

# Pedestrian Toolkit

**DEVELOP A STREET DESIGN STANDARDS MANUAL TO REFLECT THE NEW STREET TYPOLOGIES THAT INCORPORATE THE CONCEPT OF COMPLETE STREETS.**

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The purpose of this Design Treatment Toolkit is to provide options for reconfiguring streets or portions thereof, to enhance pedestrian accessibility. The toolkit provides the foundation for a street design manual while providing planners, designers and engineers the flexibility to apply different treatments in the appropriate context. The toolkit and

the accompanying Local Pedestrian Infrastructure Tour empowers communities to create safe walking routes to parks, schools, food stores and local businesses in their neighborhoods. The toolkit presents potential solutions for different concerns, be it safety, expanding open space or otherwise.

## Street Design Components

### SAFE

The treatment enhances pedestrian safety by slowing traffic speeds, reducing pedestrian exposure to traffic or enhancing visibility.



### ACCESSIBLE

The treatment enhances accessibility for those with limited mobility by reducing obstructions and easing distances travelled.



### LIVABLE

The treatment improves the conditions for living and walking along the street by providing shade, reducing visual, noise and light impacts from traffic.



### ENVIRONMENT

The treatment reduces air pollution and urban heat island, manages stormwater or creates habitat for native wildlife.



### ECONOMICS

The treatment supports the local economy by improving visibility and access to businesses, and creating stronger collective brand identity.



THE BUTTONS ON THE OVERVIEW PAGE IDENTIFY THE PRINCIPLES THAT EACH TREATMENT MOST DIRECTLY ADDRESS & SPECIFIC CONSIDERATIONS.



The toolkit does not propose where infrastructure enhancements shall go but instead provides a context for local communities to work with city officials to help improve the pedestrian environment.

### HOW TO USE IT

This Pedestrian Toolkit presents and explains potential options to community members, city officials and consultants seeking to calm traffic and make streets better for pedestrians. The majority of the treatments within this chapter are based on the PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System, 2013, published by the Federal Highway Administration. For purposes of community usability, condensed descriptions for most of the treatments are provided by Active Streets LA, developed by the Los Angeles County Bike Coalition.

This design toolkit intends to provide a common language for City Officials, consultants and community members when trying to determine ways to reconfigure streets for pedestrians. Not all of these design treatments are suitable for every street, each design treatment description includes potential streets and intersections for installation. The criteria sets a baseline, and each street design project needs to carefully consider the surrounding context to determine what treatments are most appropriate. If treatments are deemed appropriate and effective for a particular location, they still need to be crafted to fit properly within that urban context.

**FORMAT**

Each of the Design Treatments are presented in a similar format for ease of presentation. The spread is divided into an overview page and technical explanation page, each designed to be oriented to different types of audiences though presented uniformly. Translated copies of the overview pages of each design treatment are also available in the Appendix. There is also a deck of cards with scaled plans of each treatment for use by communities when planning street projects.

**TREATMENT OVERVIEW**

The overview page consists of an image of the treatment in a familiar context, in Long Beach or surrounding community which allows for firsthand experiences of the application. The dashboard identifies which of the principles each treatment specifically

serve as well as specific budgetary considerations around maintenance and construction costs. There is a short description of the treatment and an image focusing on primary elements of the treatment.

**TECHNICAL DESCRIPTION**



The technical page provides a more detailed description of the purpose, function and application of each treatment. Specific considerations related to design and purpose are specifically emphasized. A schematic design of the treatment's

application is included in plan form, based on a real scenario in the city though specifically not identified in order to avoid any confusion. Additional imagery is also provided to show prototypical examples of the treatment's application.

**FIRST RESPONDER CONSIDERATION**

First responders provide essential public services to the City, and street improvements should be designed to accommodate the access of emergency vehicles. Some of the elements presented in this toolkit can easily be built to accommodate the typical needs of emergency services, while some may require a more involved collaboration to develop designs.

# Toolkit Treatment Types

**SIDEWALKS**



**STREETS**



**INTERSECTIONS**



**TRAFFIC SIGNALS**



**TRAFFIC MANAGEMENT**





## Street Design Components

### RECREATION



The treatment encourages walking, jogging and running as physical activity by making continuous pedestrian spaces with few interruptions for traffic.

### BEAUTY



The treatment enhances the aesthetic of the street with opportunities for decoration, new greenery and special fixtures.

### SOCIAL



The treatment promotes social interaction by expanding public open space and place-making opportunities.

### COST



Dollar bills generally indicate the cost of constructing the treatment.

### MAINTENANCE



Wrenches generally indicate the amount of maintenance for the treatment after installation.

THE BUTTONS ON THE OVERVIEW PAGE IDENTIFY THE PRINCIPLES THAT EACH TREATMENT MOST DIRECTLY ADDRESSES & SPECIFIC CONSIDERATIONS.

Interagency project level review will take place for specific streetscape proposals, particularly for new intersection and block elements.

### UTILITIES CONSIDERATIONS

Implementing design treatments in the toolkit may require consideration of overhead or underground utilities. For example, overhead electrical wires may conflict with proposed street tree placement and sewer pipes may conflict with a proposed traffic island. Also changes to the streetscape, including curbs, can alter the streets capacity to carry stormwater. The location of local utilities should be considered early in the design process. Based on existing city policies, utility locations may limit design options or require relocation.

Conversely, placement of utilities should be considered for pedestrian accessibility, safety, visibility and comfort. On narrow sidewalks, above ground infrastructure like a traffic signal box, power pole or street light could make the path of travel un navigable to pedestrians in wheelchairs, with strollers or pushcarts. Below ground utilities can limit opportunities for introducing elements such as landscaping, street trees and curb ramps.

### TRANSIT CONSIDERATION

Streets that accommodate for public transportation – including light rail and buses – have specific requirements beyond those on the typical streets. These requirements can affect the application of design treatments and the details of how they are designed. This chapter presents an overview of the primary design considerations for some pedestrian improvements that overlap with transit routes.

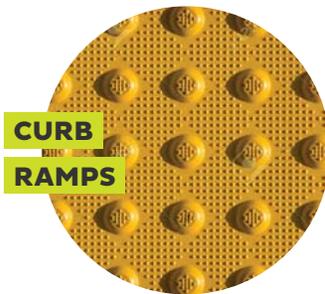
Pedestrian improvement project designs on Long Beach Transit routes generally should not include proposals that reduce transit lanes to below standard lane widths. Exceptions may be made on community routes which have lower frequency and are in primarily residential areas or on transit routes that currently have substandard travel lane widths.

Adding curb extensions at transit waiting areas can fulfill pedestrian enhancement goals while improving transit operations. However, transit curb extensions also have specific requirements for clear space in order to provide access to vehicle doors. Enhancements that include transit extensions should be coordinated with Long Beach Transit to ensure appropriate design and placement. The general planting palette for green space on transit routes should be developed with transit vehicles in mind. Where possible, pedestrian improvement projects that overlap with transit routes should include coordination with Long Beach Transit engineers or service planners to ensure that the designs support the needs of both.





**SIDEWALKS**



Sidewalks are the portion of the public right-of-way that provides a separated area for people traveling on foot. Sidewalks that are safe, accessible and aesthetically pleasing attract pedestrians. People walk for many reasons: to go to a neighbor's house, to run errands, for school, or to get to a business meeting. People also walk for recreation and health benefits or for the enjoyment of being outside. Some pedestrians must walk to transit or to other destinations if they wish to travel independently. It is a public responsibility to provide a safe, secure and comfortable system for all people who walk.



# Safe & Accessible Sidewalks



ALL STREETS



Sidewalks should be a minimum of 5' wide, with a smooth, flat surface and free of obstructions. Providing an additional 4-6' buffer area between the sidewalk and street accommodates landscape, trees, furniture and infrastructure.

- CONSIDERATIONS -

Provide adequate sidewalk widths and clear path of travel as determined by street type classification, adjoining land uses and expected pedestrian usage.

MOP P 2-18

STREET FURNITURE ZONES

In downtown or commercial districts



DESCRIPTION

Sidewalks provide people with space to travel within the public right-of-way that is separated from roadway vehicles. They provide places for children to walk, run, skate, ride bikes and play. Such facilities also improve mobility for pedestrians and provide access for all types of pedestrian travel: to and from home, work, parks, schools, shopping areas and transit stops. Walkways should be part of every new and renovated road facility and every effort should be made to retrofit streets that currently do not have sidewalks.

Both the FHWA and the Institute of Transportation Engineers [ITE] recommend a minimum width of 5 feet for a sidewalk or walkway, which allows two people to pass comfortably or to walk side-by-side. Wider sidewalks should be installed near schools, at transit stops, in Downtown areas, or anywhere high concentrations of pedestrians exist. Sidewalks should be continuous along both sides of a street and sidewalks should be fully accessible to all pedestrians, including those in wheelchairs.

A buffer zone of 4 to 6 feet is desirable to separate pedestrians from the street. The buffer zone will vary according to the street type. In downtown or commercial districts, a street furniture zone is usually appropriate. There should be a flat sidewalk provided in areas where driveways slope to the roadway. Additionally, it is necessary to maintain a sidewalk level across the driveway with no more than 2 percent cross slope in order to safely accommodate pedestrians in wheelchairs and other mobility devices and to comply with ADA standards.



FLAT SIDEWALKS

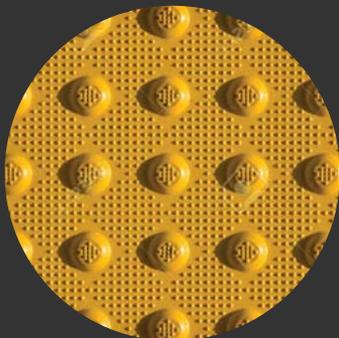
Where driveways slope to the roadway



# Curb Ramps



ALL INTERSECTIONS



Curb ramps let wheelchairs, strollers and carts cross the street from the raised curb more easily.



**DESCRIPTION**

Curb ramps provide access between the sidewalk and roadway for people using wheelchairs, strollers, walkers, crutches, handcarts and bicycles, and also for pedestrians with mobility impairments who have trouble stepping up and down high curbs. Curb ramps must be installed at all intersections and mid-block locations where pedestrian crossings exist, as mandated by federal legislation [1973 Rehabilitation Act and Americans with Disabilities Act 1990]. Curb ramps must have a slope of no more than 1:12 [must not exceed 25.4 mm/0.3 m [1 in./ft] or a maximum grade of 8.33 percent] and a maximum slope on any side flares of 1:10.

Where feasible, separate curb ramps for each crosswalk at an intersection should be provided rather than having a single ramp at a corner for both crosswalks. This provides improved orientation for visually impaired pedestrians. Similarly, tactile warnings will alert pedestrians to the sidewalk or street edge. All newly constructed and altered roadway projects must include curb ramps. In addition, audits of their pedestrian facilities should be made to make sure transit services, schools, public buildings and parks, etc. are accessible to those who use wheelchairs.

Rumble strips (stripes formed in the crosswalk) signal the transition between ramp and sidewalk while a mat consisting of truncated domes indicate the ramp and street transition.



**TACTILE WARNINGS**

Alert pedestrians to the sidewalk & street edge



**CURB RAMPS!**



# Pedestrian Lighting



ALL STREETS



Increased lighting on the sidewalk area and crosswalks for enhancing pedestrian safety and security. This can include closer placement of street lights, pedestrian scale light fixtures as well as special festive lighting.

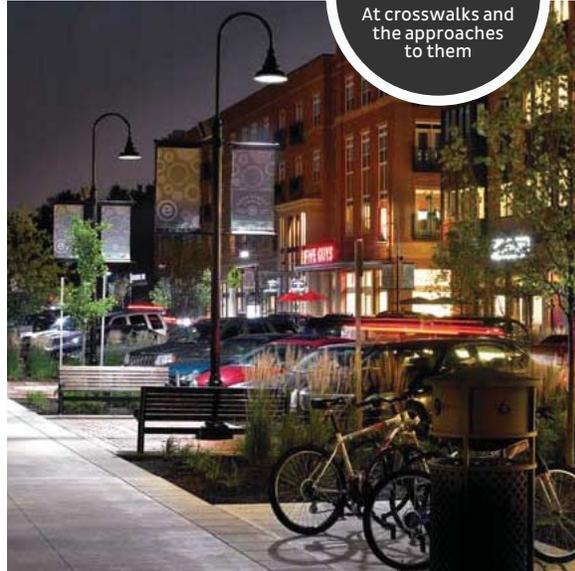


## - CONSIDERATIONS -

In commercial areas with nighttime pedestrian activity, streetlights & building lights can enhance the ambience and vibrancy of the area as well as the visibility of pedestrians for motorists.


**SHINE  
BRIGHTER  
LIGHTS**

At crosswalks and the approaches to them

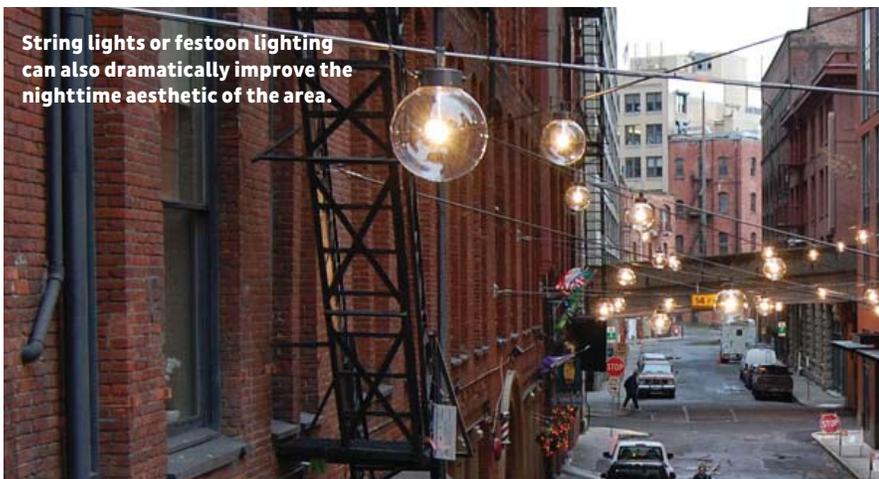

**DESCRIPTION**

Good quality and location of lighting can enhance an environment as well as increase comfort and safety. Pedestrians often assume that motorists can see them at night; they are deceived by their own ability to see the oncoming headlights. Without sufficient overhead lighting, motorists may not be able to see pedestrians in time to stop.

In commercial areas with nighttime pedestrian activity, streetlights and building lights can enhance the ambience of the area and the visibility of pedestrians by motorists. It is best to place streetlights along both sides of arterial streets and to provide a consistent level of lighting along a roadway. In Pedestrian Priority Areas, around Urban Trails and along primary Safe Routes, specialty pedestrian-level lighting should be placed over the sidewalks to improve pedestrian comfort, security and safety. Additional pedestrian lighting should be considered around intersections that have had safety issues whether through vehicle conflicts or criminal activity.

Nighttime pedestrian crossing areas may be supplemented with brighter or additional lighting. This includes lighting pedestrian crosswalks and approaches to the crosswalks. In commercial areas or in downtown areas, specialty pedestrian-level lighting may be placed over the sidewalks to improve pedestrian comfort, security and safety. Mercury vapor, incandescent, or less expensive high pressure sodium lighting is often preferred as pedestrian level lighting. Low-pressure sodium lights are low energy, but have a high level of color distortion.

String lights or festoon lighting can also dramatically improve the nighttime aesthetic of the area.


**PEDESTRIAN LIGHTING**



# Driveway Improvements



ALL STREETS

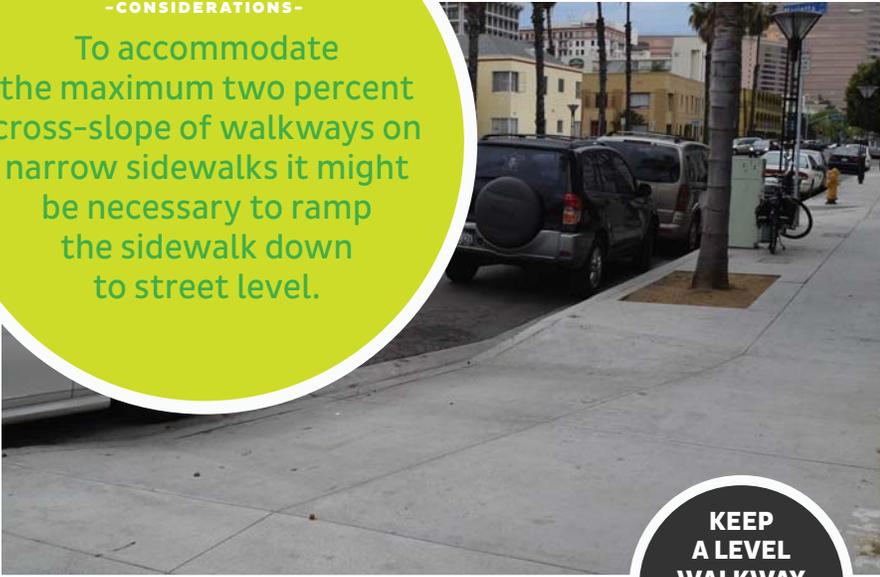


Reconfiguration of existing vehicle driveways to improve general pedestrian accessibility and safety by narrowing, altering or consolidating them. Eliminate unused vehicle driveways wherever possible.



- CONSIDERATIONS -

To accommodate the maximum two percent cross-slope of walkways on narrow sidewalks it might be necessary to ramp the sidewalk down to street level.



**KEEP  
A LEVEL  
WALKWAY**

No more than 2%  
cross-slope at  
sidewalks



**DRIVEWAY IMPROVEMENTS**



**DESCRIPTION**

Several driveway design characteristics may cause safety and access problems for pedestrians, including excessively wide and/or sloped driveways, driveways with large turning radii, multiple adjacent driveways, driveways that are not well-defined, and driveways where motorist attention is focused on finding a gap in congested traffic. Driveway improvements should include narrowing driveways, tightening turning radii, and improving driveway definition.

Closing and consolidating driveways or converting driveways to right-in-right-out are design strategies that may be part of a larger access management strategy. Driveways should be narrowed to current maximum design standards when possible. When driveways cross sidewalks, the sidewalk should be clearly delineated across the driveway to make it clear to motorists that they must watch for pedestrians. If a driveway must function as part of an intersection, it should be designed with pedestrian safety features such as crosswalks, small corner radii, tactile surface treatments and pedestrian signal heads if signalized.

When driveways cross sidewalks, it is necessary to maintain a level walkway across the driveway of no more than 2 percent cross-slope. This is more usable for all pedestrians, especially those in wheelchairs, and makes it clear to motorists that they must watch for pedestrians. It is important to minimize large signs and bushes at driveways to improve the visibility between motorists and pedestrians. The sidewalk material [usually concrete] should be maintained across the driveway as well.



# Street Landscaping



ALL STREETS



Street trees add a canopy cover over the street. This makes the streets more beautiful, cools the neighborhood, lowers energy costs in homes, gives pedestrians shade while they walk and makes the air cleaner.



**- CONSIDERATIONS -**  
 Treat streets as an important part of the public open space system and an integral part of the city's urban forest.

MOD P 2-7



**KEEP IT LOCAL**  
 Plants should be adapted to the local climate



**Growth patterns should not obscure signs or pedestrians' and motorists' views of each other.**



**DESCRIPTION**

The careful use of landscaping along a street can provide separation between motorists and pedestrians, reduce the visual width of the roadway [which can help to reduce vehicle speeds], and provide a more pleasant street environment for all. This can include a variety of trees, shrubs and/or flowerpots, which can be planted in the buffer area between the sidewalk or walkway and the street. The City of Long Beach has adopted the first phase of the Urban Forestry Master Plan, which drafts goals and policies for the long-term management and maintenance of City trees and expansion of the city's urban forest and landscape.

The most significant issue with any landscaping scheme is the ongoing maintenance. Some communities have managed effectively by creating associations to pay for landscape maintenance or through the volunteer efforts of neighbors. Others have found them to be unreliable and budget for public maintenance instead. Consider adding irrigation systems in areas with extensive planting.

Choosing appropriate plants, providing adequate space for maturation and preparing the ground can help ensure that they survive with minimal maintenance, and don't buckle the sidewalks as they mature. Plants should be adapted to the local climate and fit the character of the surrounding area—they should survive without protection or intensive irrigation and the plant's growth patterns should not obscure signs or pedestrians' and motorists' views of each other.



**STREET LANDSCAPING**



# Tree Allée



STREETS WITH A WIDE SIDEWALK OR ADJACENT OPEN SPACE



A tree allée is a walkway flanked by consistently spaced trees or tall shrubs on either side, providing constant shade for pedestrians no matter the time of day or year.



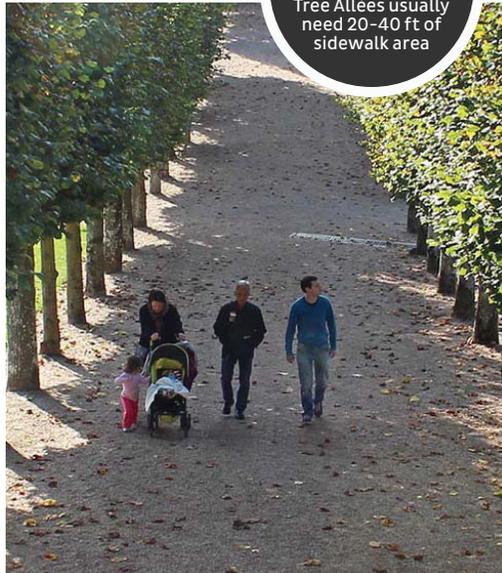
## -CONSIDERATIONS-

Though many of the most famous tree allées are located in commercial districts, the dense tree canopy can obscure signage so consider using taller trees or species with lacier canopies.



## GIVE THEM SPACE

Tree Allées usually need 20-40 ft of sidewalk area



## TREATMENT TYPE



## DESCRIPTION

When space is available along particularly desirable walking routes, tree allées can be particularly cost effective treatments for enhancing the pedestrian realm. Planting a pair of rows of consistent tree types can create an urban forestry canopy that provides constant shade for pedestrians utilizing the walking path between. It also delivers a picturesque experience for pedestrians as their walk is enveloped in nature in an otherwise urban environment.

Consistent street trees and landscape are shown to have a traffic calming effect, especially on the occasions when the tree canopy reaches over the roadway. The tree allée would expand upon the typical street tree program, resulting in traffic calming effects as well as environmental benefits for natural habitat, stormwater management, reducing the urban heat island and carbon sinking. Additional maintenance is required as there are more trees to water until establishment then followed by tree trimming when the trees reach their full maturity.

Tree allées typically require a sidewalk area of between twenty and forty feet between the trees depending on the selected tree species. For narrower areas, the trees can be offset in order to more closely space the trees. School campuses, parks and public facilities typically provide additional area when the sidewalk is not sufficiently wide to comfortably plant the two rows of trees. When working with community groups, it is possible to plant trees in front yard areas to augment street trees within the public right-of-way.



# Street Furniture



ALL STREETS



Pedestrian environments can be enhanced with street furniture like benches, bus shelters, public art and special landscaping on the sidewalk. Installation should consider accessibility, visibility and maintenance.



## - CONSIDERATIONS -

To ensure street furniture remains safe and clean, the local business association or adjacent property owner typically enters into an operating agreement with the City to be responsible for its maintenance.



## DESCRIPTION

Sidewalks should be continuous and should be part of a system that provides access to goods, services, transit and homes. Well-designed walking environments are enhanced by urban design elements and street furniture, such as benches, bus shelters, trash receptacles, public art and water fountains. The improvements can be used to support economic development along commercial districts.

Sidewalks and walk areas should be kept clear of poles, signposts, newspaper racks and other obstacles that could block the path, obscure a driver's view or pedestrian visibility, or become a tripping hazard. Benches, water fountains, bicycle parking racks and other street furniture should be carefully placed to create an unobstructed path for pedestrians. Good-quality street furniture will show that the community values its public spaces and is more cost-effective in the long run.

These areas should also be properly maintained and kept clear of any debris, overgrown landscaping, tripping hazards, or areas where water accumulates. Walking areas should also be interesting for pedestrians and provide a secure environment. Storefronts should exist at street level and walking areas should have good sight lines for adequacy of overhead clearances and detectability of protruding objects should be assured for pedestrians who are visually impaired.

KEEP  
SIDEWALKS  
CLEAR

Of tripping hazards and debris.



Good-quality street furniture will show that the community values its public spaces and is more cost-effective in the long run.

## STREET FURNITURE



**STREETS**



.....

Design and operational elements of the roadway affect the ability of pedestrians to safely and easily cross streets. A geometric element such as street width affects the time needed to cross the street, whereas an operational parameter like traffic direction affects the number of potential conflicts between motorists and crossing pedestrians. Traffic calming is a way to design streets, using physical measures, to encourage people to drive more slowly. It creates physical and visual cues that induce drivers to travel at slower speeds. Traffic calming is self-enforcing. The design of the roadway results in the desired effect, without relying on compliance with traffic control devices such as signals, signs, and without enforcement. While elements such as landscaping and lighting do not force a change in driver behavior, they can provide the visual cues that encourage people to drive more slowly.



# On-street Parking



STREETS WITH AVAILABLE ROADWAY WIDTH



On-street parking is provided by a curbside lane that vehicles can pull into parallelly or diagonally. The parked vehicles insulate pedestrians from moving vehicles while calming traffic speeds while vehicles park.



**- CONSIDERATIONS -**  
Approaches to crosswalks & intersections should be clear of on-street parking pedestrian safety. Curb extensions can reduce these distances and increase on-street parking.

**A  
PARKING  
BUFFER**

between moving vehicle traffic & pedestrians.

**BACK-IN  
DIAGONAL  
PARKING**

is preferred by the City over front-in diagonal parking

**ON-STREET PARKING**



**DESCRIPTION**

On-street parking can be both a benefit and a detriment to pedestrians. On-street parking increases positive “friction” along a street and can narrow the effective crossing width, both of which encourage slower speeds. Parking provides a buffer between moving motor vehicular traffic and pedestrians along a sidewalk. In addition, businesses that rely on on-street parking as opposed to parking lots are better oriented toward pedestrian access; they are more likely to orient their building to the sidewalk. This attention can help foster a more vibrant pedestrian-commercial environment.

On the other hand, parking creates a visual barrier between motor vehicle traffic and crossing pedestrians, especially for children with low visual profiles and people using wheelchairs. Parking should be restricted on approaches to a marked or unmarked crosswalk. Diagonal parking may require more attention to improve visibility at crossings and intersections, and it should not be used on high speed or busy streets. Back-in diagonal parking is preferred and has a number of advantages over pull-in parking, including giving drivers access to their trunk from the curb rather than the street; protection of children as an open door directs them to the sidewalk; and giving the driver clear sight lines when pulling out of the parking space.

## STREETS



# Road Diet



ANY STREET WITH SURPLUS CAPACITY

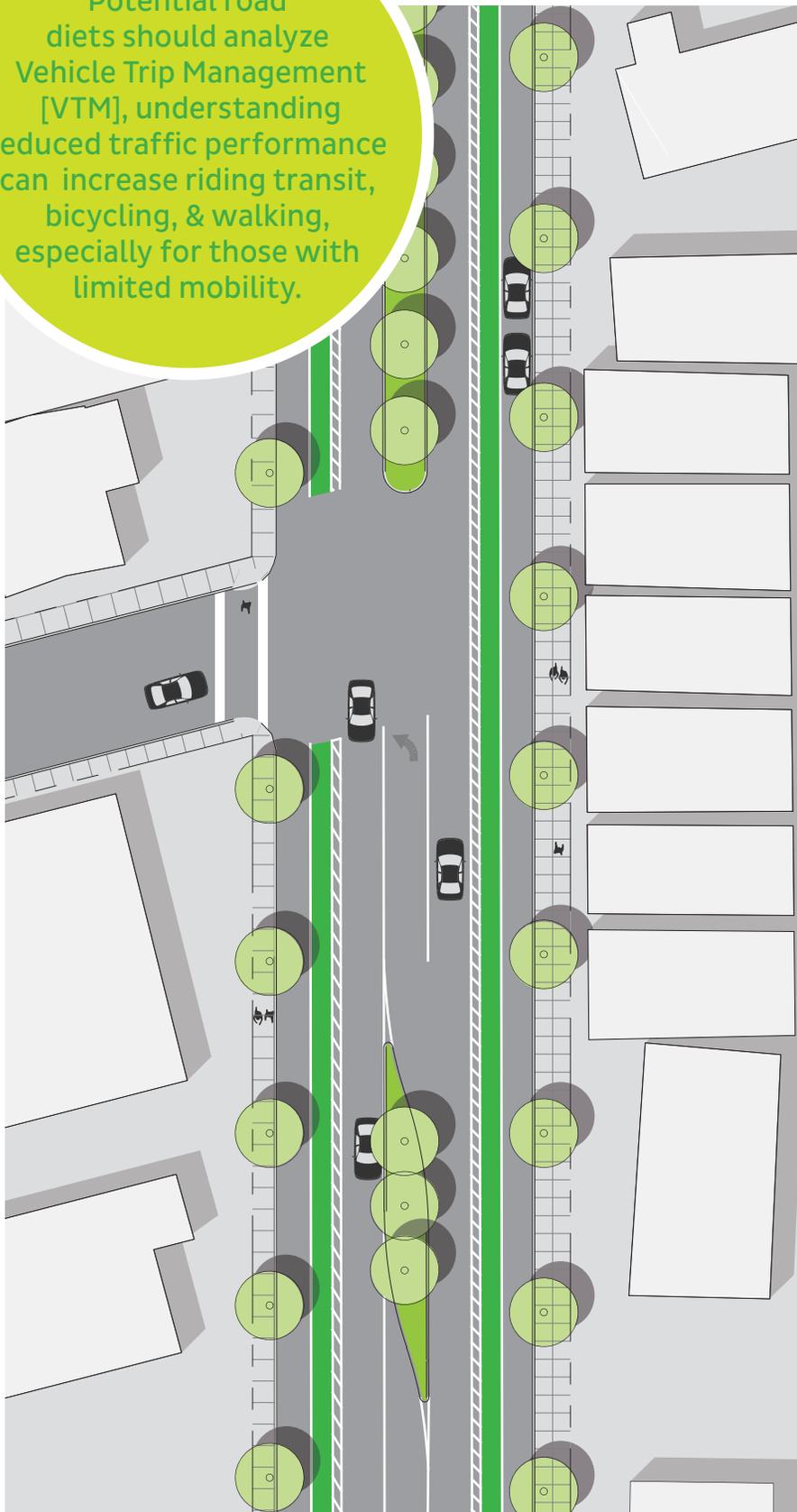


A road diet reconfigures any surplus roadway for additional on-street parking, turn lanes, bike lanes and/or pedestrian area. Road diets can help to both calm traffic speeds while reducing common conflicts.



## - CONSIDERATIONS -

Potential road diets should analyze Vehicle Trip Management [VTM], understanding reduced traffic performance can increase riding transit, bicycling, & walking, especially for those with limited mobility.



ROAD DIET



DESCRIPTION

The most common road diet configuration involves converting a four lane road to three lanes, with one travel lane in each direction and a center lane for left-turn movement, often supplemented with painted, textured, or raised center islands. Four to three lane conversions should be considered for roadways with documented safety concerns, moderate volumes [less than 15,000 ADT, up to 25,000 ADT in special cases], and along priority bicycle and pedestrian priority areas.

A traffic analysis should be conducted to determine whether a lane reduction is feasible. There are many opportunities to perform road diets, particularly on roadways with wider cross sections, one-way streets and although not as common, where volumes are low on a three lane road [one lane in each direction with center lane] can be converted to two.

Extra roadway space can be reallocated for other roadway users to improve safety, comfort and convenience for pedestrians. Reconstruction projects may allow for curb lines to be moved to narrow the roadway. With the additional space created from restriping or reconstruction, space can be redistributed for the following uses in the roadway [bicycle lanes, parking lanes or transit lanes] or for wider sidewalks or landscaped buffers.



# Landscaped Median



ANY STREET

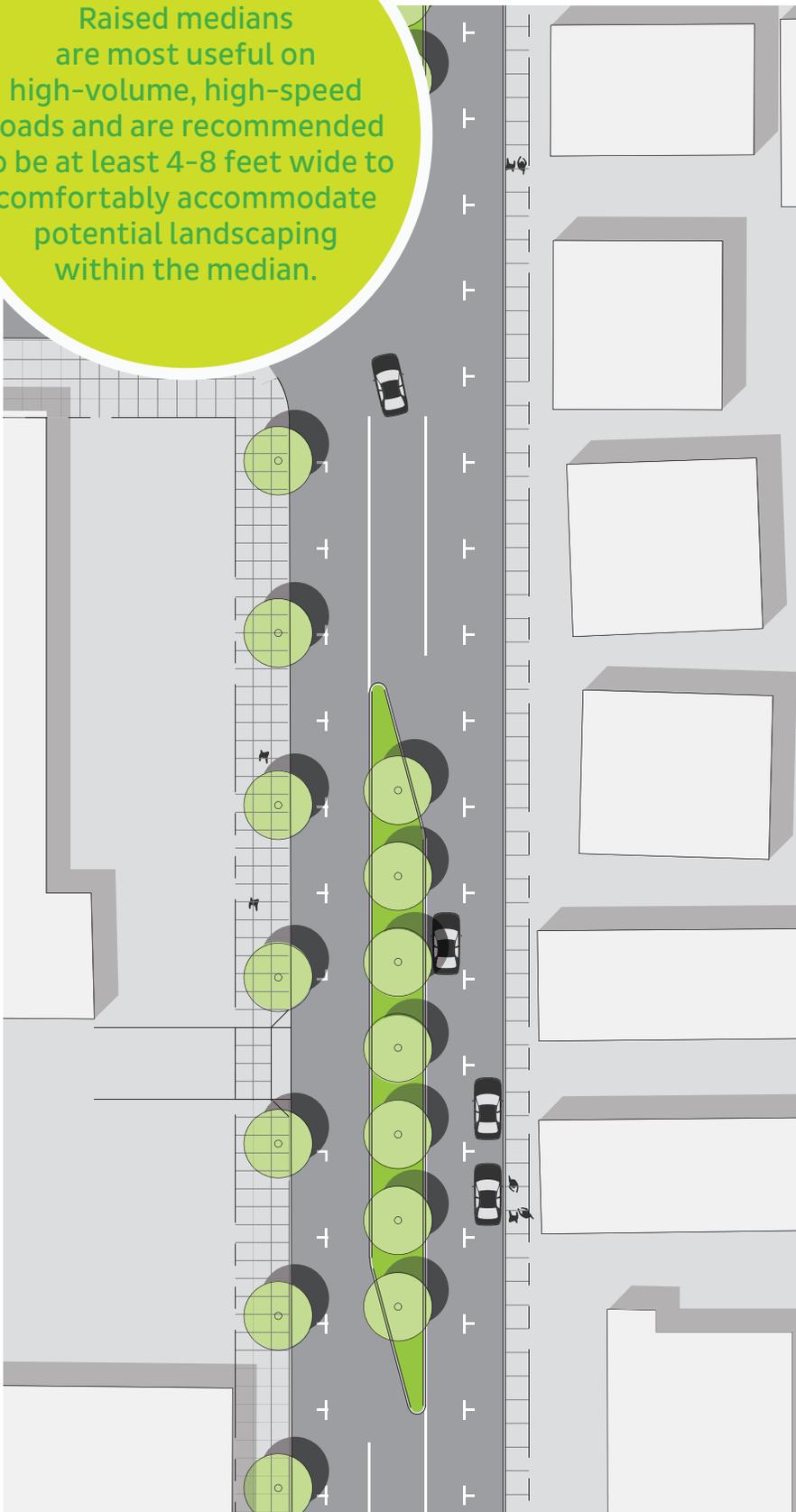


A landscaped median is a continuous curb island within the middle of the street that provides opportunity for landscaping and street trees. The median reduces conflict between opposing traffic and helps calm traffic speeds.



## -CONSIDERATIONS-

Raised medians are most useful on high-volume, high-speed roads and are recommended to be at least 4-8 feet wide to comfortably accommodate potential landscaping within the median.



RAISED MEDIANS



DESCRIPTION

Raised medians are curbed sections that typically occupy the center of a roadway. They can facilitate pedestrian crossings by providing a crossing area that is physically separated from the automobile path of travel, reducing pedestrian crossing distances and enabling pedestrians to focus on one direction of traffic at a time when crossing the street. Raised medians can be especially helpful for pedestrians who are unable to judge distances accurately or who have difficulty completing wide roadway crossings.

Trees and other landscaping elements can be added to raised medians as long as they do not restrict visibility. These elements can help change the character of a street and reduce speeds. Raised medians can also improve motorist safety when they replace two-way center turn lanes; however, desired turning movements need to be carefully studied and provided where necessary so that motorists are not forced to travel on inappropriate routes, such as residential streets, or make unsafe U-turns. In some environments, raised medians can be constructed in sections, creating an intermittent rather than continuous raised median. Another good alternative device for two-, three- or four-lane roads is the crossing island, which provides a crossing landing for pedestrians and, in some designs, aids in decreasing overall vehicle speeds.



# Choker/ Neck-down



ANY STREET

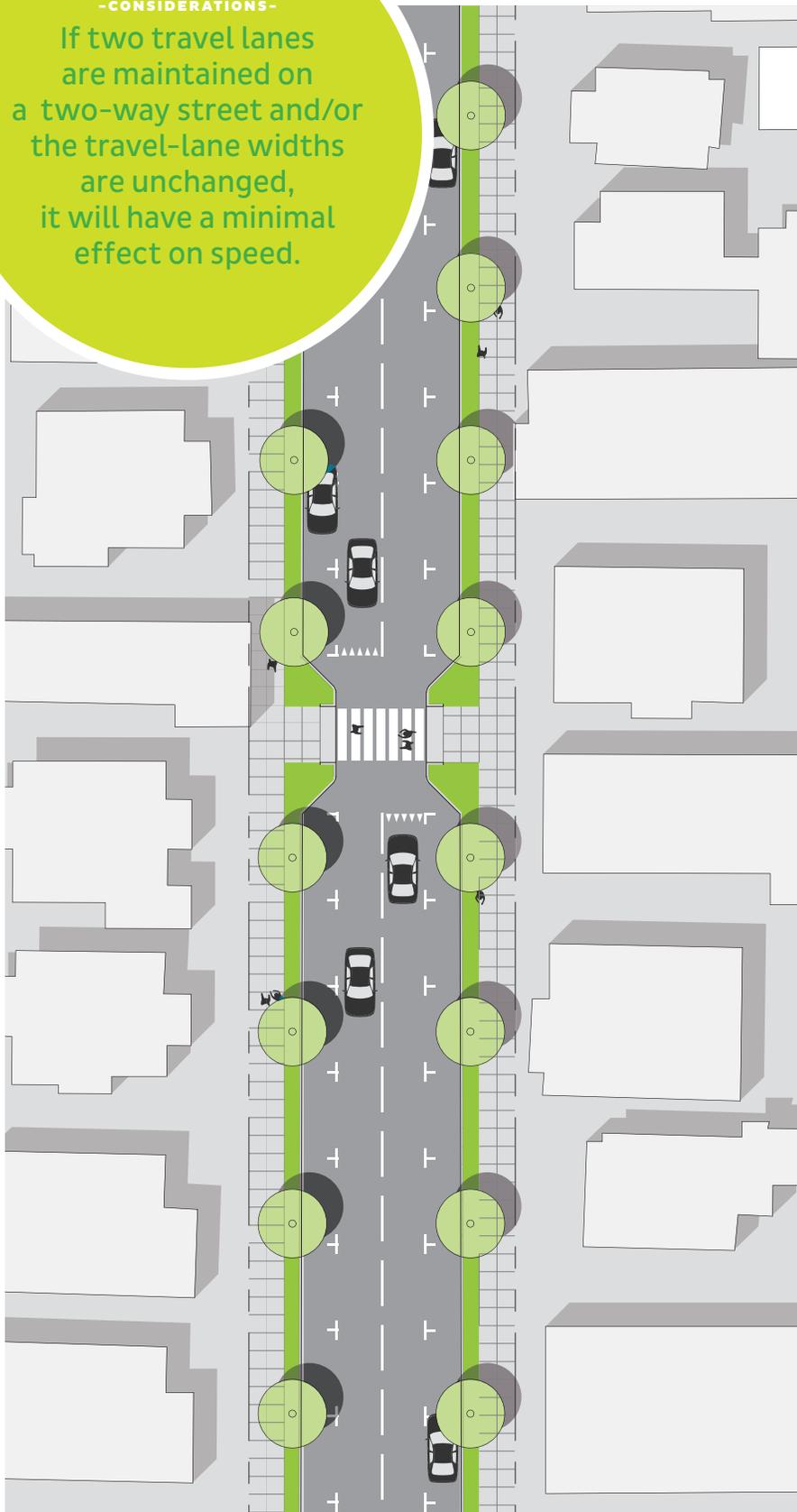


Chokers are two curb extensions on opposite sides of the street that encourage drivers to slow down by making the street narrower. They can also be used as part of mid-block pedestrian crossings.



- CONSIDERATIONS -

If two travel lanes are maintained on a two-way street and/or the travel-lane widths are unchanged, it will have a minimal effect on speed.



CHOKER/ NECK-DOWN



DESCRIPTION

Chokers are curb extensions that narrow a street by widening the sidewalks or planting strips, effectively creating a pinch point along the street. Chokers can be created by bringing both curbs in, or they can be done by more dramatically widening one side at a mid-block location. They can also be used at intersections, creating a gateway effect when entering a street.

Chokers can have a dramatic effect by reducing a two-lane street to one lane at the choker point [or two narrow lanes], requiring motorists to yield to each other or slow down. In order for this to function effectively, the width of the travelway cannot be wide enough for two cars to pass: 16 feet is generally effective [and will allow emergency vehicles to pass unimpeded]. This kind of design is usually only appropriate for low-volume, low-speed streets.

They can be used to create a clear transition between a commercial and a residential area or narrow overly-wide intersections and mid-block areas of streets. Chokers also can be designed to add room along the sidewalk or planting strip for landscaping or street furniture. Chokers can provide an opportunity to enhance mid-block pedestrian crossings by reducing the crossing distance. In this case, care should be taken to ensure that street furniture and landscaping do not block motorists' views of pedestrians.



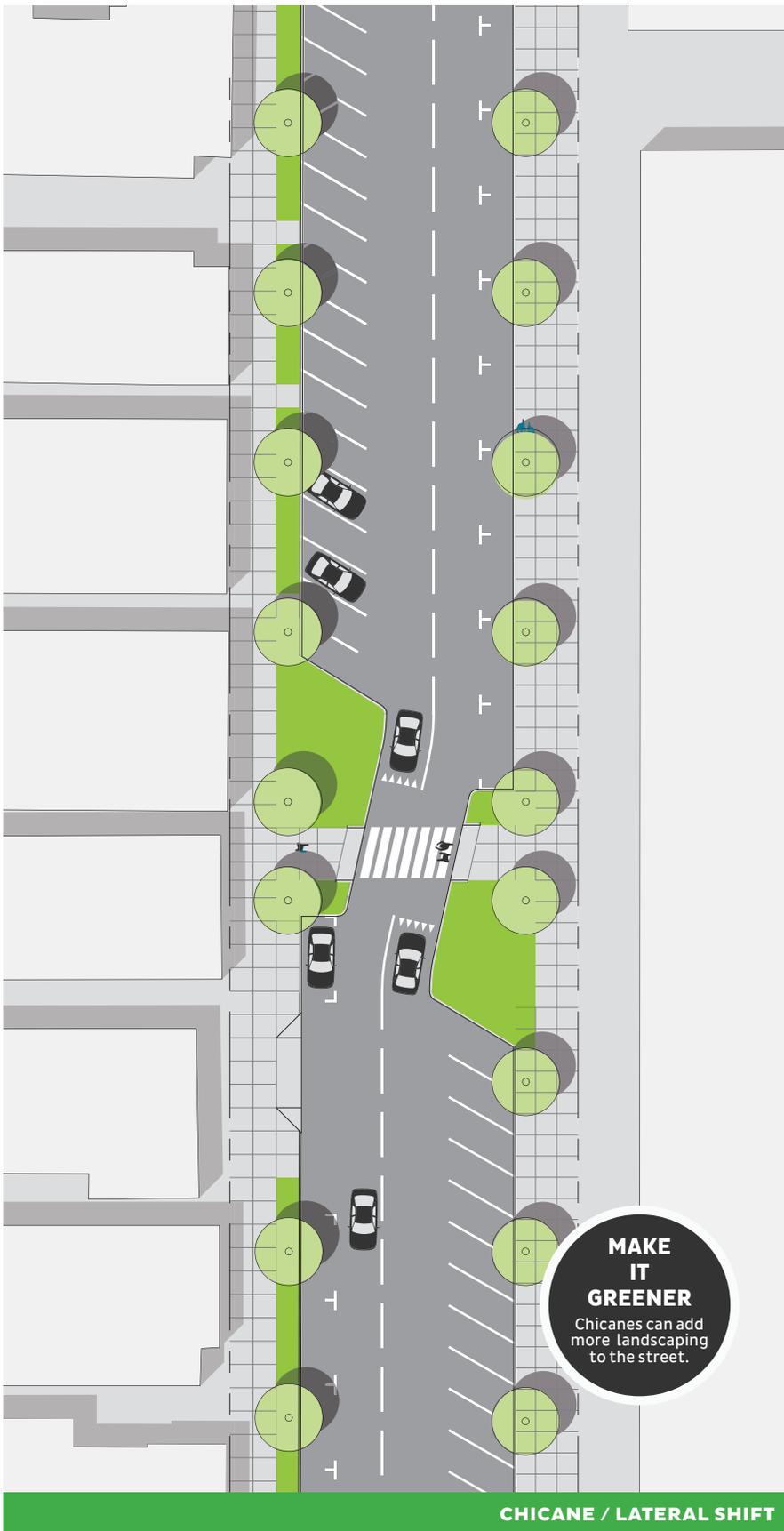
# Chicane/ Lateral Shift



LOCAL STREETS



A chicane is a series of alternating curb extensions [or on-street parking spaces] that forces drivers to slow down by creating an S-shaped roadway.



CHICANE / LATERAL SHIFT



## DESCRIPTION

Chicanes create a horizontal diversion of traffic and can be gentler or more restrictive depending on the design. A secondary benefit of installing chicanes is the ability to add more landscaping to a street but it is more important to maintain good visibility by planting only low shrubs or trees with high canopies.

## DIVERTING THE PATH OF TRAVEL

Shifting a travel lane has an effect on speeds as long as the taper is not so gradual that motorists can maintain speeds. For traffic calming, the taper lengths may be as much as half of what is suggested in traditional highway engineering. The taper lengths should reflect the desired speed which should be posted prior to the chicane. Shifts in travel ways can be created by shifting parking from one side to the other [if there is only space for one side of parking or by building landscaped islands; islands can also effectively supplement the parking shift].

## DIVERSION PLUS LANE RESTRICTION

Diverting the path of travel plus restricting the lanes [as described under “chokers”] usually consists of a series of curb extensions, narrowing the street to two narrow lanes or one lane at selected points and forcing motorists to slow down to maneuver between them. Such treatments are intended for use only on residential streets with low traffic volumes. If there is no restriction [i.e., the number of lanes is maintained], chicanes can be created on streets with higher volumes, such as collectors or minor arterials.

## MAKE IT GREENER

Chicanes can add more landscaping to the street.



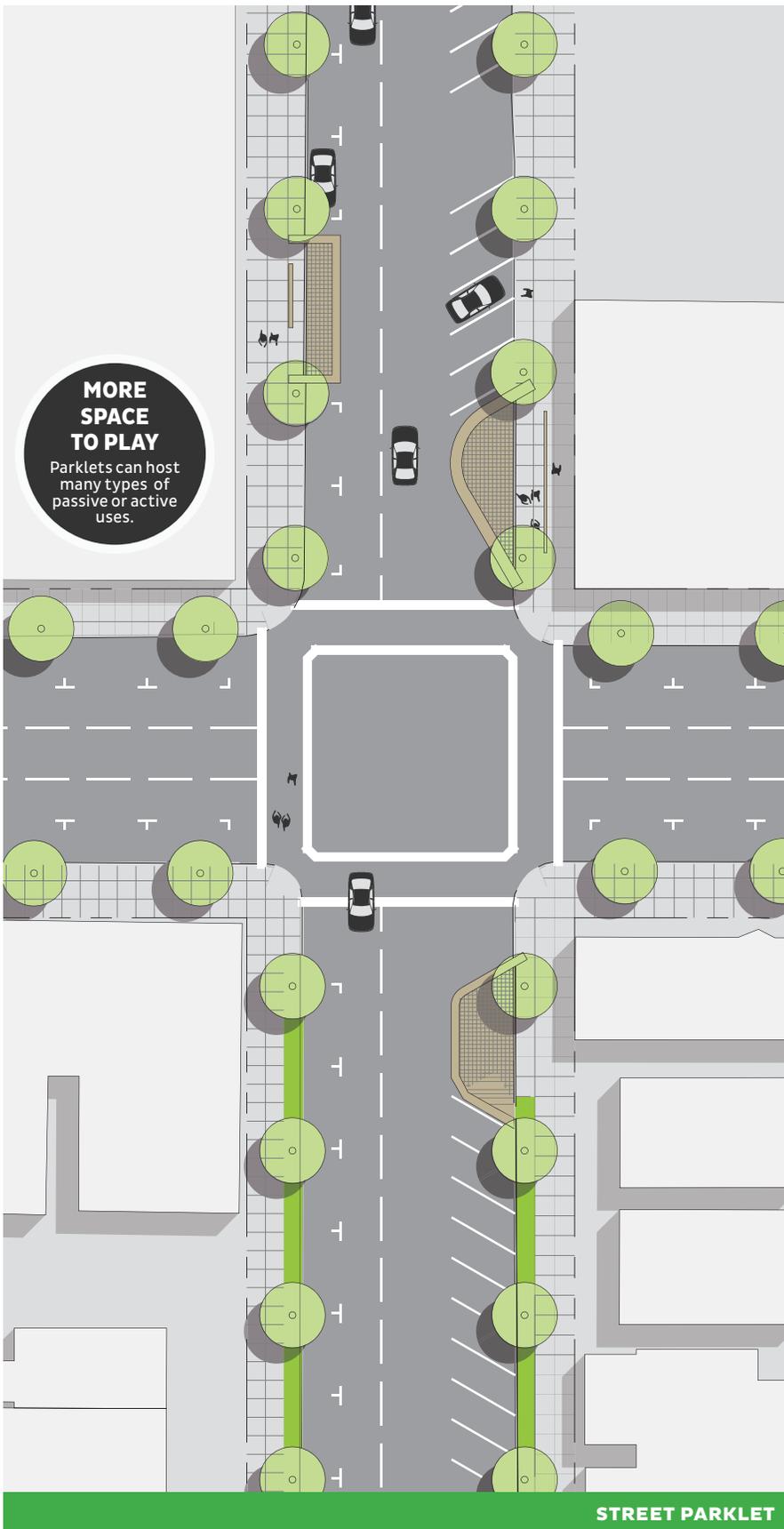
# Parklet



LOCAL STREET, NEIGHBORHOOD CONNECTORS & MINOR AVENUES



A parklet is a temporary extension of the sidewalk that takes the place of one or more on-street parking spaces. Parklets create space for seating, planting and other elements.



#### DESCRIPTION

Parklets are typically installed in the parking lane adjacent to the sidewalk area, expanding the pedestrian realm, much like a curb extension does. While most parklets developed across the country are public spaces, those in Long Beach have primarily been installed by businesses as extensions of their sidewalk dining areas. In these cases, the business owner pays for the additional area afforded through the parklet just like the public walkway occupancy permit.

Parklets are typically built using prefabricated decking systems that allow for easy installation and removal or relocation, as they are intended to be temporary in nature. The parklet's surface meets the level of the sidewalk to provide ADA access from the public walkway. The edges of the parklet are defined with a mix of planters, railing and other furniture that insulates parklet occupants from vehicle traffic in the adjacent travel lane.

Raised decking systems on parklets allow unencumbered storm water to flow through the street and into the gutter. A metal edge is affixed along the parklet deck edges facing the street to protect the decking from street-sweepers.



# Streetlet/ Block Closure



NEIGHBORHOOD COLLECTORS, LOCAL STREETS & ALLEYS WITH PARALLEL ALTERNATIVE ROUTES.

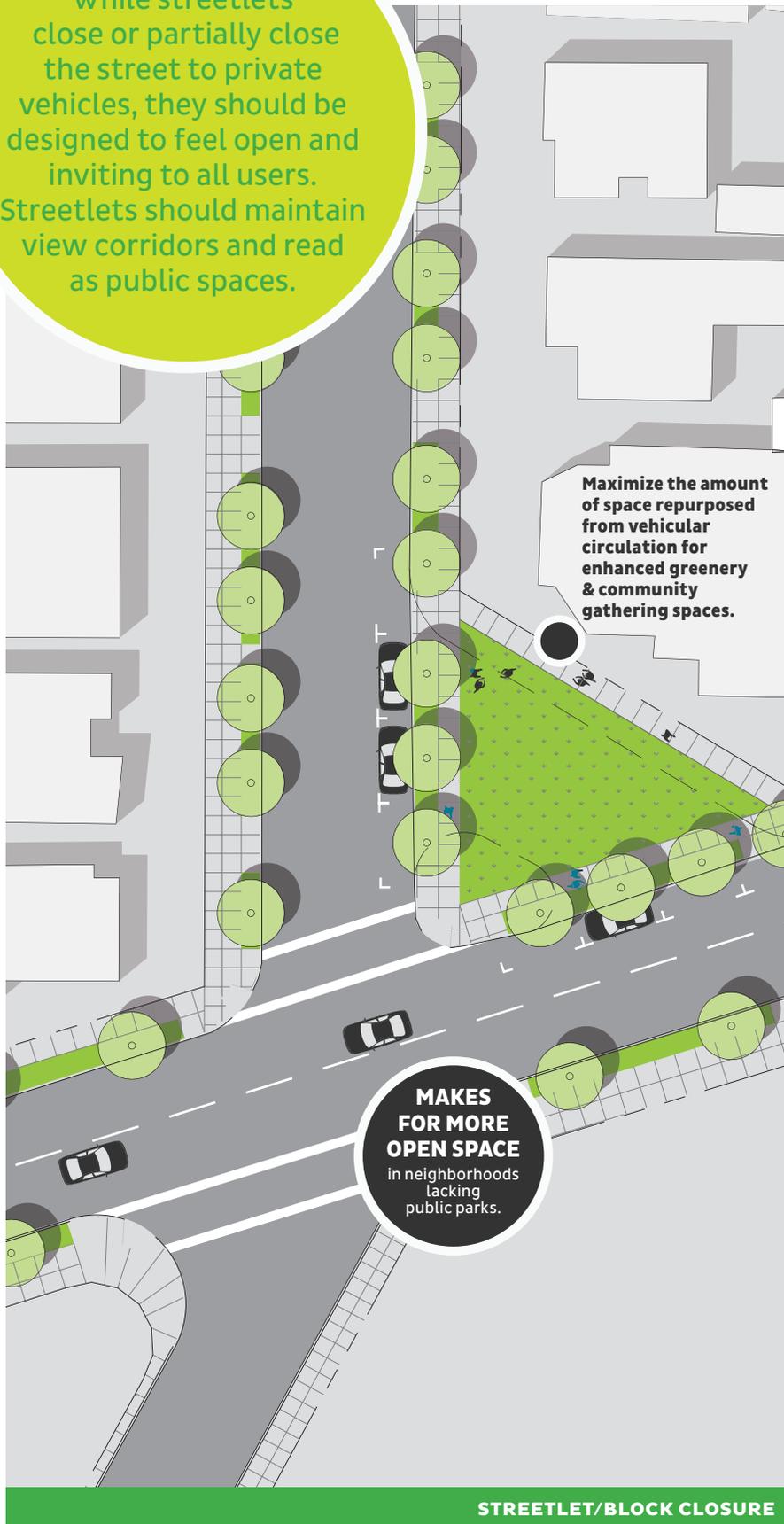


A streetlet or block closure permanently closes all or part of the roadway to create area for public open space.



## -CONSIDERATIONS-

While streetlets close or partially close the street to private vehicles, they should be designed to feel open and inviting to all users. Streetlets should maintain view corridors and read as public spaces.



## DESCRIPTION

Streetlets expand upon the complete or partial street closure to create public open space for pedestrians in the former roadway. This is accomplished by installing multiple physical barriers that block a street to motor vehicle traffic and provide some means for vehicles to turn around. The streetlet can be employed to expand open space in neighborhoods currently underserved by public parks or for place-making for commercial districts.

The streetlets should be designed with low-cost materials like paint or more expensive treatments that involve modifying curb lines, adding speed tables etc. Streetlets should be designed to maximize opportunities for greening, stormwater management and habitat creation. Streetlets should incorporate programming elements like seating, public art and informational or educational environmental graphics. The design of streetlets should maximize the amount of space repurposed from vehicular circulation for enhanced greenery and community gathering spaces.

If a street closure is conducted for the streetlet, it should always allow free through movement of all pedestrians, including wheelchair users and bicyclists. Emergency vehicles should also be able to access the street; this can be done with a type of barrier or gate that is electronically operated, permitting only large vehicles to traverse it. Streetlet projects may necessitate the installation of new catch basins to ensure potential changes to stormwater flow caused.



# Shared Street



LOCAL STREETS WITH PARALLEL ALTERNATIVE ROUTES



A shared street minimizes the difference between vehicle traffic and pedestrians, often by removing features such as curbs, road markings and traffic signs. They can also easily be closed to vehicle traffic for alternative uses and programs.



## - CONSIDERATIONS -

The street design must still meet current Americans with Disability Act [ADA] standards, and consideration must be given to provide access to fire trucks and other service vehicle where applicable.

**SLOW  
IT  
DOWN**

Motorists should travel at much slower speeds.



## DESCRIPTION

“Shared street” is the term that is commonly used in English; its origins are based in the concept of a “woonerf,” which is a Dutch term loosely meaning “street for living.” It is an integrated space used to better balance the needs of pedestrians, bicyclists and low-speed motor vehicles. They are usually local-access, narrow streets without curbs and sidewalks and vehicles are slowed by placing trees, planters, parking areas and other obstacles in the street.

A clear signal is given to designate entrance into the space, either through signage, narrowing of the roadway and/or different paving materials. Motorists in these areas are encouraged to travel at much slower speeds. Rather than relying on traffic controls, street users negotiate right of way in a cooperative manner. The shared streets often lack signs and markings necessary for the operation of conventional streets, with users instead guided by the physical design of the street. The intended result is that the street and any adjacent commercial businesses are more amenable to bicycle and pedestrian use.

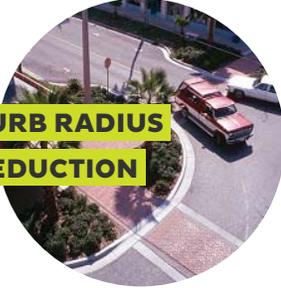
While not technically shared streets, there are also ways streets can be utilized and/or engineered to accommodate a greater variety of street space uses. This can be done with retractable bollards, operable gates or moveable planters. During the times it is open to vehicles, the street operates as a shared street with very slow vehicle traffic.



**INTERSECTIONS**



**ADVANCED  
STOP SIGN**



**CURB RADIUS  
REDUCTION**



**ENHANCED  
CROSSWALKS**



**ENHANCED  
INTERSECTION**



**CORNER CURB  
EXTENSION**



**TRANSIT CURB  
EXTENSION**



**MODIFIED SKEWED  
INTERSECTION**



**ROUNDBOUT  
MINI TRAFFIC  
CIRCLE**



**CROSSING  
ISLAND**

.....

A successfully designed intersection eliminates any possibility of conflict between transportation modes, including walking and driving. There are several counter-measures that are specifically aimed at improving intersection safety and mobility, including many of those described in the sections on roadway design and traffic calming. There are several advantages to using these traffic control devices, but it is important to consider the surrounding transportation and land use contexts, as some of these improvements may be less appropriate than others.



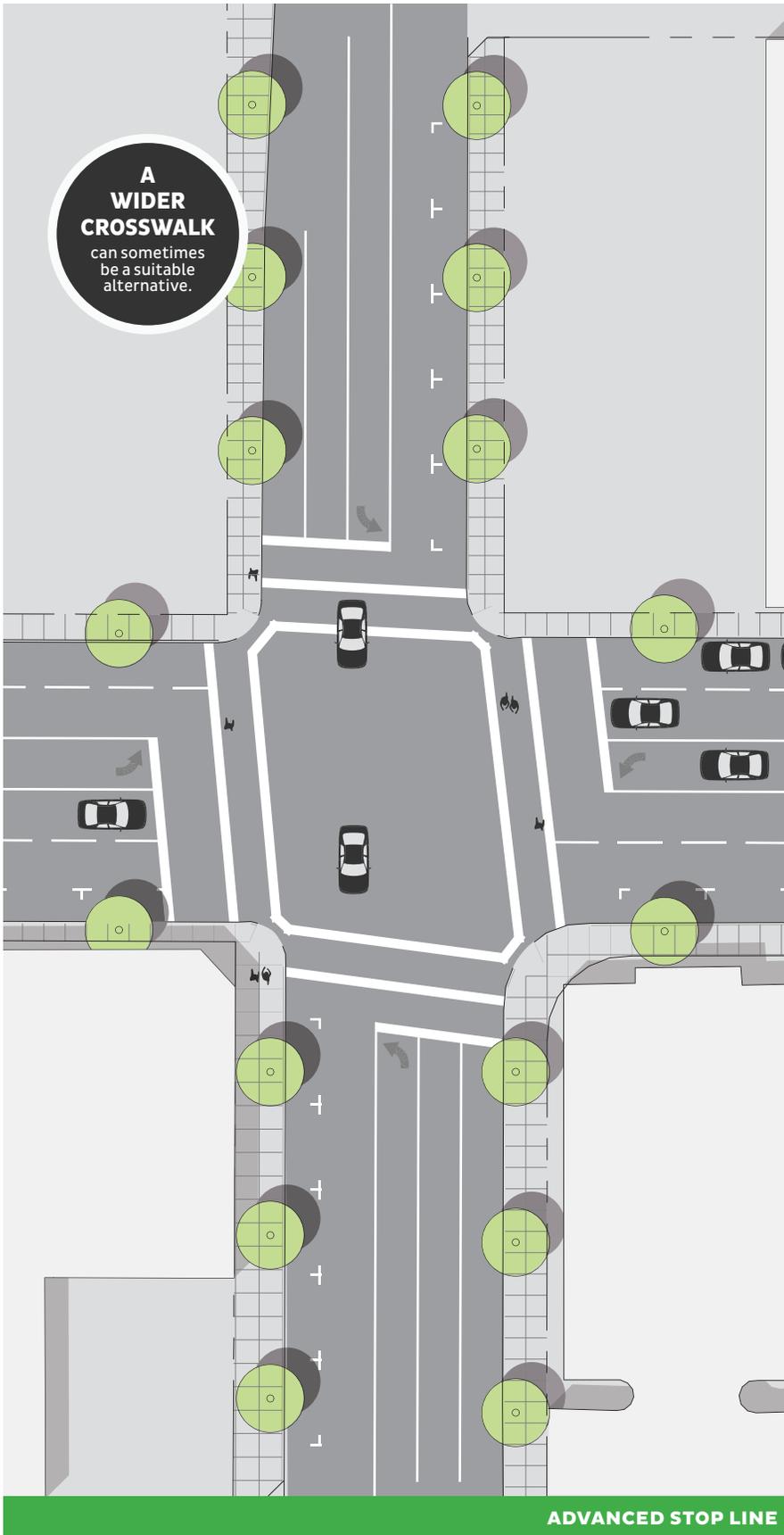
# Advanced Stop Line



NEIGHBORHOOD CONNECTORS, AVENUES, BOULEVARDS & REGIONAL CORRIDORS



Advanced stop lines before crosswalks improve pedestrian visibility and give pedestrians a headstart to cross before vehicles can make a turn.



**DESCRIPTION**

At signalized intersections and mid-block crossings, the vehicle stop line can be moved farther back from the pedestrian crosswalk for an improved factor of safety and for improved visibility of pedestrians. One study found that use of a “Stop Here For Pedestrians” sign alone reduced conflicts between drivers and pedestrians by 67 percent. With the addition of an advanced stop line, this type of conflict was reduced by 90 percent compared to baseline levels. Advanced stop lines are also applicable for non-signalized crosswalks on multi-lane roads to ensure that drivers in all lanes have a clear view of a pedestrian crossing the road.

The effectiveness of this tool depends upon whether motorists are likely to obey the stop line, which varies from place to place. At signalized intersections, place an advance stop line 8-12 feet from the crosswalk to allow pedestrians and drivers to have a clearer view of each other and more time in which to assess each other’s intentions. For marked crosswalks at uncontrolled intersections, installing the stop line 15-30’ relative to the marked crosswalk will provide considerable safety benefits for pedestrians. If it is placed too far in advance of the crosswalk, motorists may ignore the line. In some locations, a wider crosswalk may be a more effective alternative to the advance stop line.

When advanced stop lines are installed along streets with Class-II bike facilities, the area created between the advanced stop line can be used to create a bike box, which enhances bicyclist safety when attempting left turns.

## INTERSECTIONS



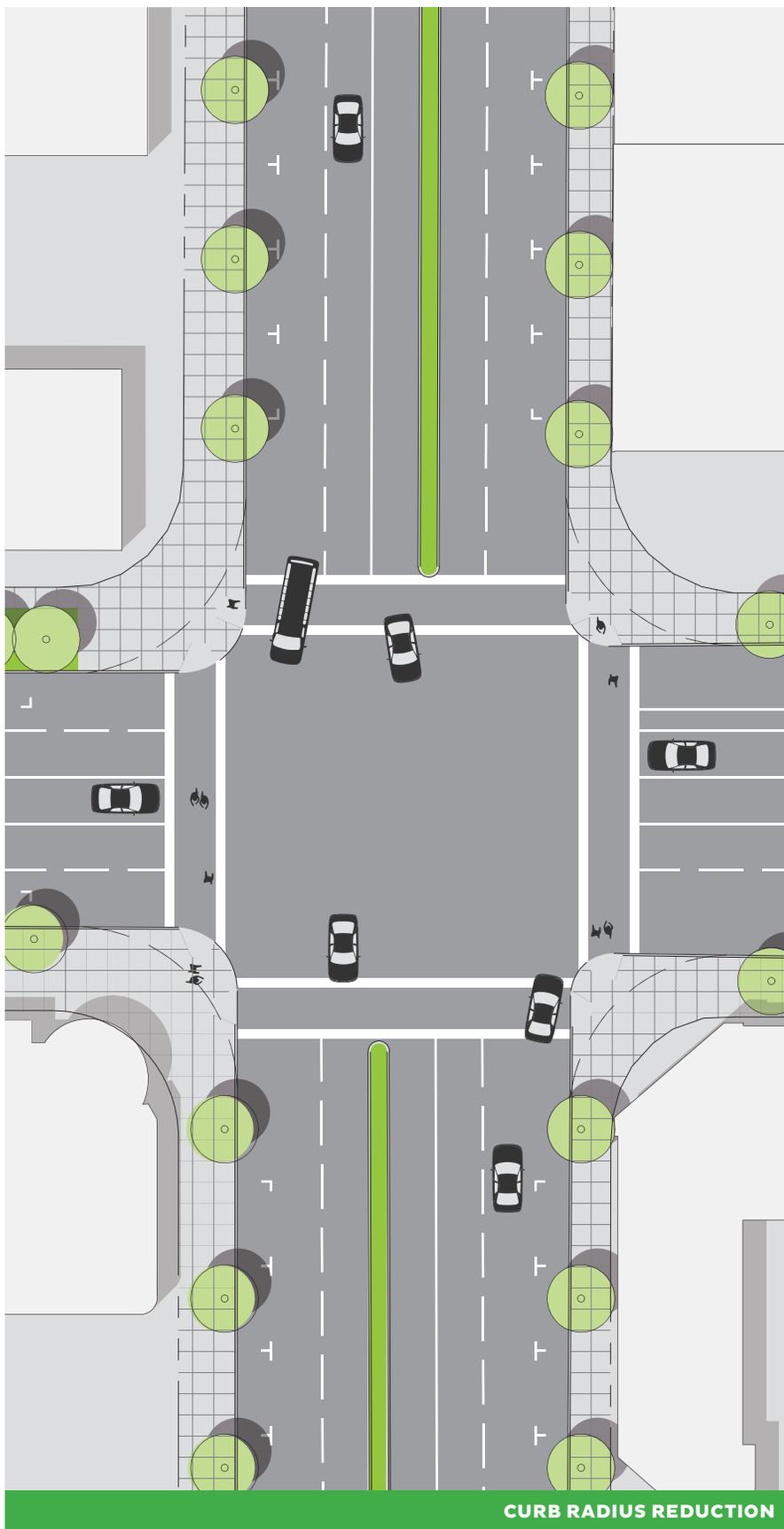
# Curb Radius Reduction



STREET WITH EXCESSIVE CURB RADIUS



Curb radius reductions make the corner tighter and more compact, slowing turning cars and reducing the distance to cross the street.



**DESCRIPTION**

Curb radii designs are determined based on the design vehicle of the roadway [i.e. the types of vehicles using the roadway, such as buses, tractor trailer trucks, fire trucks, etc.]. The most important factor for design is using the “effective radius” rather than the “actual radius” to accommodate the chosen design vehicle. Actual curb radius refers to the curvature along the curb line; effective radius refers to the curvature vehicles follow when turning. Larger effective curb radii can be achieved by adding on-street parking, bicycle lanes or striping advance stop lines on the street of multilane roadways.

In areas of intense pedestrian activity [shopping districts, schools, parks] additional consideration should be provided to slowing turning vehicles as well as reducing pedestrian crossing distances. The smallest practical actual curb radii should be chosen based on how the effective curb radius accommodates the design vehicle. An actual curb radius of 5 to 10 feet should be used wherever possible. An appropriate effective radius for urban streets with high volumes of pedestrians is 15 to 20 ft. For arterial streets with a substantial volume of turning buses and/or trucks, an appropriate effective curb radius is about 25 to 30 ft.

Curb radius designs should balance the turning needs of the design vehicle with consideration for nearby land uses and the diversity and prevalence of roadway users.

## INTERSECTIONS



# Enhanced Crosswalks



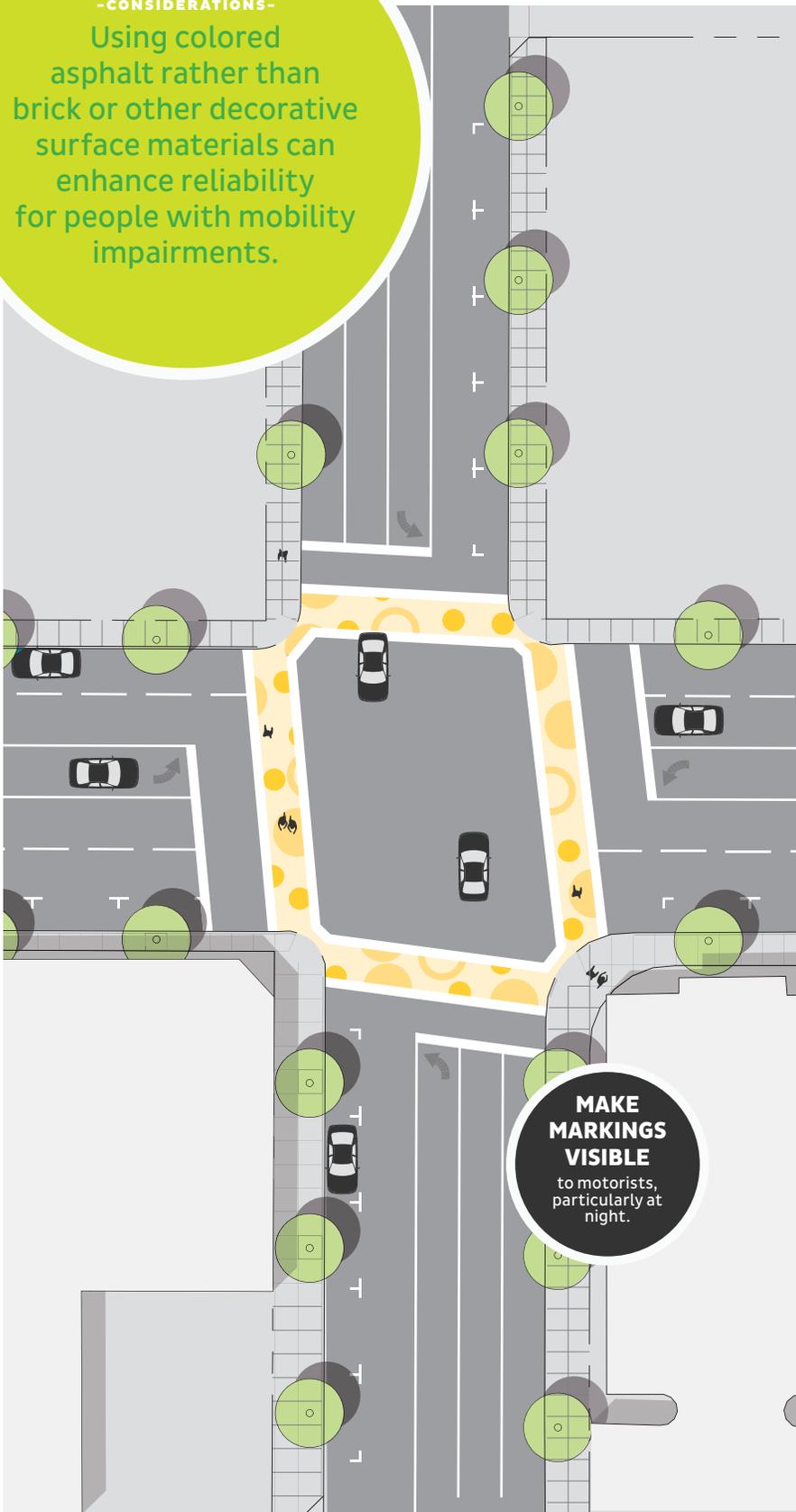
ANY STREET



Enhanced crosswalks use a combination of colors, materials, textures or a grade change within the crosswalk area to define pedestrian-priority space.



**- CONSIDERATIONS -**  
Using colored asphalt rather than brick or other decorative surface materials can enhance reliability for people with mobility impairments.



**MAKE MARKINGS VISIBLE**  
to motorists,  
particularly at  
night.

**ENHANCED CROSSWALK**



**DESCRIPTION**

Crosswalks can be enhanced using textured pavement as a surface material on the roadway, such as brick, concrete pavers and stamped asphalt, which is installed to produce small, constant changes in vertical alignment. Though textured pavements do reduce travel speeds; however, they can be difficult for bicyclists and some pedestrians to negotiate through.

It is important to ensure that crosswalk markings are visible to motorists, particularly at night. Crosswalks should not be slippery, create tripping hazards, or be difficult to traverse by those with diminished mobility or visual capabilities. Granite and cobblestones are examples of materials that are aesthetically pleasing, but may become slippery when wet or be difficult to cross by pedestrians who are blind or using wheelchairs.

A material often used for marking crosswalks is thermoplastic, which is installed on new or repaved streets. It is highly reflective, long-lasting and slip-resistant, and does not require a high level of maintenance. Although initially more costly than paint, both inlay tape and thermoplastic are more cost-effective in the long run. Inlay tape is recommended for new and resurfaced pavement, while thermoplastic may be a better option on rougher pavement surfaces. Both inlay tape and thermoplastic are more visible and are less slippery than paint when wet.

# INTERSECTIONS



# Enhanced Intersection

 INTERSECTION OF LOCAL STREETS



Enhanced intersections use a combination of colors, materials, textures or a grade change within the crosswalk area to define pedestrian-priority space.

**- CONSIDERATIONS -**  
 Design criteria should be established for enhancing spaces within intersections to ensure consistency between community projects, private development and public capital improvements.



**DESCRIPTION**

Intersections can be enhanced using textured pavement as a surface material on the roadway, such as brick, concrete pavers, and stamped asphalt. Which textured pavements may result in a reduced travel speeds; they can also be difficult for bicyclists and some pedestrians to negotiate through.

It is important to ensure that intersection markings are visible to motorists, particularly at night. Surfaces should not be slippery or create tripping hazards. Some transportation agencies allow community groups to paint murals within low volume intersections as beautification projects. Criteria for design, material and implementation are developed to ensure that the painted intersection remains safe for pedestrians, bicyclists and vehicles.

A material often used for enhanced intersection is thermoplastic, which is installed on new or repaved streets. It is highly reflective, long-lasting, slip-resistant and does not require a high level of maintenance. Although initially more costly than paint, both inlay tape and thermoplastic are more cost-effective in the long run. Inlay tape is recommended for new and resurfaced pavement, while thermoplastic may be a better option on rougher pavement surfaces. Both inlay tape and thermoplastic are more visible and are less slippery than paint when wet.



# Corner Curb Extension



ANY STREET

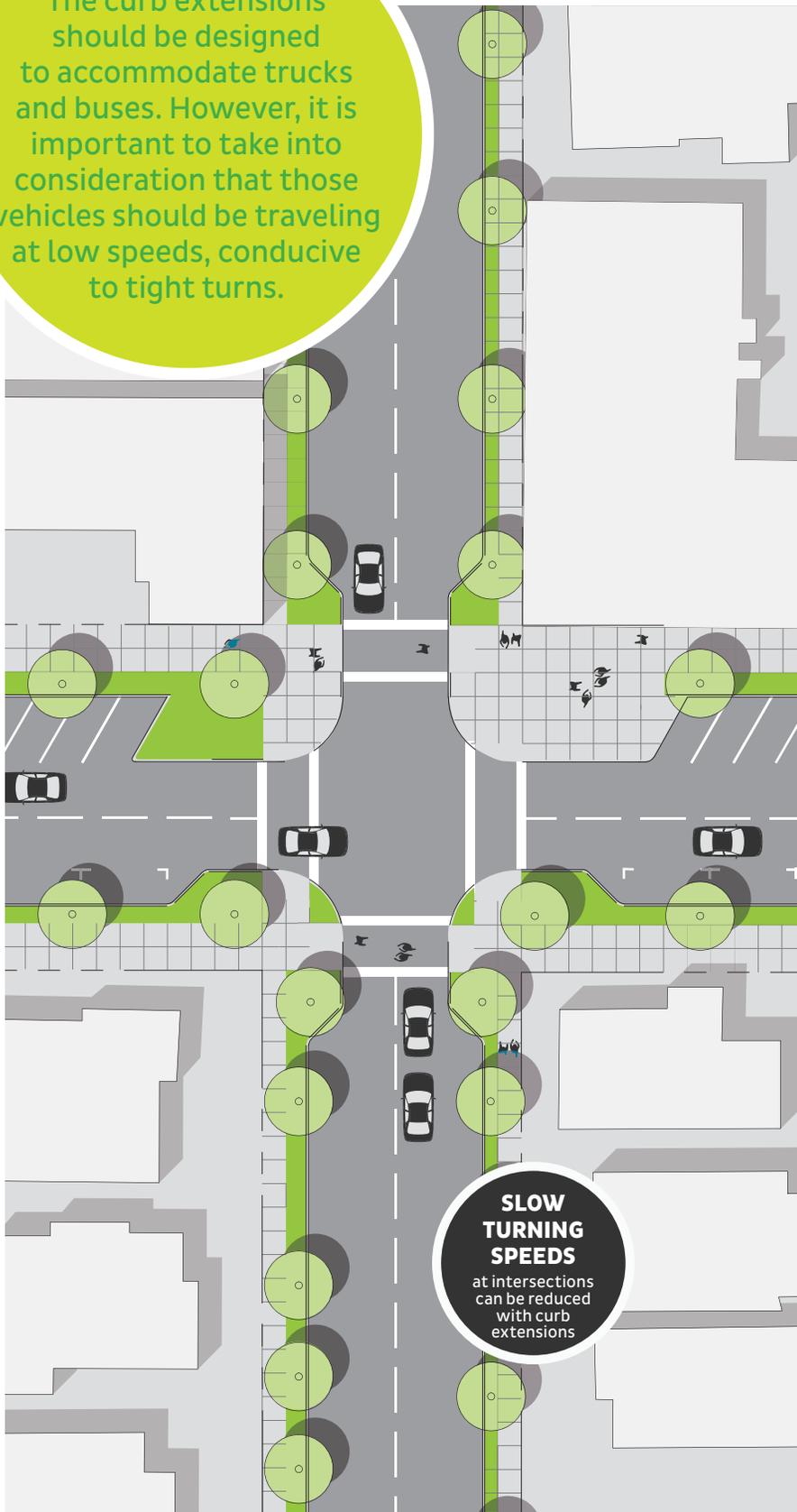


By expanding the sidewalk area into the on-street parking lane, curb extensions shorten the distance to walk across the street, make it easier for drivers to see pedestrians and make drivers slow down when turning.



## - CONSIDERATIONS -

The curb extensions should be designed to accommodate trucks and buses. However, it is important to take into consideration that those vehicles should be traveling at low speeds, conducive to tight turns.


**SLOW  
TURNING  
SPEEDS**

at intersections  
can be reduced  
with curb  
extensions

## CORNER CURB EXTENSION



## DESCRIPTION

Curb extensions—also known as bulb-outs—extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and reducing the time that pedestrians are in the street. Curb extensions placed at an intersection essentially prevent motorists from parking in or too close to a crosswalk thus blocking the curb ramp or crosswalk. It simultaneously improves sightlines for pedestrians and other vehicles, making turning particularly difficult for emergency vehicles and trucks.

Motorists are encouraged to drive slower at intersections as the restricted street width sends a visual cue to motorists. Turning speeds at intersections can be reduced with curb extensions. Curb extensions also provide additional space for curb ramps and for level sidewalks where existing space is limited. These extensions are only appropriate where there is an on-street parking lane and must not extend into travel lanes, bicycle lanes, or shoulders. The turning requirements of larger vehicles, such as school buses, need to be considered in curb extension design.



# Transit Curb Extension



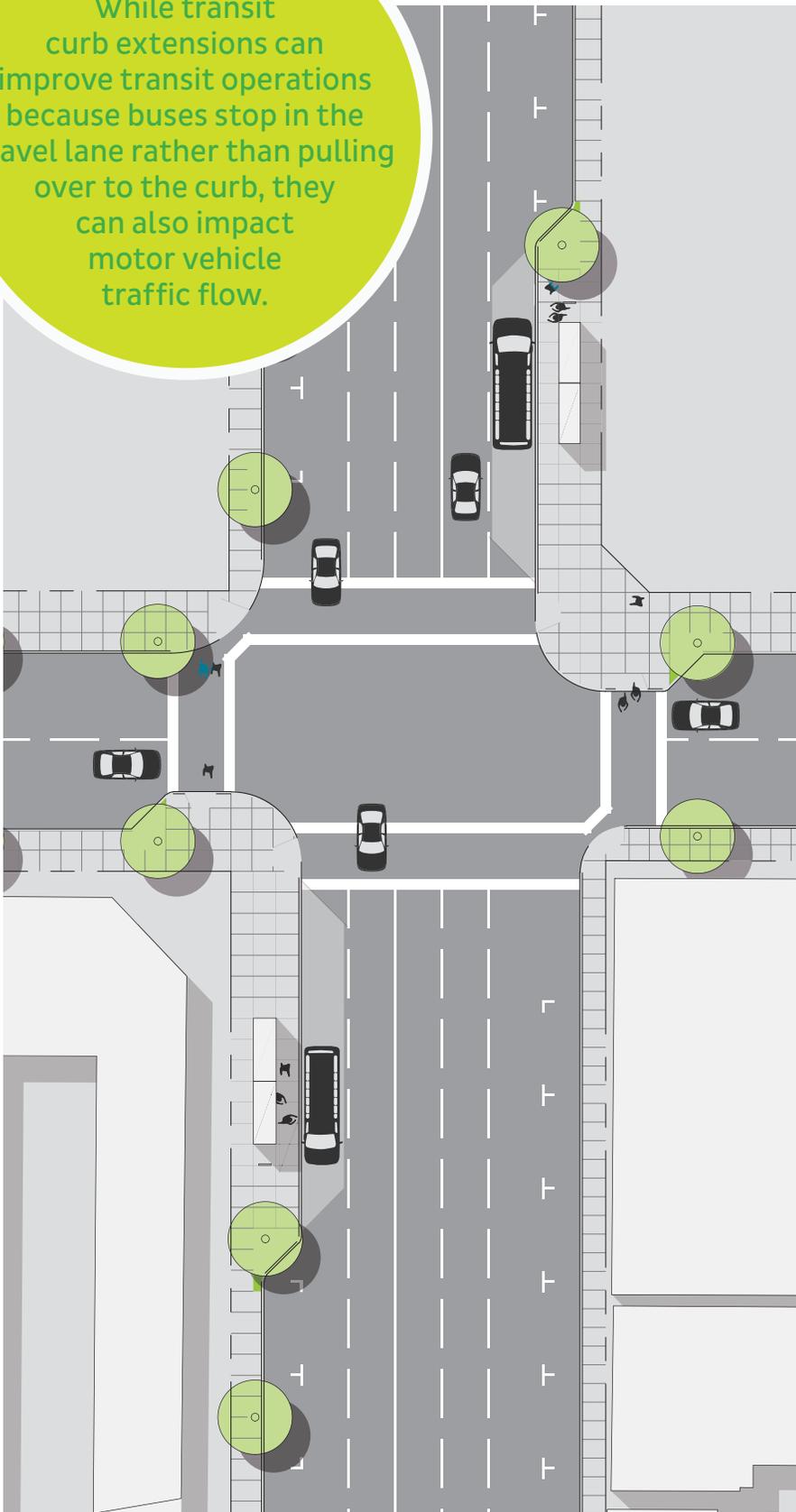
MAJOR AVENUES, BOULEVARD AND REGIONAL CORRIDORS WITH TRANSIT ROUTES



A transit curb extension expands the sidewalk area into the on-street parking lane to expand the waiting area for bus riders. It also improves bus operations by allowing the bus to remain in the travel lane thereby avoiding exiting and merging with traffic.



**- CONSIDERATIONS -**  
While transit curb extensions can improve transit operations because buses stop in the travel lane rather than pulling over to the curb, they can also impact motor vehicle traffic flow.



**TRANSIT CURB EXTENSION**



#### DESCRIPTION

Transit Curb Extensions allow buses to stop in-lane thereby eliminating the need to re-enter the traffic flow. This increases bus reliability since the bus driver no longer needs to wait for a gap in traffic; and it increases safety by reducing the potential for conflict when entering the traffic flow. Additionally, where it is not possible to provide a pad or sidewalk of sufficient width for accommodating both waiting passengers and passing pedestrians, bus bulb outs [i.e. elongated curb extensions] can be ideal. They provide additional space for passengers to board and alight transit vehicles without interfering with sidewalk flow.

The bulb out should be long enough to allow passengers to board and exit from at all doors of the bus. Bus bulb outs can also have positive traffic calming effects by narrowing the roadway, and when placed at intersections, can be designed with smaller curb radii that force right-turning vehicles to reduce speed. When coupled with a pedestrian crossing, bus bulb outs, like curb extensions, also reduce pedestrian exposure by shortening the crossing distance. Bulb outs also make pedestrians who are about to enter the crosswalk more visible to approaching traffic by bringing them out beyond objects like parked cars or street trees, which may obstruct driver visibility.



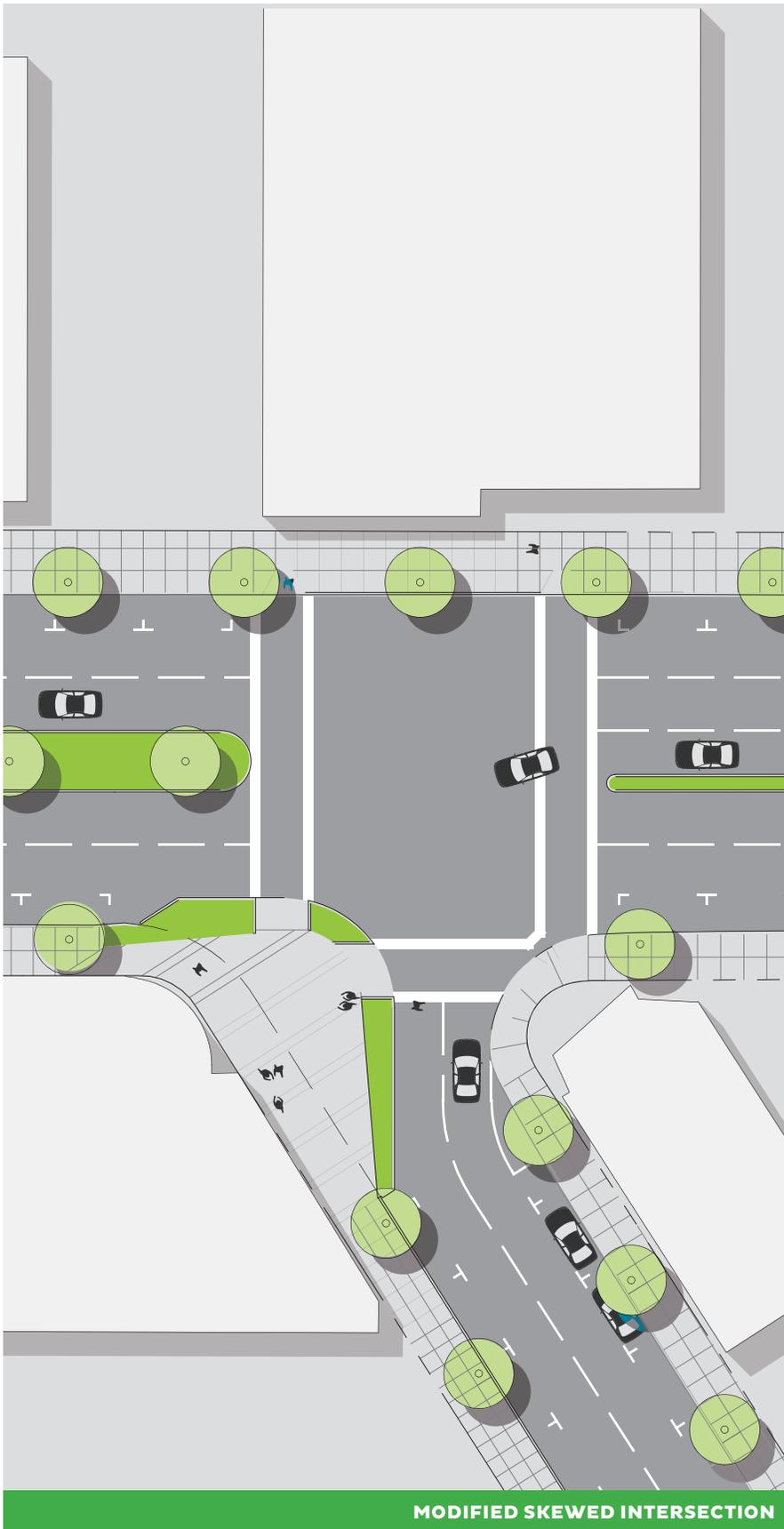
# Modified Skewed Intersection



OBLIQUE ANGLED INTERSECTIONS



Modifying skewed intersections improves pedestrian safety and accessibility by reconfiguring the intersecting street closer to 90 degrees. Other treatments include adding medians or channelization islands.



**DESCRIPTION**

Strategies for improving pedestrian safety at existing skewed intersection crossings include reconfiguring the intersection by straightening the skewed approach, thereby reducing the speed of turning vehicles by creating a tighter turning radius, and reducing the crossing distance for pedestrians. In some cases, it may just involve providing high visibility marked crosswalks and adding medians or channelization islands to reduce crossing distance. Intersection guide strips for pedestrians with restricted vision may also be considered in some situations. Moving crosswalks back from the intersection to shorten crossing distances is generally not a preferred strategy because it is counter-productive to pedestrian or motorist expectations, and can create problems for visually impaired pedestrians.

When skewed intersections are unavoidable, the intersection should be designed so that the angle between intersecting streets is as close to 90 degrees as possible. In addition, if major alterations are being done to an existing skewed intersection, engineers should consider whether it is possible to reconfigure the intersection so that the crossings are more perpendicular.

Modified skewed intersections occur when streets intersect at angles other than 90 degrees and can create complicated scenarios for pedestrians, bicyclists and motorists.



# Roundabout



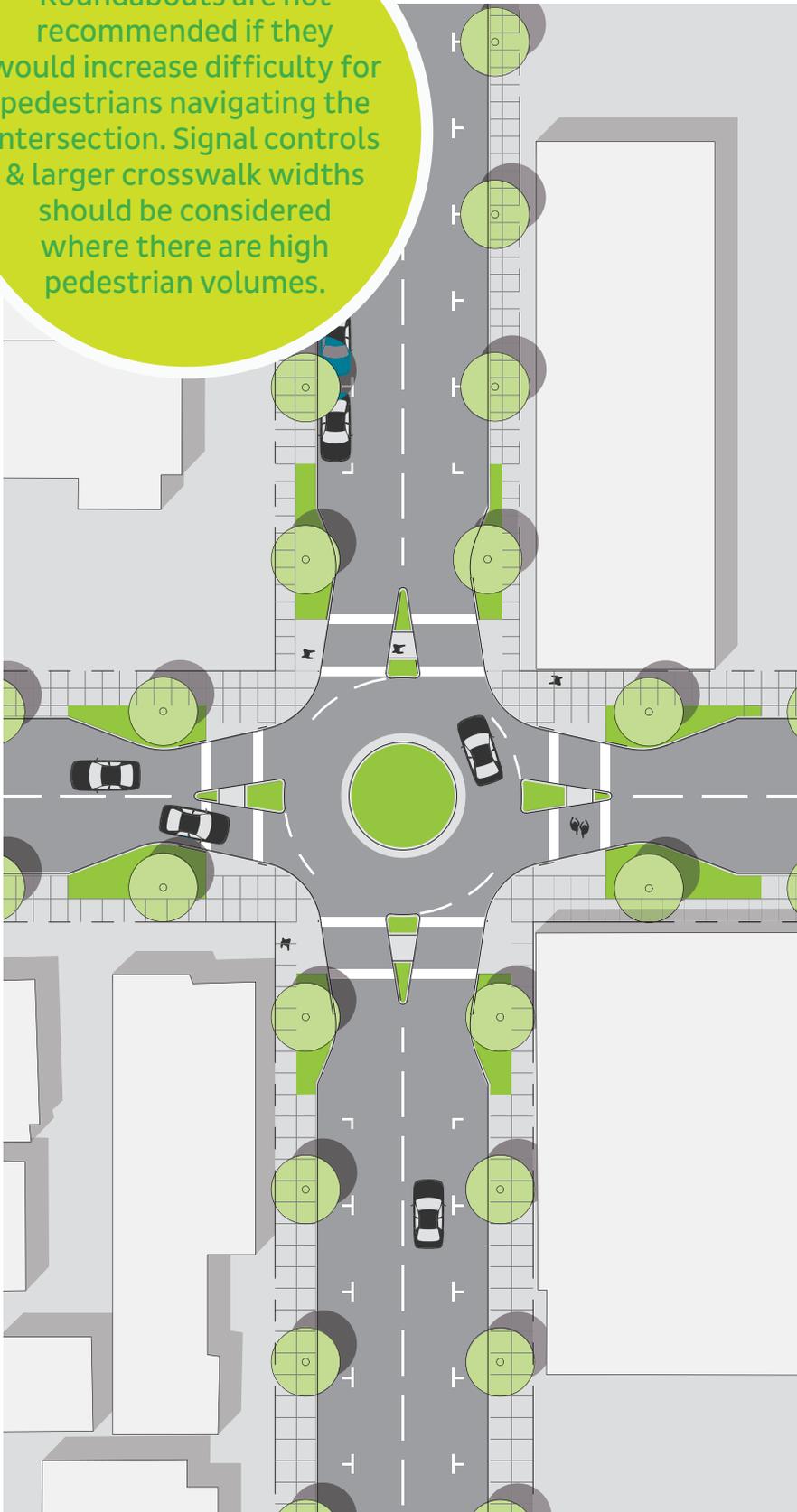
INTERSECTIONS ALONG NEIGHBORHOOD CONNECTORS



A roundabout is a circular intersection on a major street with one-way [counter-clockwise] traffic that revolves around a central island. Entering traffic must yield to traffic already in the roundabout.

**- CONSIDERATIONS -**

Roundabouts are not recommended if they would increase difficulty for pedestrians navigating the intersection. Signal controls & larger crosswalk widths should be considered where there are high pedestrian volumes.

**ROUNDBABOUT / MINI CIRCLE****DESCRIPTION**

Roundabouts are circular intersections designed to eliminate left turns by requiring traffic to exit to the right of the circle. Roundabouts are installed to reduce vehicular speeds, improve safety at intersections through eliminating angle collisions, help traffic flow more efficiently and reduce operation costs when converting from signalized intersections, and help create gateway treatments to signify the entrance of a special district or area.

A roundabout is built with a large circular, raised island located at the intersection of two or more streets and may take the place of a signalized intersection. Traffic maneuvers around the circle in a counterclockwise direction, and then turns right onto the desired street. Entering traffic yields to traffic in the roundabout, and left-turn movements are eliminated. Unlike a signalized intersection, vehicles generally flow and merge through the roundabout from each approaching street without having to stop.

ADA compliant pedestrian crosswalks and curb ramps should be provided at least 20 feet from the entry of the roundabout to give room for a vehicle to stop prior to the crosswalk but outside of the circulatory roadway. Channelization islands at the approaches can help slow vehicles and allow pedestrians to cross one direction of travel at a time. At-grade pedestrian cut-throughs should be provided at channelization islands with ADA compliant detectable warning strips.



# Mini Traffic Circle



INTERSECTIONS ALONG LOCAL STREETS



A mini-traffic circle is a raised circular island in the middle of an intersection that has one-way [counter-clockwise] traffic revolving around it. Entering traffic must yield to traffic already within the traffic circle.



## -CONSIDERATIONS-

Mini-circles are an intersection improvement as well as a traffic-calming device and can take the place of a four-way stop sign. Many unwarranted four-way stop signs are installed because of community demand.



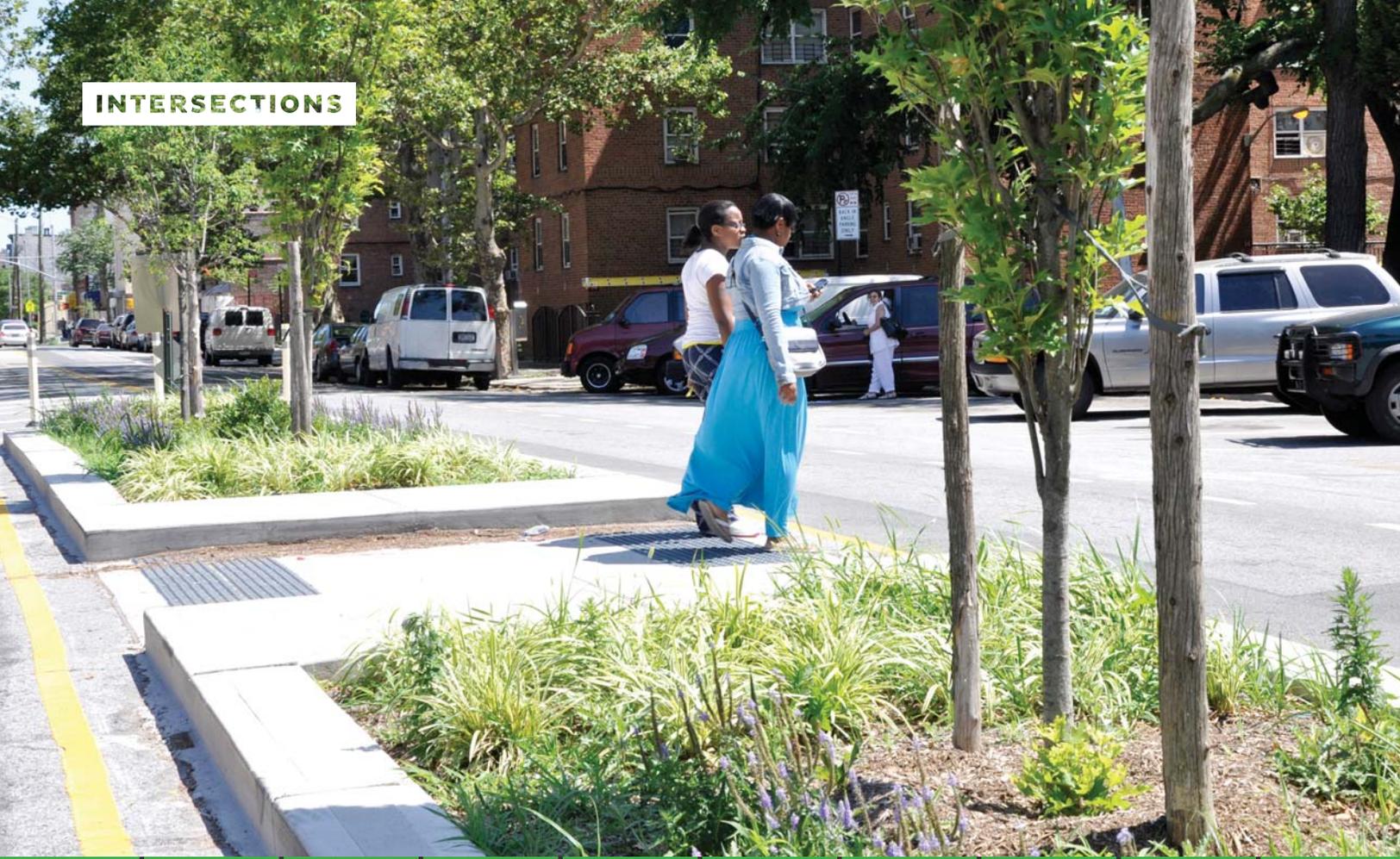
MINI TRAFFIC CIRCLE



## DESCRIPTION

Mini-circles are raised circular islands constructed in the center of local streets intersections while roundabouts are larger traffic circles that can be used at intersections with arterial streets. They reduce vehicle speeds by forcing motorists to maneuver around them. Drivers making left turns are directed to go on the far side of the circle [see diagram on the left] prior to making the turn. Channelization islands for roundabouts at the approaches can help slow vehicles and allow pedestrians to cross one direction of travel at a time. Signs should be installed directing motorists to proceed around the right side of the circle before passing through or making a left turn.

Mini-circles are commonly landscaped, most often at locations where the neighborhood has agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through specific pavement materials. Mini-circles and roundabouts must be properly designed to slow vehicles and benefit pedestrians and bicyclists. The occasional larger vehicle going through an intersection with a traffic circle [e.g., a fire truck or moving van] can be accommodated by creating a mountable curb in the outer portion of the circle.



# Crossing Island



STREETS WITH AVAILABLE ROADWAY WIDTH

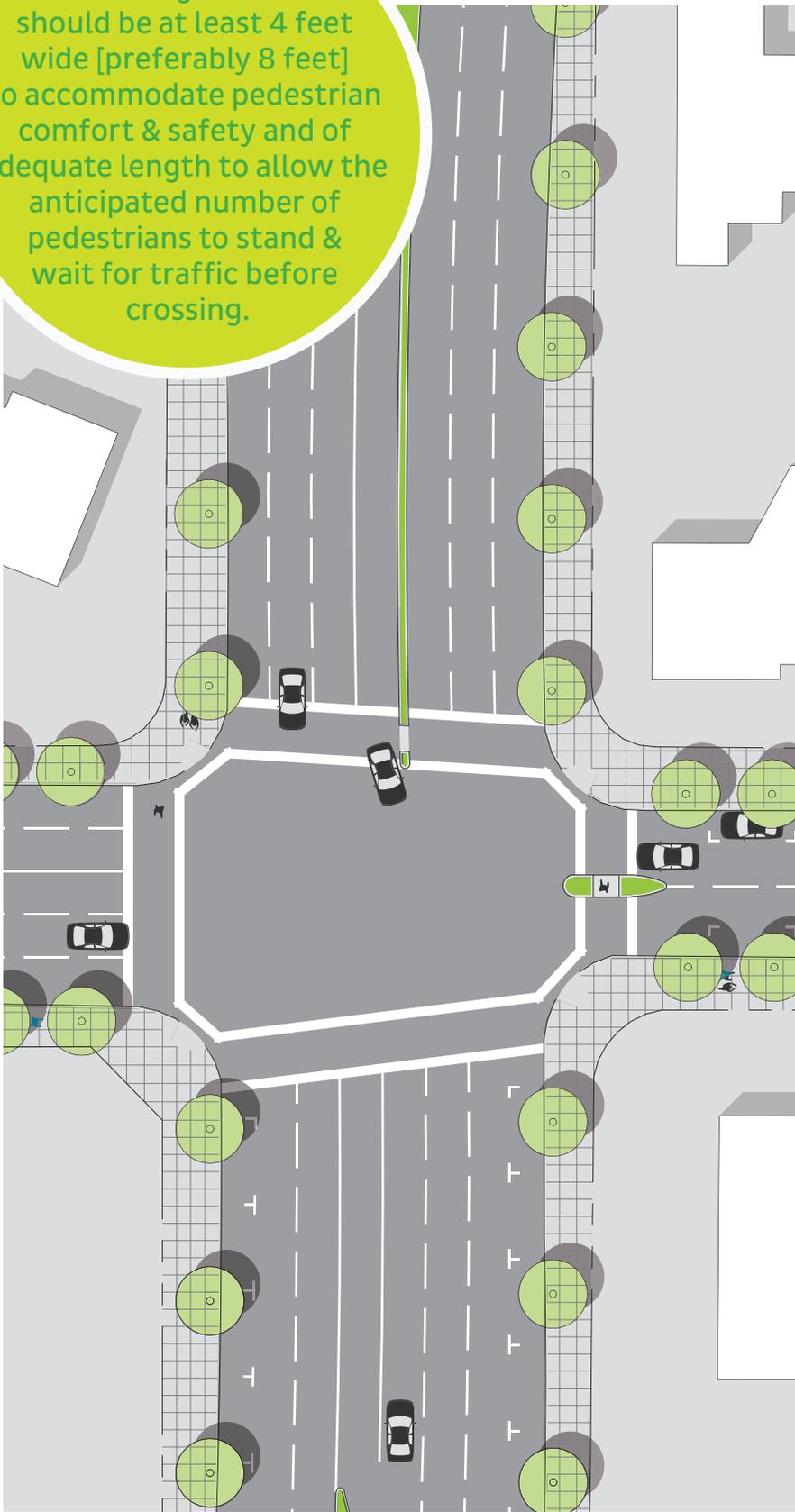


A crossing island is a raised curb island in the middle of the street that gives people a place to wait while crossing the street and allows people to cross one half at a time.



## -CONSIDERATIONS-

Crossing islands should be at least 4 feet wide [preferably 8 feet] to accommodate pedestrian comfort & safety and of adequate length to allow the anticipated number of pedestrians to stand & wait for traffic before crossing.



CROSSING ISLAND



## DESCRIPTION

Crossing islands, also known as center islands, areas of refuge or pedestrian islands, are raised islands placed in the center of the street at intersections or mid-block crossings to help protect crossing pedestrians from motor vehicles. Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and they enable pedestrians to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. Crossing islands can be constructed so that crossing pedestrians are forced to the right to view oncoming traffic as they are halfway through the crossing.

If there is enough width, center crossing islands and curb extensions can be used together to create a highly improved pedestrian crossing. Detectable warnings are needed at cut-throughs to identify the pedestrian refuge area. Crossing islands have been demonstrated to decrease pedestrian-vehicle incidents by 46 percent at marked crossings, and by 39 percent at unmarked crossings. The factors contributing to pedestrian safety include reduced conflicts, reduced vehicle speeds approaching the island, greater attention called to the existence of a pedestrian crossing and reduced exposure time for pedestrians.

CROSSWALK



# TRAFFIC SIGNALS





Traffic control devices are often used by traffic engineers to improve safety and access for pedestrians. In addition to marked crosswalks, several other devices are available, including the ones listed above. Advanced traffic signals may include auditory or sensory cues to alert people when it is safe or not safe to cross the street. Similar to intersection enhancements, certain traffic signal devices may not be appropriate at certain locations, and should consider existing pedestrian circulation patterns.



# Pedestrian Countdown



SIGNALIZED INTERSECTIONS



Countdown signals show people how much time they have left to cross the street.



## - CONSIDERATIONS -

Federal American Disabilities Act guidelines encourage the use of accessible pedestrian signals where there is a need to accommodate pedestrians with visual impairments.

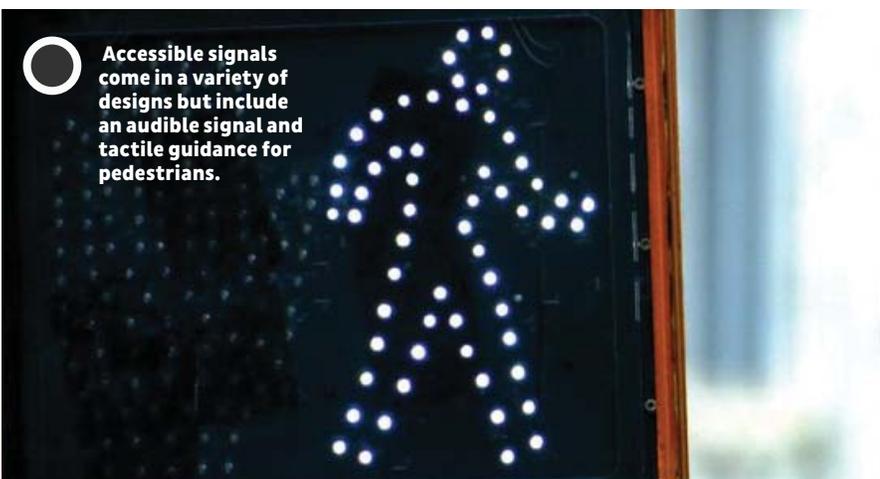


## DESCRIPTION

Countdown signals tell pedestrians the amount of time remaining before the flashing upraised hand changes to a solid upraised hand or “don’t walk” indication. Research shows that both drivers and pedestrians tend to comply with these signals more often than with non-countdown signals.

The number of seconds displayed in the countdown is determined by the pedestrian change interval [the time before the “walk” indication changes to “don’t walk”]. Signal heads may be installed in place of existing non-countdown signal heads, because they use internal logic that enables them to calculate the amount of time based upon the signal inputs received over the course of several signal cycles.

In some locations, the countdown sequence operates through the entire pedestrian phase [walk and the change interval]. Many pedestrians like knowing the actual amount of time in the full pedestrian phase, so that they can elect whether to begin crossing or adjust their speed to cross more safely. For example, an older person can cross a wide intersection with greater confidence if he or she knows from the outset how much time remains for the crossing.



Accessible signals come in a variety of designs but include an audible signal and tactile guidance for pedestrians.

## PEDESTRIAN COUNTDOWN



# Phase-Out Pedestrian Actuators



ALL SIGNALIZED INTERSECTIONS



Remove existing pedestrian signal pushbuttons and provide dedicated signal phases for all pedestrian movement at signalized intersections.



## - CONSIDERATIONS -

Pedestrian signal actuators or push button devices are not activated by about one-half of pedestrians, even fewer activate them where there are sufficient motor vehicle gaps.



## DESCRIPTION

Current pedestrian signal actuators or pushbuttons are used to trigger the pedestrian movement cycle of a traffic signal phase. Many times, pedestrians will cross streets illegally after realization that they had missed their signal phase due to not pushing the button. Removing the pedestrian actuators can be done in conjunction with installation of pedestrian countdowns, regular resignalization and traffic signal synchronization projects.

Pedestrian signals may be supplemented with audible or other messages to make crossing information accessible for all pedestrians, including those with vision impairments. The decision to install audible pedestrian signals should consider the noise impact on the surrounding area. The pushbutton can be retained to activate audible warnings for pedestrian movement, to activate Rectangular Rapid Flashing Beacons [RRFB] or to prioritize a pedestrian signal phase at an intersection, though all pedestrian movement should be accommodated through the regular traffic signal cycle.

If necessary for optimizing the Multimodal Level of Service [MMLOS], new “intelligent” pedestrian detectors can be considered. These automatically activate the red traffic and WALK signals when pedestrians are detected. Detectors can also be used to extend the crossing time for slower moving pedestrians in the crosswalk. Automatic pedestrian detectors have been found to improve pedestrian signal compliance and also reduce pedestrian conflicts with motor vehicles.



## PHASE-OUT PEDESTRIAN ACTUATORS



# Signalized Intersections



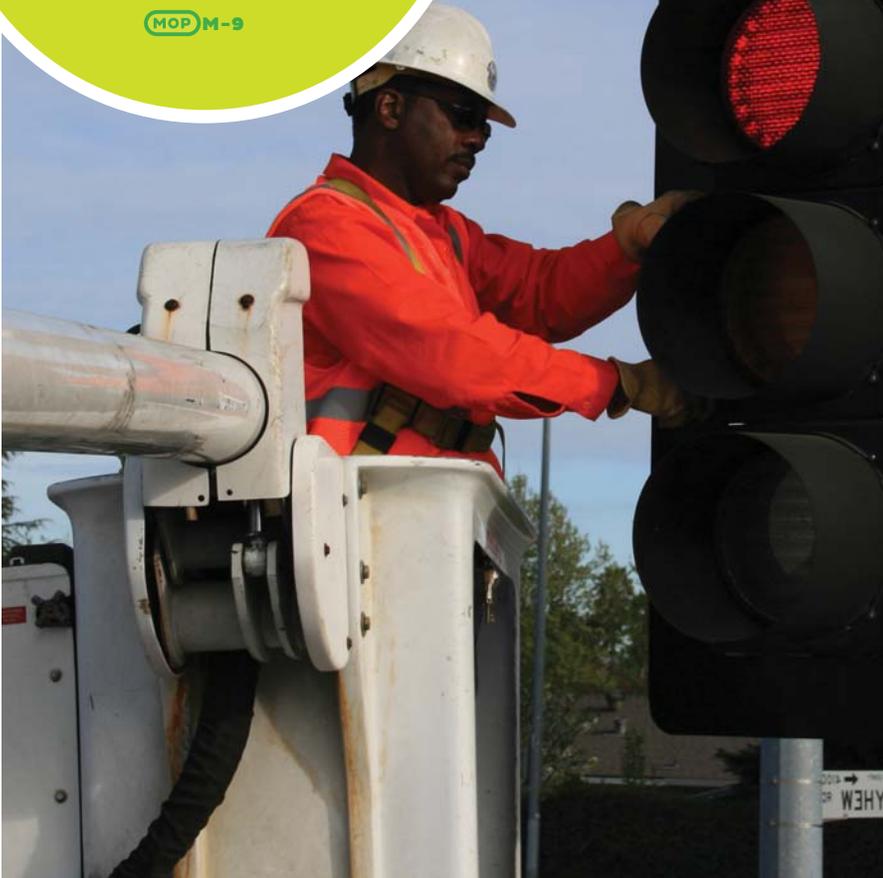
NEIGHBORHOOD CONNECTORS, AVENUES, BOULEVARDS & REGIONAL CORRIDORS



Reduce the distance between safe crossing opportunities on major thoroughfares by adding new traffic signals and marked crosswalks at intermediate intersections.

**- CONSIDERATIONS -**  
 Implement additional mid-block crossings & traffic calming as needed in the more suburban locations of the City where larger blocks and wider streets inhibit pedestrians.

MOP M-9



**DESCRIPTION**

Pedestrians are sensitive to out-of-the-way travel, and reasonable accommodation should be made to make street crossings both convenient and safe at locations with adequate visibility. Marked crosswalks indicate optimal or preferred locations for pedestrians to cross and help designate right-of-way for motorists to yield to pedestrians. Crosswalks are often installed at signalized intersections and other selected locations.

Visibly marked crosswalks along major thoroughfares should be installed at intersections in conjunction with traffic controls and/or treatments that reduce pedestrians' exposure to traffic. Typically in pedestrian priority areas, every intersection should accommodate safe and convenient opportunities for pedestrians to cross the street. Consideration for safe crossings should also be provided in relation to safe routes to schools and parks as well as transit stops.



**SIGNALIZED INTERSECTIONS**



# Leading Pedestrian Interval



SIGNALIZED INTERSECTIONS



A leading pedestrian interval gives pedestrians a head start walk signal before the motorists get a green light, giving the pedestrian several seconds to start in the crosswalk.



To be useful to pedestrians with vision impairments, an LPI needs to be accompanied by an audible signal to indicate the WALK interval.



**- CONSIDERATIONS -**  
Right turn on red rules can limit the effectiveness of a leading pedestrian interval, restricting right turn on red use. Consider adding protected turn movements to the traffic signal cycle as an alternative.

LEADING PEDESTRIAN INTERVAL



DESCRIPTION

A simple, useful signal timing change is the leading Pedestrian Interval [LPI]. A LPI gives pedestrians an advance walk signal before the motorists get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal. This makes pedestrians more visible to motorists and motorists more likely to yield to them.

LPIs increase the percentage of motorists who yield the right of way to pedestrians because pedestrians are in the crosswalk by the time the traffic signal turns green for parallel vehicle movements. This advance crossing phase approach has been used successfully in several places for two decades and studies have demonstrated reduced conflicts for pedestrians. The advance pedestrian phase is particularly effective where there is a two-lane turning movement.

To be useful to pedestrians with vision impairments, a LPI needs to be accompanied by an audible signal to indicate the WALK interval. There are some situations where an exclusive pedestrian phase may be preferable to a LPI. Exclusive phases are desirable where there are high-volume turning movements that conflict with the pedestrians crossing. Consideration should be made to potential traffic impacts due to reduced signal phase for vehicle movement.



# Rectangular Rapid Flashing Beacons



MAJOR & MINOR AVENUES



Rectangular Rapid Flashing Beacons warn drivers when they are trying to cross so they know to yield. These are used at marked crosswalks without a stop sign or traffic signal.



- CONSIDERATIONS -

Rectangular rapid flashing beacons are a traffic control device that may require outreach to the public before implementation to educate them as to how they operate.



RECTANGULAR RAPID FLASHING BEACON



NEAR SCHOOLS & TRANSIT

are good places to consider the pedestrian beacon



PEDESTRIAN HYBRID BEACON



DESCRIPTION

The Rectangular Rapid Flashing Beacon [RRFB], is a pedestrian-activated warning device installed at unsignalized marked crosswalks and are activated by a pedestrian push button. At this point, the pedestrian will push an easy to reach button that activates the beacon. RRFBs use an irregular flash pattern that is similar to emergency flashers on police vehicles. This allows them to cross a major roadway while traffic has stopped. Including RRFBs on a center island or median as well can further increase driver yielding behavior. RRFBs typically receive power by standalone solar panel units, but may also be wired to a traditional power source.

Pedestrian RRFBs should only be used in conjunction with a marked crosswalk. In general, they should be used if gaps in traffic are not adequate to permit pedestrians to cross, if vehicle speeds on the major street are too high to permit pedestrians to cross, or if pedestrian delay is excessive. Transit and school locations may be good places to consider using RRFBs. Chapter 4F of the Manual on Traffic Control Devices [MUTCD] contains a chapter on the RRFBs and when and where it should be installed. Alternatives to the RRFB include the pedestrian hybrid beacon and the High intensity Activated Crosswalk [HAWK], both of which serve similar purposes, but depending on the roadway configuration and traffic speeds, some beacons are more appropriate than others.



# Pedestrian Scramble



SIGNALIZED INTERSECTIONS

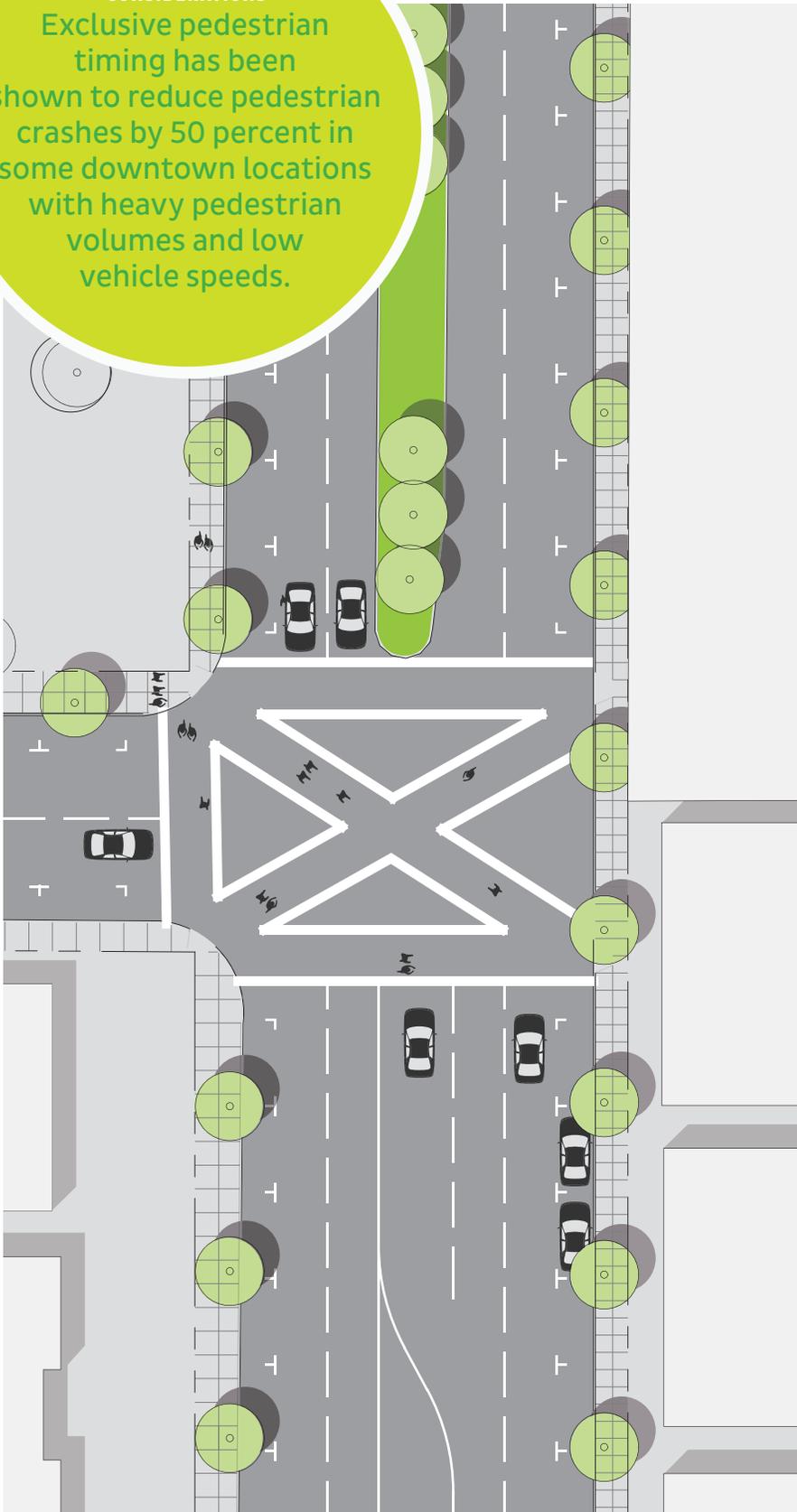


The pedestrian scramble stops cars in all directions and allows pedestrians to cross the street in any direction, including diagonally.



- CONSIDERATIONS -

Exclusive pedestrian timing has been shown to reduce pedestrian crashes by 50 percent in some downtown locations with heavy pedestrian volumes and low vehicle speeds.



PEDESTRIAN SCRAMBLE



DESCRIPTION

Also known as an Exclusive Pedestrian Phase, a pedestrian scramble is active only when all conflicting vehicle movements are stopped across an approach to an intersection. When vehicles are stopped on all approaches to an intersection while pedestrians are given a WALK indication, the phasing is referred to as “exclusive” or as a “pedestrian scramble”. Intersections with pedestrian scramble phases often feature pedestrian crossing markings indicating pedestrians may walk diagonally across the intersection.

Pedestrian Scrambles have a traffic signal phasing cycle which gives pedestrians their own signal phase to cross in any direction, including diagonally through the intersection. The Pedestrian Scramble reduces or eliminates conflicts between vehicles and pedestrians and allows intersections to operate more efficiently when large pedestrian traffic volumes prevent vehicles from being able to make turns. At traditionally signalized intersections with high pedestrian volumes, crossing pedestrians may severely limit turns and cause intersection back-ups. Adequate signage and pavement markings must be provided to ensure pedestrians understand operations of the pedestrian scramble including where they are required to wait; otherwise pedestrians may continue to disrupt certain vehicle movements and the efficiency benefits will be lost.



**TRAFFIC MANAGEMENT**



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Although they are sometimes lumped together, traffic management and traffic calming are different tools and address different problems. Traffic management includes the use of traditional traffic control devices to manage volumes and routes of traffic. Traffic calming deals with what happens to traffic once it is on a street. For example, limiting access to a street may reduce the amount of traffic on that street, but will do nothing to affect the speed of the traffic that travels on that street or others. Traffic management should be assessed from an area-wide perspective. The problem should not just be shifted from one street to another. Although implementation usually occurs in stages, an overall plan can be developed up-front, involving a larger neighborhood or area of the city. Traffic management and traffic calming should involve the community.



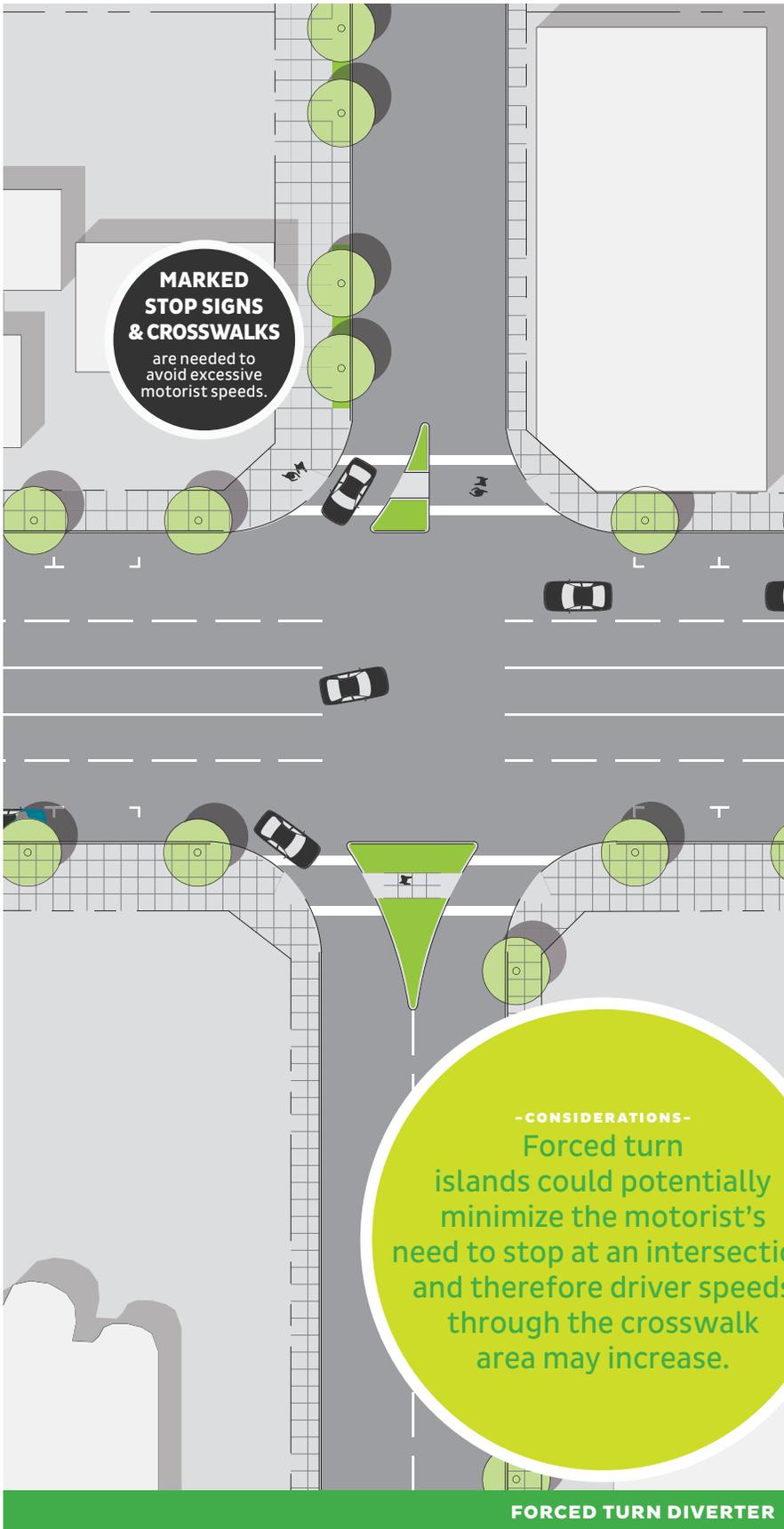
# Forced Turn Diverter



INTERSECTIONS WITH LOCAL STREETS THAT HAVE PARALLEL ALTERNATIVE ROUTES.



A forced turn diverter is a barrier that forces those entering or exiting an intersection from the secondary street to turn while typically allowing bicyclists and pedestrians to continue through.



**DESCRIPTION**

Forced turn diverters also called forced turn channelizations, pork chops, or right turn islands, preclude movements from one street through an intersection. Typically employed at intersections along thoroughfare traveling through neighborhoods, forced turn diverters limit certain movements from entering the local street when approaching an intersection. Installing diverters should be part of a concerted neighborhood traffic plan to avoid transferring negative traffic patterns to another location. Although forced turn islands have some benefits for people with mobility impairments, they are not as desirable as median barriers for diverting traffic because they complicate the intersection for people with vision impairment.

When designing forced turn diverters, minimize lane widths and tighten the angle of deflection used for the raised island to slow vehicle speeds. While attempting to calm traffic speeds, the lane width and angle of deflection must still accommodate maneuvering for emergency vehicles. The forced turn island creates a pedestrian refuge benefiting pedestrians by dividing and decreasing crossing widths. Pedestrians with slower walking speeds are able to cross one leg of traffic and then wait on a pedestrian refuge before crossing a second leg of traffic. To improve pedestrian safety, design islands to include accessible features, such as cut-throughs with detectable warnings and a minimum clear width of 48" and provide space for bicyclists to share the road with motorists.



# Diagonal & Star Diverter



INTERSECTIONS OF LOCAL STREETS THAT HAVE PARALLEL ALTERNATIVE ROUTES

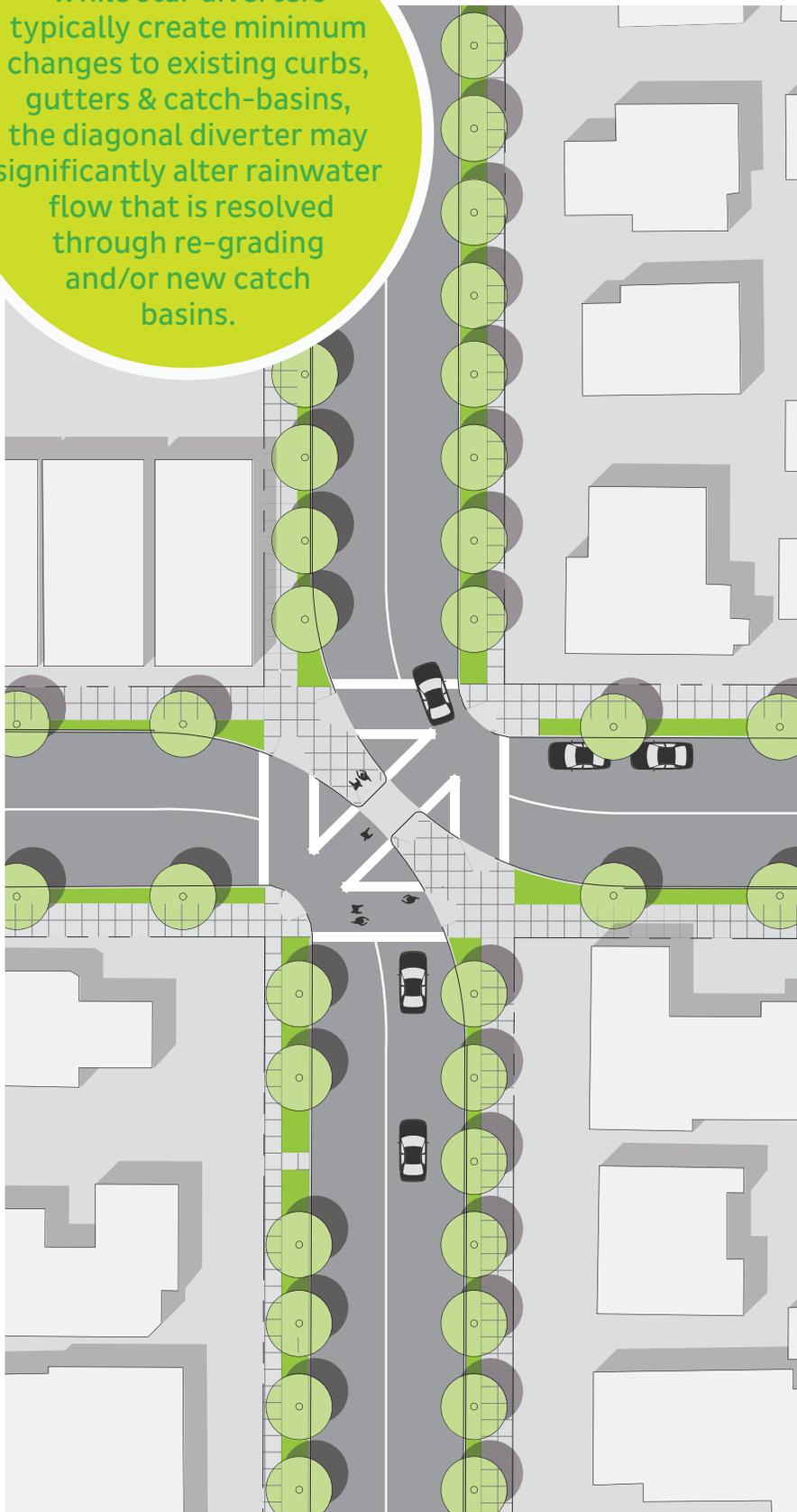


Diagonal and star diverters are barriers that require drivers in all four directions to turn while typically allowing bicyclists and pedestrians to continue through.



## -CONSIDERATIONS-

While star diverters typically create minimum changes to existing curbs, gutters & catch-basins, the diagonal diverter may significantly alter rainwater flow that is resolved through re-grading and/or new catch basins.



DIAGONAL &amp; STAR DIVERTER



## DESCRIPTION

Diagonal and star diverters are barriers designed to preclude through movement of both streets of an intersection. They are good for inner-neighborhood locations with non-local traffic volume problems. As with other traffic management tools, diverters must be used in conjunction with other traffic management tools within the neighborhood street network.

Diagonal diverters are barriers placed diagonally across an intersection, blocking through movements and creating two separate, L-shaped streets. Like half closures, diagonal diverters are often staggered to create circuitous routes through the neighborhood as a whole, discouraging non-local traffic while maintaining access for local residents. A truncated diagonal diverter is a diverter with one end open to allow additional turning movements.

A star diverter is a star-shaped raised island in the middle of the intersection that forces right turns from each approach. Both star and diagonal diverters are able to maintain full pedestrian and bicycle access through the intersection. Consider emergency vehicle access in the overall planning of the diverter locations as well as their design and construction.



# Median Diverter



INTERSECTIONS WITH LOCAL STREETS THAT HAVE PARALLEL ALTERNATIVE ROUTES

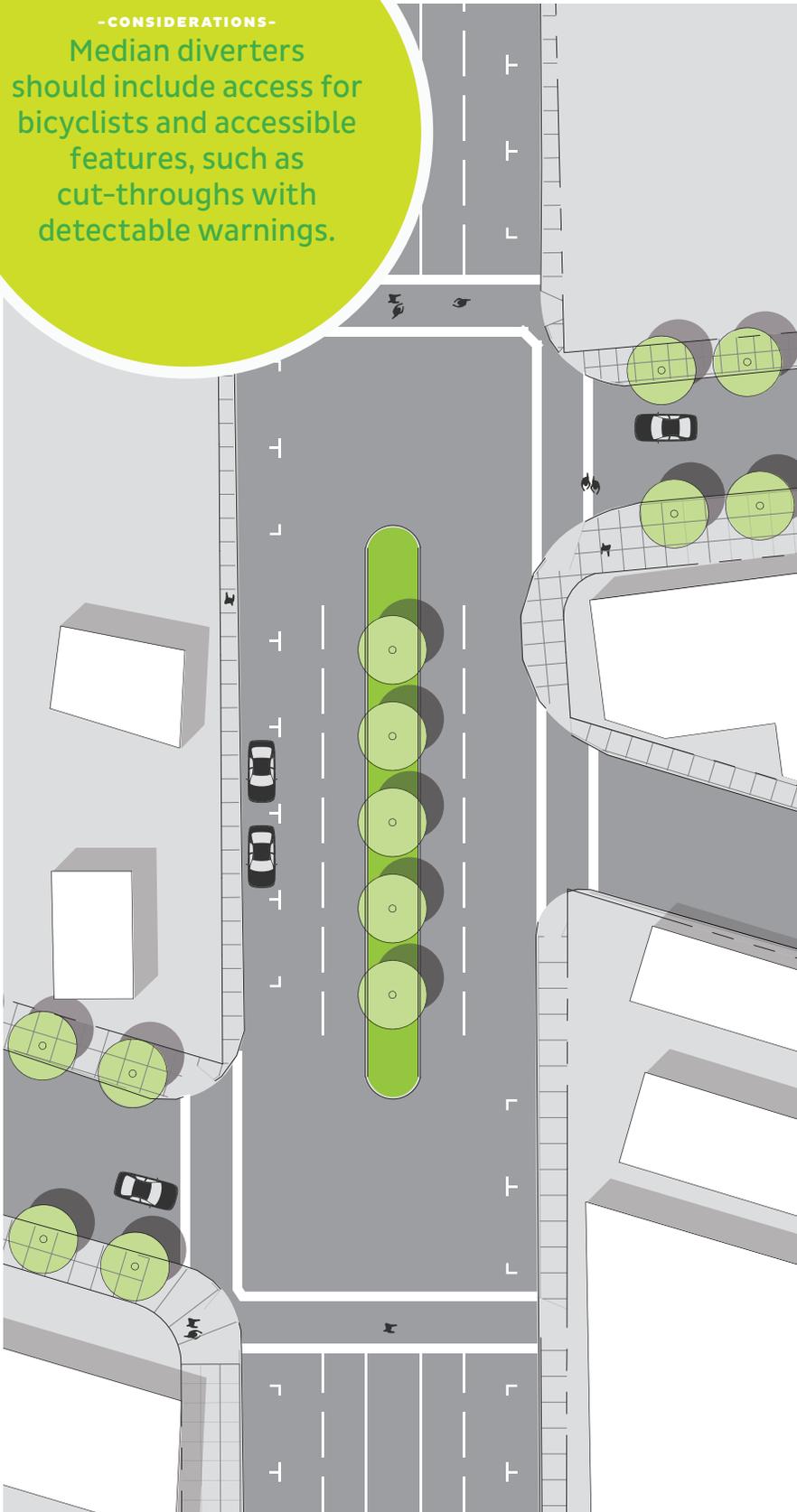


A median barrier diverter prevents drivers from crossing a street or turning left but typically allows bicyclists and pedestrians to continue the movement.



-CONSIDERATIONS-

Median diverters should include access for bicyclists and accessible features, such as cut-throughs with detectable warnings.



MEDIAN DIVERTER



DESCRIPTION

Median barrier diverters are raised islands located in the middle of a street and continuing through an intersection. These diverters are implemented to block cut-through movement of motor vehicle traffic at a cross-street. Median barrier diverters can block left turning motorists, which can benefit pedestrians. They are also called median diverters or island diverters.

Median diverters also provide additional area for landscaping and street trees which along with beautification and environmental benefits, include additional habitat, stormwater management and reducing the urban heat island. The median diverter provides visual cues for drivers to slow their speeds along the corridor as well as on intersecting streets as the street's vista can be obstructed.

Median diverters generally benefit pedestrian access by providing people that have mobility impairments benefit from divided and decreased crossing distances due to the presence of a pedestrian refuge in the center of the street. Pedestrians with slower walking speeds are able to cross one leg of traffic and then wait on a pedestrian refuge before crossing the second leg of traffic. Raised medians increase pedestrian visibility, separating pedestrians and motorists, and improving detectability for people with vision impairments.



# Partial Closure Diverter



INTERSECTIONS WITH LOCAL STREETS THAT HAVE PARALLEL ALTERNATIVE ROUTES.



A partial closure diverter is a barrier that prevents drivers from turning onto a street, but typically allows bicyclists and pedestrians to use the turn.



**DESCRIPTION**

A partial street closure uses a semi-diverter to physically close or block one direction of motor vehicle travel into or out of an intersection; it could also involve blocking one direction of a two-way street. Typically, the closures are designed to preclude traffic from entering neighborhoods from major thoroughfares. Partial street closures at the entrance to a neighborhood or area should consider the traffic flow pattern of the surrounding streets as well. The design of this measure should allow for easy access by bicyclists and all pedestrians.

A partial closure to a street provides better emergency access than a full closure. Since this design also allows motorists to relatively easily violate the prohibitions, police enforcement may be required. If the partial closure only eliminates an entrance to a street, a turnaround is not needed; closing an exit will generally require a turnaround.

Analyze whether local streets will be adversely affected and/or access into or out of the neighborhood would not be adequate. This treatment will likely put additional traffic on other streets.



# Full Closure Diverter



INTERSECTIONS WITH LOCAL STREETS THAT HAVE PARALLEL ALTERNATIVE ROUTES



A full closure diverter is a barrier that creates a dead-end street so that drivers cannot go through, but typically still allows bicyclists and pedestrians to do so.



**DESCRIPTION**

A full street closure is accomplished by installing a physical barrier that blocks a street to motor vehicle traffic and provides some means for vehicles to turn around. Full street closures should be used only in the rarest of circumstances. Neighborhoods with cul-de-sac streets require extensive indirect travel, which has potentially significant impacts on other streets. All traffic is forced to travel on feeder streets, which has negative consequences for the people who live on those streets and forces higher levels of control at critical intersections.

If a street closure is done, it should always allow for the free through-movement of all pedestrians, including wheelchair users and bicyclists. Emergency vehicles should also be able to access the street; this can be done with a type of barrier or gate that is electronically operated, permitting only large vehicles to traverse it. Examples are mountable curbs or an access way with a raised element in the center that a low vehicle would hit, though those treatments may not be able to stop pickup trucks or sport utility vehicles.

Full street closures are the ultimate limitation measures used to discourage or prevent through traffic from using certain streets. They are not an appropriate measure for addressing any crime or other social problems.

**FULL CLOSURE DIVERTER**

