicycles**

The HCM provides two bicycle performance measures for signalized intersections: average bicycle delay and a bicycle LOS score that reflects bicyclist comfort while crossing an intersection. Exhibit 113 lists the data required for these measures and provides suggested default values.

**Exhibit 113. Required data for signalized intersection bicycle analysis.**

<table>
<thead>
<tr>
<th>Input Data (units)</th>
<th>Used By</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic signal cycle length (s)*</td>
<td>DEL</td>
<td>60 (CBD), 120 (suburban)</td>
</tr>
<tr>
<td>Effective green time for bicycles (s)</td>
<td>BLOS</td>
<td>Effective green time for parallel through automobile traffic*</td>
</tr>
<tr>
<td>15-minute bicycle flow rate (bicycles/h)</td>
<td>DEL</td>
<td>Must be provided</td>
</tr>
<tr>
<td>15-minute automobile flow rate (veh/h)*</td>
<td>BLOS</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Cross street width (ft)</td>
<td></td>
<td>Must be provided</td>
</tr>
<tr>
<td>Bicycle lane width (ft)</td>
<td></td>
<td>5 (if provided)</td>
</tr>
<tr>
<td>Outside lane width (ft)*</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Shoulder/parking lane width (ft)</td>
<td></td>
<td>1.5 (curb and gutter only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 (parking lane provided)</td>
</tr>
<tr>
<td>Percentage of intersection approach and departure with occupied on-street parking (decimal)</td>
<td></td>
<td>0.00 (no parking lane)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.50 (parking lane provided)</td>
</tr>
<tr>
<td>Number of parallel through lanes (shared or exclusive)*</td>
<td></td>
<td>Must be provided</td>
</tr>
</tbody>
</table>

Notes: See HCM Chapter 19 for definitions of the required input data.

DEL = delay, BLOS = bicycle level of service, CBD = central business district.

*Input data used by or calculation output from the HCM urban street automobile LOS method.
**Bicycle Delay**

When bicyclists share the lane with automobile traffic, bicyclist delay is the same as automobile delay and can be calculated using Equation 97 (see Section L5). When bicyclists have their own lane, bicycle delay is calculated as follows:

\[
d_{b} = \frac{0.5C(1-g_{b}/C)^{2}}{1 - \min \left( \frac{v_{bic}}{c_{b}}, 1.0 \right) \frac{g_{b}}{C}}
\]

Equation 174

\[
c_{b} = s_{b} \frac{g_{b}}{C}
\]

Equation 175

where

- \(d_{b}\) = average bicycle delay (s),
- \(g_{b}\) = effective green time for the bicycle lane (s),
- \(C\) = cycle length (s),
- \(v_{bic}\) = bicycle flow rate (bicycles/h),
- \(c_{b}\) = bicycle lane capacity (bicycles/h), and
- \(s_{b}\) = bicycle lane saturation flow rate (bicycles/h) = 2,000.

**Bicycle LOS Score**

The HCM provides a method (Equations 19-79 through 19-82) for calculating a bicycle LOS score (and associated LOS letter using HCM Exhibit 19-9) for signalized intersections. This score can be used on its own or integrated into the urban street bicycle LOS procedures. Most of the method’s inputs are required by the auto LOS method for signalized intersections or can be defaulted.

**Transit**

The HCM does not provide a transit LOS score for signalized intersections; the impacts of signalized intersections on bus speeds are incorporated into the segment and facility LOS scores (see Section O4).

### 6. **Stop-controlled Intersections**

**Pedestrians**

**Two-Way Stops and Midblock Crossings**

The HCM 2016 provides a method for estimating pedestrian delay crossing the major street at two-way stop-controlled intersections and at midblock crosswalks. Exhibit 114 lists the required data.

**Exhibit 114. Required data for two-way stop-controlled intersection pedestrian delay calculation.**

<table>
<thead>
<tr>
<th>Input Data (units)</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crosswalk length (ft)</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Average pedestrian walking speed (ft/s)</td>
<td>3.5</td>
</tr>
<tr>
<td>Pedestrian start-up time and end clearance time (s)</td>
<td>3</td>
</tr>
<tr>
<td>Number of through lanes crossed</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Vehicle flow rate during the peak 15 min (veh/s)</td>
<td>Must be provided; note the units of veh/s</td>
</tr>
</tbody>
</table>

Note: See HCM Chapter 20 for definitions of the required input data.
When a pedestrian refuge area is available in the street median, pedestrians can cross the street in two stages. In this case, delay should be calculated separately for each stage of the crossing and totaled to determine the overall delay.

First, pedestrian delay is calculated for the scenario in which motorists do not yield to pedestrians (i.e., pedestrians must wait for a suitable gap in traffic). This calculation neglects the additional delay that occurs when pedestrian crossing volumes are high enough that pedestrian platoons form (i.e., some pedestrians have to wait for the pedestrians ahead of them to step off the curb before they can enter the crosswalk). The following equations are used:

\[ t_c = \frac{L}{S_p} + t_s \]  
\[ P_b = 1 - e^{-\frac{L}{N_c}} \]  
\[ P_d = 1 - \left(1 - P_b\right)^{N_c} \]  
\[ d_g = \frac{1}{v} \left(e^{vt_c} - vt_c - 1\right) \]  
\[ d_{gd} = d_g \]  

where

- \( t_c \) = critical headway for a single pedestrian (s),
- \( S_p \) = average pedestrian walking speed (ft/s),
- \( L \) = crosswalk length (ft),
- \( t_s \) = pedestrian start-up time and end clearance time (s),
- \( P_b \) = probability of a blocked lane (i.e., an approaching vehicle at the time the pedestrian arrives at the crosswalk that prevents an immediate crossing),
- \( P_d \) = probability of a delayed crossing,
- \( N_c \) = number of through lanes crossed,
- \( v \) = vehicular flow rate (veh/s),
- \( d_g \) = average pedestrian gap delay (s), and
- \( d_{gd} \) = average gap delay for pedestrians who incur nonzero delay.

When motorists yield to pedestrians, pedestrian delay is reduced. The average pedestrian delay in this scenario is calculated as follows:

\[ d_p = \sum_{i=1}^{n} h(i - 0.5)P(Y_i) + \left(P_d - \sum_{i=1}^{n} P(Y_i)\right)d_{gd} \]  

where

- \( d_p \) = average pedestrian delay (s),
- \( i \) = sequence of vehicle arrivals after the pedestrian arrives at the crosswalk,
- \( n \) = average number of vehicle arrivals before an adequate gap is available = Int\( (d_{gd}/h) \),
- \( h \) = average vehicle headway for each through lane (s),
- \( P_d \) = probability of a delayed crossing,
- \( P(Y_i) \) = probability that motorist \( i \) yields to the pedestrian, from Exhibit 115, and
- \( d_{gd} \) = average gap delay for pedestrians who incur nonzero delay.

The motorist yielding rate \( M_y \) is an input to the equations in Exhibit 115, and all other variables in the exhibit are as defined previously. Yielding rates for a selection of pedestrian crossing treatments are given in Exhibit 20-24 in HCM Chapter 20, Two-Way STOP-controlled Intersections. Alternatively, local values can be developed from field observations.
All-Way Stops

The HCM 2016 provides a qualitative discussion of contributors to pedestrian delay at all-way stop-controlled intersections. However, the research base does not exist to provide a calculation method.

Bicycles

The HCM 2016 provides qualitative discussions of bicycle delay at two-way and all-way stop-controlled intersections. However, the research base does not exist to provide calculation methods.

Transit

Buses will experience the same amount of control delay as other motor vehicles at these intersections.

7. Roundabouts

Pedestrian delay at roundabouts can be estimated using the methods for two-way stop-controlled intersections (see Section O6). The HCM provides no quantitative method for estimating bicycle delay, although it can be expected to be similar to vehicular delay, if bicyclists circulate as vehicles, or to pedestrian delay, if bicyclists dismount and use the crosswalks. Buses will experience the same amount of control delay as other motor vehicles.

8. Off-Street Pathways

The HCM 2016 provides LOS measures for three combinations of modes and facility types:

- Pedestrians on an exclusive off-street pedestrian facility,
- Pedestrians on a shared-use path, and
- Bicyclists on an exclusive or shared off-street facility.

Exhibit 116 lists the required data for analyzing each of these situations.
Pedestrians, Bicyclists, and Public Transit

Pedestrians on an Exclusive Off-Street Facility

Pedestrian LOS on an exclusive facility is based on the average space available to pedestrians. It is calculated using the following three equations:

\[ v_{15} = \frac{v_h}{4 \times PHF} \]  
Equation 186

\[ v_p = \frac{v_{15}}{15 \times W_e} \]  
Equation 187

\[ A_p = \frac{S_p}{v_p} \]  
Equation 188

where

- \( v_{15} \) = pedestrian flow rate during peak 15 min (p/h),
- \( v_h \) = pedestrian demand during analysis hour (p/h),
- \( PHF \) = peak hour factor,
- \( v_p \) = pedestrian flow per unit width (p/ft/min),
- \( W_e \) = effective facility width (ft),

---

**Exhibit 116. Required data for off-street pathway analysis.**

<table>
<thead>
<tr>
<th>Input Data (units)</th>
<th>Used By</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility width (ft)</td>
<td>PEX</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Effective facility width (ft)</td>
<td>PSH</td>
<td>Same as facility width</td>
</tr>
<tr>
<td>Pedestrian volume (ped/h)</td>
<td>BIKE</td>
<td>Must be provided</td>
</tr>
<tr>
<td>Bicycle volume (bicycles/h)</td>
<td></td>
<td>Must be provided</td>
</tr>
<tr>
<td>Total path volume (p/h)</td>
<td></td>
<td>Must be provided</td>
</tr>
<tr>
<td>Bicycle mode split (%)</td>
<td></td>
<td>55% of path volume</td>
</tr>
<tr>
<td>Pedestrian mode split (%)</td>
<td></td>
<td>20% of path volume</td>
</tr>
<tr>
<td>Runner mode split (%)</td>
<td></td>
<td>10% of path volume</td>
</tr>
<tr>
<td>Inline skater mode split (%)</td>
<td></td>
<td>10% of path volume</td>
</tr>
<tr>
<td>Child bicyclist mode split (%)</td>
<td></td>
<td>5% of path volume</td>
</tr>
<tr>
<td>Peak hour factor (decimal)</td>
<td></td>
<td>0.85</td>
</tr>
<tr>
<td>Directional volume split (decimal)</td>
<td></td>
<td>0.50</td>
</tr>
<tr>
<td>Average pedestrian speed (ft/min)</td>
<td>PEX</td>
<td>300</td>
</tr>
<tr>
<td>Average pedestrian speed (mph)</td>
<td>PSH</td>
<td>3.4</td>
</tr>
<tr>
<td>Average bicycle speed (mph)</td>
<td>BIKE</td>
<td>12.8</td>
</tr>
<tr>
<td>Average runner speed (mph)</td>
<td></td>
<td>6.5</td>
</tr>
<tr>
<td>Average inline skater speed (mph)</td>
<td></td>
<td>10.1</td>
</tr>
<tr>
<td>Average child bicyclist speed (mph)</td>
<td></td>
<td>7.9</td>
</tr>
<tr>
<td>SD of pedestrian speed (mph)</td>
<td></td>
<td>0.6</td>
</tr>
<tr>
<td>SD of bicycle speed (mph)</td>
<td></td>
<td>3.4</td>
</tr>
<tr>
<td>SD of runner speed (mph)</td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td>SD of inline skater speed (mph)</td>
<td></td>
<td>2.7</td>
</tr>
<tr>
<td>SD of child bicyclist speed (mph)</td>
<td></td>
<td>1.9</td>
</tr>
<tr>
<td>Segment length (mi)</td>
<td></td>
<td>Must be provided</td>
</tr>
<tr>
<td>Walkway grade ≤ 5% (yes/no)</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Pedestrian flow type (random/platooned)</td>
<td></td>
<td>Random</td>
</tr>
<tr>
<td>Centerline stripe presence (yes/no)</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

Source: Default values from Hummer et al. (2006), except for effective facility width.

Notes: See HCM Chapter 24 for definitions of the required input data.

PEX = pedestrian LOS on an exclusive path, PSH = pedestrian LOS on a shared path, BIKE = bicycle LOS on all types of off-street pathways, SD = standard deviation.
Pedestrians on a Shared Off-Street Facility

Pedestrian LOS on a shared off-street facility is based on the number of times per hour an average pedestrian meets or is passed by bicyclists using the path. The weighted number of meeting and passing events is calculated as follows:

\[
F_p = \frac{Q_{sb}}{PHF} \left(1 - \frac{S_p}{S_b}\right) \quad \text{Equation 189}
\]

\[
F_m = \frac{Q_{ob}}{PHF} \left(1 + \frac{S_p}{S_b}\right) \quad \text{Equation 190}
\]

\[
F = (F_p + 0.5F_m) \quad \text{Equation 191}
\]

where

- \( F_p \) = number of passing events (events/h),
- \( F_m \) = number of meeting events (events/h),
- \( Q_{sb} \) = bicycle demand in same direction (bicycles/h),
- \( Q_{ob} \) = bicycle demand in opposing direction (bicycles/h),
- \( PHF \) = peak hour factor,
- \( S_p \) = mean pedestrian speed on path (mph),
- \( S_b \) = mean bicycle speed on path (mph), and
- \( F \) = weighted total events on path (events/h).

The weighted total events \( F \) is converted into an LOS letter using HCM Exhibit 24-4. The LOS result is sensitive to the peak hour factor provided as an input.

Bicyclists on an Off-Street Facility

Bicycle LOS on all types of off-street facilities is based on a bicycle LOS score that considers:

- The average number of times per minute a bicyclist meets or is overtaken by other path users,
- The path width,
- The presence or absence of a centerline stripe, and
- The average number of times per minute a bicyclist is delayed in passing another path user (for example, because an oncoming path user is in the way).

At a minimum, total path width and the total number of hourly path users must be provided, although results will be more accurate if the actual mode split of path users (bicyclists, pedestrians, runners, inline skaters, and child bicyclists) is known or can be defaulted using local values. The bicycle LOS score is particularly sensitive to the bicycle mode split, the peak hour factor, and the directional distribution provided as inputs, and somewhat sensitive to whether or not a centerline stripe is present. HCM Exhibit 24-5 is used to convert the bicycle LOS score into an LOS letter.
The calculation process requires a large number of computations, and the use of a computational engine is recommended. The FHWA project (Hummer et al. 2006) that developed the method developed an engine, which can be downloaded from http://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/SharedUsePathsTLOSCalculator.xls. The FHWA computational engine applies the peak hour factor in a different order in the computational sequence than the HCM implementation of the method does. However, any difference between the two methods is negligible for planning purposes.

9. References


Board & Committee Agenda Item

Agenda Item
Developing BPAC Position Statements

Presenter
Wade Reynolds, MPO Staff

Summary
In recent meetings, BPAC members have expressed interest in approaching elected officials regarding the funding, prioritization, and implementation of pedestrian and bicycle projects. This item will summarize the projects supported by the BPAC over the last year and highlight any issues that should be brought forward to elected and appointed members of the MPO Board and other bodies.

Recommended Action
Development of consensus among members on items for the Chair to bring forward to Board members.

Prepared By
Wade Reynolds, MPO Staff

Attachments
None
CALL TO ORDER & PLEDGE OF ALLEGIANCE

Vice Chairman, Councilman Cohen, called the meeting to order at 9:02 a.m. The meeting was convened on the 26th floor of the County Center. Commissioner White led the group in the pledge and invocation.

SPECIAL RECOGNITION OF SUPPORT FOR VISION ZERO

Ms. Alden presented Brenden McLaughlin and Chad Kellogg, Cox Media, with plaques recognizing their support.

Councilman Cohen read a memo from Commissioner Miller, in which he stated he would not be in attendance today due to illness. Ms. Stuart also was not able to attend.

PUBLIC COMMENT

There were eleven comments from the public, generally expressing support for or skepticism of the Tampa Bay Next process and Mr. Frank’s presentation on Highways to Boulevards.

Mr. Green suggested adding community design to the list of issues being considered.

The COA rationalizes and economizes HART’s services. HART sought public input, and citizens asked for more frequent and faster bus service.

Ms. Alden stated the start of the Regional Planning Best Practices study.

COMMITTEE REPORTS, ONLINE COMMENTS

Ms. Gena Torres, MPO Staff, reviewed the Committee Reports, a copy is in Board folders. She also reviewed on the Online comments.

CONSENT AGENDA

A. Approval of Minutes – June 13, 2017
B. Committee Appointments
C. Letter on Florida New Start Grant Eligibility – Water Transit
D. USF – MPO Work Agreement
E. Bullard Parkway Complete Streets Study
F. HART Operations and Maintenance Facility Feasibility Study
G. Plant City Walk-Bike Plan
A motion was made by Commissioner Kemp to approve the Consent Agenda. The motion was seconded by Councilman Maniscalco and carried unanimously.

**STATUS REPORTS**

**A. Tampa Bay Next Update (Ed McKinley, FDOT – District 7)**

The new District Secretary, David Gwynn, introduced himself to the Board. Mr. Ed McKinney, Planning and Environmental Administrator, presented the quarterly update on Tampa Bay Next. He provided updates on mitigation efforts for the neighborhoods, community engagement, status of the PD&E (environmental impact studies), options for premium transit, efforts to report on the human impact of the projects, and continuing the reevaluation process on the different segments. Mr. McKinley distributed the Community Engagement schedule to Board members and encouraged their attendance. FDOT is also offering an online Citizens Transportation Academy to better educate the public. At some point, there will be decision points for this Board, the other MPOs in the TMA, local governments and local agencies. These decision points will need to address land use, local transit, capital, operations and maintenance, traffic distribution, financial impacts of these decisions, and how this is implemented.

Mr. Green suggested adding community design to the list of options being considered.

**B. Highways to Boulevards (Joshua Frank, USF Florida Center for Community Design & Research)**

Mr. Frank offered his “Highways to Boulevards” presentation. While a Master’s degree candidate at USF, Mr. Frank conducted research into options for the I-275 corridor to reduce neighborhood impacts while maintaining mobility. He found several examples of cities that chose to remove limited-access highways, and was invited to present options for maintaining mobility with wide boulevards and rapid transit at a community meeting in Seminole Heights. His research is now being reviewed by FDOT District 7 as part of the Tampa Bay Next planning process.

Councilman Maniscalco thanked Mr. Frank for a fascinating presentation. He feels this plan benefits the local neighborhoods and needs to be further explored. Commissioner Kemp feels we need “to kick this open”. She feels I-275 splits the community and would like to take advantage of the CSX rail and ferry opportunities. Councilman Cohen also thanked Mr. Frank and feels his presentation allows opportunities for discussions about the regional challenges.

**C. HART Transit Development Plan Update (Steve Feigenbaum, HART)**

Mr. Feigenbaum gave a brief 10-year transit development plan (TDP) update. A major update is required by FDOT every five years. HART coupled this TDP update with a Comprehensive Operations Analysis (COA), as the last one was conducted in 2003. The COA is essentially year one of the TDP. The COA rationalize and economizes HART’s services. HART sought public input, who asked for more frequent and faster bus service.
In 2018, HART will move towards a grid system to straighten out routes and deemphasize the transfer centers. Within six years, HART plans to build a grid system that will have ten routes (5 north/south and 5 east/west) and operate in 15 minute or better frequencies. By the end of this year, they will offer more routes with less wait time. HART will also offer 3 routes to the airport, with a 4th route planned. Two of the routes will serve the airport every 15 minutes. They are also expanding the hyperlink service (on demand service, via app or phone call). HART is currently in negotiations with a vendor for the autonomous car project in downtown Tampa. They hope to have this project running by the end of the year.

EXECUTIVE DIRECTOR’S REPORT

A. TMA Leadership Group Update
Ms. Alden updated the Board on the Transportation Management Area (TMA) Leadership Group. The members are working on projects of regional transportation system significance in the tri-county area. Priority decisions have been integrated into the priority list approved by the Board in June. Due to time constraints today, Ms. Alden would like to discuss these regional significant transportation projects at the next Board meeting. They are also looking at how the Group can play a role in supporting the Tampa Bay Next process and the Regional Transit Feasibility Plan. The next step for the local MPOs is updating their long-range transportation plans to 2045. The first step is looking at growth scenarios for 2045; those decisions will be greatly affected by the decisions made for Tampa Bay Next and the Regional Transit Feasibility Plan. The group is proposing a scenario planning process coordinated at the Tri-County level and carried out in each County by their MPO. The TMA Leadership Group’s next meeting is September 9, 2017.

Ms. Alden announced the Vision Zero Coalition workshop on August 22nd at 9:00 a.m. at the Tampa Theatre. At the workshop, the Coalition will be rolling out their action plan. The plan will then be circulated to the MPO Board and local governments.

Ms. Alden stated the start of the Regional Plan Best Practices study has been postponed a couple of months at the request of the TBARTA Board as they look at the award of the consultant contract. That decision will hopefully be made at their August meeting.

OLD BUSINESS & NEW BUSINESS

The next MPO Board meeting is Tuesday, August 29th.

ADJOURNMENT

A quorum was maintained for the duration of the meeting. There being no further business, the meeting adjourned at 10:50 a.m.
Committee Reports

Meeting of the Citizens Advisory Committee (CAC) on August 9

The CAC approved and forwarded to the MPO:

- The TIP Annual Roll-forward and HART State of Good Repair Amendments

The CAC did not take action on the Dale Mabry Pedestrian Crossing Study. There were concerns expressed about access from neighborhoods, cost, and expected usage. The study will be revised to reflect comments and brought back to the CAC.

The CAC received presentations and did not offer additional comments on the Hillsborough Air Quality Update, Vision Zero Action Plan, and TBARTA CAC Report. The next meeting of the CAC will be September 13th.

Meeting of the Technical Advisory Committee (TAC) on August 21

The TAC approved and forwarded to the MPO:

- The TIP Annual Roll-forward and HART State of Good Repair Amendments

The committee received presentations on the Hillsborough Air Quality Update and HART Transit Development Plan Update. The next meeting of the TAC is scheduled for September 18, 2017.

Meeting of the Policy Committee on August 22

The committee hosted a Vision Zero Coalition Workshop at the Tampa Theater. Led by the “One Message, Many Voices” team, the workshop focused on the personal stories of local residents whose lives have been touched by traffic violence. A draft of the Action Plan was provided, and coalition members were invited to share one thing they commit to do during the coming year to improve traffic safety in Hillsborough County. The draft Action Plan will be brought to local governments and the MPO’s advisory committees for review and support in the next few months.

Meeting of the Bicycle Pedestrian Advisory Committee (BPAC) on August 9

The BPAC approved and forwarded to the MPO:

- Dale Mabry Pedestrian Crossing Study

After a presentation on the 2045 Plan: Issues for Exploration, the committee discussed the need for an alternate plan to move forward; adding transit supply to
the transportation trends chart; how the committee can work with the MPO Board to make biking and walking options a higher priority.

Public comment was received regarding debris on bike lanes in Northwest Hillsborough County, glass on the Courtney Campbell Causeway Trail, and the status of the Upper Tampa Bay Trail gap. The next BPAC meeting is September 13th.

Meeting of the Livable Roadways Committee (LRC) on August 16, 2017

The LRC approved and forwarded to the MPO:

- Dale Mabry Pedestrian Crossing Study, with a request for further consideration of the route through the stormwater pond, if there are opportunities for cost reduction and combining the pedestrian bridge with an existing over-roadway signage structure.

The committee also was briefed on Getting to School Survey Results, 2045 Plan: Issues for Exploration, and THEA’s Selmon Greenway Pocket Parks. The next meeting will be September 20th, with a guest speaker on the topic of Green Infrastructure.

Meeting of the Transportation Disadvantaged Coordinating Board on August 25

A verbal report will be provided at the board meeting.

Meeting of the School Transportation Working Group on July 26

The group was briefed by Joe Simmons, HCSD STEM Coordinator, on a national training program for incorporating transportation and engineering problem-solving activities in school curricula. The group discussed options to leverage this program with the Planning Commission’s Future Leaders in Planning program and the existing USF/THEA balsa-wood bridge-building contest.

The group worked with the MPO’s School Safety Study consultant on the first-draft methodology for selecting and ranking schools based on safety data. The consultant will come back to the group with a shorter list, field reviews, and follow-up activities.

Hillsborough County Public Works staff provided an overview of the Pedestrian Facility Improvement Program, and noted that there will be stakeholder input meetings in the coming months.

In addition, the group went over back-to-school activities and preparations, and heard jurisdiction updates.

Meeting of the TBARTA MPO CC Directors on August 11

The TBARTA MPO Chairs Coordinating Committee (CCC) Staff Directors discussed:

- Preparations for the first-annual Gulf Coast Safe Streets Summit, to be held February 27, 2018, at the Children’s Museum in Downtown Tampa;
- The actions of the June 16 regional meeting of the MPO Chairs, including their review of the priorities for TRIP and Multi-Use Trails;
Survey Reveals Need For Better Sidewalks, Security And Lighting In University Area

KENYA WOODARD
Sentinel Feature Writer

Sidewalks in the area that encompasses University Area Community Development Corporation (UACDC) need expansion and repair and walkways need more streetlights and increased security.

That’s the results of a recent walkability survey conducted by the UACDC in conjunction with the county’s Metropolitan Planning for Transportation and City-County Planning Commission and the Florida Department of Health.

A report of the survey was shared last week at the UACDC’s Partners Coalition quarterly meeting.

Nearly 300 University Area residents responded to the survey, which was conducted last year from May to August.

In addition to walkway safety, participants were asked to give their input on driver behavior and neighborhood aesthetics.

About half stated that they had mostly enough room to walk on their routes. But almost nearly that many reported that the sidewalks started and stopped or were broken or cracked.

Respondents stated that drivers “rarely” or “sometimes” followed traffic laws 57 percent of the time. More than half stated that failure to stop for people crossing walkways and speeding were the most outstanding offenses.

And while respondents reported a “mostly pleasant” walk, they also noted their routes were littered and had a lack of light, shade, and green-space.

Walking is the main mode of transportation for a large percentage of residents who live in the University Area community. UACDC officials will work with its partners to find ways to remedy the problems highlighted in the survey, said Sarah Combs, the corporation’s chief executive officer.

“If (residents) think there’s no security or adequate safety, it’s important to shine a spotlight,” she said.

The study will be helpful when applying for grants and other resources for community planning as well as when requesting participation in related projects in the University Area community, Combs said.

“We’re creating a map to leverage it with different opportunities,” she said.
Communities across Florida recognize that outdoor recreation supports health, contributes to a high quality of life and—perhaps most importantly—attracts and sustains employers and families. Investing in outdoor infrastructure attracts employers and active workforces, ensuring those communities thrive economically and socially.

55% OF FLORIDA RESIDENTS PARTICIPATE IN OUTDOOR RECREATION EACH YEAR

Florida residents are more likely to PARTICIPATE IN CYCLING AND KAYAKING than the average American.

IN FLORIDA OUTDOOR RECREATION GENERATES:

- $58.6 BILLION in consumer spending annually
- 485,000 DIRECT JOBS
- $17.9 BILLION in wages and salaries
- $3.5 BILLION in state and local tax revenue

1 Enterprise Florida
OUTDOOR RECREATION IS A POWERFUL ECONOMIC ENGINE

Outdoor recreation is among our nation's largest economic sectors, representing the lifeblood of thousands of American communities and providing livelihoods for millions of American workers.

THE NATION'S OUTDOOR RECREATION ECONOMY GENERATES:

- $887B in consumer spending annually
- 7.6M American jobs
- $65.3B in federal tax revenue
- $59.2B in state and local tax revenue

Job Comparison

BY INDUSTRY

1 Bureau of Economic Analysis
2 Bureau of Labor Statistics
3 Computing Technology Industry Association

GET INVOLVED

1. Visit the OIA Advocacy Center at outdoorindustry.org/advocacy to learn more about the issues and actions affecting outdoor recreation.
2. Educate your elected officials about the outdoor recreation economy, how it can support healthy economies and healthy communities in your neighborhood and encourage policies that promote it.
3. Go outside and enjoy the public lands and waters that are our nation’s treasures. They belong to you.

Visit the OIA Advocacy Center at outdoorindustry.org/advocacy to learn more about the issues and actions affecting outdoor recreation. Educate your elected officials about the outdoor recreation economy, how it can support healthy economies and healthy communities in your neighborhood and encourage policies that promote it. Go outside and enjoy the public lands and waters that are our nation’s treasures. They belong to you.
The Florida Automated Vehicles (FAV) Summit assembles industry leaders from around the world to address technologies, operations, and policy issues. Our mission is to gain insight into what Florida is doing to create the ideal climate for the implementation and deployment of autonomous and connected vehicle technologies. Topics will include automated, connected, electric and shared (ACES) mobility, operations, law, infrastructure, functional design, cyber security, ethics, aftermarket products, enabling technologies, and public policy.

**LIVE DEMONSTRATIONS**
Live demonstrations showcasing connected and automated tech will provide a visualization of the positive impacts these technologies will have on Florida roadways.

**GLOBAL ATTENDANCE**
An organized agenda full of industry experts, keynote speakers, and ongoing live demonstrations are only some of the events planned. You won’t want to miss this event.

**REGISTER TODAY!**
Last year’s FAV Summit sold out very early! Don’t delay, register today for the 2017 FAV Summit. Get some extra tickets for family and friends. Group rates available.

[WWW.FAVSUMMIT.COM](http://WWW.FAVSUMMIT.COM)
Project Description:
This is a pedestrian safety improvement project along Florida Avenue. The work will include a proposed mid-block pedestrian crossing signal approximately 500’ south of Waters Avenue, and milling and resurfacing on Florida Avenue from south of Bird Street to north of Waters Avenue and on Waters Avenue from Tampa Street to east of Suwannee Avenue. To reduce conflicts between turning vehicles and increase pedestrian visibility, the existing free-flow right turning movements on the northeast and northwest corners of the intersection at Waters Avenue will be eliminated through the removal of intersection islands and the relocation of the existing curb returns and pedestrian ramps. A new traffic separator on Waters Avenue will be installed to prevent conflicting left turn movements to and from a gas station/convenience store driveway at the intersection. Signing and pavement markings will be part of the project scope as well as signal upgrades at existing intersections.

Project Location:
This project will be constructed along SR 685 (Florida Avenue) from south of Bird Street to north of Waters Avenue, in the City of Tampa, Hillsborough County.

Schedule:

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* Please note that cost estimates may change as the project progresses.
**Cost estimate does not include funding for Construction, Engineering, and Inspection.

FDOT Project Manager
Tana Johnston-Schultz, P.E.
11201 N McKinley Drive, MS 7-600
Tampa, FL 33612
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tana.schultz@dot.state.fl.us

Public Information Officer
Kris Carson
11201 N McKinley Drive, MS 7-110
Tampa, FL 33612
Office Phone: (813) 975-6202
kris.carson@dot.state.fl.us
Project Description:
The purpose of this 0.879 mile project is to construct sidewalks on both sides of US 41 (50th Street) from Denver Street to north of South 30th Avenue. The alignment of the road will not be altered from the existing conditions and all improvements are to be made within the existing right-of-way and easements.

Project Location: Hillsborough County

Schedule:

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Project Costs:

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*Please note that cost estimates may fluctuate as the project progresses.

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U.S. Department of Transportation Announces $500 Million Funding Opportunity through TIGER Program

WASHINGTON – The U.S. Department of Transportation today announced the opportunity for state and local stakeholders to apply for $500 million in discretionary grant funding through the Transportation Investment Generating Economic Recovery (TIGER) program.

“The TIGER grant program is a highly competitive program whose winners will be awarded with the funding they need to rebuild the infrastructure of their communities,” said Secretary Elaine L. Chao. “TIGER grants will continue to fund innovative projects that will improve the safety of America’s passengers and goods.”

The Consolidated Appropriations Act, 2017 appropriated $500 million, available through September 30, 2020, for National Infrastructure Investments otherwise known as TIGER grants. As with previous rounds of TIGER, funds for the fiscal year (FY) 2017 TIGER grants program are to be awarded on a competitive basis for projects that will have a significant impact on the Nation, a metropolitan area, or a region. The FY 2017 Appropriations Act specifies that TIGER Discretionary Grants may not be less than $5 million and not greater than $25 million, except that for projects located in rural areas the minimum TIGER Discretionary Grant size is $1 million.

The selection criteria remain fundamentally the same as previous rounds of the TIGER grants program, but the description of each criterion was updated. Additionally, the FY 2017 TIGER program will give special consideration to projects which emphasize improved access to reliable, safe, and affordable transportation for communities in rural areas, such as projects that improve
infrastructure condition, address public health and safety, promote regional connectivity, or facilitate economic growth or competitiveness.

To provide technical assistance to a broad array of stakeholders, USDOT is hosting a series of webinars during the FY 2017 TIGER grant application process. Webinars on How to Compete for TIGER Discretionary Grants will be held from 2:00 to 4:00 PM EDT on Wednesday, September 13th and Tuesday, September 19th. To register, please visit the TIGER Webinar Series webpage. Additional webinars will be scheduled and more information posted online.

The deadline to submit an application for the FY 2017 TIGER grant program is Monday, October 16.

Since the TIGER grant program was first created, $5.1 billion has been awarded for capital investments in surface transportation infrastructure over eight rounds of competitive grants. Throughout the TIGER program, these grants have supported projects that have a significant impact on the Nation, a metropolitan area, or a region. TIGER grants have historically achieved, on average, co-investment of 3.6 dollars (including other Federal, State, local, private and philanthropic funds) for every TIGER dollar invested.

For more information, please visit www.transportation.gov/TIGER.

###
Atlanta's First Food Forest Aims To Increase Access To Fresh Produce

Stephannie Stokes

Listen to the audio story.

The Lakewood neighborhood in southeast Atlanta fits most descriptions of a food desert. The closest grocery stores are two, three miles away.

Like us on Facebook

But now the residents there are getting a new place to find fresh produce: the city’s first official food forest.

On a recent afternoon, Atlanta’s urban agriculture director Mario Cambardella showed off the 7-acre greenspace off Browns Mill Road.

“As we’re walking through, I’ll point out a number of pecan and black walnut trees,” he said.

The property, while currently overgrown, already has a lot of food-producing trees, Cambardella said. That’s thanks to the family whose house once stood on the site.

And he said, to turn this into a food forest, the city's just going to work with what's here.

“So what it's going to look like is a place that has tall trees, large shrubs, then some low brush area and maybe some ground crops,” he said.

It will be a hierarchy of food-producing plants, he said, with strawberries and nuts, all in a public park.

The hope is that the food forest will give surrounding residents more ways to access fruits and vegetables.

Cambardella said that’s either by allowing them to pick produce at the site or by teaching them how to grow it at their own homes.

“Learning here and taking it to their own home, that strengthens and makes a more resilient neighborhood,” he said.

The idea is not such a new one in this Atlanta community, where some properties...
look downright rural and several residents already grow their own food.

Still, Arthur Elder, who lives next door, said he’s looking forward to a new public space.

“It’s going to be a community thing. That’s what we need in the community, instead of more homes,” he said.

Cambardella said the city is working with nearby residents now to design the site.

The food forest off Browns Mill Road is a pilot project, supported by a U.S. Forest Service grant. Eventually, the city hopes to replicate the idea in other parts of Atlanta.
FDOT will host local and regional opportunities to participate in developing meaningful transportation solutions. For more project specific information and to get involved:

www.TampaBayNext.com TampaBayNext@dot.state.fl.us (813) 975-NEXT

Like us on /TampaBayNext Follow us on @TampaBayNext

NEW DESIGN BENEFITS
The new design will improve incident management in emergency response situations, which addresses safety concerns raised by the community during our outreach process.

Hurricane evacuation plans can utilize all the lanes. In the aftermath of Hurricane Irma, this is particularly important for coastal Pinellas County, the most densely populated county in Florida.

The new design would provide improved operations of Express Bus Service and better accommodate the possibility of future transit.

The new design includes a bicycle/pedestrian trail, which accommodates requests from both the Hillsborough MPO and Forward Pinellas and reflects the increased emphasis the community has asked us to place on bicycle/pedestrian facilities.

In order to accommodate light rail in the future, we would not have to construct a third bridge as called for in the previous plan. We would only need to widen the existing southbound bridge and shift some of the travel lanes to the widened bridge, which would be more cost efficient and less impactful to the environment.

This new design would accommodate future demand at a much lower cost than adding lanes as part of future construction.

The additional express lane in each direction will better prepare the Howard Frankland Bridge for the potential of autonomous vehicles. Experts believe that initially autonomous vehicles (passenger and transit) may operate in dedicated lanes.

FDOT is rebuilding the existing northbound bridge, which was originally constructed in 1960, and adding capacity to alleviate traffic congestion.

The most recent plan for the Howard Frankland Bridge was announced in early 2017. Since that time, the Florida Department of Transportation conducted public outreach as part of the Tampa Bay Next process and gathered valuable input to enhance the project.

The community has made it clear that they want:

- infrastructure that can accommodate transit, with flexibility across modes
- safety to be a top priority, including incident management and evacuation preparedness
- transportation improvements that anticipate future demand and are cost effective
- more bicycle and pedestrian options across the entire region

HOWARD FRANKLAND BRIDGE PUBLIC HEARING
The dates and locations are as follows:

Tuesday, November 14 5:30 p.m. - 7:30 p.m.
Tampa Marriott Westshore
1001 N. Westshore Blvd.
Tampa, FL 33607

Thursday, November 16 5:30 p.m. - 7:30 p.m.
Hilton-St. Pete Carillon Park
950 Lake Carillon Drive
St. Petersburg, FL 33716

Public participation is solicited without regard to race, color, national origin, age, sex, religion, disability, or family status. Persons who require special accommodations under the Americans with Disabilities Act to participate in this informational meeting, or persons who require translation services (free of charge) are asked to notify the agency at least seven (7) days prior to the meeting by contacting: Christopher Speese, Public Involvement Coordinator, at Christopher.Speese@dot.state.fl.us, 1 (800) 226-7220 or (813) 975-6405. The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. §327 and a Memorandum of Understanding dated December 14, 2016 and executed by the Federal Highway Administration and FDOT. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1 (800) 955-8771 (TDD) or 1 (800) 955-8770 (Voice).

Comuníquese con nosotros: Nos importa mucho la opinión del público sobre el proyecto. Si tiene preguntas o comentarios, o simplemente desea más información, por favor comuníquese con nosotros. Nuestra representante en español es: Lilliam Escalera, (813) 975-6445, Lilliam.Escalera@dot.state.fl.us.
This is what we are proposing to build in 2020.

New Bridge with Bike/Ped Trail on the Outside and 2 Express Lanes in each direction.

Existing Southbound Convert to Northbound

Structure will support future rail transit.

This is how we would accommodate rail in the future.

Southbound Bridge with Express Lanes and Rail Transit.

Northbound widened to outside to accommodate Express Lanes.
Public input helps identify top regional transit projects

*Regional Transit Feasibility Plan team will do more public engagement as it continues to narrow its recommendations*

Tampa Bay, FL, Sept. 29, 2017 – The team behind the Regional Transit Feasibility Plan has recommended the top projects (connection + transit mode = a project) to take to the next step of the evaluation process, which is designed to identify the most competitive catalyst project(s) for federal and state funding.

After holding a series of community workshops and studying options – which included such possible modes as express bus, bus rapid transit, light rail/modern streetcar, and commuter rail - the team ranked the technical merit of each of the 15 projects that proceeded from Step One.

The results of the technical analysis coupled with public input has resulted in the following top six projects:

1. Wesley Chapel, USF, Tampa, St. Petersburg connection on light rail
2. Wesley Chapel, USF, Tampa, St. Petersburg connection on rubber tire (in dedicated lanes)
3. Downtown Tampa to USF connection on light rail
4. Downtown Tampa to USF connection on rubber tire (in dedicated lanes)
5. Wesley Chapel, USF, Tampa, St. Petersburg connection on commuter rail – tied for 5th
6. Downtown Tampa to USF connection on commuter rail – tied for 5th

The public is encouraged to provide comments on these results by visiting [http://www.tbregionaltransit.com](http://www.tbregionaltransit.com) and taking an online survey. In addition to the survey, the project team will be coordinating numerous opportunities for the public to provide their comments and suggestions in the coming months.

A draft implementation plan is scheduled to be completed in January 2018. Then, after an eight-month community vetting process that focuses heavily on getting more feedback from the public, the final implementation plan will be completed by October 2018 with a proposed “catalyst” project(s), completing a two-year planning process that began in fall 2016.

Next, the region will begin coordination with the Federal Transit Administration and the Florida Department of Transportation (FDOT) as options are considered for how to pay for the project.

“Thank you to everyone who attended one of our community workshops and helped us identify which connections are most important for this region,” said Katharine Eagan, Chief Executive Officer of HART, the agency administering the plan. “We’d still like to hear from others in the
community, which is why the public comment period will continue uninterrupted through October 2018.”

For this plan, the Tampa Bay region is defined as the urbanized areas of Hillsborough, Pasco, and Pinellas Counties. The plan is funded by FDOT and supported by a number of local governments and agencies, including Hillsborough, Pasco, and Pinellas Counties and their respective transit agencies, HART, PCPT, and PSTA.

“People don’t notice when they cross county lines while traveling around our region, which is why planning regionally for transit is so important,” said Kris Hughes, Planning and Development Director for Pasco County. “This plan is an excellent opportunity to bring transit options to one of the fastest-growing regions in the state, and it’s important to gather information and viewpoints from as many people as we can.”

To see all the displays from the community workshops, click here.

To learn more about the Regional Transit Feasibility Plan and to vote on your favorite regional connections, visit the project website at http://www.TBRegionalTransit.com.

# # #
On the cusp of finishing their plans for the Citrus Park Drive Extension, Hillsborough County staff offered a new timeline for its start and completion at a July community meeting.

The July 19 meeting of the Park Place Community Development District (CDD) at Highland Park’s Lake House featured a presentation from Project Manager Tommy Rawls, engineer Andrew Greenwood of WSP Engineering and landscape architect Jon Toner of Terra Techtonics. The trio detailed near complete plans for the extension. Once complete, it will connect Countryway Boulevard just north of the UTB Regional Library with Sheldon Road near the Westfield Citrus Park mall.

The completed road will be two lanes in both directions. Once beyond Deer Park Elementary, the extension will dip to the south between two large lakes and hug the TECO high-power line easement that begins just south of the library on Countryway Boulevard. It follows this path until bending north again to intersect Sheldon Road just north of Fawn Ridge’s entrance on Sheldon Road. The extension will ultimately continue into Citrus Park Drive, which runs in front of Westfield Citrus Park mall.

The county presentation largely focused on the existing portion of the road that runs through the Park Place CDD – specifically from Deer Park Elementary to Countryway Boulevard. That part passes the neighborhoods of Mandolin Estates on the north of the road and Windsor Place and Mandolin Reserve on the south side of the road.

Rawls stated that the current right of way through these communities will be maintained but the road will be expanded, impacting current landscaping buffers. The one island median on the road will also be narrowed to permit road expansion. The greatest impact, said Rawls, will be outside of Mandolin Estates. “There is a significant buffer here,” Rawls said of the landscaping just to the east of the neighborhood entrance, where its homes lie closest to the road.

The existing landscape buffer, he added, would have to be removed to widen the road. The impact, he added, may alarm Mandolin Estates homeowners during the work, but he added that a new landscape buffer will be replanted. Only the home closest to the Mandolin entrance will not see the extension of the landscape buffer. Toner stated that replanting the area between that home and Citrus Park Drive would block the approaching view of the Mandolin entrance monument for westbound traffic. Once grown in, Rawls committed, the new landscaping buffer will work as well as the existing one.

Mandolin Estates, which lies across the road from Deer Park Elementary, will also see an enhanced landscape buffer east of its entrance and along the pond across from the school. Toner stated this was an attempt to
minimize road and school noise from impacting its homeowners.

Quizzed by Windsor Place President Chuck Shanberg about whether landscaping buffers will be enhanced outside his community, Rawls said staff was limited in what they could do given the existing buffer. Stating that the six-foot wall and existing landscaping planted by the developer should be adequate, he added that any enhancement would require them to pull out existing, mature landscaping, which would offer no additional benefit. When Shanberg inquired whether increasing the wall’s height to eight feet would benefit homeowners, Rawl cautioned, “That would become a zoning issue.”

Along the stretch of the road between Countryway and the school, the medians and rights of way will be landscaped and irrigated before handing responsibilities for maintenance over to the Park Place CDD. Fawn Ridge will maintain that portion of the road bisecting its entrance.

Stating they would soon release a project plant list, Toner said that plants for the district-maintained stretch would include cypress, cedar, palms and crepe myrtle. Planted trees will be 16 to 18 feet tall with four-inch trunk calipers and the median within the Park Place CDD will be planted with perennial peanut. The sod will be bahia.

The road’s traffic lanes, however, will be decreased in width by a foot to eleven feet. “That should provide for some traffic calming,” Rawls stated. The width reduction will also allow planned bike lanes, running the length of the road, to be expanded to six feet in width.

The road, however, will not have additional turn lanes into the Mandolin or Windsor Place neighborhoods. Greenwood added there would also not be traffic lights at the neighborhood entrances. “It doesn’t meet the requirement,” he stated.

A traffic lights, however, will be installed at the entrance to Deer Park Elementary. Citing the number of homes in Fawn Ridge, Greenwood said that another light will be installed at the intersection of Citrus Park Drive and Fawn Ridge Boulevard, which it will bisect.

Fawn Ridge will see the biggest impact from the new road. To align it with that portion of Citrus Park Drive that runs past the front entrance of the mall, the extension will actually bisect Fawn Ridge Boulevard about 0.2 miles inside the entrance to Fawn Ridge off Sheldon Road. Homes located on Key West Circle in Fawn Ridge will actually lie south of the Citrus Park Extension while the rest of Fawn Ridge will lie north of the Citrus Park Drive extension.

County staff has added enhanced landscape buffering along this stretch as well to minimize traffic noise.

Near complete plans show the extension being two lanes in both directions with a continuous sidewalk running along the north lanes. The portion of the road between Countryway and Deer Park Elementary, however, will have a sidewalk on the north and south sides of the road.

The new portion of Citrus Park Drive between Deer Park Elementary and Fawn Ridge will also feature landscaping. The medians between the lanes, however, will not be irrigated. Rather than sod, Toner stated the county was exploring planting wildflowers in the median to give them color.

As part of the project, Rawls stated they were looking at adding a sidewalk on the west side of Countryway Boulevard, where the extension will terminate, to Race Track Road.

Rawls stated that the project’s start has been delayed because the project had to again go through environmental permitting. Environmental standards, he added, are more rigorous than when the plan first
passed through them before the Great Recession. That downturn caused the county to shelve the project. He expects, however, to have the project bid by the spring.

He added, however, that the previously announced two-year construction timetable will be extended to two and a half years. This occurred after staff returned a previously planned overpass into the project. Rawls said the overpass would enable the Parks, Recreation and Conservation Department to design a trail system that passes under the road for possible future bike, pedestrian and equestrian use. The overpass added six months to the construction timeframe.

Rawls added that the land surrounding the extension is currently owned by county utilities. With the exception of one area, it is also largely protected wetlands, which minimizes the possibility that the road will enable the development of additional subdivisions and add to the road’s traffic load.

Mandolin HOA President Tom Cockerell, present at the meeting, announced that a Mandolin community meeting would be held in late August or early September to allow its residents to review the county’s plan.

By Chris Barrett, Publisher

COMMENTS

Please login or register to post a comment.
Proposed reversible lane on Bloomingdale Avenue draws ire

By Crystal Owens, Times Correspondent
Published: September 21, 2017

RIVERVIEW — Bloomingdale Avenue business owners and members of the Greater Brandon Chamber of Commerce are preparing to protest possible changes to the busy roadway that they say will likely take away millions in tax revenue from the county and cut their profits by as much as 40 percent.

The proposed changes, cited in the Aug. 17 Brandon Corridors and Mixed-Use Centers Pilot Program, if approved, would convert the center turn lanes and medians on Bloomingdale Avenue into reversible lanes during peak traffic times. The changes could affect the road from U.S. 301 in Brandon to Lithia Pinecrest Road in Valrico, meaning motorists couldn’t make left turns during high traffic periods, including into Bloomingdale High School.
"Say you want to go to Starbucks (next to Bloomingdale High). That will mean that you will have to drive down Bloomingdale, turn right onto Culbreath Road and find a safe place to make a U-turn to catch the light and turn left and then right to get into the business," said John Sullivan, co-founder of Winthrop Town Centre in Riverview, during a meeting Monday at the mixed-use complex.

Sullivan has paid for his own traffic study to see how the proposed changes would affect commuter times and business profits. The study is not yet completed, but Sullivan said he believes the county’s proposed changes would cut commuter time down by about a minute.

At this point, the project is a feasibility study, according to Rich Clarendon, assistant director of the Hillsborough County Metropolitan Planning Organization.

"It’s nowhere near to being a project yet," Clarendon said, adding that he’s already met with several business owners and community members about their concerns over the possible changes.

If the changes are approved by county officials, don’t expect a major overhaul on the road to accommodate the new traffic pattern. Road widening, construction of a new parallel road or reconfiguration of an adjacent street to work as a one-way pair, are not feasible options, according to the county’s study, because of expected right-of-way impacts.

At the most, the county would implement new traffic signals or ‘innovative intersection treatments’ to relieve traffic on the road.

Brandon, the study said, is nearly built out and there are no viable options to build a parallel road.

Lumsden Road and Brandon Boulevard, it says, are the only other roadways in the area that run east to west, but are located too far to the north to accommodate reversible traffic lanes.

But while county transportation planners are looking for ways to improve traffic flow on the busy road, business owners are scrambling to make sure their profits stay viable.

"My husband owns [Winthrop Liquors] and that’s his retirement," said Cynthia Manchesi, Winthrop vice-president. "If this happens, there goes his retirement."

Still, county officials believe reversible lanes could be the best option for relieving traffic backup on Bloomingdale Avenue. Widening the road to six lanes is not an option.

"Bloomingdale Avenue is not only a main street for residents in the area but a commuter route," Clarendon said. "Short of doing a major widening, if we did make that a six-lane road, we’re looking at taking away major property."

Other areas in the country, according to Clarendon, have had success in establishing reversible traffic lanes, including Jacksonville, Salt Lake City and Indianapolis.

But there have also been some failures.

Nancee Sorenson, Hillsborough Community College Brandon campus president, came to the meeting as a representative of the Greater Brandon Community Foundation. She said when she lived in Tucson, Ariz., reversible lanes were put in place on a busy east to west thoroughfare. Residents, she said, nicknamed the road “the suicide lanes.”

"They ended up reversing them because it was much more awkward to have them because you always had to be on the lookout for people making turns … but our main problem here is that many of these
side streets don't connect [to Bloomingdale Avenue],” Sorenson said.

The study will be discussed by the county's planning commission at a 2 p.m. Oct. 9 meeting at 601 E Kennedy Blvd. in Tampa.

Contact Crystal Owens at hillsnews@tampabay.com.

Sponsored Content

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By Allianz Travel Insurance

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QuickenLoans, NMLS #3030

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HealthiNation

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EverQuote Insurance Quotes

Here Are The Best Cell Phone Plans For Seniors
Yahoo Search

Culver's crosses into Brandon near Selmon Expressway

BRANDON — Like many children, Theresa Hutchins recalls pleading with her parents to take her for ice cream. But unlike most kids, her zest for custard didn’t end at the bottom of the
**What is Tampa Bay Next?**

Tampa Bay Next is a program to modernize Tampa Bay’s transportation infrastructure and prepare for the future.

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**The Program Includes:**

- Interstate Modernization
- Transit
- Bike/Pedestrian Facilities
- Complete Streets
- Transportation Innovation
- Freight Mobility

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**Tampa Bay Next Priorities:**

- Move people and goods safely and efficiently
- Build a comprehensive regional transportation system
- Create meaningful opportunities for public input
- Balance regional needs with community concerns
- Commit to sustainable infrastructure decisions

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**Citizens Transportation Academy**

Interested in learning more about how transportation is planned, developed, funded, and implemented? Join the Florida Department of Transportation’s [Citizens Transportation Academy](#)! You talk. We listen. This webinar series is a direct response to the questions and comments we heard at our Community Working Groups and public outreach events.

**WEBINAR COURSES**

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<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>September 15</td>
<td>Regional Transportation Roles and Responsibilities</td>
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<td>September 22</td>
<td>Metropolitan Planning Process</td>
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<td>September 29</td>
<td>How Transportation Projects are Funded</td>
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<td>October 6</td>
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The online series is free and open to the public. For more information on how to participate, please visit: [TampaBayNext.com/CitizensTransportationAcademy](#). If you do not have computer access or prefer to participate in person, please join us at FDOT District Seven Headquarters, 11201 McKinley Dr, Tampa, FL 33612.

Questions? Contact [TampaBayNext@dot.state.fl.us](mailto:TampaBayNext@dot.state.fl.us) or call (813) 975-NEXT (6398)

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**Next Steps Newsletter**

Modernize infrastructure | Prepare for the future | Embrace collaboration and innovation

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**Community Working Groups: Top Focus Areas**

- **Downtown:** Prioritizing transportation solutions like rail, bus, biking, and walking to align with the many values of the community.
- **Westshore:** Use data/impact driven decision making, cost/benefit analysis vs. “whoever screams the loudest.”
- **Pinellas:** Account for new technologies, including automated vehicles, mass transit, maximize access to airports, and multimodal centers.
- **North and West Hillsborough:** Connecting transportation hubs of Tampa Bay with affordable, flexible transit options.
- **Pasco/Hernando:** Adding light rail to the transportation system, possibly in the Hwy 301/SR 56, for travel to the airport and other activity hubs, and more bus service focused on long distance and high traffic areas with Wi-Fi.
- **East and South Hillsborough County/Polk County:** Create a master plan for regional hubs and in/out movements. Include in the conversation the Regional Transit Feasibility Study.

The next round of meetings will start in September. For more information, please visit: [TampaBayNext.com/get-involved/community-working-groups](http://TampaBayNext.com/get-involved/community-working-groups). We hope you will get involved!
Upcoming Events

**Thursday, September 7:**
Historic Resources Information Meeting, 5:00 p.m. – 7:00 p.m.
Centro Asturiano, Ballroom, 1913 N. Nebraska Avenue, Tampa, FL 33602

**Every Friday, September 15 to October 20:**
Citizens Transportation Academy webinar series,
12:00-1:00 p.m., Webinar online:
TampaBayNext.com/CitizensTransportationAcademy
or Florida Dept. of Transportation, 11201 McKinley Dr., Tampa, FL 33612

**Tuesday, September 19:**
Community Working Group for Westshore/West Tampa/South Tampa,
5:30 p.m. – 7:30 p.m., Centre Club at the Urban Center,
123 S. Westshore Boulevard (8th Floor), Tampa, FL 33609

**Monday, September 25:**
Community Working Group for Downtown Tampa,
6:30 p.m. – 8:30 p.m., The Barrymore Hotel, 111 Fortune Street,
Tampa, FL 33602

Please visit the website for up to date event information: TampaBayNext.com/get-involved/.

**Would you like FDOT to present information at your community or neighborhood event? Please email us at TampaBayNext@dot.state.fl.us.**

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**Back to School Traffic Safety Tips**

August is back to school month! School buses have returned to their rounds, hurried parents are dropping off their kids, and some children are navigating their route to school by bicycle or foot. As we continue adjusting to the new normal of school traffic, please consider these safety tips:

**Give yourself time.** Plan for a few extra minutes in your commute. You don’t want your kids to be late to school and you don’t want to be late to work. Give yourself the time to not feel rushed.

**Avoid school zones, if possible.** There is a higher volume of young pedestrians in these zones. Avoid adding to the traffic in that area by going around it altogether if you can find a good, alternative route.

**Eliminate driving distractions.** Research shows that taking your eyes off the road for just two seconds doubles your chances of crashing. Children can be quick, darting into the street unexpectedly or emerging from an area of parked cars. In neighborhoods and near schools especially, consider pausing your conversations, putting your phone down, and turning your radio down in volume.

**Be careful to watch for students** who walk and bike to school. Children on bikes are often inexperienced and unpredictable. Slow down and allow for at least three feet between your vehicle and a bicyclist. Do not startle pedestrians or cyclists by honking even if you think you have the right of way.

**Be cautious around bus stops.** Slow down when approaching school bus stops with students present. Never pass a bus from behind, or from either direction if you are on an undivided road, if it is stopped to load or unload children.

**Respect the school zones.** Decrease your speed at the Begin School Zone sign and maintain reduced speed until the End School Zone sign. Anticipate that children will be riding bicycles and walking in these areas.

By planning a little better and exercising caution, we can all have a safe and punctual school year.
Interested in learning more about how transportation is planned, developed, funded, and implemented? Join the Florida Department of Transportation’s Citizens Transportation Academy!

WEBINAR COURSES

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<tr>
<td>September 22</td>
<td>Regional Transportation Roles and Responsibilities</td>
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<tr>
<td><strong>Note:</strong> There will be no session on Sept. 29 due to the TMA Leadership Meeting</td>
<td></td>
</tr>
<tr>
<td>October 6</td>
<td>Metropolitan Planning Process</td>
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<td>October 27</td>
<td>How Transportation Projects are Funded</td>
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<td>November 2</td>
<td>Congestion Management Strategies</td>
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If you do not have computer access or prefer to participate in person, please join us at FDOT District Seven Headquarters, 11201 McKinley Dr, Tampa, FL 33612

Questions? Contact [TampaBayNext@dot.state.fl.us](mailto:TampaBayNext@dot.state.fl.us) or call (813) 975-NEXT (6398)

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The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. §327 and a Memorandum of Understanding dated December 14, 2016 and executed by the Federal Highway Administration and FDOT.

If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1 (800) 955-8771 (TDD) or 1 (800) 955-8770 (Voice). Comuníquese con nosotros: Nos importa mucho la opinión del público sobre el proyecto. Si tiene preguntas o comentarios, o simplemente desea más información, por favor comuníquese con nosotros. Nuestra representante en español es: Lilliam Escalera, (813) 975-6445, Lilliam.Escalera@dot.state.fl.us.
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<tr>
<th>Date</th>
<th>Time</th>
<th>Event Name</th>
<th>Location</th>
</tr>
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<tbody>
<tr>
<td>Friday, September 22</td>
<td>12:00 p.m.</td>
<td>Citizens Transportation Academy Regional Transportation Roles and Responsibilities</td>
<td>Online Webinar (or attend at FDOT) 11201 McKinley Drive, Tampa, FL 33612</td>
</tr>
<tr>
<td>Monday, September 25</td>
<td>6:30 p.m. – 8:30 p.m.</td>
<td>Downtown/East Tampa Community Working Group - Meeting #2</td>
<td>Barrymore Hotel (near Straz) 111 Fortune St., Tampa, FL 33602</td>
</tr>
<tr>
<td>Thursday, October 5</td>
<td>5:30 p.m. – 7:30 p.m.</td>
<td>Westshore/West Tampa/South Tampa Community Working Group - Meeting #2</td>
<td>Centre Club, 8th Floor 123 S. Westshore Blvd, Tampa, FL 33609</td>
</tr>
<tr>
<td>Friday, October 6</td>
<td>12:00 p.m.</td>
<td>Citizens Transportation Academy Metropolitan Planning Process</td>
<td>Online Webinar (or attend at FDOT) 11201 McKinley Drive, Tampa, FL 33612</td>
</tr>
<tr>
<td>Monday, October 9</td>
<td>4:00 p.m. – 7:00 p.m.</td>
<td>Tampa Interstate Study, SEIS Public Workshop - Westshore</td>
<td>Marriott Westshore 1001 N. Westshore Blvd., Tampa, FL 33607</td>
</tr>
<tr>
<td>Tuesday, October 10</td>
<td>4:00 p.m. – 7:00 p.m.</td>
<td>Tampa Interstate Study, SEIS Public Workshop - Downtown Tampa</td>
<td>Hilton Downtown Tampa 211 N. Tampa Street, Tampa, FL 33602</td>
</tr>
<tr>
<td>Friday, October 13</td>
<td>12:00 p.m.</td>
<td>Citizens Transportation Academy Introduction to Transportation Project Development</td>
<td>Online Webinar (or attend at FDOT) 11201 McKinley Drive, Tampa, FL 33612</td>
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<tr>
<td>Friday, October 20</td>
<td>12:00 p.m.</td>
<td>Citizens Transportation Academy Introduction to Transit: Transit Modes and How They Work</td>
<td>Online Webinar (or attend at FDOT) 11201 McKinley Drive, Tampa, FL 33612</td>
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<tr>
<td>Friday, October 27</td>
<td>12:00 p.m.</td>
<td>Citizens Transportation Academy How Transportation Projects are Funded</td>
<td>Online Webinar (or attend at FDOT) 11201 McKinley Drive, Tampa, FL 33612</td>
</tr>
<tr>
<td>Thursday, November 2</td>
<td>12:00 p.m.</td>
<td>Citizens Transportation Academy Congestion Management Strategies</td>
<td>Online Webinar (or attend at FDOT) 11201 McKinley Drive, Tampa, FL 33612</td>
</tr>
<tr>
<td>Tuesday, November 14</td>
<td>5:30 p.m. – 7:30 p.m.</td>
<td>Howard Frankland Bridge Public Hearing</td>
<td>Tampa Marriott Westshore 1001 N. Westshore Blvd., Tampa, FL 33607</td>
</tr>
<tr>
<td>Thursday, November 16</td>
<td>5:30 p.m. – 7:30 p.m.</td>
<td>Howard Frankland Bridge Public Hearing</td>
<td>Hilton-St. Pete Carillon Park 950 Lake Carillon Dr., St. Petersburg, FL 33716</td>
</tr>
</tbody>
</table>

To attend the Citizens Transportation Academy online webinars, visit TampaBayNext.com/CitizensTransportationAcademy or attend at The Florida Department of Transportation, 11201 N. McKinley Drive, Tampa, FL 33612. Please note that recorded versions of the webinars will be available online the afternoon of each session.

The second round of Community Working Groups are being scheduled for Pinellas, Pasco/Hernando, North and West Hillsborough County, and East and South Hillsborough/Polk Counties. An update will be provided immediately as dates, times and locations are confirmed.

For more information, please call (813) 975-NEXT or email us at TampaBayNext@dot.state.fl.us.

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Comuníquese con nosotros: Nos importa mucho la opinión del público sobre el proyecto. Si tiene preguntas o comentarios, o simplemente desea más información, por favor comuníquese con nosotros. Nuestra representante en español es: Lilliam Escalera, (813) 975-6445, Lilliam.Escalera@dot.state.fl.us.
Re: Tampa Interstate Study (TIS)
Supplemental Environmental Impact Statement (SEIS)
I-275 from the Howard Frankland Bridge to north of Dr. Martin Luther King Jr. Boulevard and I-4 from I-275 to east of 50th Street
Work Program Item Segment Number: 258337-2
and
Northwest (Veterans) Expressway Design Change Reevaluation
From north of Cypress Street to north of Independence Parkway
Work Program Item Segment Number: 258736-1
Hillsborough County, Florida
Alternatives Public Workshop & Section 106 Historic Resources Information Meeting

The Florida Department of Transportation (FDOT), District Seven, invites you to attend and participate in a public workshop for the above referenced studies. FDOT is holding this public workshop on two separate dates and locations to allow for maximum participation. The information at each workshop will be identical. The dates and locations are as follows:

<table>
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<tr>
<th>Date</th>
<th>October 9, 2017</th>
<th>October 10, 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
<td>Tampa Marriott Westshore</td>
<td>Hilton Tampa Downtown</td>
</tr>
<tr>
<td></td>
<td>1001 N. Westshore Blvd.</td>
<td>211 N. Tampa St.</td>
</tr>
<tr>
<td></td>
<td>Tampa, FL 33607</td>
<td>Tampa, FL 33602</td>
</tr>
<tr>
<td>Time</td>
<td>4 p.m. – 7 p.m.</td>
<td>4 p.m. – 7 p.m.</td>
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</table>

Hilton Tampa Downtown Parking: Fort Brooke Garage, 107 North Franklin Street, Tampa, FL 33607. Whiting Street entrance. From the parking garage take the elevator to the third floor and use the walk over bridge to One City Center and the Hilton Hotel. Parking voucher will be provided at workshop sign-in table.

RESCHEDULED
Historic Resources Information Meeting
I-275 from the Howard Frankland Bridge to north of Dr. Martin Luther King Jr. Blvd. and I-4 from I-275 to east of 50th Street
WPI Segment Number: 258337-2
The purpose of this meeting is to provide information to residents, local public officials, and interested persons and organizations relative to the process and schedule for identifying and evaluating historic resources, determining significant historic properties, and eventually evaluating potential impacts to significant historic properties.
The purpose of this workshop is to involve the public in the preparation of the Supplemental Environmental Impact Statement (SEIS) that will be prepared for the Tampa Interstate Study (TIS). The SEIS will focus on the downtown Tampa and Westshore interchanges, and the section of I-275 between those areas. The SEIS is a fresh look at the long-standing plan to improve and modernize Tampa's interstate system, originally called the TIS. The workshop will also serve as an opportunity for the public to provide comments on the design changes to the Northwest Expressway as part of the Northwest (Veterans) Expressway Design Change Reevaluation.

Please understand this is an informal meeting, not a public hearing, and the first of several to be included throughout the process. The meetings will be held in an informal open house format. There will be no formal presentation. During the meeting, representatives of the FDOT will be available to discuss the process, answer questions, and receive comments specific to these studies. Written or emailed comments not received at the meeting must be postmarked or emailed by October 31, 2017 to be included in the official meeting record. Written comments can be mailed to: Ashley Henzel, P.E., PD&E Senior Project Manager, Florida Department of Transportation, MS 7-500, 11201 N. McKinley Drive, Tampa, FL, 33612, or emailed to: Ashley.Henzel@dot.state.fl.us. See the map on the first page showing the meeting locations.

A Historic Resources Meeting will be held in conjunction with the Alternatives Workshop. This meeting was rescheduled due to hurricane Irma. The purpose of this meeting is to provide information to residents, local public officials, and interested persons and organizations relative to the process and schedule for identifying and evaluating historic resources, determining significant historic properties, and eventually evaluating potential impacts to significant historic properties.

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Sincerely,

Kirk Bogen, P.E.
District Seven Environmental Management Engineer

KB/ps