Innovative Land Use and Transportation Approaches

Educational Series – June 5, 2019

Spokane Regional Transportation Council

What Do We Do?

What Does it Take to Achieve Balanced Transportation Networks and Streets?

- ✓ Establishing Sound Policy – Complete Streets
- ✓ Distinguishing Street Functional Classification & Typology
- ✓ Enhancing Multimodal Street Standards with Land Use Context
  - ✓ Street Typologies
  - ✓ Transit
  - ✓ Bike-Ped Facilities
  - ✓ Utilities
  - ✓ Parking
- ✓ Master Streets Plan
- ✓ Regional Travel Model Applications
- ✓ Re-purposing Streetscape – Breakout Session

Traditional Street Functional Classification & Street Design

Determine Functional Classification → **Establish Design Controls** → **Fit Design Elements**

Hierarchy & Functional Class Context

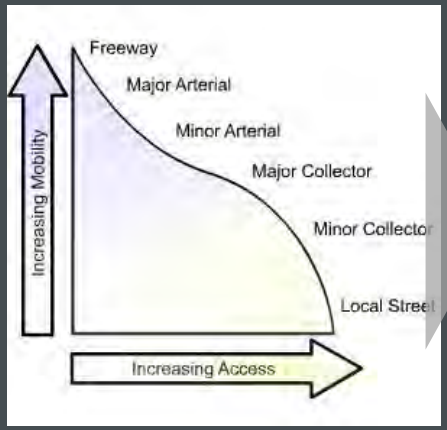
Land Use Context

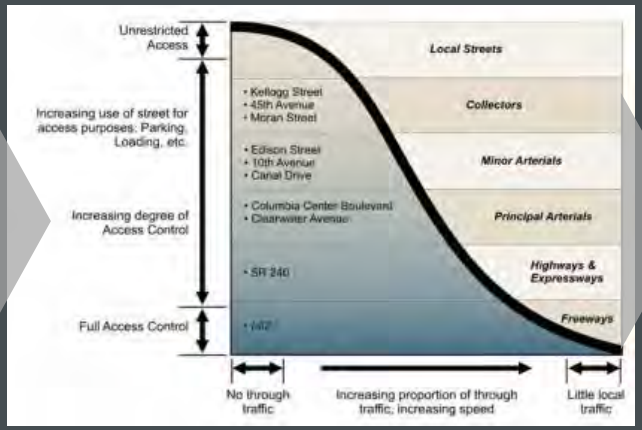
Design Traffic
- Role of Regional Travel Model
- Understanding Travel Patterns
- Vehicle Types
- Detailed Traffic Analyses

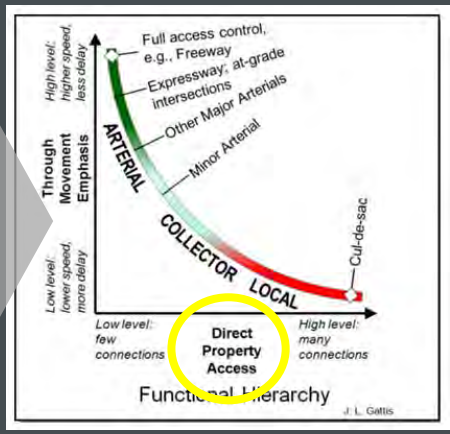
Design Speed
- Target Speed – Min & Max
- Travel Lane Dimensions
- Freight Routes
- Travel Safety
- Speed / Flow Relationship

Street Design Standards
- Geometric (Sight/Stopping Distance)
- Dimensions
- Design Elements (trees, parking, transit stops)
- AASHTO Design Guidelines
- State/Local Design Standards
- Design Variances & Exceptions

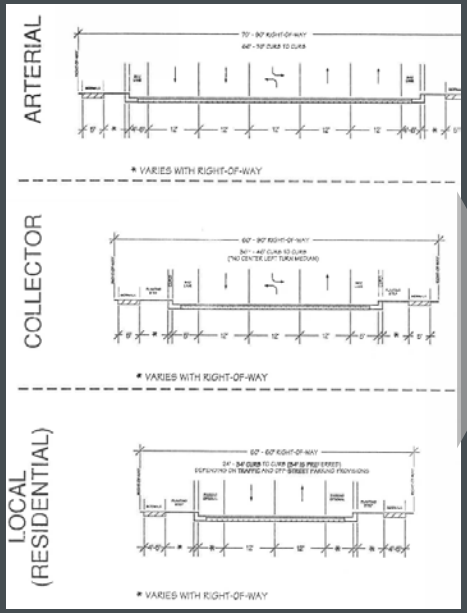
Access & Mobility

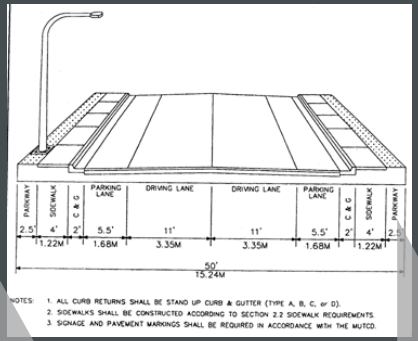


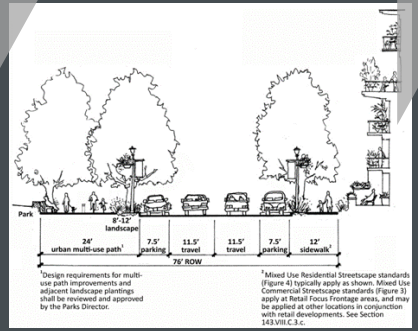


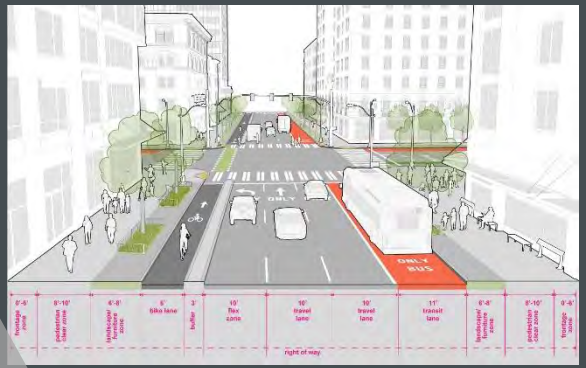


Evolution of Street Standards









Street Functional Classification & Typology

- ✓ <u>Functional Classification</u> – definitions of level of access and traffic control (mobility) guiding street design standards (historic policy)
- ✓ <u>Street Typology</u> – defines street use and design features to support adjacent land uses as (policy overlay)

Why Consider Street Typologies?

- Responsive to community concerns
- Ease planning efforts to include evaluation of street design standards to better address multimodal functions, particularly within constrained corridors
  - ✓ Transit
  - ✓ Bicycle
  - ✓ Pedestrian

Complete Streets Policy

Example Complete Streets Policy

The safety and convenience of all users of the transportation system including pedestrians, bicyclists, transit users, freight, and motor vehicle drivers shall be accommodated and balanced in all types of transportation and development projects and through all phases of a project so that even the most vulnerable – children, elderly, and persons with disabilities – can travel safely within the public right of way.

Examples of how the complete streets policy may be implemented:

- **Design and construct right-of-way improvements in compliance with ADA accessibility guidelines.**
- **Incorporate features that create a pedestrian friendly environment, such as**
  - **narrower traffic lanes**
  - **median refuges**
  - **curb extensions ("bulb-outs")**
  - **count-down pedestrian signals**
- **Improve pedestrian accommodation and safety at signalized intersections by:**
  - **using good geometric design to minimize crossing distances and increase visibility between pedestrians and motorists**
  - **timing signals to minimize pedestrian delay & conflicts**
  - **balancing competing needs of vehicular level of service and pedestrian safety (e.g., 2007 version of MUTCD to reduce design walking speed from 4 ft./sec. to 3.5 ft./sec.)**
- **Reclaim street space for other uses through the use of "road diets" (e.g., convert four-lane roadway to three-lane roadway with marked bike lanes)**

Benefits of Complete Streets Policy & Plans

- ✓ Can Bolster Economic Growth
- ✓ Improved Traveler Safety
- ✓ Greater Active Living
- ✓ More Travel Choices
- ✓ Increased Transportation System Capacity
- ✓ Greater SRTS Routes / Improved Child Safety
- ✓ Short-Term & Long-Term Fiscal Savings

Complete Streets
Land Use/Transportation Integration

- ✓ To be effective, Complete Streets Policy must be incorporated into:
  a) local comprehensive plans, zoning ordinance, and,
  b) transportation system plans and design guides

- ✓ CS must be sensitive to surrounding community character – current/planned buildings, trails, parks, etc.

Complete Street Transect

FIGURE 2 FDOT CONTEXT CLASSIFICATIONS

C1-Natural
Lands preserved in a natural or wilderness condition, including lands unsuitable for settlement due to natural conditions.

C2-Rural
Sparsely settled lands; may include agricultural land, grassland, woodland, and wetlands.

C2T-Rural Town
Small concentrations of developed areas immediately surrounded by rural and natural areas; includes many historic towns.

C3R-Suburban Residential
Mostly residential uses within large blocks and a disconnected or sparse roadway network.

C3C-Suburban Commercial
Mostly non-residential uses with large building footprints and large parking lots within large blocks and a disconnected or sparse roadway network.

C4-Urban General
Mix of uses set within small blocks with a well-connected roadway network. May extend long distances. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway.

C5-Urban Center
Mix of uses set within small blocks with a well-connected roadway network. Typically concentrated around a few blocks and identified as part of a civic or economic center of a community, town, or city.

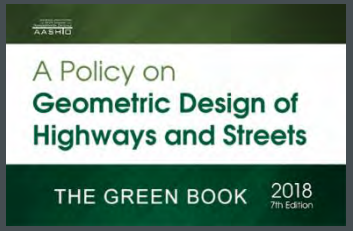
C6-Urban Core
Areas with the highest densities and building heights, and within FDOT classified Large Urbanized Areas (population >1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network.

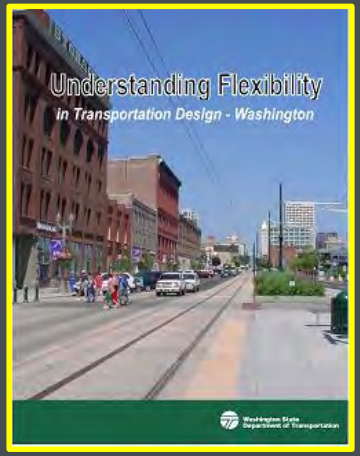
Street Network, Building Form and Land Use

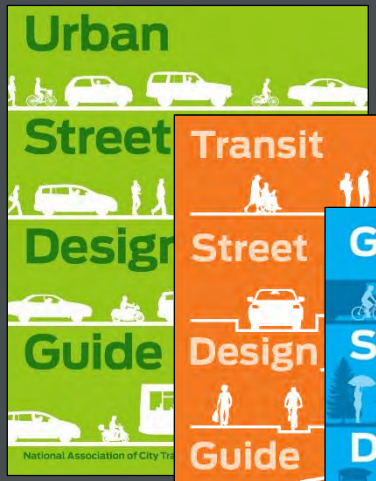
Your ‘Standard” Arterial (Historical)

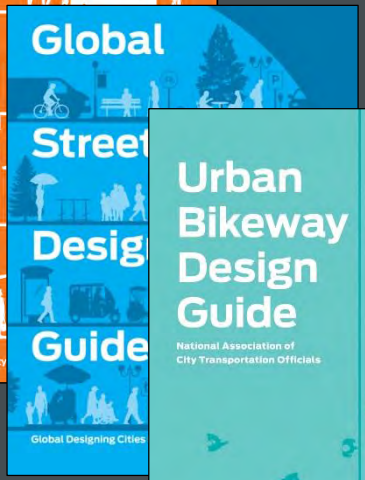
General Characteristics	Designed to provide a high degree of mobility and generally serve longer vehicle trips to, from, and within urban areas. Interconnects major urban elements such as the Central Business District, industrial facilities, large urban and suburban commercial centers, major residential areas, and other key activity centers.
Primary Function	Movement of people and goods, also known as "mobility," rather than access to adjacent land uses. Serve a citywide function and are, therefore, designated using a broader citywide perspective. (Arterials are not planned on a neighborhood level since the result would be discontinuity and a breakdown in the street’s citywide or regional function.)
Posted Speed Limits	Generally range between 30 and 45 mph, varying based on the type of area being served. Higher-density central business usually accommodate businesses usually accommodate the lower end of the speed range, while higher speeds are found on facilities in outlying areas.
Volume & Capacity	Traffic volume and capacity of an arterial street are dependent, in part, on the number of through and turning lanes, signalization, the number of driveways and access points, and the volume of bus and truck traffic. The volumes and capacity of arterials can range from 10,000 vehicles per day on a two-lane arterial to 75,000 vehicles on a six-lane arterial.
Modal Context	With an emphasis on mobility, an arterial facility is generally designed to accommodate vehicle trips in the form of passenger cars, trucks, and buses. Bicycle facilities may be provided. Pedestrian facilities are always provided, but the width of these facilities varies depending on adjacent land use and the level of pedestrian activity.

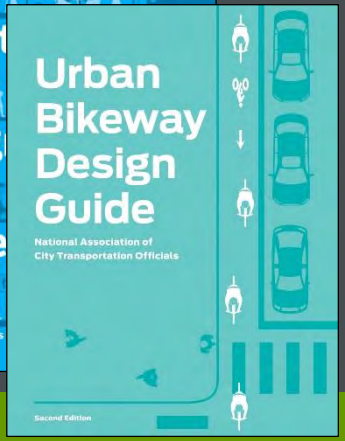
Street Design Guidance



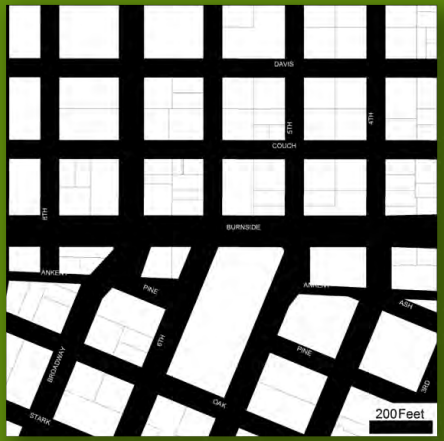




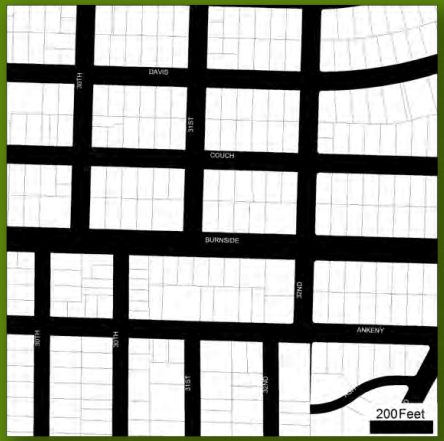




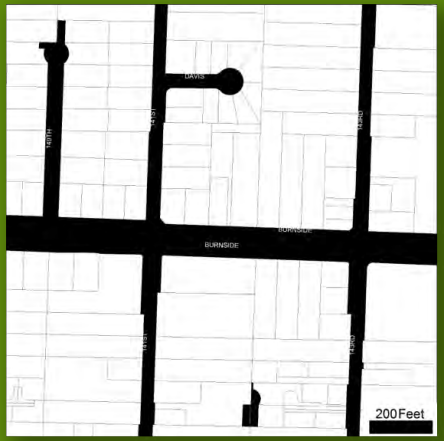
Street Patterns – Built Environment



Highly Connected



Well Connected



Poorly Connected

Traditional Commercial Arterial

Street Network

The arterial is the primary street in the area, with most principal commercial streets oriented to it.

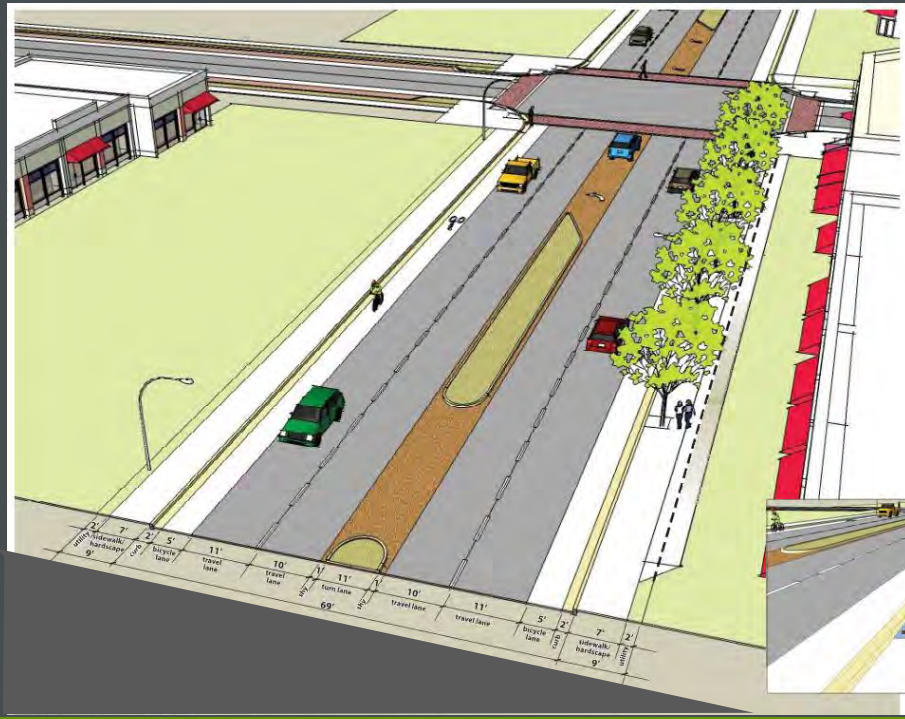
Building Form

Many buildings in typical commercial context are not fully oriented to the street: they may face it, but parking demand often influences their form and placement relative to the street.

Land Use

Often in these contexts the commercial land use is just along the main street, though the nature of this land use will have implications on the design of the roadway.

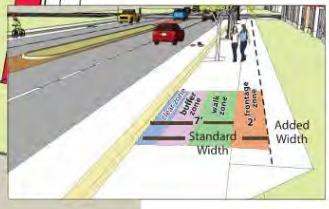
Traditional Commercial Arterial



Design Element	Typical
Design/Operating Speed	35 mph
Number of Travel Lanes (per direction)	2
Lane Dimensions	10' inner*, 11' outer
Right Turn Lanes	Allowed for heavy turning movements or heavy truck traffic
Bicycle Lanes	5'
On-Street Parking	none
Curb	6" with 1.5' gutter pan
Sidewalk	See details below on clear/buffer/walk zone
Frontage Zone	see details below
Intersection Control	signals or stops (cross streets only)
Lighting Standards	vehicles/roadway

** Generally, ACHD allows lanes no smaller than 10.5' to 11' wide on arterials but may consider 10' lanes in the following circumstances:*

- *Low traffic volumes*
- *Little or no truck volume*
- *Speed 30 mph or less*
- *In Town Centers*
- *In retrofit situations where constraints prohibit wider lanes*



Pedestrian Zone

This is an illustrative legend to explain how the pedestrian zone is broken down: the colors do ***NOT*** indicate color-based surface treatments.

Clear/Buffer/Walk Zone: 7' total; includes walk area and space for future tree plantings with private development

Frontage Zone: 2' space for utilities; to be hardscaped when utilities are placed underground from private development. Any added width through either easement or right-of-way dedicated by private development.

Town Center Commercial Arterial

Street Network

Town centers typically have the most thoroughly connected street networks of a community.

Building Form

Building form is often street-oriented: usually the traditional city centers or business districts; buildings were placed in a way to maximize pedestrian access.

Land Use

Overall development patterns tend to be more intense and combine many uses in a small area (especially office, retail, dining and sometimes residential).

Town Center Commercial Arterial

Design Element	Typical
Design/Operating Speed	30 mph
Number of Travel Lanes (per direction)	1 (2 if one-way street is used)
Travel Lane Dimensions	11'
Left Turn Lane Dimensions	11'
Right Turn Lanes	Allowed for heavy turning movements or heavy truck traffic
Medians	optional, when left turns not needed
Median Openings	when medians are used, openings for cross streets only
Block length	intersecting streets should be no more than 500' apart; 660' maximum mid-block curb cuts permitted only for intersecting alleys
Bicycle Lanes	5'
On-Street Parking	7.5' maximum (includes gutter pan width)
Curb	6" with 1.5' gutter pan
Buffer Area	6' minimum recommended (see clear zone and buffer zone dimensions below)
Sidewalk	9' minimum recommended (see walk zone and frontage zone dimensions below)
Mid-block crossings	permitted only in front of civic facilities
Intersection Control	signal or stop (cross streets only)
Preferred Building Placement	edge of right-of-way
Lighting Standards	pedestrian and vehicle/roadway

Pedestrian Zone

This is an illustrative legend to explain how the pedestrian zone is broken down: the colors do ***NOT*** indicate color-based surface treatments.

- Clear Zone: 1.5'
- Buffer Zone: 4.5'
- Walk Zone: 8' minimum recommended
- Frontage Zone: 1' provides buffer from buildings

Residential Arterial

Street Network

Street networks are often well-connected in older residential areas, where newer development patterns have favored cul-de-sacs and dead-end streets.

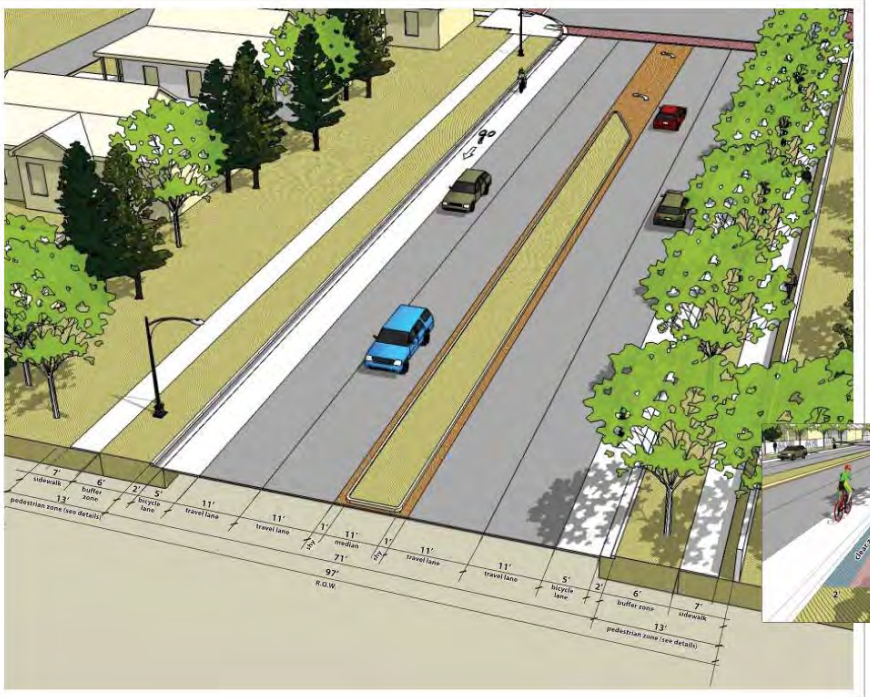
Building Form

Buildings are typically detached and though they face streets, there is not the same street orientation as in town center areas.

Land Use

Along regional arterials, more recent development patterns have favored inward-facing subdivisions, often surrounded by walls to separate the rear side of residential lots from the arterial roadway.

Residential Arterial



Design Element	Typical
Design/Operating Speed	35 mph
Number of Travel Lanes (per direction)	2
Travel Lane Dimensions	11'
Center Turn Lane Dimensions	11'
Right Turn Lanes	Allowed for heavy turning movements or heavy truck traffic
Medians	11', to be substituted with turn lanes at intersections
Median Openings	for cross streets only when medians used
Bicycle Lanes	5'
On-Street Parking	Permitted, not typical; but possible 7' parallel when used (includes gutter pan width)
Drainage	curb and gutter
Buffer Area	6' (see clear zone and buffer zone below)
Sidewalk	5' minimum recommended (see walk zone dimension below; frontage zone allows shy area from sidewalk as needed)
Intersection Control	signals or stops (stops on cross streets only)
Lighting Standards	vehicle/roadway only

Pedestrian Zone

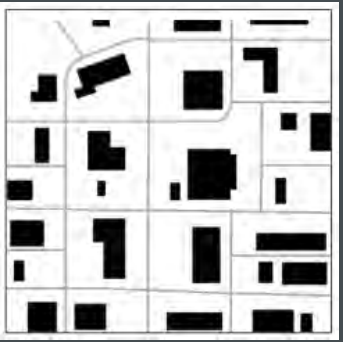
This is an illustrative legend to explain how the pedestrian zone is broken down; the colors do ***NOT*** indicate color-based surface treatments.

- Clear zone: 2'
- Buffer Zone: 4'
- Walk Zone: 5' minimum recommended
- Frontage Zone: 2' for utility placement and buffer from walls

Industrial Arterial

Street Network

Partly due to the size of many industrial properties, network connectivity varies in industrial areas, typically focused on main streets and cross streets providing additional access.



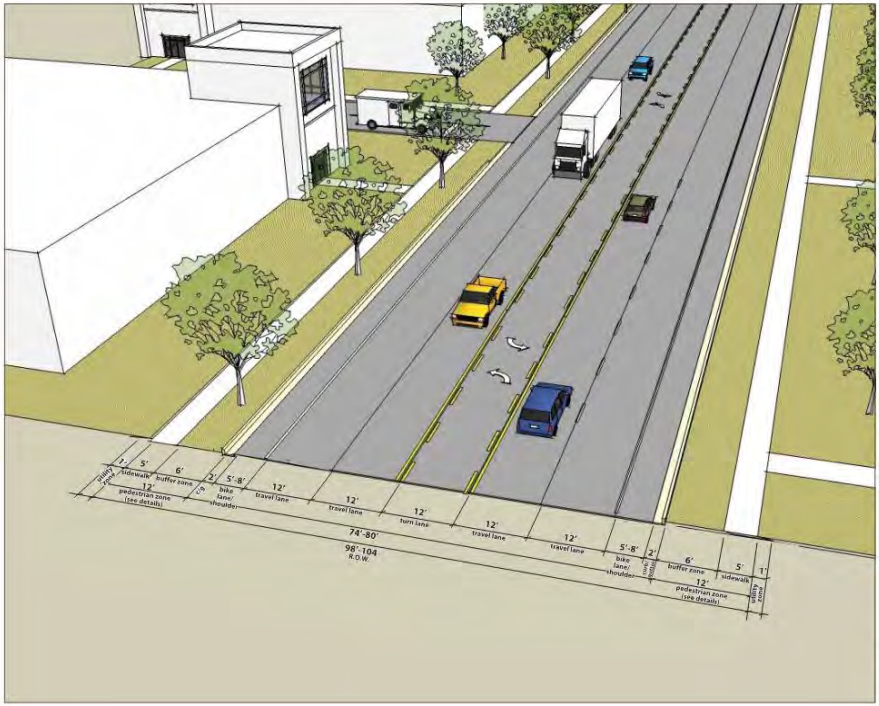
Building Form

Newer industrial areas have a service function that often requires significant vehicle circulation space in front of buildings; this leaves buildings separated from streets.

Land Use

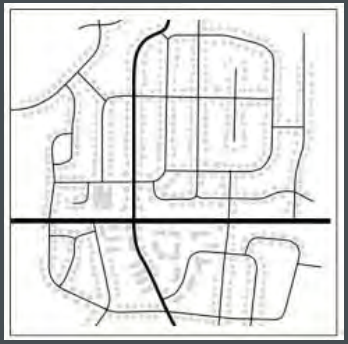
Industrial areas tend to be larger in their extent than 'strip commercial' corridors: many have evolved from being oriented to a railroad facility to having adjacency to principal roads as well.

Industrial Arterial



Design Element	Typical
Design/Operating Speed	45 mph
Number of Travel Lanes (per direction)	2
Travel Lane Dimensions	12'
Paved Shoulders	6'
Center Turn Lane Dimensions	12'
Right Turn Lanes	allowed for heavy turning movements or heavy truck traffic
Medians	not typically needed, permitted to bifurcate roadway before transition to center turn lane
Median Openings	medians for transition into three- or five-lane section not needed
Bicycle Lanes	bike lane appropriate for lower speeds, 5' minimum
On-Street Parking	none
Curb	6" with 1.5' gutter pan
Sidewalk	5' sidewalk on at least one side of the street; in certain cases both sides are desirable
Intersection Control	signal or stop
Lighting	vehicles/roadway
Utility Zone	1'

Residential Local



Street Network

Street networks are often well-connected in older residential areas, where newer development patterns have favored cul-de-sacs and dead-end streets.

Building Form

Buildings are typically detached and face local streets. Some residential developments include backside alleys and parking.

Land Use

Land use patterns along residential local streets are typically exclusively residential and commonly detached, single-family structures.

Residential Local

Design Element	Typical
Design/Operating Speed	20 - 25 mph
Number of Travel Lanes (per direction)	1 (lanes not striped)
Travel Lane Dimensions*	25' for total roadway, not striped
Center Turn Lane Dimensions	center lane not used
Right Turn Lanes	Allowed for heavy turning movements or heavy truck traffic
Medians	none
Median Openings	none
Bicycle Lanes	none
On-Street Parking*	permitted, intended for one side of street only (included in total pavement width)
Curb	6" with 1.5' gutter pan
Buffer Area	6' (see clear zone and buffer zone below); this dimension can accommodate utilities
Sidewalk	5' minimum (see walk zone below)
Intersection Control	signal, stop or roundabouts
Lighting Standards	vehicle/roadway; additional pedestrian-level lighting acceptable

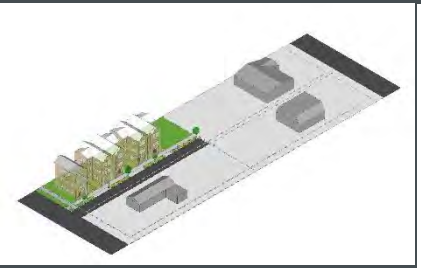
* Other street sections are described in ACHD's policy for Minor Residential Local Streets and parking on both sides of the street.

Pedestrian Zone

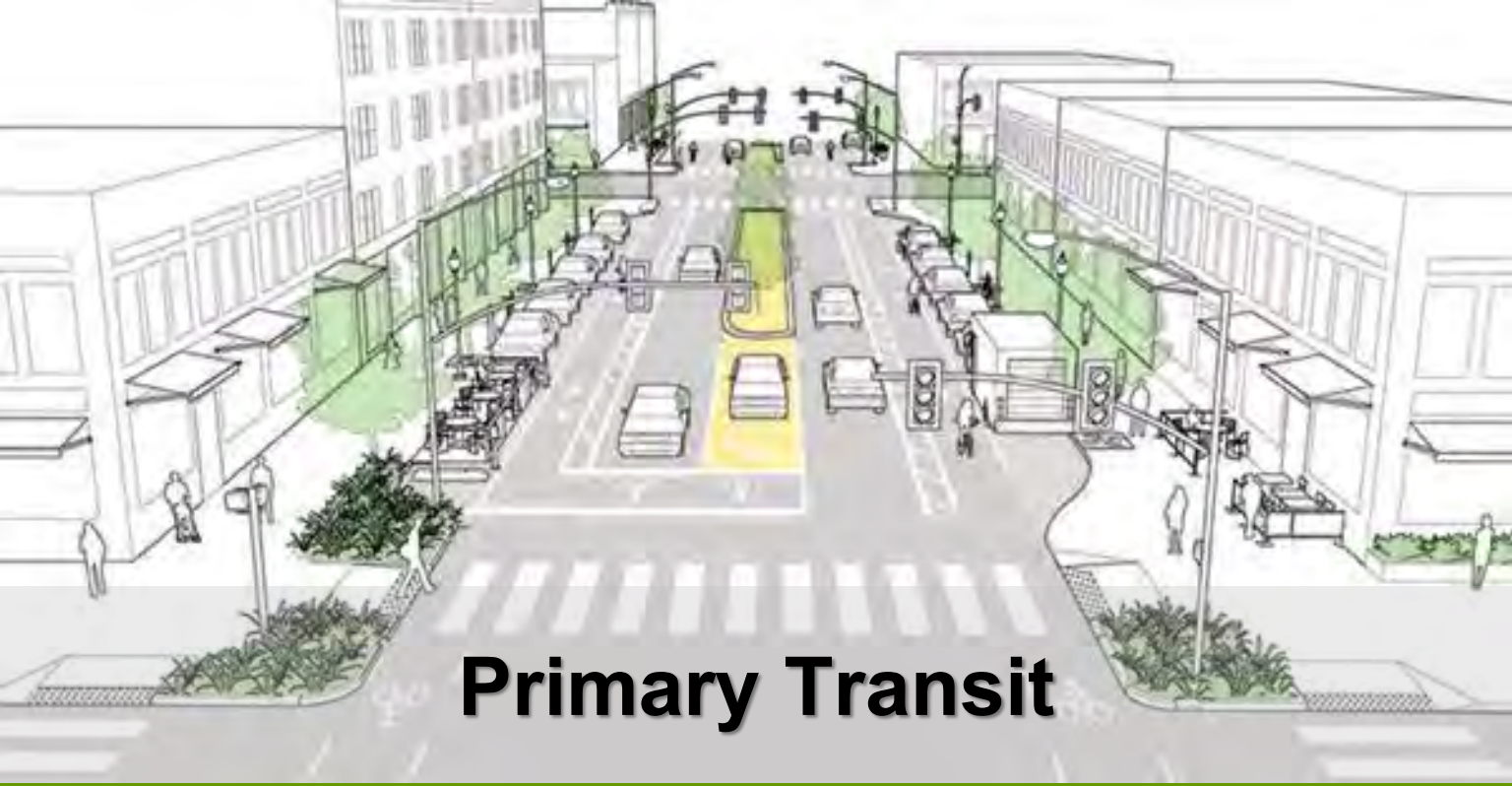
This is an illustrative legend to explain how the pedestrian zone is broken down: the colors do ***NOT*** indicate color-based surface treatments.

- Clear zone: 2'
- Buffer Zone: 4'
- Walk Zone: 5' minimum recommended
- Frontage Zone: not needed; utility placement in Buffer Zone acceptable

Residential Local



Infill – Higher Density



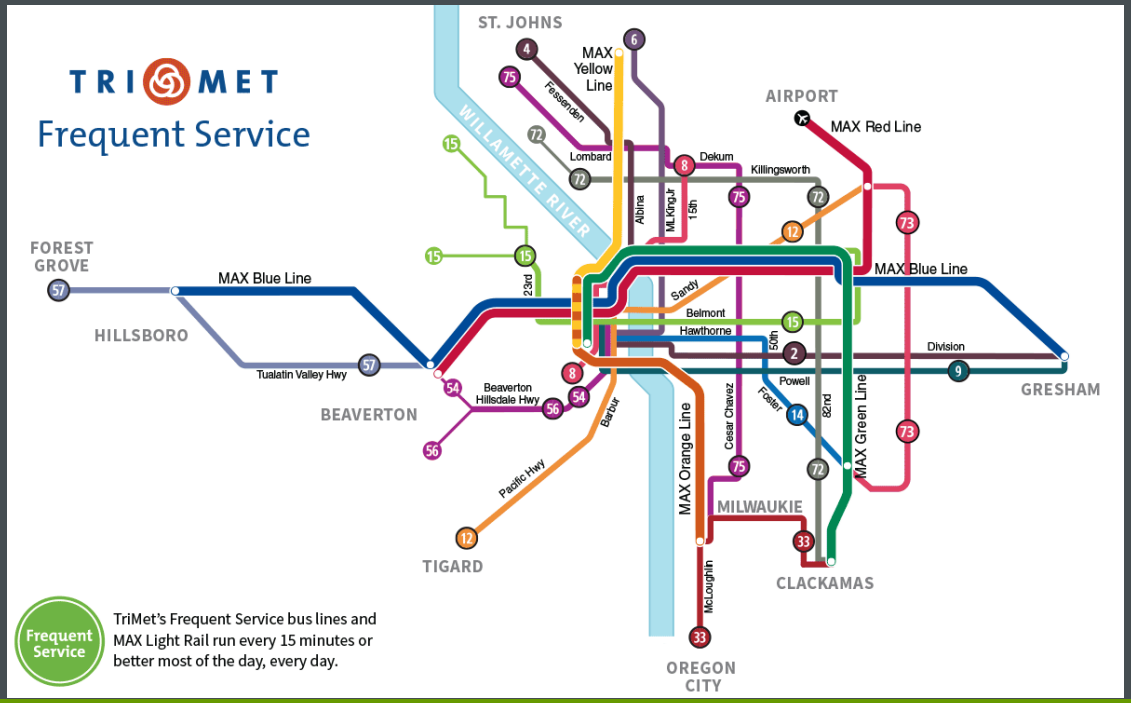
Primary Transit

Primary Transit Network

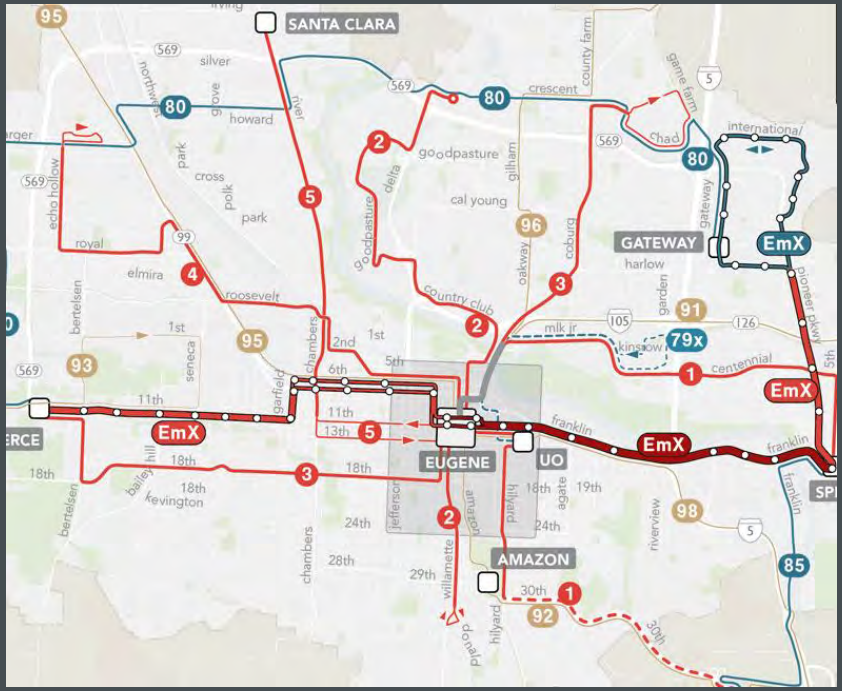
- What is the PTN: network of core routes that aspire to minimum level and quality of service
  - Frequencies of 15 minutes or better **(frequent service)**
  - Span of 18 hrs, 7 days per week
  - Minimum operating speed and on-time performance
- PTN provides a core network or routes to plan transit supportive land uses around
- PTN is infrastructure, meaning (community x) is committed to managing PTN ROW to support high transit quality and/or levels of service
- Secondary Transit Network (STN) supports by *feeding* PTN and *covering* lower density neighborhoods

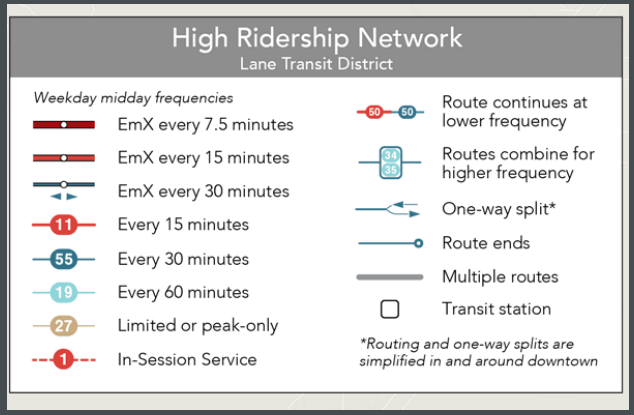
C-Tran's The Vine: 4th Plan Boulevard

Primary Transit Network Maps



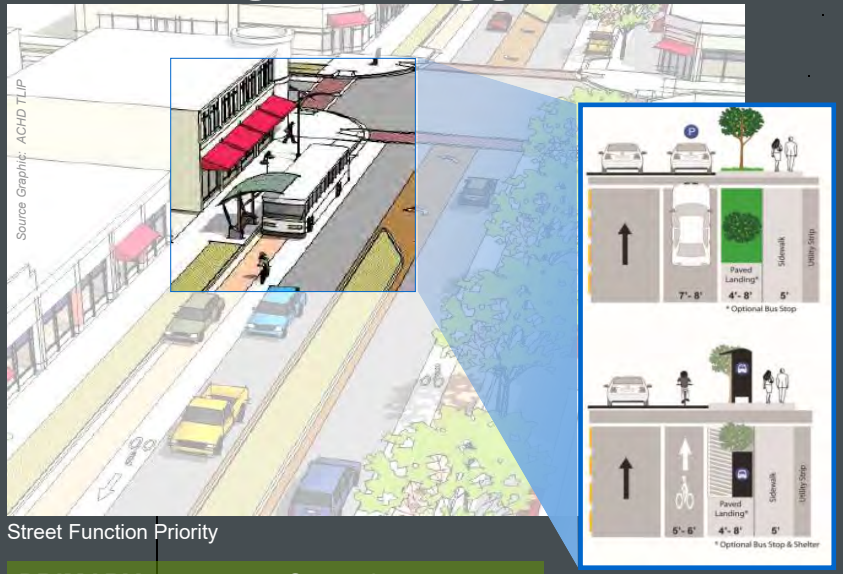
Primary Transit Network Maps





Lane Transit District

Typology: Mixed-Modal Street



Street Function Priority

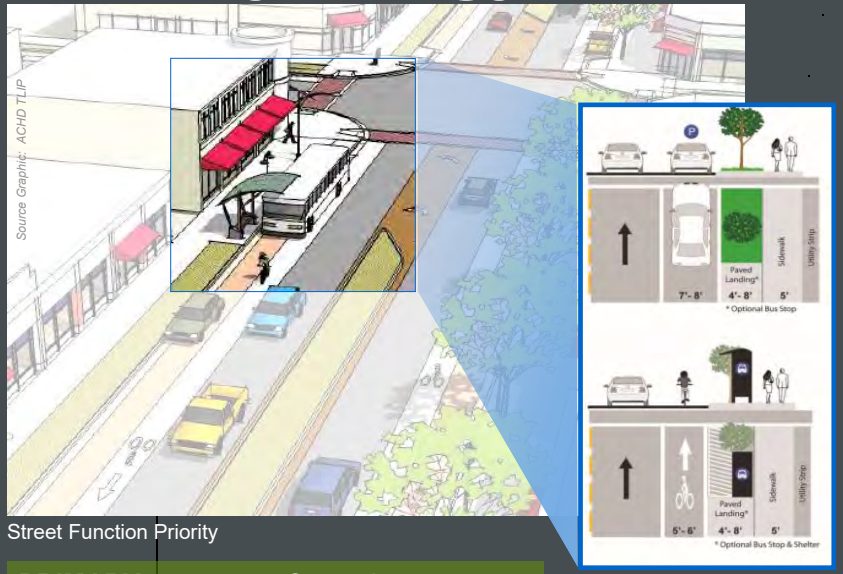
PRIMARY	Secondary
Bicycle	Transit
	Auto/Truck

On **Mixed-Modal Streets**….

where **transit frequencies** (>=30 minutes) (STN) and **bicycle volumes** are relative low and balanced….

Simultaneous use of space is infrequent / non-conflicting

Typology: Mixed-Modal Street



Street Function Priority

PRIMARY	Secondary
Bicycle	Transit
	Auto/Truck

If / when route is part of **Primary Transit Network**

With **higher frequencies...**

(=<15 minutes) (PTN)

and **need to preserve higher level of operation speed and reliability…**

in the form of frequent bus, bus rapid transit or streetcar…

And **bicycle volumes** are also high…

results in much higher conflict.

Auto/Bike/Transit Street Examples

Left Side Bike Lanes in Portland (top) and Minneapolis (bottom)

Contra flow bus/bike lanes and two-way center bike lanes in Minneapolis

(1) Shift **Bicycle** facility to parallel routes with either on-street bike lanes or designate as **Bike Boulevards** (shared roadway, increased Bicycle priority), and

(2) Accommodate both **bicycles** and **frequent transit** by separating bicycle and transit lanes (only on on-way streets) or providing dedicated ROW for both (requires substantial reduction of auto capacity)

(3) Remove on-street parking (if applicable) and bike lane from **primary transit network** routes

- ✓ Easy to do in a grid system.
- ✓ Difficult when no parallel routes exist.

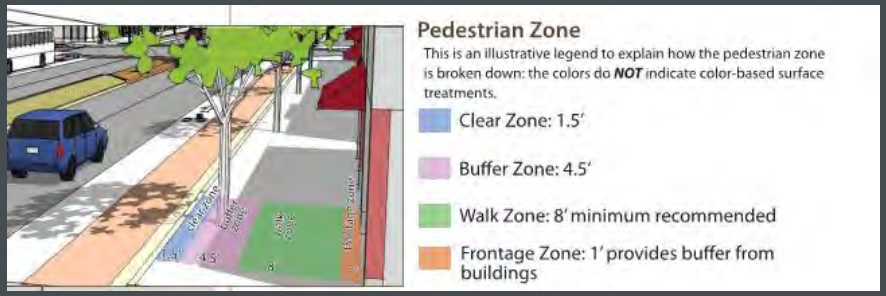
Note: Allocation of street ROW should be based on some measurement of person movement capacity/person delay.

Pedestrian Zone / Bicycle Facility Best Practice

Example Pedestrian Zone

- ✓ **Variable Dimensions for Land Use Context**

Town Center Arterial



Residential Arterial

Bicycle Facility Options

Shared Lane

Bike Lane

Buffered Bike Lane

Raised Cycle Track

Two-Way Cycle Track

Shared-Use Pathway

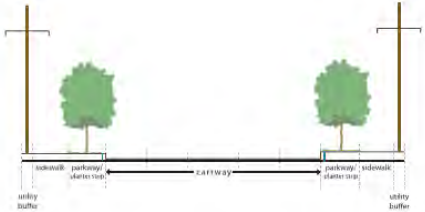
Utilities

Utilities

DEFAULT CASE
Utilities built in buffer at edge of right-of-way

DESIGN IMPLICATIONS: *Utilities are placed at the edge of right-of-way. Individual pole placement needs to be coordinated with access points and other roadway design features.*

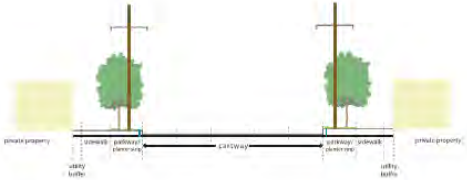
The TLIP efforts thus far have demonstrated the benefits of land uses that engage pedestrians along the street. As local governments redefine land development standards to reflect this, transportation projects will need to reconsider utility placement.



Land development regulations change and bring building placement to right-of-way edge

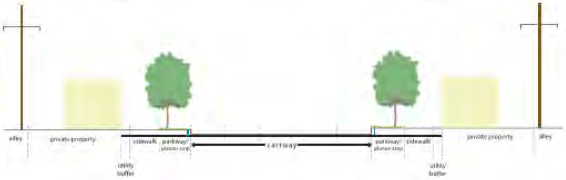
OPTION 1
Overhead utilities placed in planter strip

DESIGN IMPLICATIONS: *Tree placement and selection must keep in mind typical utility vertical clearance to avoid damage to trees from utility provider maintenance. Utility buffer can be hardscaped to add to pedestrian area as 'shy zone' against buildings (see Sections 2.5 and 2.6).*



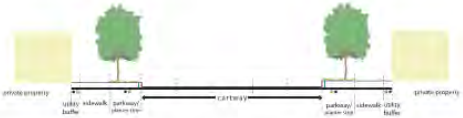
OPTION 2
Overhead utilities placed alley behind private property

DESIGN IMPLICATIONS: *Occurs when alleys added as part of a street design or other easements are secured for utility placement behind buildings. Utility buffer can be hardscaped to add to pedestrian area as 'shy zone' against buildings (see Sections 2.5 and 2.6).*

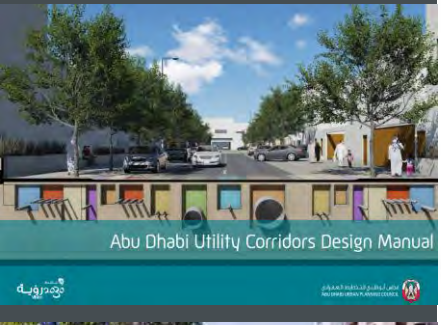


OPTION 3
Utilities placed underground in right of way, either in planter strip or in designated utility buffer

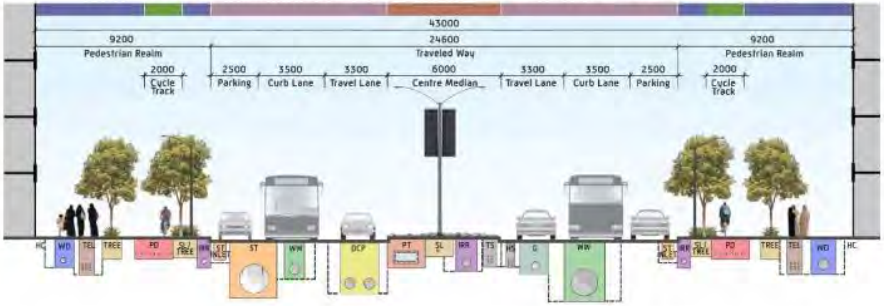
DESIGN IMPLICATIONS: *Though hardscaping is optional, utility buffer can remain grass or ground cover if utilities are placed there.*

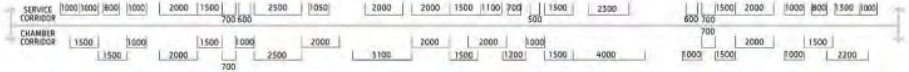


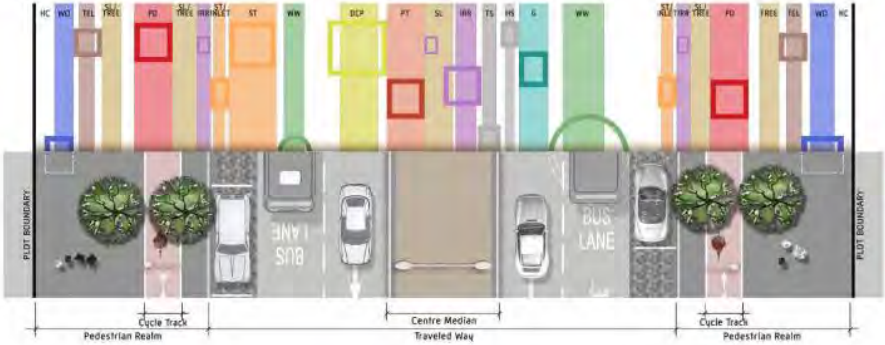
Utilities



TYPICAL CITY AVENUE WITHOUT FRONTAGE LANE WITH ON-STREET PARKING AND CYCLE TRACK ON BOTH SIDES

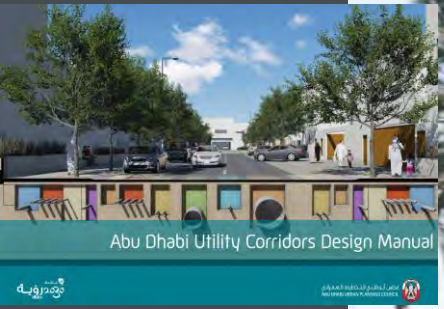






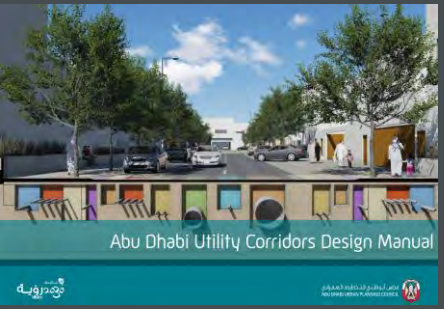
- WD WATER DISTRIBUTION
- WW WASTEWATER
- IRR IRRIGATION
- ST STORMWATER
- DC DISTRICT COOLING
- PT POWER TRANSMISSION
- PD POWER DISTRIBUTION
- SL STREET LIGHTING
- TEL TELECOMMUNICATION
- TS TRAFFIC SURVEILLANCE
- HS HIGH SECURITY
- G GAS
- HC HOUSE CONNECTION

Utilities


Abu Dhabi Utility Corridors Design Manual


TOYOTA
35402
GIVE WAY

Utilities


Abu Dhabi Utility Corridors Design Manual


Abu Dhabi Urban Street Design Manual

On-Street Parking

On-Street Parking

Best-Suited

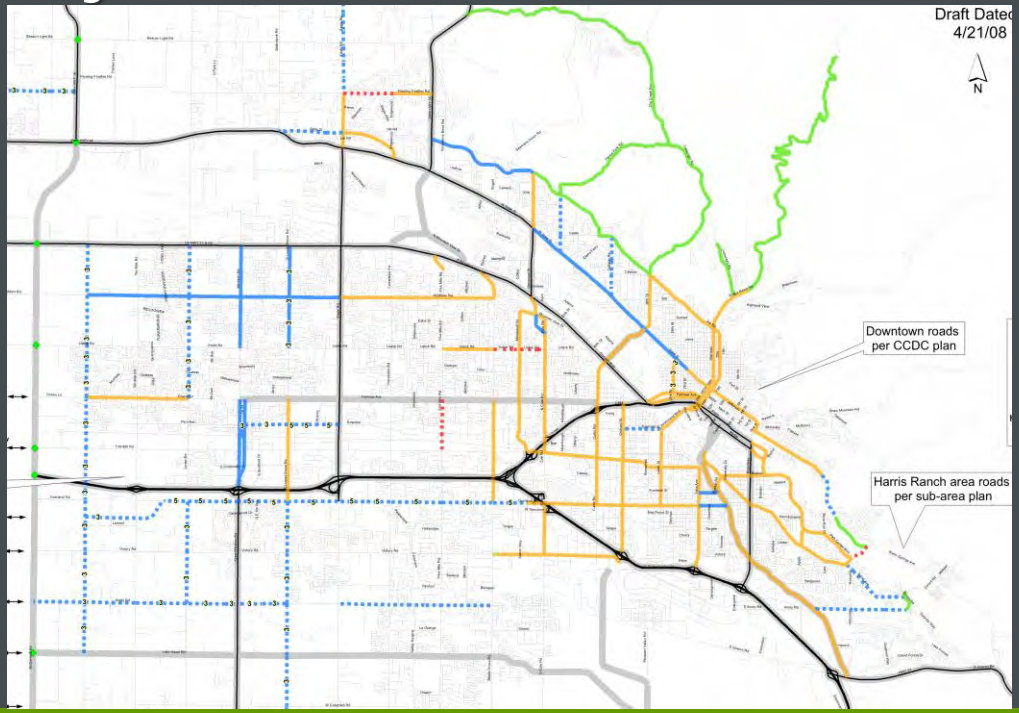
- ✓ City Center Streets
- ✓ Local Streets
- ✓ Lower Volume/Speed Town Center Streets

Ill-Suited

- ✓ Primary Transit Streets
- ✓ Higher Volume/Speed Mobility Arterials

Mapping Street Master Plans

Major Streets Plan



Legend

- Future Interchanges
- Other ACHD Streets

Type

- Built (Street Footprint Fixed)
- Built Soon
- Plan/Policy (Adopted)
- Plan/Policy (Unofficial)
- Environmental

Mobility Roadways

- Mobility Arterials*
- State Mobility Highways**

***Mobility Arterials are typically ACHD Principal Arterials but not all Principal Arterials are Mobility Arterials (e.g. State Street, east of Glenwood). All arterials provide a mobility function, but the Mobility Arterial is to provide a higher speed and through-put function than other arterials; possibly with as many as seven (7) potential future travel lanes.**

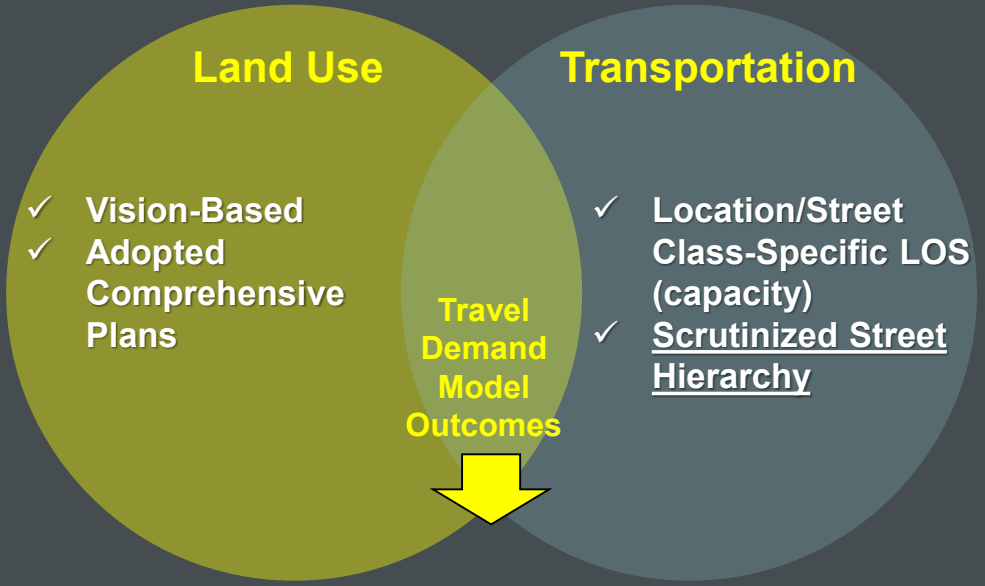
****State Mobility Highways are to provide higher speeds, higher capacities, with greater access control, to achieve a greater inter-city through-put function; multi-lane expressways and freeways included.**

Principles of Access Management

- Lay the foundation for access management in local comprehensive plans.
- Limit the number of driveways per lot (generally, one per parcel).
- Locate driveways away from intersections.
- Connect parking lots and consolidate driveways (so vehicles can travel between parcels without reentering an arterial).
- Provide residential access through neighborhood streets (residential driveways should generally not connect directly to arterials).
- Increase minimum lot frontage on major streets (minimum lot sizes on major arterials should be larger than on minor streets).
- Promote a Connected street system (avoid street networks that force all local traffic onto arterials).
- Encourage internal access to out parcels (i.e., locations in shopping centers located on arterial streets).
- Regulate the location, spacing and design of driveways.
- Coordinate with the WSDOT.

Appropriate Regional Travel Model Applications

Integrating Land Use & Transportation



- ✓ Right-Size Long-Range Transportation Plans
- ✓ Right-Size Livable Streets

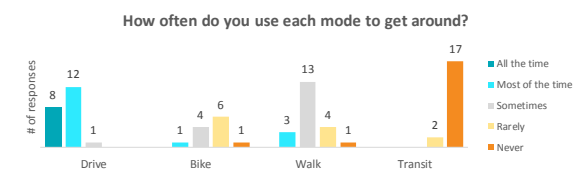
Principles to Consider in the Future

- ✓ **Tailor Network with Streets for Different Modes**
- ✓ **Separate Streets by Speed**
  - ✓ Connected / Autonomous Vehicles (CAV) & digital navigation tools may enable faster streets to move people, and slower streets to focus more on cycling / walking
- ✓ **Incorporate Flexibility into Street Space**
  - ✓ Adaptable infrastructure and real-time traffic management systems may enable ‘dynamic’ land and traffic control that varies by time of day.
- ✓ **Recapture Some Street Space for the Public Realm**
  - ✓ CAV, adaptable infrastructure and moveable street furniture may enable cities to recapture space previously devoted to parked vehicles.

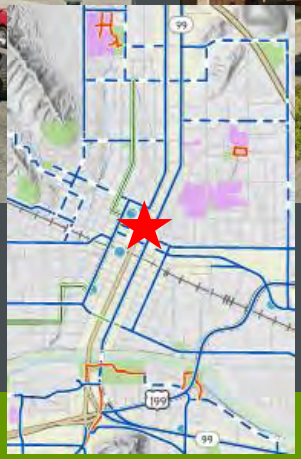
Breakout Session
Repurposing Streetscape

Incomplete Bicycle Network

- A River Runs Through It!
- Bridges Lack Bike Facilities
- State Highway / One-Way Couplet Lacks Width for Wider Bike Facilities
- Low Cycling Utility
- Community Seeks Greater Connectedness
- Growing Tourism Demand



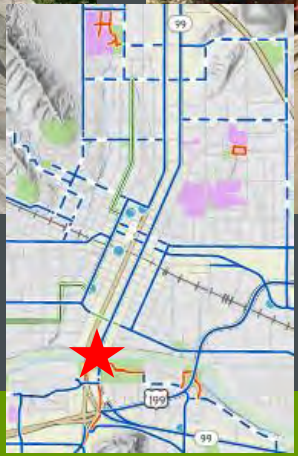
City Center



6th St

7th St

Bridges Lack Bicycle Facilities



6th St

7th St

Bicycle Facility Options to Consider

Shared Lane

Bike Lane

Buffered Bike Lane

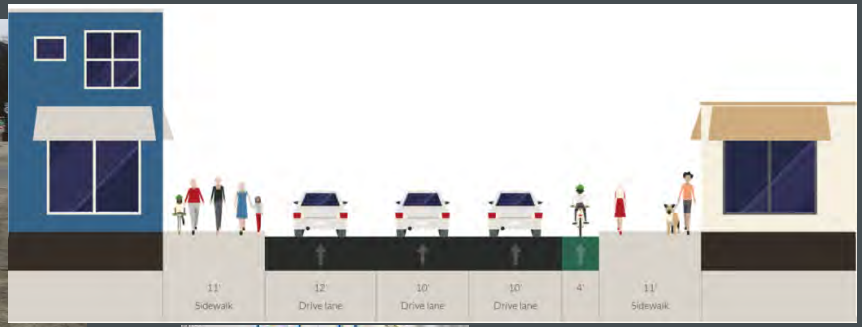
Raised Cycle Track

Two-Way Cycle Track

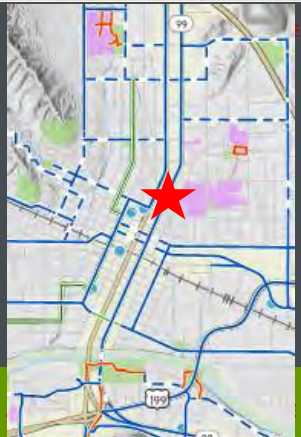
Shared-Use Pathway

7th Street

Existing



PM Peak Hour Volume-to-Capacity				Highway Plan
	2040			Mobility
2018	No Action	Drop Lane		Target
0.64	0.75	0.95		0.95



TRACK ON EAST SIDE

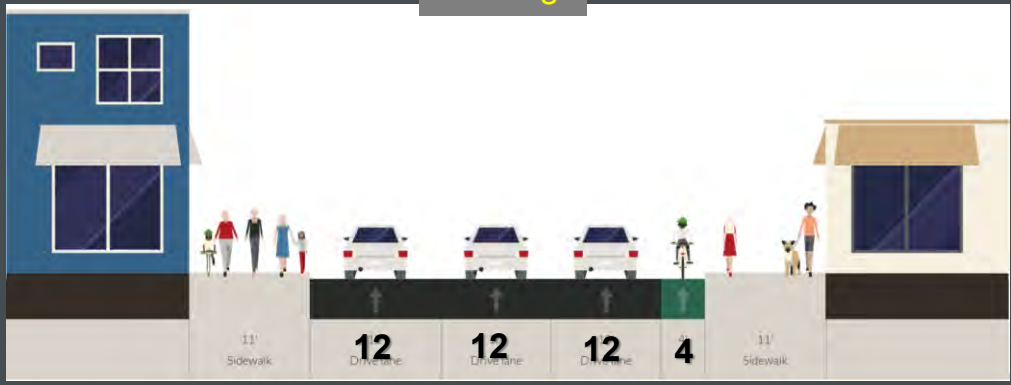
TRACK ON WEST SIDE

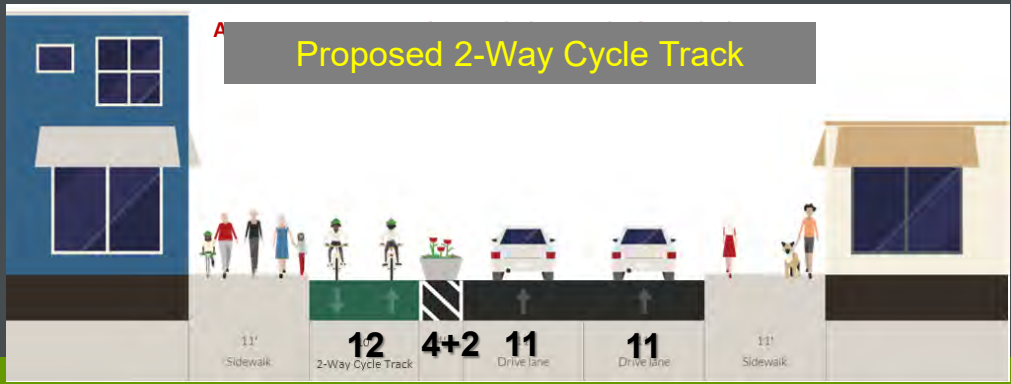
7th Street


EXISTING


ALTERNATIVE A – TWO-WAY CYCLE TRACK ON EAST SIDE


ALTERNATIVE B – TWO-WAY CYCLE TRACK ON WEST SIDE


Existing
11'
Sidewalk
12
12
12
4
11'
Sidewalk

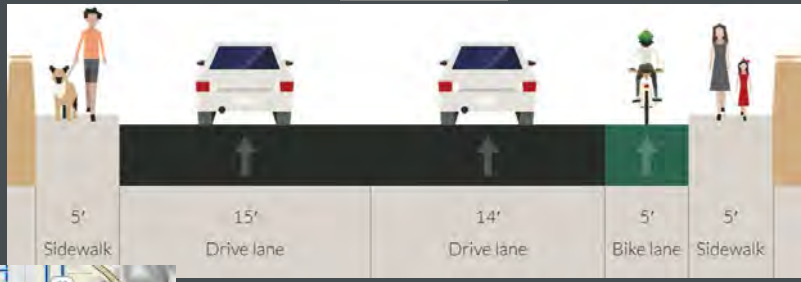

Proposed 2-Way Cycle Track
11'
Sidewalk
12
2-Way Cycle Track
4+2
11
Drive lane
11
Drive lane
11'
Sidewalk

Seattle – 2nd Avenue 2-way Cycle Track

7th Street Bridge

7th St

Existing

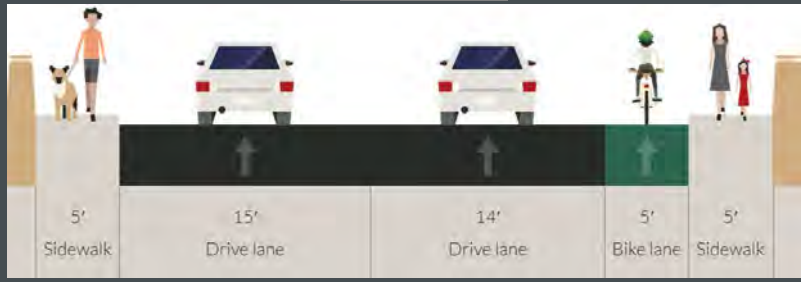


ALTERNATIVE – SHARED USE PATH

7th Street Bridge

7th St

Existing



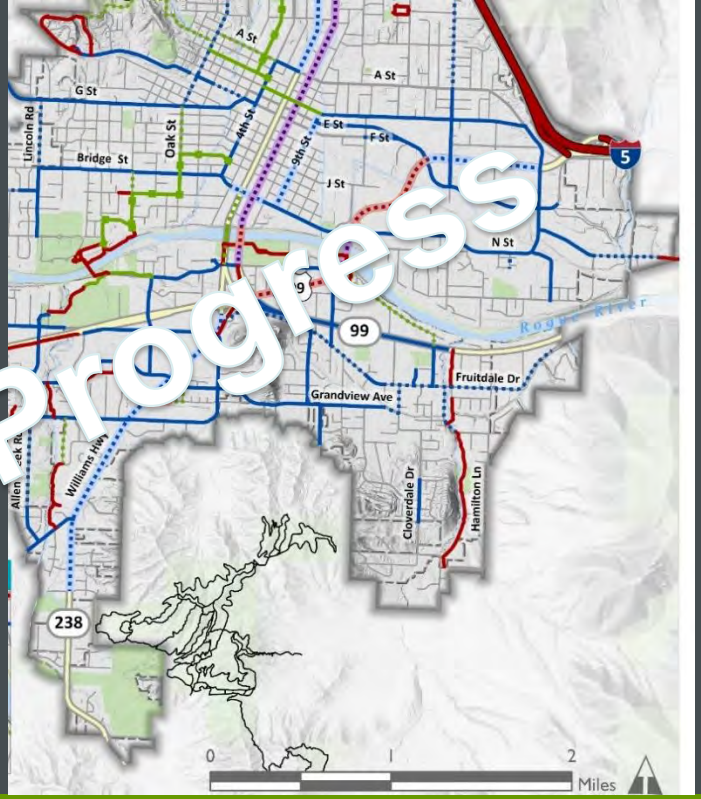
Proposed Shared-Use Path

Draft Bicycle & Pedestrian Network Plan

Legend

Bicycle Facilities
- Striped Bike Lane
- Bike Boulevard
- Shared Lanes
- Shared Use Path
- Mountain Bike Trails

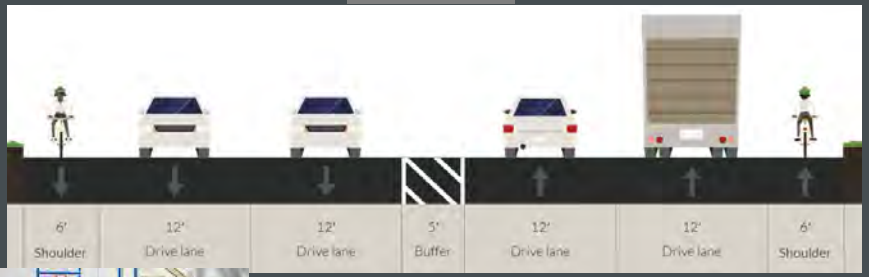
Future Connections
- Bike Lane
- Bike Boulevard or Shared Lanes
- Shared Use Path
- Buffered Bike Lane
- Two-Way Cycle Track

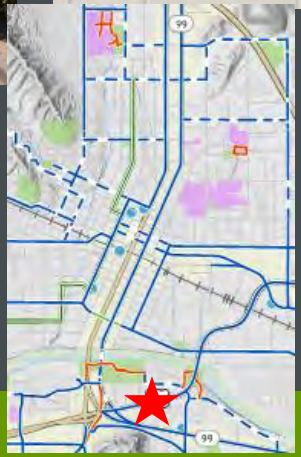


Work-In-Progress

US 199: Y Junction – Park St

Existing

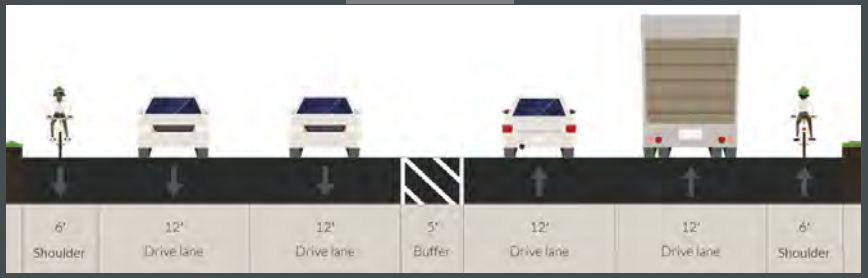




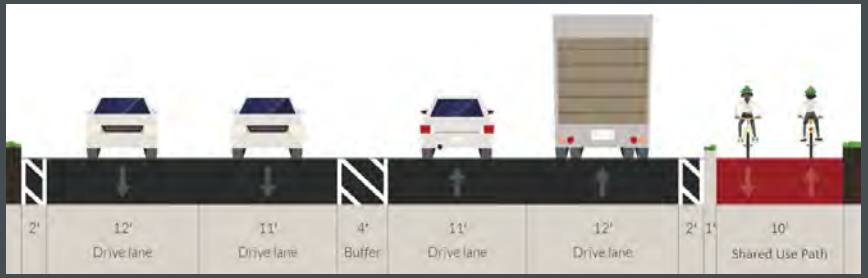
ALTERNATIVE – SHARED USE PATH

US 199: Y Junction – Park St

Existing

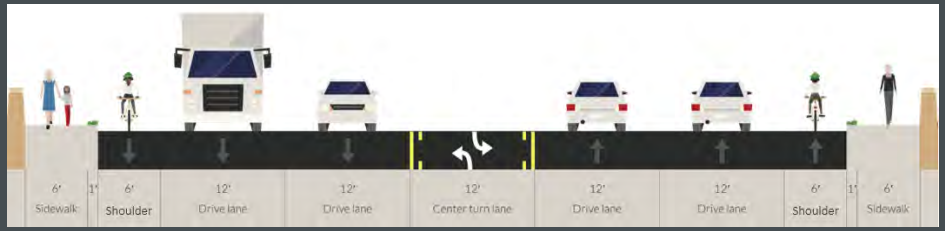


Proposed Shared-Use Path



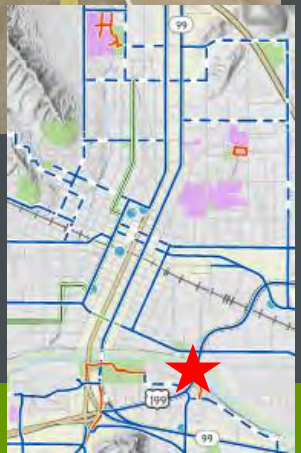
US 199: Rogue River BR

Existing

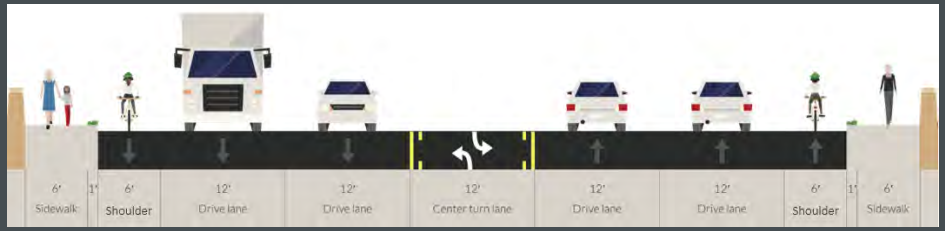


ALTERNATIVE – TWO-WAY CYCLE TRACK

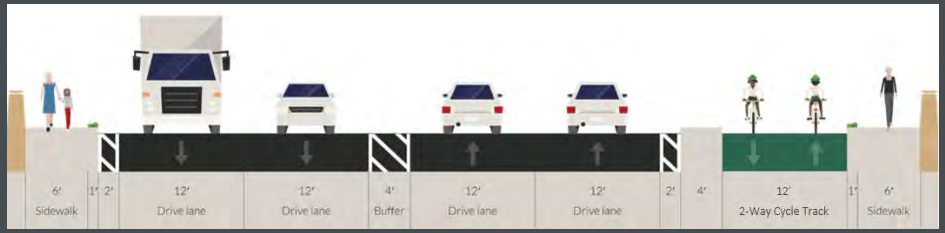
US 199: Rogue River BR



Existing

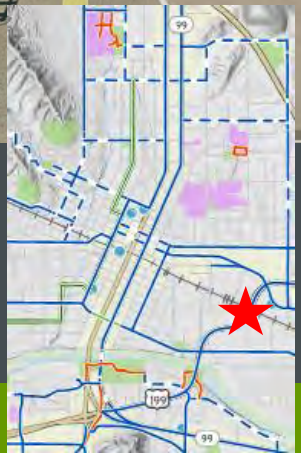


Proposed 2-Way Cycle Track



US 199: Railroad Overpass

Existing

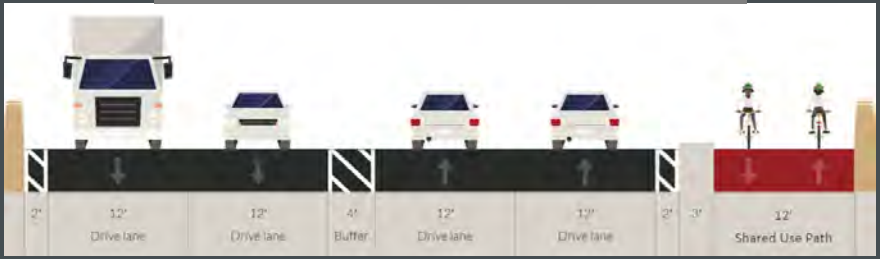


ALTERNATIVE – SHARED USE PATH

US 199: Railroad Overpass

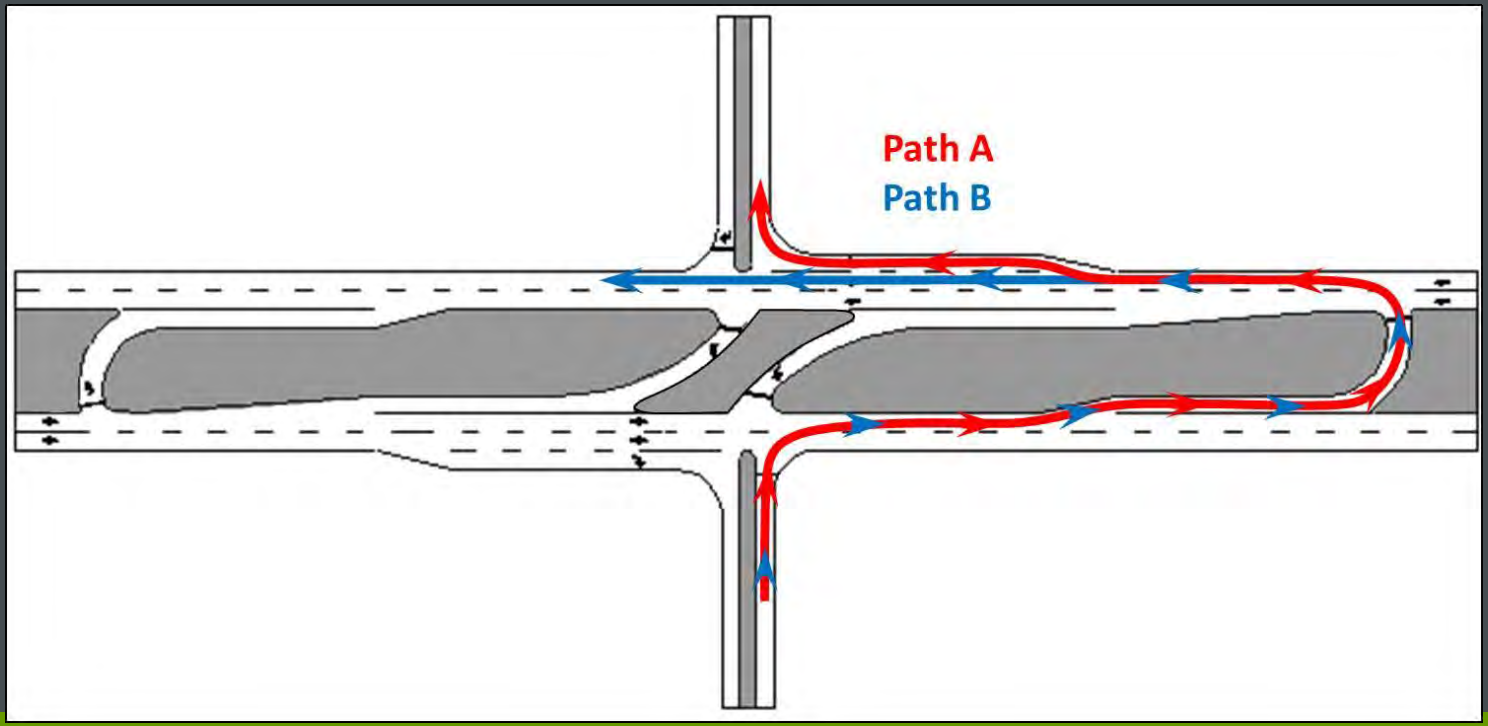
Existing

Proposed Shared-Use Path

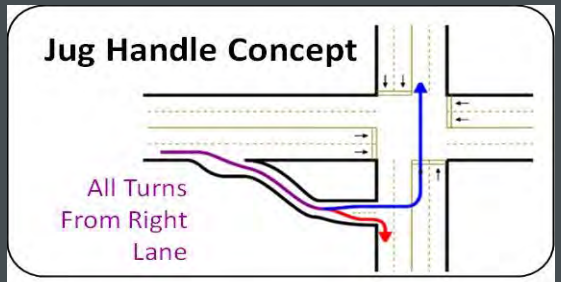


Arterial Junction Options (supplemental slides)

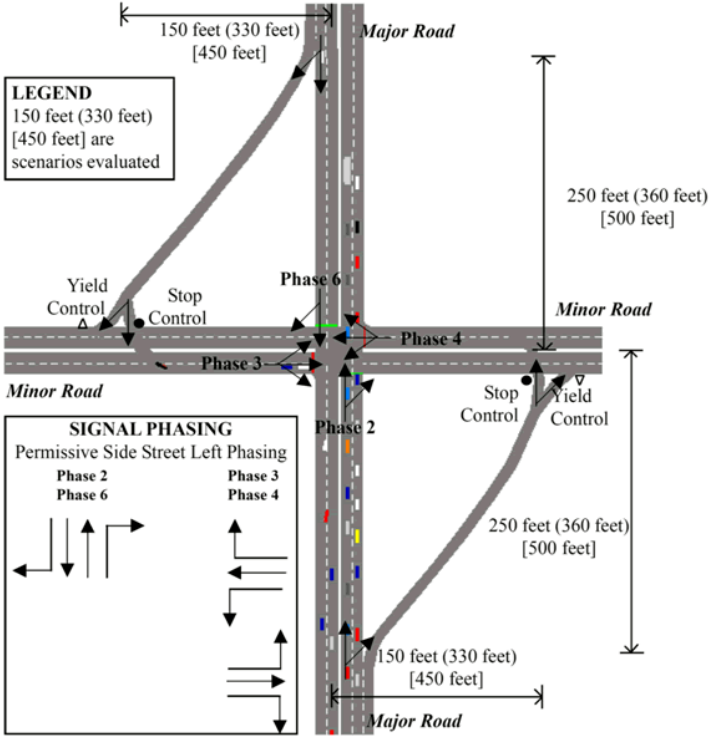
Restricted U-Turn Junctions



J-Turn Junctions



The Jug Handle concept removes all turn movements from the major highway and shifts them to the cross-street via a right-turn lane.



FORWARD/FORWARD JUGHANDLE INTERSECTION