1st Avenue: River Road to Grant Road

1st Avenue Citizens' Task Force Meeting

11/21/2024

1ST AVENUE PUBLIC OUTREACH

Public Outreach Update

Survey

422 responses

Final Pop-up Events

Vantage West | November 22

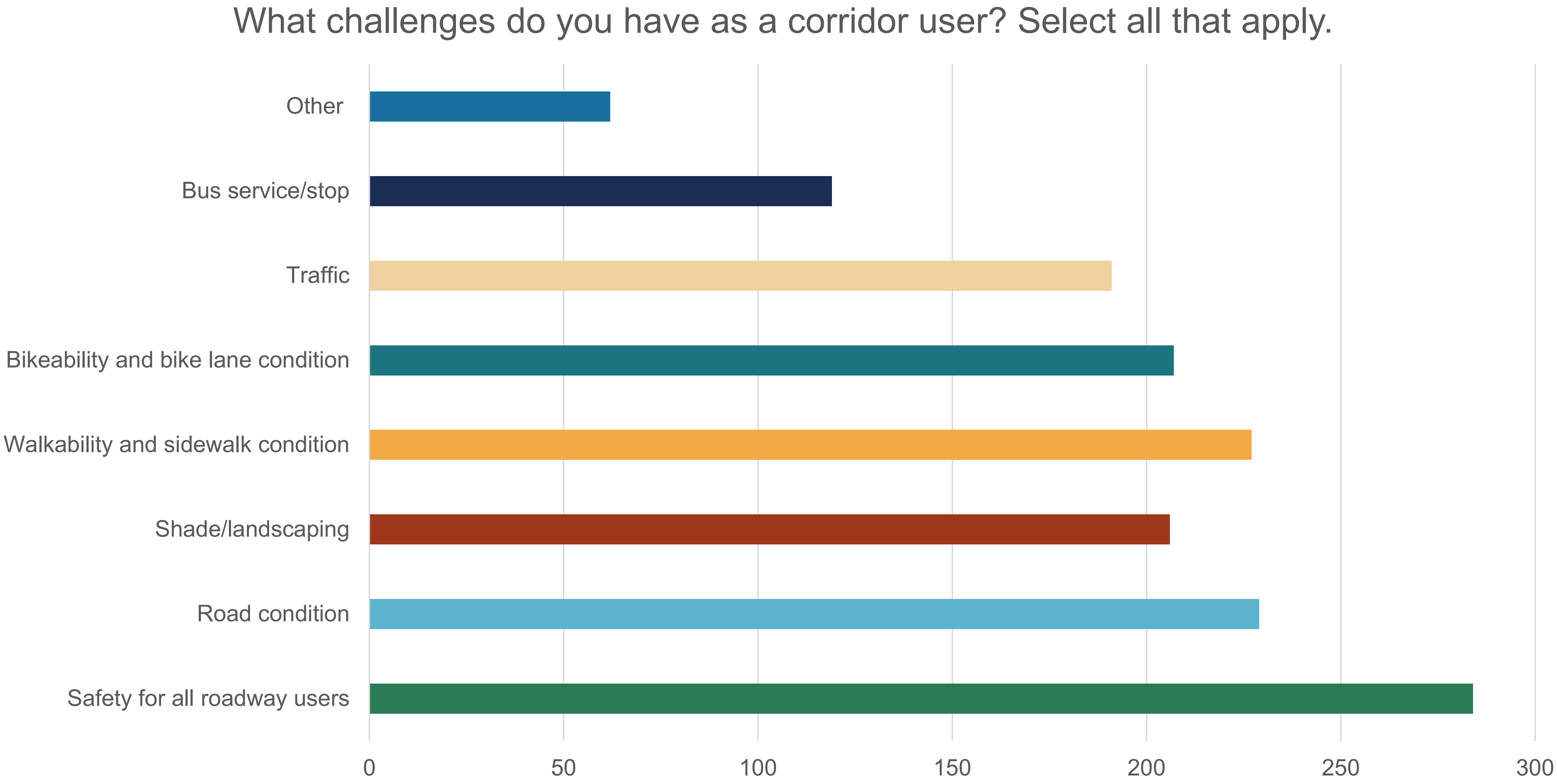
Amphi Cyclovita | December 7

Survey Extended

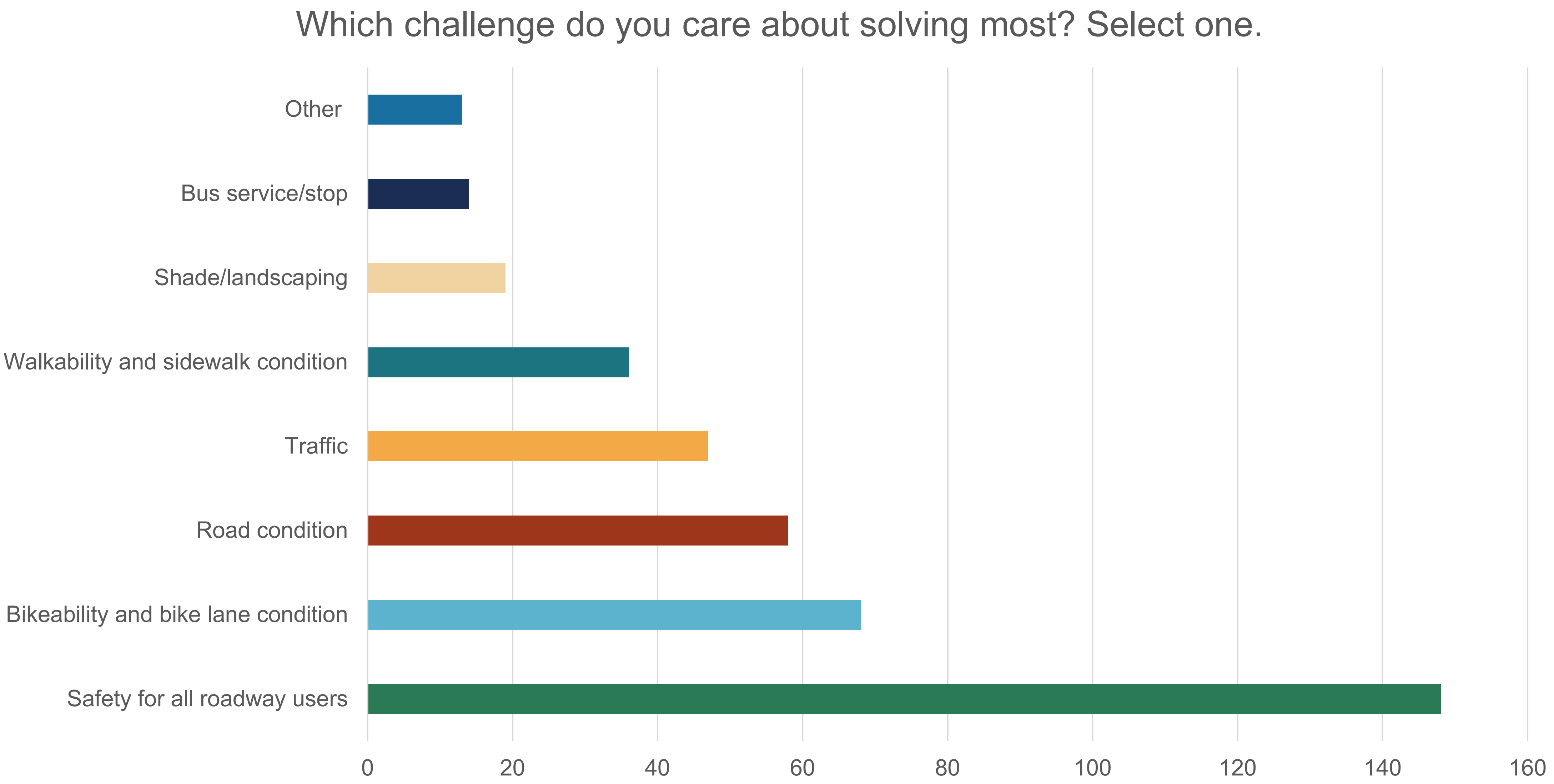
Accepting responses through December 8

Additional efforts to secure more responses and more representative responses

Preliminary Results

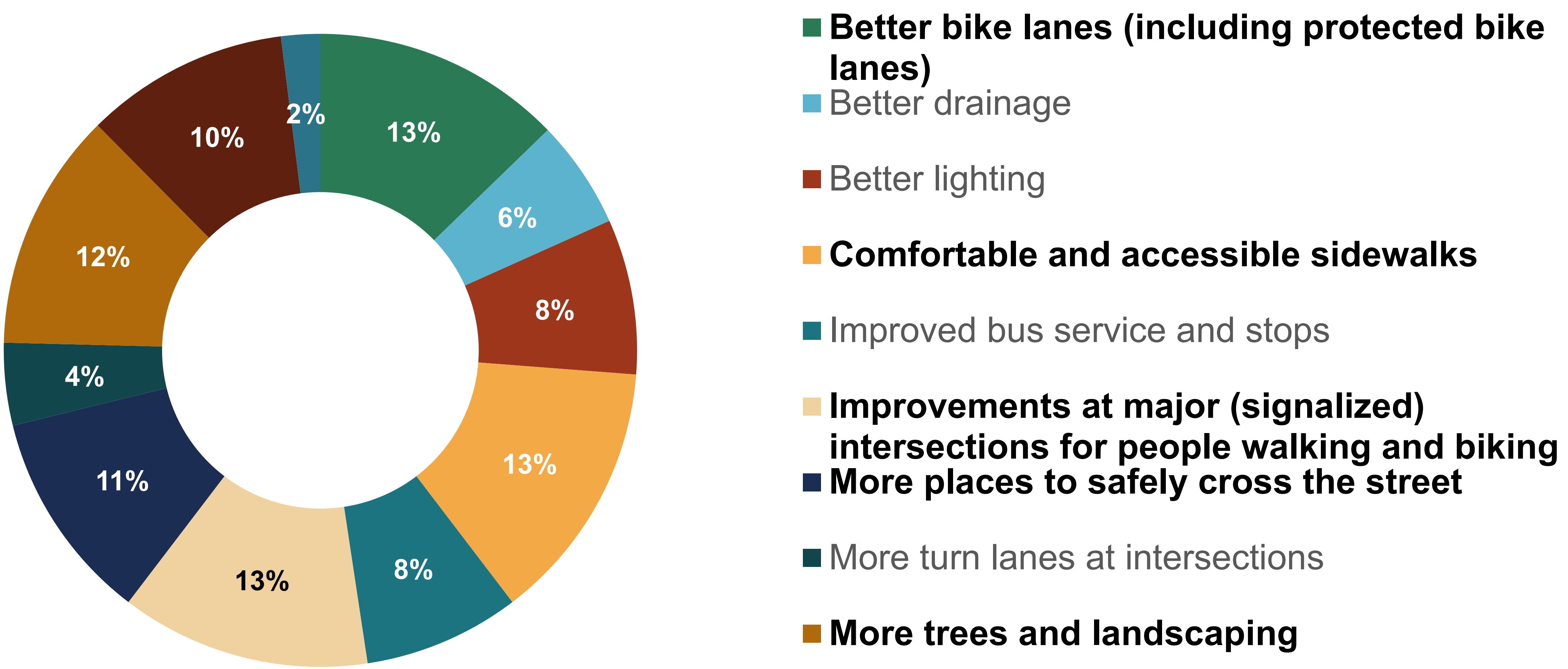


Preliminary Results



Preliminary Results

What are the top five things you want to make better on the corridor?



Preliminary Results

Please rank the following project considerations in order of importance from 1 to 4 (1 = most important and 4 = least important).

Categories	Average weight	Rank
Bicycle/pedestrian safety and comfort	**3.23**	**1**
Minimizing project costs	1.93	4
Minimizing impacts on private property and businesses	2.30	3
Reducing traffic congestion and travel time	2.54	2

Existing Conditions Equity and Microsimulation Mopel

1st Avenue DCR Data Analysis

- **Community and Infrastructure**
  - Demographics
  - Land Use
  - Street Network
- **Travel and Safety Trends**
  - Crash Data
  - Near Miss Video Data
  - Field Review Observations
  - Interviews and Engagement
- **Mobility Analysis**
  - Vehicle
  - Pedestrian
  - Bicyclist
  - Transit
- **Additional Analysis**
  - Equity
  - Simulation Model
  - Intersection Types

August

September

October

Today

EQUITY

Transportation Equity

What is Equity?

- It begins by recognizing that not everyone starts their journey from the same place.
- It acknowledges that some communities face disadvantages and, as a result, need extra support to achieve a just outcome.

Why Equity Matters in Transportation

- <u>Transportation is a critical need:</u> Access to safe, reliable, and affordable transportation influences people's ability to work, attend school, access healthcare, and participate in the community.
- <u>Unequal impacts:</u> Some communities face barriers to transportation due to geography, income, race, disability, and language, which can widen existing disparities.

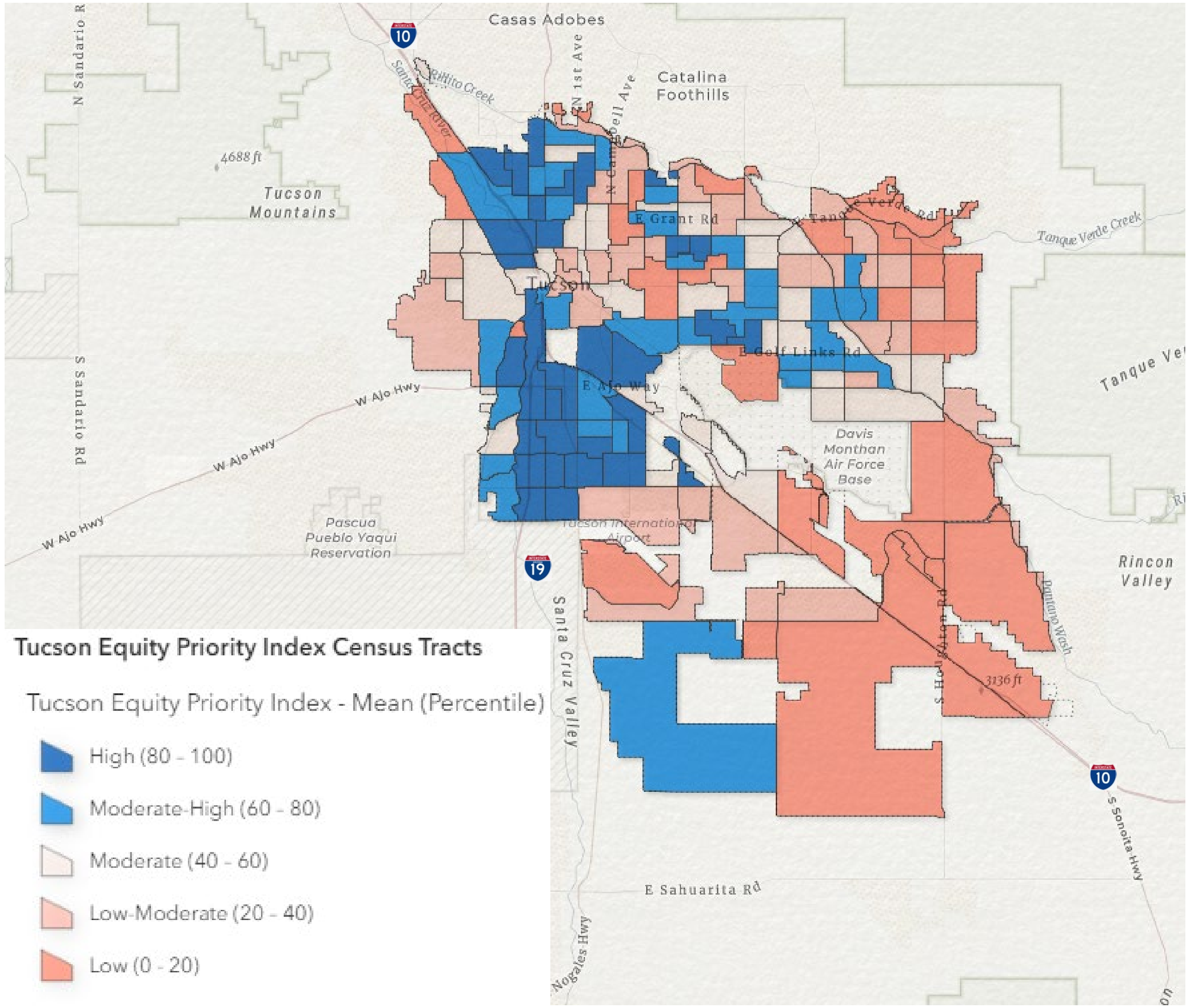
Transportation Equity

Equity in Transportation Means:

- Ensuring Accessibility: Transportation options that serve all, especially underserved groups (low-income, people of color, seniors, people with disabilities).
- Improving Mobility: Addressing travel challenges for those with limited transportation choices, providing options so that everyone can move efficiently.
- Investing in Communities: Prioritizing improvements in areas with the greatest need and least access to quality transportation options.

City of Tucson Equity Priority Index

- Data Analyzed by Census Tract
- Priority Index Data
    - Income
    - Employment
    - Education
    - Age
    - Transportation Access
    - Health Care Access
    - Ethnicity
    - Disability



1st Avenue Equity Priority Index

Study Area

Median Income
$36,602

Bachelors+
37.4%

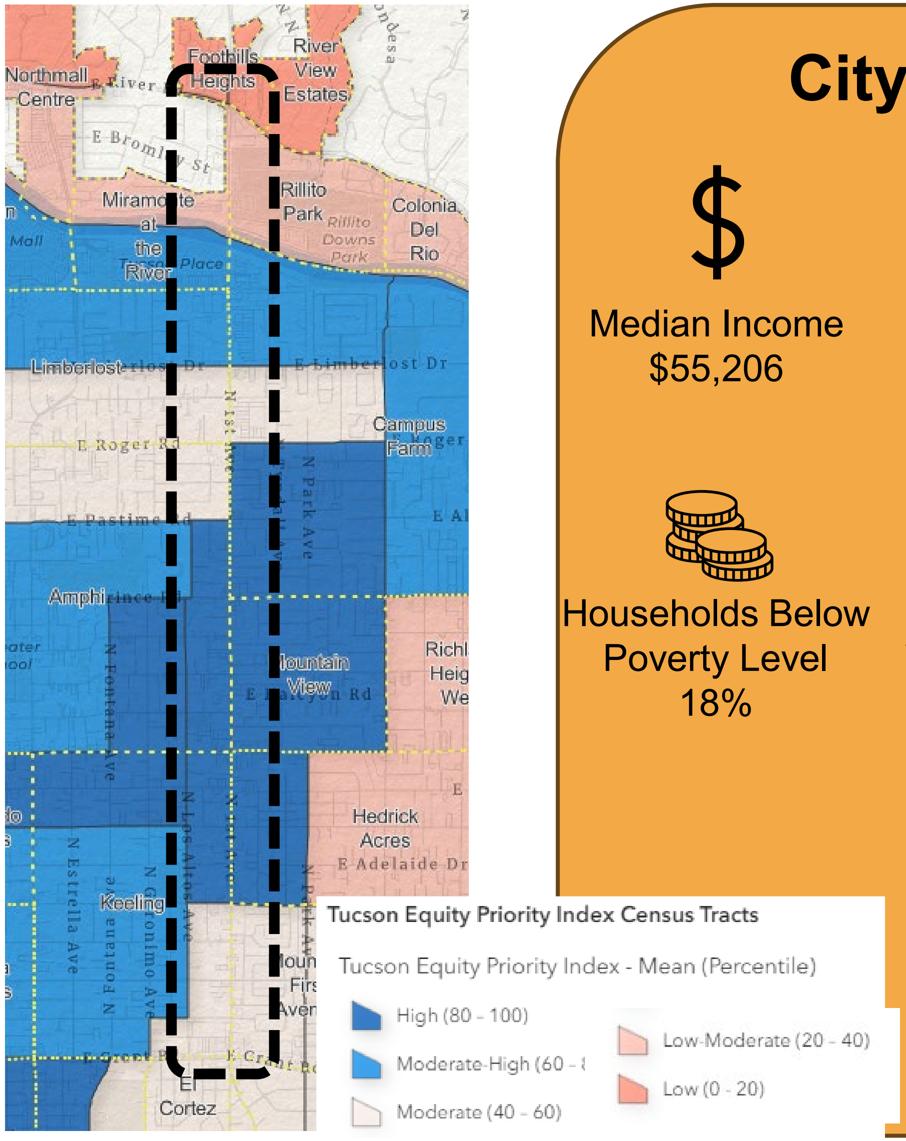
65+
13.0%

Households Below Poverty Level
28%

Households Without Vehicle
13.6%

Population Speak No English
2.3%

Households With Disability
29.2%



City of Tucson

Median Income
$55,206

Bachelors+
31.7%

65+
18.1%

Households Below Poverty Level
18%

Households Without Vehicle
9.7%

Population Speak No English
1.6%

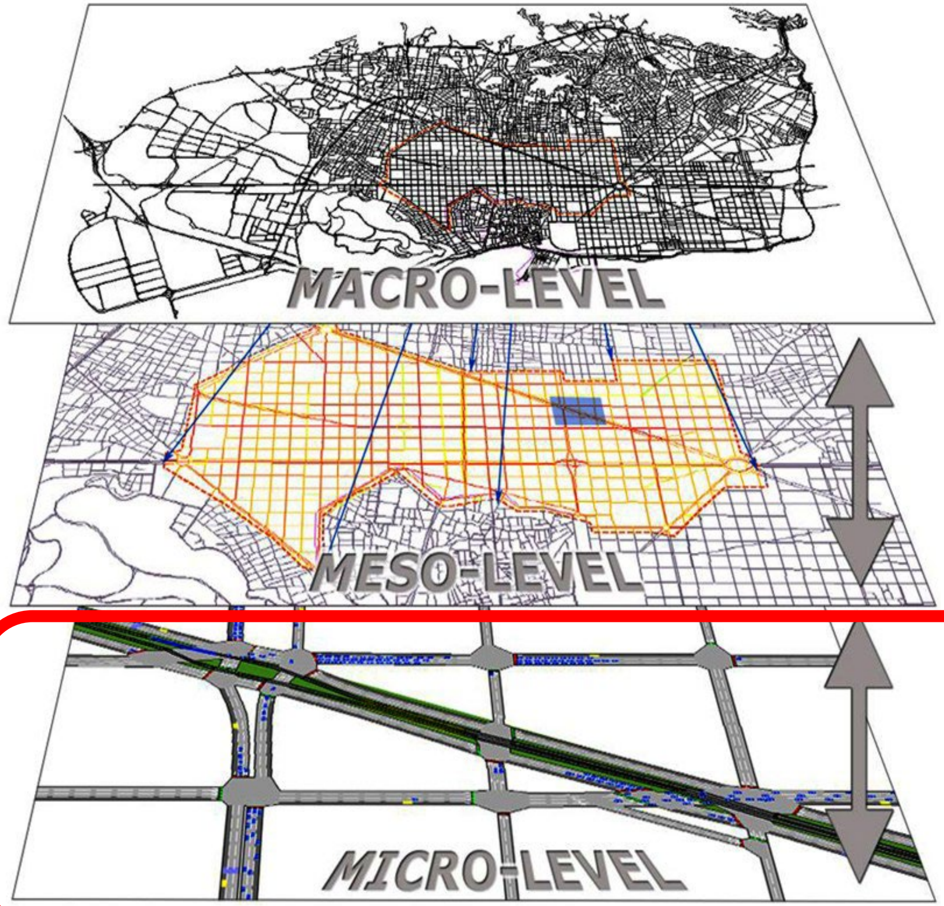
Households With Disability
27.5%

Simulation Model

Presentation Overview

- Transportation Modeling
- Microsimulation
- Why Use Microsimulation?
    - *Strengths*
    - *Limitations*
- Performance Measures
- 1st Avenue Simulation Model

Transportation Modeling



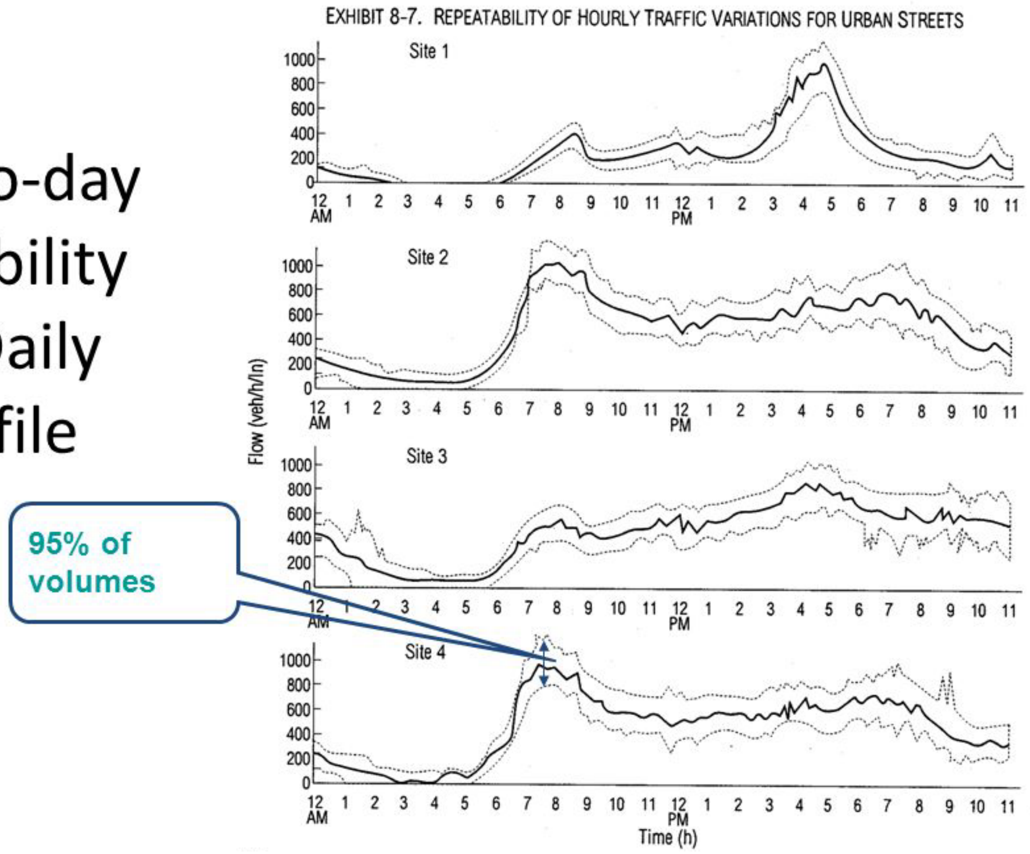
Regional networks (large scale by PAG)
Volume-delay functions
Low temporal resolution (4-hour intervals)
No traffic signal timings

Sub-regional networks
Simulation-based dynamic traffic assignment
Medium temporal resolution (15-mins)
Approximate signal and phasing settings

Small subarea networks or corridors
Car-following (second-by-second) of individual vehicles
High temporal resolution
Detailed signal and phasing settings

Modeling Approach

Day-to-day Variability of Daily Profile



- **Deterministic tools (Synchro, HCM):**
  - Same Input = Same Output
  - Equation (Empirical) Based

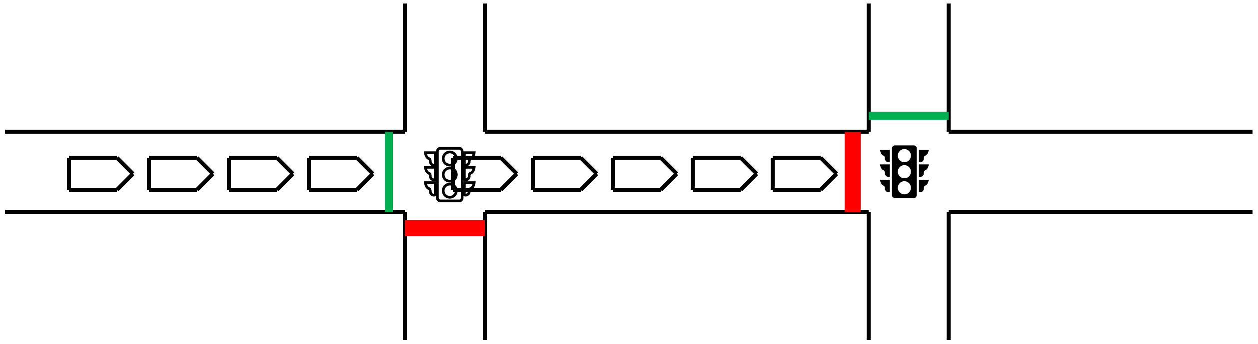
- **Stochastic tools (VISSIM, Corsim)**
  - Variations in inputs (volume, interarrival times, lane changing, etc.)

Multimodal Modeling

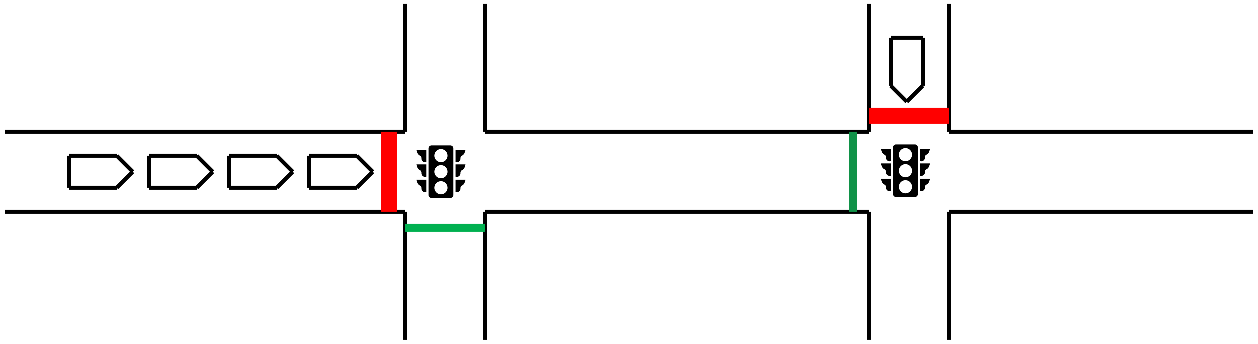
Dynamic interaction of multimodal road users:

- Vehicles
- Pedestrians
- Bicyclist
- Buses
- Light Rail

Microsimulation (Queue Interactions)

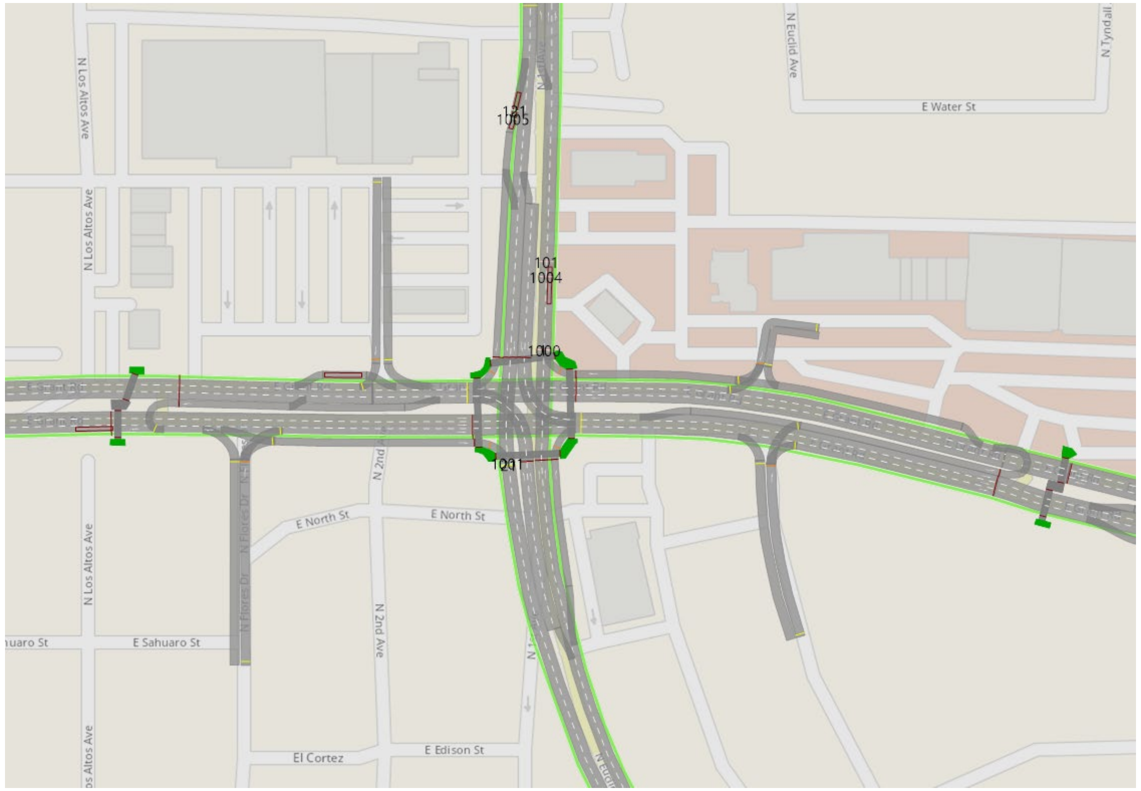


Queue Spillback



Green Starvation

Why Microsimulation



STRENGTHS

- *Complex Modeling*
- *Multimodal*
- *Visualization*

LIMITATIONS

- *Data Requirements*
- *Calibration Efforts*

KITTELSON & ASSOCIATES

Strengths

- **Complex Modeling**
  - Intersection Configurations
  - Pedestrian/Crowd
- **Customized models/ signal control**
  - Transit timing
  - Exclusive pedestrian phasing

KITTELSON & ASSOCIATES

Strengths

- **Visualization**
  - Contextual
  - Tailored to match surroundings

Limitations

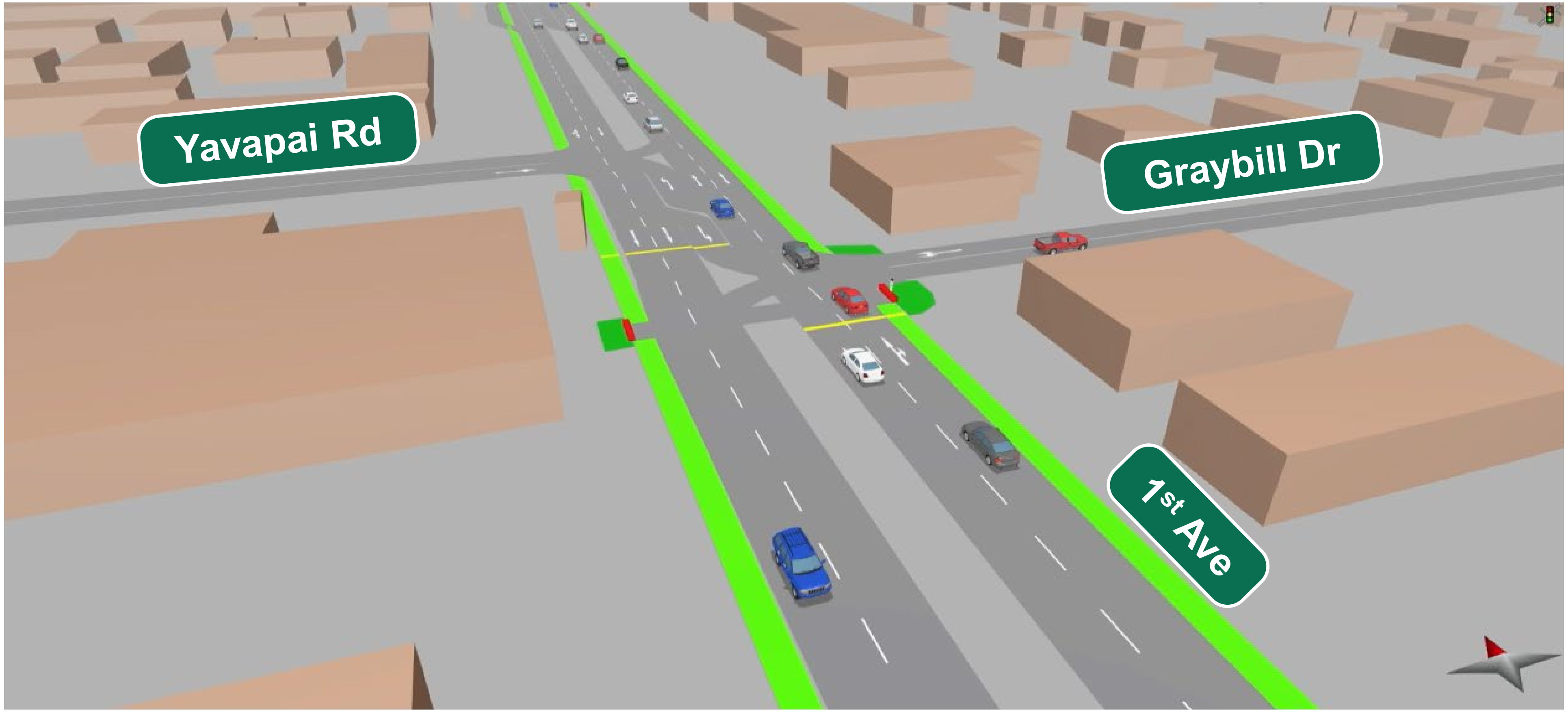
- Requires extensive input data
  - Labor-intensive and time-consuming
- Needs to be properly calibrated to reflect actual conditions
  - Limited calibration may lead to misleading/inaccurate results
- Good data and calibration are critical for reliable microsimulation model results

Performance Measures

Key Performance Area	Performance Metric
Mobility	Delay/Level of service (LOS) Travel time/Speed Average queue/Maximum queue Green time statistics Vehicle/person throughput Latent (unserved) demand Transit speed Transit on-time performance/headway adherence Pedestrian signal delay
Reliability	Extreme travel times Travel time standard deviation Transit headway coefficient of variation Transit travel time reliability
Emissions	Total fuel consumption Number of stops Emissions (e.g., CO, NOx)

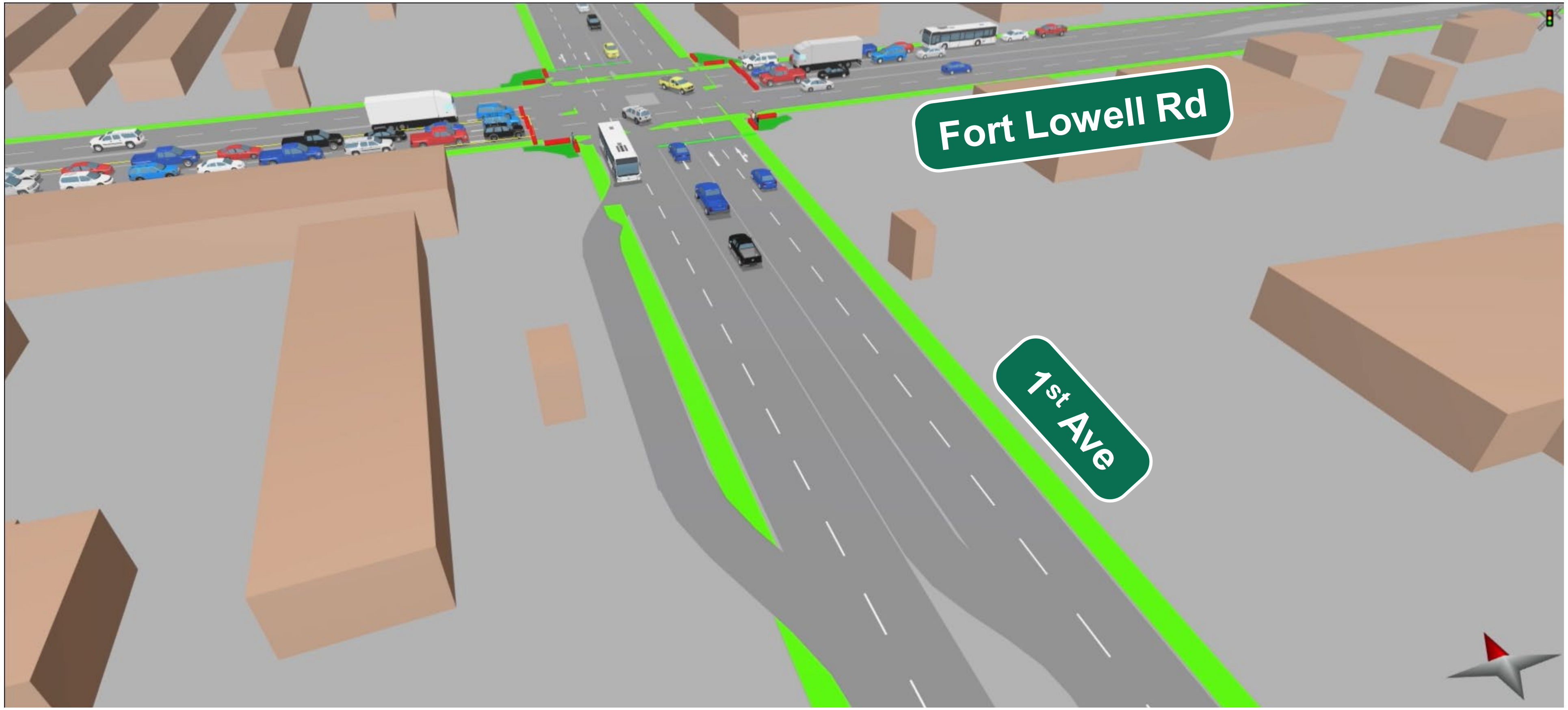
1st Avenue Vissim Model

HAWK – Pedestrian Crossing



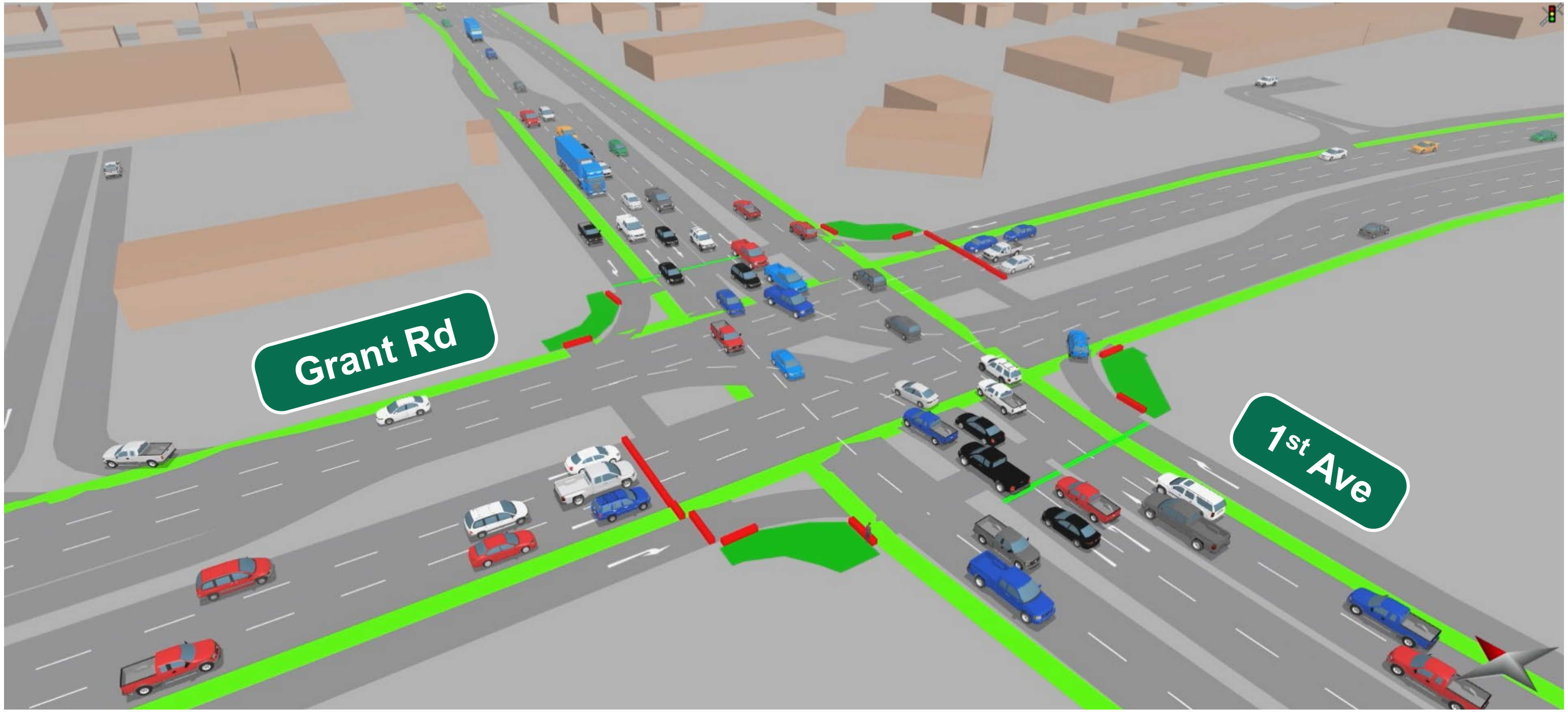
1st Avenue Vissim Model

Transit Interactions – Bus Pullouts



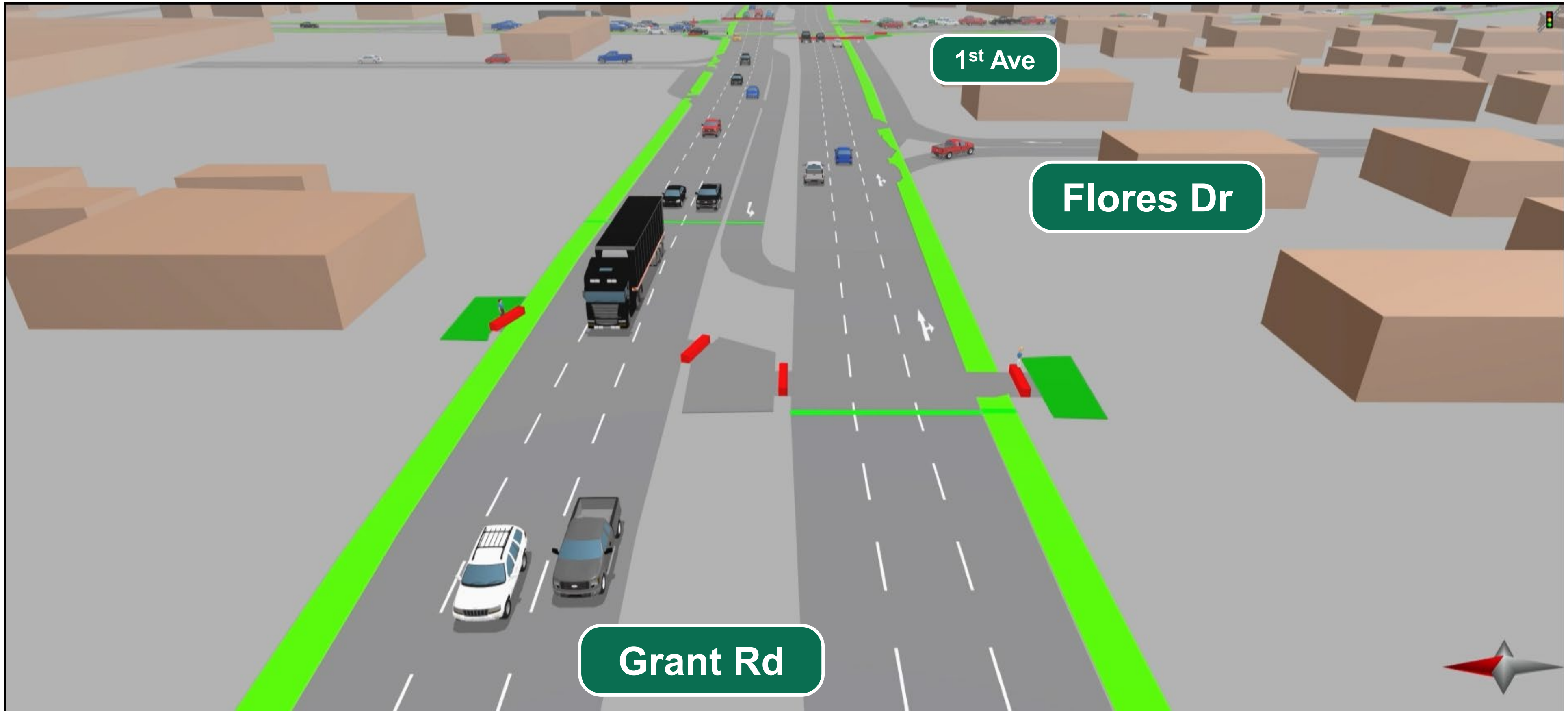
1st Avenue Vissim Model

Transit Interactions – In-lane Bus Stop



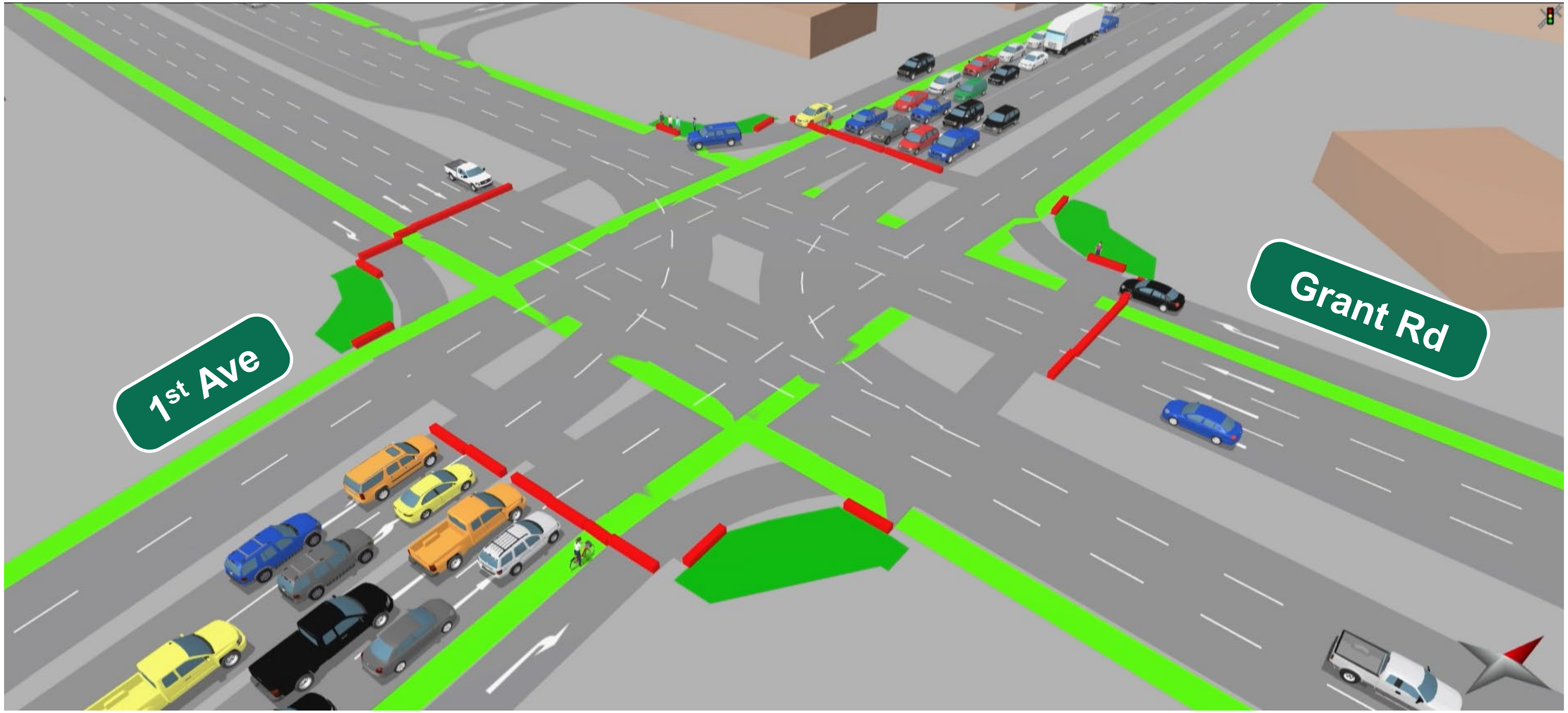
1st Avenue Vissim Model

Unique Operations – Indirect Left-Turns



1st Avenue Vissim Model

Multimodal Interactions



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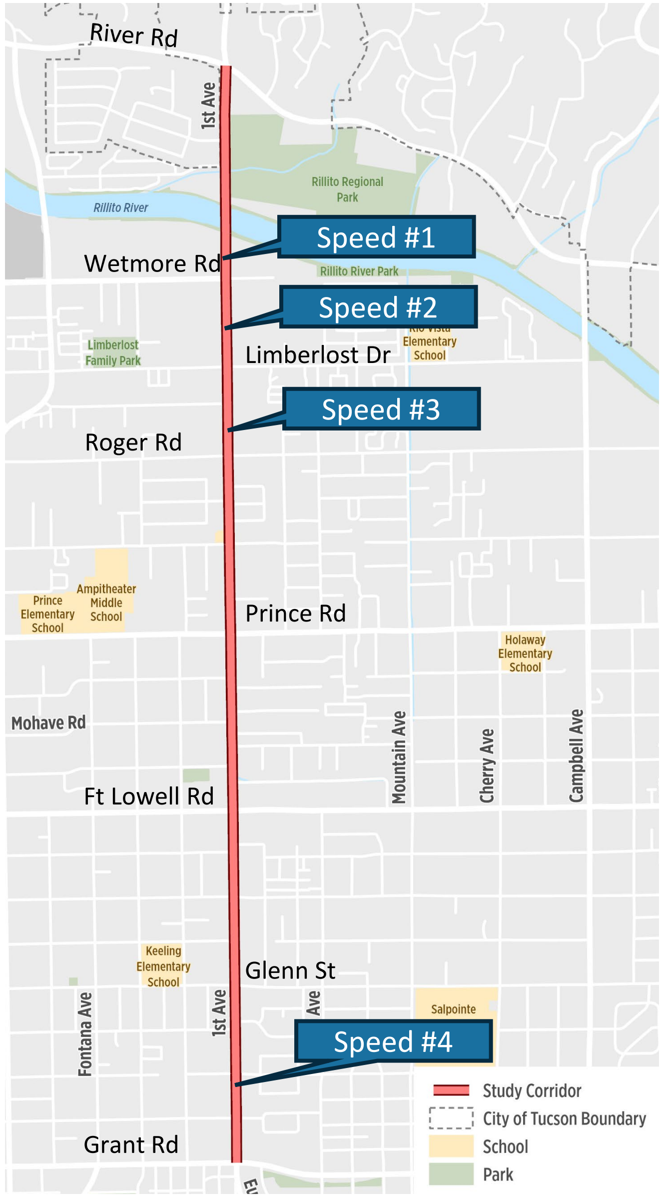
Existing Condition Results

- **Corridor Travel Times**
- Vehicle Speeds
- Intersection Operations

Direction	AM Peak Hour		PM Peak Hour	
	Observed	Simulated	Observed	Simulated
ALL VEHICLES TRAVEL TIME (MIN)				
Northbound	6.3	6.3	7.3	7.2
Southbound	6.6	6.4	6.7	7.0
SUNTRAN ROUTE 6 BUSES				
Northbound	14.0	13.3	15.0	14.1
Southbound	11.0	10.9	11.0	11.7

Results

- Corridor Travel Times
- **<u>Vehicle Speeds</u>**
- Intersection Operations



Calibration Goal:
85% of analyzed segments within 10 miles per hour (mph)

Model Result: 100%, Goal met

Additionally, 94% of analyzed segments are within 5 miles per hour (mph)

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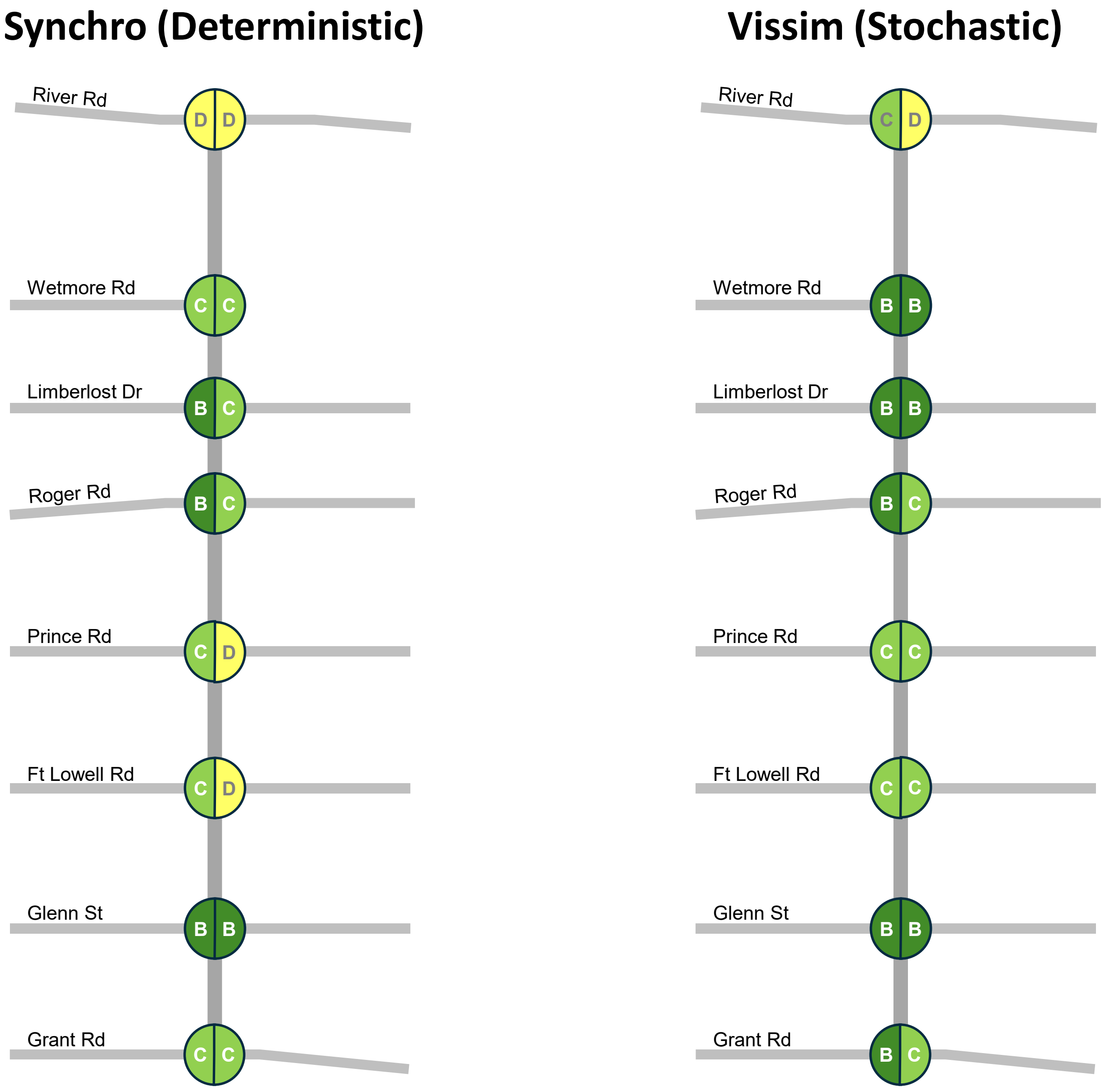
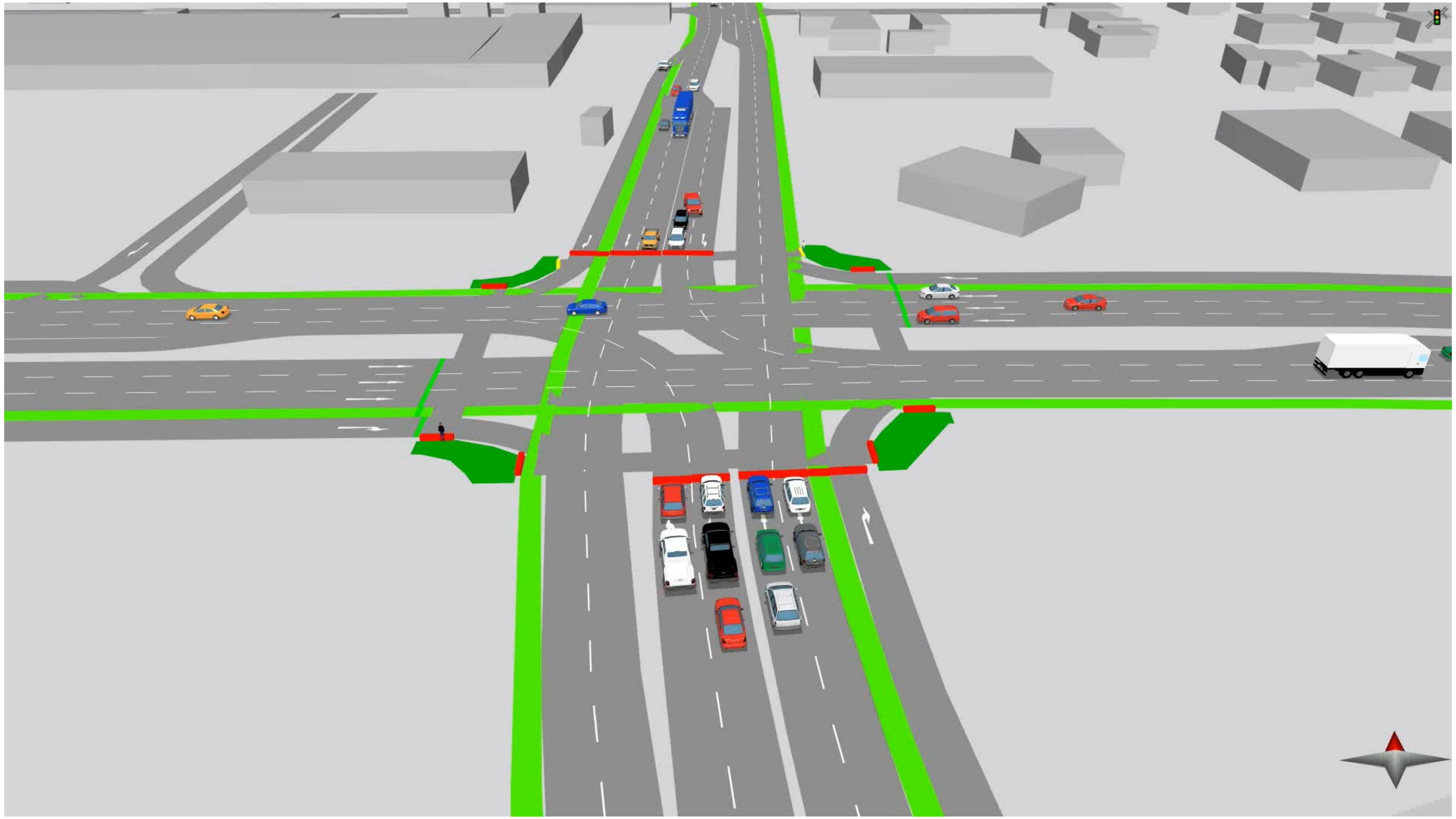
Results

- Corridor Travel Times
- Vehicle Speeds
- **Intersection Operations**



KITTELSON & ASSOCIATES



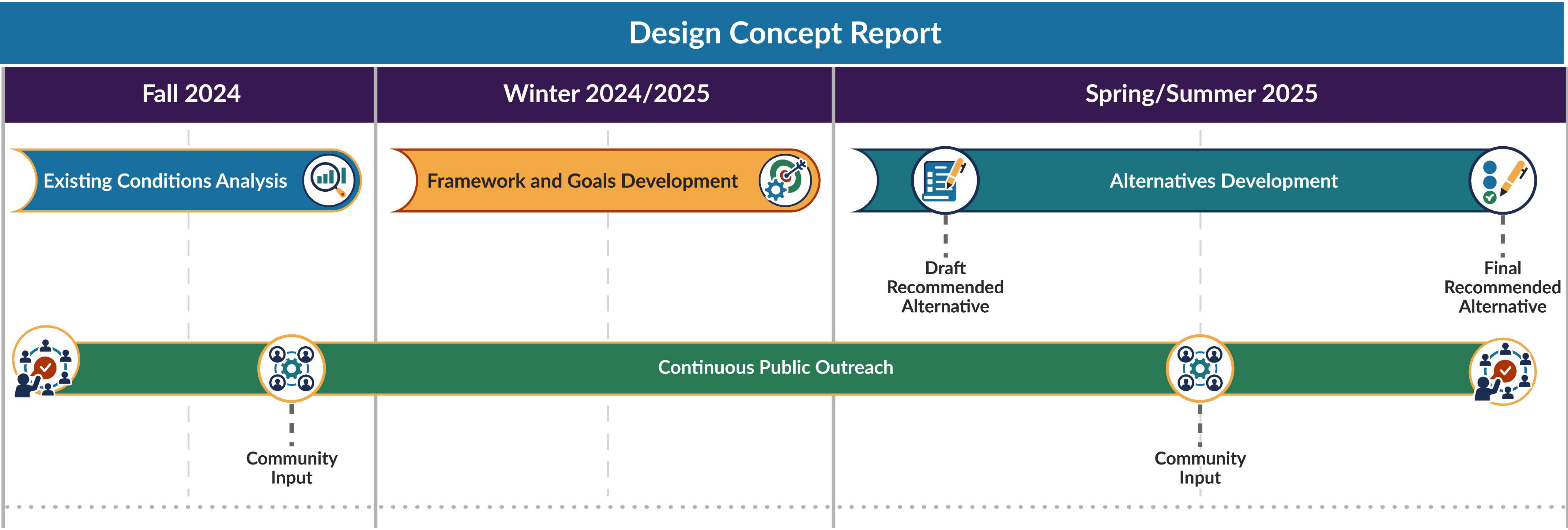
1ST AVENUE Improvement Project

Transportation Design

Intersections, Non-Vehicular Crossings, Bus Pullouts, Turn Lanes, Alignment Design Criteria

CITY OF TUCSON | RTA | PAG

Project Overview

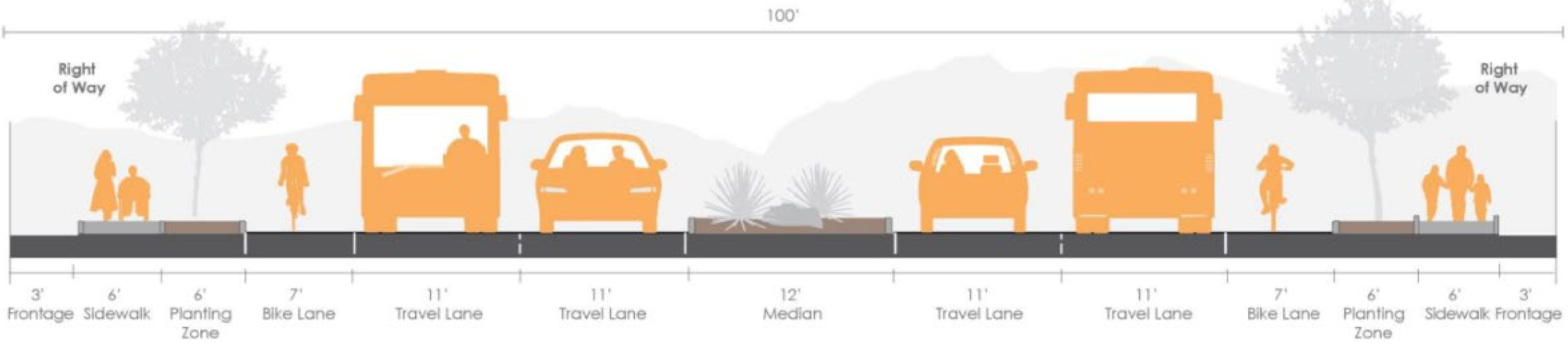


Project Overview

Design Concept Report

- What will the design team evaluate?
  - Existing Conditions
  - Cross-section and alignment alternatives
  - Constructability and construction phasing
  - Right-of-Way
  - Cost estimation
  - Traffic Design
  - Floodplain and Drainage
  - Utilities (Existing and New)
  - Landscape
  - Social, Economic, and Environmental

4-Lane Cross-Section



INTERSECTIONS

Conventional Signalized Intersection

Benefits of Traffic Signals:

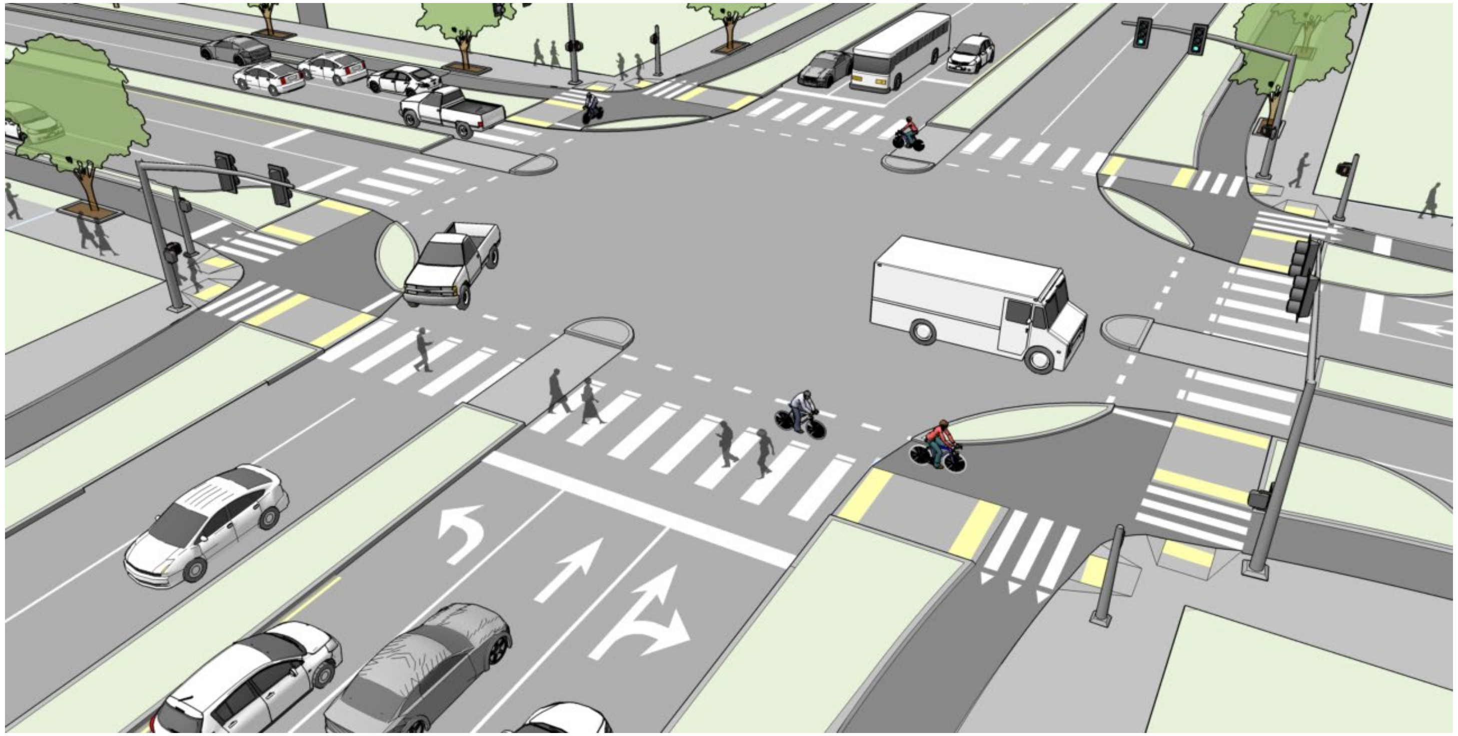
- Improved traffic flow:
  - Signal cycles help manage traffic, reducing conflicts and preventing accidents
- Increased safety:
  - Dedicated pedestrian and cyclist phases provide safer crossings
- Adjustable timing:
  - Adaptive signals can optimize traffic flow during peak hours, reducing congestion

Source: NACTO Intersections

Protected Intersection

Benefits

- <u>Enhanced safety:</u>
  - _Physical separation reduces conflicts between vehicles, cyclists, and pedestrians
- <u>Safer crossings:</u>
  - Dedicated phases for each user group allow safe and efficient crossings
- <u>Encourages cycling and walking:</u>
  - Well-designed bike lanes and pedestrian crossings promote active transportation

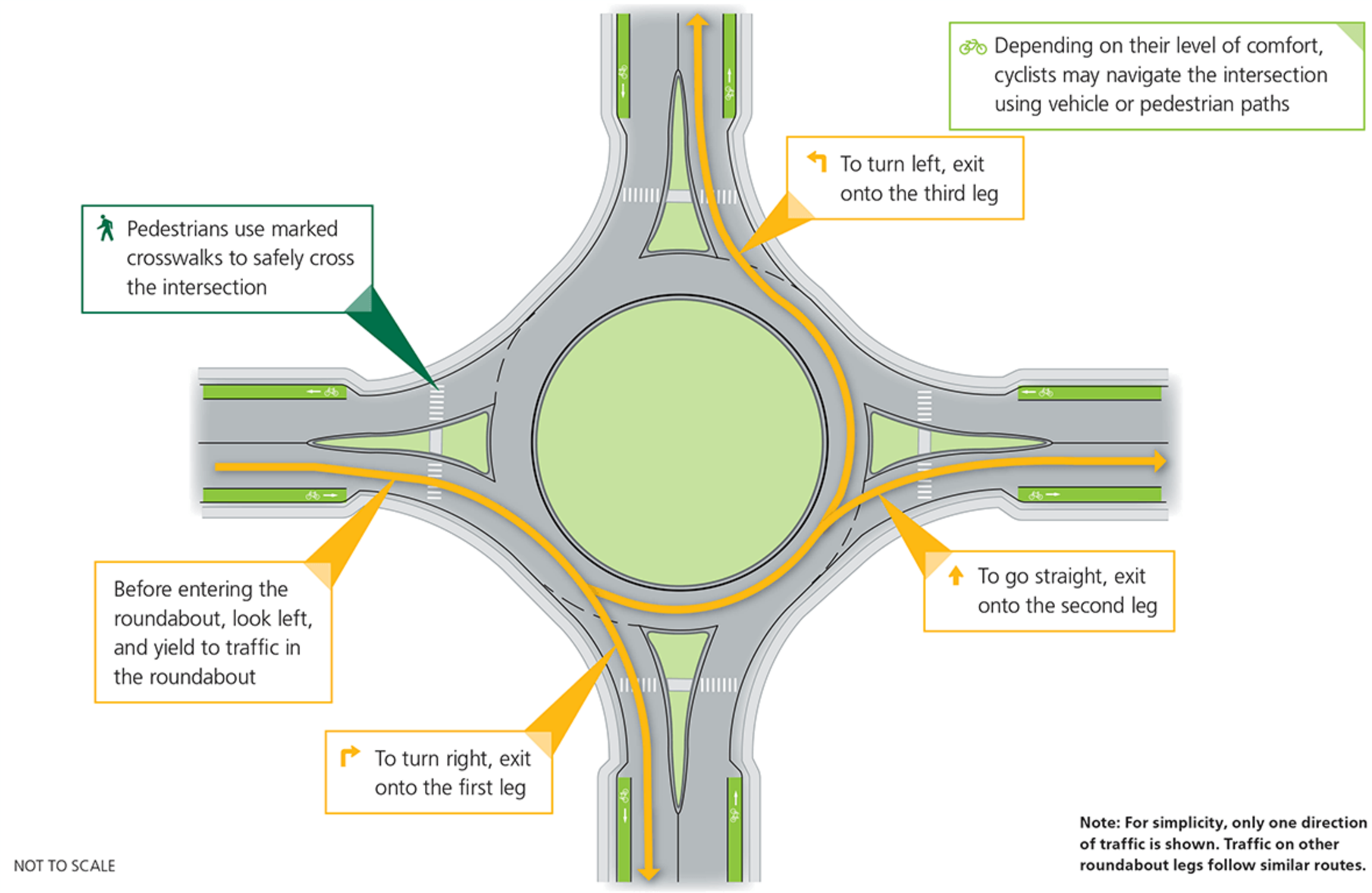


Source: NACTO Intersections

Roundabout

Benefits

- Improved safety:
    - Reduces the number of points where vehicles can cross paths and eliminates the potential for right-angle and head-on crashes
- Increased efficiency:
    - Yield-controlled design means fewer stops, fewer delays and shorter queues
- Safer speeds:
    - Promotes lower vehicle speeds, giving drivers more time to react
- Long-term cost effectiveness:
    - No traffic signals means lower long-term costs for operations and maintenance
- Aesthetics:
    - Allows for landscaping and beautification

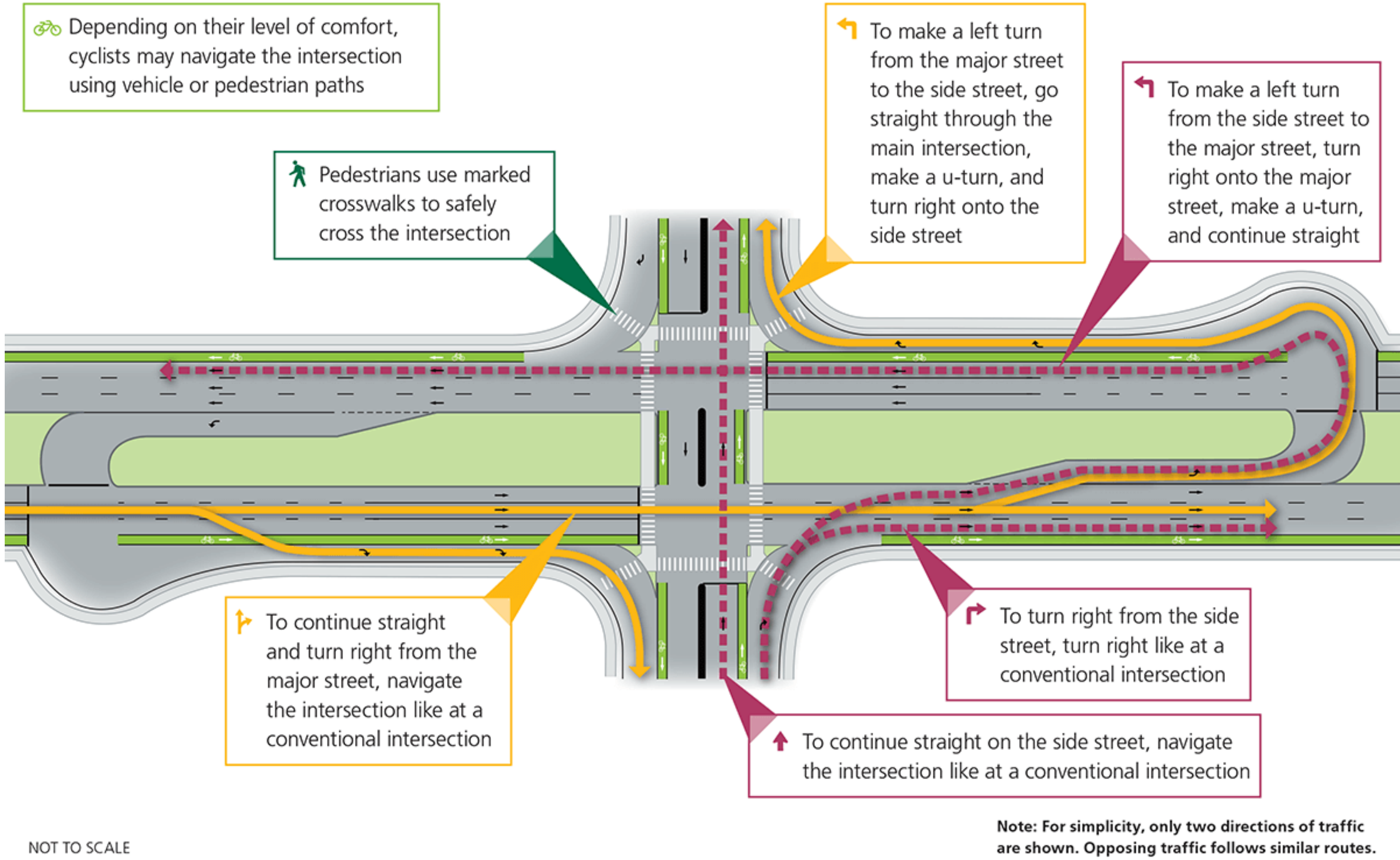


Source: VDOT iCAP Intersections

Median U-Turn (MUT)

Benefits

- Improved safety:
  - Reduces the number of points where vehicles cross paths and decreases the potential for right-angle crashes
- Increased efficiency:
  - Eliminates left-turn movements from the main intersection, allowing for fewer traffic signal phases, which reduces delay and increases capacity
- Shorter wait times:
  - Fewer traffic signal phases means less time stopped at the main intersection
- Cost-effective:
  - An MUT can be more cost effective than adding lanes to improve capacity

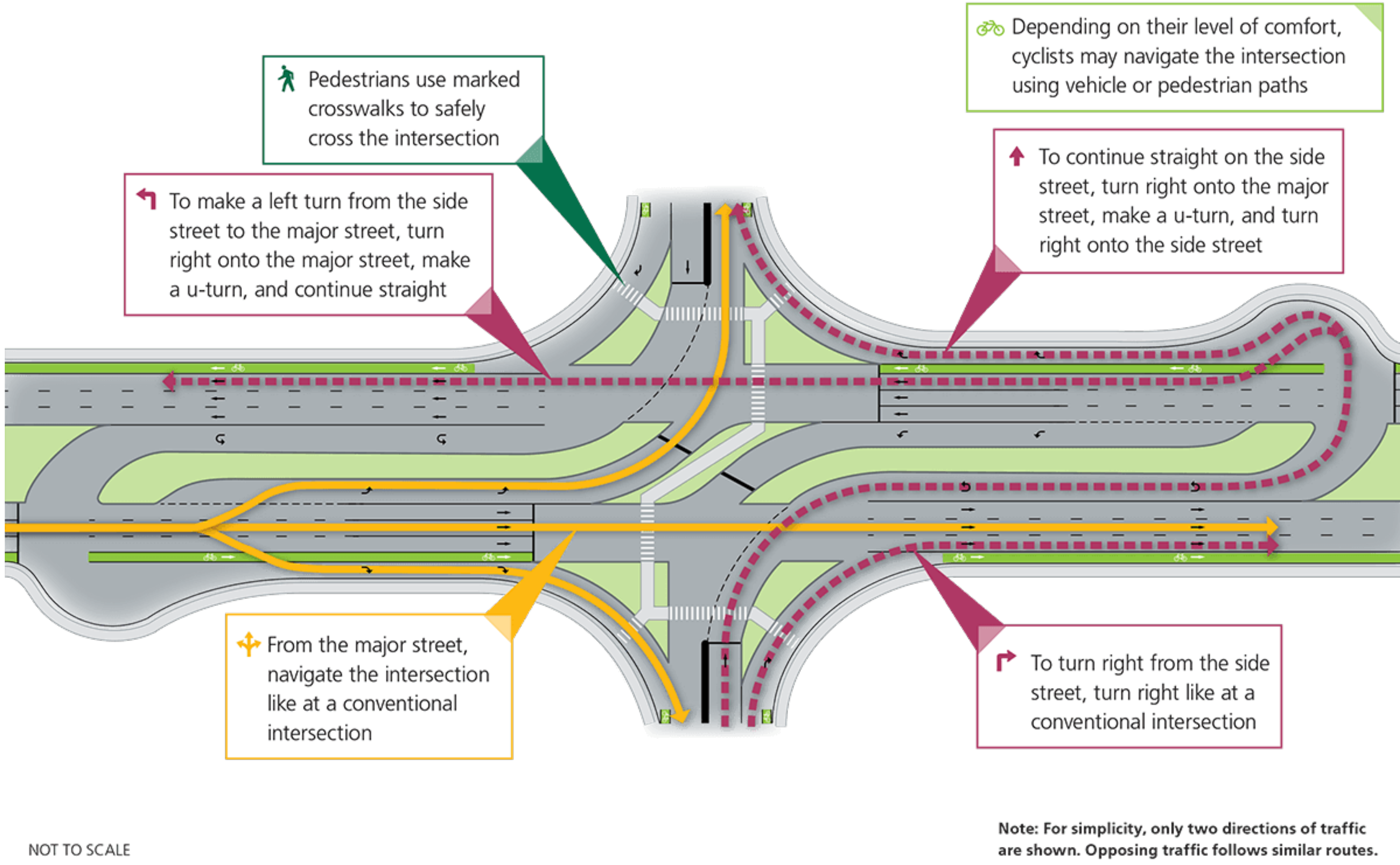


Source: VDOT iCAP Intersections

Restricted Crossing U-Turn (RCUT)

Benefits

- Improved safety:
  - Reduces the number of points where vehicles cross paths and eliminates the potential for head-on crashes
- Increased efficiency:
  - Each direction of the major street can operate independently, creating two one-way streets and increasing the overall intersection capacity
- Shorter wait times:
  - Fewer traffic signal phases means less stopping for arterial vehicles and allowing only right turns from side street vehicles means less waiting
- Cost-effective:
  - An RCUT can be more cost effective than adding lanes to improve capacity

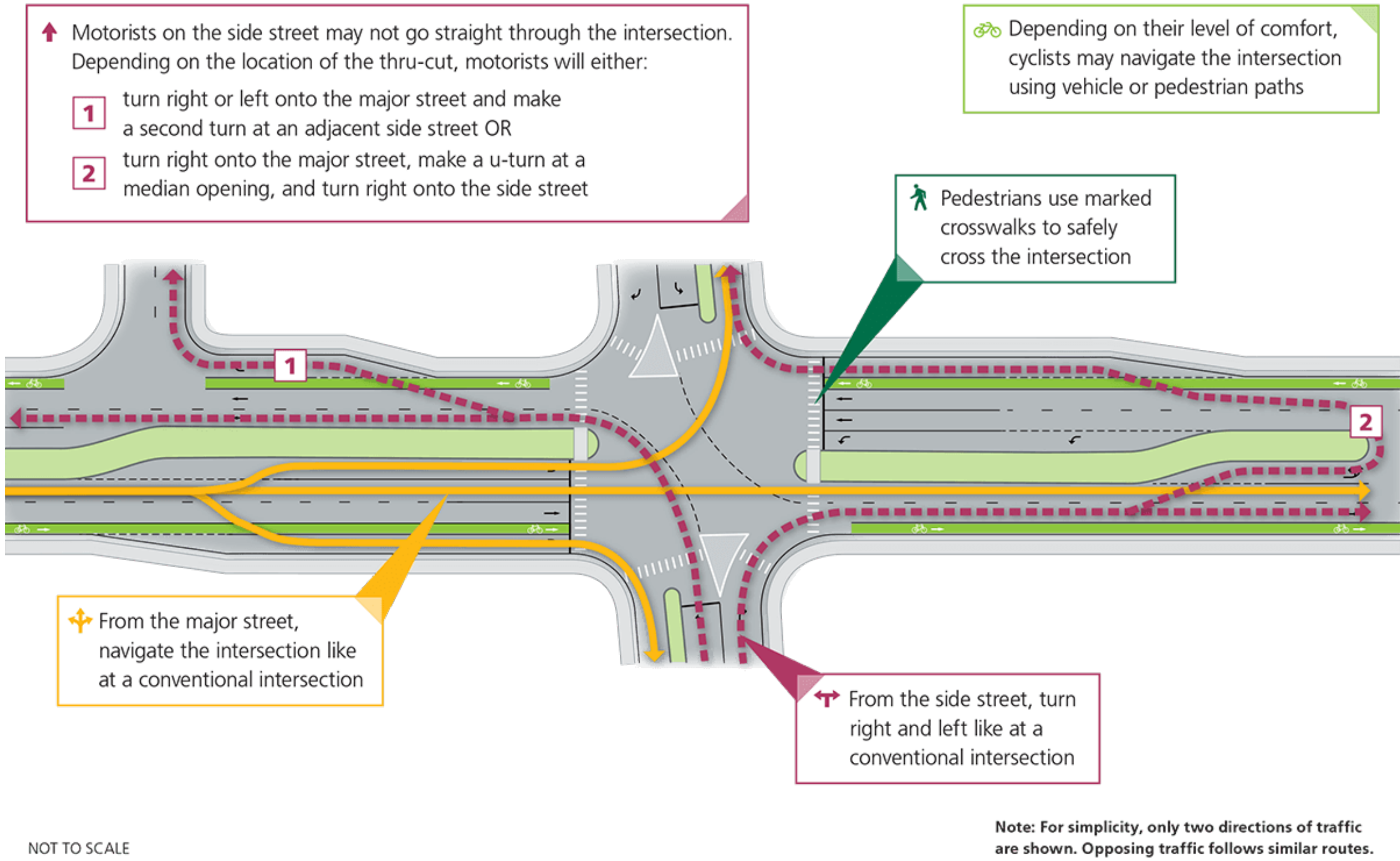


Source: VDOT iCAP Intersections

Thru-Cut Intersection

Benefits

- Improved safety:
  - Reduces the number of points where vehicles cross paths
- Increased efficiency:
  - Eliminates the side street through movements, allowing for fewer or shorter traffic signal phases, which reduces delay and increases capacity
- Shorter wait times:
  - Fewer traffic signal phases means less time stopped at the intersection
- Cost effective:
  - A thru-cut may be more cost-effective than adding lanes to improve capacity

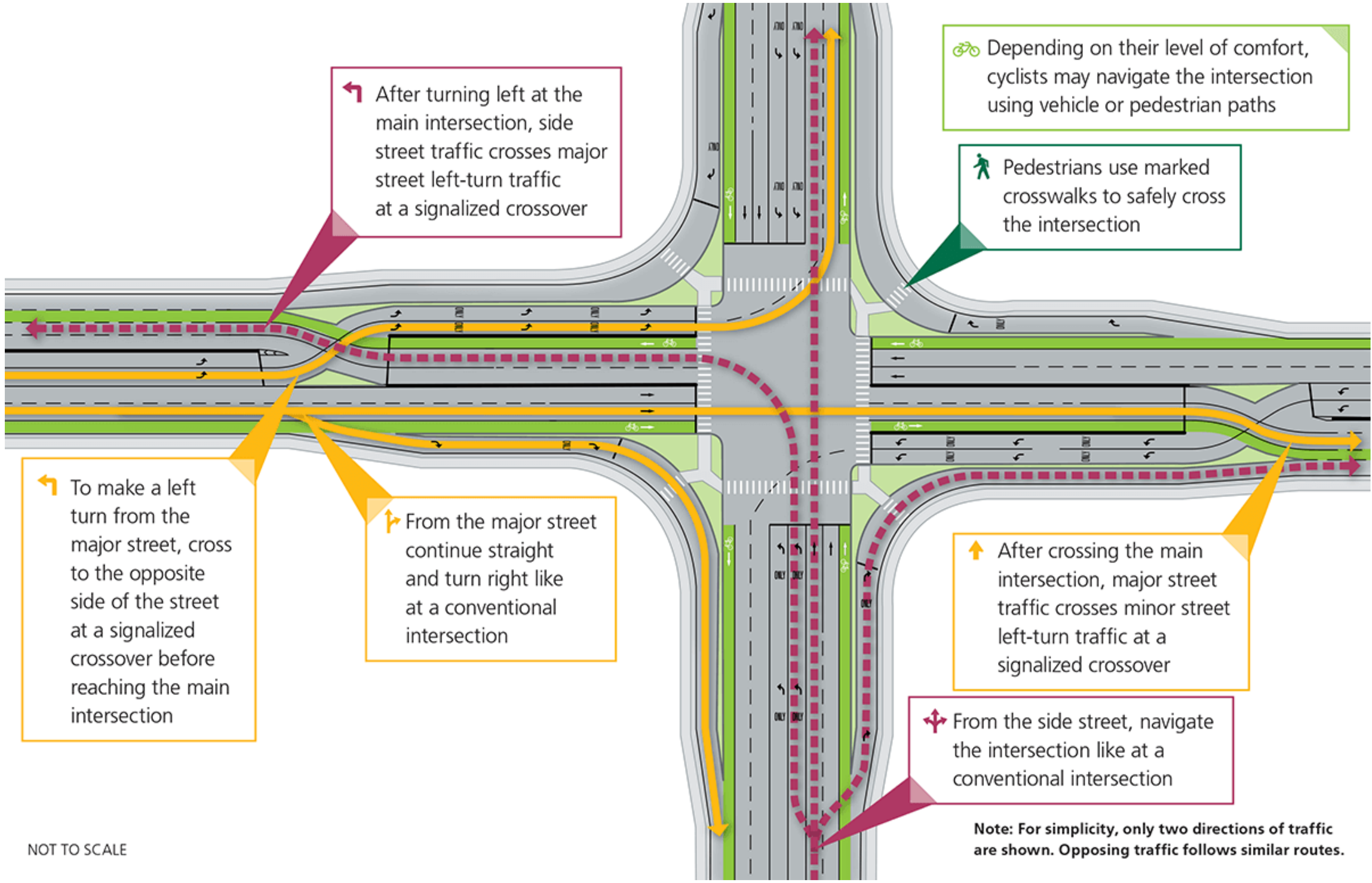


Source: VDOT iCAP Intersections

Displaced Left Turn (DLT)

Benefits

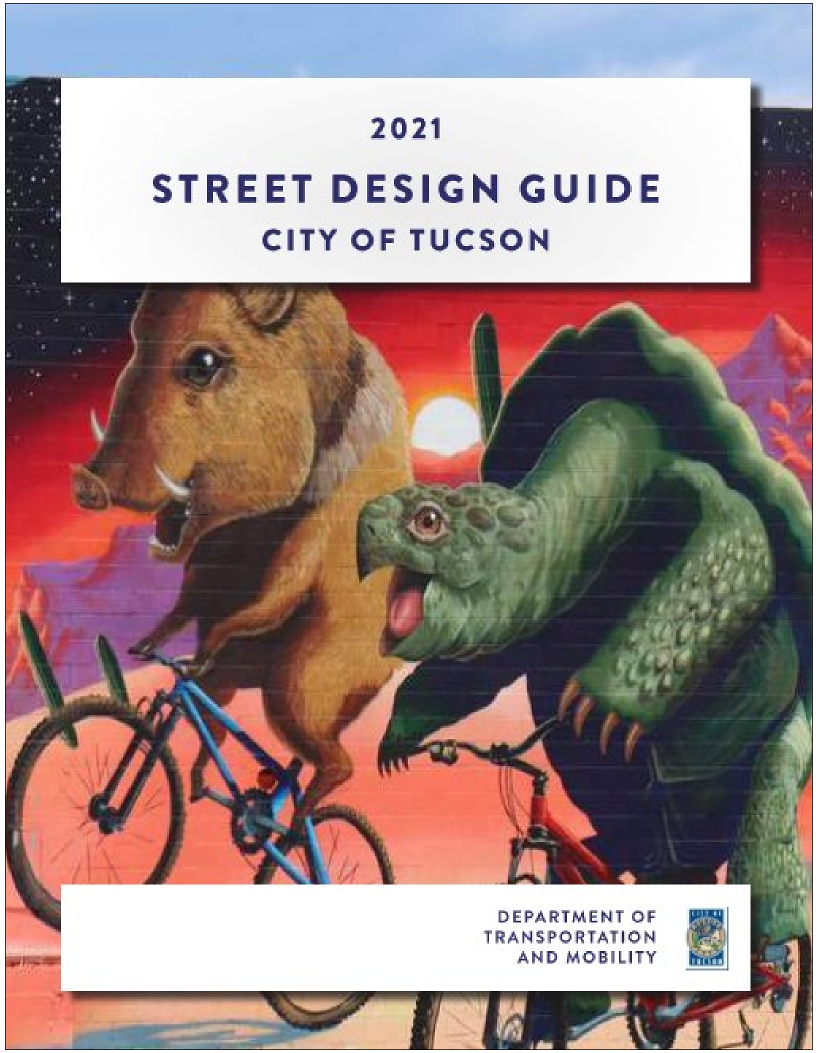
- Improved safety:
  - Channelizing left-turn vehicles from the side street reduces the potential for angle crashes
- Increased efficiency:
  - One direction of travel on the major street is free-flow, and, as a result, more green time can be provided to the other movements, reducing delay
- Free-flow in one direction:
  - One direction of travel on the major street never stops, which improves traffic signal synchronization and reduces corridor travel times



Source: VDOT iCAP Intersections

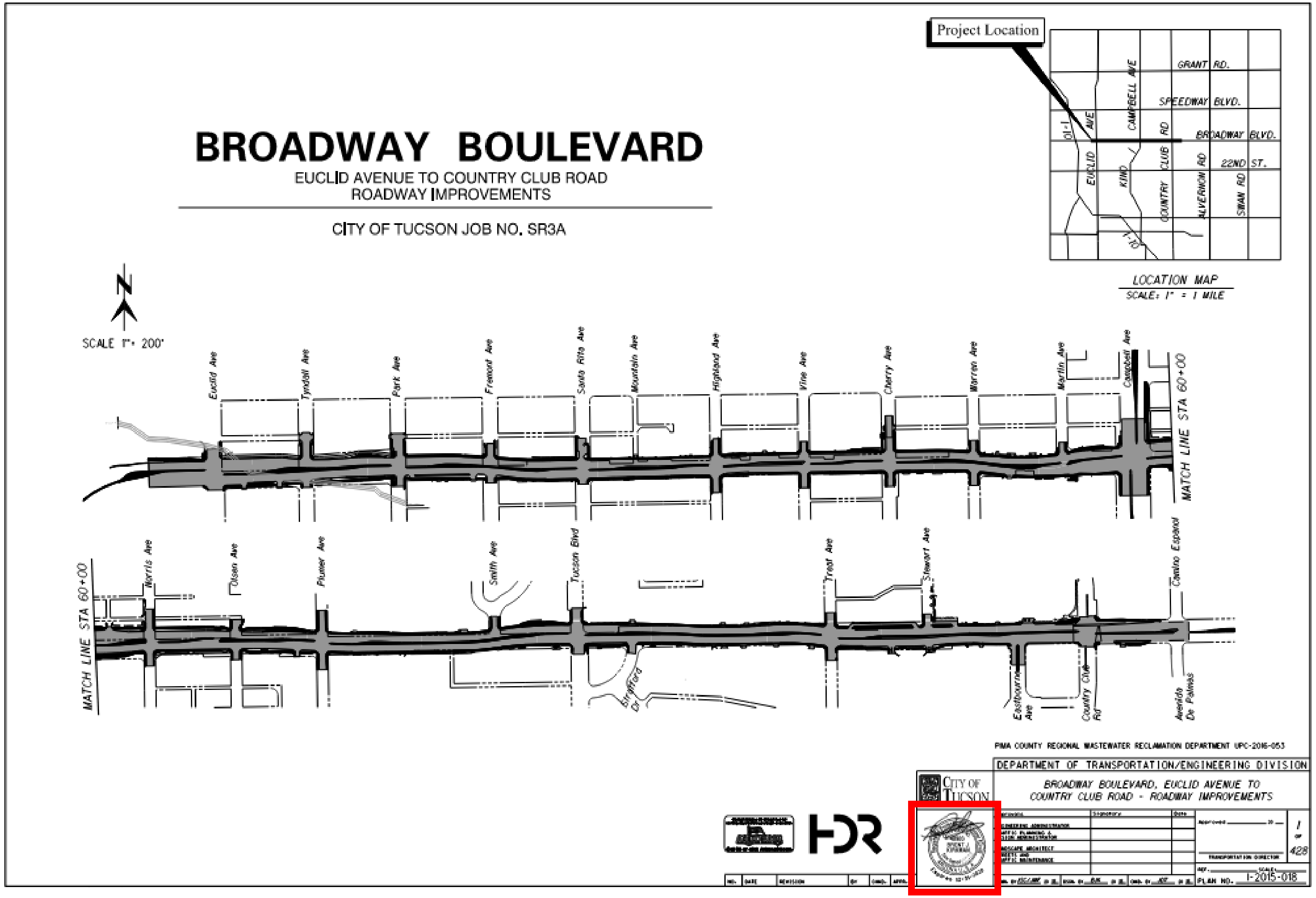
Design Standards

- Engineering Design
  - National (FHWA, AASHTO, MUTCD, etc…)
  - State (ADOT)
  - Local (PAG, City of Tucson, Pima County)
- Conceptual Guidelines
  - Local
  - National
- How can we design smarter to meet the needs of all users?



CORRIDOR PLANNING	CONCEPTUAL DESIGN	ENGINEERING DESIGN
• **Tucson Street Design Guide**	• **Tucson Street Design Guide**	• AASHTO A Policy on Geometric Design of Highways and Streets
• Move Tucson, RMAP, RTA	• Tucson Technical Standards Manual	• MUTCD
• Tucson Major Streets and Routes Plan	• NACTO Guidelines	• PAG Standard Specifications and Details for Public Improvements
• NACTO Guidelines	• AASHTO A Policy on Geometric Design of Highways and Streets	• Pima County/City of Tucson Signing and Pavement Marking Manual
• Tucson Access Management Guidelines	• Tucson Access Management Guidelines	• TDOT Active Practice Guidelines
• Transportation Research Board Highway Capacity Manual	• District specific (4th Ave/Downtown) design guidelines	• TDOT Departmental Policies and Procedures
	• International Fire Code (with Tucson Amendments)	• Tucson Technical Standards Manual
	• Tucson City Code Chapters 25/26	• Standard Manual for Drainage Design and Floodplain Management in Tucson, Arizona
	• Tucson Major Streets and Routes Plan	• Tucson City Code Chapters 25/26
	• Landscape Design and Green Streets Active Practice Guidelines	• Tucson Water Standards Specifications and Details
	• Tucson Water Standards Specifications and Details	• **Tucson Street Design Guide**

Design Standards



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STREET DESIGN GUIDE 2021
1-16

Design Elements

- Curb Return Radius
- Left-Turn Lanes
- Right-Turn Lanes
- Channelized Right-Turn Lanes
- Pedestrian Design Elements
- Bicycle Design Elements

Curb Return Radius

- Effective Radius
- Radius vs. Speed
- Speed vs. Stopping Distance
- Crossing Distance and Time
- Vehicles: Design vs. Control

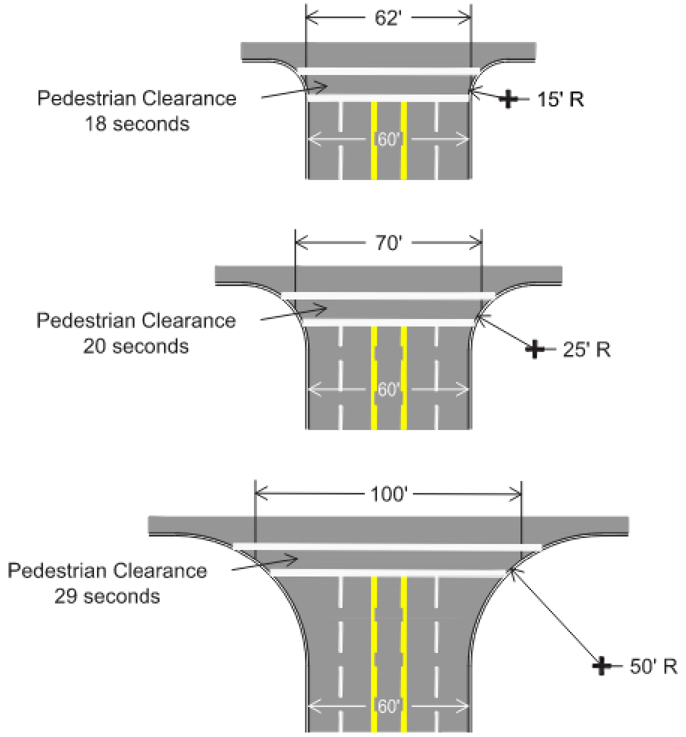
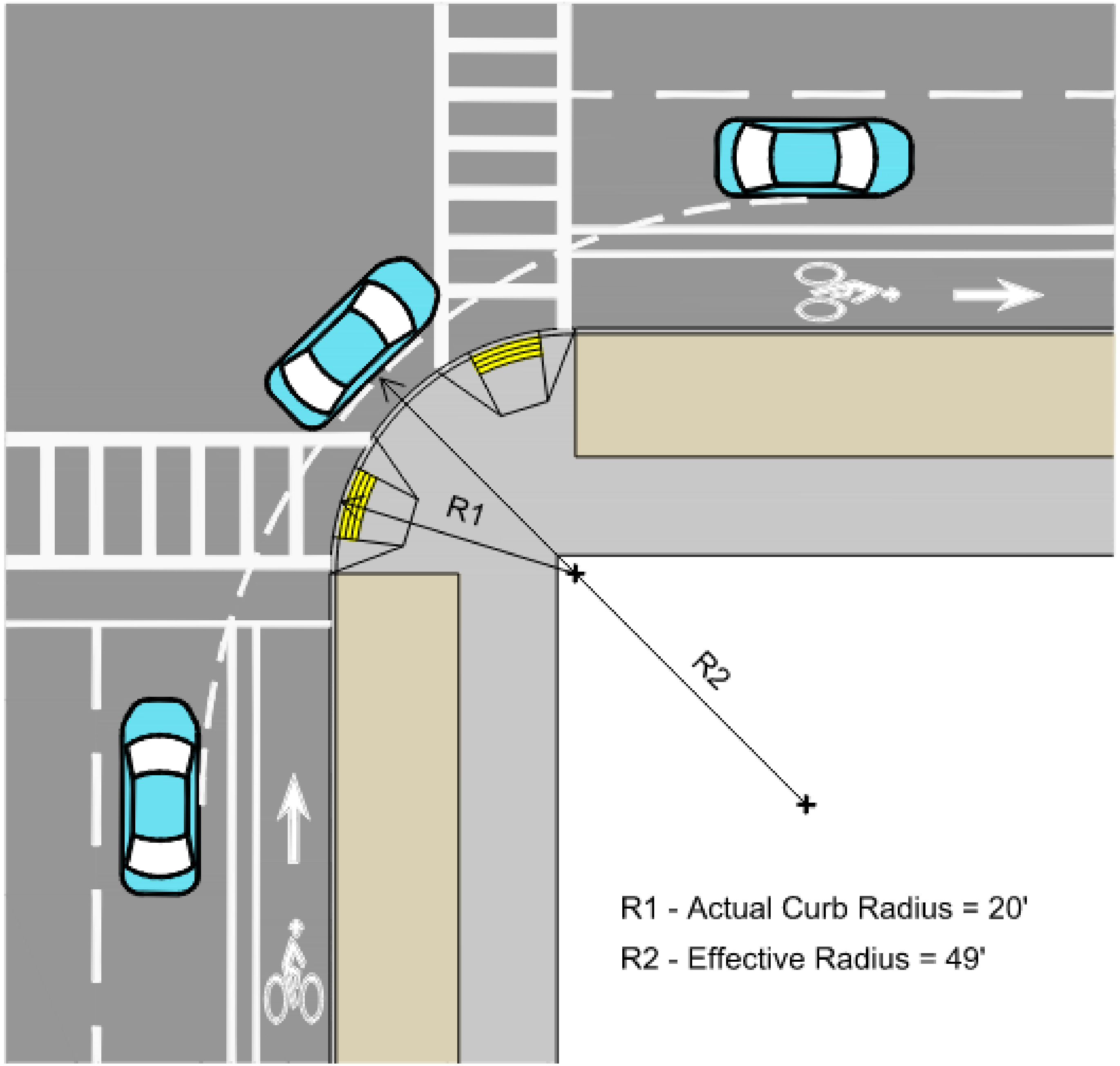
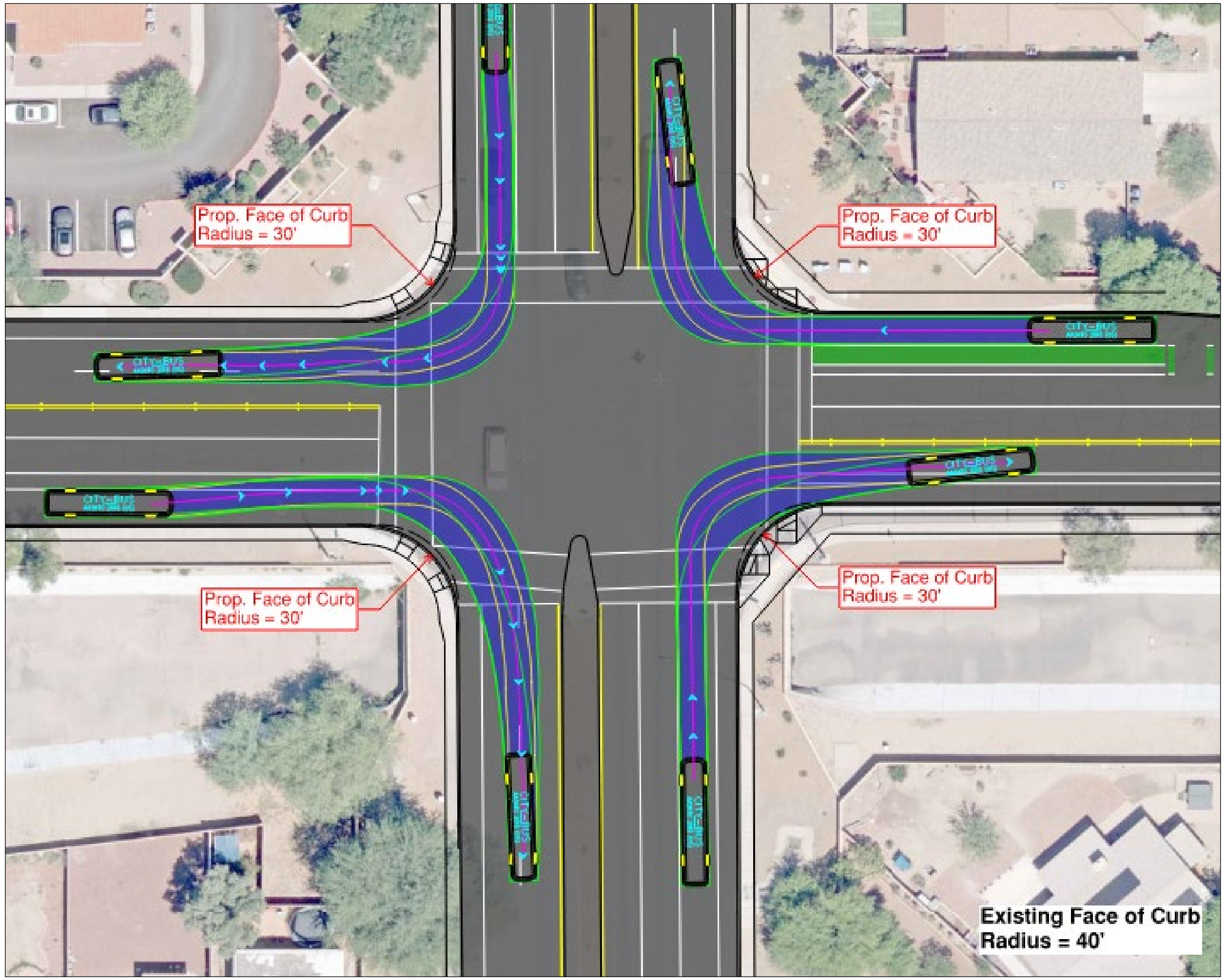
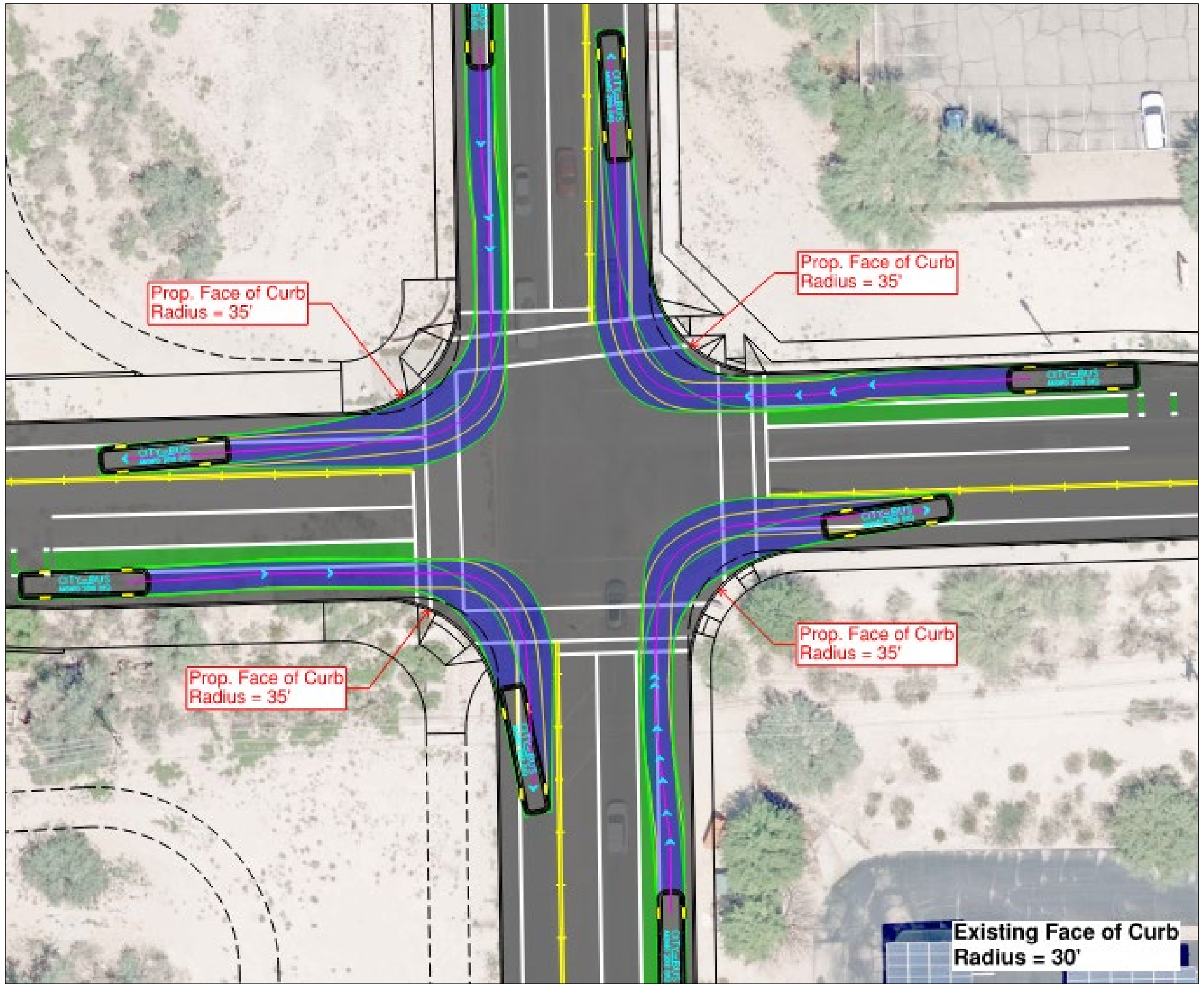


Figure 5.2
Pedestrian clearance times at different curb radii



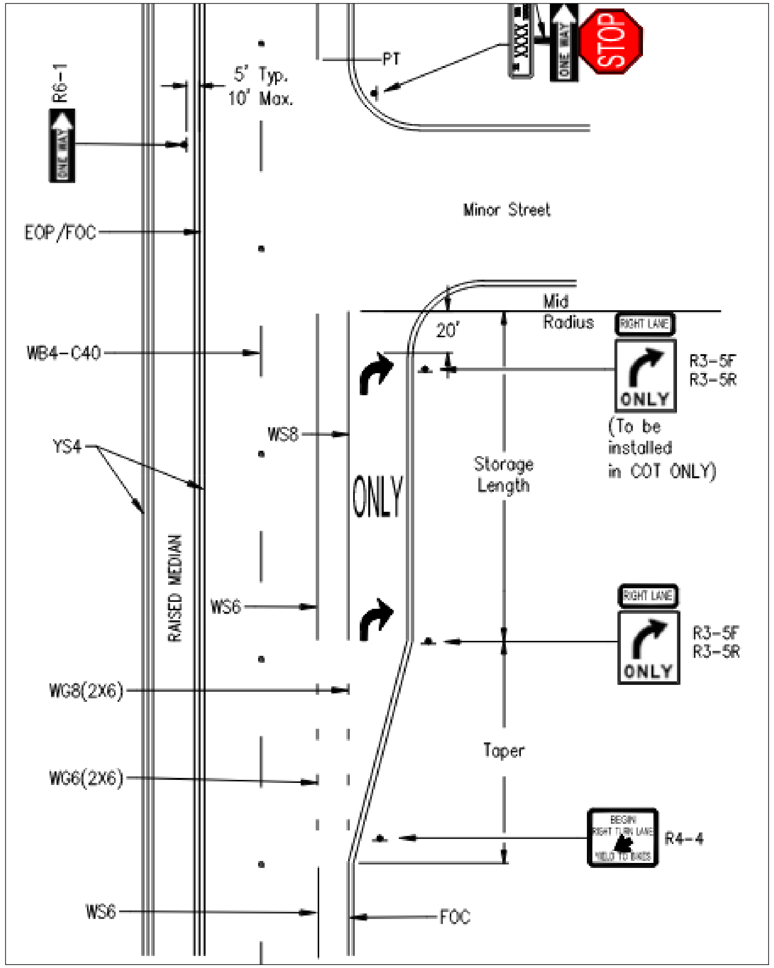

Prop. Face of Curb
Radius = 30'
Prop. Face of Curb
Radius = 30'
Prop. Face of Curb
Radius = 30'
Prop. Face of Curb
Radius = 30'
Existing Face of Curb
Radius = 40'

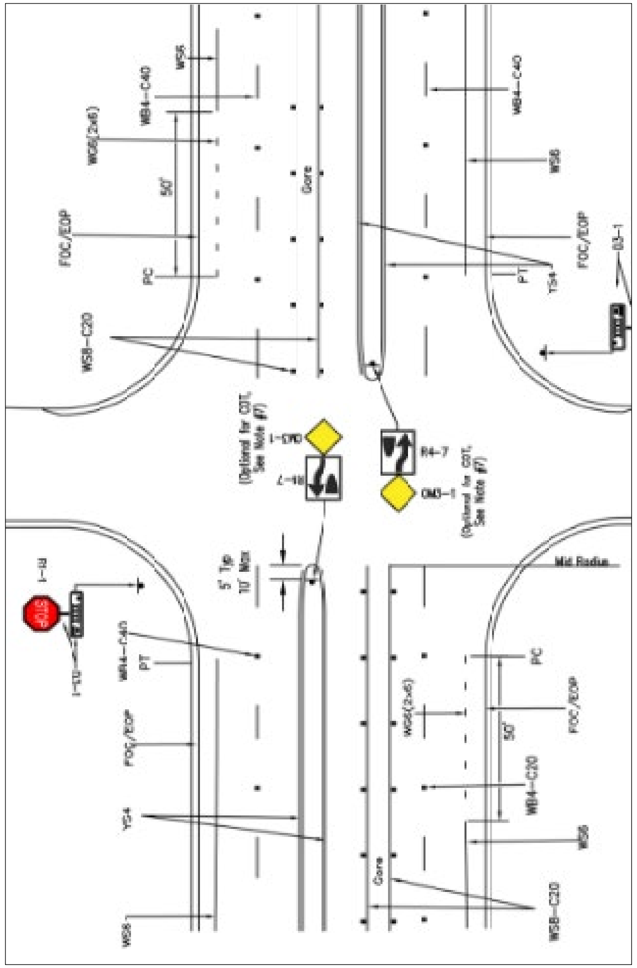

Prop. Face of Curb
Radius = 35'
Prop. Face of Curb
Radius = 35'
Prop. Face of Curb
Radius = 35'
Prop. Face of Curb
Radius = 35'
Existing Face of Curb
Radius = 30'

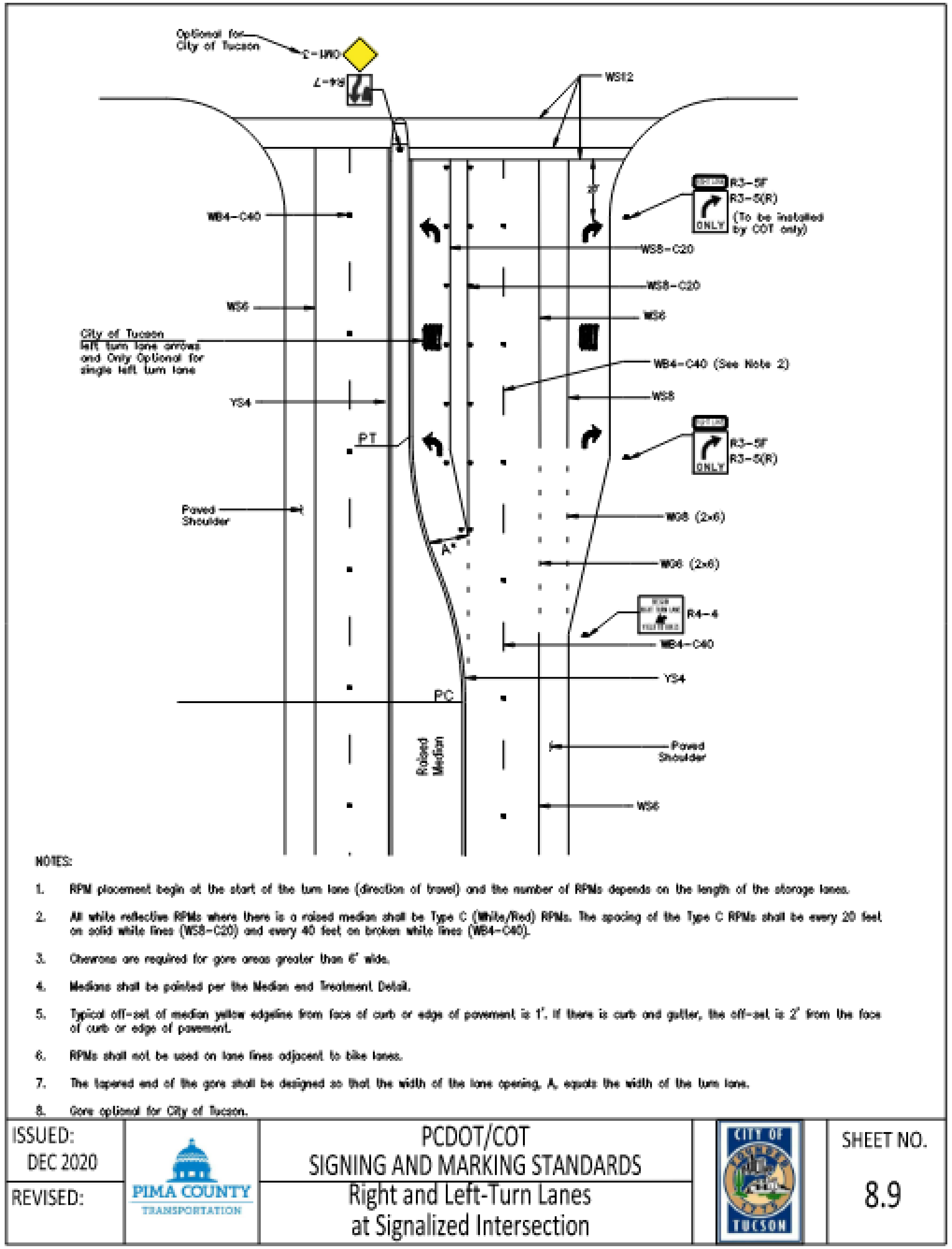
Left and Right-Turn Lanes

- Entry Taper
- Storage Length
- Offset

- Tradeoffs
  - Operations
  - Space
  - Cost







Channelized Right-Turn Lanes

- Accommodates Large Design Vehicles
- Shortens Pedestrian Crossing Distance and Times
- Improves Ability to Optimize Signal Timing

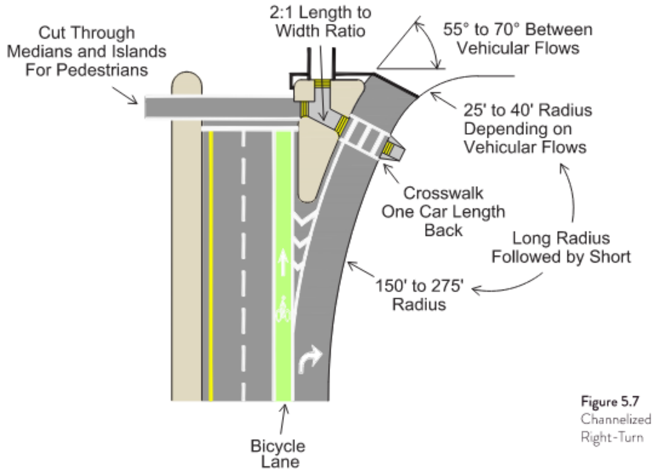
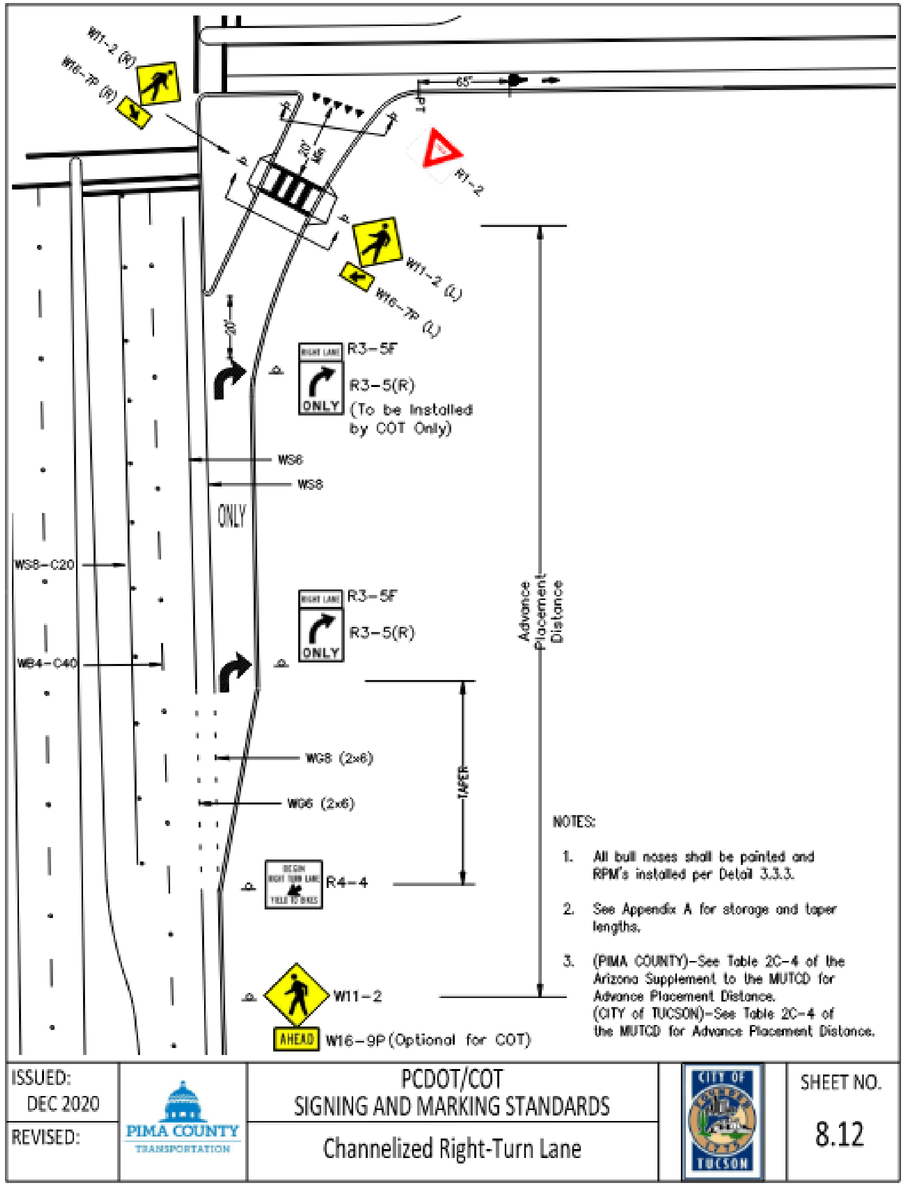
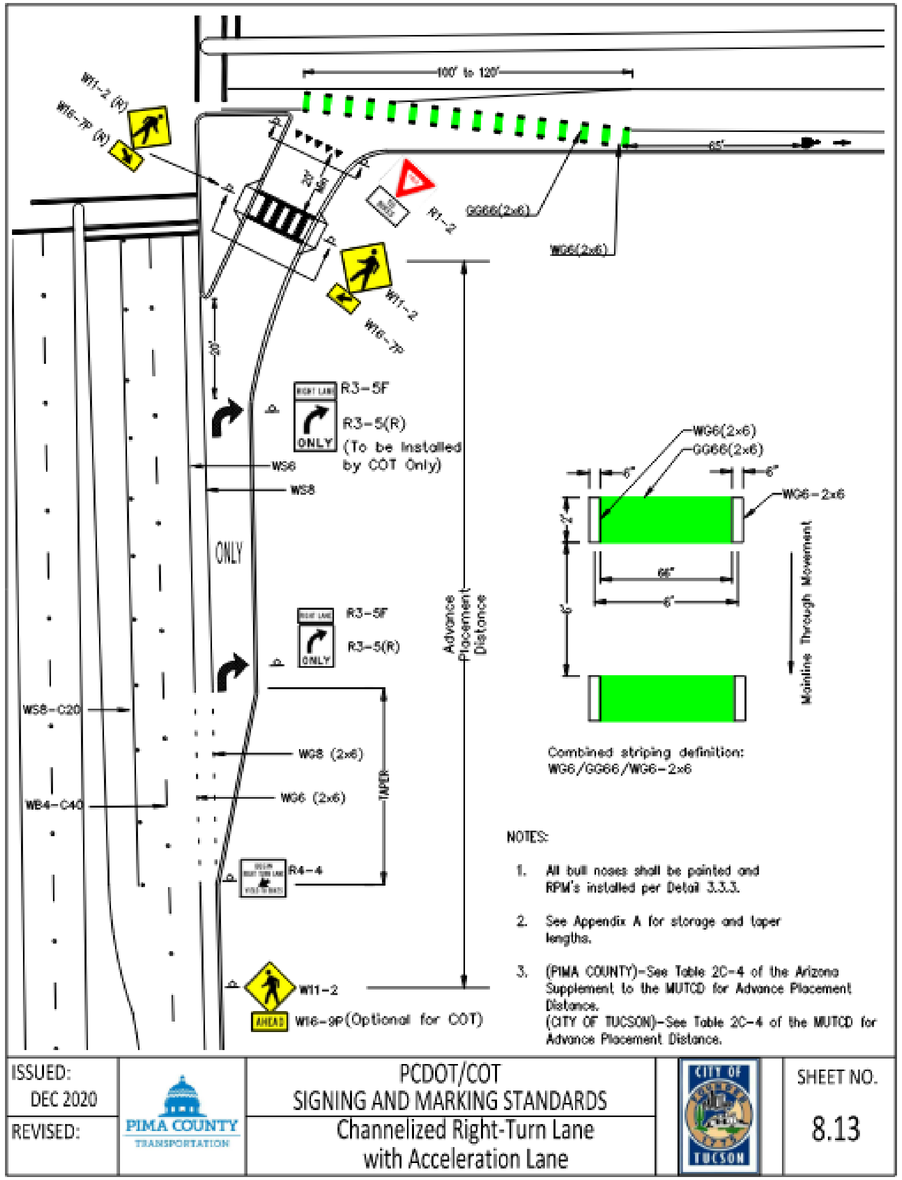


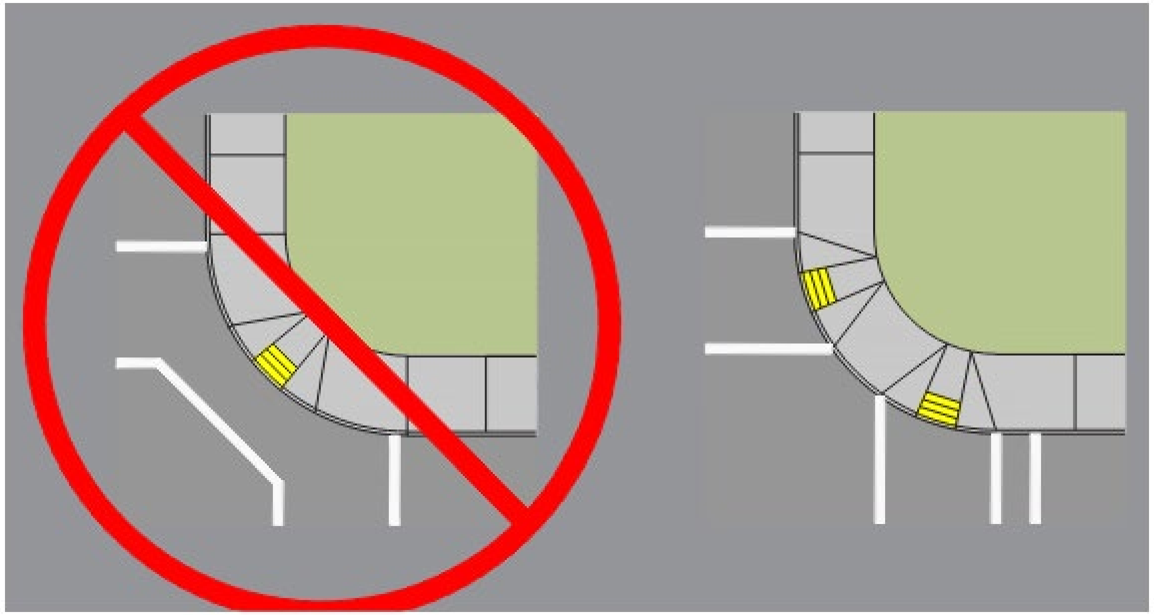
Figure 5.7
Channelized Right-Turn





Pedestrian and Bicycle Design Elements

- Signal Timing
- Pedestrian Signals
  - Actuated vs. Automated
- Crosswalks
- Curb Access Ramps
- Clear, Direct and Continuous Routes
- Reduce and Manage Conflicts
- Reduce Vehicle Turning Speeds
- Provide Access to Off-Street Destinations
- Raise Visibility and Awareness



NON-VEHICULAR CROSSINGS, BUS PULLOUTS, ALIGNMENTS

1ST AVENUE Improvement Project

CITY OF TUCSON | RTA | PAG

Transportation Design
Non-Vehicular Crossings

HAWK & BikeHAWK

- Activated
- Mid-Block

TOUCAN

- Center Crossing
- Limits Vehicles

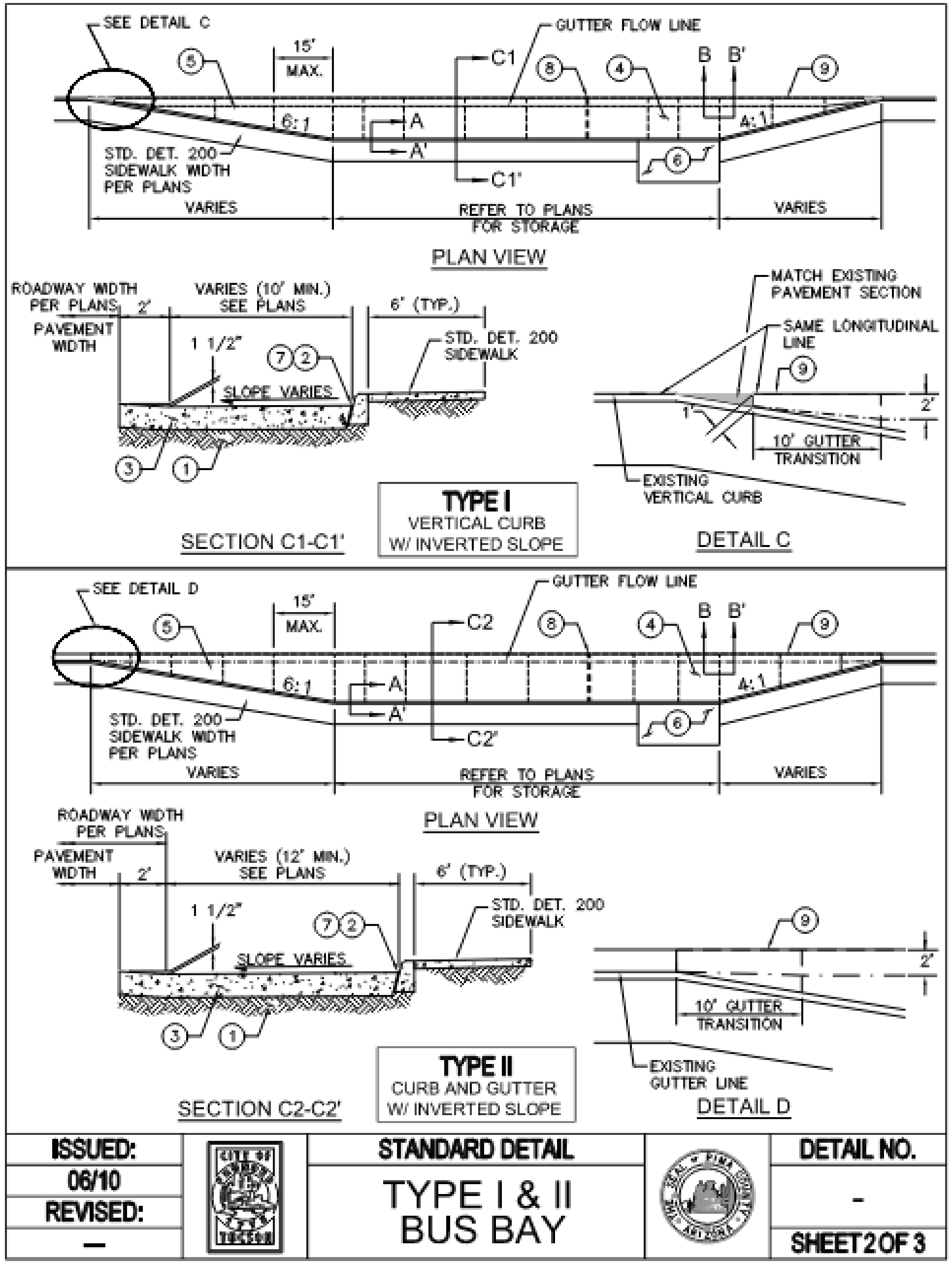
PELICAN

- Two-Stage Crossing
- Median Refuge

Transportation Design
Bus Pullouts

Overview and Application

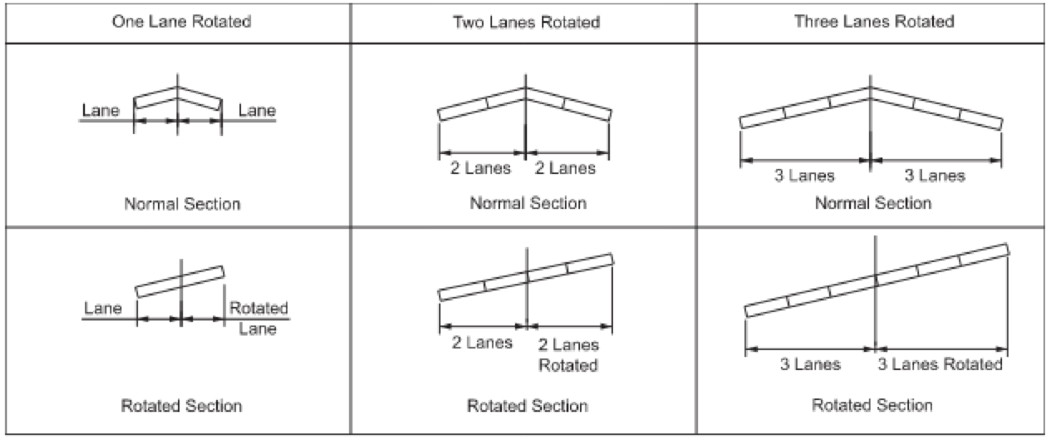
- Allow for bus to completely leave travel lane
- Increase bus transition times
- Reduce delay for vehicles
- Decrease crash risk
- Where speeds are 35MPH or greater
- Major transfer points, end of routes, major intersections, or stops with long dwell times
- Far side of intersection
- Near side should be paired with a queue jump

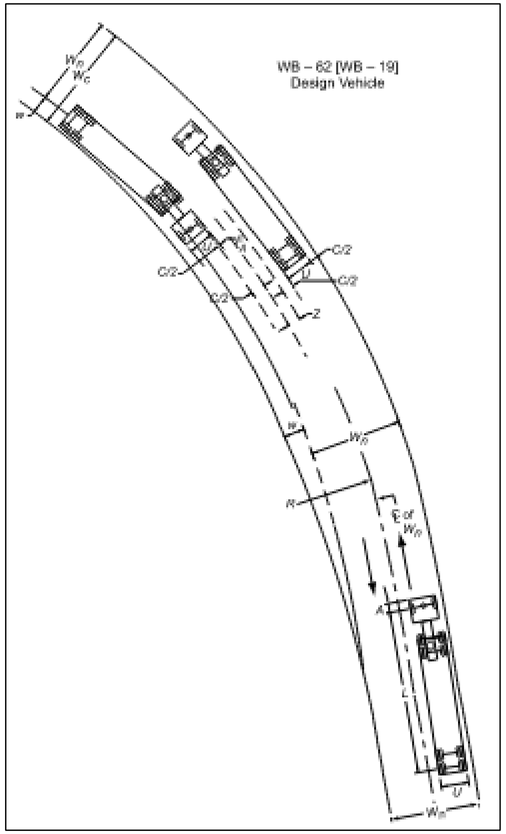


Transportation Design Alignment Design Criteria

Controlling Factors

- Alignment = Centerline = Tangents and Arcs
- Roadway Classification or Type
- Speed
- Cross Slope
- Lane Width and Widening





Future Agenda Items

- Questions on presented information
- Topics for future agendas
- Additional information requests

1st Ave Corridor Map