



Business-Friendly

Safe

Green

Healthy

Complete Streets Toolbox

Clarksville, IN

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Complete Streets

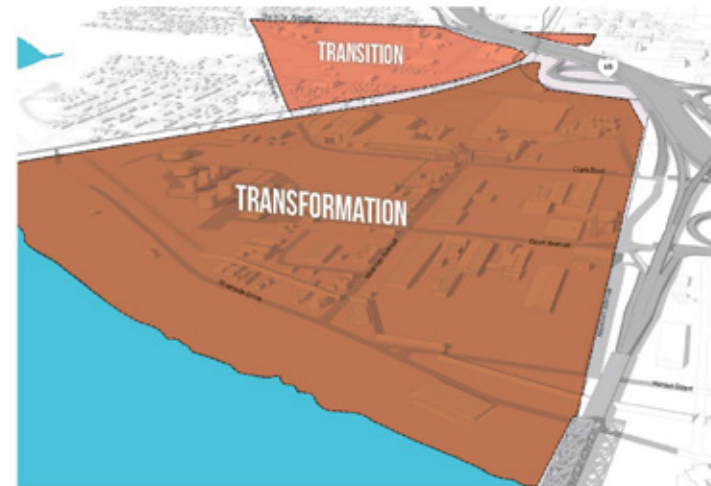
Streets play an omnipresent role in our daily lives. We use streets to get to work or school, to access healthcare and other critical destinations, and as spaces to interact with our neighbors and community. At their most basic level, streets need to be passable for everyone- meaning that no matter your physical ability or what neighborhood you live in, you should be able to travel along and across every street.

Complete streets push beyond the bottom rung of the hierarchy of street needs (see graphic on the bottom right) and aim to allow users of all ages and abilities to safely use all streets and to deliver convenient, comfortable journeys for people driving, walking, biking, and using public transit.

While all complete streets have similar goals, there is no list of required features complete streets must include. According to the National Complete Streets Coalition, though, complete streets projects often include: wider and improved sidewalks, bike lanes, crosswalks and pedestrian refuge islands, landscaping and street trees, and upgraded transit shelters.

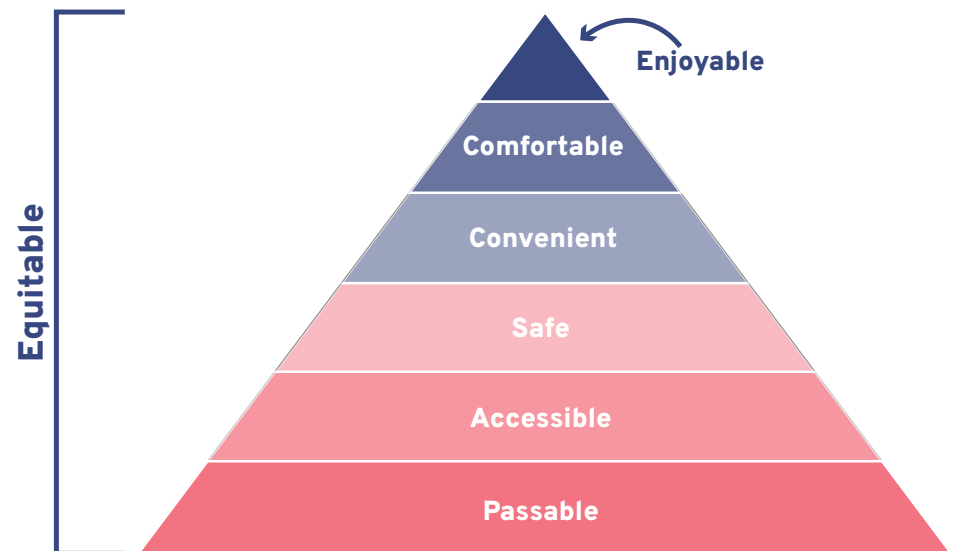
The Complete Streets Toolbox provides guidance on how to choose between the many street design tools that are available today. The Toolbox was developed for use within the “transition area” of the South Clarksville Redevelopment Area but can be applied and used as a resource for the entire Town. Each tool includes an explanatory description, benefits, application guidance, and estimates of costs and time to completion. The Toolbox is divided into four sections detailing general street design tools and strategies, tools for pedestrians, tools for transit, and tools for bicyclists. It also includes several example street cross sections that illustrate how the individual tools can be combined to create a more complete street.

Map of the South Clarksville Redevelopment Area

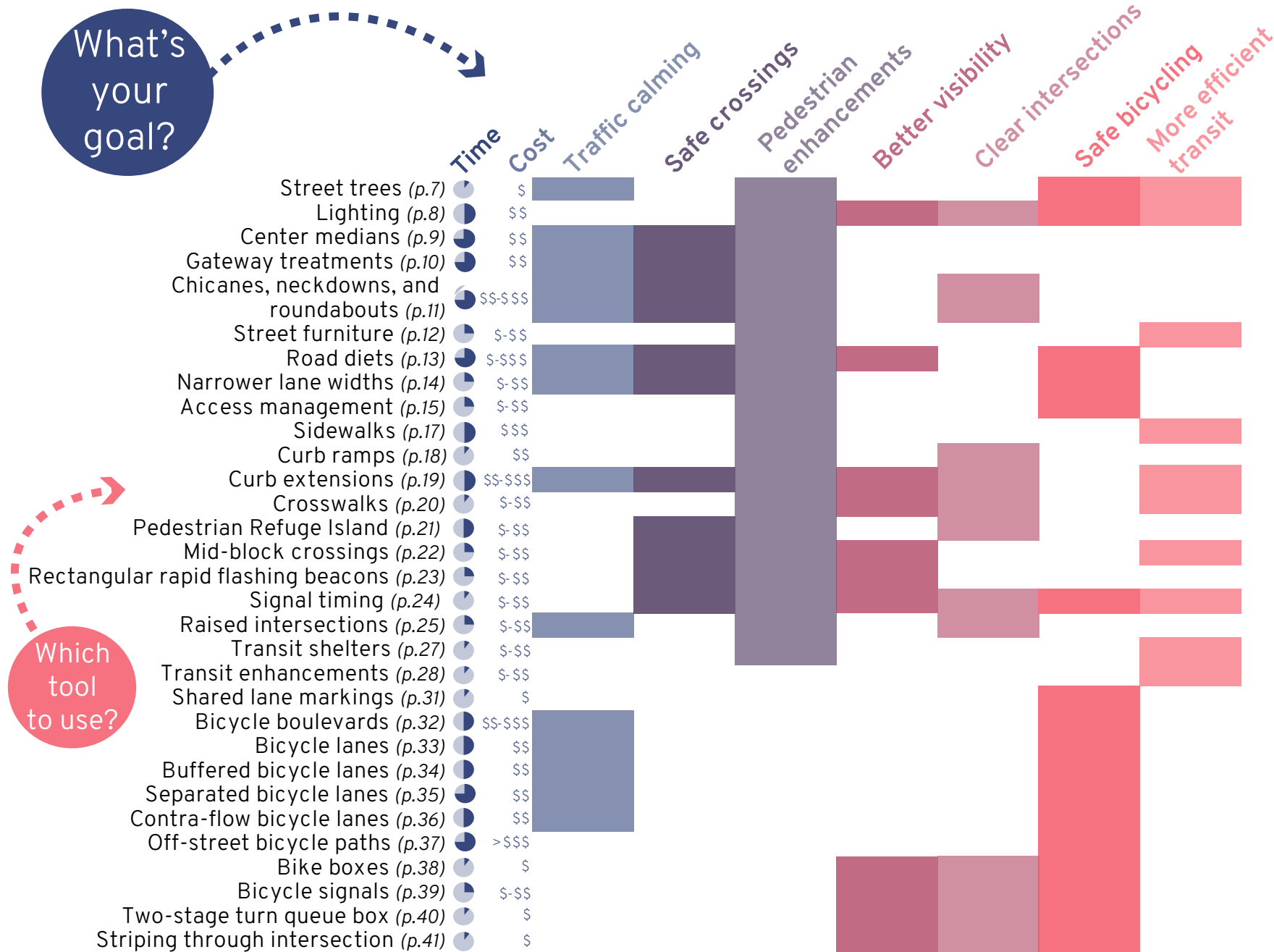


The transition area is bounded by the L&I railroad, Stansifer Ave., and S. Clark Blvd.

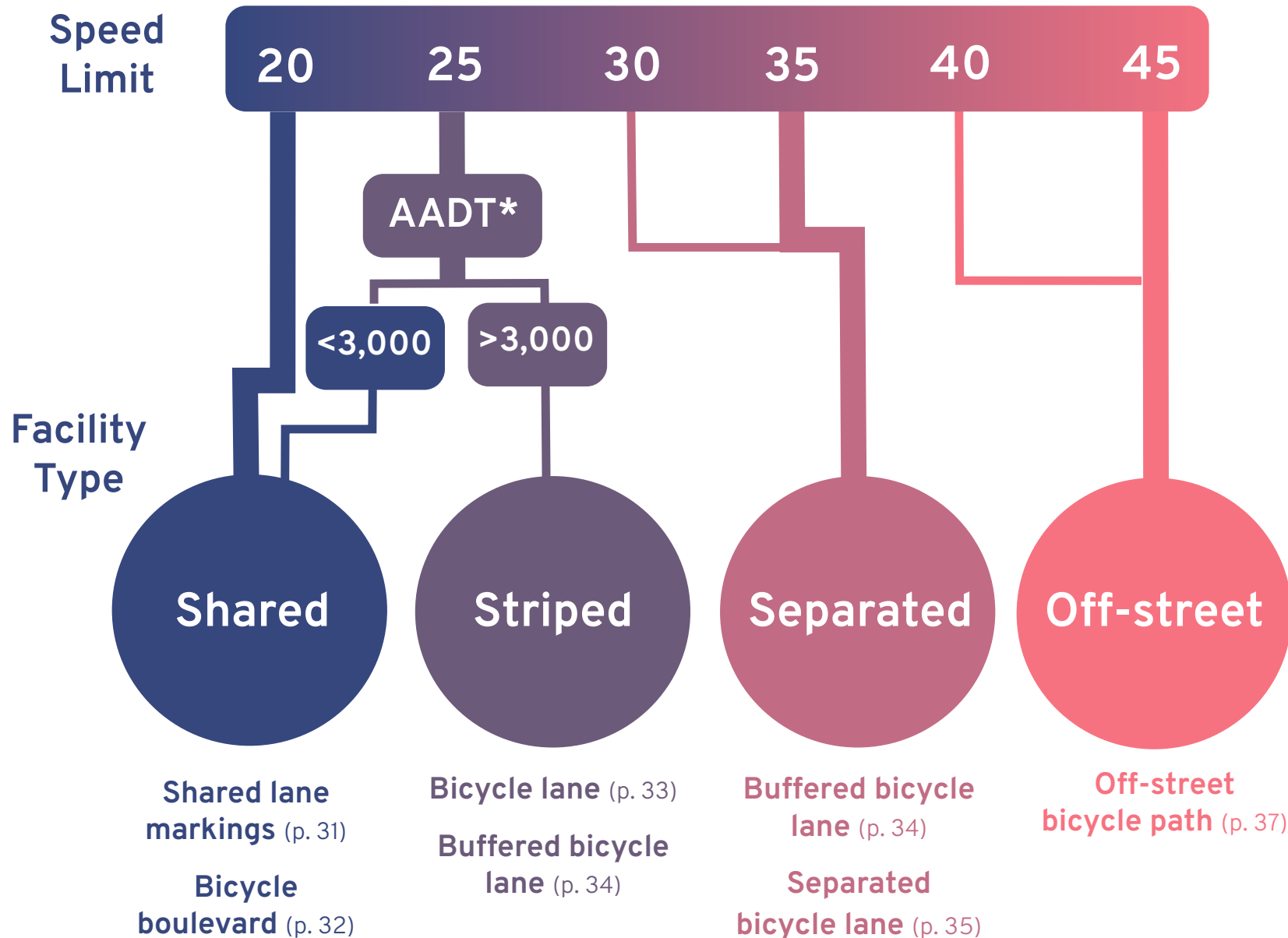
Hierarchy of Street Needs



Selecting the Right Tools



Bicycle Facility Guidance



* Average annual daily traffic

** Criteria are adapted from the National Association of City Transportation Officials' Contextual Guidance for All Ages and Abilities Bikeways.

General
Street Design
Tools + Strategies

Street Trees ●●●●

Street trees located between the sidewalk and street are a cost-effective way to enhance aesthetics and improve environmental quality while creating a safer and accessible corridor. Street trees buffer pedestrians from the vehicular traffic and calm traffic by visually narrowing the roadway.

Benefits

- Buffer and protect the sidewalk from the roadway traffic.
- Calm traffic by visually narrowing the roadway.
- In addition to the safety benefits, street trees offer many economic, social and environmental benefits by offering opportunities for urban wildlife habitats, cooling the urban environment, reducing storm water runoff, improve air quality and increasing pavement life by avoiding extreme heat.

Time: Short

Cost: \$

Application

- Proper width between the curb and sidewalk is required for planting street trees or heaving or cracked sidewalks may result.
- Trees should be limbed properly and setback from intersections and crossings to maintain proper sight lines.
- Street tree species, form and aesthetic qualities should be determined based on characteristics of the road including cross section, usage, etc. and must meet all town guidelines.
- Planting of street trees requires the removal of portions of sidewalk, the digging and preparation of a tree pit and on-going watering and maintenance until the tree is established (generally 1- 2 years).



Lighting ●●●●●

Lighting is a key element of the visual environment that allows pedestrians to move about safely and feel more secure after sundown. Well-lit sidewalks and roadways allow drivers to see pedestrians entering the roadway and allow pedestrians to avoid tripping hazards or other sidewalk elements.

Benefits

- Increases visibility of pedestrians.
- Reduces conflicts between bicycles/cars and pedestrians.
- Reduces tripping hazards.

Time: Medium

Cost: \$\$

Application

- There are two types of lighting that may be used to illuminate the roadways: Pedestrian-Scale Lighting (12 foot - 16 foot height); and Roadway Lighting (20 foot - 26 foot height).
- Proper light levels vary depending on road typology and usage. For example, areas with high pedestrian traffic, such as commercial corridors, may require pedestrian-scale lighting in addition to standard roadway lighting.
- Light levels of adjacent properties are a contributing factor, as light from these properties may supplement the sidewalk lighting.
- The means, methods, and level of difficulty involved with installing existing lighting varies greatly depending on existing site conditions, such as availability of electricity, existing poles and footings, light level requirements, etc.



Center Medians ●●●

Center medians are used to separate opposing lanes of traffic along wide roadways. Medians can be used to deter mid-block crossing or jaywalking and may also be used to calm traffic by visually reducing the road width, especially if they contain trees and/or landscaping.

Benefits

- Calm traffic along excessively wide roadways.
- If median is landscaped, can provide similar benefits to street trees, such as opportunities for urban wildlife habitats, cooling the urban environment, reducing storm water runoff, improve air quality and increasing pavement life by avoiding extreme heat.

Application

- Medians are constructed in the center of the roadway and consist of a curbed edge and either paved or landscaped center area. Additional elements that may be designed into the median include street lighting, landscape materials, raised planters or fencing.
- Unlike highway medians, medians installed within the town should be designed to visually narrow the roadway and calm traffic. If not properly designed, medians may inadvertently result in increased travel speeds.
- Medians may interfere with emergency vehicle access.
- Landscaped medians require long-term maintenance.

Time: Medium - Long

Cost: \$\$



Gateway Treatments ●●●

Gateway treatments are often used to calm traffic when drivers are transitioning from a higher-speed roadway into a more pedestrian-oriented residential neighborhood or center. They typically involve a decorative sign, landscaping and lighting.

Benefits

- Notifies drivers that they are entering a neighborhood and should expect pedestrians to be using the street.
- Calms traffic at neighborhood entry and transitional points.
- Defines transitions to low speed, shared streets and pedestrian-friendly areas.

Time: Medium - Long

Cost: \$\$

Application

- Gateways should be identified by the community and designed to express the character of the community.
- Gateway designs vary greatly and may incorporate curb extensions, center medians, vertical speed control elements and other tools identified in this manual.



Chicanes, Neckdowns, and Roundabouts ●●●●

Chicanes, neck-downs, and roundabouts are modifications made to the curb line, lanes, or traffic flow intended to slow, redirect or block vehicular through-traffic. They are useful tools for deterring speeding and cut-through traffic, particularly on local residential streets.

Benefits

- Reduce cut-through traffic on neighborhood streets.
- Reinforce speed limit.
- Enhance safety at intersections.

Time: Medium - Long

Cost: \$\$ - \$\$\$

Application

- These improvements have impacts on traffic circulation and therefore traffic volumes and emergency access requirements should be considered.
- Installing these improvements may impact roadway drainage.
- These elements may be installed either permanently or temporarily. Permanent installation requires the construction of concrete curb and a combination of landscape and hardscape materials. Extent of implementation depends on the site specific requirements.



Street Furniture ●●

Street furniture such as benches, garbage and recycling cans, bicycle racks, and others can be located in the furniture zone between the sidewalk and street.

Benefits

- Improve walkability by providing comfortable places to sit and rest and add to the visual interest of the street.
- Helps create a more welcoming pedestrian environment for people of all ages and abilities.

Application

- Street furniture should generally be setback at least 2' from the curb while still providing a suitable clear portion of the sidewalk for pedestrians (minimum 4').
- Street furniture that is accessible, comfortable, well-maintained, and located in the right places is critical to successful placemaking.
- Maintenance of street furniture will help contribute to an attractive public realm.

Time: Short - Medium

Cost: \$ - \$\$



Road Diets ●●●●●

Road diets, also known as a road reconfiguration, refer to a reduction in the amount of space allocated to motor vehicles on a street by eliminating travel lanes or reducing lane widths. This reduction allows the roadway space to be reallocated for other uses such as bike lanes, pedestrian crossing islands, or sidewalks.

Benefits

- Enhance safety for all road users by improving speed limit compliance and calming traffic.
- Create more and higher-quality space for other uses, such as pedestrians, bicyclists, or transit facilities.
- Reduce distance pedestrians must walk to cross the street, which reduces exposure to vehicles.

Time: Medium - Long

Cost: \$ - \$\$\$

Application

- While road diets may have traffic implications, they do not necessarily increase travel times for people driving and can actually increase lane capacity at certain volume thresholds. In many cases, a traffic study is required in order to fully understand the feasibility and potential impacts.
- The most common type of road diet is a 4:3 conversion, which reduces the number of travel lanes from four to two and adds a two-way left-turn lane. Introducing a turn lane reduces the speed differential between cars and eliminates conflict points that cause most crashes.



Narrower Lane Widths ●●●●

Travel lanes are striped to define the intended path of travel for vehicles along a street. Narrower lane widths (e.g., 10') reduce speeding and improve safety without impacting a street's capacity or traffic flow.

Benefits

- Reduce speeding and can, therefore, decrease the number and severity of traffic crashes.
- Reduce distance pedestrians must walk to cross the street, which reduces exposure to vehicles.
- Create more and higher-quality space for other uses, such as pedestrians, bicyclists, or transit facilities.

Time: Short - Medium

Cost: \$ - \$\$

Application

- In most urban settings, 10' lanes can be implemented without impacting the flow of vehicle traffic.
- Narrower lane widths may not be suitable on streets that carry large numbers of trucks or buses or are primary routes for emergency vehicles responding to incidents.



Access Management ●●

Access management policies should provide access to land development while striving to limit driveways and curb cuts on major streets and encourage shared access points and connections between adjacent parcels.

Benefits

- Reducing the number of curb cuts along a street eliminates conflicts between vehicles and people walking.
- Reducing curb cuts is usually good for business as it increases the efficiency of parking, reduces crashes and conflict points, and reduces stress on customers and motorists.
- Access management policies maintain capacity on surrounding streets while ensuring safe and convenient access to parcels of land.

Time: Short - Medium

Cost: \$ - \$\$

Application

- Cities can require driveway permit applications and establish where new access should be allowed.
- Closing, consolidating, or improving existing driveways are all elements of access management.



Street Design
Tools for
Pedestrians

Sidewalks ●●

Sidewalks provide safe and accessible pedestrian circulation throughout the town. Proper sidewalk widths vary depending on the roadway type, usage, location, and land use, among other factors. The Federal Highway Administration recommends at least 5 feet of unobstructed sidewalk width. If there is enough room, a planted buffer between pedestrians and vehicles can enhance safety and comfort.

Benefits

- Minimize conflicts between pedestrians and cars.
- Reduce traffic crashes involving pedestrians.
- Properly designed sidewalks offer a number of social, economic and environmental benefits by promoting walking and public transit as a transportation mode.
- Sidewalks can improve the shopping experience in retail corridors and enhance the sense of community by encouraging social interaction.

Application

- Throughway, buffer zones, and frontage widths will vary based on the road typology and surrounding land use.
- Compliance with the most current Americans with Disabilities Act Accessibility Guidelines (ADAAG) as well as the Public Rights-of-Way Accessibility Guidelines (RRWAG) is essential.
- Installing or widening sidewalks often requires relocating curbs and drainage as well as re-striping.

Time: Medium

Cost: \$\$\$



Curb Ramps ●●

Curb ramps are the sloping element of the sidewalk that transitions pedestrians from the sidewalk elevation to the roadway elevation. This transition allows for safe crossing and ADA-compliant accessibility.

Benefits

- Provide accessible crossing for pedestrians of all ages and abilities.
- Minimize the need for pedestrians in wheel chairs or pushing strollers to walk in the street.

Time: Short

Cost: \$\$

Application

- All pedestrian crossing areas (corners and mid-block) should be equipped with curb ramps.
- All curb ramps must be installed in compliance with ADAAG and PROWAG standards.



Curb Extensions

A curb extension, or bump-out, is an area of sidewalk that is widened into the parking lane to reduce crossing distances, slow turning vehicles, and improve pedestrian visibility.

Benefits

- Reduce distance pedestrians must walk to cross the street, which reduces exposure to vehicles.
- Increase pedestrian visibility at intersections.
- Reduce turning speed, giving priority to pedestrian crossings.
- Newly created space can act as a gathering space, waiting zone, or landscaped area for green infrastructure.

Time: Medium

Cost: \$\$ - \$\$\$

Application

- Installation of curb extensions may reduce the number of on-street parking spaces.
- The site should be reviewed to determine any interference with fire hydrants, snow plows, street sweepers, deliveries, bus stops, etc.
- Depending on the slope of the sidewalk, roadway and road crown, curb extensions may impact roadway and sidewalk drainage. Particular care should be taken to avoid pooling.
- Curb extensions require the installation of new curbing, sidewalks and, in some cases, drainage infrastructure.
- Temporary curb extensions can be implemented using roadway paint and flexible delineators or cones.



Crosswalks ●●●●

Crosswalks are used to clearly identify where pedestrians should cross the road. Crosswalks are differentiated from other areas of the roadway by a change in the surface to designate the pedestrian right-of-way.

Benefits

- Alert drivers to the presence of pedestrians in the roadway.
- Notify pedestrians of the designated areas to cross the roadway.
- Reduce the incidence of traffic crashes involving pedestrians.

Time: Short

Cost: \$ - \$\$

Application

- Crosswalks should be located based on the desired walking paths of pedestrians. Crosswalks will typically be located at corners and intersections, but mid-block crosswalks should be provided at major pedestrian generators (e.g., bus stops, schools, commercial centers).
- Crosswalks should be aligned perpendicular to the roadway to provide the shortest possible crossing distance.



Pedestrian Refuge Islands ●●●

A pedestrian safety island is a segment of roadway median that is used as a refuge for pedestrians that are crossing the road. Pedestrian refuge islands can be used whenever people walking need to cross more than one lane of traffic going in a single direction, at transit stops, or on wide streets.

Benefits

- Reduce distance pedestrians must walk to cross the street, which reduces exposure to vehicles.
- Reduces the complexity of crossing multiple lanes of traffic by allowing pedestrians to cross one direction of traffic at a time if needed.
- Provides protection to pedestrian from turning cars.
- Reduces speed of on-coming as well as turning vehicles.

Time: Medium

Cost: \$ - \$\$

Application

- Pedestrian refuge islands require the installation of a curbed island, flush sidewalk zone, tactile paver and bollards. Size and materials may vary greatly depending on location.
- Constructing pedestrian refuge islands may require decreasing the width or number of travel lanes and can impact emergency vehicle access.



Mid-Block Crossings ●●●●

Mid-block crossings are often installed in areas with heavy pedestrian traffic to provide more frequent crossing opportunities. They may also be added near major pedestrian destinations, such as schools, where people might otherwise cross at unmarked locations.

Benefits

- Provide additional opportunities for pedestrians to cross the street.

Time: Short - Medium

Application

- Additional pedestrian safety measures such as advanced warning signs, raised crosswalks and curb extensions should be considered at mid-block crossings.
- Stop lines at mid-block crossings should be set back a minimum of 20 feet from the crossing.

Cost: \$ - \$\$



Rectangular Rapid Flashing Beacons ●●●

Rectangular rapid flashing beacons (RRFB) are yield-to-pedestrian-signals that can have sensors or be wirelessly synchronized to alert drivers when a pedestrian is entering the crosswalk. RRFBs are usually placed at mid-block crossings or on neighborhood main streets where an additional level of pedestrian safety is required.

Benefits

- Visually alerts drivers when pedestrians are entering the crosswalk.
- Extra nighttime and high-fog visibility.
- Ideal for uncontrolled crossings locations like midblock crossings.

Time: Short - Medium

Cost: \$ - \$\$

Application

- RRFBs have to be installed in pairs with one on each side of the roadway. If a median or Pedestrian Safety Island is used, then three RRFBs may be needed.



Signal Timing ●●●●●

Signal timing such as leading pedestrian intervals (LPI), lagging left turns, and protected turning phases are used to give pedestrians priority at intersections and temporarily separate pedestrian and vehicles at crossings. Crossing speeds of pedestrians should also be considered when retiming traffic signals.

Benefits

- Reduce overall pedestrian wait times and exposure at intersections.
- LPIs allow pedestrian to begin crossing 3-6 seconds before vehicles traveling in the same direction are given the green light.
- Decrease conflicts between pedestrians and vehicles by improving visibility.

Time: Short

Cost: \$ - \$\$

Application

- Short cycle lengths of 60 - 90 seconds are ideal for urban areas.
- Crossing time should be site specific. Longer crossing times should be considered in areas with higher populations of elderly residents and children.
- The Federal Highway Administration suggest that crossing time should be calculated based on a walking speed no more than 1.065 m/s (3.5 ft/s).



Raised Intersections ●●●

Raised intersections create a safe, slow-speed crossing and public space at intersections with low to moderate traffic volumes. Similar to speed humps and other vertical speed control elements, they reinforce slow speeds and encourage motorists to yield to pedestrians at the crosswalk.

Benefits

- Reduce vehicle travel speeds
- Raised intersections improve pedestrian safety, facilitate crossing by the disabled and elderly and increase pedestrian visibility.
- Can serve as a form of a gateway treatment at or near the entrance to a development, shopping area or other attraction.

Time: Short - Medium

Cost: \$ - \$\$

Application

- Raised intersections should be constructed level with the sidewalk.
- Crosswalks do not need to be marked at raised intersections unless they are not at grade with the sidewalk. ADA-compliant ramps and detector strips are always required.
- Bollards or other physical separation at corners keep motorists from crossing into the pedestrian space and protect pedestrians from vehicles.



Street Design
Tools for
Transit

Transit Shelters ●●

Transit shelters are located in the streets' furniture zone and provide a protected place for people to sit and wait for the bus.

Benefits

- Provide seating and protection from the elements for people waiting for the bus.
- Space to provide information to riders on the transit system and schedule.
- Can generate revenue through advertising.

Time: Short

Cost: \$ - \$\$

Application

- Transit shelters should be provided at all stops with moderate to high boardings, as well as at transfer points, stops in weather-exposed locations, and stops with a prevalence of children and/or older adults.
- Ensure transit shelters are well-lit and people waiting are easily visible.
- Transit shelters should include street furniture (particularly garbage cans) and need to be cleaned and maintained.
- Shelters are typically oriented open towards the street but other configurations are possible.
- Shelters are typically 4' deep and must provide a minimum 2.5- by 4-foot clear space for wheelchair users located entirely within the shelter space.



Transit Enhancements ●

Transit enhancements such as bus-only lanes, queue jumps, and transit signal priority can all be used to improve transit service and customer experience.

Benefits

- All of the tools mentioned above can reduce travel times for buses and increase on-time performance.
- These tools can also reduce conflicts between buses and vehicles and improve traffic flow for the street as a whole.

Time: Short

Cost: \$ - \$\$

Application

- Transit enhancements should be prioritized on corridors where transit is delayed by congestion and curbside activities.
- Deciding where to implement transit enhancements should be based existing and future transit volume and demand, and the potential to reduce total person delay for the corridor.
- The reliability of transit travel times can be a good indicator of the potential benefit of transit enhancements.
- Markings, signage, and enforcement are necessary to ensure transit enhancements function at their highest level.





FARE PAID ZONE
BEYOND THIS POINT

Markham Stouffville
5225

VIVA VIVA VIVA VIVA VIVA

Street Design

Tools for

Bicyclists

Shared Lane Markings ●

A shared lane marking can be used to alert drivers to the presence of bicyclists, indicates proper riding position, and provide wayfinding but does not provide dedicated roadway space for bicycling.

Benefits

- Shared lane markings can be used where other limiting factors, such as roadway width, would not otherwise allow for a connection in the bicycle network. They require no additional street space.
- The use of shared lane markings, or “sharrows,” reinforces the legitimacy of bicyclists on the street and can recommend safer bicyclist positioning.
- Provide wayfinding guidance for people biking.

Time: Short

Cost: \$

Application

- Because they do not provide any protection or separation from vehicular traffic, bicycle shared lane markings provide a low level of comfort to bicyclists. Therefore, shared lane markings should only be used on streets with low speed limits and traffic volumes.
- Requires proper signage and pavement markings.
- If there is on-street parking, the shared lane marking should be placed at least 11' from the curb.



Bicycle Boulevard ●●

Bicycle boulevards are low-volume neighborhood streets designated and designed to give bicycle travel priority. Through the use of signs, pavement markings and speed and volume management measures, bicycle boulevards discourage vehicular through trips, creating a safe and comfortable bicycling environment.

Benefits

- Bicycle boulevards create quiet, low-speed streets that benefit residents as well as bicyclists.
- Calms vehicular traffic creating safe roads for all levels of user.
- Diverting vehicular traffic from the intended bicycle route as part of the bicycle boulevard design approach can create an exceptionally safe and low stress bicycling environment.

Application

- Bicycle boulevards provide a high level of comfort to all bicyclists because they are located on side streets.
- Because bicycle boulevards avoid main roads, where many destinations are, they are sometimes less convenient for bicyclists making local (versus through) trips.
- The time required to implement bicycle boulevards depends on which design elements are being used. Speed tables, traffic circles, chicanes and other volume management strategies can be capitolly-intensive and require partial reconstruction of the roadway.
- Costs range from moderate (i.e. bicycle boulevards implemented primarily through signs, markings and low-cost treatments like speed humps) to high (those involving significant construction work for traffic, diverters, and landscaping).

Time: Medium - Long

Cost: \$\$ - \$\$\$



Bicycle Lanes ●●

Bicycle lanes create a dedicated space for bicyclists to ride adjacent to traffic by designating a portion of the roadway for exclusive use by bicyclists using signs, striping, and pavement markings. Bicycle lanes are located in the street between the travel lane and the parking lane or curb.

Benefits

- Bicycle lanes provide dedicated space for bicyclists, increasing safety, comfort and mobility, especially on busy streets.
- Bicycle lanes allow bicyclists to ride at their own pace with minimal pressure or interference from automobile traffic.
- Bicycle lanes foster more predictable behavior and movements between bicyclists and motorists.
- Bicycle lanes, in conjunction with other bicycle infrastructure, encourages more bicycling, creating safety in numbers.

Time: Medium

Cost: \$\$

Application

- Standard bicycle lanes provide a low to moderate level of comfort. While they provide dedicated space for bicyclists, this space can be violated by motorists (for example through double-parking or swerving). On higher-speed streets or those with frequent curbside parking and loading activity, bicycle lanes do not provide a low-stress experience for the majority of bicyclists.
- Bicycle lanes require a change to the striping on a street. This may necessitate shifting (or eliminating) travel lanes to accommodate the bicycle lane, plus the addition of street signs alerting motorists to the presence of the lane.



Buffered Bicycle Lanes ●●

A buffered bicycle lane is a standard bicycle lane coupled with a striped buffer space separating the bicycle lane from the adjacent travel lane and/or parking lane, enhancing bicyclist comfort.

Benefits

- Buffered bicycle lanes provide greater clearance for bicyclists, allowing them to ride further outside the “door zone” and pass one another without encroaching on the vehicle travel lane.
- Buffered bicycle lanes provide similar benefits as standard bicycle lanes while appealing to a greater number and type of bicyclists.

Time: Medium

Cost: \$\$

Application

- Buffered bicycle lanes provide a moderate level of comfort to bicyclists. Less experienced riders may find them more attractive on higher-speed streets than standard bike lanes.
- Buffered bicycle lanes require a change to the striping on a street. This may necessitate shifting (or eliminating) travel lanes to accommodate the buffered bicycle lane, plus the addition of street signs alerting motorists to the presence of the lane.
- Costs include roadway markings and signage, and will be higher if it is part of a larger street reconfiguration (e.g. a road diet).



Separated Bicycle Lanes ●●

A separated bicycle lane, or cycle track, is physically separated from motor traffic using a variety of treatments such as on-street parking, raised curbs or medians, bollards, landscaping, planters, concrete barriers and/or distinctive paving.

Benefits

- The dedicated, separated space for bicyclists increases perceived comfort and safety (and, depending on the particular location and design, actual safety), making the facility more attractive to bicyclists of a wide range of abilities and ages.
- Physical separation all but eliminates the risk and fear of a collision with vehicles mid-block and decreases the risk of dooring.
- Physical separation prevents or reduces parking in the bicycle lane.

Application

- Separated bicycle lanes provide a moderate to high level of comfort to a wide range of bicyclists, particularly when the separation is a physical barrier.
- While separated bicycle lanes have the potential to provide a superior facility for bicyclists, there are many more design challenges that must be addressed in their implementation. In particular, special consideration must be given to the design at intersections, driveways and transit stops to manage conflicts, improve visibility and maximize awareness for both bicyclists and motorists.

Time: Medium

Cost: \$\$



Contra-Flow Bicycle Lanes ●●

A contra-flow bicycle lane allows bicyclists to ride in the opposite direction of vehicular traffic on what would otherwise be a one-way street. The contra-flow lane allows for shorter connections in the bicycle network that makes bicycling more convenient and, in some cases, safer.

Benefits

- Contra-flow bicycle lanes decrease trip distance and time by creating more direct links in the bicycle network, significantly enhancing bicyclist mobility and convenience.
- Decrease the incidence of bicyclists riding the wrong way on a street or on the sidewalk and provide connectivity for bicyclists traveling in both directions.

Time: Medium

Cost: \$\$

Application

- Contra-flow bicycle lanes can provide a moderate to high level of comfort depending on where they are sited (e.g. traffic speeds) and how they are designed (e.g. visibility, separation from motor vehicle traffic, intersection treatments).
- The impact of contra-flow bike lanes is greatest in sections of the street network dominated by one-way streets and large or disconnected blocks where bicyclists would have to go far out of their way to legally ride from one point to another.
- Contra-flow bicycle lanes should be used where alternate routes are unsafe, uncomfortable, or are unduly long; bicyclists are already riding the wrong way; a direct connection is made with a key destination; or a two-way connection between other bicycle facilities is needed.
- Because contra-flow bicyclists will be unexpected to motorists, careful consideration should be given to signage alerting motorists to their presence.



Off-Street Bicycle Paths ●

Off-street bicycle paths, such as shared use paths used by pedestrians and bicyclists, are completely separated from vehicular traffic, aside from intersection crossings.

Benefits

- The dedicated space for bicyclists increases comfort and safety, making the facility more attractive to bicyclists of a wide range of levels and ages.
- Isolation from vehicular traffic allows for low stress riding and eliminates the risk and fear of being hit by a door or colliding with a vehicle (apart from any intersections).
- Off-street bicycle paths provide an ideal environment to learn to ride a bike in the city or to teach children how to ride.
- Off-street bicycle paths provide recreational and exercise opportunities.

Application

- The planning, design and construction of off-street bicycle facilities can require capital construction work and consequently take a long time, especially when the facility is not being built on an existing right-of-way.
- If implemented as part of a larger street construction project, then off-street bicycle paths need only add a marginal cost. Costs could be significantly higher for a standalone project that requires major site preparation and construction work.

Time: Medium - Long

Cost: \$\$\$ - \$\$\$\$



Bike Boxes ●●●

Bike boxes are designated spaces for bicyclists between the stop bar and pedestrian crosswalk at signalized intersections. They allow bicyclists to queue in front of motor vehicles at red lights, either to position themselves to make a left turn or to improve their visibility when proceeding on a green light.

Benefits

- Provides designated space to increase the visibility of queued bicyclists for motorists waiting at red lights.
- Offers bicyclists the ability to enter the intersection in front of motor vehicles when the signal turns green, which improves visibility and reduces bicycle-vehicle conflicts at intersections.
- Formalizes bicyclist behavior at intersections and encourage bicyclists to move up and in front of stopped motor vehicle traffic to increase their visibility when navigating the intersection during the next green phase.
- Provides bicyclists with the opportunity to position for a left turn during red phases. On multi-lane streets, bike boxes that extend across all lanes up to the left turn lane allow left-turning bicyclists to queue in front of left-turning vehicles behind them.

Application

- Provides a moderate improvement to cyclist comfort by facilitating safer and more convenient maneuvers at intersections.
- Requires changes to street markings, including a potential shift in the location of an intersection's stop bar.

Time: Short

Cost: \$



Bicycle Signals ●●●

Bicycle signals provide a dedicated indicator for bicyclists proceeding through an intersection. They are used in conjunction with separated bicycle lanes to separate through bicycle phases from the motor vehicle turning phase. For example, for a separated bike lane on the right side of a street, a bike signal would be used to separate the bicycle through phase from the motor vehicle right turn phase.

Benefits

- Decrease intersection conflicts between bicyclists proceeding straight through an intersection and vehicles making turns across the bike lane.
- Through the use of leading bicycle intervals, bike signals can be timed to provide a green signal for cyclists before motor vehicles receive a green light. This allows bicyclists to enter the intersection earlier and increase their visibility to motorists navigating the intersection.
- Provide more clarity for all road users and provide motorists with a better understanding of bicycle movements to anticipate at intersections.

Application

- When used at appropriate locations, bike signals can provide a high level of comfort to bicyclists by providing clarity at intersections for riders of all skill levels. Novice bicyclists will see the most benefit from bike signals.
- Signal installation can be capital-intensive and may require the town to evaluate the effects of a new signal phase(s) on existing traffic volumes and flows.

Time: Short - Medium

Cost: \$ - \$\$



Two-Stage Turn Queue Box ●●●

Two-stage turn queue boxes allow bicyclists to make left turns across high-volume or multi-lane intersections from a right-side aligned bike lane (or right turns from a left-side aligned bike lane). A bicyclist uses the queue box as a staging area to divide a difficult turn into two distinct phases with fewer vehicle conflicts.

Benefits

- Formalizes a “pedestrian style” bicyclist turning movement, in which the bicyclist typically crosses a street with through traffic and then waits in the queue box for a signal change to proceed across the intersection with cross street traffic. The refuge area provides bicyclists with a safe location to wait to make the second portion of the maneuver out of the way of other through bicycle and vehicle traffic.
- Bicyclists performing a two-stage turn avoid higher-speed conflicts with vehicles using the intersection.
- Positions bicyclists in front of stopped vehicles at red lights on the second leg of the turning movement, providing the safety benefits associated with bike boxes.
- Provides clear visual cues for bicyclists and reduces uncertainty when navigating an intersection.

Time: Short

Cost: \$

Application

- Provides a high level of comfort to less experienced or more risk-averse bicyclists because “pedestrian style” two-stage turns generally require less skill than merging into moving traffic to perform “vehicle style” turns.
- Depending on the intersection configuration, convenience for motorists may be reduced, as a two-stage turn queue box is typically positioned in the path of vehicles seeking to make a right turn on red.



Striping Through the Intersection ●●●

Striping through an intersection guides bicyclists through an intended path. White dashed markings are typically used but can be supplemented by green paint to increase visibility and draw attention to potential conflicts. Similar striping can be applied at driveways and other curb cuts.

Benefits

- Provides a direct path for bicyclists and reduces their uncertainty about how to navigate the intersection. Predictable cycling behavior through an intersection reduces the risks of conflicts with motorists.
- Markings such as dotted lines and green paint are also intended to give motorists an increased awareness of where bicyclists may be positioned. They provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in adjacent lanes, and in doing so alert motorists to the potential presence of bicyclists in the intersection or other traffic conflict areas.
- Striping, especially with colored paint, may increase the likelihood of turning motorists yielding to through bicyclists.

Time: Short

Cost: \$

Application

- Intersections with striping provide a moderate level of comfort to bicyclists, contributing to a more comfortable experience than intersections with no markings at all. However, since the markings offer no physical protection, less experienced cyclists who are uncomfortable riding in mixed traffic may still choose to avoid certain busy intersections, regardless of markings.



Example Cross Sections

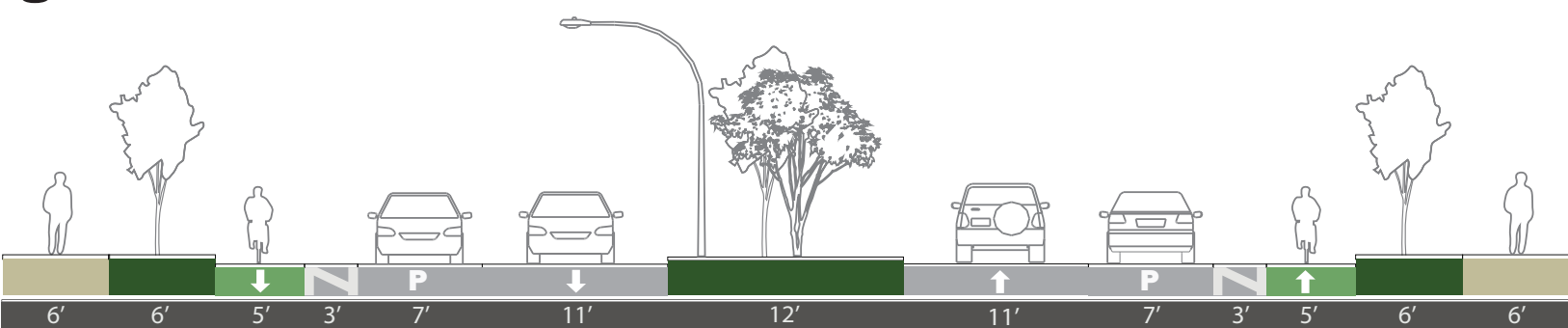
STANSIFER AVE - EXISTING

west-facing



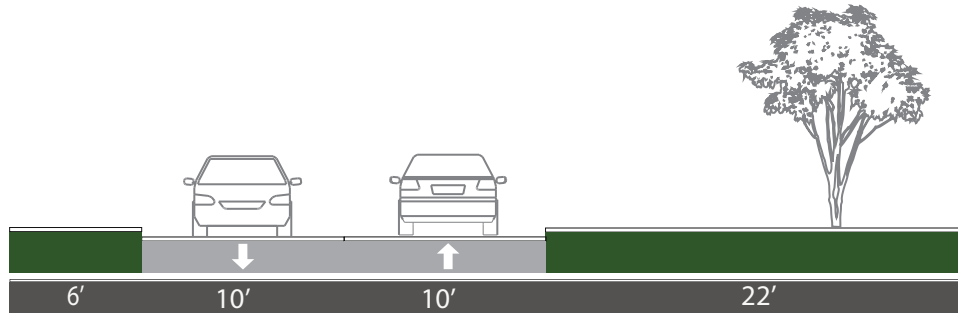
STANSIFER AVE - UPDATED

west-facing



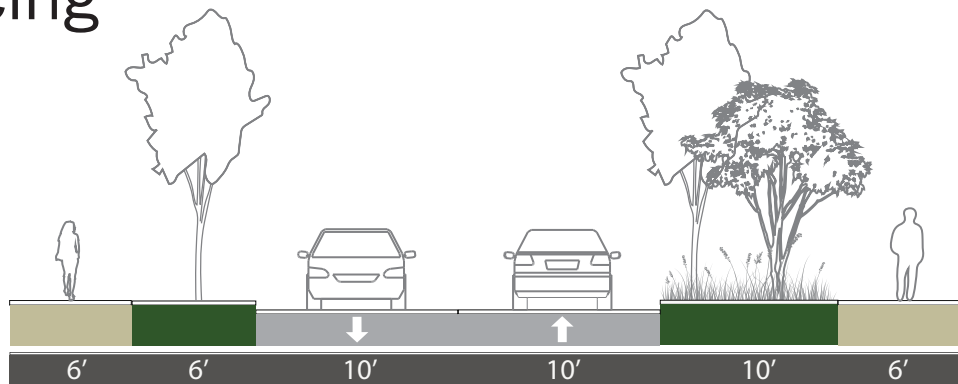
NEWMAN AVE - EXISTING

south-facing



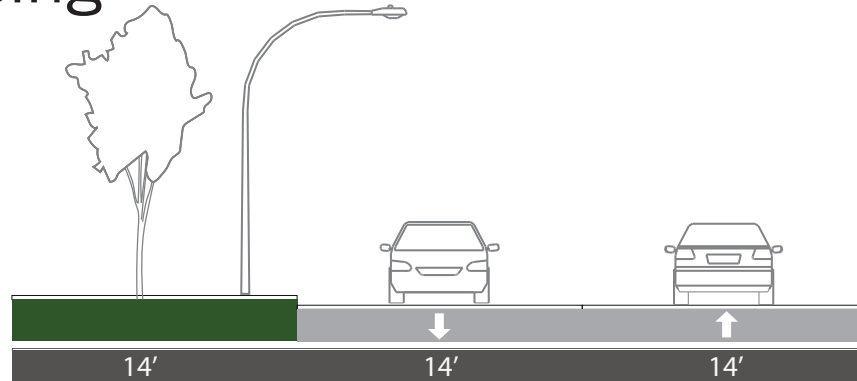
NEWMAN AVE - UPDATED

south-facing



MARRIOT DR - EXISTING

north-facing



MARRIOT DR - UPDATED

north-facing

