TOOLKIT OVERVIEW

The Green Connections Design Toolkit is a resource for community members, city agencies and designers when developing and implementing Green Connections routes. The Toolkit includes 20 intersection and block elements, to give communities a broad range of options for creating Green Connections routes in their neighborhoods. Toolkit elements include information that can inform a conversation about potential tradeoffs and benefits of different types of street improvements.

The Toolkit is not intended to be prescriptive: there may be situations where more than one element is appropriate for a given location. Similarly, there may be situations where design solutions not anticipated in the Design Toolkit are appropriate, and project designers are encouraged to use their judgment and creativity to design an intervention that best matches the site constraints and opportunities.

Each element in the Design Toolkit is presented with:

- A short description of the element and how it functions
- One or more illustrative graphics
- Location criteria describing what street types are appropriate for this element
- Design guidelines
- A chart and discussion of how the element performs in relation to Green Connections project goals:
  - Public Health: Increase active transportation to parks
  - Sustainability: Enhance urban ecology
  - Livability: Support neighborhood stewardship and placemaking

New Placemaking Tools for San Francisco

The Green Connections project builds on a number of City-adopted plans and policies such as the Better Streets Plan (BSP), the Bicycle Master Plan and Storm Water Design Guidelines, which establishes a broad range of streetscape and traffic calming elements available for use in San Francisco. The Toolkit identifies which of those elements are best suited to Green Connections and also introduces several new elements to the City's traffic calming toolbox.

These components are intended to be added to the elements already approved in the City's Better Streets Plan (*www.sfbetterstreets.org*).

Multiple elements can be combined to achieve greater traffic calming and pedestrian and bicycle safety benefits. Some hybrid block treatments presented in the toolkit show how individual elements such as chicanes, curb extensions, and different parking configurations can be arranged to create different places and experiences (for instance, Chicane with Sidewalk Widening, Chicane with Back-In Angle Parking and Wide Sidewalk Garden). However, designs may combine a number of different elements to create unique, appropriate solutions for each route.

INTESECTION ELEMENTS

TREATMENT NAME	IN BSP
HAWK (High-intensity Activated Crosswalks)	NA
Bicycle Signals	No
Rapid Rectangular Flashing Beacons (RRFB)	NA
Intersection Murals	No
4 Standard Bulb-outs with stops for cross traffic	Yes
Traffic Circles	Yes
Partial Diverters	No
Intersection Islands	No
Diagonal Diverters	No
Block-end Plazas	Yes

BLOCK ELEMENTS

TREATMENT NAME	IN BSP
Parking Lane Planters	Yes
Chicanes	Yes
Chicane with Sidewalk Widening	Yes
Chicane with Back-in angled parking (1-way)	Yes
Neck Downs	No
Landscaped Center Medians	Yes
Wide Sidewalk Gardens	Yes
Play Streets	No

Considerations for Utilizing the Toolkit

All streetscape elements, including those detailed in this toolkit, require consideration of the multiple functions of the public right of way. This section highlights some key considerations.

The Better Streets Plan (*www.sfbetterstreets.org*) provides guidance on design of specific streetscape features related to utility placement and relocation when installing street trees and traffic calming devices.

SAN FRANCISCO FIRE DEPARTMENT CONSIDERATIONS

San Francisco's first responders provide essential public services to the City, and Green Connections should be designed to accommodate the mobility of emergency vehicles. Some of the elements presented in this toolkit for Green Connections projects can easily be built to accommodate the typical needs of emergency services, while some may require a more involved collaboration to develop designs. Fire Department staff has reviewed the Green Connections design toolkit. Interagency project level review will take place for specific streetscape proposals, particularly for new intersection and block elements.

UTILITIES CONSIDERATIONS

Implementing streetscape elements 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 curbwork, 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.

MUNI CONSIDERATIONS

Streets on the Green Connections network that serve public transportation – including light rail and buses – have specific requirements beyond those on the typical streets. These requirements affect the application of specific elements and the details of how they are designed.

This section provides a summary of some of the primary design considerations for Green Connections that overlap with transit routes. Additional guidance is given in each toolbox entry as to its appropriateness for use on a transit route.

The standard lane width for transit routes is 12 feet, which accommodates the width of one transit vehicle. Green Connections project designs on Muni routes generally should not include proposals that reduce transit lanes to below this width. Exceptions may be made on community routes which have lower frequency and are in primarily residential areas (see below for the tiers of service) or on transit routes that currently have travel lanes under 12 feet.

Adding curb extensions at transit stops can fulfill Green Connections project goals while improving transit operations. However, transit bulbs have specific requirements for clear space in order to provide access to vehicle doors. Green Connections designs that include transit extensions should be coordinated with 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. Because transit vehicles are tall and often have overhead wires, plantings should not be developed that would be damaged by transit vehicles, or which would interfere with overhead wires. As one example, trees with low canopies should not be planted immediately adjacent to transit lanes.

Considerations will need to be made for overhead wires on new plazas adjacent to electric trolley bus lines.

Where possible, projects along Green Connections routes that overlap with Muni routes should include coordination with SFMTA transit engineers or service planners to ensure that the designs support the needs of both.

See also Chapter 5.5 of the Better Streets Plan which describes additional considerations for transit service and street design.

TOOLKIT ELEMENT:
PEDESTRIAN ACTIVATED BEACONS

The Green Connections toolkit includes recommendations to make Green Connections streets more comfortable for walking and bicycling. The network includes many locations where Green Connections routes intersect with busier streets that may be difficult to cross. Signals and beacons can improve accessibility and facilitate crossings at these major intersections.

While in some cases standard traffic signals or 4-way stop signs can be added to stop traffic on a busy street, these measures must be warranted by a variety of specific intersection conditions. When those conditions are not met, alternative traffic signal devices or beacons that are activated by bicyclists and/or pedestrians may be added to enable users to cross arterial streets more easily and comfortably. Since these beacons must be activated to operate, they do not disrupt the flow of the cross street when bicyclists and pedestrians are not present.

High-intensity Activated Crosswalks (HAWK), also known as a Pedestrian Hybrid Beacon, is a beacon that is dark when not activated by a pedestrian, but when activated flashes yellow and then red, requiring traffic to stop. The HAWK beacon is used where it is difficult for pedestrian traffic to cross a major street and traditional traffic signals would not be warranted.

The beacon is located on the roadside or on mast arms over midblock pedestrian crossings. The beacon head consists of two red lenses above a single yellow lens. The beacon head is "dark" until the pedestrian desires to cross the street. At this point, the pedestrian will push an easy to reach button that activates the beacon. After displaying brief flashing and steady yellow intervals, the device displays a steady red indication to drivers and a "WALK" indication to pedestrians, allowing them to cross a major roadway while traffic is stopped. After the pedestrian phase ends, the "WALK" indication changes to a flashing orange hand to notify pedestrians that their clearance time is ending. The hybrid beacon displays alternating flashing red lights to drivers while pedestrians finish their crossings before once again going dark at the conclusion of the cycle.

Pedestrian hybrid beacons 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 the pedestrian hybrid beacon. Practitioners should follow the guidelines in Chapter 4F of the Manual on Traffic Control Devices (MUTCD), which provides specifications for pedestrian hybrid beacons and when and where they should be installed.

Since the pedestrian hybrid beacon is a traffic control device many people are not yet familiar with, effort should be made to perform outreach to the public before implementation so there is no confusion about how the beacon operates and what drivers and pedestrians should do when encountering it.

HAWK Signal

LOCATION CRITERIA:

When a Green Connection crosses a busy arterial where a stop sign or traditional traffic signal would not be appropriate.


Bicycle Signal

Bicycle Signals. Signal heads with a bicycle icon can be added next to pedestrian crossing signals to indicate when bicycle traffic along a green connection should cross during the pedestrian phase. This is sometimes called a "Toucan" signal (since "two can cross.") Distinct paths of travel can be marked, or in some cases, a bicycle may use the pedestrian crossing. Bicycle signals can be added as part of a HAWK installation or at a traditional traffic signal that includes a pedestrian phase.

LOCATION CRITERIA:

When bicycle traffic along a Green Connection should use the pedestrian crossing time.

Rapid Rectangular Flashing Beacons (RRFB) – also known as LED Rapid-Flash System, Stutter Flash or LED Beacons – are user-actuated amber LEDs that supplement warning signs at unsignalized intersections or mid-block crosswalks. They can be activated by pedestrians manually by a push button or passively by a pedestrian detection system. RRFBs do not change the legal circumstances of the pedestrian crossing (the California Vehicle Code requires motorists to yield to pedestrians using the crosswalk); however, the beacons alert motorists to the presence of pedestrians entering a crosswalk and have been shown to significantly improve yielding behavior.

The addition of RRFBs may also increase the safety effectiveness of other treatments, such as the use of advance yield markings with "YIELD (or STOP) HERE FOR PEDESTRIANS" signs. These signs and markings are intended to reduce the incidence of multiple-threat crashes at crosswalks on multi-lane roads (i.e., crashes where a vehicle in one lane stops to allow a pedestrian to cross the street while a vehicle in an adjacent lane, traveling in the same direction, strikes the pedestrian.) Alone they only have a small effect on driver behavior, but when supplemented with RRFBs there is a demonstrated and significant increase in driver yielding at crosswalks.

RRFBs are a lower cost alternative to traffic signals and hybrid signals and can be used in locations where a full traffic signal may not be warranted.


RRFB Signal

ACTIVE TRANSPORTATION TO PARKS

Support Pedestrians	●●●●●
Support Bikes	●●●●○
Calm Traffic	●●●○○

URBAN ECOLOGY

Manage Stormwater	○○○○○
Enhance Habitat	○○○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	○○○○○

ABILITY TO IMPLEMENT

Cost Effective (Low cost scores highly)	●●●○○
Ease of Maintenance	●●●●●

TRAFFIC AND PARKING CONSIDERATIONS

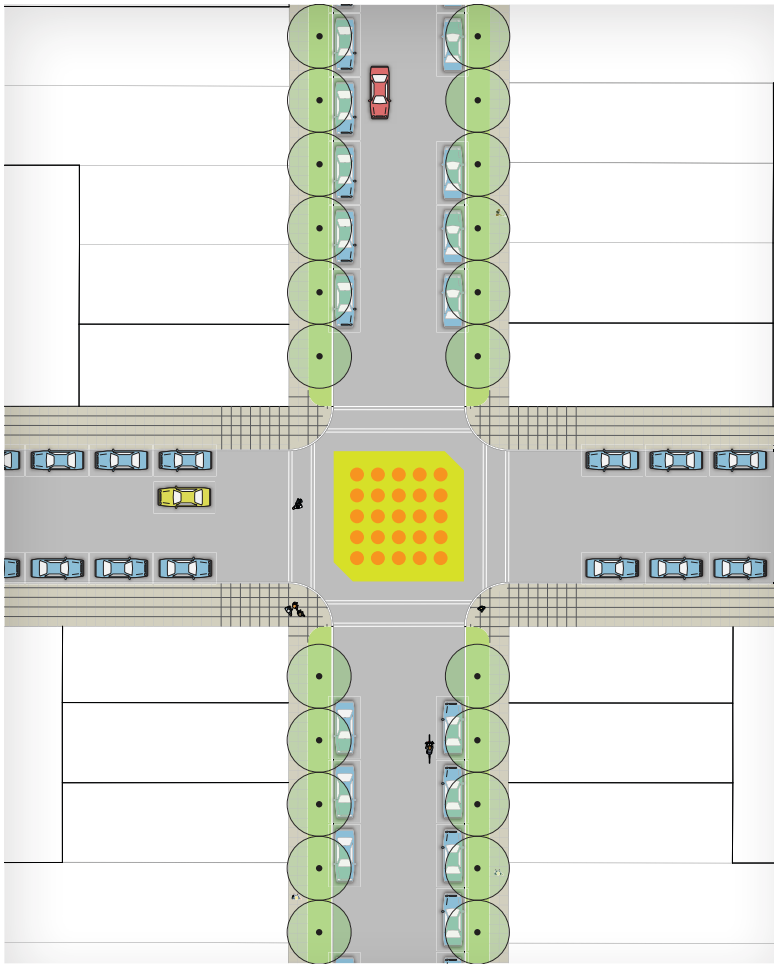
Parking Loss	None
Auto Access Changes	None

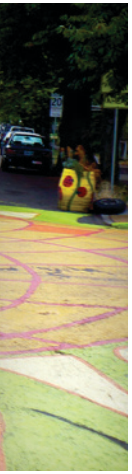
TOOLKIT ELEMENT:
INTERSECTION MURALS

Intersection murals are large works of art in neighborhood intersections painted by neighborhood residents. Experience in other cities has shown that painting a mural on the pavement of a public square or intersection encourages neighbors to gather in these locations, and drivers to slow down to admire the artwork. Intersection murals can thus calm traffic and build identity for the neighborhood. Intersection murals should be designed and implemented through community-driven processes.

LOCATION CRITERIA:

When a Green Connection crosses a residential street with low traffic volumes.





DESIGN GUIDELINES

Intersection murals should be developed under an inclusive community process that involves nearby residents.

Intersection murals should installed using use water-based, slip resistant paint or stains.

Intersection murals will require regular maintenance and upkeep.

The SFMTA Crosswalk Guidelines outline considerations for using decorative paving in the crosswalk, and the conditions would also apply to intersection murals:

> Decorative paving treatments, including colored and/or textured concrete, asphalt or pavers, Street Print, Duratherm, or other similar treatments may be desirable and appropriate from an urban design standpoint, but should not be considered a safety or traffic control measure. Decorative crosswalk treatments are not a substitute for, and should not detract from, standard or continental crosswalk markings consisting of thermoplastic treated with retroreflective glass beads. When used, decorative crosswalk paving treatments should consist of durable, skid-resistant materials that do not cause discomfort to those who use wheelchairs and other assistive mobility devices. All decorative crosswalk markings will be reviewed on a case-by-case basis. See also Chapter 3G of the California MUTCD for further guidance on the use of colored paving materials at crosswalks. (SFMTA Crosswalk Guidelines, 2011, page 15)

Traffic volumes may affect maintenance costs as higher volumes will result in greater wear-and-tear on the mural. Similarly, streetscape work such as utility upgrades may affect intersection mural maintenance costs. Companies and city departments doing utility work in the public right-of-way are typically required to repair the street with standard materials like asphalt or concrete. Community groups sponsoring intersection murals will need to agree in advance to accept responsibility for restoring intersection murals after spot utility projects and maintaining them over time.

This treatment is acceptable on Muni routes except where there are yellow dots (on trolley routes) or breaker markings in the pavement. These are used to signal positioning to Muni operators.

ACTIVE TRANSPORTATION	
Support Pedestrians	●●●○○
Support Bikes	●○○○○
Calm Traffic	●○○○○

URBAN ECOLOGY	
Manage Stormwater	○○○○○
Enhance Habitat	○○○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING	
Potential Increase in Usable Public Space	●●●○○

ABILITY TO IMPLEMENT	
Cost Effective (Low cost scores highly)	●●●●●
Ease of Maintenance	●●●●○

TRAFFIC AND PARKING CONSIDERATIONS	
Parking Loss	None
Auto Access Changes	None

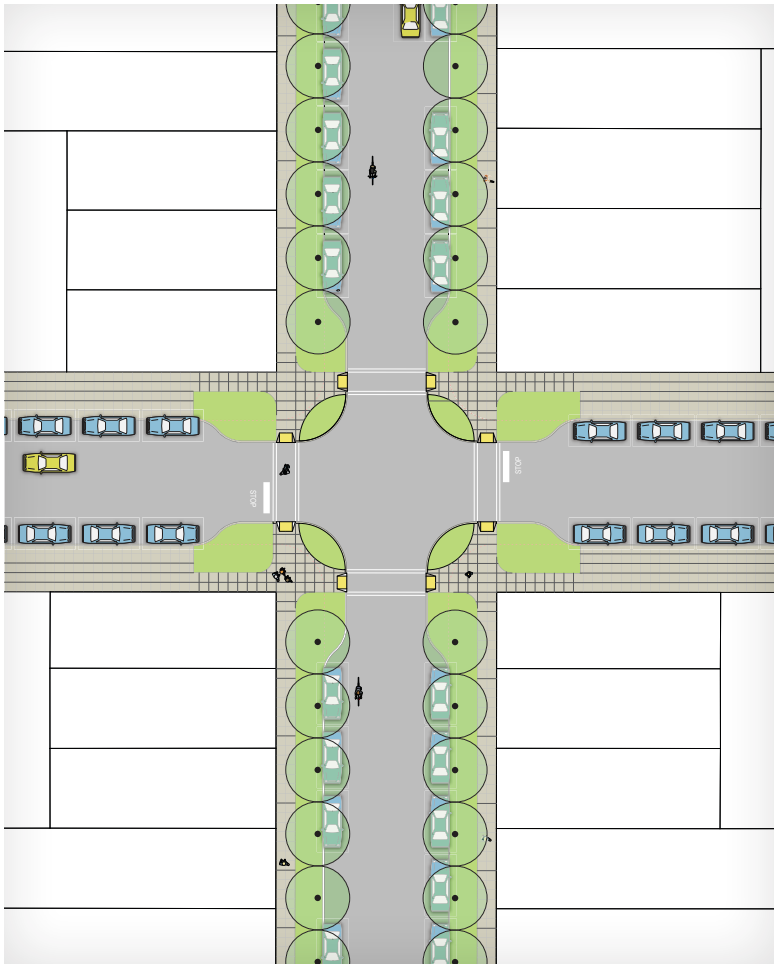
TOOLKIT ELEMENT:
FOUR STANDARD BULBS WITH STOP FOR CROSS TRAFFIC

Corner bulb-outs can extend the sidewalk into the parking lane to narrow the roadway and provide additional pedestrian space. Corner bulb-outs can enhance pedestrian safety by increasing pedestrian visibility, shortening crossing distances, slowing turning vehicles, and visually narrowing the roadway.

Generally, benefits are greater the further the bulb-out extends into the roadway and the tighter the turn radius created by the bulb-out, but should be balanced against other needs such as accommodating minimum turning radii for oversized and emergency vehicles. Bulb-outs can often be extended to create public spaces, landscaped areas, or transit waiting areas.

LOCATION CRITERIA:

Can be applied at all intersections.



DESIGN GUIDELINES

See the Better Streets Plan for placemaking and engineering details:

http://www.sfbetterstreets.org/find-project-types/pedestrian-safety-and-traffic-calming/traffic-calming-overview/curb-extensions/

ENGINEERING GUIDELINES

The Better Streets Plan provides design details that take into account requirements for emergency response vehicles.

When this treatment is used along a Muni route, bulbs must be sized so that 12 feet of lane width is maintained for each vehicle lane where buses are expected, and Muni transit engineers should have the opportunity to review curb radii. Note that bulb size may be affected at locations where Muni vehicles turn.

When bulbs are located at transit stops, they should be designed as transit bulbs which are longer than standard corner bulbs. This allows for improved boarding and accessibility, and typically can accommodate a transit shelter. Proposed transit bulbs should be coordinated with Muni transit engineers.

ACTIVE TRANSPORTATION

Support Pedestrians	●●●●●
Support Bikes	●●○○○
Calm Traffic	●○○○○

URBAN ECOLOGY

Manage Stormwater	●●●●○
Enhance Habitat	●●○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●○○○

ABILITY TO IMPLEMENT

Cost Effective (Low cost scores highly)	●●○○○
Ease of Maintenance	●●●●○

TRAFFIC AND PARKING CONSIDERATIONS

Parking Loss	None
Auto Access Changes	None

TOOLKIT ELEMENT: TRAFFIC CIRCLES

Traffic Circles are raised islands located in the center of an intersection around which traffic must circulate. Drivers approaching an intersection with a traffic circle must yield to other vehicles and pedestrians passing through the intersection, but may not be required to come to a complete stop before entering the intersection. Traffic circles visually reduce the scale of wide intersections and break up the monotony of the street grid. When they include landscaping, they can beautify and enliven the streetscape. Traffic circles are generally used at low volume neighborhood intersections.

LOCATION CRITERIA:

When a Green Connection crosses a residential street with low traffic volumes.

DESIGN GUIDELINES

The Better Streets Plan provides placemaking and engineering details:

http://www.sfbetterstreets.org/find-project-types/pedestrian-safety-and-traffic-calming/traffic-calming-overview/traffic-circles/

As noted in the Better Streets Plan, traffic circle design should follow DPW Bureau of Engineering's standard plan for Traffic Circle Details. However, intersection geometry varies greatly, and the standard plan may need to be adjusted for different conditions.

Traffic circles should be designed to accommodate emergency response vehicles.

Mountable Traffic Circles function similarly to traffic circles. They can be useful in situations where traffic circles may not fit, or to accommodate wide-turning vehicles such as trucks or buses. They are slightly raised bumps in the center of an intersection. Cars can navigate the mountable traffic circle as if it were a traditional traffic circle or as if it were a speed bump, whereas larger vehicles can slowly mount the device in order to pass through the intersection.

LOCATION CRITERIA:

When a Green Connection crosses a residential street with low traffic volumes, where tight geometry prohibits a traffic circle; OR at intersections that must accommodate larger vehicles.

DESIGN GUIDELINES

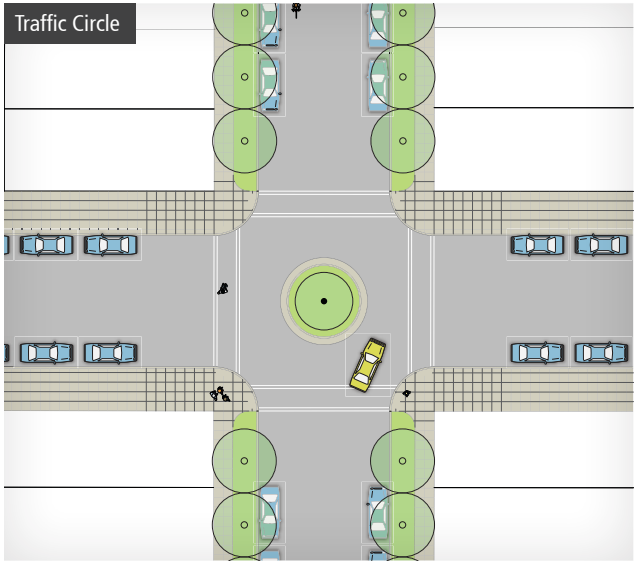
Mountable traffic circles are appropriate alternatives to traffic circles in situations where existing street geometry precludes the instillation of a traffic circle. Where geometry allows, traffic circles are the preferred option.

Mountable traffic circles should be designed to minimize street clutter. This can be achieved by incorporating materials that visually contrast with the surrounding streets surfaces.

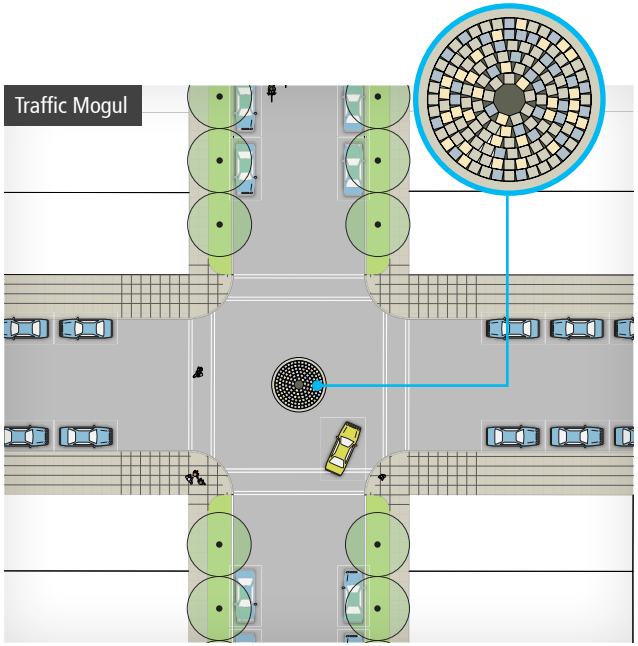
One design variant of mountable traffic circles is to include a tree in the center of the circle. When incorporating trees into the design of mountable traffic circles, a protective raised element such as large stones, a curb, or granite blocks should be added to protect the tree from collisions with passing vehicles.

Mountable traffic circles should be designed with appropriate cross sections to ensure that passing vehicles can drive over them without damaging their axles.

Traffic Circle



Traffic Mogul



ACTIVE TRANSPORTATION

Support Pedestrians	●●●○○
Support Bikes	●●●○○
Calm Traffic	●●○○○

URBAN ECOLOGY

Manage Stormwater	●○○○○
Enhance Habitat	●●○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●○○○

ABILITY TO IMPLEMENT

Cost Effective (Low cost scores highly)	●●●●○
Ease of Maintenance	●●●●○

TRAFFIC AND PARKING CONSIDERATIONS

Parking Loss	None
Auto Access Changes	None

TOOLKIT ELEMENT:
PARTIAL DIVERTERS

A partial diverter can reduce traffic volumes on Green Connections blocks by restricting auto access in some directions, while creating additional public spaces and opportunities for greening.

PARTIAL DIVERTERS (Moderate to Low Volume Crossing): At intersections with moderate to low volumes of cross traffic, partial diverters would include wider corner bulbs that extend into the right of way and prevent automobile traffic from entering the block at that end, requiring some traffic to turn off the Green Connections route. Movement of pedestrians and bicycles is unrestricted, and the design should allow emergency vehicles to access the block either by crossing the bulb or by entering the oncoming traffic lane.

LOCATION CRITERIA:

When a Green Connection crosses a street with low to moderate traffic volumes.

PARTIAL DIVERTERS (High Volume Crossing): At intersections where cross streets have fast-moving traffic, partial diverters can be designed with enhanced pedestrian and bicycle crossing amenities such as striping and signalization.

LOCATION CRITERIA:

When a Green Connection crosses a major arterial with a bike lane.

DESIGN GUIDELINES

Consider incorporating programming elements like seating nooks, sculptural elements and informational or educational signage into the design of partial diverters.

While partial diverters restrict some movements of private vehicles through an intersection, they should be designed to feel open and inviting to all users. Partial diverters should maintain view corridors through the project site and read as public spaces.

The design of partial diverters should seek to maximize the amount of space repurposed from vehicular circulation for enhanced greenery and community gathering spaces.

Partial diverters should be designed to maximize opportunities for greening, stormwater management and habitat creation.

To ensure that partial diverters maximize their potential as stormwater management devices, bicycle pass-throughs that are raised should be carefully graded to ensure that stormwater will be directed to the partial diverter. This may be achieved by slightly raising the elevation of the bike lane relative to the street.

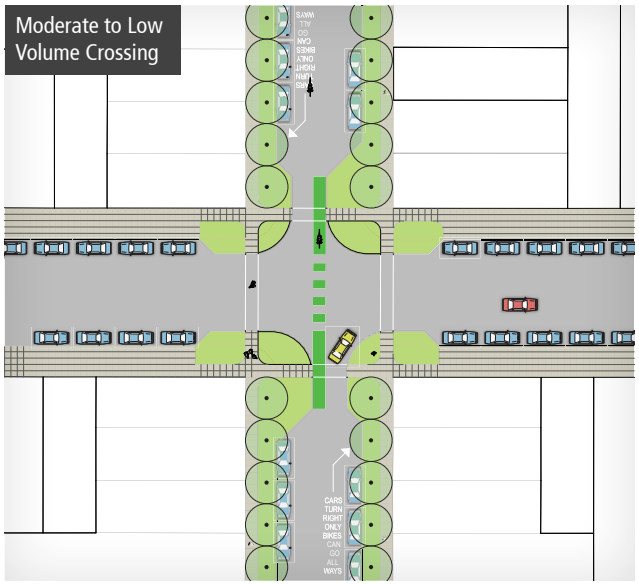
Partial diverters should be designed to maintain accessible paths of travel across intersections. On high-volume streets bicycle pass-throughs may be incorporated between the partial diverter and the adjacent sidewalk to improve bicyclist comfort. Designs should include visual and/or tactile cues like contrasting color or textured paving materials to alert bicyclists that they are crossing the pedestrian path.

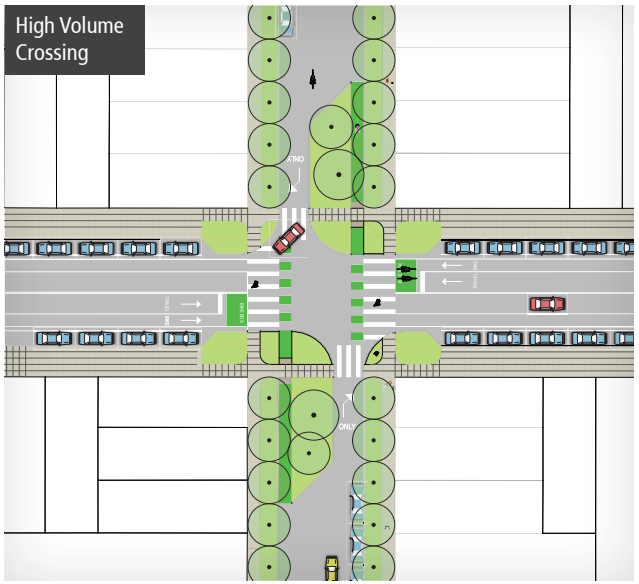
On low volume crossings, a dashed bicycle lane line, shared lane markings (sharrows), or a combination of these elements can be installed to guide bicyclists through the intersection. The SFMTA's Innovative Bicycle Treatments Toolbox provides guidelines for intersection guide markings.

Partial diverters should be designed to accommodate emergency vehicle movements.

Partial diverters should not extend into streets with Muni routes. If curbs are also extended into cross streets that have Muni routes, these should follow the guidelines laid out under "4 Standard Bulbs."

Alternative designs exist that use barricades and planters to prohibit through-traffic, without the placemaking benefits of partial diverters. While not preferred, these treatments could be considered in locations where vehicle volume reductions are desired but true partial diverters are not feasible.





Conceptual rendering, SFPUC
Tiffany Avenue and Duncan Street

ACTIVE TRANSPORTATION

Support Pedestrians	●●●●●
Support Bikes	●●●●○
Calm Traffic	●●●●○

URBAN ECOLOGY

Manage Stormwater	●●●●○
Enhance Habitat	●●●○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●●●○

ABILITY TO IMPLEMENT

Cost Effective (Low cost scores highly)	●●●○○
Ease of Maintenance	●●○○○

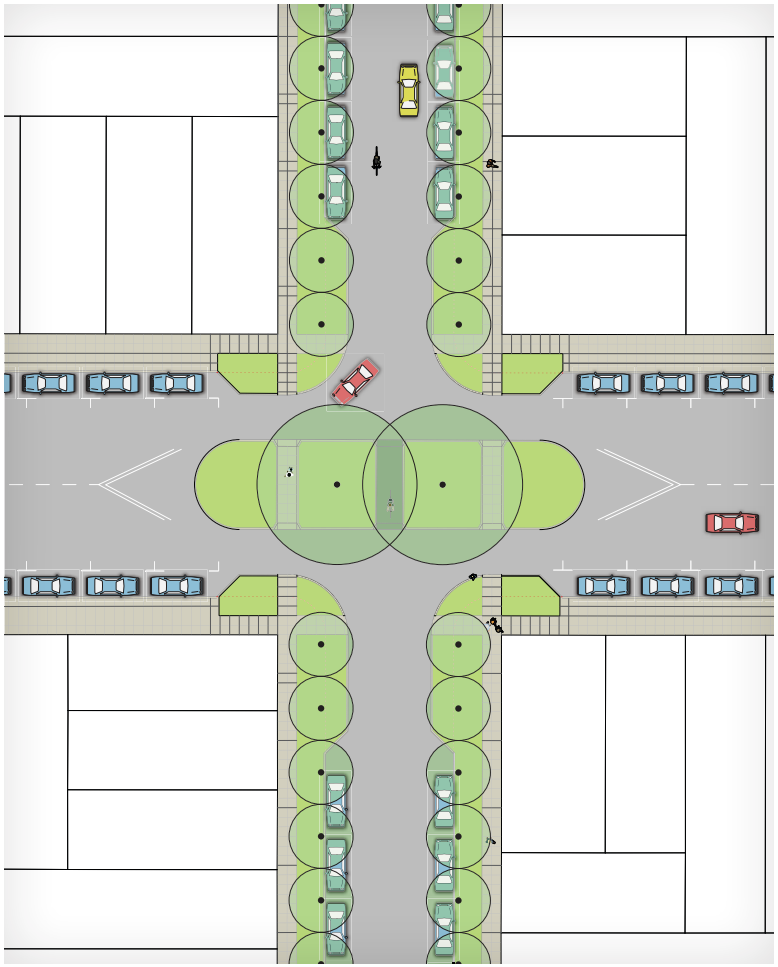
TRAFFIC AND PARKING CONSIDERATIONS

Potential Parking Loss at Intersection

Restricts Some Auto Access

TOOLKIT ELEMENT:
INTERSECTION ISLANDS

Intersection islands are wide median islands designed to block the movement of through vehicle traffic in some directions, while allowing for pedestrian and bicycle access. Intersection Islands can create additional greening space and reduce traffic volumes on a Green Connection.



LOCATION CRITERIA:

When a Green Connection crosses a street with low to moderate traffic volumes.

DESIGN GUIDELINES

Incorporating large canopy trees into the design of intersection islands is strongly encouraged as it can create a visual focal point and sense of enclosure for the surrounding streetscape. Tree planting must comply with DPW Director's Order 169,946.

The design of intersection islands should seek to maximize the amount of space repurposed from vehicular circulation for enhanced greenery and community gathering spaces.

Intersection islands should be designed to the maximum width allowed by streetscape geometry. They should be at least six feet wide to provide comfortable refuge areas for pedestrians and bicyclists crossing the street and include courtesy strips at perimeter for ease of maintenance.

Intersection islands should be designed to maximize opportunities for greening, and habitat creation. The Better Streets Plan includes additional design guidelines for medians and islands: *http://www.sfbetterstreets.org/find-project-types/greening-and-stormwater-management/greening-overview/median-greening/*

Intersection islands should include pedestrian pathways along the accessible path of travel through the intersection.

Intersection islands should include an emergency vehicle pathway through the center of the island, which can also serve as the bicycle path of travel through the island. The pathway should be designed to discourage non-emergency vehicles from crossing the intersection. This can be achieved with a metal bar that is low enough for emergency vehicles to drive over but tall enough that a conventional car can't clear it, or with a safe hit post that could be driven over by any vehicle but serves as a strong visual cue that this is not a through-way.

Intersection islands should not be placed across (i.e. blocking) Muni routes or at intersections where Muni routes turn. However, intersection islands can be effective tools for improving transit flow along Muni corridors where the bus line runs perpendicular to the Green Connection because they reduce potential conflicts from vehicles making left turn movements from the Green Connection across the path of the bus line. When a Muni route runs along an intersection island, designs should maintain a 12 foot vehicle lane and plantings should be selected that will not extend into the Muni vehicle right of way.

ACTIVE TRANSPORTATION	
Support Pedestrians	●●●●●
Support Bikes	●●●●○
Calm Traffic	●●●●○

URBAN ECOLOGY	
Manage Stormwater	●○○○○
Enhance Habitat	●●●○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING	
Potential Increase in Usable Public Space	●●●●○

ABILITY TO IMPLEMENT	
Cost Effective (Low cost scores highly)	●●●○○
Ease of Maintenance	●●●○○

TRAFFIC AND PARKING CONSIDERATIONS	
Parking Loss	None
Restricts Some Auto Access	

Deciding when to lower traffic volumes on Green Connections

Streets with low volumes of vehicle traffic are generally more comfortable for people walking, and significantly more comfortable for people riding bikes. City streets designated as "Neighborhood Greenways" are residential streets with low volumes of auto traffic and low speeds where vulnerable users like bicycle and pedestrians are given priority. Various cities with Neighborhood Greenways identify target vehicle volumes to ensure that bicyclists of all ages and abilities are comfortable sharing the lane, and the National Association of City Transportation Officials recommends a target volume of 1,500 and a maximum volume of 3,000 vehicles per day to maximize comfort and perceived safety.

While some streets along the Green Connections Network already have volumes in this range, many do not. Some of the Green Connection streetscape elements have the potential to divert traffic off of a Green Connections route, either through physically forcing motorists to turn off the street, or by imposing considerable speed reductions such that the majority of non-local-access traffic can be expected to seek alternate routes:

» Treatments that block access: Partial Diverters, Intersection Islands, Diagonal Diverters and Block-end Plazas

» Treatments that dramatically reduce speeds: Play Streets, Neckdowns

Treatments that restrict local access and/or cause traffic diversion require special consideration and a robust community outreach process, because they have a greater potential than other Green Connections treatments to impact neighboring streets.

Is the device appropriate for the street in question? Whether or not diversion is appropriate for a given street is primarily a function of the street's classification. Generally diversion would be expected to reduce through-traffic but allow access for residents. Neighborhood Residential Streets are most appropriate for traffic diversion, as they do not serve commercial users.

Streets that have an identified purpose beyond providing local access are generally not appropriate for diversionary measures. Examples of street types that would not be appropriate for diversion include:

» Streets with Muni routes

» Streets frequently used for emergency response (unless access for emergency vehicles is maintained.)

» Arterial streets prioritized for cross-town traffic (defined as Throughway Streets in the Better Streets Plan)

» Streets designated as truck routes (as defined in the transportation element of the City's General Plan)

» Commercial streets

Note that this question is not dependent on the existing volumes of the street. On streets where existing volumes are very low, these treatments may be proposed for reasons other than volume control. On streets where existing volumes are high, the device may be "appropriate" in the sense that volume reduction would be in keeping with the desire to create a neighborhood character.

Consider the broader neighborhood network. Green Connections routes were selected to provide a neighborhood serving route to connect people to their parks. Implementation of the network would provide a citywide network of safe streets for residents of all ages to walk or bicycle to the neighborhood parks. Calming traffic and reducing traffic volumes on these routes may cause traffic to seek alternate routes on surrounding streets.

Improvements that reduce volumes on a Green Connections route, should be completed with consideration of the adjacent streets. Choosing a street for reduced volumes and traffic calming, will require changes to the use patterns on adjacent streets. Improvements should be implemented in a thoughtful way that does not unnecessarily degrade the use and performance or livability of adjacent streets.

Because diversionary measures are relatively new to San Francisco, evaluation will be important in the early years of implementing the Green Connections Network. Beyond standard "Level of Service" criteria, San Francisco has not identified thresholds for determining whether a certain amount of diverted traffic is acceptable. The experiences of other cities can be educational for considering the impacts of diversion, but are not directly applicable because of San Francisco's density and unique street network.

Community Base Design Process

A community based design process, should include consideration of the broader neighborhood and result in a design that addresses the following questions:

How can the traffic calming and volume reduction goals of the project be met?

- How much traffic would be re-routed?
- Where is diverted traffic expected to go?
  - Is there a parallel arterial street where through-traffic would be more appropriate, or would traffic be diverted to local access streets?
  - Does a parallel street have a Muni route or emergency access route that would experience delay if volumes increased?
  - Are there multiple alternative routes that could receive the new traffic, or would it be concentrated on one street?

Once the community and decision makers are on board with a proposed project, the necessary environmental review will be determined. Once funding is secured and the necessary City approvals are complete, a project could move towards implementation.

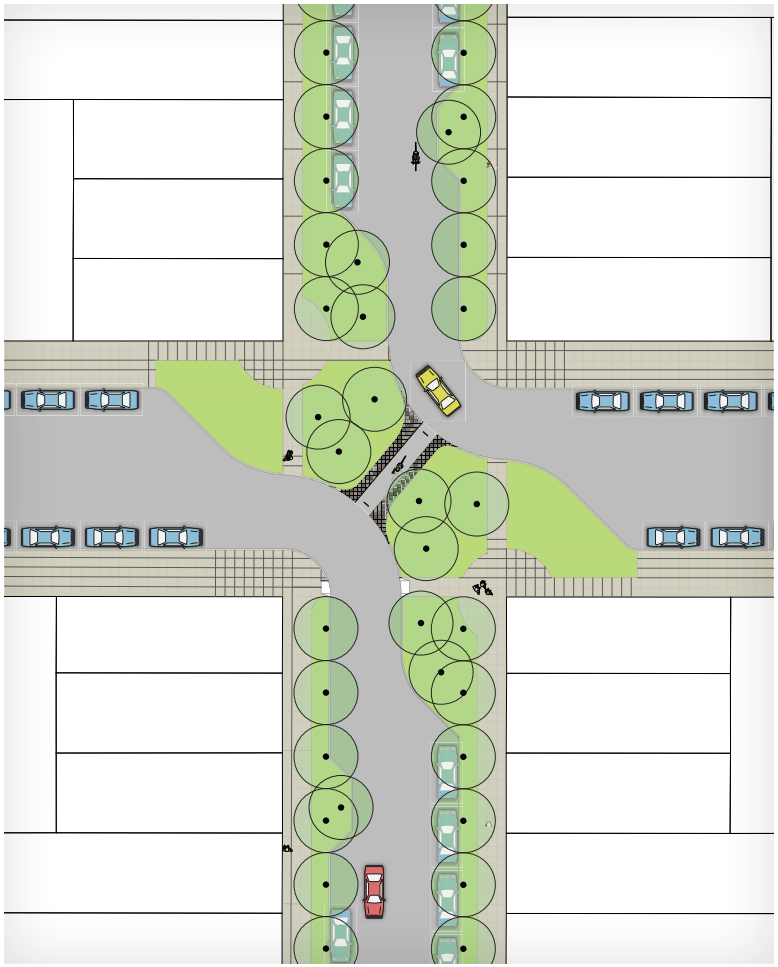
TOOLKIT ELEMENT:
DIAGONAL DIVERTERS

Diagonal diverters are landscaped areas that bisect an intersection diagonally. They prevent vehicles from traveling through a given intersection by forcing all vehicles at the intersection to turn. This reduces the use of the Green Connection street as well as the cross street for through traffic. Diagonal diverters can also provide opportunities to add greening and enhance urban ecology.

Motorists who drive through a neighborhood – rather than to a local destination – can cause congestion on residential streets, detracting from the neighborhood feel and reducing the comfort level for people bicycling or walking on that street. Diagonal Diverters can significantly reduce the volume of this "cut-through" traffic.

LOCATION CRITERIA:

When a Green Connection crosses a residential street with low traffic volumes or when two Green Connections cross.



DESIGN GUIDELINES

Incorporating large canopy trees into the design of diagonal diverters is strongly encouraged as it can create a visual focal point and sense of enclosure for the surrounding streetscape. Tree Planting must comply with DPW Director's Order 169,946.

While Diagonal Diverters partially restrict private vehicles movements through the intersection the street to they should be designed to feel open and inviting to all users. Diagonal Diverters should maintain view corridors through the project site and read as public spaces.

Diagonal diverters should be designed to maximize opportunities for greening, stormwater management and habitat creation.

Consider incorporating programming elements like seating nooks, sculptural elements and informational or educational signage.

Consider including a pedestrian pathway diagonally across the intersection, along the diagonal diverter.

The design of diagonal diverters should seek to maximize the amount of space repurposed from vehicular circulation for enhanced greenery and community gathering spaces.

Diagonal Diverters should include an emergency vehicle pathway through the center of the diverter, which can also serve as the bicycle path of travel through the diverter. The pathway should be designed to discourage non-emergency vehicles from crossing the intersection. This can be achieved with a metal bar that is low enough for emergency vehicles to drive over but tall enough that a conventional car can't clear it, or with a safe hit post that could be driven over by any vehicle but serves as a strong visual cue that this is not a through-way. Another strategy is to create a narrow path using asphalt (6-8') that is lined on each side with textured pavers like cobble stones, designed to withstand the weight of an emergency vehicle.

This treatment would not be appropriate on any Muni route.

ACTIVE TRANSPORTATION

Support Pedestrians	●●●●●
Support Bikes	●●●●○
Calm Traffic	●●●●○

URBAN ECOLOGY

Manage Stormwater	●●●●○
Enhance Habitat	●●●○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●●●○

ABILITY TO IMPLEMENT

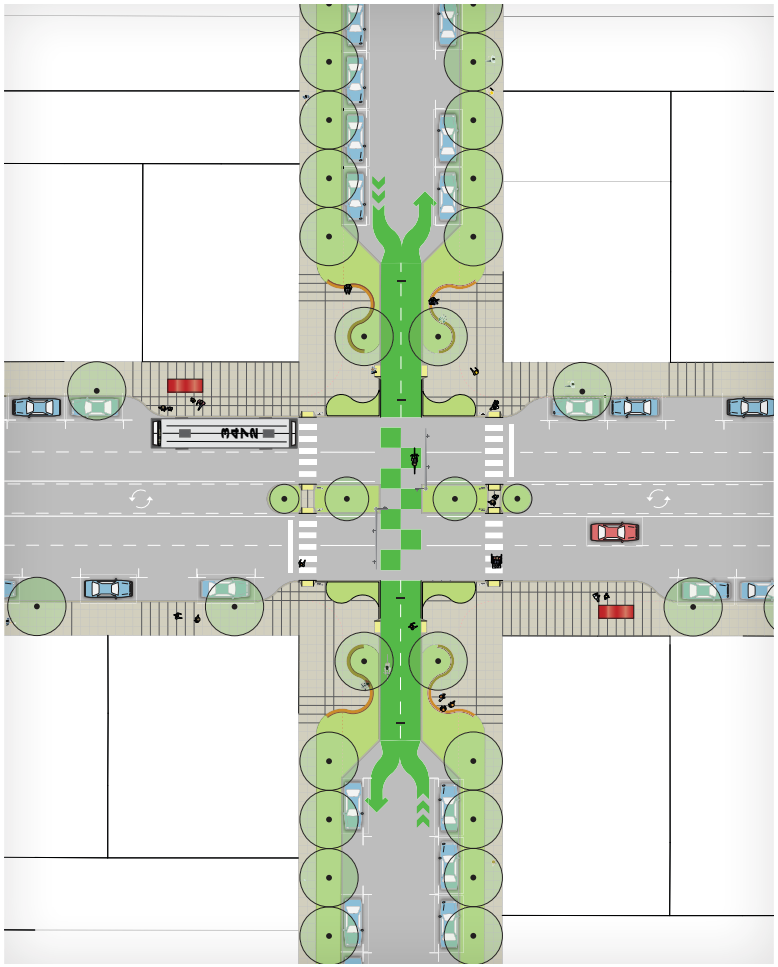
Cost Effective (Low cost scores highly)	●●●○○
Ease of Maintenance	●●○○○

TRAFFIC AND PARKING CONSIDERATIONS

Potential Parking Loss at Intersection
Restricts Some Auto Access

TOOLKIT ELEMENT:
BLOCK-END PLAZAS

Block-end plazas are areas of a street that have been closed-off to non-emergency vehicles and converted to community gathering spaces. They can be effective tools for reducing traffic volumes on a Green Connection by diverting through-traffic from cars while allowing bicycle and pedestrian access.



LOCATION CRITERIA:

Anywhere along a Green Connection with the exception of street segments classified as Throughway Streets, and streets along, the Muni network. Block-end Plazas can be effective tools when installed on a residential street with low traffic volumes adjacent to a street with high traffic volumes and/or a Muni route (e.g. Sloat Boulevard)

DESIGN GUIDELINES

Block-end plazas may be designed with low-cost materials like paint or more expensive treatments that involve modifying curb lines, adding speed tables etc.

Block-end plazas should be designed to maximize opportunities for greening, stormwater management and habitat creation.

Block-end plazas should incorporate programming elements like seating nooks, sculptural elements and informational or educational signage into the design of diverters.

The design of block-end plazas should seek to maximize the amount of space repurposed from vehicular circulation for enhanced greenery and community gathering spaces.

Block-end plazas should include an emergency vehicle pathway through the center of the plaza, which can also serve as the bicycle path of travel through the diverter. The pathway should be designed to discourage non-emergency vehicles from crossing the intersection. This can be achieved with a metal bar that is low enough for emergency vehicles to drive over but tall enough that a conventional car can't clear it, or with a safe hit post that could be driven over by any vehicle but serves as a strong visual cue that this is not a through-way.

Block-end plazas should not be sited across (i.e. blocking) the path of a Muni route. However, when placed adjacent to a Muni route, block-end parks could improve Muni operations by reducing vehicular conflicts between the Muni route and the Green Connection. In addition, if the block-end plaza includes bulb-outs into the cross street, transit stops may be able to be incorporated. If so, the curb extensions should be designed to ensure boarding and accessibility, and should contain a transit shelter. Proposed transit bulb extensions should be coordinated with Muni transit engineers. Considerations will need to be made for overhead wires on block-end plazas adjacent to electric trolley bus lines.

Block-end plaza projects may necessitate the installation of new catch basins to ensure potential changes to overland stormwater flow caused by dead-ending a street does not cause flooding on adjacent properties.

While block-end plazas close or partially close the street to private vehicles they should be designed to feel open and inviting to all users. Block-end plazas should maintain view corridors through the project site and read as public spaces.

ACTIVE TRANSPORTATION

Support Pedestrians	●●●●●
Support Bikes	●●●●●
Calm Traffic	●●●●●

URBAN ECOLOGY

Manage Stormwater	●●●●●
Enhance Habitat	●●●●○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●●●●

ABILITY TO IMPLEMENT

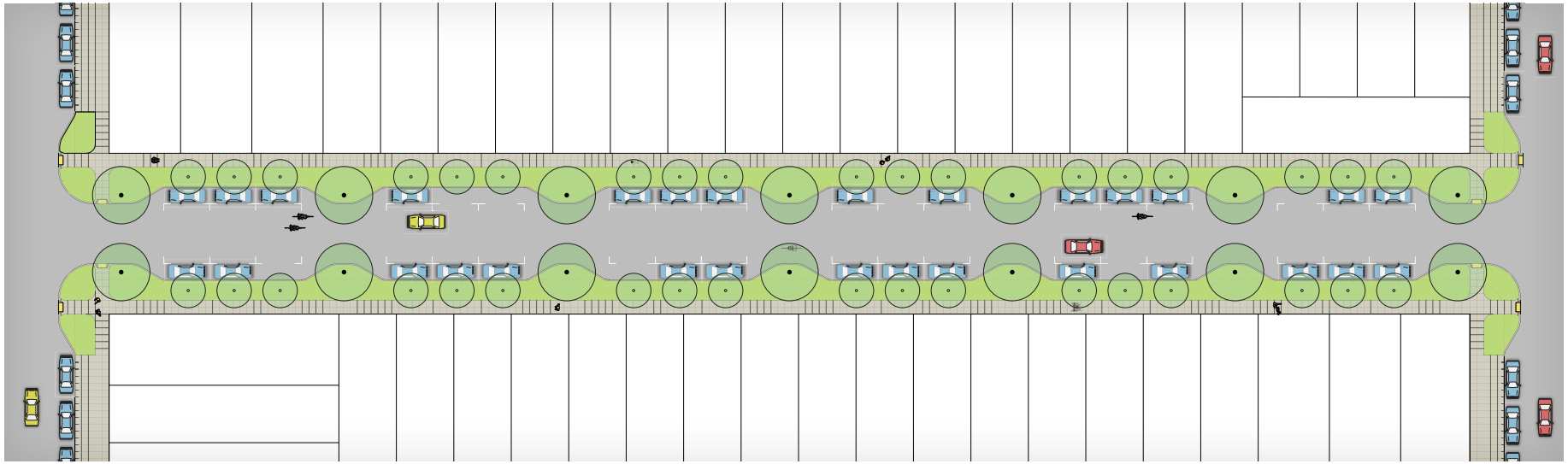
Cost Effective (Low cost scores highly)	●●○○○
Ease of Maintenance	●○○○○

TRAFFIC AND PARKING CONSIDERATIONS

Potential Parking Loss at Intersection
Restricts Some Auto Access

TOOLKIT ELEMENT:
PARKING LANE PLANTERS

Parking lane planters create additional space for landscaping and street trees, which can calm traffic. Landscaped sidewalk extensions could be placed between parking spaces at regular intervals or at specific locations.



DESIGN GUIDELINES

See the Better Streets Plan for design guidance:

http://www.sfbetterstreets.org/find-project-types/greening-and-stormwater-management/greening-overview/parking-lane-planters/

Parking lane planters placed along Muni routes must maintain 12 foot lanes for transit vehicles, and plantings should be selected that will not extend into the Muni vehicle right of way or interfere with Muni overhead wires, if present.

LOCATION CRITERIA:

All street types, especially on streets with narrow sidewalks, where tree planting is limited by conflicts with utilities or driveways, or where there is a desire to visually narrow the roadway.

ACTIVE TRANSPORTATION

Support Pedestrians	●●○○○
Support Bikes	●●○○○
Calm Traffic	●●○○○

URBAN ECOLOGY

Manage Stormwater	●●●●●
Enhance Habitat	●●○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●●○○

ABILITY TO IMPLEMENT

Cost Effective (Low cost scores highly)	●●○○○
Ease of Maintenance	●●●●○

TRAFFIC AND PARKING CONSIDERATIONS

Limited Parking Loss at Corner (depends on bulb-out length)	

TOOLKIT ELEMENT: CHICANES

Chicanes can create new areas for landscaping and public space. A chicane is a series of alternating mid-block curb extensions or islands that narrow the roadway and require vehicles to follow a curving, S-shaped path. This can help to slow traffic and discourage speeding.

LOCATION CRITERIA:

Low traffic volume streets.

DESIGN GUIDELINES

See the Better Streets Plan for design guidance on chicains:

http://www.sfbetterstreets.org/find-project-types/pedestrian-safety-and-traffic-calming/traffic-calming-overview/chicanes/

Chicanes should not be located on streets with Rapid or Local lines per Muni's operating framework. Though generally discouraged, chicanes could be implemented on streets with Community Routes; in these cases the design should be coordinated with Muni transit engineers.

Alternative chicane designs include the following:

Chicane + Sidewalk Widening. A chicane combined with widened sidewalks can create larger areas for landscaping and public space.

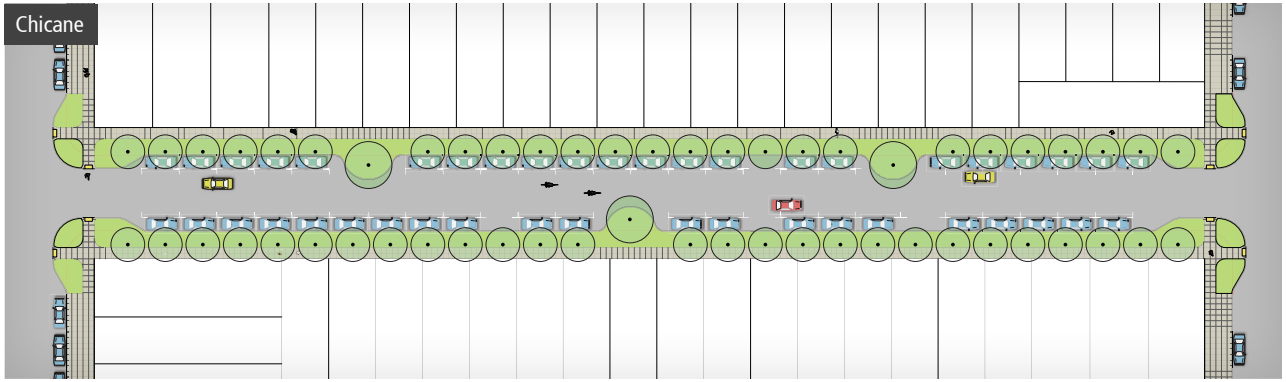
Chicane + Back-In Angled Parking. A chicane can include back-in angled parking and larger bulb-outs in instances where costs do not allow for extended sidewalks, or where more street parking is desired. A chicane with back-in angled parking could create expanded area of landscaping and public space. Back-in angled parking is preferred to front-loaded angled parking because it improves visibility between the driver exiting a parking spot and a motorist or bicycle rider in the roadway.

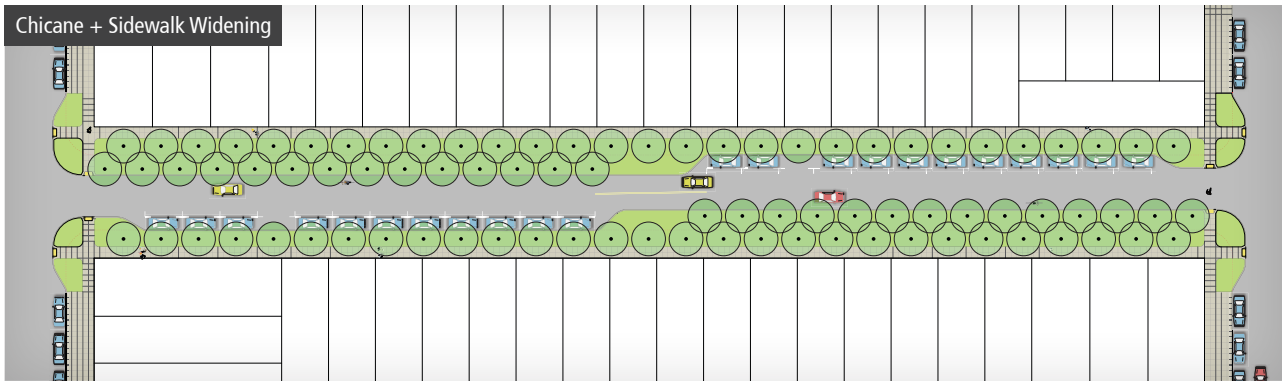
The Livable Streets Division of the SFMTA has a Bicycle Toolkit with guidelines on back-in angle parking.

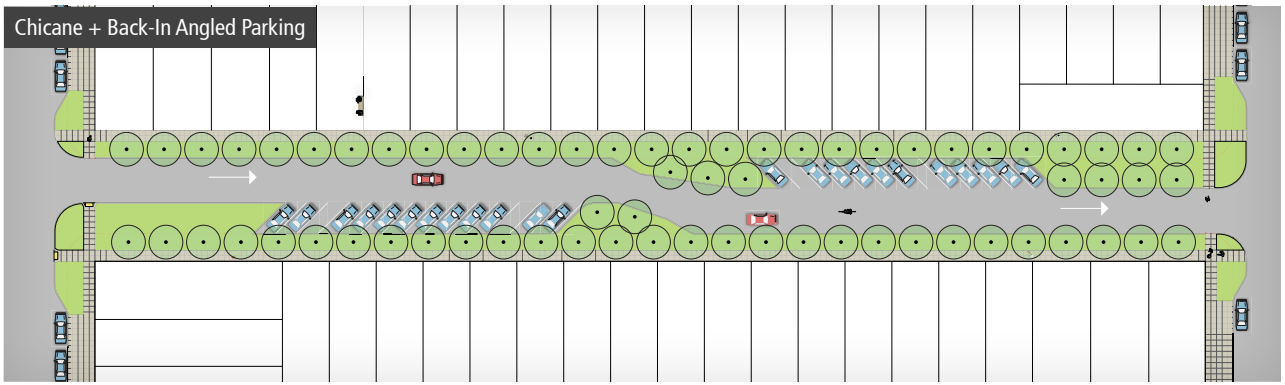
Note: See discussion on back-in angled parking below.

LOCATION CRITERIA:

Residential streets with low traffic volumes.







ACTIVE TRANSPORTATION

- Support Pedestrians ●●○○○
- Support Bikes ●●●○○
- Calm Traffic ●●●●○

URBAN ECOLOGY

- Manage Stormwater ●●●●○
- Enhance Habitat ●●○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

- Potential Increase in Usable Public Space ●○○○○

ABILITY TO IMPLEMENT

- Cost Effective (Low cost scores highly) ●●●●○
- Ease of Maintenance ●●●●○

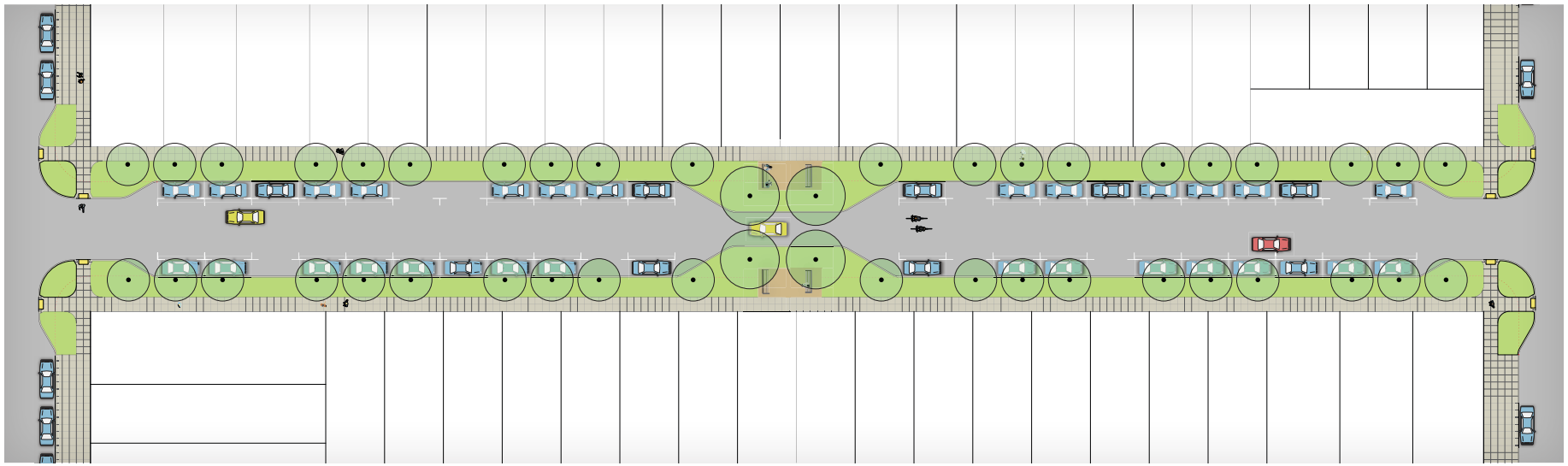
TRAFFIC AND PARKING CONSIDERATIONS

- Limited Parking Loss at Corner (depends on bulb-out length)

TOOLKIT ELEMENT:
NECKDOWNS

Neckdowns, also known as Chokers, are mid-block curb extensions that extend beyond the line of the parking lane into the vehicle lane, effectively creating a pinch point along the street. They are effective traffic calming tools as they reduce a two-lane street to one lane (or two very narrow lanes) at the choker point, requiring motorists to yield to each other and slow down.

Neckdown sidewalk extensions can create opportunities for placemaking, greening, and public realm amenities.



DESIGN GUIDELINES

Incorporating large canopy trees into the design of neckdowns is strongly encouraged as it can create a visual focal point and sense of enclosure for the surrounding streetscape. Tree Planting must comply with DPW Director's Order 169,946.

Neckdowns should be designed to maximize opportunities for greening, stormwater management and habitat creation.

Consider incorporating programming elements like seating nooks, sculptural elements and informational or educational signage. Neckdowns provide an opportunity to add greenery and/or community gathering space, depending on the character of the street.

This design is usually only appropriate for low-volume, low-speed streets, but can also be a way to bring speeds down on an otherwise wide open street or to reduce volumes of traffic using the street.

For a neckdown to function effectively, the width of the travel way should not be wide enough for two cars to comfortably pass, but wide enough for one vehicle to pass unimpeded.

The neckdown should be designed to allow emergency vehicles to pass unimpeded.

This treatment would not be appropriate on any Muni route.

Trees located in neck-downs should be placed a minimum of 5' away from sewer mains.

LOCATION CRITERIA:

Low traffic volume streets.

ACTIVE TRANSPORTATION

Support Pedestrians	●●○○○
Support Bikes	●●●○○
Calm Traffic	●●●●●

URBAN ECOLOGY

Manage Stormwater	●●●●○
Enhance Habitat	●●○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●●○○

ABILITY TO IMPLEMENT

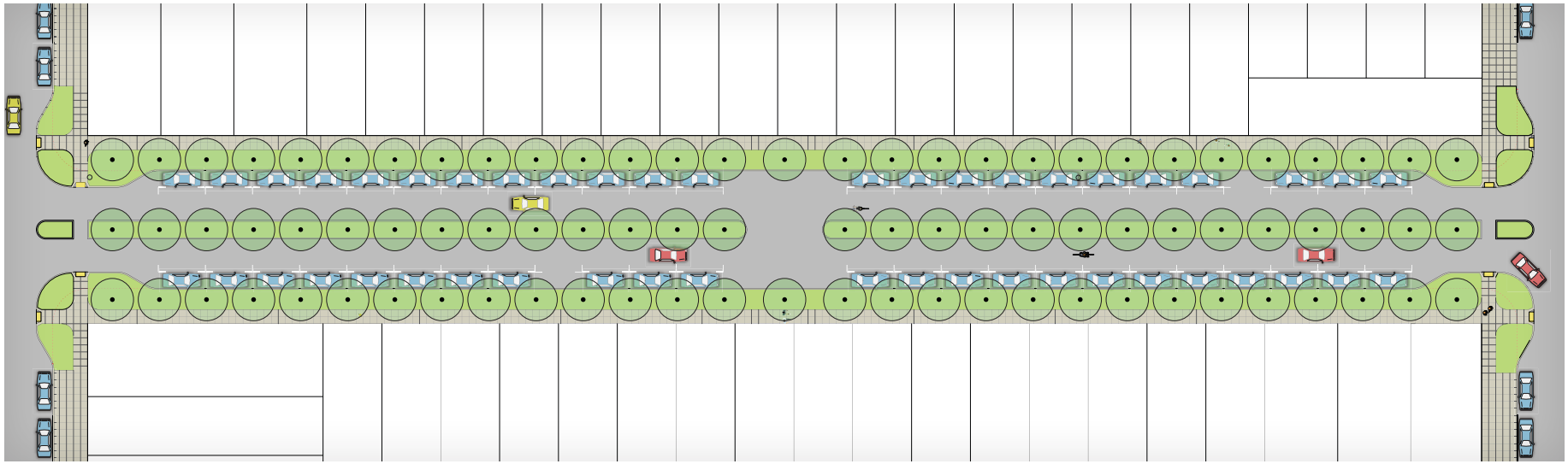
Cost Effective (Low cost scores highly)	●●●●○
Ease of Maintenance	●●●●○

TRAFFIC AND PARKING CONSIDERATIONS

Limited Parking Loss at Corner (depends on bulb-out length)	

TOOLKIT ELEMENT:
LANDSCAPED CENTER MEDIANS

Landscaped medians can create opportunities for greening, landscaping and public realm amenities. Landscaped medians can calm traffic, support urban ecology, and facilitate stormwater management.



DESIGN GUIDELINES

See the Better Streets Plan for design guidance:

http://www.sfbetterstreets.org/find-project-types/greening-and-stormwater-management/greening-overview/median-greening/

http://www.sfbetterstreets.org/find-project-types/pedestrian-safety-and-traffic-calming/traffic-calming-overview/medians-and-islands/

If landscaped center medians are placed along Muni routes, they should maintain 12 foot lanes for transit vehicles, and plantings should be selected that will not extend into the Muni vehicle right of way or interfere with Muni overhead wires, if present.

Sewer lines are typically located in the center of the street, directly beneath the proposed median islands. Projects that propose new landscaped medians will require an evaluation of existing sewer lines that may result in the reconstruction and/or relocation of sewer lines in the project area.

LOCATION CRITERIA:

Low, mid and high-volume residential and mixed-use streets along the Green Connections network

ACTIVE TRANSPORTATION

Support Pedestrians	●●○○○
Support Bikes	●●●○○
Calm Traffic	●●●●●

URBAN ECOLOGY

Manage Stormwater	●○○○○
Enhance Habitat	●●●○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●○○○

ABILITY TO IMPLEMENT

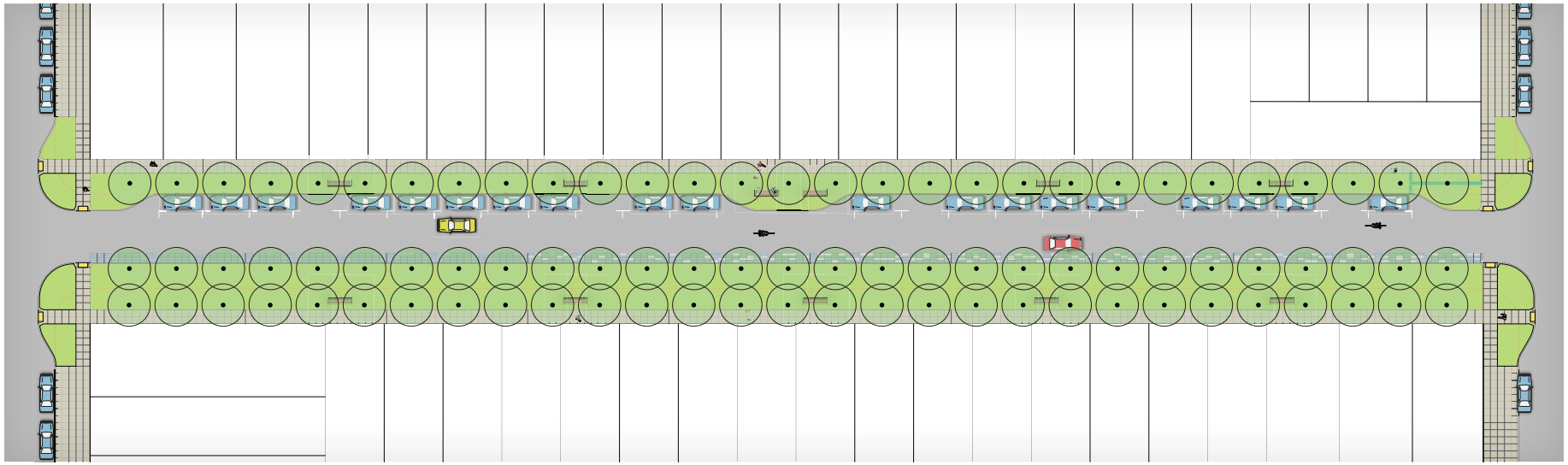
Cost Effective (Low cost scores highly)	●●●○○
Ease of Maintenance	●●○○○

TRAFFIC AND PARKING CONSIDERATIONS

Parking Loss	None

TOOLKIT ELEMENT:
WIDE SIDEWALK GARDENS

Sidewalk widening can create space for greening and public space. Reduced travel lanes can enhance pedestrian safety by reducing the road width and calming auto traffic.



DESIGN GUIDELINES

See the Better Streets Plan for design guidance:

http://www.sfbetterstreets.org/find-project-types/greening-and-stormwater-management/greening-overview/sidewalk-landscaping/#design_guidelines

http://www.sfbetterstreets.org/find-project-types/reclaiming-roadway-space/street-and-sidewalk-parks/#design_guidelines

Widened sidewalks along Muni routes should maintain 12 foot lanes for transit vehicles and plantings should be selected that will not extend into the Muni vehicle right of way or interfere with Muni overhead wires, if present.

LOCATION CRITERIA:

All street types, especially streets with excess road width.

ACTIVE TRANSPORTATION

Support Pedestrians	●●●●●
Support Bikes	●●●○○
Calm Traffic	●●●●○

URBAN ECOLOGY

Manage Stormwater	●●●●●
Enhance Habitat	●●●●●

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●●●●

ABILITY TO IMPLEMENT

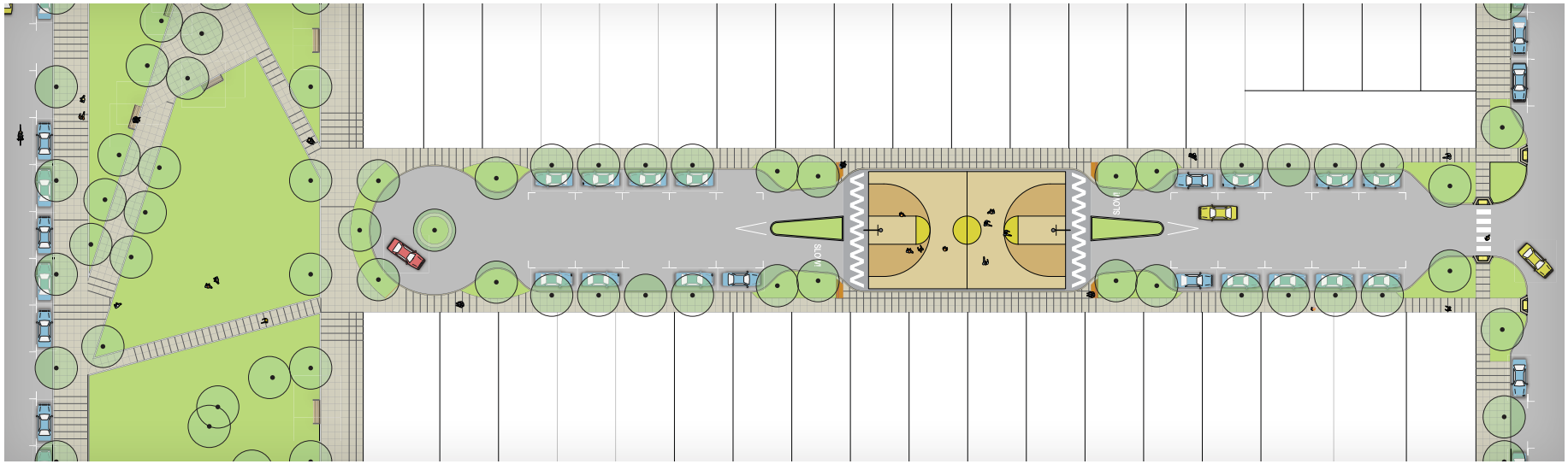
Cost Effective (Low cost scores highly)	●○○○○
Ease of Maintenance	●●○○○

TRAFFIC AND PARKING CONSIDERATIONS

Moderate to High Parking Loss

TOOLKIT ELEMENT:
PLAY STREETS

Play streets repurpose street rights-of-way to create large areas of public space for active recreational uses, such as a basketball courts, hop scotch, and other unstructured play activities. While play streets still accommodate local traffic, they typically include intense traffic calming to promote very slow driving speeds and allow people to use the street comfortably.



DESIGN GUIDELINES

Play streets should be sited on residential streets with very low traffic volumes, and are well suited to dead-end streets. They are can also be sited next to children-serving land uses like community centers and schools. Play streets should be designed to encourage active recreational uses.

Play streets should be sited on streets with a running slope of 5% or less.

Entry points to play streets should be heavily traffic calmed to slow traffic entering the street, but should maintain access for emergency vehicles.

Play streets may be designed with low-cost materials like paint or more expensive treatments that involve modifying curb lines, adding speed tables etc.

Above-ground structures incorporated into play street designs, should be sited to minimize potential impacts and/or conflicts to below-ground utilities.

LOCATION CRITERIA:

Extremely low volume residential streets; dead-end streets.

Play streets may function on a temporal basis where they are open to through traffic during commute hours but are otherwise restricted to local traffic at other times of the day.

Play streets shall be designed to accommodate emergency vehicle movements.

Designs for play streets should incorporate seating areas where adults can sit and supervise children at play.

The detailed design of a play street must consider demarcation such as detectible tactile warnings.

This treatment would not be appropriate on any Muni route.

ACTIVE TRANSPORTATION

Support Pedestrians	●●●●●
Support Bikes	●●●○○
Calm Traffic	●●●●●

URBAN ECOLOGY

Manage Stormwater	●○○○○
Enhance Habitat	●○○○○

NEIGHBORHOOD STEWARDSHIP AND PLACEMAKING

Potential Increase in Usable Public Space	●●●●●

ABILITY TO IMPLEMENT

Cost Effective (Low cost scores highly)	●●○○○
Ease of Maintenance	●●○○○

TRAFFIC AND PARKING CONSIDERATIONS

Some Parking Loss

CHAPTER

6

Implementation