5

Improvement Strategies

The sections that follow describe the improvement strategies proposed for the Rio Grande Avenue corridor. The implementation plan envisions incremental incorporation of pedestrian and bicycle safety improvements in the corridor. The first section of this chapter includes a discussion of the target speed. The following three sections of this chapter describe the proposed improvements in the short-term, mid-term, and long-term. The remaining sections discuss the preliminary cost estimates developed for the short- and mid-term improvements, the findings of the operational analysis performed, and the anticipated safety benefits of the proposed improvements.

5.1 Context Classification and Target Speed

This corridor has been identified as a C4-Urban General corridor. The allowable target speed range for a C4-Urban General corridor in the FDOT Design Manual is 30 mph to 45 mph. Given the high levels of pedestrian activity, particularly the presence of student walkers throughout the corridor, a target speed of 35 mph has been identified as the most appropriate speed to balance mobility for motor vehicles with the safety of pedestrians, bicyclists, and public transit users in this corridor.

5.2 Short-Term Improvements

As mentioned in Section 4, short-term improvements that could be easily and cost-effectively implemented, or reverted to the existing design, if necessary, were identified for inclusion in the initial project implementation phase. In this phase, pavement markings will be used to modify the existing typical sections. Throughout the corridor, painted medians will replace the continuous two-way left turn lane. North of I-4 to Gore Street, the outside through lanes in the five-lane section of Rio Grande Avenue will be repurposed to provide a 7’ wide bike lane with a 4’ wide painted buffer. These typical section modifications are presented in **Figures 14-1 and 14-2**. In addition to the typical section modifications, the proposed short-term improvements also included spot improvements, including easily implementable signalization strategies, painted bulb-outs and tightened intersection corners, and midblock crossings. The figures in **Appendix I** depict the conceptual improvement drawings for these short-term improvements. While the short-term improvements depict general locations for painted median islands, the exact design and integration with the existing two-way left turn lane will need to be refined in the design process. This includes providing single lane left turn channelization in appropriate locations and the removal and relocation of existing double arrows provided within the existing two-way left turn lane (as described in FDOT Standard Plan 711-001, Sheet 8).

A detailed summary of the recommended short-term improvements is provided below.

- Provide painted median islands throughout the corridor to limit impacts to local access while serving as an envelope for the incorporation of raised median islands in future phases.
- Optimize intersection corners and bulb-outs using pavement markings at various intersections to accommodate SU-40 trucks while minimizing pedestrian crossing distances and slow vehicle turning speeds. These painted corners and bulb-outs will serve as the envelope for the intersection corner reconstruction in the mid-term. The wearing of the paint on intersections corners can serve as an indicator for any adjustments to the corner radius that may be needed.
    - Northeast corner at 33rd Street
    - Northeast and southwest corners at LB McLeod Road
    - All corners at 29th Street
    - Northeast and southeast corners at Michigan Street
    - Northeast and southeast corners at Kaley Street
    - Southeast, southwest, and northwest corners at Gore Street
- Between I-4 and Gore Street, repurpose the outside travel lanes in the northbound and southbound direction to provide a 7-foot wide bike lane with a 4' wide painted buffer.
- Provide midblock crossings enhanced with raised refuge islands, RRFBs, and enhanced lighting at several locations along the corridor to address documented pedestrian crash history, serve pedestrian generating land uses and transit stops, and/or provide cross-corridor connectivity at regular intervals.
    - Provide new midblock crossing between 24th Street and 25th Street
    - Relocate the existing crossing from Grand Street to the midblock location between Indiana Street and Grand Street
    - Provide a new midblock crossing just north of Acme Street
- At proposed midblock crosswalk locations, relocate the bus stops downstream of the crosswalks to encourage pedestrians to cross behind the bus.
- Enhance existing midblock crossings with RRFBs
    - South of 45th Street
    - 45th Street
    - 23rd Street
- Remove unnecessary school pavement markings as directed by the County near Grand Street and the duplicate northbound school pavement marking near 22nd Street.
- Provide LPIs at the intersections near schools and/or with a documented crash history of pedestrian crashes that could be corrected with LPI
    - LB McLeod Road intersection
    - 29th Street intersection
    - Gore Street intersection

Figure 14-1: Proposed Short-term Typical Section (Gore Street to I-4) - Looking South on Rio Grande Ave

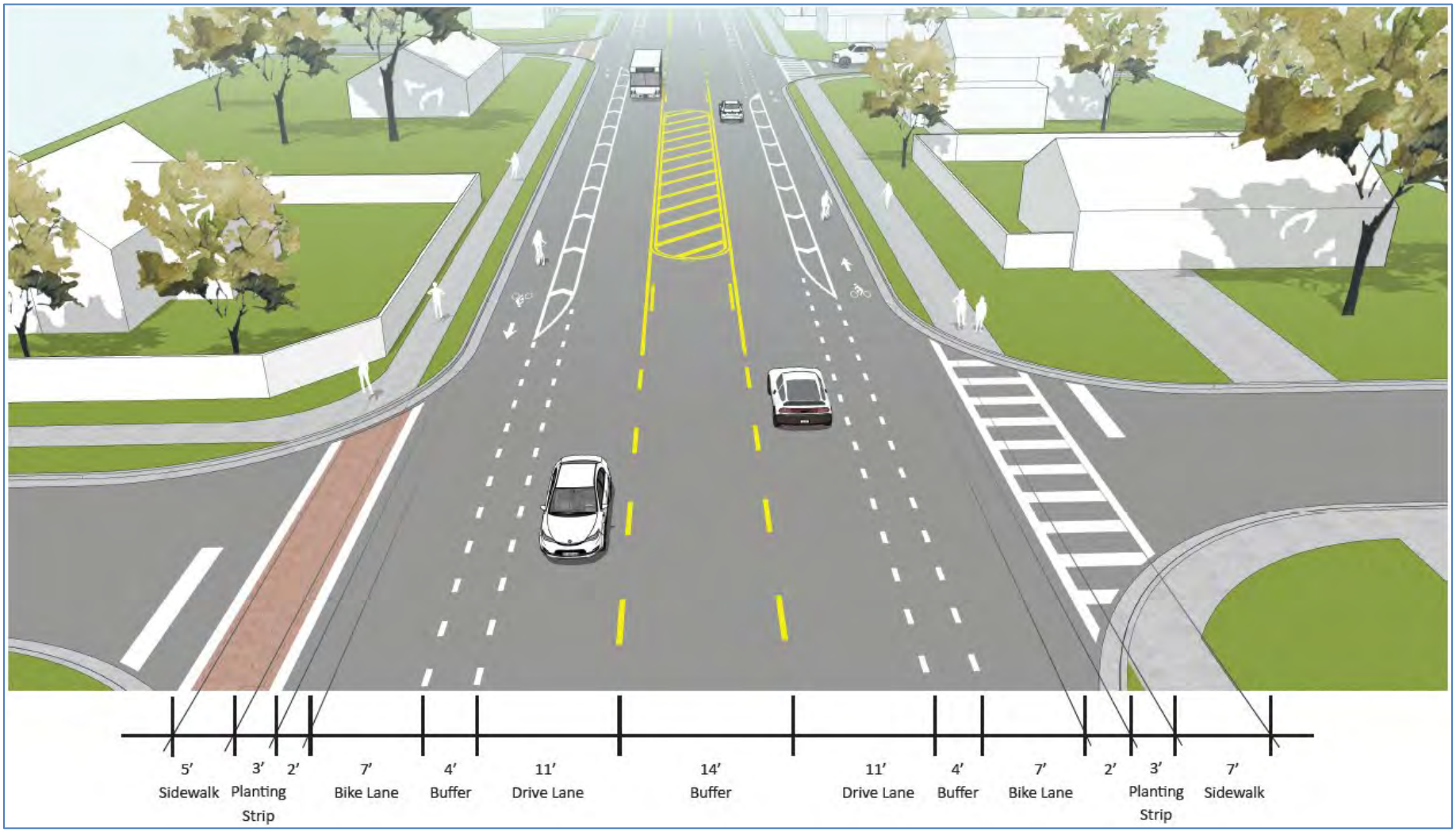
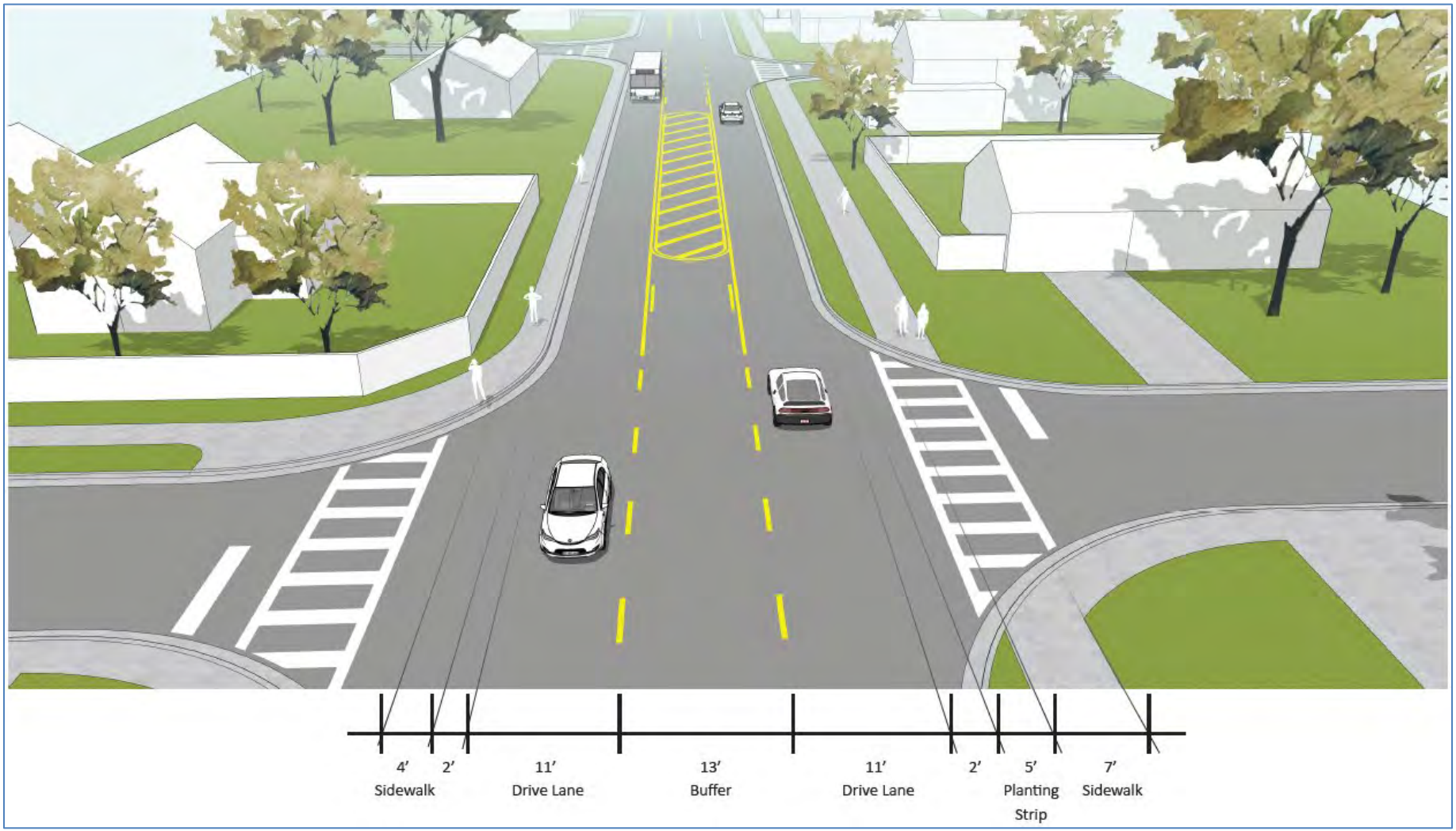


Figure 14-2: Proposed Short-term Typical Section (I-4 to Holden Avenue) - Looking South on Rio Grande Ave



5.3 Mid-Term Improvements

The mid-term improvements have been developed to build on the foundation laid in the short-term improvements, formalizing the proposed changes with more permanent modifications. The major change to the typical section is the incorporation of vertical separators within the painted bicycle lane buffer between I-4 and Gore Street. The proposed mid-term typical sections are presented in **Figures 15-1 and 15-2.**

Spot improvements included in the mid-term improvements include reconstructing intersection corners to tighten corner radii and provide bulb-outs, reconstruction of curb ramps to address ADA deficiencies, and more complex signalization strategies. The figures in **Appendix J** depict the conceptual improvement drawings for these mid-term improvements. A detailed summary of the recommended mid-term improvements is provided below.

- Incorporate vertical separation between the travel lane and bicycle lane to create a separated bicycle lane between I-4 and Gore Street.
- Provide special emphasis crosswalk markings at signalized intersections (note: all locations need to be analyzed for appropriate school crossing locations and ADA upgrades).
    - Refurbish the crosswalks across the west, south, and east legs of the 33d Street intersection and update to special emphasis crosswalks
    - Refurbish the crosswalk across the north leg of the LB McLeod Road intersection and update to special emphasis crosswalks
    - Refurbish the crosswalks across the north, south, and west legs of the 29th Street intersection and update to special emphasis crosswalks
    - Refurbish the crosswalk across on the north, east, and west legs of the Michigan Street intersection and update to a special emphasis crosswalk
    - Provide a new curb ramp on the southwest corner of the Michigan Street intersection and realign the south crosswalk accordingly
    - Refurbish worn crosswalk markings at the Gore Street intersection and update to special emphasis crosswalks
    - Install missing crosswalks on the north and south leg of the signalized south access drive to Jones High School
- Provide special emphasis crosswalk markings on stop-controlled approaches of side streets/driveways at unsignalized intersections.
- In locations where intersection corners and bulb-outs were painted in the short-term improvements, reconstruct the curb line to formalize these tightened corners.
    - Northeast corner at 33d Street
    - Northeast and southwest corners at LB McLeod Road
    - All corners at 29th Street
    - Northeast and southeast corners at Michigan Street
    - Northeast and southeast corners at Kaley Street
    - Southeast, southwest, and northwest corners at Gore Street
    - Reconstruct the curb ramps and sidewalk on the northeast corner at Gore Street
- Implement pedestrian actuated right turn on red restrictions using blank out signs.
    - LB McLeod Road
    - 29th Street intersection
    - Gore Street intersection
- Consider restricting permissive left turns, allowing protected only left turns, during school arrival and dismissal times.
    - LB McLeod Road
    - 29th Street intersection
    - Gore Street intersection

- Address ADA deficiencies as described in **Appendix B.**
- Provide green colored pavement markings in the extensions of the bicycle lanes through the signalized intersections between I-4 and Gore Street.
- Remove the curb ramp and abandoned driveway on the east side of the road, near the Jones High School northern access drive, and replace with boarding/alighting pads.

Figure 15-1: Proposed Mid-term Typical Section (Gore Street to I-4) - Looking South on Rio Grande Ave

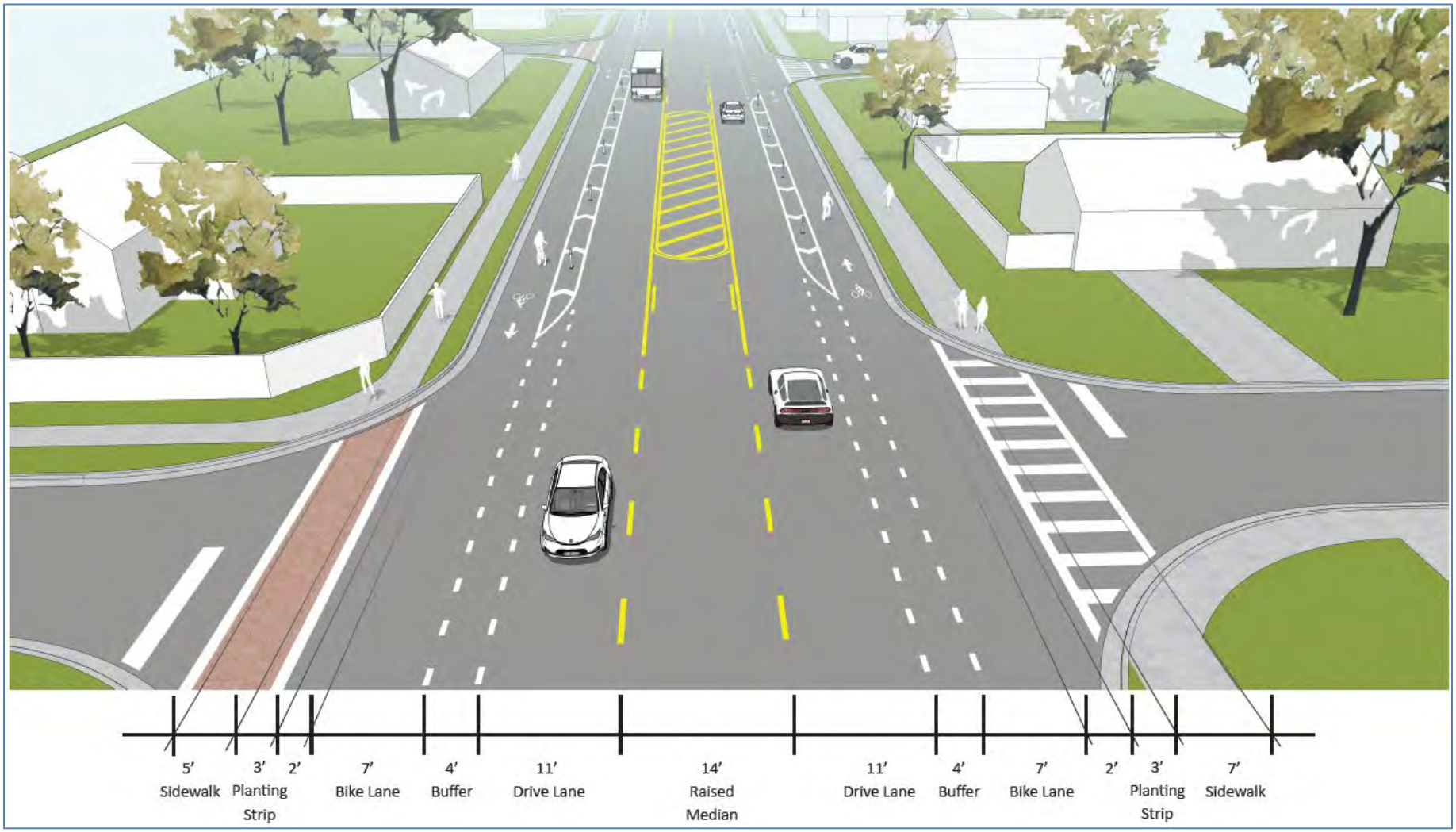
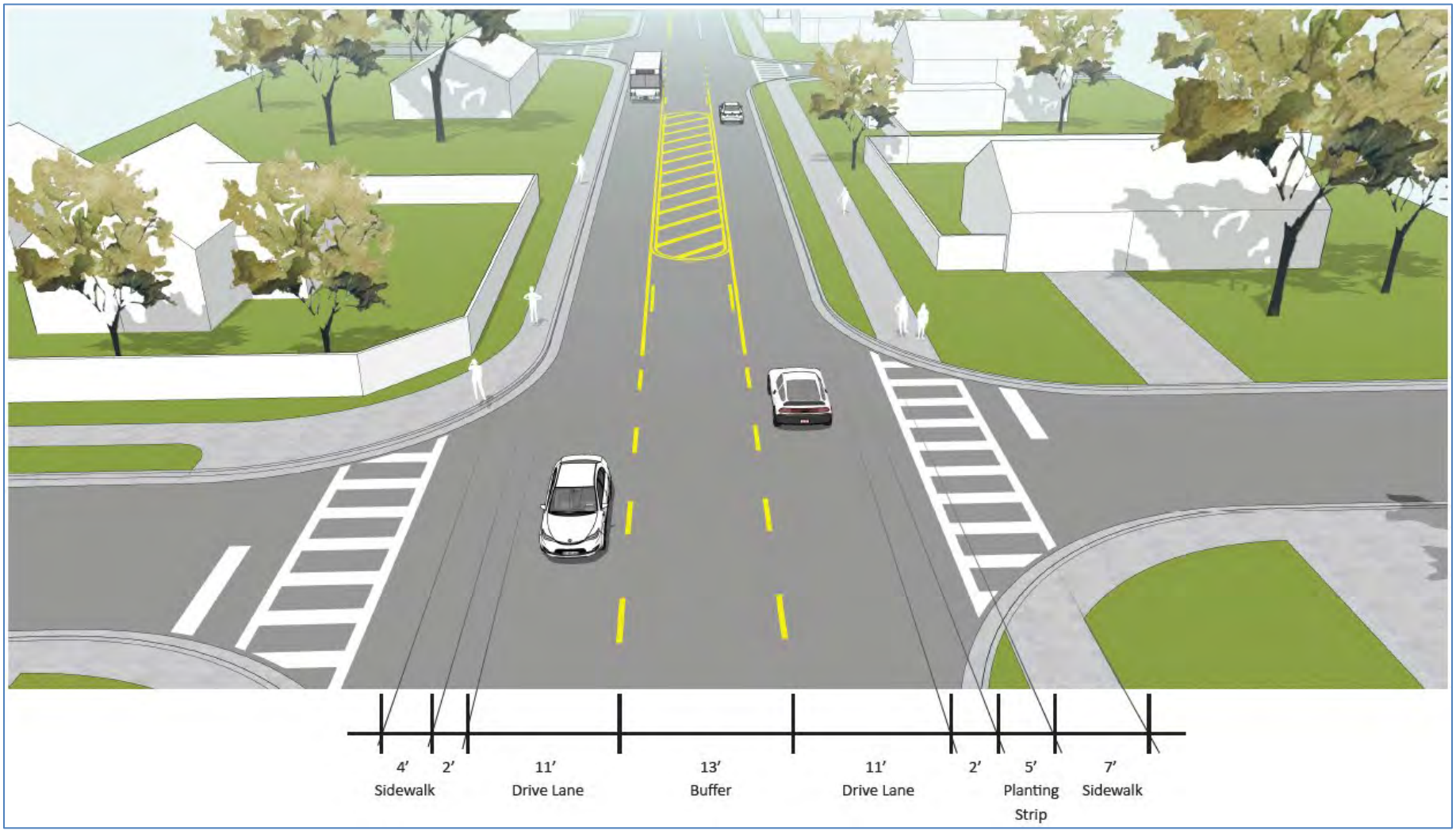


Figure 15-1: Proposed Mid-term Typical Section (I-4 to Holden Avenue) - Looking South on Rio Grande Ave



5.4 Long-Term Improvements

The long-term improvements represent the ultimate vision for the corridor and have been developed to build on the short-term and mid-term improvements. These improvements represent the more expensive and permanent strategies in the corridor. The major changes to the typical section included in this phase include converting the painted median islands to raised islands, replacing the painted bicycle lane buffers with raised islands, the incorporation of street trees and landscaping within the raised median islands, and sidewalk widening in various locations throughout the corridor. The proposed long-term typical sections are presented in **Figure 16**.

The lone spot improvement included in the long-term improvements include reconfiguration of the skewed, four-legged Michigan Street/Montview Street to a T-intersection at Michigan Street and associated access management improvements.

A detailed summary of the recommended long-term improvements is provided below.

- Replace painted median islands with raised median islands throughout the corridor.
    - Between just north of 45th Street and 35th Street, offset the edge of the raised median 2' from the edge of the northbound travel lane to accommodate long-term plans to move the eastern curb line in 2' and provide a 6' wide sidewalk along the eastern edge of the roadway.
- Incorporate street trees or other landscaping in the raised median islands throughout the corridor
- Convert the painted bicycle lane buffer to a raised island between I-4 and Gore Street. At transit stop locations, provide island platforms (floating bus stops) to accommodate in-lane boarding and alighting activities, widening the raised island to 5 feet wide (narrowing the bike lane to 6 feet), and providing necessary curb ramps to connect to the sidewalk. To manage the conflict of pedestrians and cyclists at these locations, mark crosswalks and yield lines across the bike lane.
- Move in the curb line on east side of Rio Grande Avenue by 2 feet, between just north of 45th Street and 35th Street, to provide a 6-foot wide sidewalk.
- Widen the sidewalk on the west side of Rio Grande Avenue, south of 33rd Street, to the back of the curb to provide a 12' wide sidewalk/path.
- Widen the sidewalk on the east side of Rio Grande Avenue, from Gore Street to Jones High School to accommodate high volumes of student walkers.
- Reconfigure the skewed, four-legged Michigan Street/Montview Street to a T-intersection.
    - Remove northbound left turn lane and provide raised median island in short segment between 27th Street and Michigan Street (retaining full access at 27th Street)
    - Relocate marked crosswalk across Rio Grande Avenue from north of Montview Street to North of Michigan Street
    - Restrict access at Montview Street to right-in, right-out with use of a traffic separator in the median
    - Close the driveway to/from Rio Grande just south of the Sunoco gas station
    - Modify the access at the Sunoco gas station driveway to right-in only, given the location of the driveway within the middle of the Michigan Street intersection
- Identify and provide lighting enhancements at locations that are not currently meeting standards.
    - East leg of the 43rd Street intersection
    - East leg of the 36th Street intersection
    - All legs of the 33rd Street intersection
    - All legs of the LB McLeod Road intersection
    - East leg of the 30th Street intersection
    - West leg of the 28th Street intersection
    - North leg of the 23rd Street intersection
    - East leg of the Gore Street intersection
    - West leg of the Jones High School northern access drive

Figure 16-1: Proposed Long-term Typical Section (Gore Street to I-4) - Looking South on Rio Grande Ave

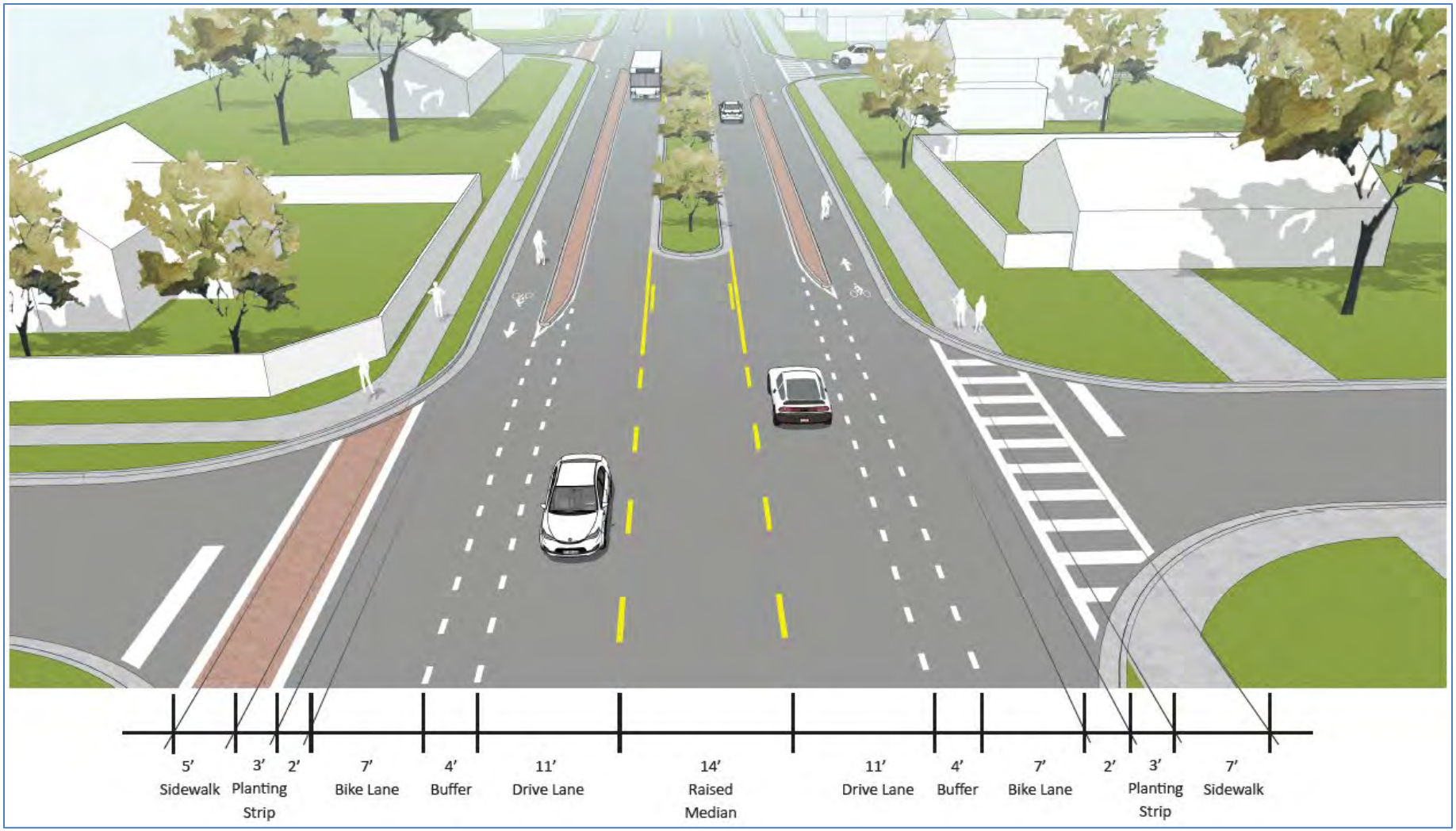
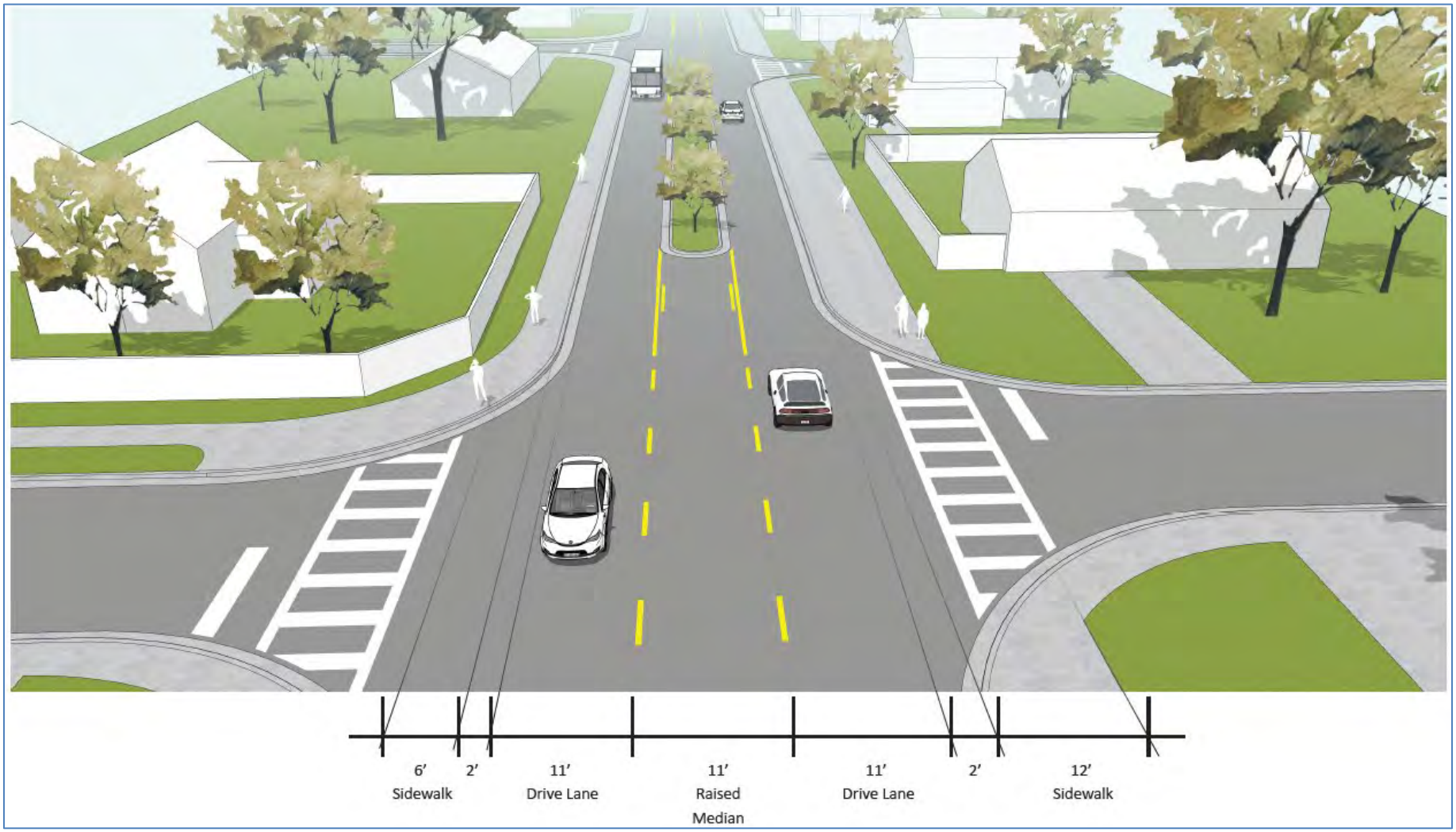


Figure 16-1: Proposed Long-term Typical Section (I-4 to Holden Avenue) - Looking South on Rio Grande Ave



5.5 Preliminary Cost Estimates

This section summarizes the methodology and assumptions used in preparing the preliminary cost estimate for the Rio Grande Pedestrian Safety Study. The preliminary cost estimates were prepared for the short-term and mid-term improvements identified along Rio Grande Avenue as shown in the conceptual improvement drawings prepared for the report (**Appendices I and J**) and summarized in Sections 5.2 and 5.3. The displays are conceptual only and the cost estimate should be refined once design drawings have been prepared. Unit costs were provided using the FDOT Historical Item Average Unit Cost 12-month average from February 1, 2020 to January 31, 2021, and engineering judgment.

Table 14 shows the preliminary cost estimates for the short-term and mid-term improvements broken out by the work category. A more detailed summary, broken down by pay item is included in **Appendix K**. The preliminary cost estimate for short-term improvements is $427,984.24. For mid-term improvements, the preliminary cost estimate is $376,224.66.

Table 14: Preliminary Cost Estimates by Work Category (Short- and Mid-Term)

Work Category	Short-Term	Mid-Term
Mobilization, MOT, Erosion Control, Litter Removal, Mowing, Earthwork	$ 61,273.12	$ 103,600.59
Surface Courses and Concrete Pavement	$ -	$ 16,524.63
Incidental Construction, Curb, Sidewalk, Guardrail, Crash Cushions, Fencing, Turf	$ 25,117.66	$ 99,436.46
Traffic Control Signals and Devices, Conduit, Midblock Crosswalks, Traffic Monitoring Sites	$ 150,722.00	$ -
Signing, Pavement Markings, Lighting	$ 119,540.75	$ 93,958.87
Project Unknowns (20%)	$ 71,330.71	$ 62,704.11
Total	**$ 427,984.24**	**$ 376,224.66**

The following important assumptions and considerations were incorporated into the preliminary cost estimates.

- Pavement quality was not evaluated as part of this effort and the timing of future resurfacings along the corridor are unknown at this time. In meeting the County's goal to keep costs down, it was assumed that conflicting pavement markings would be removed, rather than with milling and resurfacing. The lone exception was the intersection of Rio Grande Avenue and Gore Street, where pavement quality is noticeably deficient and substantial changes to crosswalk markings are proposed. The cost estimates assume that this intersection would be milled and resurfaced in the mid-term.
- The ease of implementation of pedestrian-friendly signal operations improvements, specifically the implementation of LPIs, blank-out signs, and protected left turn phasing is largely dependent on the ability of the existing signal infrastructure and controllers to accommodate these strategies. This will need to be investigated in further engineering evaluations; thus, the cost of implementation is not included in these cost estimates.
- Further analysis of lighting in the corridor will be required to understand the necessary lighting improvements; thus, the cost estimate does not account for these lighting improvements along the corridor.
- In the mid-term improvements, it was assumed that tubular markers would be used as the vertical separation for the separated bicycle lane to reduce costs.
- Further analysis will be required to understand the necessary improvements to address ADA deficiencies; thus, the cost estimate does not account for these improvements along the corridor.

- A 20% contingency factor was applied to the cost estimates to account for any project unknowns.
- Construction projects are underway at Holden Avenue and the I-4 underpass; the cost estimates assume those improvements are in place before this project is implemented and do not include the costs of improvements proposed at those locations.

5.6 Operational Analysis

Since the proposed improvements include repurposing the outside through lanes in the five-lane section of Rio Grande Avenue (North of I-4 to Gore Street) to provide a 7' wide bike lane with a 4' wide painted buffer, a planning-level intersection analysis was conducted for the existing (current roadway and intersection geometry) and modified (lane repurposing) conditions. The objective of this analysis is to determine the operational impacts under the modified conditions for the 5-lane section of Rio Grande Avenue. It is anticipated that a certain amount of the current traffic will use alternative routes after the implementation of the recommended improvements. The following table shows the critical PM peak hour intersection analysis results for the existing and modified conditions using existing turning movements volumes for the signals on Rio Grande Avenue between I-4 and Gore Street.

Based on the analysis results shown in **Table 15**, with a 3-lane section on Rio Grande Avenue from 33rd Street to Gore Street, all the signalized intersections are expected to operate within LOS E conditions. However, it is anticipated that all the study intersections will have a slightly increased average intersection delays, except for the intersections at Jones High School (where number of through lanes on Rio Grande Avenue remain the same as the existing conditions).

Table 15: Intersection LOS Comparison between Existing and Modified Conditions – PM Peak Hour

Study Intersection	PM Peak delay (seconds per vehicle)/LOS	
	(5-lane Section)	(3-lane Section)
Rio Grande Ave & 33rd Street	31.2/C	33.1/C
Rio Grande Ave & LB McLeod Road	42.9/D	54.8/D
Rio Grande Ave & 29th Street	10.1/B	20.0/B
Rio Grande Ave & Montview Street/W Michigan Street	16.7/B	22.1/C
Rio Grande Ave & Gore Street	41.5/D	42.2/D
Rio Grande Ave & Jones High School (South Access)	1.1/A	1.1/A
Rio Grande Ave & Jones High School (North Access)	16.1/B	16.1/B

5.7 Safety Benefits

Anticipated safety benefits are presented in this section based on reduction in crashes using Crash Reduction Factor (CRF) for each of the proposed safety improvements. The most common source for CRFs is the Federal Highway Administration's (FHWA) CMF Clearinghouse. It is important to note that the CRFs are based on historical data for similar roadway geometrics and traffic characteristics. The following **Table 16** illustrates the available CRFs (for locations reasonably like the study corridor) that can be used to determine the anticipated reduction in crashes. CRFs are not available for all the proposed improvements.

Please note that a benefit/cost analysis using crash reduction benefits is not conducted because of the phased approach of the recommended improvements and because of the difficulty of applying these CRFs to the study corridor. The supporting documentation from the *CMF Clearinghouse* is provided in **Appendix L.**

Table 16: Anticipated Safety Benefits for the Recommended Improvements

Proposed Improvement	Safety Benefit[1]	
	Percent	Crash Type/ Severity
Road Diet[2] (four-lane roadway to three-lane roadway with center turn lane)	19%	All/All
10% reduction in mean speed[3]	32%	All/All
Install raised median with or without a marked crosswalk	32%	Vehicle-Pedestrian/All
Install RRFB	47%	Vehicle-Pedestrian/All
Highway Lighting	32%	All/serious, minor, and possible injuries

Notes:
1) Source: http://www.cmfclearinghouse.org/. CFRs with a star quality rating of 3 or more are considered
2) CRF for 5-lane to 3-lane road diet is not available
3) A 10% reduction in mean speed is assumed for the segment with 5-lane to 3-lane conversion