

TECHNICAL MEMORANDUM #3

TITLE: Alternatives Analysis
PROJECT: Main Streets on Halsey
PROJECT #: 23021.043
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TABLE OF CONTENTS

<ul style="list-style-type: none"> I. Introduction II. Project Area <ul style="list-style-type: none"> 1. Context Zones III. Summary of Concerns IV. Evaluation Criteria V. Streetscape and Cross-Section Alternatives <ul style="list-style-type: none"> 1. Residential Context Zones <ul style="list-style-type: none"> a. Existing Conditions b. Alternatives c. Near-Term Solution d. Separated Bike Lanes e. Sidewalk-Level Bike Lanes f. Sidewalk-Adjacent Bike Lanes 2. Commercial Context Zones <ul style="list-style-type: none"> a. Existing Conditions b. Alternatives c. Near-Term Solution d. Separated Bike Lanes e. Sidewalk-Level Bike Lanes f. Sidewalk-Adjacent Bike Lanes g. Two-Lane Cross-Section with Parking-Protected Bike Lanes 3. Edgefield <ul style="list-style-type: none"> a. Existing Conditions b. Alternatives c. Near-Term Solution d. Shoulder Bike Lanes with Shared-Use Paths e. Three-Lane Cross-Section with Sidewalk-Level Bike Lanes f. Three-Lane Cross-Section with Shared-Use Paths 	<ul style="list-style-type: none"> VI. Intersection Alternatives <ul style="list-style-type: none"> 1. NE Halsey Street/NE 223rd Avenue <ul style="list-style-type: none"> a. Existing Conditions b. Alternatives c. Enhances Features d. Protected Intersection e. Roundabout 2. NE Halsey Street/NE 238th Drive <ul style="list-style-type: none"> a. Existing Conditions b. Alternatives c. Enhances Features d. Protected Intersection 3. NE Halsey Street/SW 257th Drive <ul style="list-style-type: none"> a. Existing Conditions b. Alternatives c. Enhances Features d. Protected Intersection VII. Pedestrian Crossings <ul style="list-style-type: none"> 1. Crossing Treatments 2. Crossing Locations VIII. Appendices <ul style="list-style-type: none"> A. Context Zone Maps B. Evaluation Matrix C. Roadway Cross-Section Alternatives D. Intersection Alternatives
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INTRODUCTION

This memorandum presents preliminary streetscape and roadway design alternatives developed by the project team with the intent to improve multimodal access and circulation along the NE Halsey Street corridor. Previous memoranda summarized information on existing conditions and future needs along the corridor and identified key concerns from the three cities (Fairview, Wood Village, and Troutdale), Multnomah County (County), Oregon Department of Transportation (ODOT), and the local community. Design alternatives presented in this memorandum are intended to address key concerns identified through this project and include:

- Potential refinements to Multnomah County’s standard cross-section that enhance multimodal access and circulation – the cross-sections were designed to reflect various context zones along the corridor (residential, commercial, Edgefield).
- Potential improvements at several key intersections along the corridor (NE 223rd Avenue, NE 238th Drive, SW 257th Drive) to enhance traffic operations and safety for all travel modes.
- Potential improvements at several mid-block crosswalks along the corridor to enhance access and circulation for people walking, biking, and accessing transit as well as other adjacent land uses.

The streetscape and roadway design alternatives presented in this memorandum will be evaluated based on the project evaluation criteria presented in this memorandum and a preferred alternative will be selected for further refinement. The results of the evaluation will be presented in a subsequent memorandum and reviewed and approved by the project team and the local community. The preferred alternative will be used to develop conceptual design plans for NE Halsey Street.



PROJECT AREA

The project area includes the segment of NE Halsey Street from NE 201st Avenue to SW 257th Drive, which includes portions of roadway within Fairview, Wood Village, and Troutdale. As indicated in previous memoranda, this segment of NE Halsey Street is owned and operated by Multnomah County, which coordinates with the three cities on the design and construction of the street's multimodal features. This segment of NE Halsey Street primarily consists of three travel lanes with on-street bike lanes and sidewalks on both sides, except for the area adjacent to the McMenamins Edgefield property which consists of two travel lanes and narrow shoulders. Several major facilities connect this segment of NE Halsey Street to the surrounding area, including:

- **Fairview Parkway** – a five-lane, access-controlled roadway that connects NE Halsey Street to I-84 to the north and NE Glisan Street to the south. The City of Fairview recently updated their Transportation System Plan (TSP) to incorporate a roundabout at the NE Fairview Parkway/NE Halsey Street intersection. Therefore, this intersection is considered, but not evaluated as a part of this project.
- **NE 223rd Avenue** – a two to three-lane roadway that connects NE Halsey Street to NE Sandy Boulevard, NE Marine Drive, and several industrial uses to the north and NE Glisan Street, SE Stark Street, and NW Burnside Road to the South. The City of Fairview recently evaluated potential alternatives to improve conditions at the intersection. The alternatives are evaluated later in this memorandum.
- **NE 238th Drive** – a five-lane roadway that connects NE Halsey Street to I-84 and NE Sandy Boulevard to the north and NE Glisan Street, NE Stark Street, and NE Burnside Road to the south. The northwest corner of the intersection was recently redeveloped with a mixed-use development. The development included frontage improvements along NE Halsey Street including a new bus-pull out and on-street parking area.
- **SW 257th Drive** – a five-lane roadway that connects NE Halsey Street to I-84 and NW Marine Drive to the north and SE Stark Street to the south. The City of Troutdale recently updated its TSP to include potential improvements at the intersection to improve connections between opportunity sites along NE Halsey Street and downtown Troutdale.

Land uses along NE Halsey street consist primarily of residential and commercial. The residential uses include single-family and multi-family residential homes with direct access to NE Halsey Street or access via local street connections. The commercial uses include general commercial, shopping centers, retail/commercial centers, mixed-use residential/commercial. Other land uses include institutions (e.g., schools, churches, public utilities), industrial (e.g., light industrial, manufacturing), and open space (e.g., parks). McMenamins Edgefield is also located along NE Halsey Street, which is a commercial use, but includes a hotel, golf course, multiple restaurants, music venues, meeting spaces, etc.

The existing transportation facilities and land use contexts along NE Halsey Street were used to develop streetscape and roadway design alternatives that reflect the unique character of NE Halsey Street. These contexts are described in more detail below.



Context Zones

The project area is divided into context zones, or areas with distinct land use characteristics and associated transportation needs. The context zones reflect the underlying zoning of the three cities as identified in their zoning maps and include residential, commercial, and other/open space uses as indicated below.

- **Residential zones** include low, medium, and high-density residential, which allows for single-family and multi-family development, including townhomes and manufactures homes; mixed-use residential/commercial is included in the commercial zones given that the commercial uses tend to be at street level.
- **Commercial zones** include corridor, village, neighborhood, community, and general commercial, which allows for a mix of retail and commercial uses, including ground floor retail; the storefront and town center districts are included in the commercial zones.
- **Other/Open Space zones** include industrial and manufacturing, which are generally located off NE Halsey Street and parks, which are located in multiple locations along the corridor.

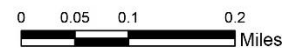
The context zones are shown in Maps 1-4 below. The maps include the location of existing and potential future enhanced crossings and intersections discussed later in this memorandum.

Map 1: Context Zones along NE Halsey Street

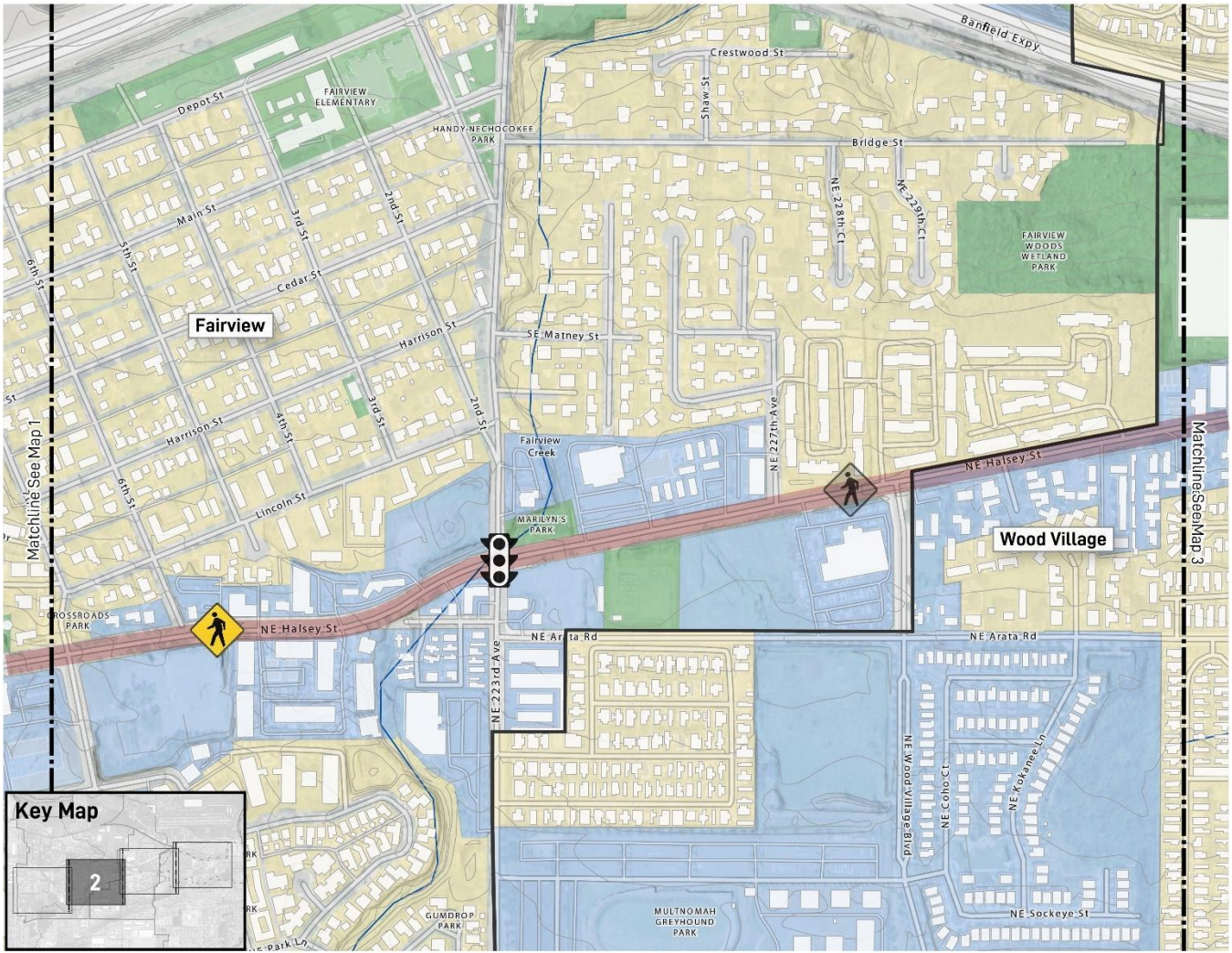


Legend

- City Limits
- Residential Context Zone
- Commercial Context Zone
- Other/ Open Space
- Street Improvements
- Building Footprints
- Contours (five ft.)
- Streams
- Existing Enhanced Pedestrian Crossing



Map 2: Context Zones along NE Halsey Street

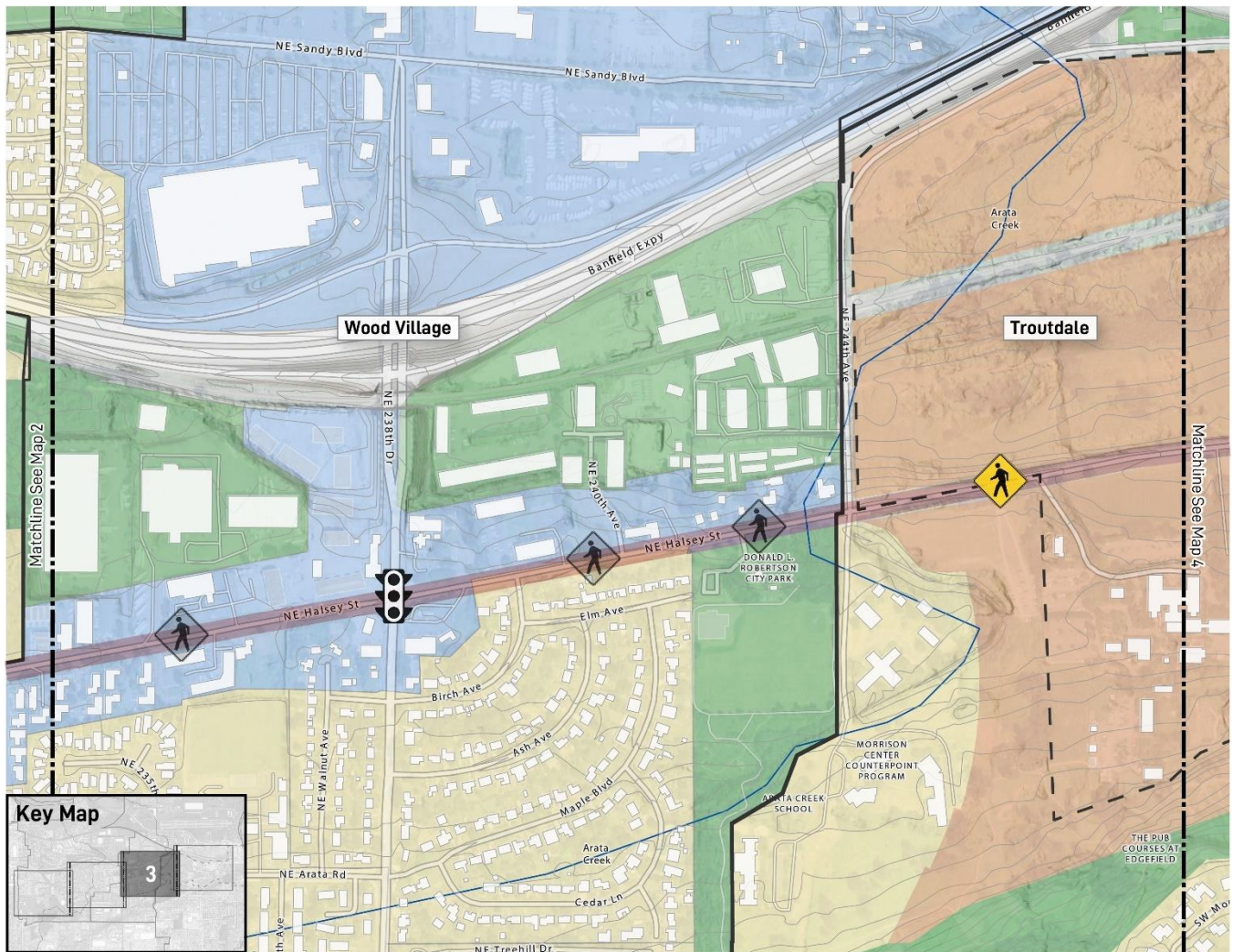


Legend

- City Limits
- Building Footprints
- Contours (five ft.)
- Streams
- Residential Context Zone
- Commercial Context Zone
- Other/ Open Space
- Street Improvements
- Existing Enhanced Pedestrian Crossing
- Proposed Enhanced Pedestrian Crossing
- Proposed Intersection Improvements

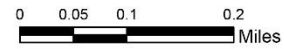


Map 3: Context Zones along NE Halsey Street



Legend

- | | | | |
|---------------------|--------------------------|---------------------------------------|---------------------------------------|
| City Limits | Residential Context Zone | Edgefield Context Zone | Proposed Enhanced Pedestrian Crossing |
| Building Footprints | Commercial Context Zone | Troutdale Town Center | Proposed Intersection Improvements |
| Contours (five ft.) | Other/ Open Space | Existing Enhanced Pedestrian Crossing | |
| Streams | Street Improvements | | |



Map 4: Context Zones along NE Halsey Street



Legend

- | | | | |
|---------------------|--------------------------|---------------------------------------|---------------------------------------|
| City Limits | Residential Context Zone | Edgefield Context Zone | Proposed Enhanced Pedestrian Crossing |
| Building Footprints | Commercial Context Zone | Troutdale Town Center | Proposed Intersection Improvements |
| Contours (five ft.) | Other/ Open Space | Existing Enhanced Pedestrian Crossing | |
| Streams | Street Improvements | | |



SUMMARY OF CONCERNS

This section summarizes concerns this project aims to address. Technical Memorandum #1 summarizes the community input received at the 2016 Community Visioning Workshop and the 2020 Halsey Main Street Survey. Since then, another survey has been conducted as a part of this project. The results of that survey will be presented in the Public Event #2 Summary report and incorporated in the alternatives evaluations. Public concerns regarding transportation are presented below using three categories: overall, motor vehicle, and active transportation concerns.

- The key overall concerns and needs:
 - Lack of sufficient lighting along the corridor
 - Changing the suburban and rural corridor to feel more like an urban environment
 - Access to greenspaces
- The key motor vehicle concerns:
 - High travel speeds
 - Turn lanes at major intersections
 - Safety at the NE 223rd Avenue, NE Fairview Parkway, NE 238th Drive, SW 257th Drive intersections
- The key active transportation concerns:
 - Need for improved public transit along the corridor
 - Lack of bus stop amenities (shelters, lighting, reader boards)
 - Lack of safe and frequent pedestrian crossing along NE Halsey Street
 - Safety at the NE 223rd Avenue, NE Fairview Parkway, NE 238th Drive, SW 257th Drive intersections
 - Lack of consistent and ADA-compliant sidewalks (ADA – The American with Disabilities Act)
 - Lack of protected bicycle facilities
 - Lack of consistent planting strips and trees



EVALUATION CRITERIA

The streetscape and roadway design alternatives presented in this memorandum will be evaluated against a set of criteria which are based on the project objectives developed at the outset of the project in Technical Memorandum 1. The project objectives and related criteria are summarized below. *Appendix B presents a matrix of the proposed evaluation criteria.*

- Project Objective 1. Create a cohesive Halsey streetscape and pedestrian environment that supports existing small businesses, attracts new businesses, and creates new jobs.
 - Criteria 1A: Promotes economic development by supporting access to local businesses and business districts for all travel modes.
- Project Objective 2. Design Halsey Street to unite the three cities while also allowing each city to be distinguished in the ways they build community and drive economic development.
 - Criteria 2A: Minimizes impacts to adjacent properties
 - Criteria 2B: Can be implemented on an incremental basis through development
 - Criteria 2C: Construction and long-term maintenance costs are equal to existing costs
- Project Objective 3. Make Halsey Street safer, more accessible, and more visually attractive.
 - Criteria 3A: Creates safe and convenient access for people with disabilities
 - Criteria 3B: Improves street appearance through added landscaping and street trees
 - Criteria 3C: Creates space for adding street furnishing
- Project Objective 4. Make public transit, walking, and biking in the Halsey Street corridor more appealing and safer
 - Criteria 4A: Improves safety for people walking, biking and taking transit
 - Criteria 4B: Increases number and frequency of protected crossings of Halsey Street
 - Criteria 4C: Improves access to adjacent land uses and public transit facilities and services
- Project Objective 5. Improve the environment by reducing pollution, planting street trees, and using cost-efficient, sustainable landscaping treatments.
 - Criteria 5A: Incorporates sustainable design strategies
 - Criteria 5B: Creates space for incorporating stormwater facilities
 - Criteria 5C: Reduces impervious surfaces
 - Criteria 5D: Increases tree canopy coverage in the corridor
- Project Objective 6. Enhance bikeability and walkability by slowing motor vehicle traffic, improving intersections, and discouraging through-traffic by trucks.
 - Criteria 6A: Slows motor vehicle traffic
 - Criteria 6B: Discourages through truck traffic
 - Criteria 6C: Maintains access to local businesses for delivery trucks
 - Criteria 6D: Provides low-street pedestrian and bicycle facilities



- Project Objective 7. Engage with local business owners and the public to broaden commitment and ongoing involvement in the corridor.
 - Criteria 7A: Supported by local property owners, business owners and operators, and the public.
 - Criteria 7B: Consistent with previous planning efforts (e.g., Previous Main Streets on Halsey Plans, local Transportation System Plans, Regional Transportation Plan (RTP), Metro 2040 Growth Concept Plan, TriMet High-Capacity Transit plan).

Consistency with the criteria will be presented on a scale of 1 to 5, where 1 means **poor** and 5 means **good**. Evaluation of each alternative will be in relation to other alternatives, rather than against an absolute scale. All criteria will be weighted equally for the purposes of the evaluation. Figure 1 illustrates the evaluation matrix legend that can be applied to each of the project objectives and criteria identified above.

Figure 1: Evaluation Matrix Legend

1	2	3	4	5
Design concept has little or no benefit in achieving the project objective.	Design concept has poor benefit in achieving the project objective.	Design concept has some benefit in achieving the project objective.	Design concept has good benefit in achieving the project objective.	Design concept has significant benefit in achieving the project objective.

STREETSCAPE AND CROSS-SECTION ALTERNATIVES

The roadway cross-sections presented below were developed using feedback received from public engagement, the Public Advisory Committee, the Technical Advisory Committee, and the Project Management Team. They are intended to provide a range of suitable options for each context zone.

The alternative cross-sections for each context zone will be evaluated using the evaluation process described above, which will result in a single preferred cross-section for each context zone, to be presented in Technical Memorandum #5. Each preferred cross-section may simply be a selection of one of the alternatives, or it may be a combination of features from multiple alternatives. Please refer to Appendix C for full-size versions of the cross-section graphics, as well as tables showing the ranges of potential total widths for each cross-section.

Residential Context Zone

Most of the residential context zone (see Maps 1, 2, 3, and 4 above) consists of single- and multi-family housing, plus commercial and agricultural uses that will become housing when they are eventually redeveloped. The homes are primarily accessed from side streets or community driveways, but some of the older homes are directly accessed by driveways on NE Halsey Street.

The residential context zone will see less foot traffic than commercial areas, so should have a relatively narrow sidewalk. Most or all residences have on-site parking, so on-street parking is not needed in most places. Where parking is provided, there should be paved cut-throughs between each street tree to allow access from the parking to the sidewalk. Where there is no on-street parking the planting strip should be continuous.

Figure 2: Typical existing conditions in the Residential context zone



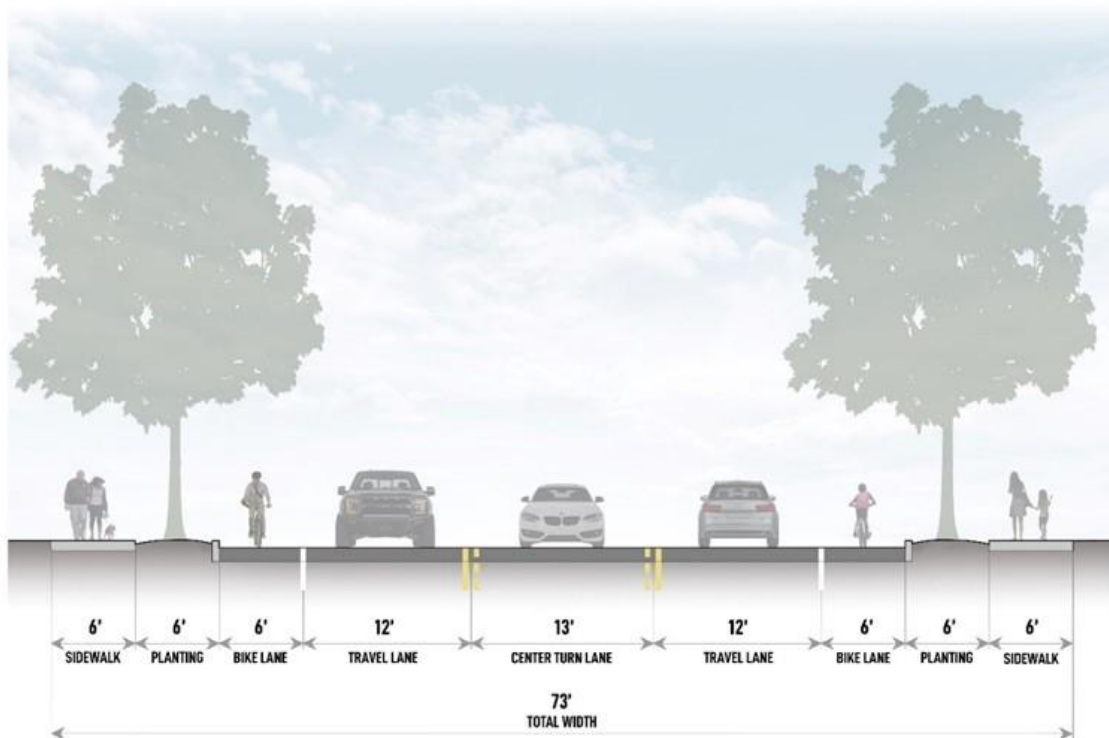
Existing Conditions

Halsey Street through most of the residential context zone consists of two travel lanes, a center turn lane, on-street bike lanes, sidewalks, and street trees. There is street parking on one side of the street along approximately half of the residential context zone. A few blocks within Troutdale have a sidewalk on only one side, and there are no curbs along NE Halsey Street west of NE 208th Place. Most sidewalks are curb-tight within this context zone, with minimal street trees and landscaping.

NE Halsey Street in this context zone is narrowest within Troutdale where it has no center turn lane. It is widest where long slip lanes are added around the intersection with NE Fairview Parkway, for five total travel lanes.

The unprotected on-street bike lanes, curb-tight sidewalks, and gaps in the sidewalks create a more stressful, potentially more dangerous environment for pedestrians and bicyclists.

Figure 3: Residential – Typical Existing Conditions (Varies)



Alternatives

Four alternative cross-sections for the residential context zone are presented below. These cross-sections will be evaluated using the evaluation criteria listed above, and one of the alternatives or one combination of elements from multiple alternatives will be selected as the preferred cross-section for the residential context zone.

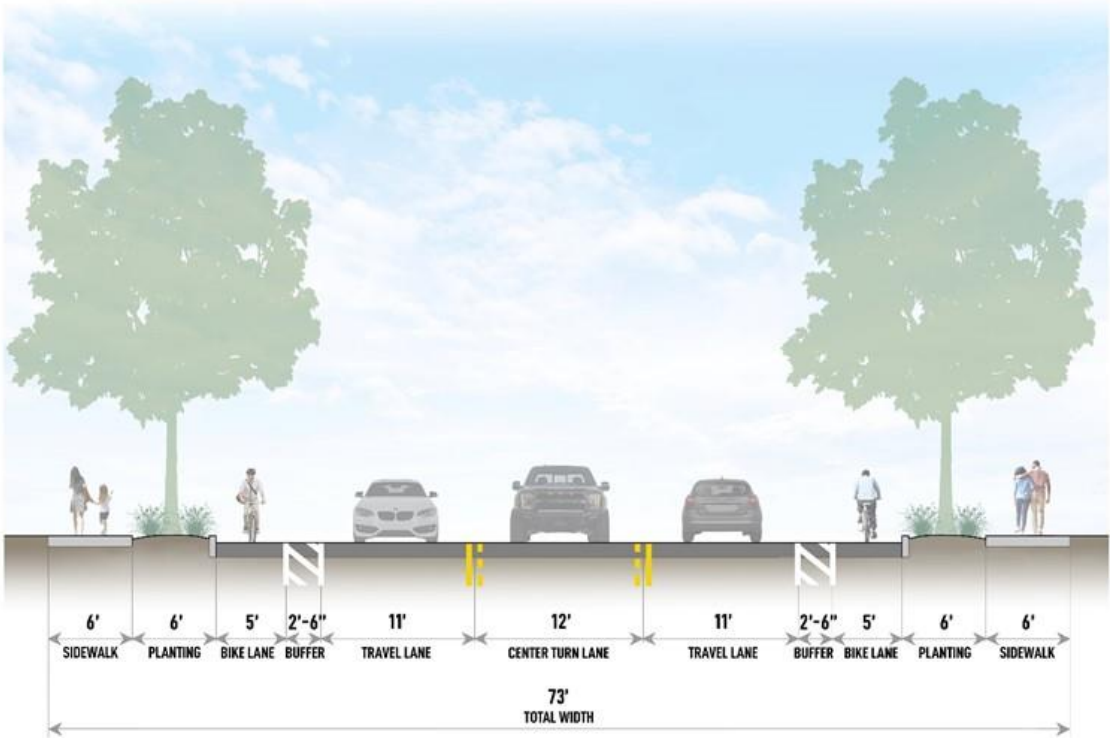
Most of the alternatives are named based on the type of bicycle facility included because the bicycle facilities have the widest variation of all the roadway components across alternatives. The choice of bicycle facility can affect the roadway curb-to-curb width, sidewalk configuration, and location of the street trees relative to the curb.

Near-Term Solution

This cross-section reconfigures the striping of the existing roadway, with no changes to the paving, curbs, or sidewalks. As such it is the least expensive of the alternatives and should be considered as an interim measure until the preferred cross-section can be constructed.

The near-term solution reduces the widths of the travel lanes in order to dedicate more width to the bicycle facilities, allowing for painted buffers with each on-street bike lane. The sidewalks and planting areas remain unchanged, and the overall roadway width remains the same.

Figure 4: Residential - Near-Term Solution



Notes:

- 1. Improvements are limited to re-striping of the existing roadway.
- 2. Parking will only be striped where existing parking is present.

Separated Bike Lanes

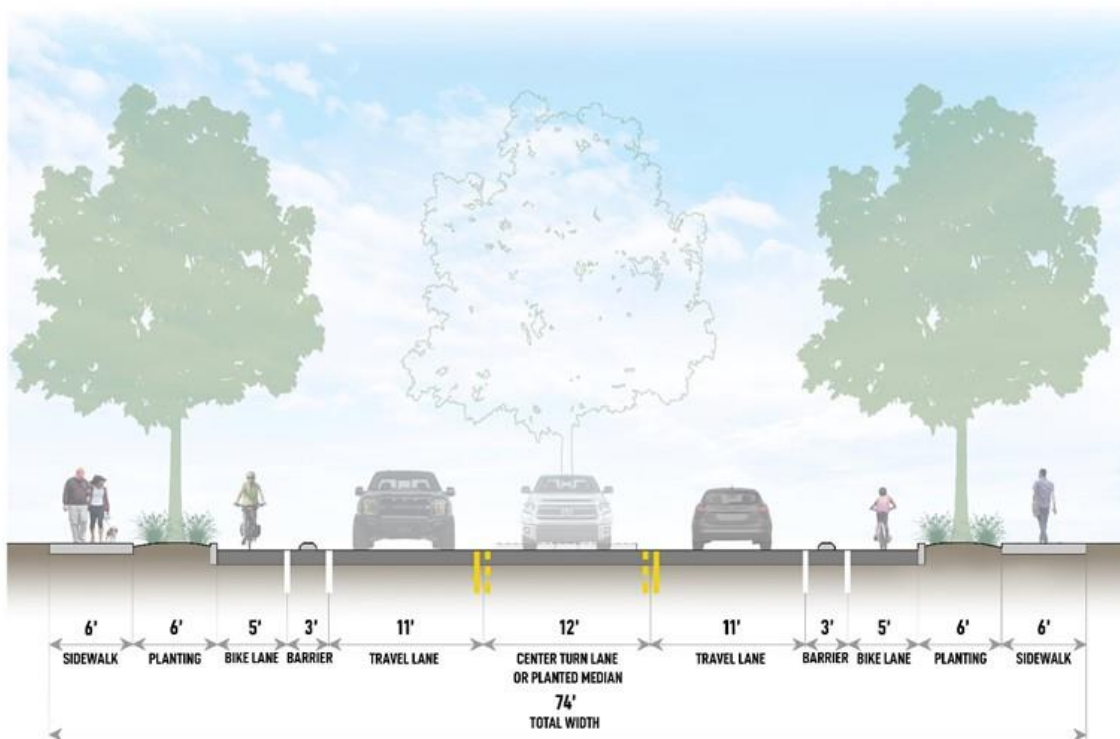
This alternative narrows the travel lanes, adds barriers for the on-street bike lanes, and includes sidewalks that are separated from the street by planting areas with street trees.

On-street parking could be added along the curb where the right-of-way width allows. Where parking is provided, the barrier should be replaced with a buffer and there should be paved cut-throughs between each street tree to allow access from the parking lane to the sidewalk. Where there is no on-street parking, the planting strip should be continuous. The planting strip can potentially be used for stormwater management.

Most bus stops along the corridor will continue to be in-lane, except within the vicinity of major intersections. Where bus pullouts are provided, they will replace the width of parking or, where there is no parking, add to the total roadway width by shifting the bike lane, planting strip, and sidewalk. The bus stop designs will need to account for passengers loading and unloading across the bike lane, possibly including special caution paint in the bike lane and a waiting area.

A planted median with a third row of street trees (only where there are no driveways or intersections) will visually narrow the roadway, which tends to calm traffic speeds.

Figure 5: Residential – Separated Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Planting strips are continuous except for short, paved connections to the sidewalk.
3. Stormwater facilities may be used in place of the planting strips in some areas.
4. Street parking may be added. With parking, planters would be 8' long at each tree, with special paving between the planters.



Sidewalk-Level Bike Lanes

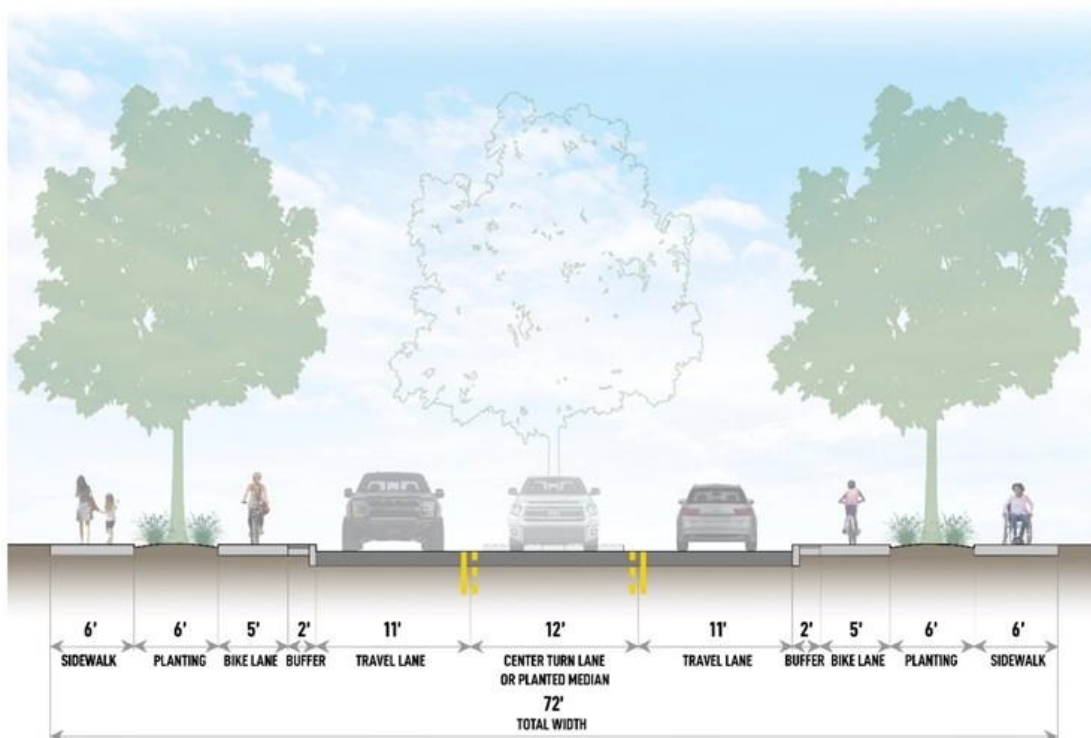
This alternative narrows the travel lanes, moves the bike lanes behind the curb, and includes sidewalks that are separated from the street and bike lanes by planting areas with street trees.

On-street parking could be added along the curb where the right-of-way width allows. Where parking is provided, there should be paved cut-throughs between each street tree to allow access from the parking to the sidewalk. Where there is no on-street parking the planting strip should be continuous. The planting strip can potentially be used for stormwater management.

Most bus stops along the corridor will continue to be in-lane, except within the vicinity of major intersections. where bus pullouts are provided, they will replace the width of parking or, where there is no parking, add to the total roadway width by shifting the bike lane, planting strip, and sidewalk. The bus stop designs will need to account for passengers loading and unloading across the bike lane, possibly including special caution paint in the bike lane and a waiting area.

A planted median with a third row of street trees (only where there are no driveways or intersections) will visually narrow the roadway, which tends to calm traffic speeds.

Figure 6: Residential – Sidewalk-Level Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Planting strips are continuous except for short, paved connections to the sidewalk.
3. Stormwater facilities may be used in place of the planning strips in some areas.
4. Street parking may be added. With parking, planters would be 8' long at each tree, with special paving in the strip between the planters.

Sidewalk-Adjacent Bike Lanes

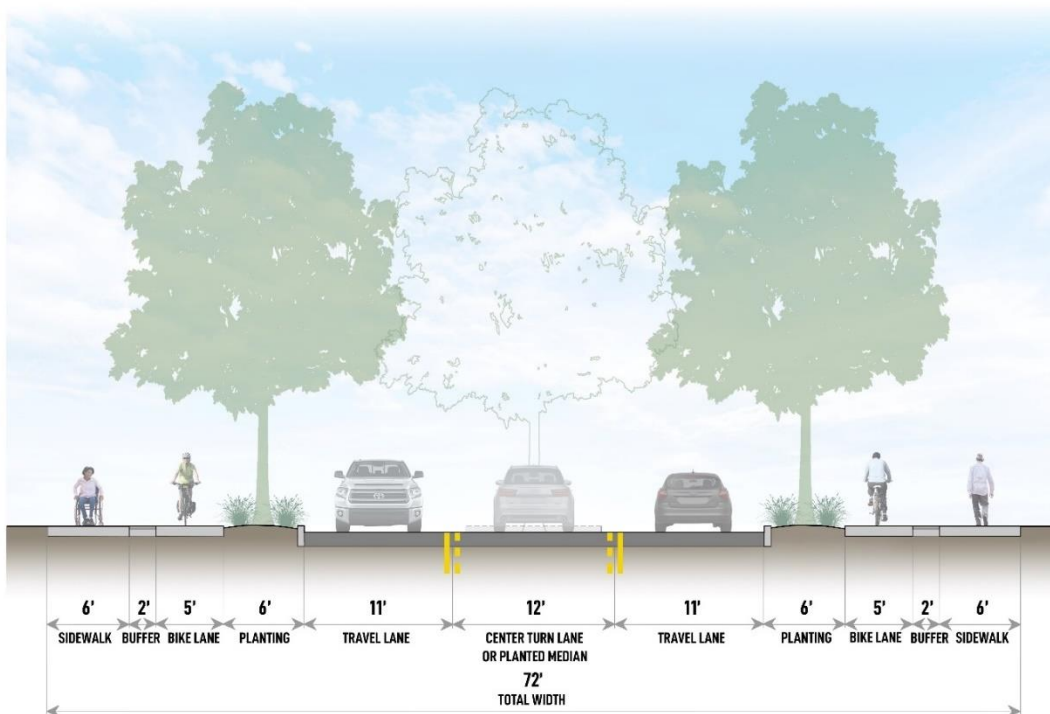
This alternative is very similar to the Sidewalk-Level Bike Lanes alternative above, except the bike lane and planting areas trade positions. This puts the street trees closer to the travel lanes for an added traffic calming effect and provides further separation of bicyclists from the roadway for increased safety and comfort. The bike lane is separated from the sidewalk with a visually contrasting 2' buffer, but that near-adjacency could potentially create conflicts between bicyclists and pedestrians.

On-street parking could be added along the curb where the right-of-way width allows. Where parking is provided, there should be paved cut-throughs between each street tree to allow access from the parking to the sidewalk. Where there is no on-street parking the planting strip should be continuous. The planting strip can potentially be used for stormwater management.

Most bus stops along the corridor will continue to be in-lane, except within the vicinity of major intersections. Where pullouts are provided, they will replace the width of parking or, where there is no parking, add to the total roadway width by shifting the bike lane, planting strip, and sidewalk. The bus stop designs will need to account for passengers loading and unloading across the bike lane, possibly including special caution paint in the bike lane and a waiting area.

A planted median with a third row of street trees (only where there are no driveways or intersections) will visually narrow the roadway, which tends to calm traffic speeds.

Figure 7: Residential – Sidewalk-Adjacent Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Planting strips are continuous except for short, paved connections to the sidewalk.
3. Stormwater facilities may be used in place of the planning strips in some areas.
4. Street parking may be added. With parking, planters would be 8' long at each tree, with special paving in the strip between the planters.

Commercial Context Zone

The commercial context zone consists of a wide variety of businesses, including small shops, lodging, dining, storage, a big-box store, a VA clinic, and automotive services. Mixed-use commercial zones are included in this context zone because they typically include commercial uses on the ground floor. It also includes several non-commercial uses such as the Ukrainian Bible Church, MLA Public Charter School, an ODOT maintenance facility, and a power line corridor.

In the commercial context zone, wider sidewalks with compact tree wells are desirable to create more room for sidewalk traffic that supports the local businesses. The spaces between tree wells also provides a space for furnishings that help create an inviting streetscape such as benches, bike racks, trash cans, special paving, and drinking fountains. On-street parking is an important component too, where there is sufficient right-of-way width.

Figure 8: Typical existing conditions in the Commercial context zone



Existing Conditions

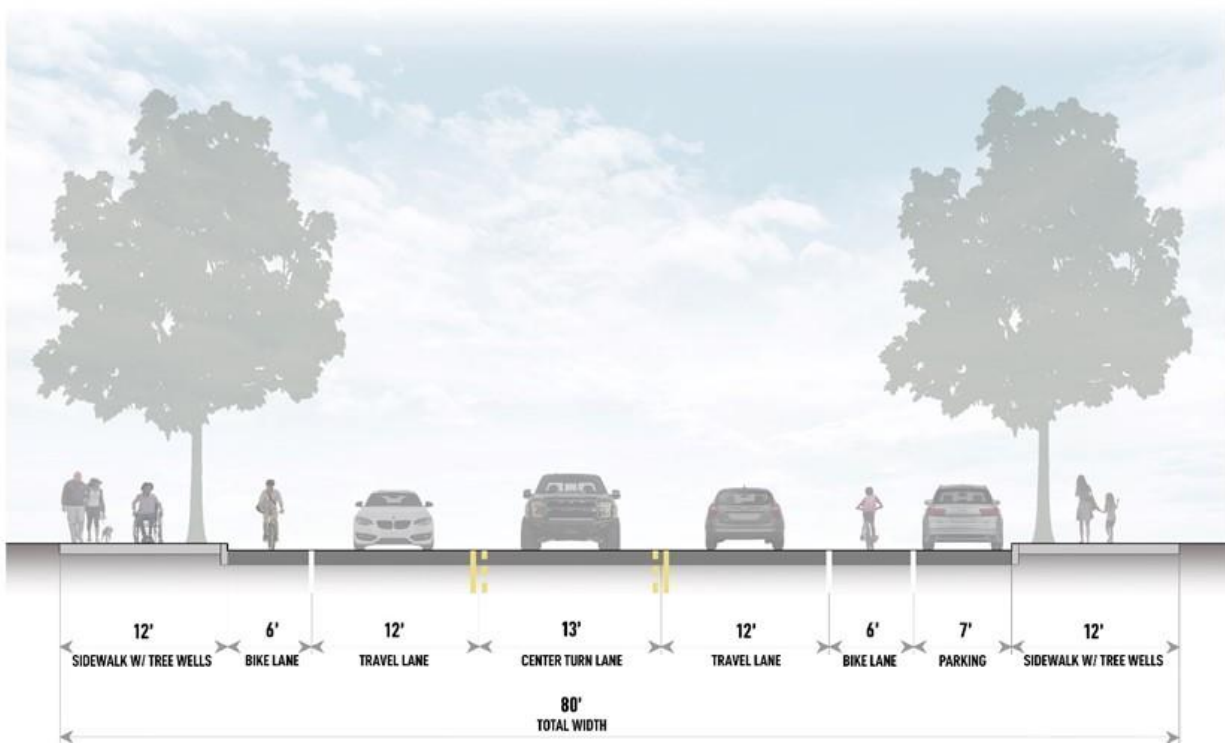
NE Halsey Street through most of the commercial context zone consists of two travel lanes, a center turn lane, on-street bike lanes, sidewalks, and street trees. There is street parking on one or both sides of the street along approximately half of the commercial context zone.

NE Halsey Street in this context zone is narrowest within Troutdale where it has no center turn lane. It is widest where long slip lanes are added around the intersection with NE Fairview Parkway, for five total travel lanes.

Byway is a recently built mixed-use development at the intersection with NE 238th Drive, with retail/commercial buildings that front on NE Halsey Street, and apartment buildings set back from the street. The half-street improvements constructed with this project include a sidewalk set back from the curb, street trees and landscaping along the curb, an on-street bike lane, and street parking that is wide enough to reconfigure with an added buffer or protection for the bike lane.

Older parts of the commercial context zone have curb-tight sidewalks with minimal street trees and landscaping, while most areas with newer development have sidewalks set behind street trees and landscaping. The unprotected on-street bike lanes and curb-tight sidewalks create a more stressful, potentially more dangerous environment for pedestrians and bicyclists.

Figure 9: Commercial – Typical Existing Conditions (Varies)



Alternatives

Five alternative cross-sections for the commercial context zone are presented below. These cross-section will be evaluated using the evaluation criteria listed above, and one of the alternatives or one combination of elements from multiple alternatives will be selected as the preferred cross-section for the residential context zone.

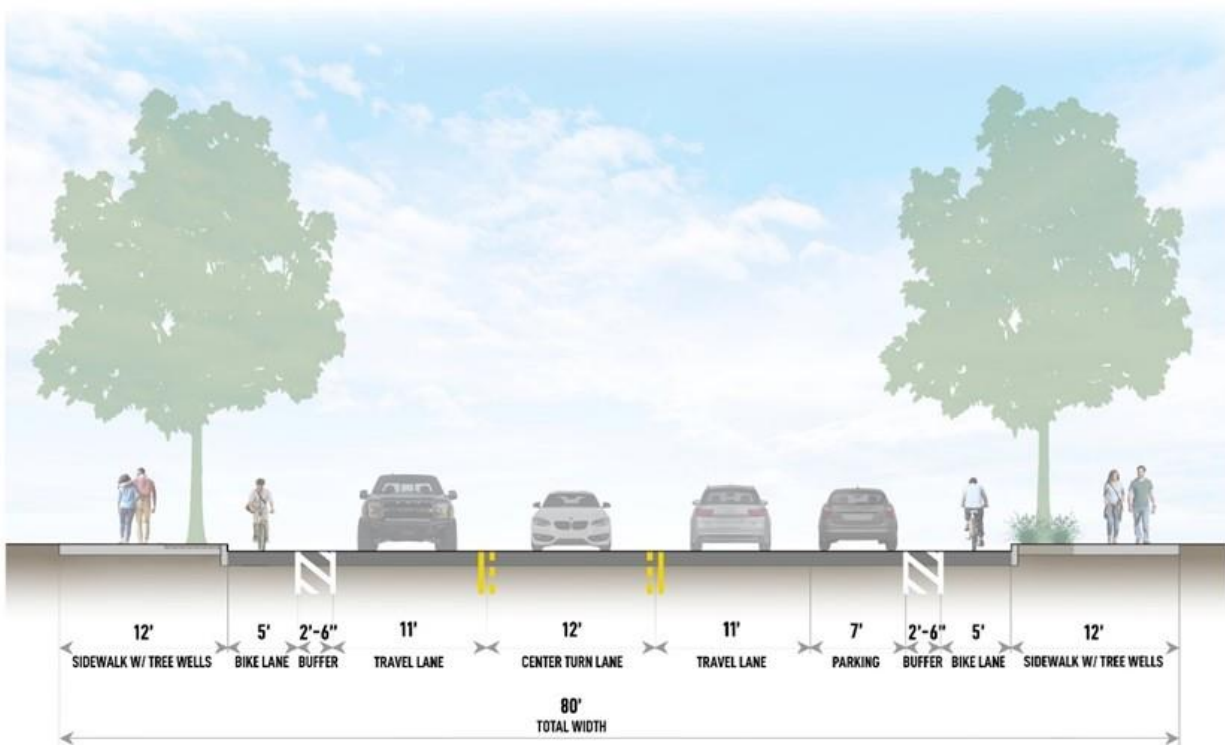
Most of the alternatives are named based on the type of bicycle facility included because the bicycle facilities have the widest variation of all the roadway components across alternatives. The choice of bicycle facility can affect the roadway curb-to-curb width, sidewalk configuration, and location of the street trees relative to the curb.

Near-Term Solution

This cross-section reconfigures the striping of the exiting roadway, with no changes to the paving, curbs, or sidewalks. As such it is the least expensive of the alternatives and should be considered as an interim measure until the preferred cross-section can be constructed.

The near-term solution reduces the widths of the travel lanes in order to dedicate more width to the bicycle facilities, allowing for painted buffers with each on-street bike lane. The sidewalks and planting areas remain unchanged, and the overall roadway width remains the same (the example below shows a portion of the commercial context zone with parking on one side).

Figure 10: Commercial – Near-Term Solution



Notes:

1. Improvements are limited to re-striping of the existing roadway.
2. Parking will only be striped where existing parking is present.



Separated Bike Lanes

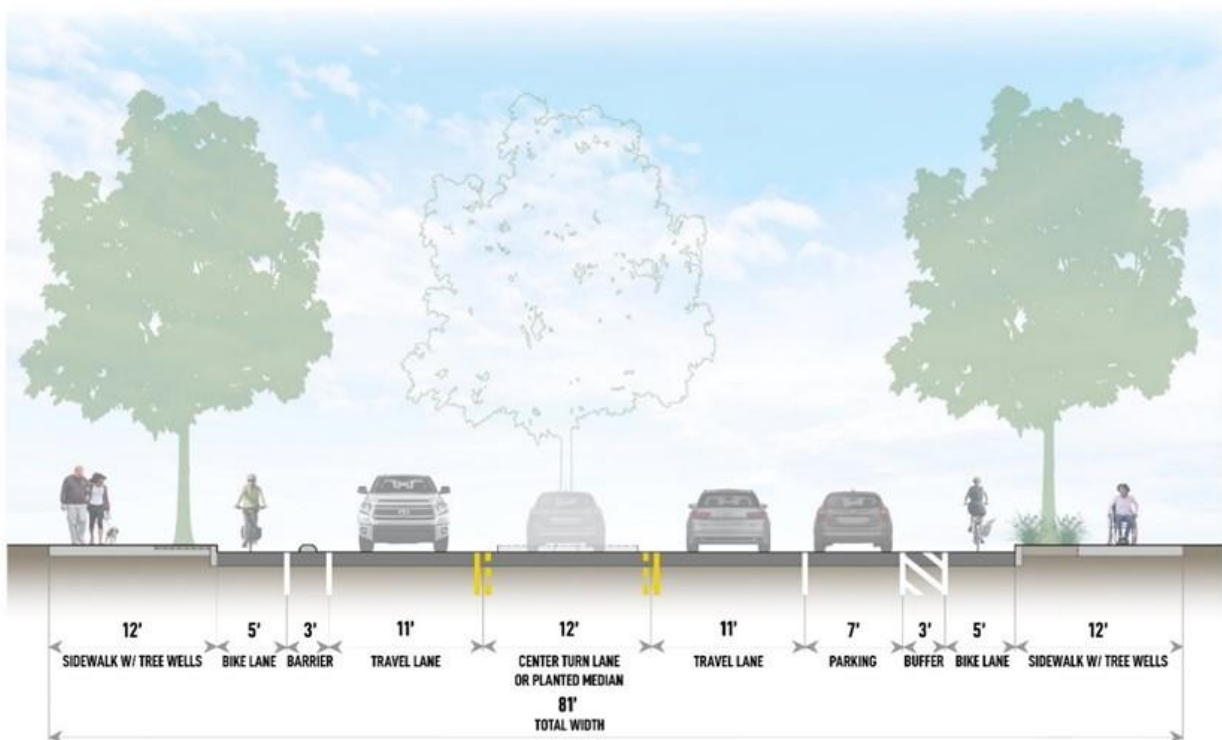
This alternative narrows the travel lanes, adds buffers or barriers for the on-street bike lanes (depending on the presence of on-street parking), and includes wide sidewalks with tree wells that are similar to existing. The space between tree wells has special paving and can include furnishings to create an inviting streetscape, such as benches, bike racks, trash cans, and drinking fountains.

On-street parking is included on one or both sides of the street, where the right-of-way width allows. Parking is located between the travel lanes and the bike lanes, effectively making the parking a very wide buffer or a barrier (when occupied) for the bike lane. Where there is no parking, the bike lane has a low physical barrier such as precast curbs instead of just a painted buffer.

Most bus stops along the corridor will continue to be in-lane, except within the vicinity of major intersections. Where bus pullouts are provided, they will replace the width of parking. Depending on the design of the bus stop it could be in-lane with the parking stalls, with special caution paint in the bike lane, or it could be on the curb with the bike lane shifting behind the bus stop.

A planted median with a third row of street trees (only where there are no driveways or intersections) will visually narrow the roadway, which tends to calm traffic speeds.

Figure 11: Commercial – Separated Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Two options for bike lane separation are shown.
3. Sidewalk through-zones are 8' wide, and tree wells are 4' x 6' with special paving between.
4. Two options for tree wells are shown: tree grate to maximize pedestrian space, or open with planting.



Sidewalk-Level Bike Lanes

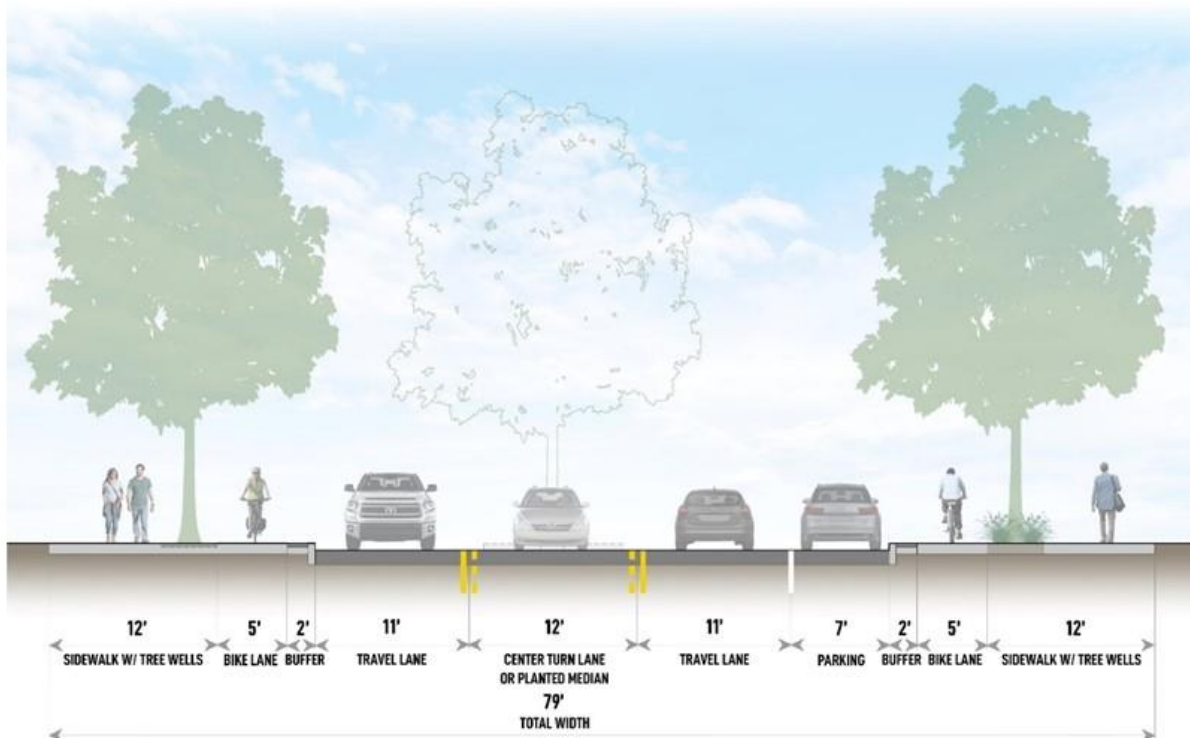
This alternative narrows the travel lanes, moves the bike lanes out of the street, and includes wide sidewalks with tree wells that are similar to existing. The space between tree wells has special paving and can include furnishings to create an inviting streetscape, such as benches, bike racks, trash cans, and drinking fountains.

On-street parking is included on one or both sides of the street, where the right-of-way width allows.

Most bus stops along the corridor will continue to be in-lane, except within the vicinity of major intersections. Where bus pullouts are provided, they will replace the width of parking. The bus stop designs will need to account for passengers loading and unloading across the bike lane, possibly including special caution paint in the bike lane.

A planted median with a third row of street trees (only where there are no driveways or intersections) will visually narrow the roadway, which tends to calm traffic speeds.

Figure 12: Commercial – Sidewalk-Level Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Sidewalk through-zones are 8' wide, and tree wells are 4' x 6' with special paving between.
3. Two options for tree wells are shown: tree grate to maximize pedestrian space, or open with planting.

Sidewalk-Adjacent Bike Lanes

This alternative is very similar to Sidewalk-Level Bike Lanes above, except the bike lane and tree wells trade positions. This puts the street trees closer to the travel lanes for added traffic calming effect and provides further separation of bicyclists from the roadway for increased safety and comfort. The bike lane is separated from the sidewalk with a visually contrasting 2' buffer, but that near-adjacency could potentially create conflicts between bicyclists and pedestrians.

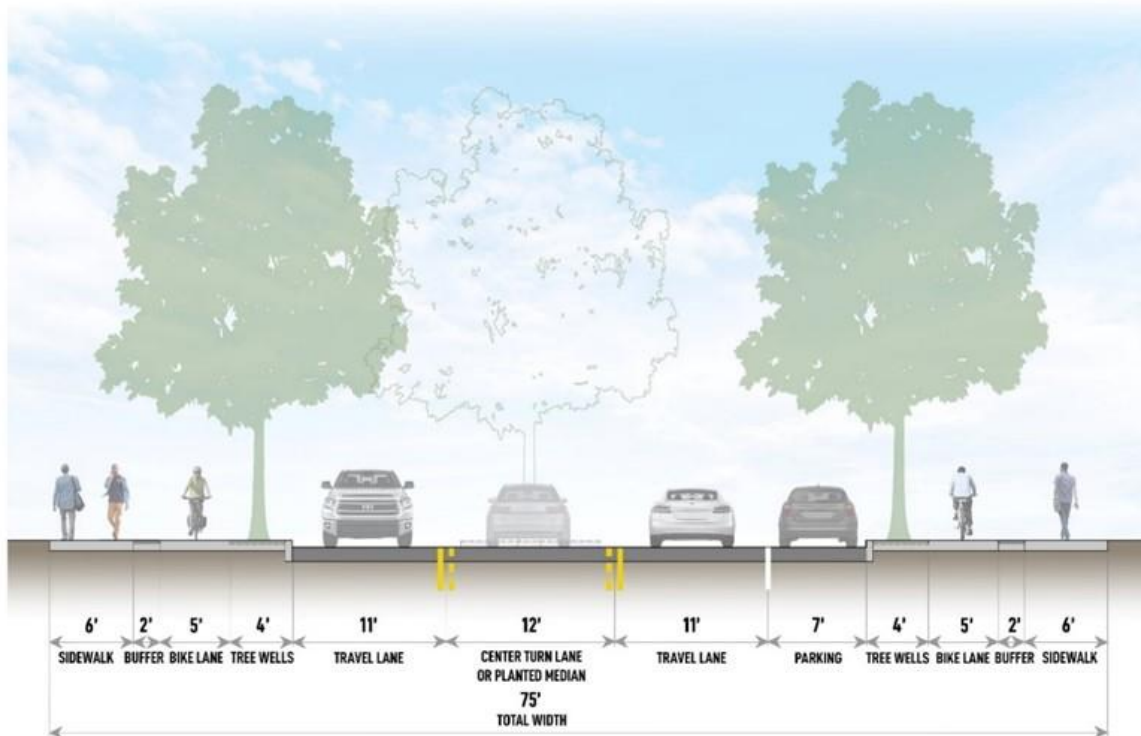
The space between tree wells has special paving and can include furnishings to create an inviting streetscape, such as benches, bike racks, trash cans, and drinking fountains. However, since the bike lane is positioned between the sidewalk and furnishing zone, pedestrians have less access to those furnishings.

On-street parking is included on one or both sides of the street, where the right-of-way width allows.

Most bus stops along the corridor will continue to be in-lane, except within the vicinity of major intersections. Where bus pullouts are provided, they will replace the width of parking. The bus stop designs will need to account for passengers loading and unloading across the bike lane, possibly including special caution paint in the bike lane.

A planted median with a third row of street trees (only where there are no driveways or intersections) will visually narrow the roadway, which tends to calm traffic speeds.

Figure 13: Commercial – Sidewalk-Adjacent Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Sidewalk through-zones are 8' wide, and tree wells are 4' x 6' with special paving between.
3. Two options for tree wells are shown: tree grate to maximize pedestrian space, or open with planting.



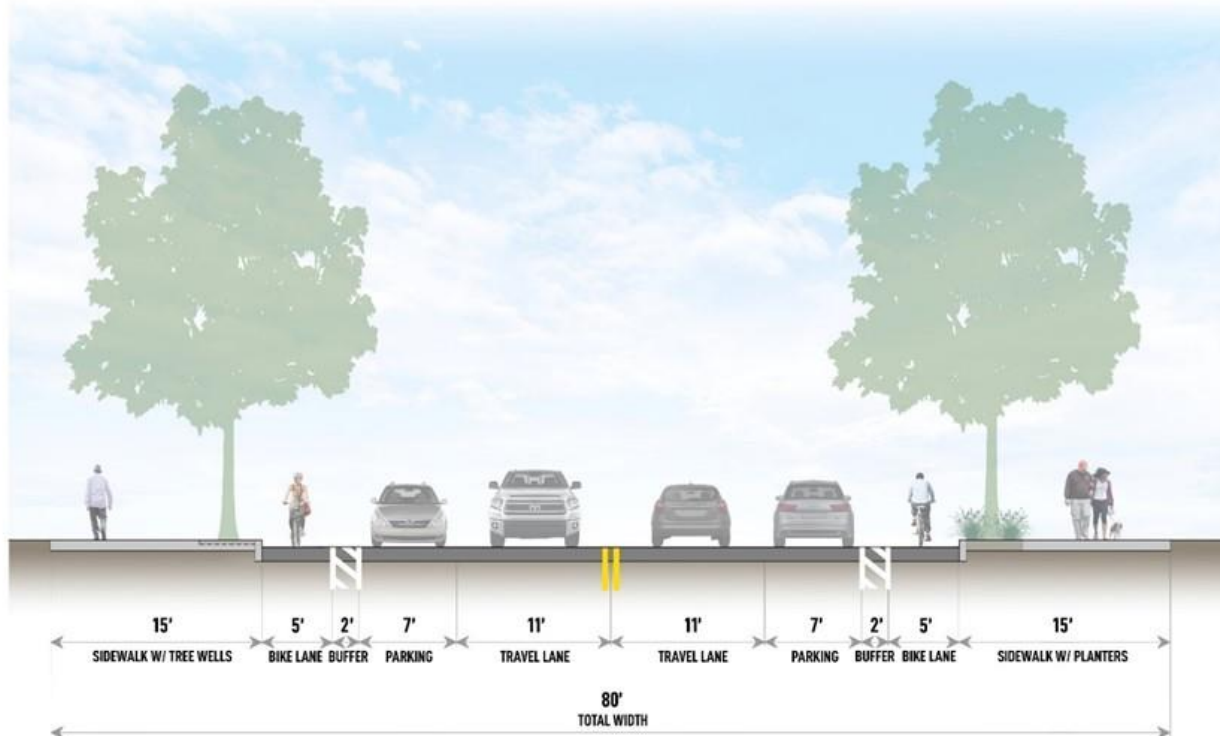
Two-Lane Cross-Section with Parking-Protected Bike Lanes

This alternative is very similar to Separated Bike Lanes above, except it removes the center turn lane/median to make room for parking on both sides of the street. It also features wider sidewalks to handle more foot traffic in busy commercial areas. The space between tree wells has special paving and can include furnishings to create an inviting streetscape, such as benches, bike racks, trash cans, and drinking fountains.

On-street parking is included on both sides of the street. Parking is located between the travel lanes and the bike lanes, effectively making the parking a very wide buffer or a barrier (when occupied) for the bike lane. Where there is no parking, the bike lane has a low physical barrier such as precast curbs instead of just a painted buffer.

Most bus stops along the corridor will continue to be in-lane, except within the vicinity of major intersections. Where bus pullouts are provided, they will replace the width of parking. Depending on the design of the bus stop it could be in-line with the parking stalls, with special caution paint in the bike lane, or it could be on the curb with the bike lane shifting behind the bus stop.

Figure 14: Commercial – Two-Lane Cross-Section with Parking-Protected Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Sidewalk through-zones are 8' wide, and tree wells are 4' x 6' with special paving between.
3. Two options for tree wells are shown: tree grate to maximize pedestrian space, or open with planting.
4. The buffed bike lanes could be replaced by sidewalk level bike lanes or sidewalk-adjacent bike lanes.

Edgefield Context Zone

McMenamins Edgefield is a destination resort and concert venue that features multiple pubs and restaurants, gardens, a golf course, and a spa, all centered on a historic lodge. It attracts large crowds for its summer concert series, and for the purposes of this project, the traffic generated by these concerts sets it apart from the other businesses in the project area.

All McMenamins Edgefield facilities are currently on the south side of NE Halsey Street, but McMenamins owns the adjacent property on the north side of the road and has plans to develop it in the future. All the northern frontage and most the southern frontage currently have an agricultural character, with large open fields and a vineyard in front of the lodge.

All McMenamins Edgefield property is zoned commercial by the City of Troutdale, but it is considered a separate context zone for this project because of its unique character, narrow existing roadway, and potentially differing needs for proposed improvements.

Figure 15: Typical existing conditions in the Edgefield Context Zone



Existing Conditions

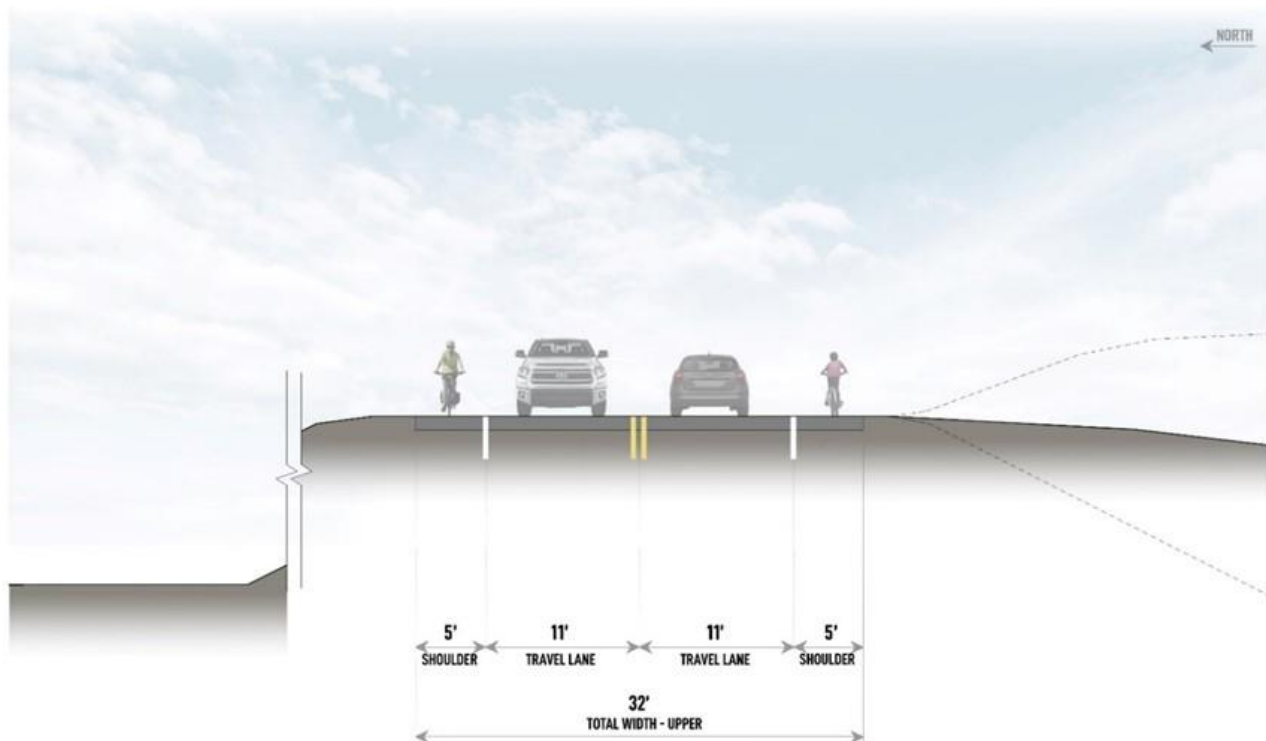
Halsey Street within the Edgefield context zone has a very different character than in the rest of the project area, consisting of only two travel lanes and paved shoulders with bike lane markings. There are no curbs, sidewalks, marked pedestrian crossings, street parking, or street trees, and most of it is raised above the surrounding fields on a narrow dike. Any improvements that widen this part of Halsey Street will require significant fill slopes, retaining walls, and/or raised walkways due to the steep slopes adjacent to the current roadway.

This section of Halsey Street is signed at 40 mph, with traffic that routinely exceeds that limit. The paved shoulder has no protection or buffer from the travel lane, so it is uncomfortable and potentially dangerous for pedestrians and bicyclists.

There are signed transit stops on either side of the road in front of the lodge, but there are no bus pullouts, so stopped buses can block traffic. Long queues of vehicles waiting to park for concerts at Edgefield also block through traffic, including public transit. Edgefield does hire flaggers to manage the traffic generated by these concerts, but the narrow roadway doesn't allow for separate queueing, and there is no opportunity to let other traffic through.

The lack of sidewalks and the unprotected bike lanes, combined with higher traffic speeds in this context zone, creates a more stressful experience for cyclists and pedestrians and the potential for more exposure to vehicle crash risks.

Figure 16: Edgefield – Typical Existing Conditions (Varies)



Notes:

1. In the west end of the Edgefield south frontage, existing grade is a slope up from the road.
2. In front of the Edgefield lodge and vineyard, the south frontage existing grade is roughly level.
3. In the east half of the Edgefield south frontage, existing grade is a slope down from the road.

Alternatives

Four alternative cross-sections for the Edgefield context zone are presented below. These cross-sections will be evaluated using the evaluation criteria listed above, and one of the alternatives or one combination of elements from multiple alternatives will be selected as the preferred cross-section for the Edgefield context zone.

Most of the alternatives are named based on the type of bicycle facility included because the bicycle facilities have the widest variation of all the roadway components across alternatives. The choice of bicycle facility can affect the roadway curb-to-curb width, sidewalk configuration, and location of the street trees relative to the curb.

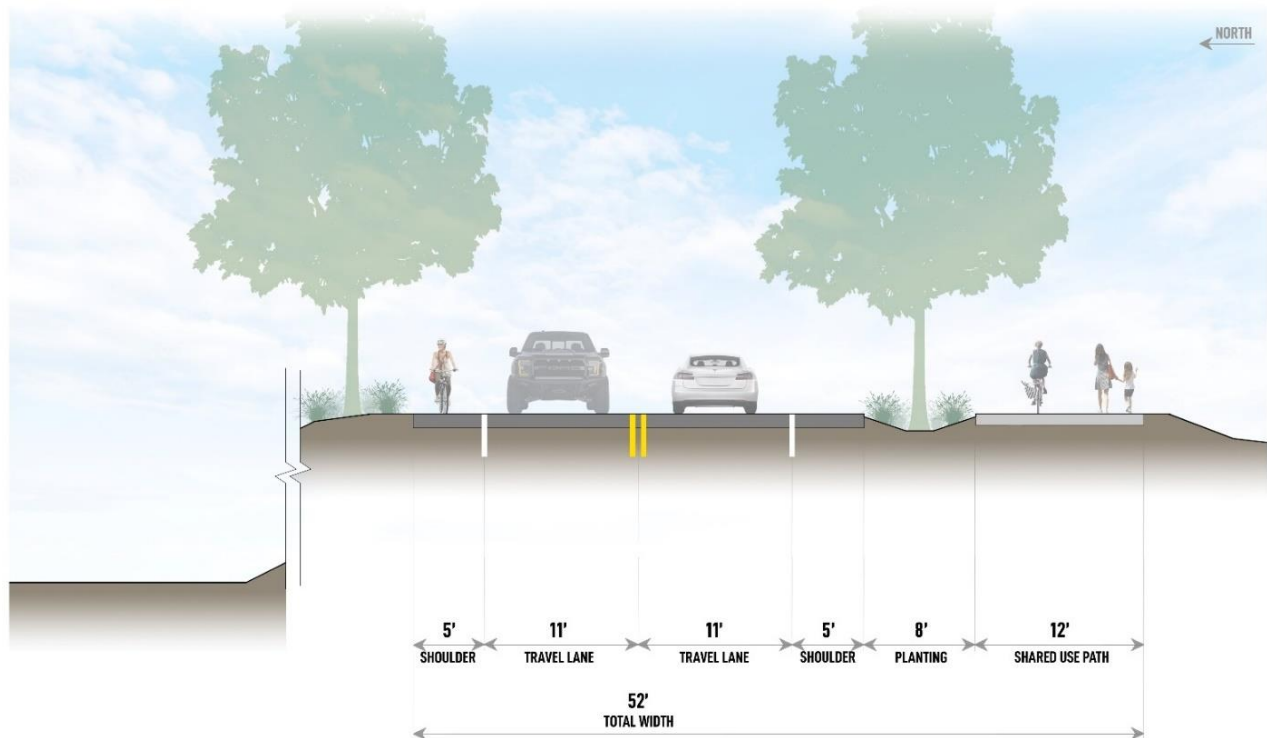
Near-Term Solution

This cross-section adds a shared-use path on the south side of the road and plantings on both sides, with no changes to the roadway or to the existing shoulder bike lanes. As such it is the least expensive of the alternatives and should be considered as an interim measure until the preferred cross-section can be constructed.

The shared-use path provides a much-needed connection on the south side of the road. Currently there are no destinations on the north side of the road and no marked pedestrian crossings within the Edgefield context zone. Users of the shared-use path on the south side will be limited to crossing at existing enhanced pedestrian crossings about two blocks beyond the west and east ends of the Edgefield context zone.

The addition of street trees and planting areas will provide shade, opportunities for stormwater treatment, and visual narrowing of the roadway which tends to reduce traffic speeds.

Figure 17: Edgefield – Near-Term Solution



Notes:

1. The shared-use path will be on significant cut or fill conditions for the majority of the frontage.



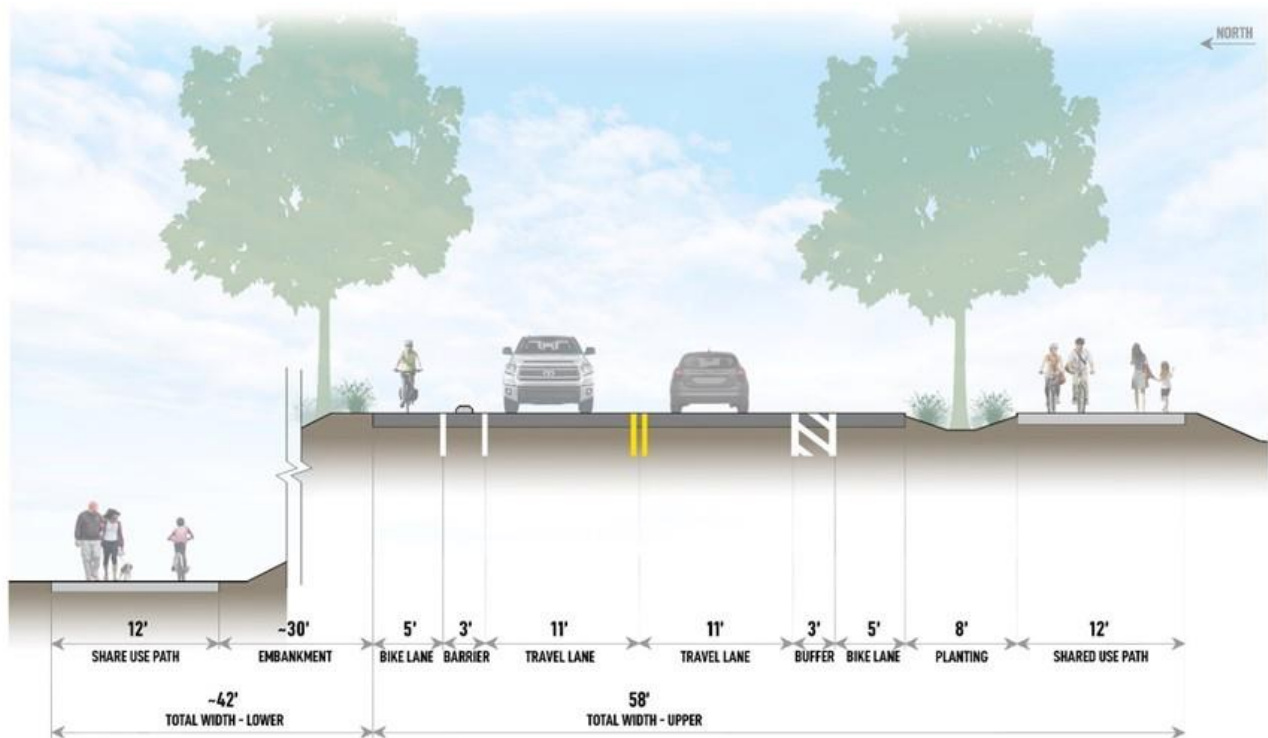
Shoulder Bike Lanes with Shared-Use Paths

This alternative adds shared-use paths on both sides of the road and widens the road slightly to allow for bike lane buffers or barriers but does not add curbs. The north-side shared-use path is on McMenamins property at the toe of the existing embankment, to minimize grading and provide connections to potential future Edgefield facilities. The south-side shared-use path is primarily within the right-of-way where existing grades allow, but it could move down onto McMenamins property at the east end to minimize grading.

No on-street parking is included in this alternative because there are no destinations besides Edgefield, which has its own on-site parking. No bus pullouts are planned for this corridor segment.

The addition of street trees and planting areas will provide shade, opportunities for stormwater treatment, and visual narrowing of the roadway which tends to reduce traffic speeds. The planting strip can potentially be used for stormwater management.

Figure 18: Edgefield – Shoulder Bike Lanes with Shared-Use Paths



Notes:

1. Two options for bike lane separation are shown.
2. The shared-use path on the south side will be on significant cut or fill conditions for the majority of the frontage.
3. The shared-use path on the north side will be on existing grade, outside of Halsey right-of-way.

Three-Lane Cross-Section with Sidewalk-Level Bike Lanes

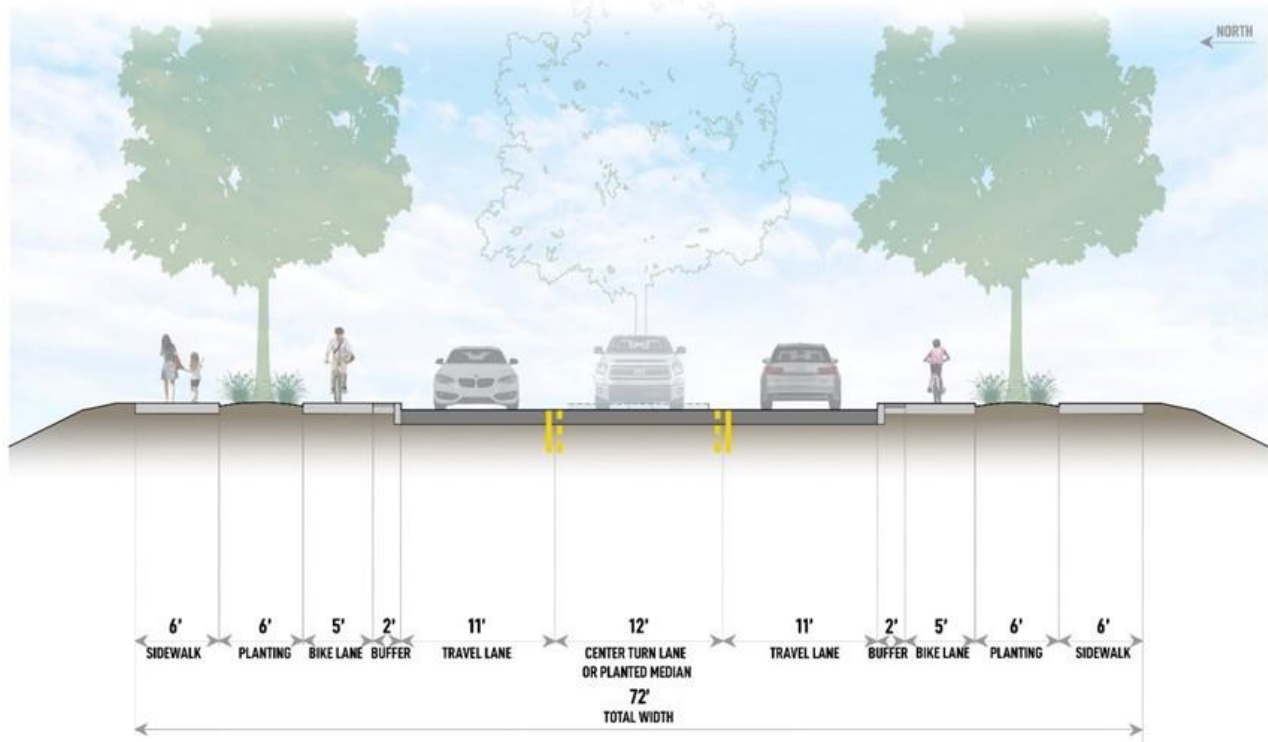
This alternative adds a center turn lane/median, curbs, sidewalks, planting areas, and separated bike lanes. It resembles alternatives proposed for the other context zones, except that it does not include parking.

The added width will require significant fill slopes, retaining walls, and/or raised walkways due to the steep slopes adjacent to the current roadway. No bus pullouts are planned for this corridor segment.

No on-street parking is included in this alternative because there are no destinations besides Edgefield, which has its own on-site parking.

The addition of street trees and planting areas will provide shade, opportunities for stormwater treatment, and visual narrowing of the roadway which tends to reduce traffic speeds. The trees in this alternative are set wider than in the other Edgefield alternatives, so would provide less of the visual narrowing effect. A planted median with a third row of street trees (only where there are no driveways or intersections) will further narrow the roadway, with a stronger traffic calming effect.

Figure 19: Edgefield – Three-Lane Cross-Section with Sidewalk-Level Bike Lanes



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Planting strips are continuous except for short, paved connections to the sidewalk.
3. Sidewalks and bike lanes will be built on significant fill slopes, walls, or elevated boardwalk and partly in a cut condition.

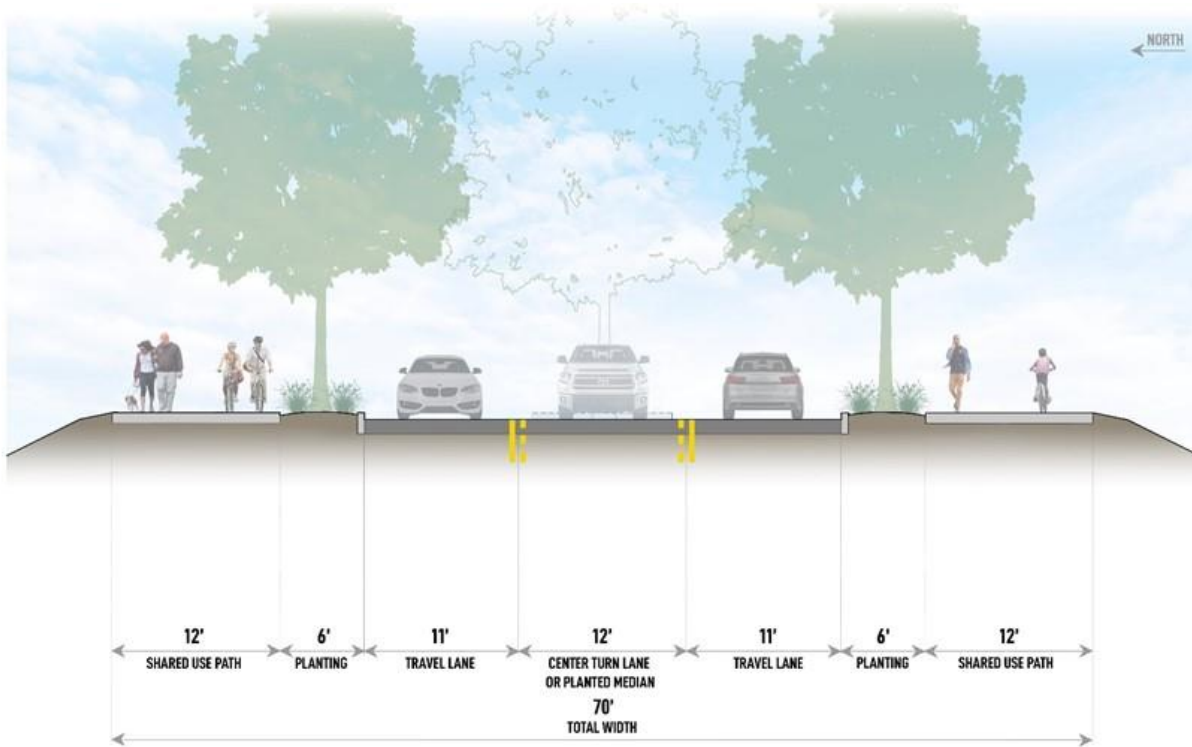
Three-Lane Cross-Section with Shared-Use Paths

This alternative adds a center turn lane/median, curbs, planting areas, and shared-use paths on both sides of the road. The added width will require significant fill slopes, retaining walls, and/or raised walkways due to the steep slopes adjacent to the current roadway.

No on-street parking is included in this alternative because there are no destinations besides Edgefield, which has its own on-site parking. No bus pullouts are planned for this segment.

The addition of street trees and planting areas will provide shade, opportunities for stormwater treatment, and visual narrowing of the roadway which tends to reduce traffic speeds. A planted median with a third row of street trees (only where there are no driveways or intersections) will further narrow the roadway, with a stronger traffic calming effect.

Figure 20: Edgefield – Three-Lane Cross-Section with Shared-Use Paths



Notes:

1. Planted medians will only occur where there are no driveways or intersections.
2. Planting strips are continuous except at driveways, transit stops, and pedestrian crossings.
3. Sidewalks and bike lanes will be built mainly on significant fill slopes, walls, or elevated boardwalk and partly in a cut condition.

INTERSECTION ALTERNATIVES

The intersection alternatives presented below were developed using the feedback received from public engagement, the Public Advisory Committee, the Technical Advisory Committee, and the Project Management Team. They are intended to provide near-term and long-term safety improvements at the study intersections. The intersection alternatives will be evaluated using the evaluation process described above, which will be presented in Technical Memorandum #5.

Intersection Treatments

This section introduces three types of potential intersection treatments. The Enhanced Features include a set of lower cost treatments that can be implemented on a permanent or interim basis. Protected Intersections and Roundabouts are higher cost treatments that would require complete reconstruction of the intersections.

Enhanced Features

The enhanced features include a combination of signing, striping, and enhanced signal systems equipment designed to improve crossing conditions for people walking, biking, and accessing transit by increasing visibility and awareness of pedestrian and bicycles at the intersection. The enhanced features considered for implementation along NE Halsey Street include:

- **Lighting** is currently provided at each intersection. However, additional lighting could be provided to increase lighting levels to City and County standards at a minimum.
- **Advanced stop markings & signs** could be provided at each approach to reduce the potential for motor vehicles encroaching on the marked crosswalks.
- **Countdown pedestrian heads** could be installed on both sides of the marked crosswalks at signalized intersections to provide people walking with an indication of the remaining time to cross the street.
- **Audible pedestrian signals** could be installed in conjunction with the countdown pedestrian heads to assist the visually impaired.
- **Leading pedestrian interval** could be installed at each approach to give people walking a head start when crossing the street – leading bicycle interval could also be installed with a bike only signal.
- **High visibility crosswalk markings** can be used at intersections to improve pedestrian visibility.
- **Green bike boxes** could be installed on each approach to provide a waiting area for bicyclists, reduce their signal delay and to improve the visibility of cyclists at the intersections. They can also serve as a left-turn box, allowing cyclists to have space for making two-stage left turns.
- **Green skip striping** could be installed in conflict points (such as driveways, turn lanes, and bus stops) to warn motorists of the potential for people biking. Green skip striping could also be installed through the intersection on each approach. An example of this type of striping is shown in Figure 21.
- **Green high visibility bike lanes** can be installed within bicycle lanes on all intersection legs. They improve visibility of cyclists and better define travel patterns for all users.
- **No Right on Red** could be implemented at each approach to reduce the potential for conflicts between right-turning vehicles and people walking and biking – this treatment would impact motor vehicle capacity at the intersections.



- **Combined Bike Lane/Turn Lane** could be installed at each approach where the bike lane drops prior to the right turn lane. This treatment could be installed on an interim basis. An example of this treatment is shown in Figure 22.
- **Access management strategies** can be used along the corridor and specifically at intersections to reduce the number of conflicts between people traveling along NE Halsey Street and people using driveways. Some driveways can be restricted to right-in/right-out movements and some driveways can be closed completely.

Additional information on many of these enhanced features is provided in *the Street and Landscape Design Toolkit* as well as other publications, including ODOT's *Oregon Bicycle & Pedestrian Safety Implementation Plan*.

Figure 21: Green Skip Striping



Figure 22: Combined Bike Lane/Turn Lane



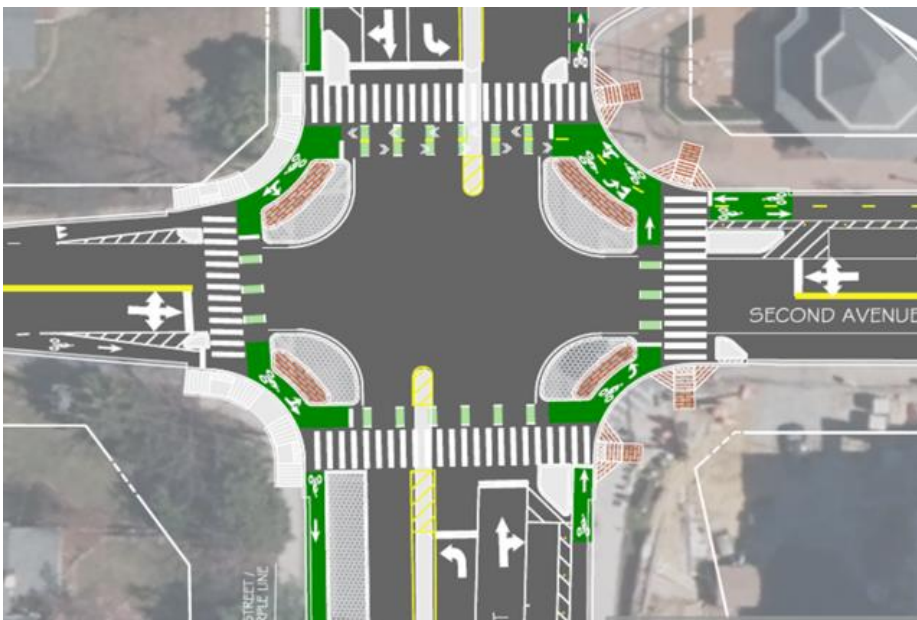
Protected Intersection Treatments

Protected intersections are designed to protect people walking, biking, and accessing transit by creating physical separation between travel modes. The physical separation is intended to control speeds, promote visibility, and reduce conflicts among all road users while increasing comfort for bicyclists and pedestrians. The main features of protected intersections include setbacks, corner islands, queuing areas, pedestrian islands, and waiting zones. Figures 23 and 24 show examples of protected intersection treatments. Additional information on protected intersections is provided in the Street and Landscape Design Toolkit as well as other publications, such as NACTO's *Don't Give Up at the Intersection* (2019).

Figure 23: Protected Intersection Treatments



Figure 24: Protected Intersection Treatments



Roundabouts

Roundabouts consist of a center island where vehicles drive counterclockwise around at a slow speed until they reach their desired exit. Because of their design, roundabouts significantly reduce the speed at which traffic travels, decrease the need to install signaled four-way intersections and decrease the likelihood of head-on collisions. Roundabouts can be designed to accommodate trucks with trailers and other large vehicles. Pedestrians benefit from roundabouts due to the shorter crossing distances, reduced waiting times to cross, and the need to cross only one direction of traffic at a time. Bicycle users and pedestrians both benefit from increased yielding rates, and all users benefit from reduced frequency and severity of crashes. Figures 25 and 26 show examples of roundabouts. Additional information on roundabouts is provided in the Street and Landscape Design Toolkit as well as other publications, such as FHWA’s *Roundabouts: An Informational Guide* (2010).

Figure 25: Roundabout



Figure 26: Roundabout



NE Halsey Street/NE 223rd Avenue

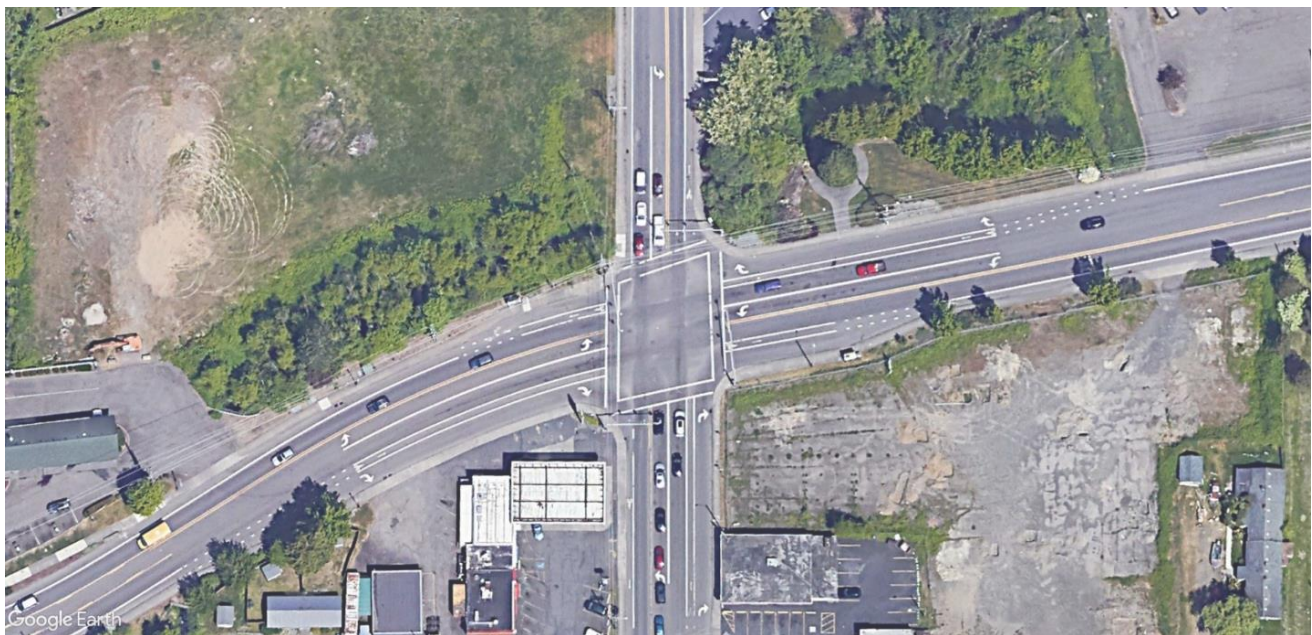
The NE Halsey Street/NE 223rd Avenue intersection is located near the west end of the corridor. The intersection serves traffic volumes traveling north-south along NE 223rd Avenue between NW Burnside Road and NE Marine Drive, as well as traffic volumes traveling to I-84 via NE 238th Drive to the east and NE Fairview Parkway to the west.

Existing Conditions

The NE Halsey Street/NE 223rd Avenue intersection has four legs with separate left-turn lanes on each approach and separate right-turn lanes on the eastbound, westbound, and northbound approaches. There are also bus pull-outs on the northwest and southeast corners of the intersection. The intersection is signalized with protected left-turn and permissive right-turn phasing on each approach. The signal is fully actuated, which means it can be activated by motor vehicles by in-ground detection and by pedestrians by pushbuttons. Figure 27 illustrates the existing NE Halsey Street/NE 223rd Avenue intersection.

Recent traffic studies show that the intersection currently meets Multnomah County performance standards; however, several crashes were reported at the intersection over the last five years, including one severe injury crash. The intersection is also identified in the top five percent of crash sites throughout the state for frequency and severity of crashes – none of the crashes involved people walking or biking.

Figure 27: Existing Conditions - NE Halsey Street/NE 223rd Avenue



Alternatives

The alternatives developed for the NE Halsey Street/NE 223rd Avenue intersection are intended to improve crossing conditions for people walking, biking, and accessing transit, as well as improve traffic operations and safety for all travel modes. The alternatives include the addition of enhanced features and reconfiguration of the intersection as a protected intersection and as a roundabout.

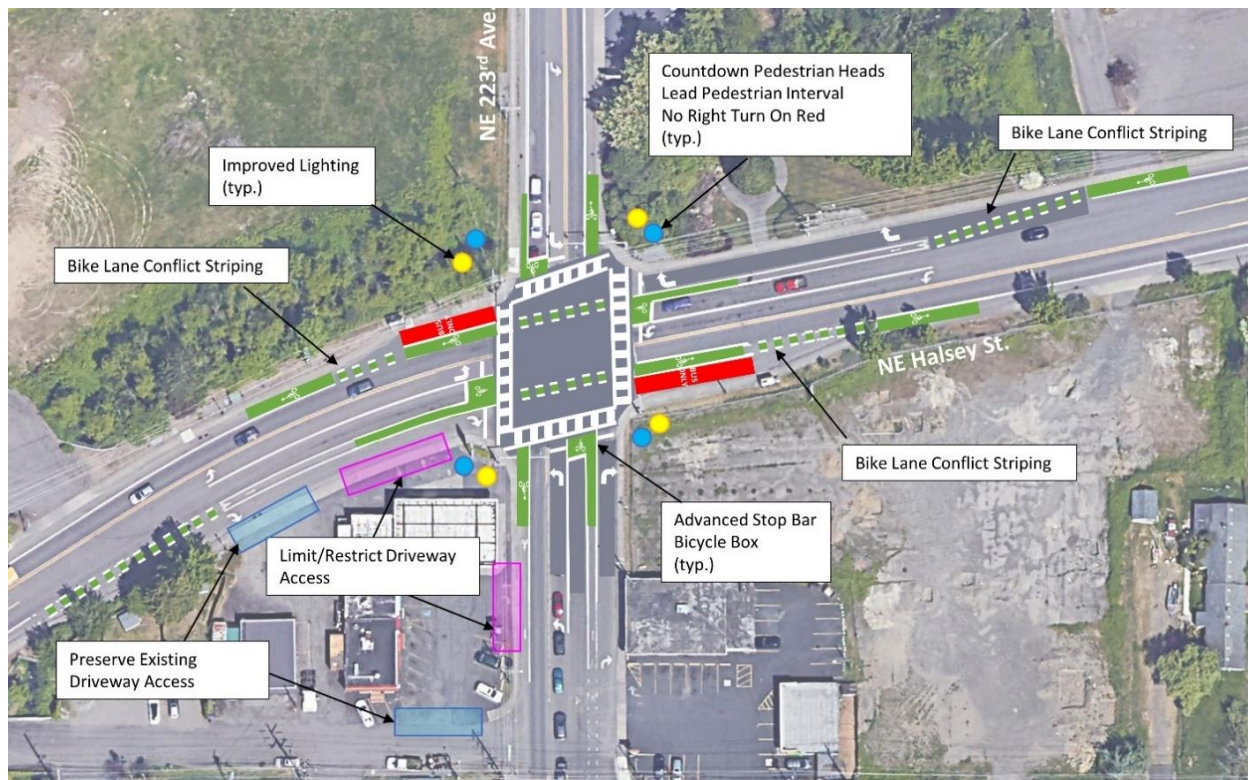
Enhanced Features

Several enhanced features could be installed at the NE Halsey Street/NE 223rd Avenue intersection on a permanent or interim basis, which are illustrated in Figure 28. It should be noted that several of the enhanced features shown in Figure 28 could be installed independently of or in coordination with the streetscape and cross-section alternatives described above.

The enhanced features include:

- Improved lighting at all intersection corners.
- Countdown pedestrian heads, lead pedestrian interval, no right turn on red on all intersection legs and approaches.
- High visibility crosswalks on all legs. The presented crosswalks use perpendicular bar or ladder style markings, but they can be replaced with longitudinal bar or continental style markings.
- Advanced stop bars within all approaching lanes.
- Green bike boxes and high visibility green bike lanes on all intersection approaches.
- Green bike lane conflict striping at driveways, bus pullouts, beginning of the right-turn lanes, and through the intersection.
- Red bus stop pavement markings at the two bus stops. Even though these bus stops are equipped with pullouts, having additional paint would help right-turning vehicles to avoid pulling into the bus stop and would discourage them from parking within that area.
- Limiting or restricting access at the two driveways for the Chevron gas station in the southwest corner of the intersection. The other two driveways would still allow for full access. Limiting or restricting access would minimize vehicle conflicts at the intersection.

Figure 28: Enhanced Features - Halsey Street/NE 223rd Avenue



Protected Intersection

Protected intersection treatments could be installed at the NE Halsey Street/NE 223rd Avenue intersection with or without reconfiguration of NE Halsey Street.

Key considerations in developing protected intersection treatments at this location include:

- **Corner islands** should be provided on each corner to separate bikes from motor vehicles, prevent motor vehicles from encroaching on bikeways, and create a protected queueing area for people waiting to cross the street. The corner radii should be small enough to reduce motor vehicle turning speeds but reflect the needs of large trucks.
- **Pedestrian Islands** should be provided, if feasible, to reduce crossing distances and improve the visibility of people waiting to cross. Pedestrian islands should be wide enough to support a high volume of people walking and biking. Pedestrian islands may be limited at this location given the lack of on-street parking/loading areas and the presence of bus pull-outs.
- **Bikeway setback** should be sufficient to provide motor vehicles with space to wait and yield to people crossing the street and decrease the angle at which they cross the bikeway. It should also be sufficient to provide people with more time to notice and react to turning vehicles.
- **High-visibility** signs and pavement markings should be provided at each approach as appropriate given the design and include (at a minimum) bike and pedestrian crosswalk striping.

Figure 29 illustrates a design concept for the NE Halsey Street/NE 223rd Avenue intersection with protected intersection treatments developed as part of a previous project. This concept may need to be revised based on the most recent design guidance and preferred cross-section.

Figure 29: Protected Intersection – NE Halsey Street/NE 223rd Avenue



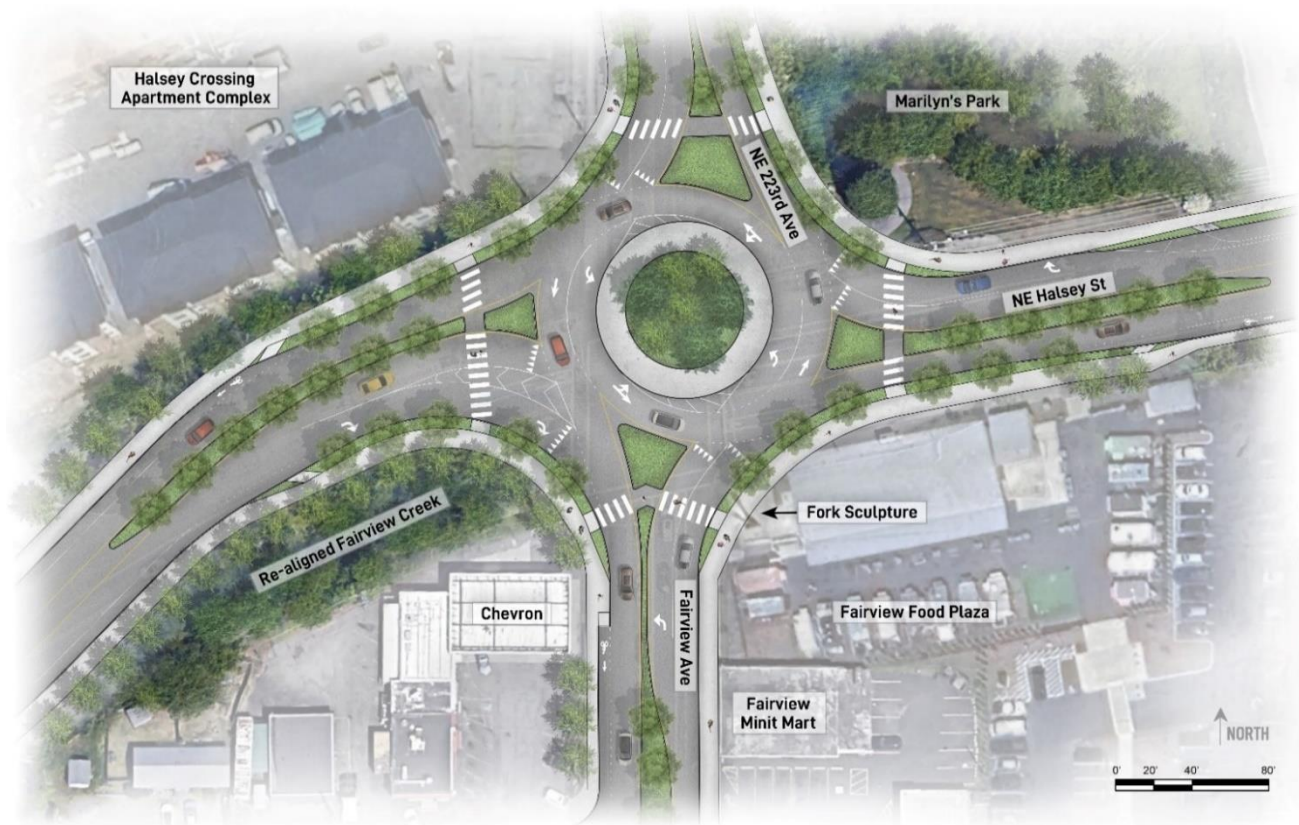
Roundabout

A multi-lane roundabout could be installed at the NE Halsey Street/NE 223rd Avenue intersection with reconfiguration of NE Halsey Streets adjacent to the intersection. Key features include:

- High-visibility pedestrian and bicycle crossings
- Spitter islands at each approach with pedestrian refuge

Figure 30 illustrates a roundabout design concept developed for the NE Halsey Street/NE 223rd Avenue intersection as part of a separate project. It should be noted that a roundabout could be installed independent of or in coordination with the streetscape and cross-section alternatives described above.

Figure 30: Roundabout Intersection – NE Halsey Street/NE 223rd Avenue



NE Halsey Street/NE 238th Drive

The NE Halsey Street & NE 238th Drive intersection is located in the central portion of the corridor. In the north-south direction, this intersection serves volumes traveling between NE Burnside Road and NE Sandy Boulevard, and it also provides a connection to Interstate 84 (I-84) on and off ramps. In the east-west direction, this intersection serves traffic traveling along NE Halsey Street between SW 257th Drive and the rest of the corridor.

Existing Conditions

The NE Halsey Street/NE 238th Drive intersection has four legs with separate left-turn lanes on each approach and a separate right-turn lane on the westbound approach. There are also bus pullouts on the northwest and southeast corners of the intersection. The intersection is signalized with protected left-turn and permissive right-turn phasing on each approach. The signal is fully actuated, which means it can be activated by motor vehicles by in-ground detection and by pedestrians by pushbuttons. Figure 31 illustrates the NE Halsey Street/NE 238th intersection.

Recent traffic studies show that the intersection currently meets Multnomah County performance standards; however, several crashes were reported at the intersection over the last five years. The intersection is also identified in the top fifteen percent of crash sites throughout the state for frequency and severity of crashes – none of the crashes involved people walking or biking.

Figure 31: Existing Conditions – NE Halsey Street/NE 238th Drive



Alternatives

The alternatives developed for the NE Halsey Street/NE 238th intersection are intended to improve crossing conditions for people walking, biking, and accessing transit, as well as improve traffic operations and safety for all travel modes. The alternatives include the addition of enhanced features and reconfiguration of the intersection as a protected intersection.

Enhanced Features

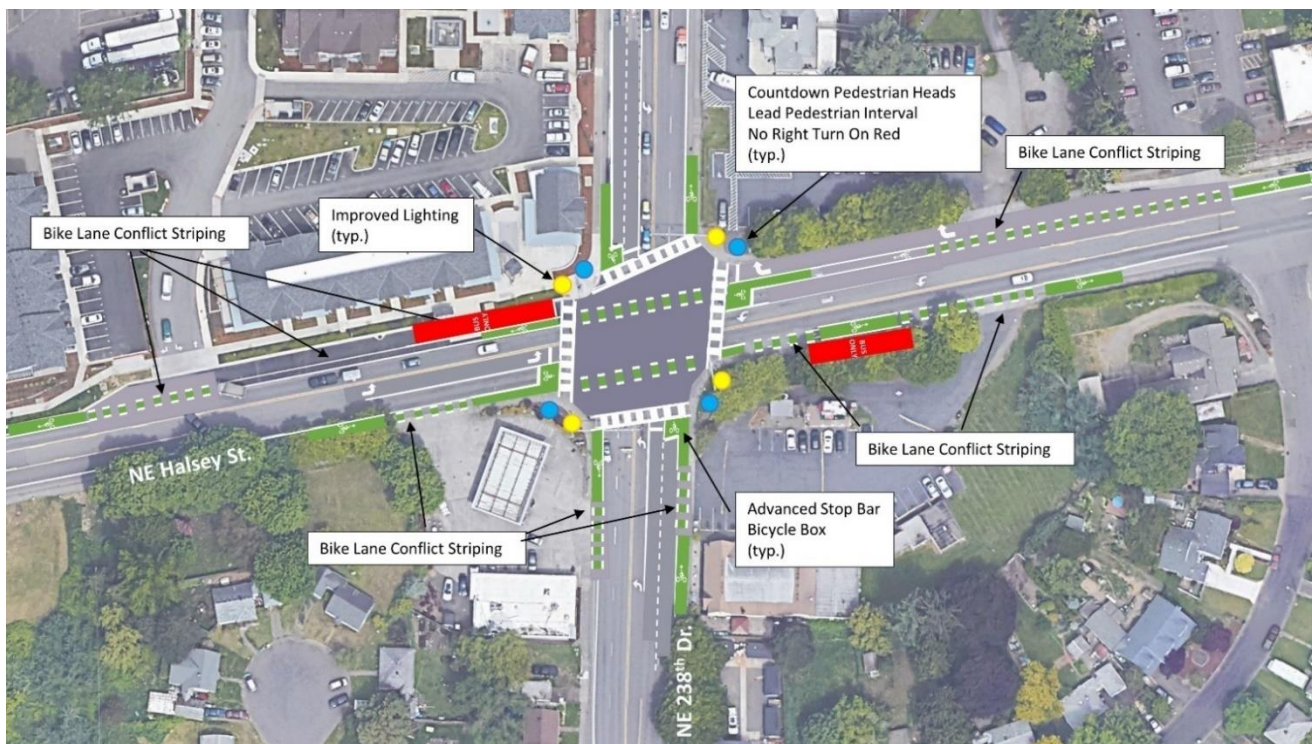
Several enhanced features could be installed at the NE Halsey Street/NE 238th Drive intersection on a permanent or interim basis, which are illustrated in Figure 32. It should be noted that several of the enhanced features shown in Figure 32 could be installed independently of or in coordination with the streetscape and cross-section alternatives described above.



The enhanced features include:

- Improved lighting at all intersection corners.
- Countdown pedestrian heads, lead pedestrian interval, no right turn on red on all intersection legs and approaches.
- High visibility crosswalks on all legs. The presented crosswalks use perpendicular bar or ladder style markings, but they can be replaced with longitudinal bar or continental style markings.
- Advanced stop bars within all approaching lanes.
- Green bike boxes and high visibility green bike lanes on all intersection approaches. Notably, this concept shows high visibility bike lane in the southbound direction on the south leg, however, the bike lane ends shortly after the intersection.
- Green bike lane conflict striping at driveways, bus pullouts, beginning of the right-turn lanes, and through the intersection.
- Red bus stop pavement markings at the two bus stops. Even though these bus stops are equipped with pullouts, having additional paint would help right-turning vehicles to avoid pulling into the bus stop and would discourage them from parking within that area.

Figure 32: Enhanced Features – NE Halsey Street/NE 238th Drive



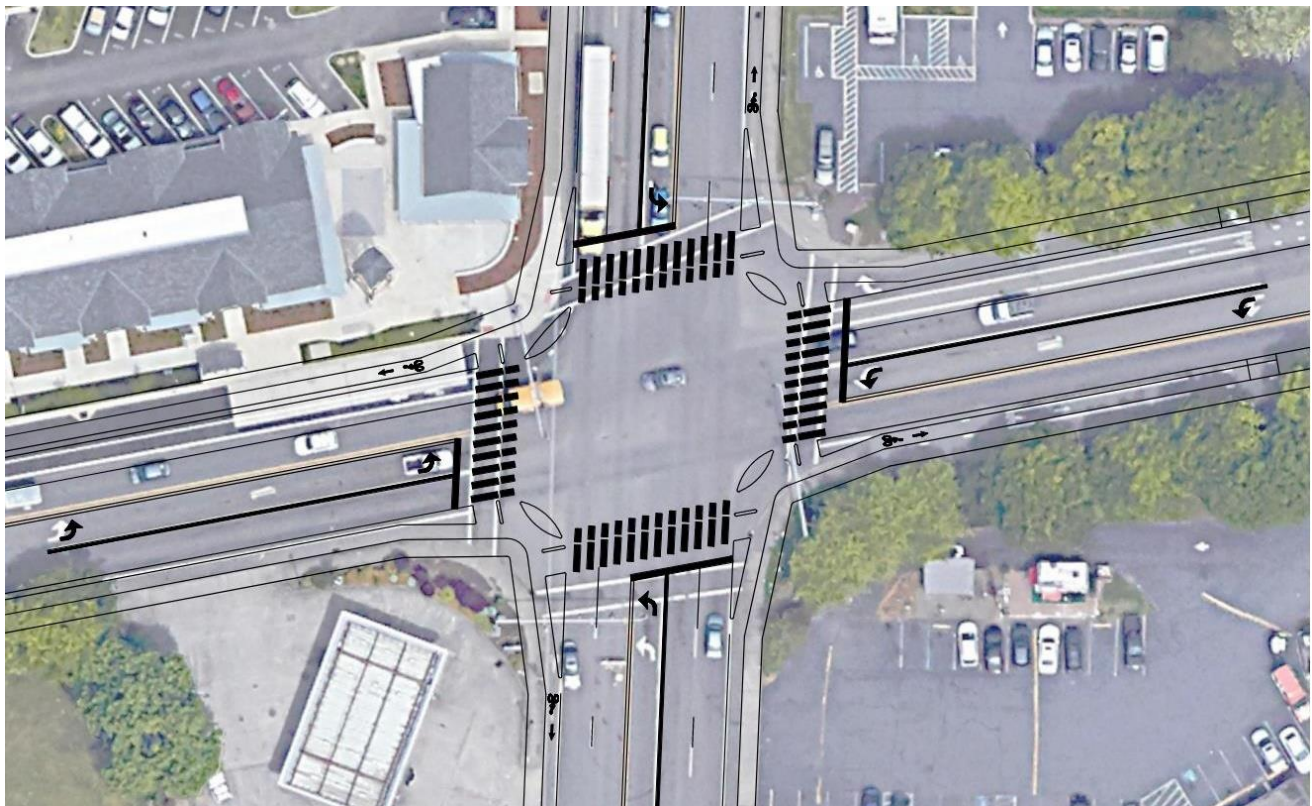
Protected Intersection

Protected intersection treatments could be installed at the NE Halsey Street/NE 238th Drive intersection with or without reconfiguration of NE Halsey Street. Key considerations in developing protected intersection treatments at this location include:

- **Corner islands** should be provided on each corner to separate bikes from motor vehicles, prevent motor vehicles from encroaching on bikeways, and create a protected queueing area for people waiting to cross the street. The corner radii should be small enough to reduce motor vehicle turning speeds but reflect the needs of large trucks.
- **Pedestrian Islands** should be provided, if feasible, to reduce crossing distances and improve the visibility of people waiting to cross. The islands should be wide enough to support a high volume of people walking and biking. The islands may be limited at this location given the lack of on-street parking/loading areas and the presence of bus pull-outs.
- **Bikeway setback** should be sufficient to provide motor vehicles with space to wait and yield to people crossing the street and decrease the angle at which they cross the bikeway. It should also be sufficient to provide people with more time to notice and react to turning vehicles.
- **High-visibility** signs and pavement markings should be provided at each approach as appropriate given the design and include (at a minimum) bike and pedestrian crosswalk striping.

Figure 33 illustrates a design concept for the NE Halsey Street/NE 238th Drive intersection with protected intersection treatments.

Figure 33: Protected Intersection – NE Halsey Street/NE 238th Drive



NE Halsey Street/SW 257th Drive

The NE Halsey Street/SW 257th Drive intersection is located at the east end of the corridor. In the north-south direction, this intersection serves volumes traveling between the City of Gresham and Interstate 84 (I-84). In the east-west direction, this intersection serves traffic traveling along NE Halsey Street between the City of Troutdale and the rest of the corridor.

Existing Conditions

The NE Halsey Street/SW 257th Drive intersection has four legs with separate left-turn lanes on each approach and a separate right-turn lane on the eastbound and westbound approaches. There is a bus stop at the northwest corner of the intersection. The intersection is signalized with protected left-turn and permissive right-turn phasing on each approach. The signal is fully actuated, which means it can be activated by motor vehicles by in-ground detection and by pedestrians by pushbuttons. Figure 34 illustrates the NE Halsey Street/NE 238th intersection.

Recent traffic studies show that the intersection currently meets Multnomah County performance standards; however, several crashes were reported at the intersection over the last five years - none of the crashes involved people walking or biking.

Figure 34: Existing Conditions – NE Halsey Street/NE 238th Drive



Alternatives

The alternatives developed for the NE Halsey Street/SW 257th Drive intersection are intended to improve crossing conditions for people walking, biking, and accessing transit, as well as improve traffic operations and safety for all travel modes. The alternatives include the addition of enhanced features and reconfiguration of the intersection as a protected intersection. Notably, the north leg of the intersection is located on a bridge over railroad track which might prevent construction of certain improvements in its vicinity.

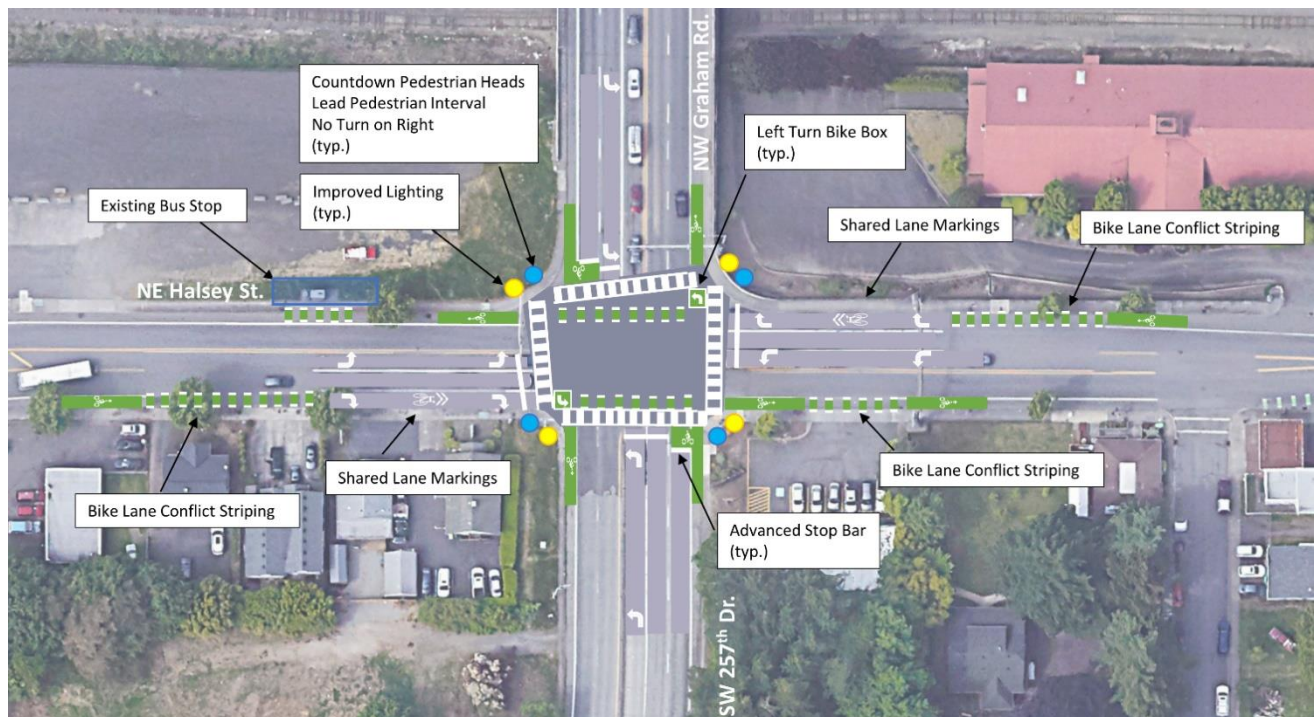
Enhanced Features

Several enhanced features could be installed at the NE Halsey Street/SW 257th Drive intersection on a permanent or interim basis, which are illustrated in Figure 35. It should be noted that several of the enhanced features shown in Figure 35 could be installed independently of or in coordination with the streetscape and cross-section alternatives described above.

The proposed improvements include:

- Improved lighting at all intersection corners.
- Countdown pedestrian heads, lead pedestrian interval, no right turn on red on all intersection legs and approaches.
- High visibility crosswalks on all legs. The presented crosswalks use perpendicular bar or ladder style markings, but they can be replaced with longitudinal bar or continental style markings.
- Advanced stop bars within all approaching lanes.
- Green bike boxes and high visibility green bike lanes on north and south intersection legs.
- Combined bike lane/right turn lane on the eastbound and westbound approaches.
- Additional two-stage left-turn bike boxes in the northeast and southwest intersection corners.
- Green bike lane conflict striping at driveways, beginning of right-turn lanes, and through the intersection.

Figure 35: Enhanced Features – NE Halsey Street/SW 257th Drive



Protected Intersection

Protected intersection treatments could be installed at the NE Halsey Street/SW 257th Drive intersection with or without reconfiguration of NE Halsey Street. Key considerations in developing protected intersection treatments at this location include:

- **Corner islands** should be provided on each corner to separate bikes from motor vehicles, prevent motor vehicles from encroaching on bikeways, and create a protected queueing area for people waiting to cross the street. The corner radii should be small enough to reduce motor vehicle turning speeds but reflect the needs of large trucks.
- **Pedestrian Islands** should be provided, if feasible, to reduce crossing distances and improve the visibility of people waiting to cross. The islands should be wide enough to support a high volume of people walking and biking. The islands may be limited at this location given the lack of on-street parking; however, the City of Troutdale has expressed interest in providing on-street parking on the west leg given the available right-of-way and demand from adjacent land uses.
- **Bikeway setback** should be sufficient to provide motor vehicles with space to wait and yield to people crossing the street and decrease the angle at which they cross the bikeway. It should also be sufficient to provide people with more time to notice and react to turning vehicles.
- **High-visibility** signs and pavement markings should be provided at each approach as appropriate given the design and include (at a minimum) bike and pedestrian crosswalk striping.

Figure 36 illustrates a design concept for the NE Halsey Street/SW 257th Drive intersection with protected intersection treatments.

Figure 36: Protected Intersection – NE Halsey Street/SW 257th Drive



PEDESTRIAN CROSSING ALTERNATIVES

NE Halsey Street currently has numerous enhanced pedestrian crossings at major intersections and midblock locations within the study corridor; however, there are several long stretches between intersections with no designated pedestrian crossings. These are an inconvenience for residents and other pedestrians who go out of their way to use the designated crossings, and a potential safety hazard when they choose to cross the street between designated crossings.

The 2017 Main Streets on Halsey Plan (2017 Plan) identified seven locations to add enhanced pedestrian crossings. Since then, five of those have been built, and two more were built in Wood Village in locations not identified in the 2017 Plan. The following identifies several enhanced pedestrian crossing treatments and crossing locations that could be considered along the corridor.

Crossing Treatments

The typical components of an enhanced pedestrian crossing increase safety for users by visually highlighting them and providing a refuge at the midpoint. These components also visually narrow the roadway, which tends to lower traffic speeds, resulting in further safety for all road users. Figure 37 shows a typical enhanced pedestrian crossing along NE Halsey Street that features the following components:

- Continental style crosswalk markings
- Advanced stop bars with “Stop Here for Pedestrians” signage
- Crosswalk signage
- Pedestrian refuge islands
- Rectangular Rapid Flashing Beacons (RRFBs) with audible pushbuttons

Figure 37: Typical Enhanced Pedestrian Crossing



Crossing Locations

Potential crossing location include the remaining two crossings from the 2017 Plan, plus three more (two along the Edgefield frontage and one west of NE 223rd Avenue), for a total of 11 enhanced pedestrian crossings within the study corridor (see Maps 1, 2, 3, and 4).

Enhanced pedestrian crossings, from west to east:

- East side of NE 205th Avenue intersection (built)
- East side of NE 213th Avenue intersection (built)
- Between NE Village Street NE 223rd Avenue, at Stomping Grounds Coffee (proposed)
- Approximately 550' west of NE 223rd Avenue (proposed by 2017 Plan)
- Between NE 227th Avenue and Wood Village Boulevard, at the Ukrainian Bible Church (built)
- Two blocks west of NE 238th Drive, at the Best Western (built)
- Between Birch Avenue and NE 240th Avenue (built)
- Between NE 213th Avenue and NE 213th Avenue, at Wood Village City Hall and City Park (built)
- At Edgefield's furthest west driveway (proposed)
- At the transit stop on Edgefield's frontage (proposed)
- West side of SW Edgefield Meadows Avenue intersection (built – no refuge island)
- East side of SW Halsey Loop intersection (proposed by the 2017 plan)

APPENDICES

The appendices listed below include full-size versions of the graphics included in this memorandum and the evaluation matrix:

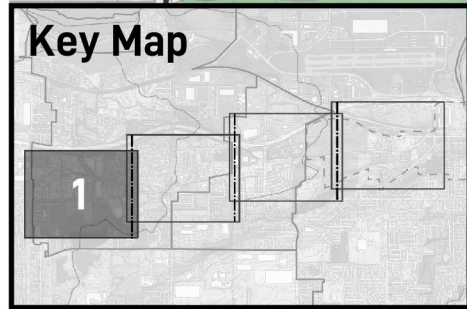
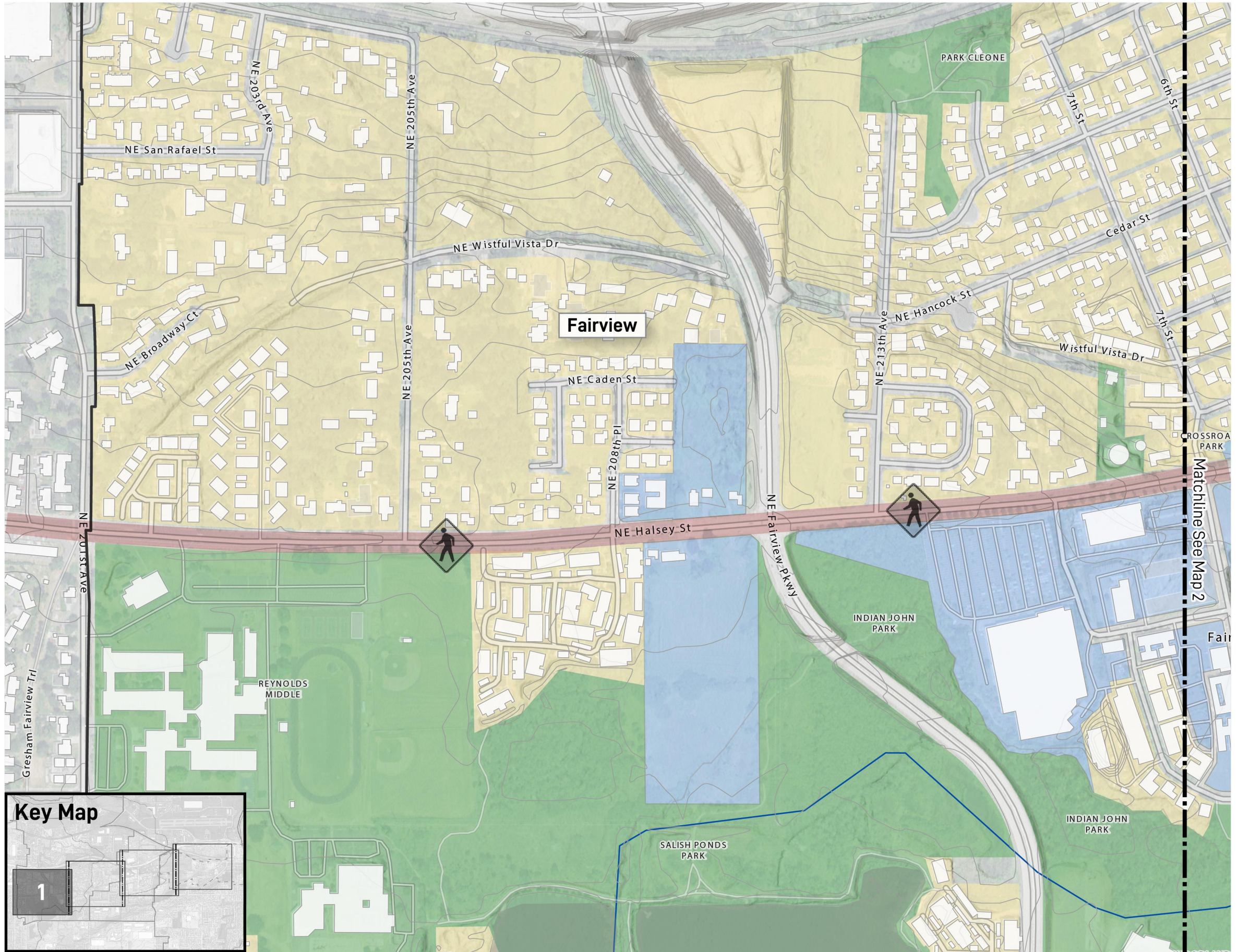
- **Appendix A:** Context Zone Maps, also showing intersections to be re-designed, and pedestrian crossing locations
- **Appendix B:** Evaluation Matrix
- **Appendix C:** Roadway Cross-Section Alternatives, and tables of potential cross-section widths
- **Appendix D:** Intersection Alternatives









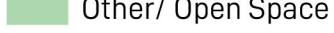


Appendix A: Context Zone Maps

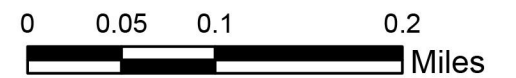


CONTEXT ZONE MAP 1

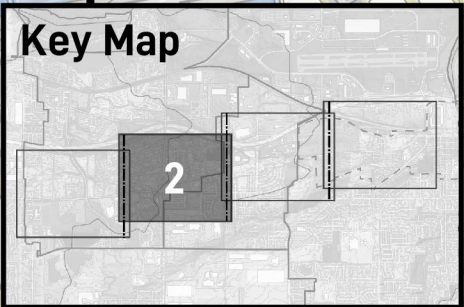
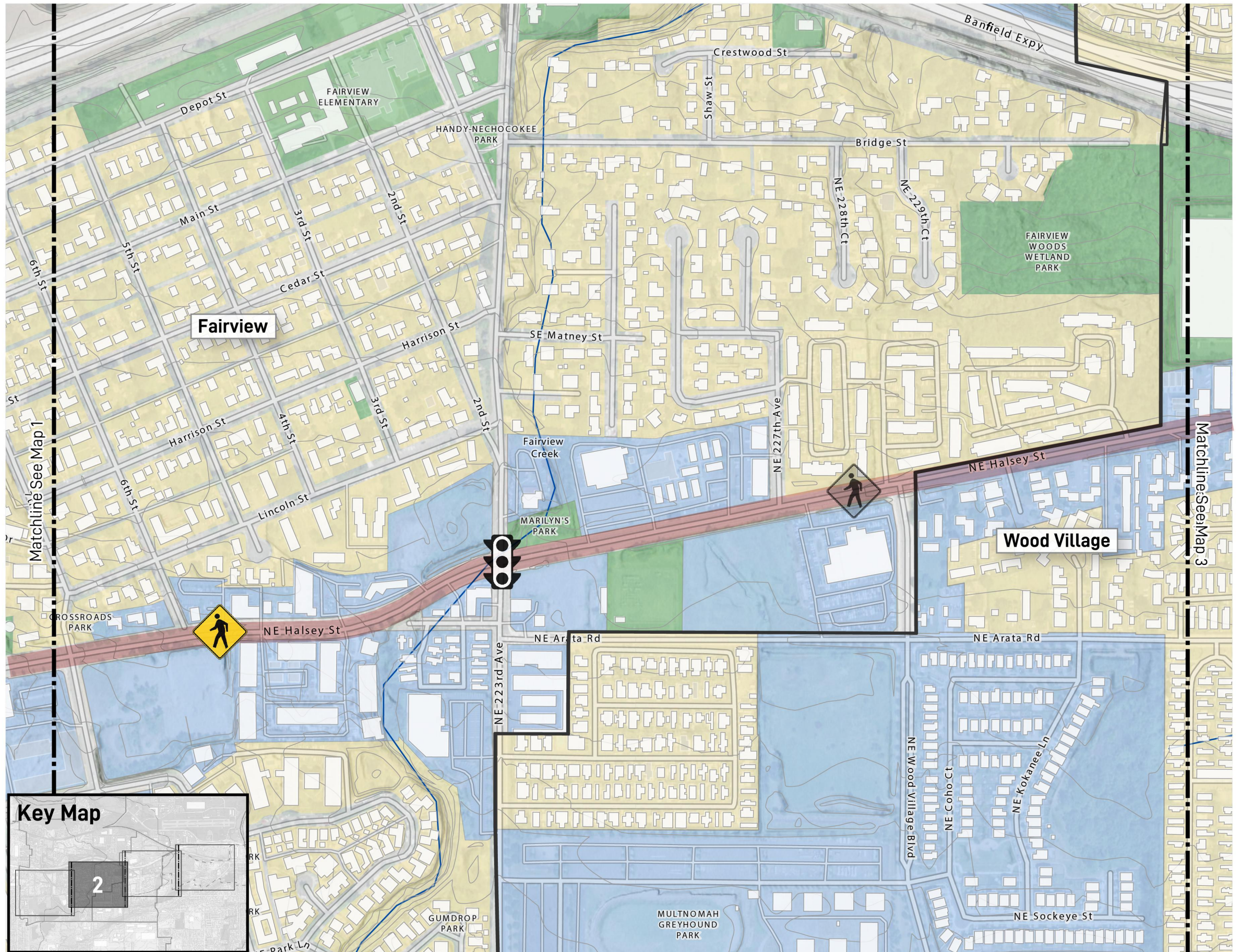


Legend












-  City Limits
-  Residential Context Zone
-  Existing Enhanced Pedestrian Crossing
-  Building Footprints
-  Commercial Context Zone
-  Contours (five ft.)
-  Other/ Open Space
-  Streams
-  Street Improvements



CONTEXT ZONE MAP 2

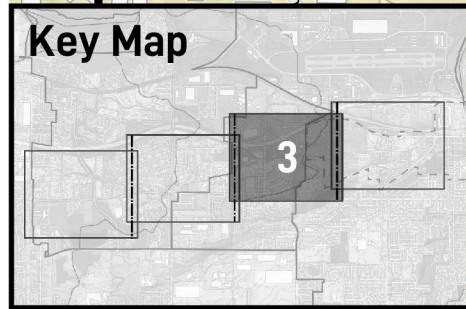
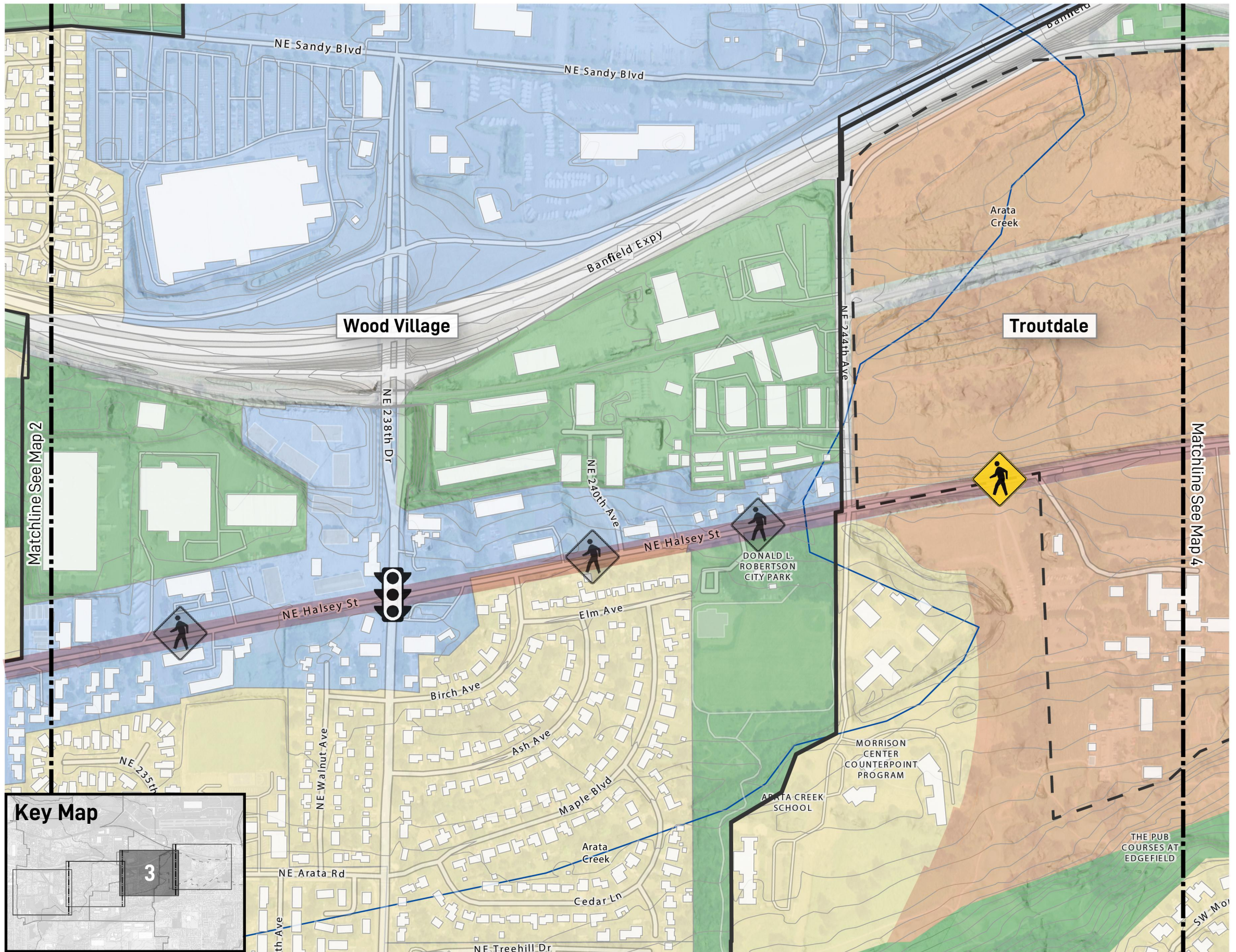


Legend

-  City Limits
-  Residential Context Zone
-  Commercial Context Zone
-  Other/ Open Space
-  Street Improvements
-  Building Footprints
-  Commercial Context Zone
-  Street Improvements
-  Existing Enhanced Pedestrian Crossing
-  Proposed Enhanced Pedestrian Crossing
-  Proposed Intersection Improvements

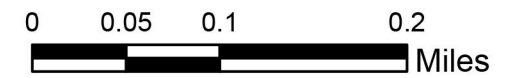


CONTEXT ZONE MAP 3

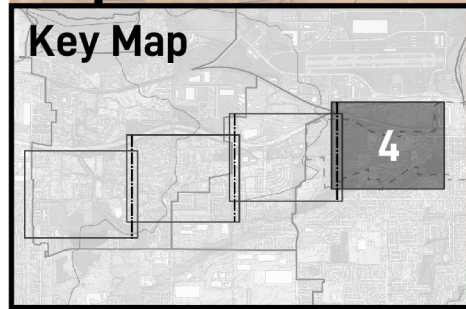
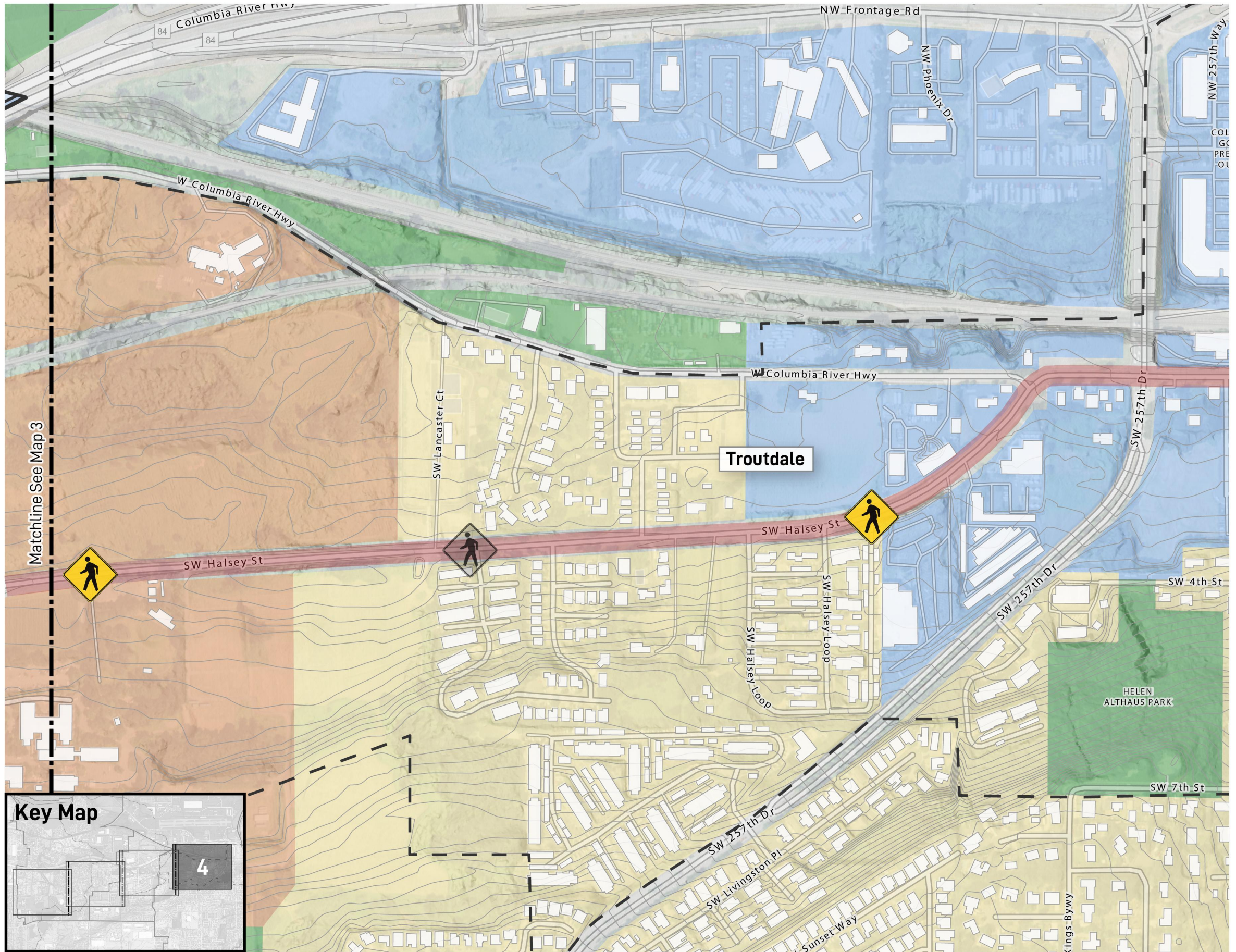


Legend

- | | | | |
|---------------------|--------------------------|---------------------------------------|---------------------------------------|
| City Limits | Residential Context Zone | Edgefield Context Zone | Proposed Enhanced Pedestrian Crossing |
| Building Footprints | Commercial Context Zone | Troutdale Town Center | Proposed Intersection Improvements |
| Contours (five ft.) | Other/ Open Space | Existing Enhanced Pedestrian Crossing | |
| Streams | Street Improvements | | |

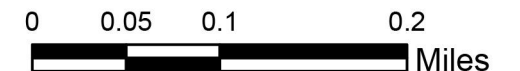


CONTEXT ZONE MAP 4



Legend

- | | | | |
|---------------------|--------------------------|---------------------------------------|---------------------------------------|
| City Limits | Residential Context Zone | Edgefield Context Zone | Proposed Enhanced Pedestrian Crossing |
| Building Footprints | Commercial Context Zone | Troutdale Town Center | Proposed Intersection Improvements |
| Contours (five ft.) | Other/ Open Space | Existing Enhanced Pedestrian Crossing | |
| Streams | Street Improvements | | |



Appendix B: Evaluation Matrix



EVALUATION MATRIX

Figure 1: Evaluation Matrix Legend

1	2	3	4	5
Design concept has little or no benefit in achieving the project objective.	Design concept has poor benefit in achieving the project objective.	Design concept has some benefit in achieving the project objective.	Design concept has good benefit in achieving the project objective.	Design concept has significant benefit in achieving the project objective.

Table 1: Residential Context Cross-Sections Evaluation

Project Objective	Evaluation Criteria	Separated Bike Lanes	Sidewalk-Level Bike Lanes	Sidewalk-Adjacent Bike Lanes
1. Create a cohesive Halsey streetscape and pedestrian environment that supports existing small businesses, attracts new businesses, and creates new jobs	1.1 Promotes economic development by supporting access to local businesses and business districts for all travel modes.			
2. Design Halsey Street to unite the three cities while also allowing each city to be distinguished in the ways they build community and drive economic development	2.1 Minimizes impacts to adjacent properties			
	2.2 Can be implemented on an incremental basis through development			
	2.3 Construction and long-term maintenance costs are equal to existing costs			
3. Make Halsey Street safer, more accessible, and more visually attractive	3.1 Creates safe and convenient access for people with disabilities			
	3.2 Improves street appearance through added landscaping and street trees			
	3.3 Creates space for adding street furnishing			
4. Make public transit, walking, and biking in the Halsey Street corridor more appealing and safer	4.1 Improves safety for people walking, biking and taking transit			
	4.2 Increases number and frequency of protected crossings of Halsey Street			

	4.3 Improves access to adjacent land uses and public transit facilities and services			
5. Improve the environment by reducing pollution, planting street trees, and using cost-efficient, sustainable landscaping treatments	5.1 Incorporates sustainable design strategies			
	5.2 Creates space for incorporating stormwater facilities			
	5.3 Reduces impervious surfaces			
	5.4 Increases tree canopy coverage in the corridor			
6. Enhance bikeability and walkability by slowing vehicular traffic, improving intersections, and discouraging through-traffic by trucks	6.1 Slows vehicular traffic			
	6.2 Discourages through truck traffic			
	6.3 Maintains access to local businesses for delivery trucks			
	6.4 Provides low-street pedestrian and bicycle facilities			
7. Engage with local business owners and the public to broaden commitment and ongoing involvement in the corridor	7.1 Supported by local property owners, business owners and operators, and the public.			
	7.2 Consistent with previous planning efforts			
TOTAL				

Table 2: Commercial Context Cross-Sections Evaluation

Project Objective	Evaluation Criteria	Separated Bike Lanes	Sidewalk-Level Bike Lanes	Sidewalk-Adjacent Bike Lanes
1. Create a cohesive Halsey streetscape and pedestrian environment that supports existing small businesses, attracts new businesses, and creates new jobs	1.1 Promotes economic development by supporting access to local businesses and business districts for all travel modes.			
2. Design Halsey Street to unite the three cities while also allowing each city to be distinguished in the ways they build community and drive economic development	2.1 Minimizes impacts to adjacent properties			
	2.2 Can be implemented on an incremental basis through development			
	2.3 Construction and long-term maintenance costs are equal to existing costs			
3. Make Halsey Street safer, more accessible, and more visually attractive	3.1 Creates safe and convenient access for people with disabilities			
	3.2 Improves street appearance through added landscaping and street trees			
	3.3 Creates space for adding street furnishing			
4. Make public transit, walking, and biking in the Halsey Street corridor more appealing and safer	4.1 Improves safety for people walking, biking and taking transit			
	4.2 Increases number and frequency of protected crossings of Halsey Street			
	4.3 Improves access to adjacent land uses and public transit facilities and services			
5. Improve the environment by reducing pollution, planting street trees, and using cost-efficient, sustainable landscaping treatments	5.1 Incorporates sustainable design strategies			
	5.2 Creates space for incorporating stormwater facilities			
	5.3 Reduces impervious surfaces			
	5.4 Increases tree canopy coverage in the corridor			
6. Enhance bikeability and walkability by slowing vehicular traffic, improving intersections, and discouraging through-traffic by trucks	6.1 Slows vehicular traffic			
	6.2 Discourages through truck traffic			
	6.3 Maintains access to local businesses for delivery trucks			

	6.4 Provides low-street pedestrian and bicycle facilities			
7. Engage with local business owners and the public to broaden commitment and ongoing involvement in the corridor	7.1 Supported by local property owners, business owners and operators, and the public.			
	7.2 Consistent with previous planning efforts			
TOTAL				

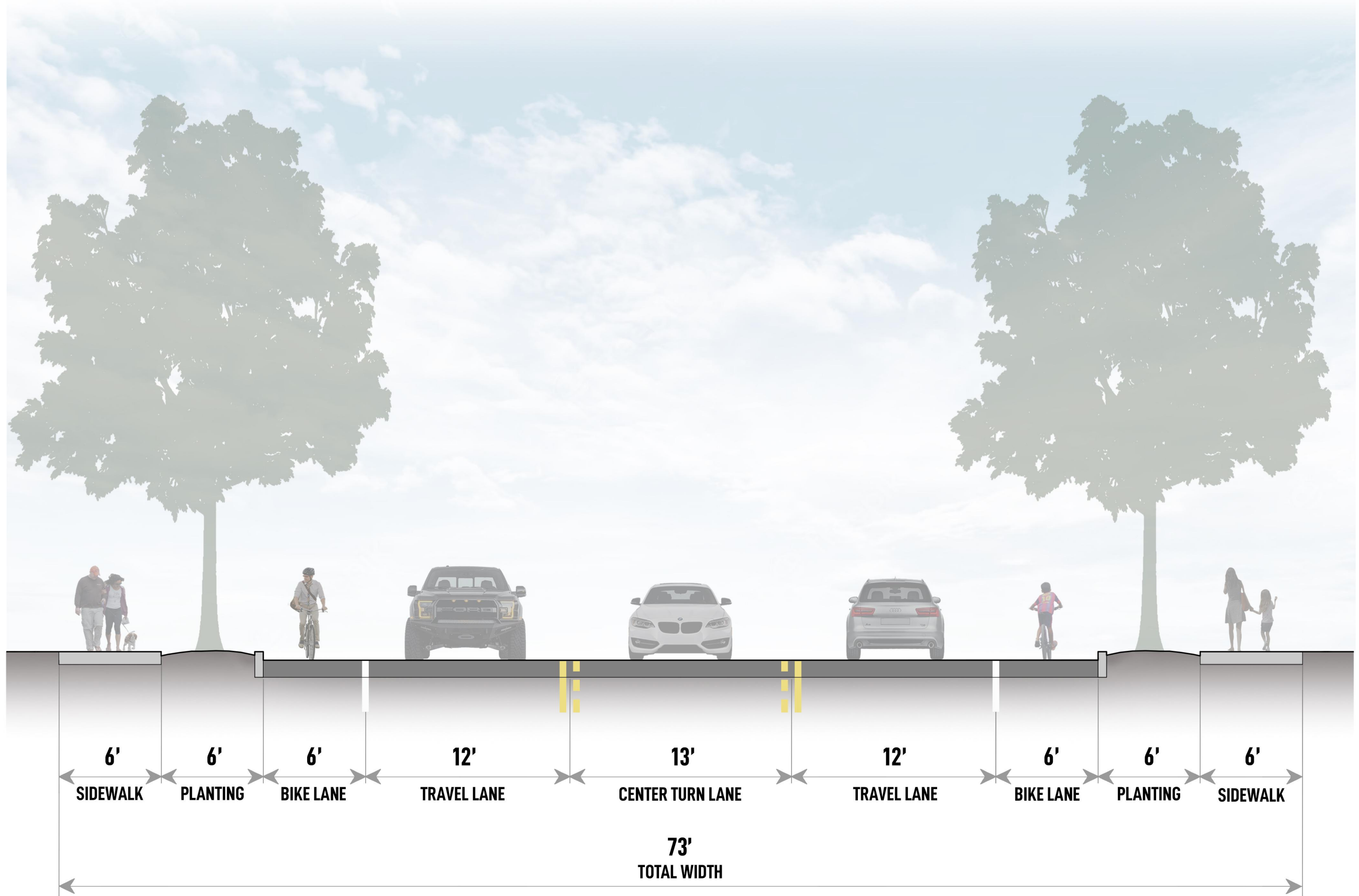
Table 3: Edgefield Context Cross-Sections Evaluation

Project Objective	Evaluation Criteria	Separated Bike Lanes	Sidewalk-Level Bike Lanes	Sidewalk-Adjacent Bike Lanes
1. Create a cohesive Halsey streetscape and pedestrian environment that supports existing small businesses, attracts new businesses, and creates new jobs	1.1 Promotes economic development by supporting access to local businesses and business districts for all travel modes.			
2. Design Halsey Street to unite the three cities while also allowing each city to be distinguished in the ways they build community and drive economic development	2.1 Minimizes impacts to adjacent properties			
	2.2 Can be implemented on an incremental basis through development			
	2.3 Construction and long-term maintenance costs are equal to existing costs			
3. Make Halsey Street safer, more accessible, and more visually attractive	3.1 Creates safe and convenient access for people with disabilities			
	3.2 Improves street appearance through added landscaping and street trees			
	3.3 Creates space for adding street furnishing			
4. Make public transit, walking, and biking in the Halsey Street corridor more appealing and safer	4.1 Improves safety for people walking, biking and taking transit			
	4.2 Increases number and frequency of protected crossings of Halsey Street			
	4.3 Improves access to adjacent land uses and public transit facilities and services			
5. Improve the environment by reducing pollution, planting street trees, and using cost-efficient, sustainable landscaping treatments	5.1 Incorporates sustainable design strategies			
	5.2 Creates space for incorporating stormwater facilities			
	5.3 Reduces impervious surfaces			
	5.4 Increases tree canopy coverage in the corridor			
6. Enhance bikeability and walkability by slowing vehicular traffic, improving intersections, and discouraging through-traffic by trucks	6.1 Slows vehicular traffic			
	6.2 Discourages through truck traffic			
	6.3 Maintains access to local businesses for delivery trucks			

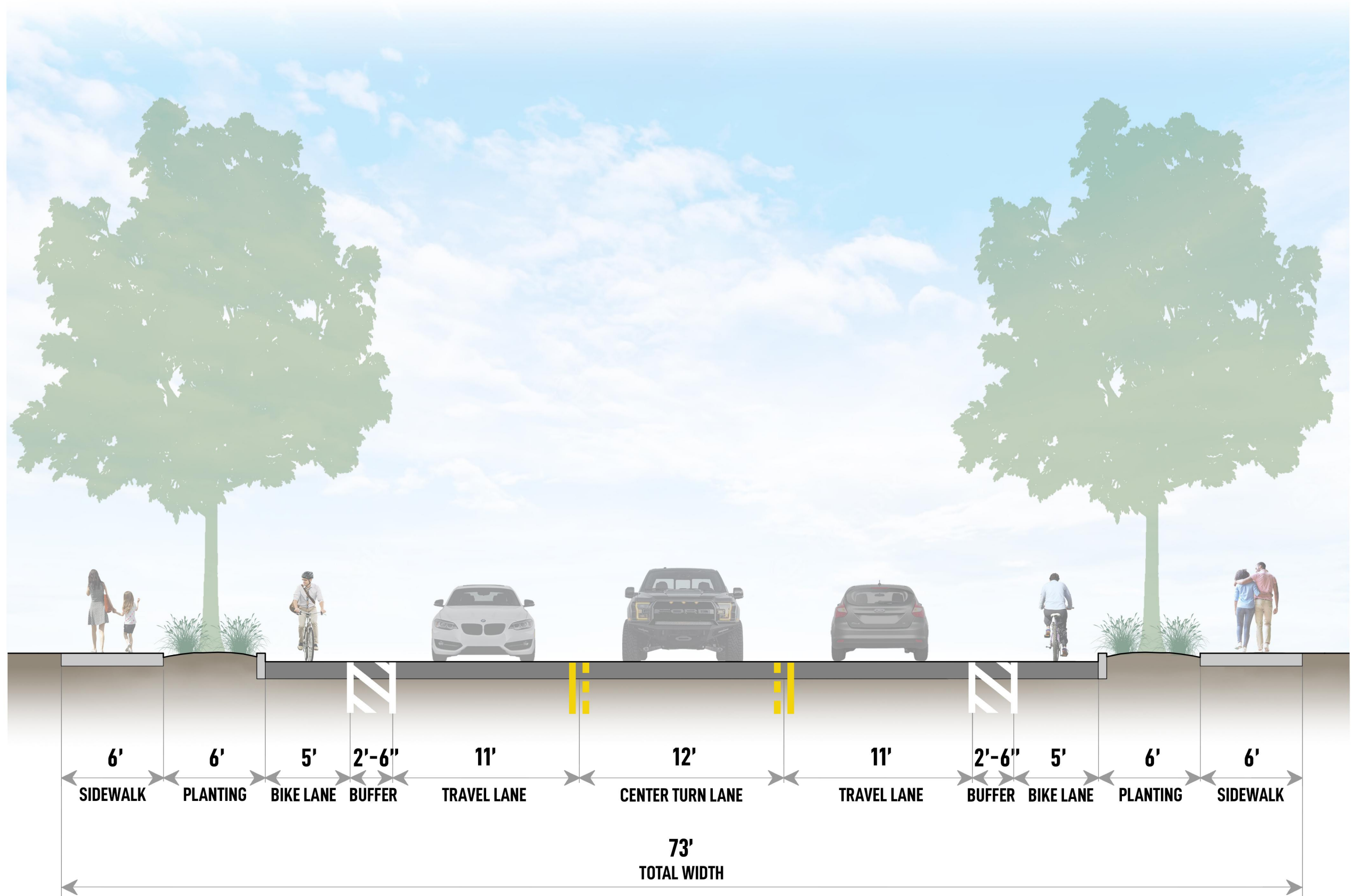
	6.4 Provides low-street pedestrian and bicycle facilities			
7. Engage with local business owners and the public to broaden commitment and ongoing involvement in the corridor	7.1 Supported by local property owners, business owners and operators, and the public.			
	7.2 Consistent with previous planning efforts			
TOTAL				

Appendix C: Roadway Cross-Section Alternatives

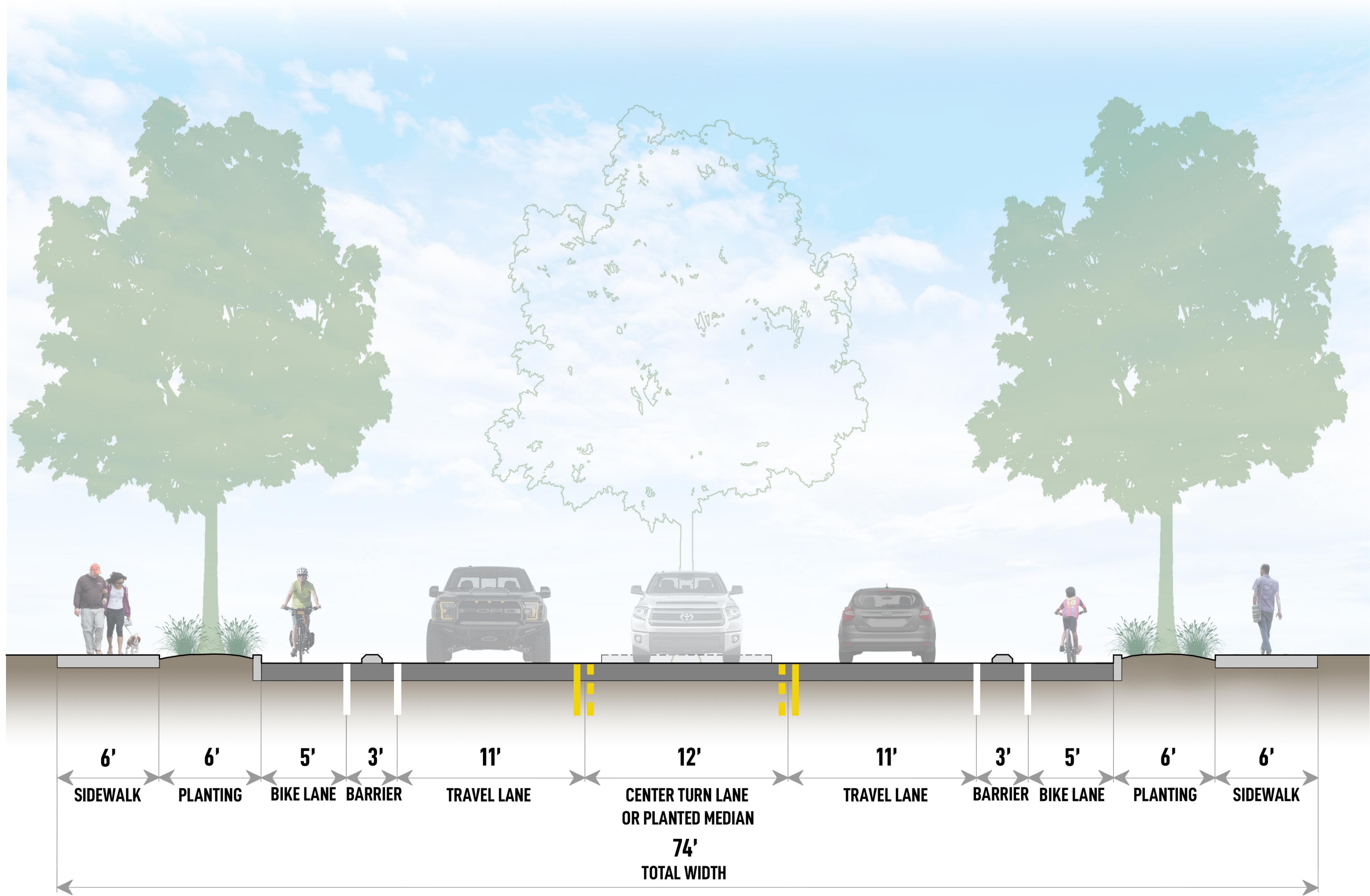




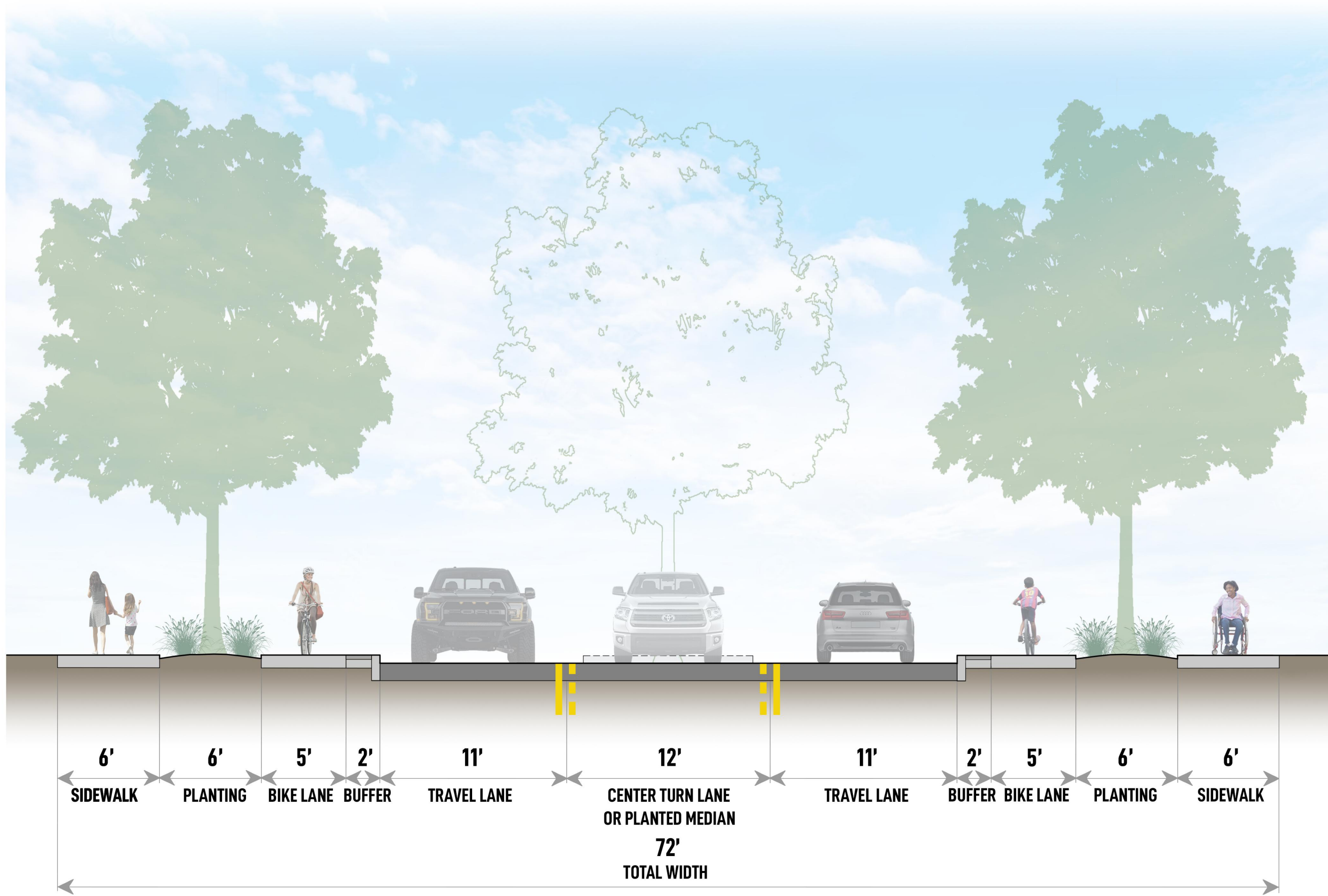
RESIDENTIAL - EXISTING SECTION



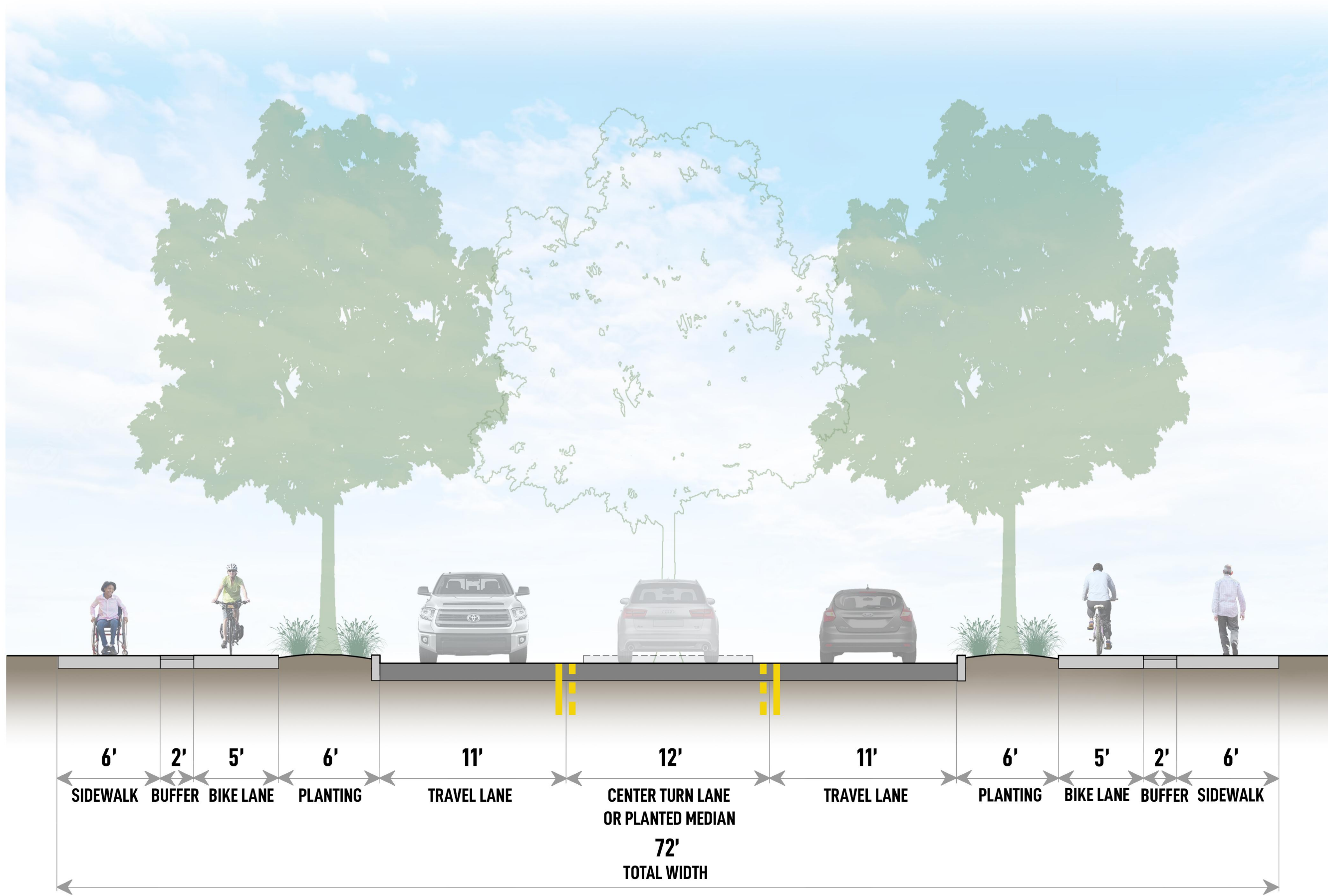
RESIDENTIAL - NEAR TERM SOLUTION



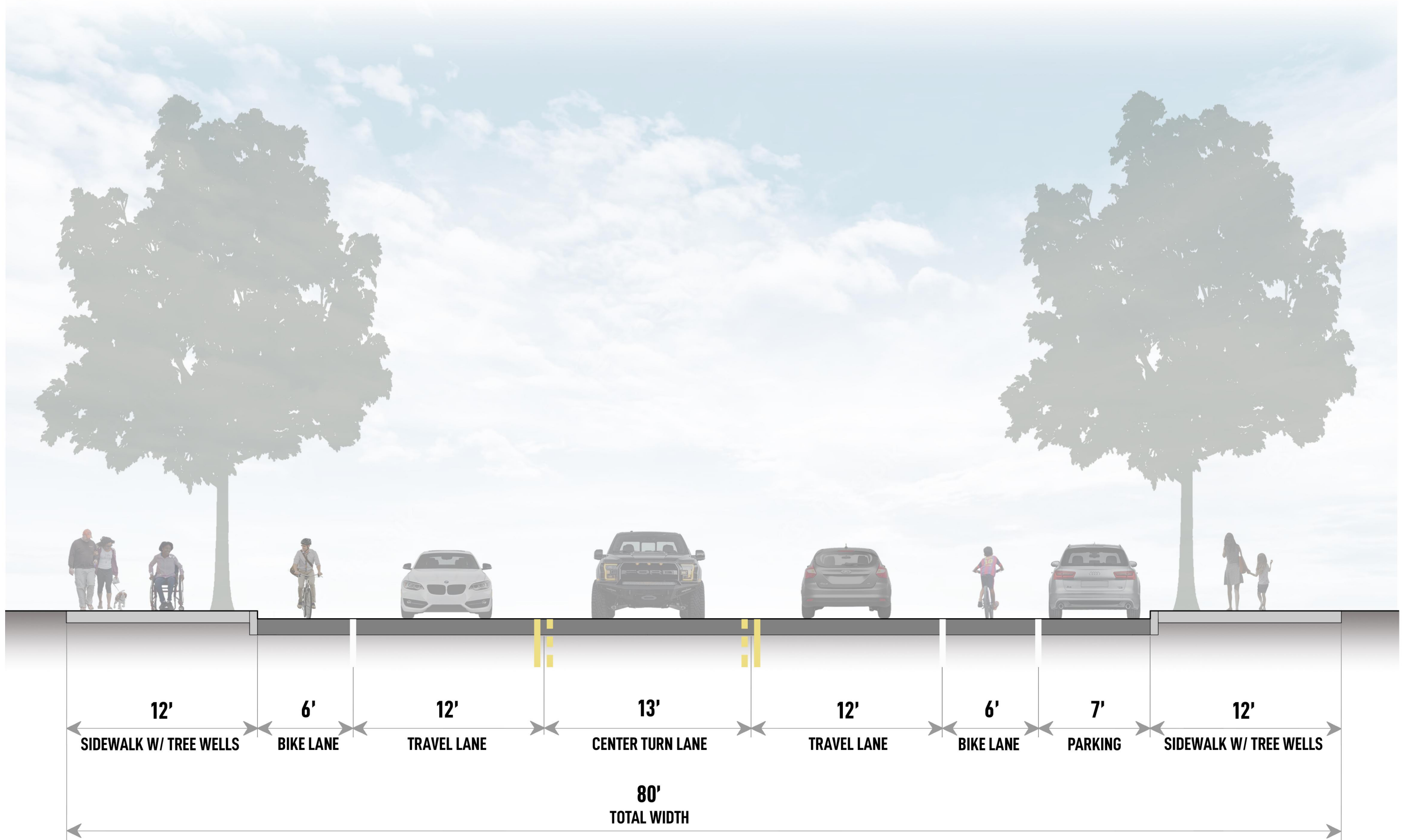
RESIDENTIAL - SEPARATED BIKE LANES



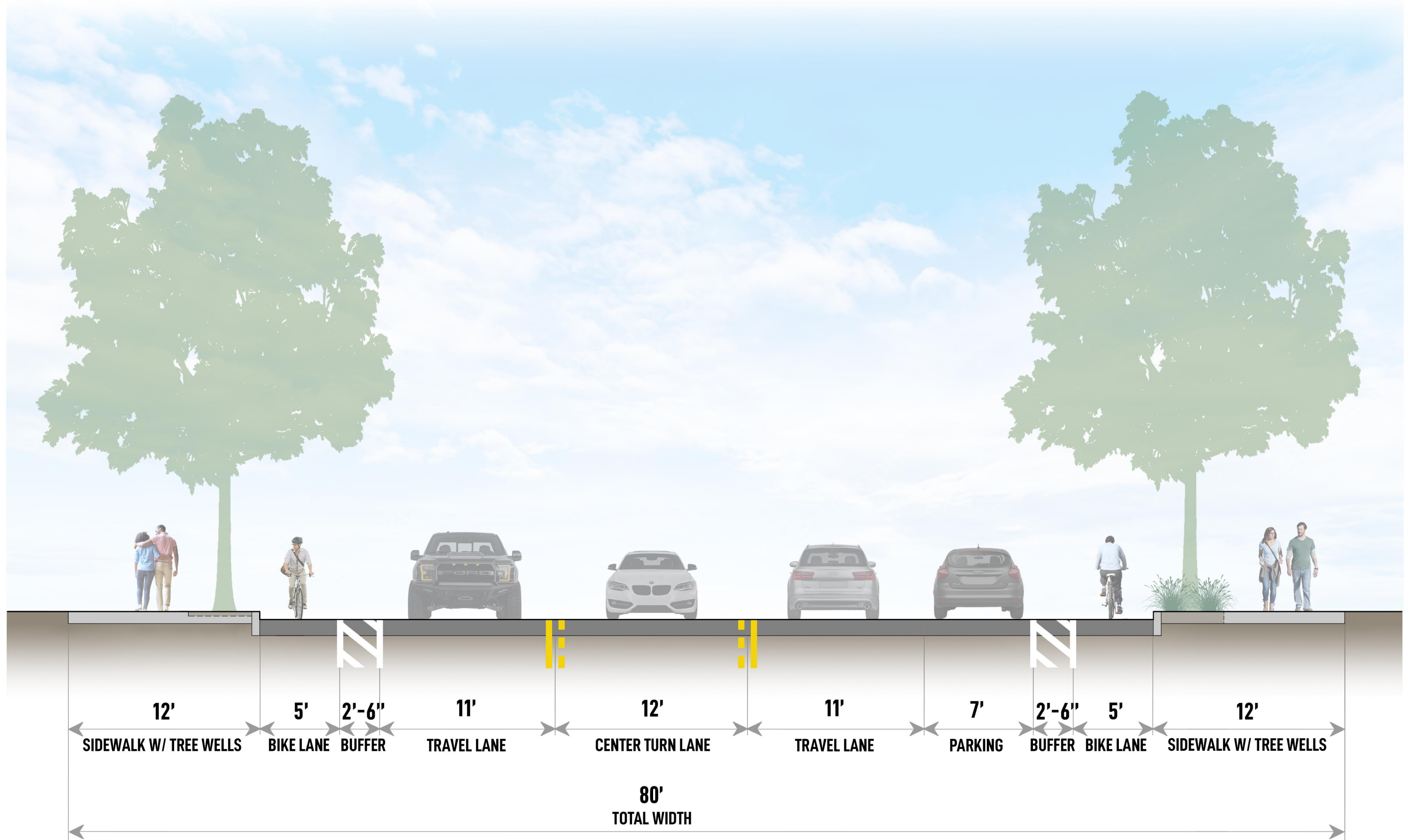
RESIDENTIAL - SIDEWALK LEVEL BIKE LANES



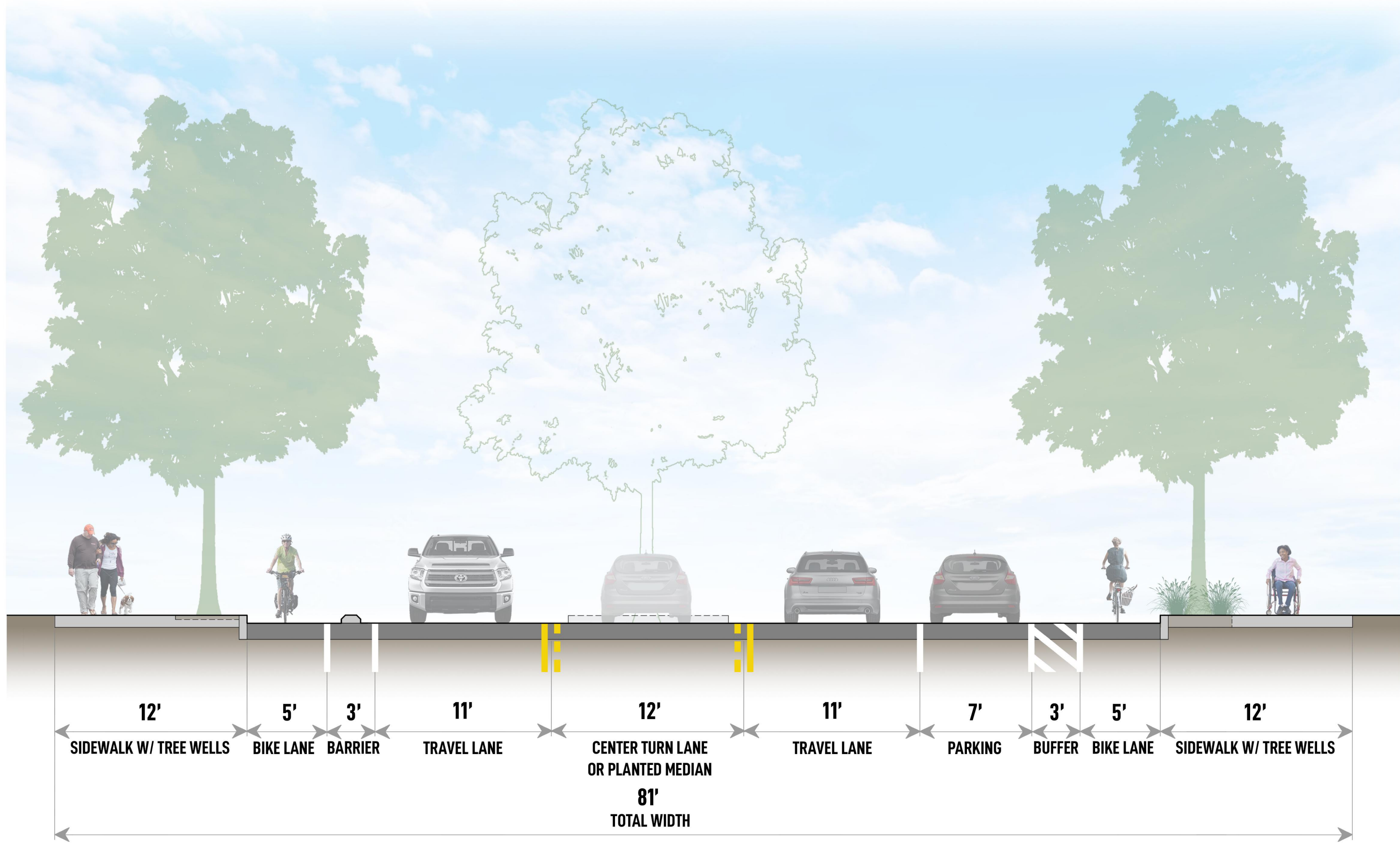
RESIDENTIAL - SIDEWALK ADJACENT BIKE LANES



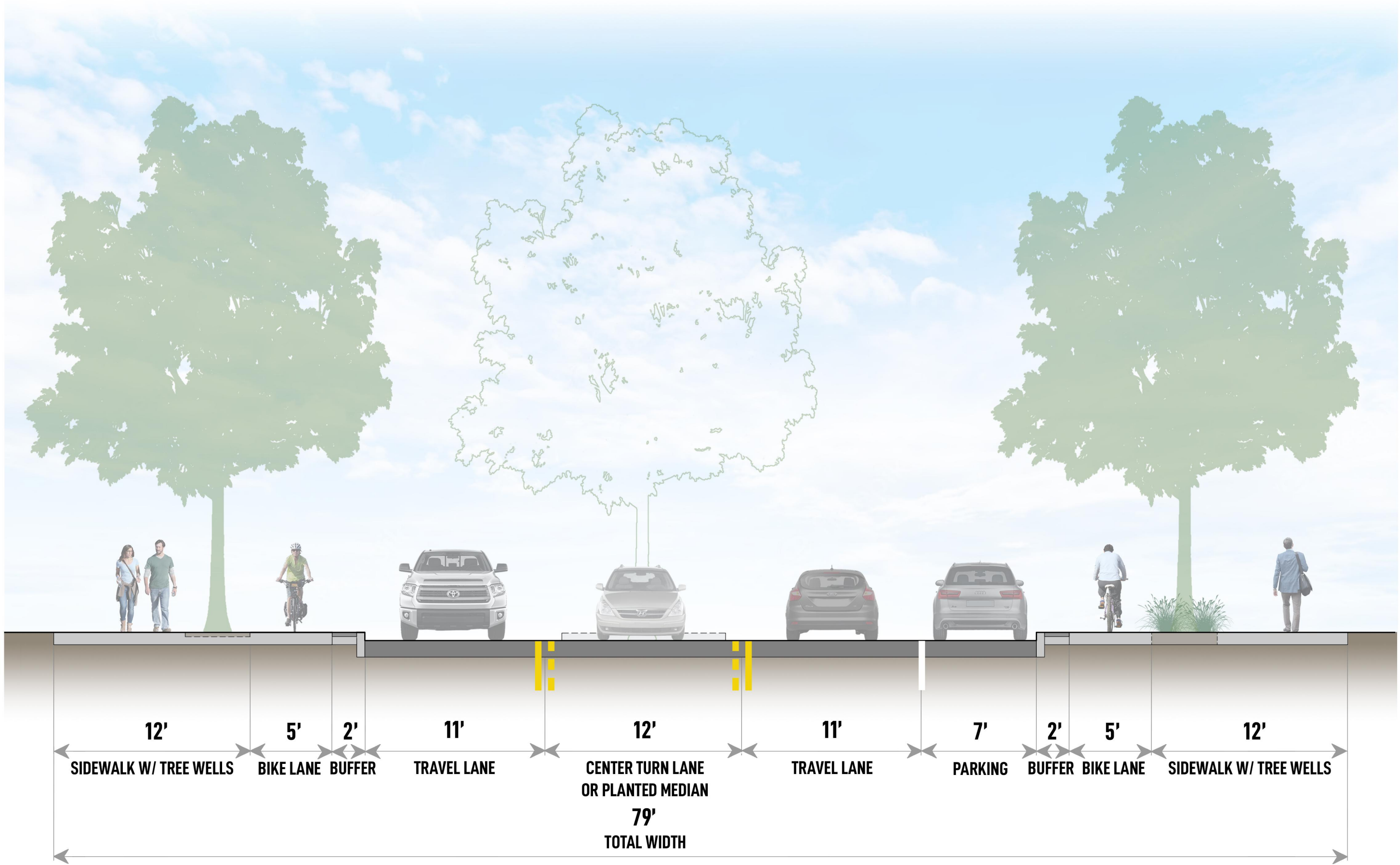
COMMERCIAL - EXISTING SECTION



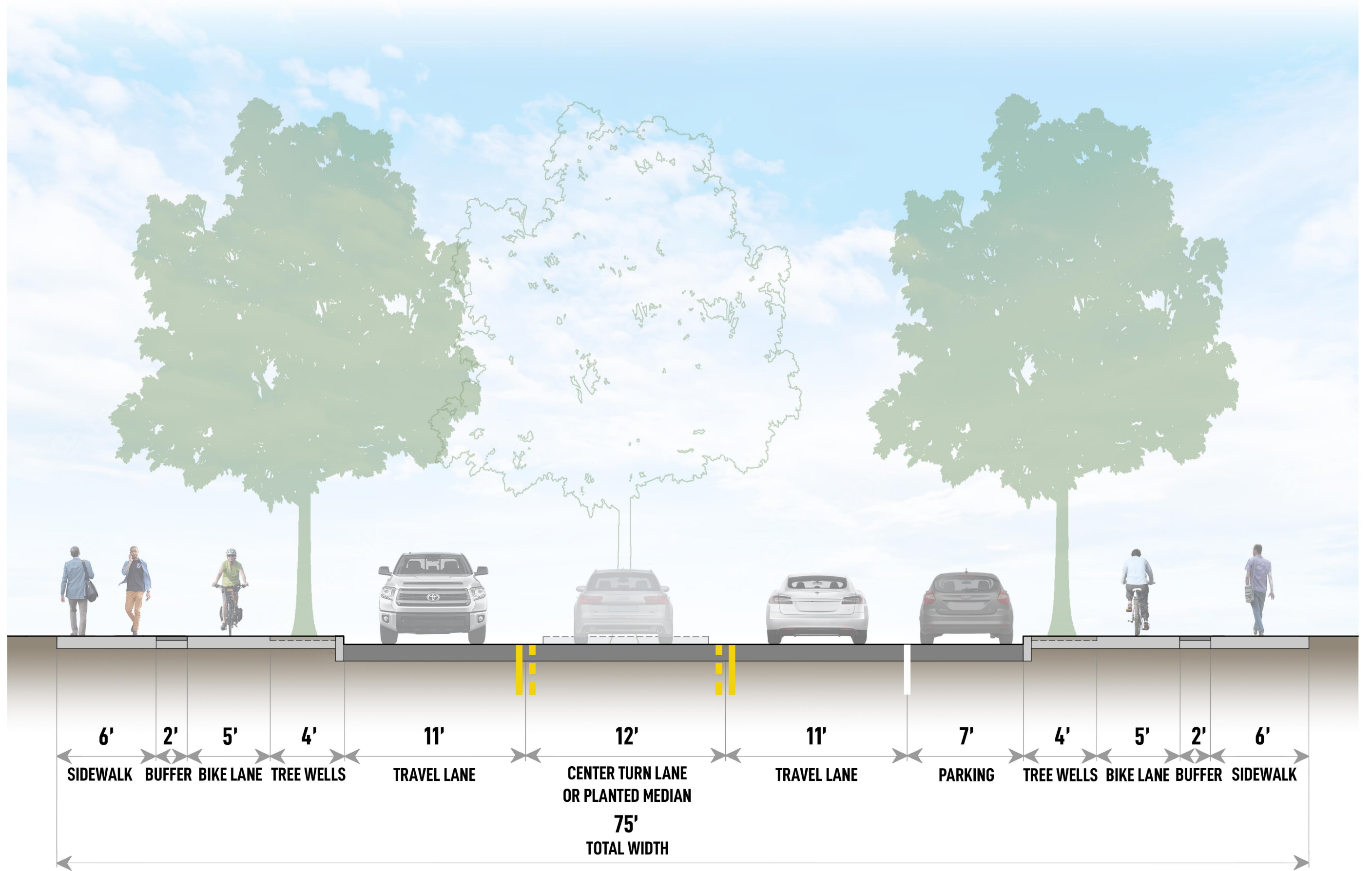
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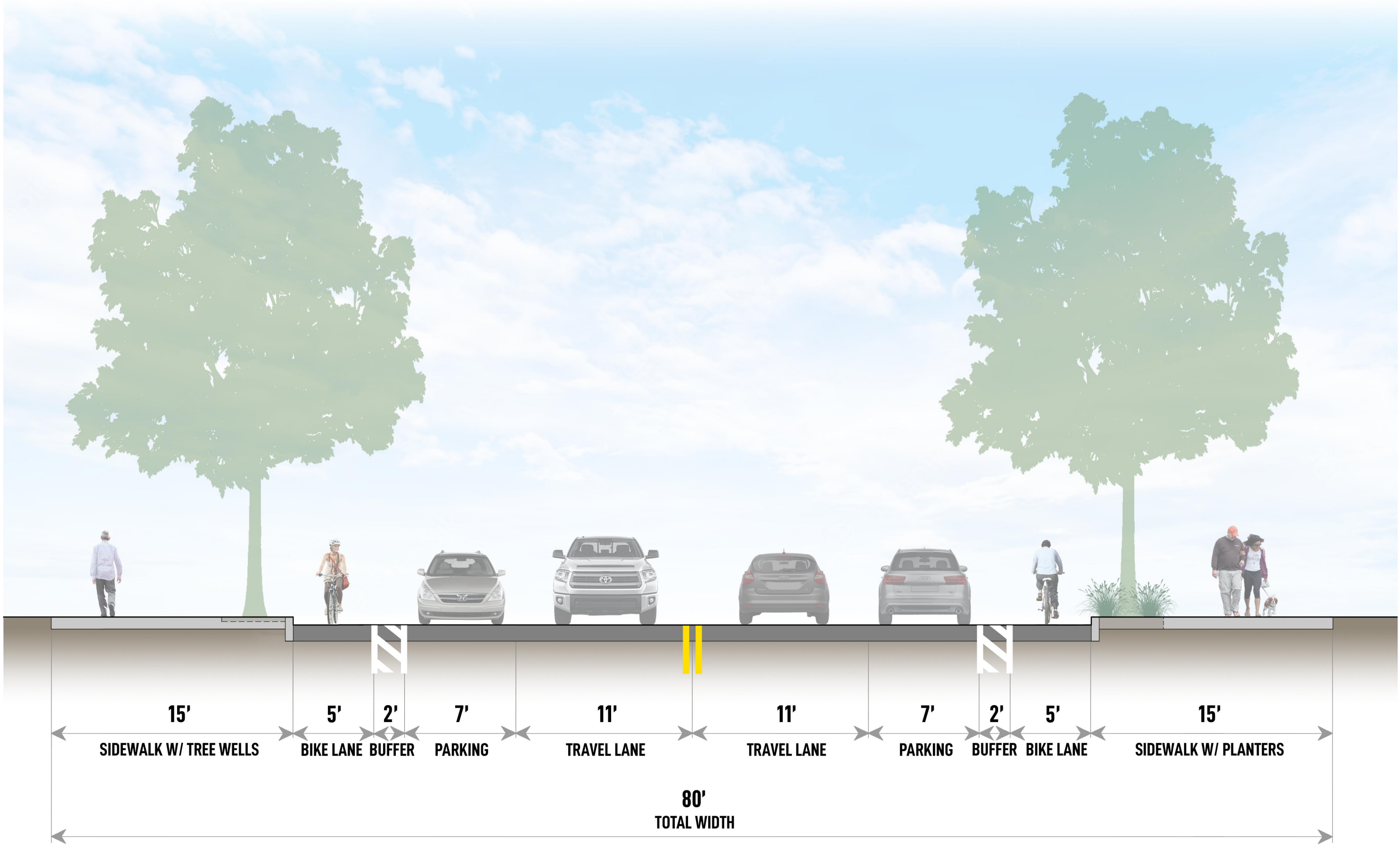
COMMERCIAL - SEPARATED BIKE LANES



COMMERCIAL - SIDEWALK LEVEL BIKE LANES

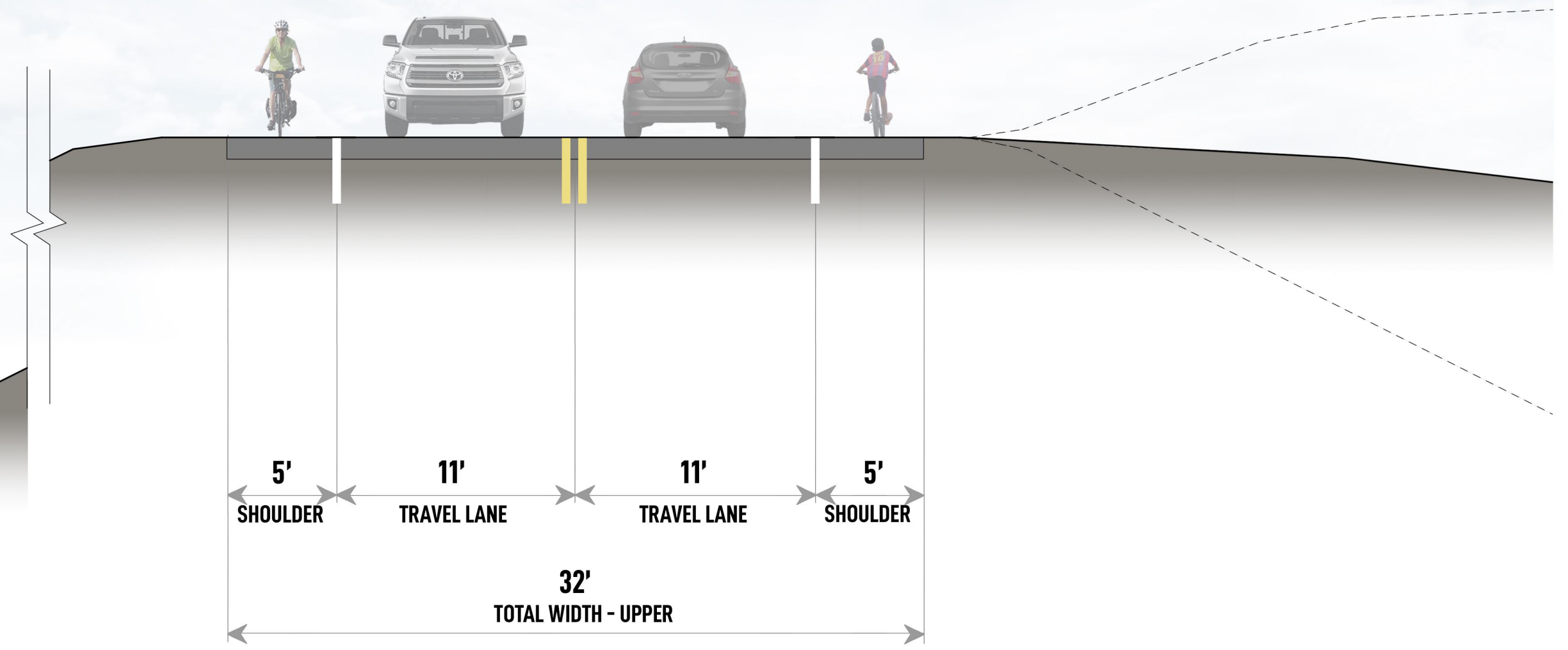


COMMERCIAL - SIDEWALK ADJACENT BIKE LANES



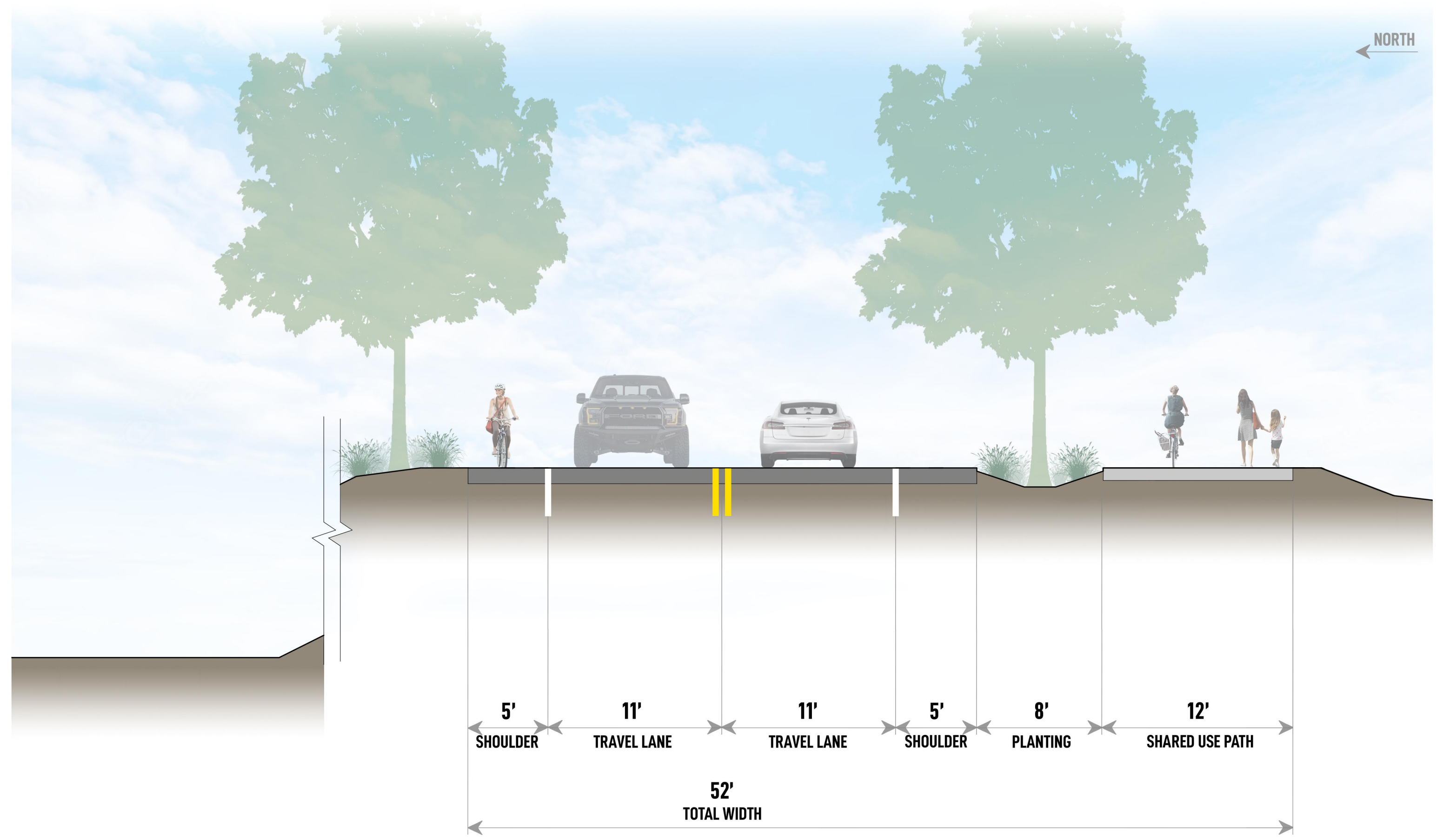
COMMERCIAL - TWO-LANE CROSS-SECTION WITH PARKING ON BOTH SIDES AND PARKING-PROTECTED BIKE LANE

NORTH ←



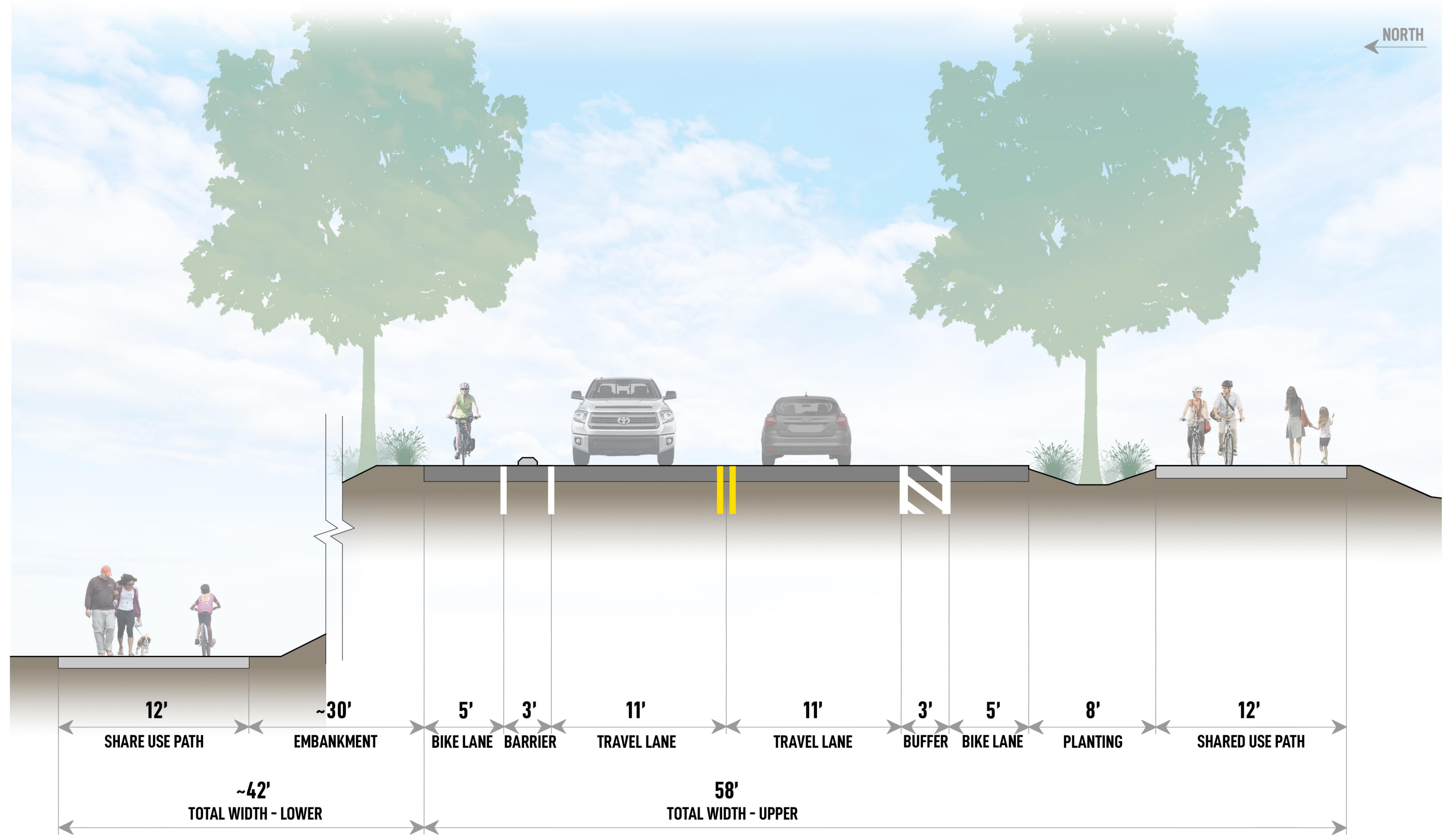
EDGEFIELD - EXISTING SECTION

NORTH ←

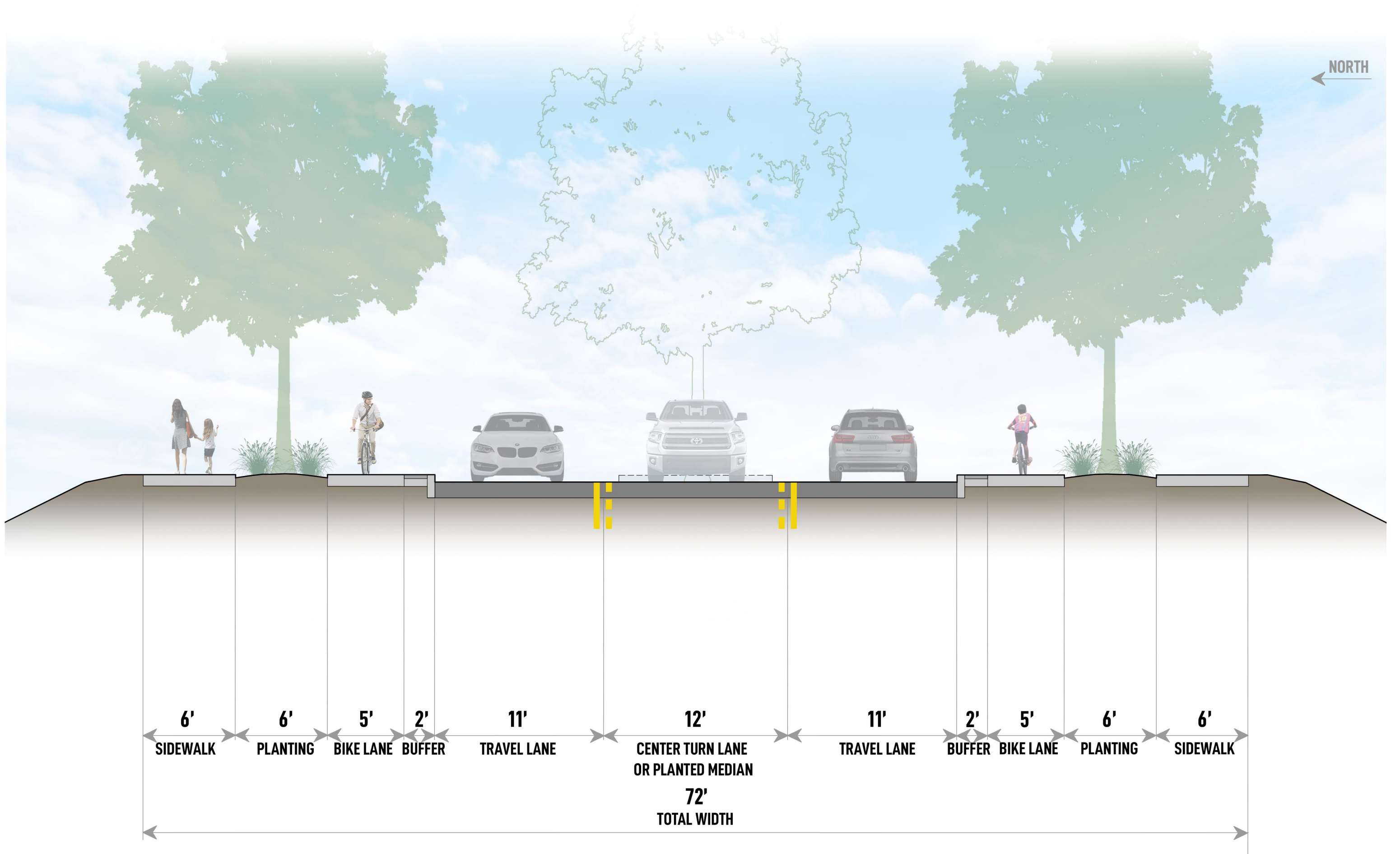


EDGEFIELD - NEAR TERM SOLUTION

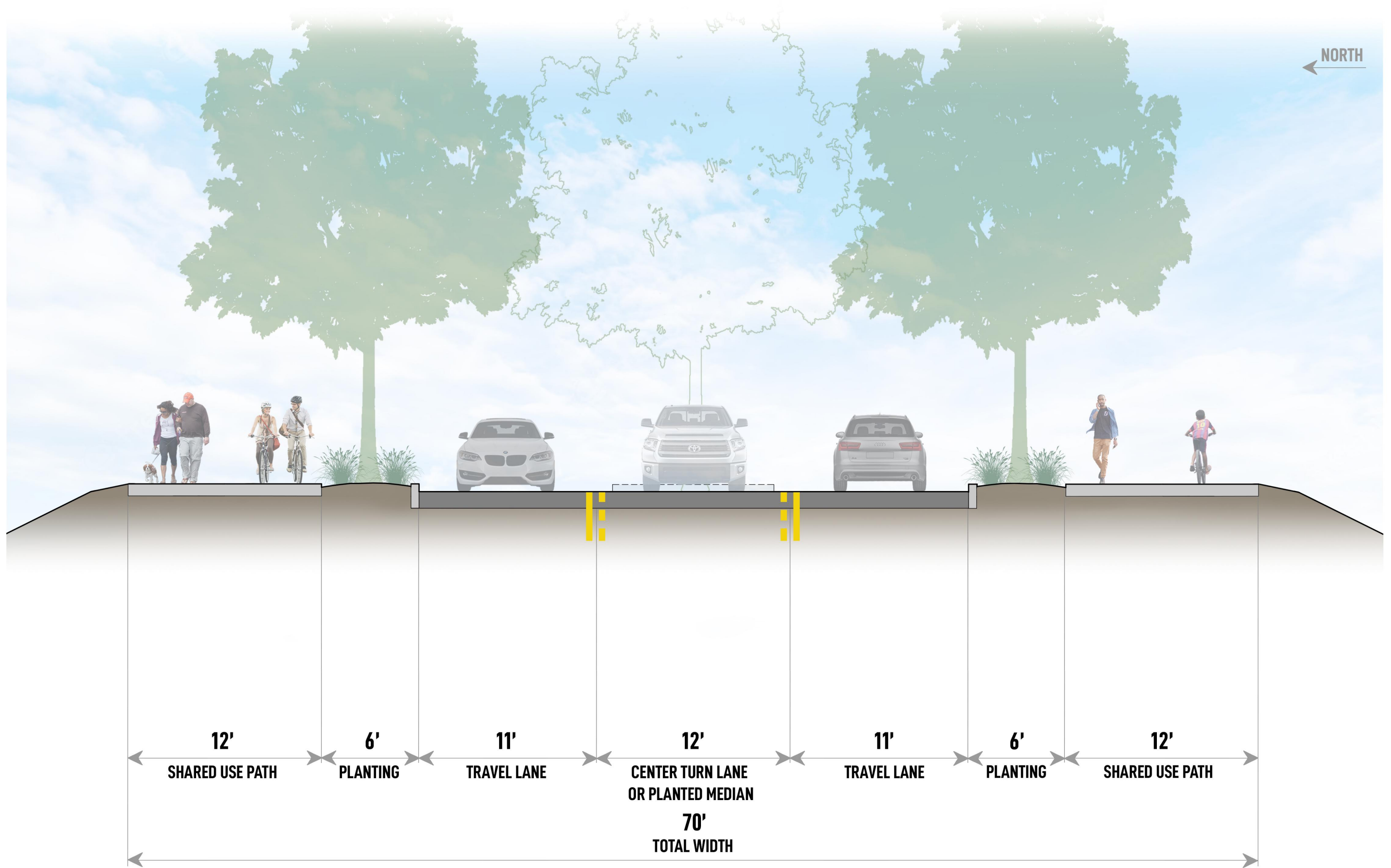
NORTH ←



EDGEFIELD - SHOULDER BIKE LANES WITH SHARED USE PATHS



EDGEFIELD - THREE-LANE CROSS-SECTION WITH SIDEWALK-LEVEL BIKE LANES



**EDGEFIELD - THREE-LANE CROSS-SECTION
WITH SHARED-USE PATHS**

POTENTIAL CROSS-SECTION WIDTHS

The following tables present a range of potential cross-section widths for the alternatives. The **bold green** text represents the cross-sections that are illustrated in the body of the report.

Table C1: Residential Cross-Section Alternatives

Alternatives	Parking	SW (feet)	PS (feet)	BL (feet)	PL (feet)	TL (feet)	M/CTL (feet)	TL (feet)	PL (feet)	BL (feet)	PS (feet)	SW (feet)	Paved Width (feet)	Right-of-Way (feet)
Existing	No Parking	6	6	6	0	12	13	12	0	6	6	6	49	73
	1 Side	6	6	6	0	12	13	12	7	6	6	6	56	80
	2 Sides	6	6	6	7	12	13	12	7	6	6	6	63	87
Near-term Solutions	No Parking	6	6	7.5	0	11	12	11	0	7.5	6	6	49	73
	1 Side	6	6	7.5	0	11	12	11	7	7.5	6	6	56	80
	2 Sides	6	6	7.5	7	11	12	11	7	7.5	6	6	63	87
Separated Bike Lanes	No Parking	6	6	8	0	11	12	11	0	8	6	6	50	74
	1 Side	6	6	8	0	11	12	11	7	8	6	6	57	81
	2 Sides	6	6	8	7	11	12	11	7	8	6	6	64	88
Sidewalk-Level Bike Lanes	No Parking	6	6	7	0	11	12	11	0	7	6	6	48	72
	1 Side	6	6	7	0	11	12	11	7	7	6	6	55	79
	2 Sides	6	6	7	7	11	12	11	7	7	6	6	62	86
Sidewalk-Adjacent Bike Lanes	No Parking	6	6	7	0	11	12	11	0	7	6	6	48	72
	1 Side	6	6	7	0	11	12	11	7	7	6	6	55	79
	2 Sides	6	6	7	7	11	12	11	7	7	6	6	62	86

Note: SW=Sidewalk; PS=Planting Strip; BL=Bike Lane; PL=Parking Lane; TL=Travel Lane; M/CTL= Median/Center Turn Lane

Table C2: Commercial Cross-Section Alternatives

Alternatives	Parking	SW (feet)	PS (feet)	BL (feet)	PL (feet)	TL (feet)	M/CTL (feet)	TL (feet)	PL (feet)	BL (feet)	PS (feet)	SW (feet)	Paved Width (feet)	Right-of-Way (feet)
Existing	No Parking	6	6	6	0	12	13	12	0	6	6	6	49	73
	1 Side	6	6	6	0	12	13	12	7	6	6	6	56	80
	2 Sides	6	6	6	7	12	13	12	7	6	6	6	63	87
Near-term Solutions	No Parking	6	6	7.5	0	11	12	11	0	7.5	6	6	49	73
	1 Side	6	6	7.5	0	11	12	11	7	7.5	6	6	56	80
	2 Sides	6	6	7.5	7	11	12	11	7	7.5	6	6	63	87
Separated Bike Lanes	No Parking	8	4	8	0	11	12	11	0	8	4	8	50	74
	1 Side	8	4	8	0	11	12	11	7	8	4	8	57	81
	2 Sides	8	4	8	7	11	12	11	7	8	4	8	64	88
Sidewalk-Level Bike Lanes	No Parking	8	4	7	0	11	12	11	7	7	4	8	55	79
	1 Side	8	4	7	0	11	12	11	0	7	4	8	48	72
	2 Sides	8	4	7	7	11	12	11	7	7	4	8	62	86
Sidewalk-Adjacent Bike Lanes	No Parking	6	4	7	0	11	12	11	0	7	4	6	48	68
	1 Side	6	4	7	0	11	12	11	7	7	4	6	55	75
	2 Sides	6	4	7	7	11	12	11	7	7	4	6	62	82
Two-Lane Cross Section with Parking Protected Bike Lanes	No Parking	11	4	7	0	11	0	11	0	7	4	11	36	66
	1 Side	11	4	7	0	11	0	11	7	7	4	11	43	73
	2 Sides	11	4	7	7	11	0	11	7	7	4	11	50	80

Note: SW=Sidewalk; PS=Planting Strip; BL=Bike Lane; PL=Parking Lane; TL=Travel Lane; M/CTL= Median/Center Turn Lane

Appendix D: Intersection Alternatives



NE HALSEY ST. AND NE 223RD AVE. PROTECTED INTERSECTION

Halsey Crossing
Apartment Complex

Fairview Creek

Marilyn's Park

NE 223rd Ave

NE Halsey St

Fork Sculpture

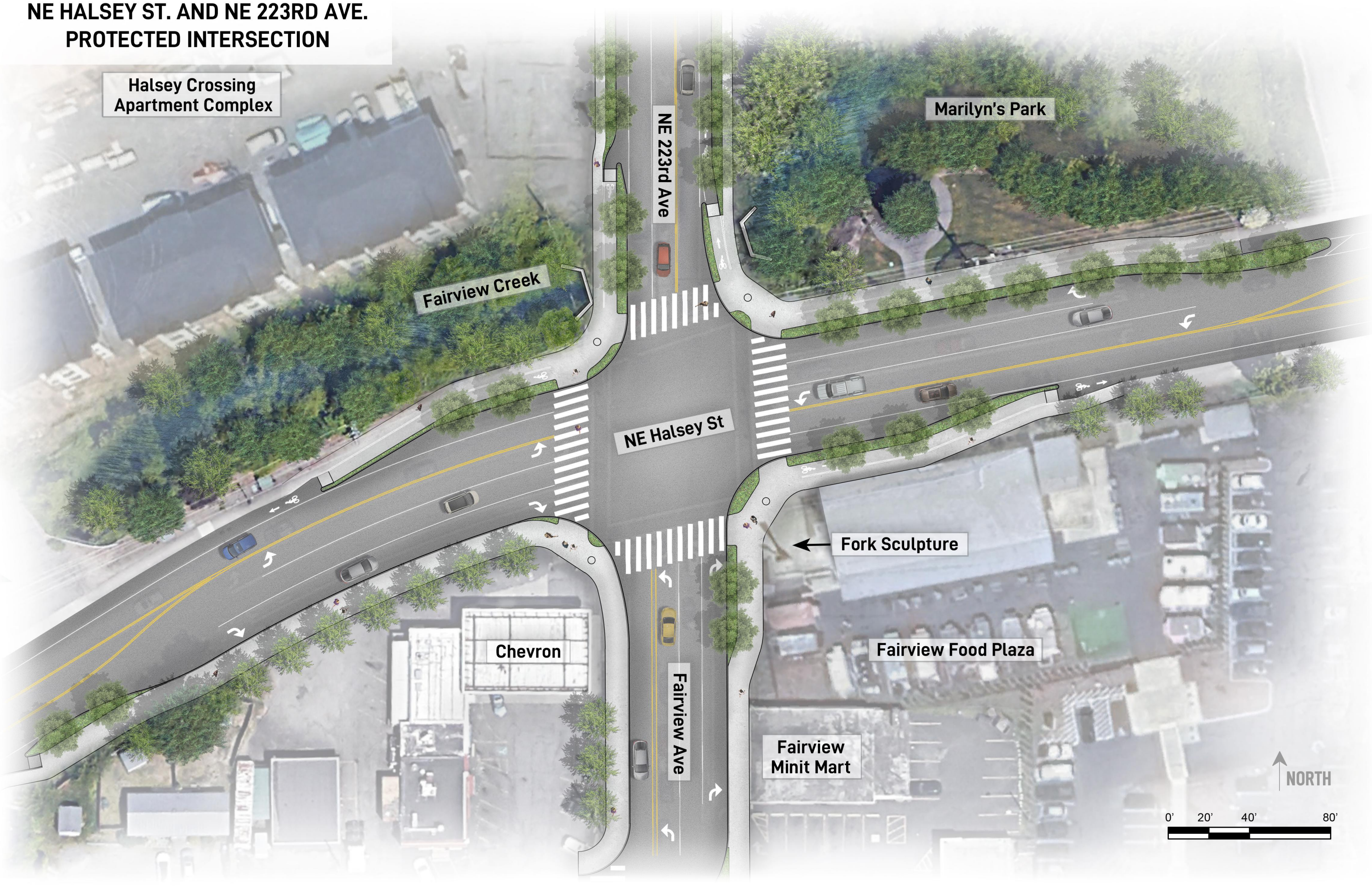
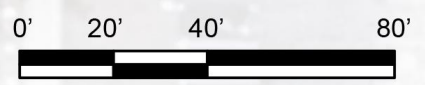
Chevron

Fairview Food Plaza

Fairview Ave

Fairview
Minit Mart

NORTH



NE HALSEY ST. AND NE 223RD AVE. ROUNDBABOUT

Halsey Crossing
Apartment Complex

Marilyn's Park

NE 223rd Ave

NE Halsey St

Re-aligned Fairview Creek

Fork Sculpture

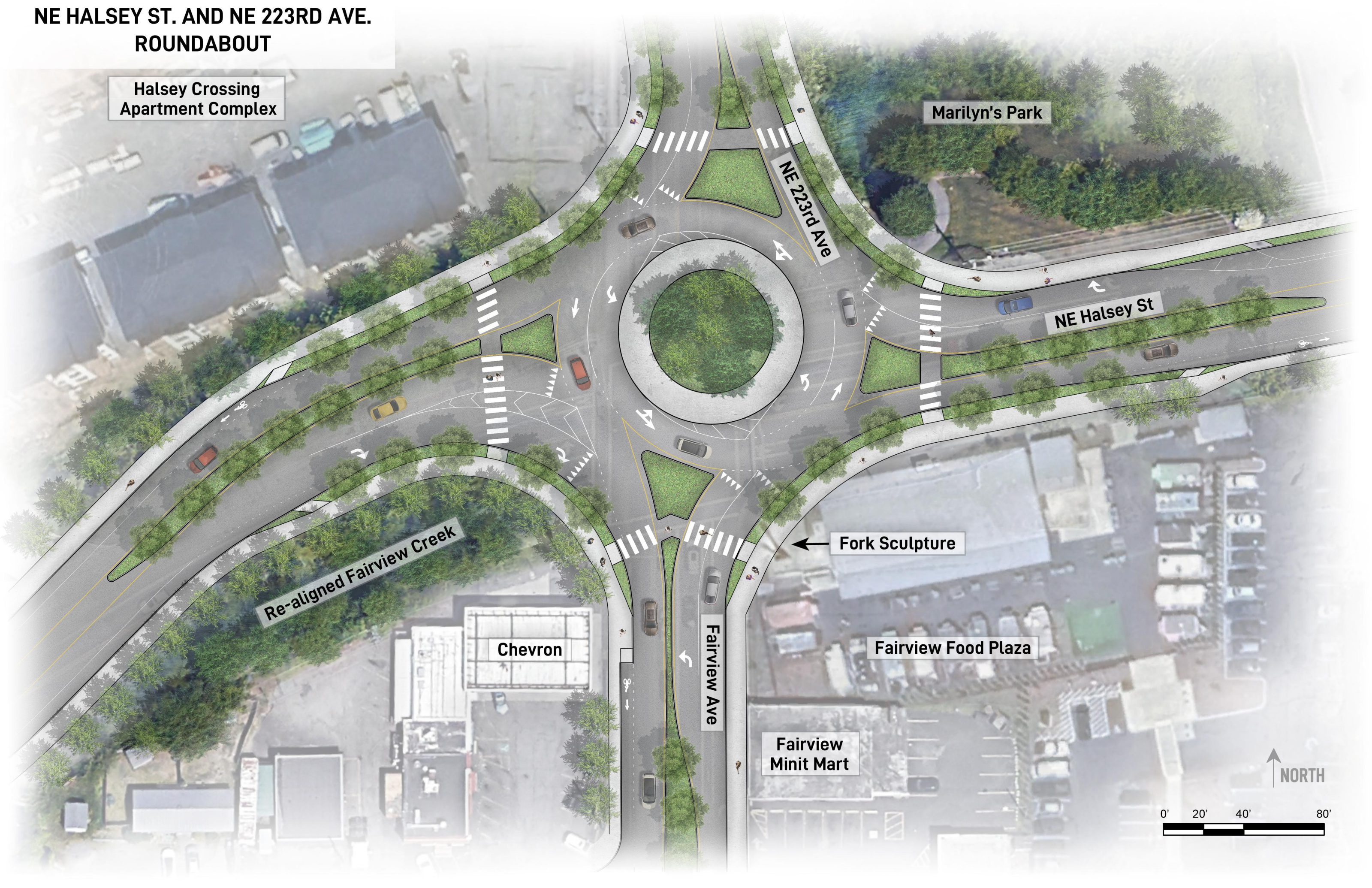
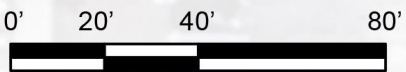
Chevron

Fairview Food Plaza

Fairview Ave

Fairview
Minit Mart

NORTH



NE 238TH DRIVE PROTECTED INTERSECTION



SW 257TH DRIVE PROTECTED INTERSECTION

