MARICOPA ASSOCIATION of GOVERNMENTS

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DESIGNING TRANSIT ACCESSIBLE COMMUNITIES STUDY

Transit Committee
March 14, 2013

Project Overview – Work Program

Existing Conditions	• Gather GIS data • Develop database for all stops • Literature search	Winter 2011/2012
Categorize Stops & Case Studies	• Cluster analysis • Ground truth data • Field review	Spring 2012
Develop Prototypes	• Conceptual design for each category • Implementation strategies • Develop access toolkit	Summer 2012
Financial Analysis	• Prototype costing • Funding options • Funding policies & guidelines	Fall 2012
Progress Point		
Final Report	• Final report • Compile study record	Spring 2013

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Transit Accessibility Toolkit

Issue

Importance

Improvement Considerations

Planning/Policy Guidance

Cost

Lighting

Information Signage

Wayfinding

Seating

Shelter

Shade

Adjacent Land Use

Bicycle Access

Bicycle Parking

Pedestrian Crossing

Sidewalk

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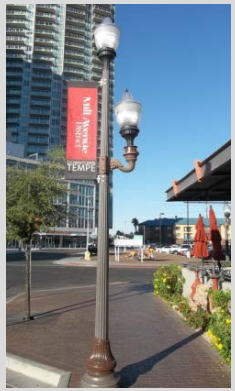
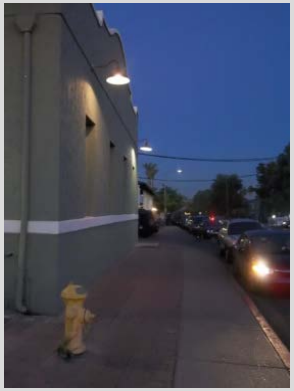
Lighting

			
Freestanding pedestrian-oriented lighting at bus stops.	Pedestrian light mounted to street light pole.	Attached to street light pole in catchment area.	Attached to building face in catchment area.

- **Planning/Policy Guidance**
- Perform lighting study to conform to current lighting standards.
- Site bus stops and bus shelters to take advantage of overflow lighting from existing street lights (see graphic at right).
- Provide solar lighting in locations where connecting to power can be costly.
- Position backlit information kiosks to illuminate the interior of a bus shelter.
- Provide pedestrian level lighting either by retrofitting existing streetlight poles with a new lighting arm or by installing new/additional lighting.

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Security/ Lighting	Luminaire adjacent to shelter	Each	$10,000					
	Pedestrian lighting attached to existing street light pole	Each	$7,500					
	Pedestrian lighting along walkway; 80' spacing	Each	$5,500					
	Electrical circuit / wire	Foot	$2					
	CCTV camera (1)	Each	$5,000					

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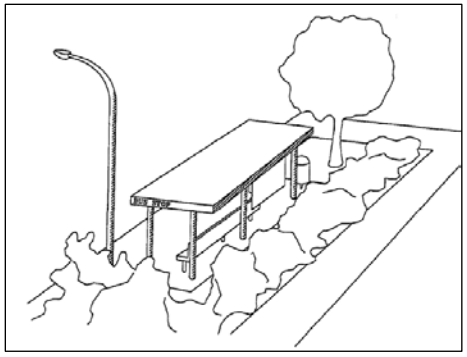

Source: TCRP Report 19c - Guidelines for the Location and Design of Bus Stops

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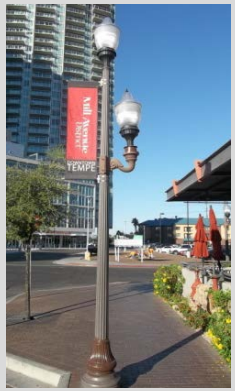
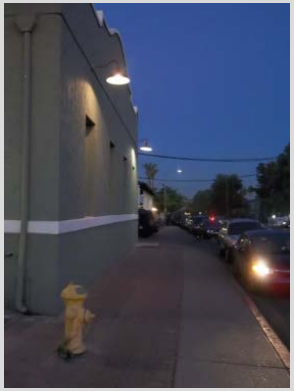
Lighting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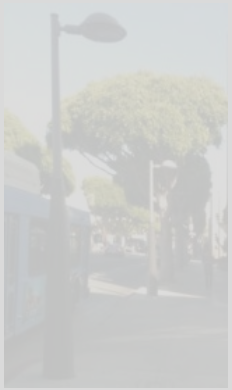

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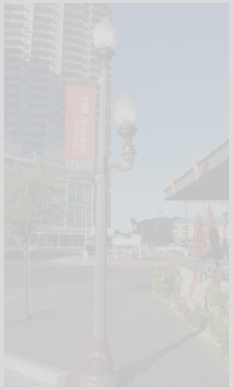
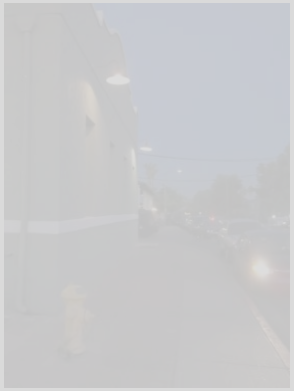


Pedestrian light mounted to street light pole.

Attached to street light pole in catchment area.



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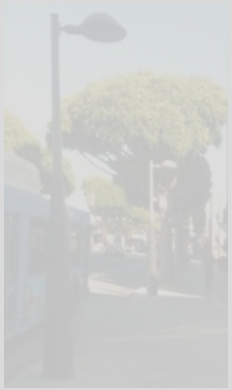

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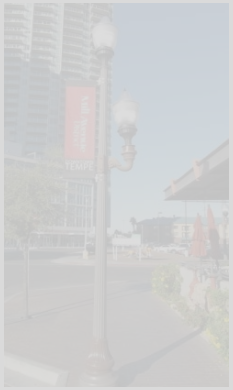

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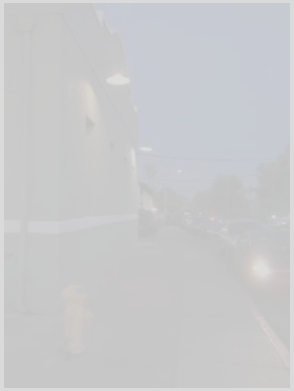

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	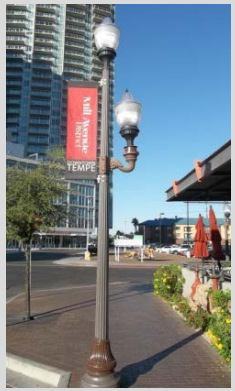		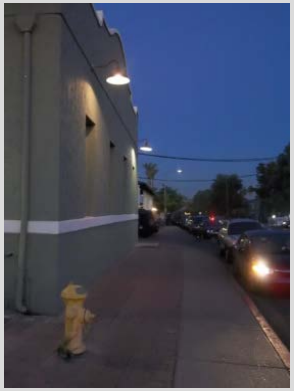
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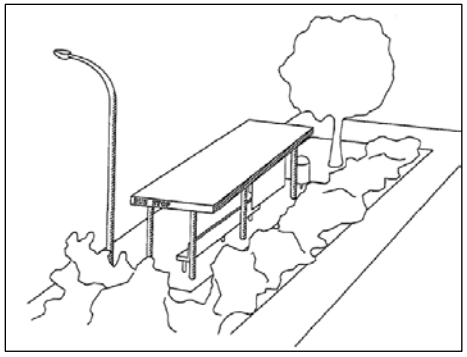

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	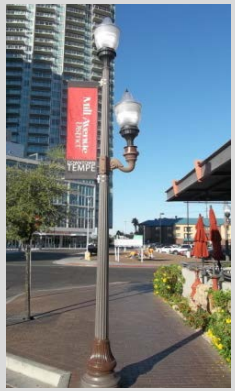		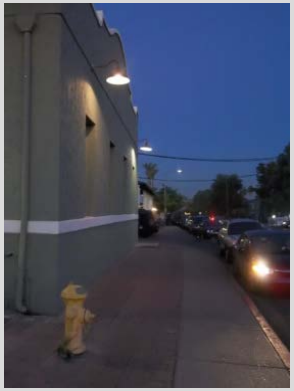
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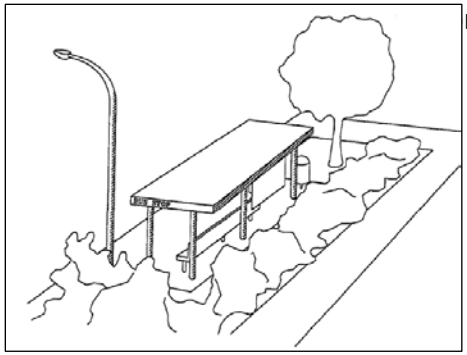

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Information Signage

Freestanding information kiosk with detailed route and schedule information.	Existing post-mounted bus stop sign with bus route number. Proposed post-mounted bus stop sign with bus route number and destination.	Post-mounted information box with route map.

Related Elements

Information Content	*Station/stop, route, schedule, service alert, real-time location, destination, vehicle load factor.*
Information Format	*Map, table, website, trip planner, electronic message, phone text.*
Information Delivery Media	*Telephone, personal computer, mobile device, signage, kiosk.*

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Information Signage	Real-time information display (1)	Each	$5,000					
	Static information display	Each	$500					

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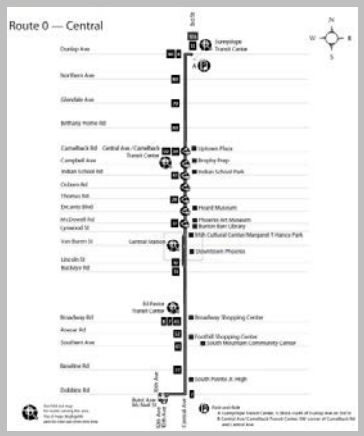
- **<u>Planning/Policy Guidance</u>**
- Consider incorporating transit-related information technologies (i.e. smart phone apps, phone text lines).
- In addition to improvements made at specific bus stop locations, a destination-based route map can be used throughout the transit system in the region. The sample below shows an example of what that map may include.



The sample destination-based route map shown above could serve as an example for the region.

Information Signage

Freestanding information kiosk with detailed route and schedule information.

Information Content	
Information Format	
Information Delivery Me	

Feature	
Information Signage	Real-time i
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- **Planning/Policy Guidance**

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- 64% of transit riders said they would ride the bus more often if adequate schedule information was provided.

Information Signage

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Existing post-mounted bus stop sig

Proposed post-mounted bus stop s and destination.

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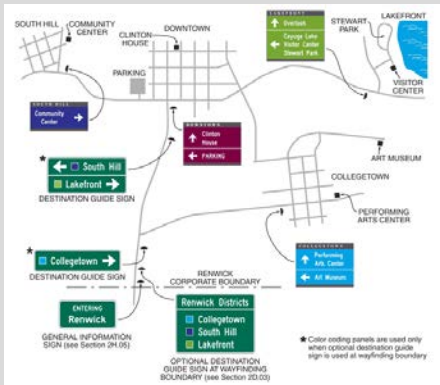
Wayfinding



Transit stop wayfinding can be provided as part of a larger community wayfinding signage program.

Source: MUTCD 2009, Ch. 2D

The MUTCD provides general information signs that may be used to identify transit stops/stations.

Source: MUTCD 2009, Ch. 2H

Bicycle wayfinding signs may also indicate the direction of transit station.

Source: City of Long Beach

Example of Destination Classifications

Primary	*Downtown and adjoining jurisdictions (signed at a distance up to five miles).*
Secondary	*Transit stations and districts (signed at a distance up to two miles).*
Tertiary	*Parks, landmarks, colleges, hospitals, and high schools (signed at a distance up to one mile).*

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Wayfinding	Wayfinding sign	Each	$250					

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- **<u>Planning/Policy Guidance</u>**
- Consider incorporating a comprehensive, city-wide wayfinding signage program in the local community and consider transit riders, bicyclists, and pedestrians when designing the wayfinding system.
- Use an interdisciplinary team to design and develop wayfinding systems.
- Include an evaluation component into the implementation of wayfinding to understand how customers use them and assess effectiveness.
- Consider establishing regional transit wayfinding guidelines and standards.
- Establish a hierarchy that classifies destinations as primary, secondary and tertiary destinations.

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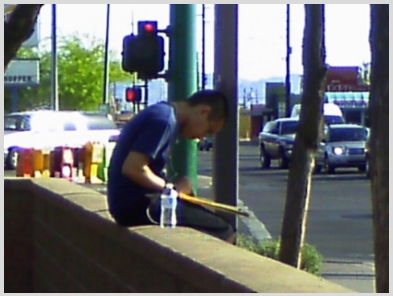
Seating

Bench with no advertising (shade from tree and building)

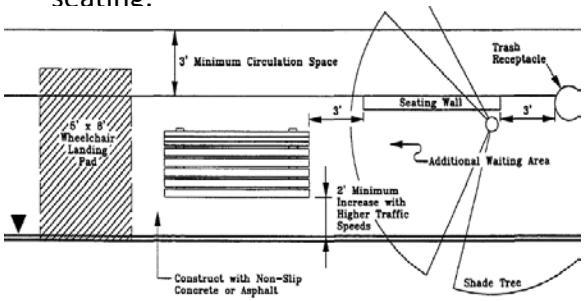


Seating provided on adjacent street wall, also known as a seat wall.

Bench located under adjacent shade trees.

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Seating	Standard shelter w/ seating, lighting, bicycle rack, concrete pad, trash receptacle	Each	$16,000					
	Enhanced shelter w/ seating, side screens, lighting, bicycle rack, concrete pad, trash receptacle	Each	$25,000					
	Custom shelter w/ seating, side screens, interior lighting, stop area lighting, bicycle rack, concrete pad, trash receptacle	Each	$35,000					
	Bench w/ concrete pad, shade	Each	$3,000					
	Bench w/ concrete pad, shade, lighting, trash receptacle	Each	$6,000					

- **Planning/Policy Guidance**
- TCRP Report 19c provides detailed guidance on the siting of bus benches. The siting of bus stop benches in the MAG region should consider:
  - distance from intersection,
  - distance from street light,
  - proximity to existing shade,
  - distance from driveways,
  - ADA mobility clearances, and
  - proximity and access to surrounding destinations.
- Seating may also be incorporated into the design of the adjacent development including designing street walls along the property line to be at a height that allows passengers to use the wall as seating.



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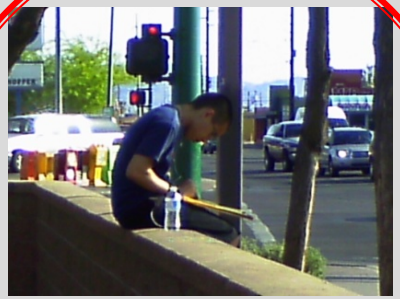

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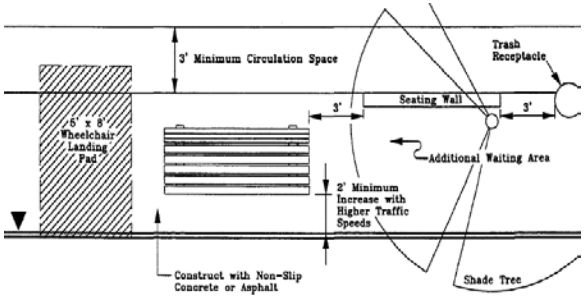

Source: TCRP Report 19c - Guidelines for the Location and Design of Bus Stops

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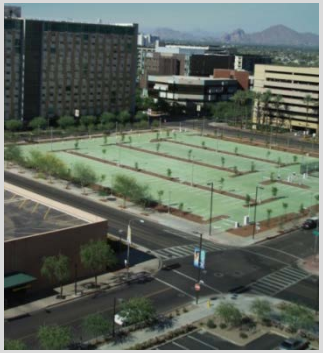
Shelter (1 of 2)

Bus shelters can provide sufficient shade at all times of day to encourage their use. Shelters that do not provide sufficient shade may have a negative impact on transit ridership.

Source: MAG

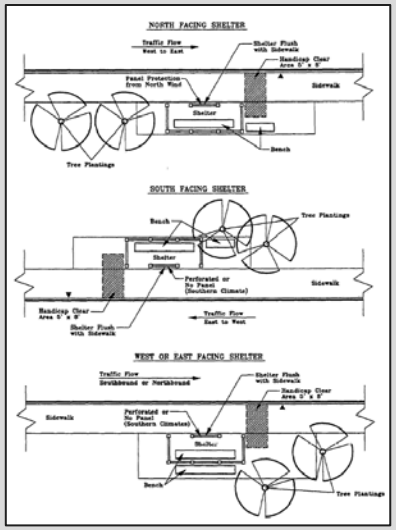
Public or development-funded bus shelters may be designed to satisfy more rigorous aesthetic or functional requirements. ***However, the provision of shade, during all times of day, always takes precedence over purely aesthetic design considerations.***

Source: South Mountain Studios



Coated, light color pavement attracts and retains less heat.

Source: http://emeraldcoolpavements.com/



Conceptual Shelter Design for Southern Climates

Source: TCRP Report 19c - Guidelines for the Location and Design of Bus Stops

- **Planning/Policy Guidance**
- Consider requiring private developers to install and/or maintain bus shelters.
- Consider establishing a southern climate shelter standard for bus stops and create a program to convert local shelters to shelters with enhanced protection from the sun.
- Consider the local transit agency's criteria to determine if a shelter should be provided at a bus stop and consider steps to be made to prove the need for a shelter at a stop location. Common factors in determining shelter need include:
  - Number of passenger boardings
  - Transit service type and frequency
  - Number of transfers
  - Available space
  - Number physically challenged individuals in the area
  - Adjacent land use compatibility

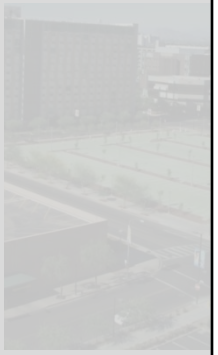
Shelter (1 of 2)

Bus shelters can provide sufficient shade at all times of day to encourage their use. Shelters that do not provide sufficient shade may have a negative impact on transit ridership.

Source: MAG

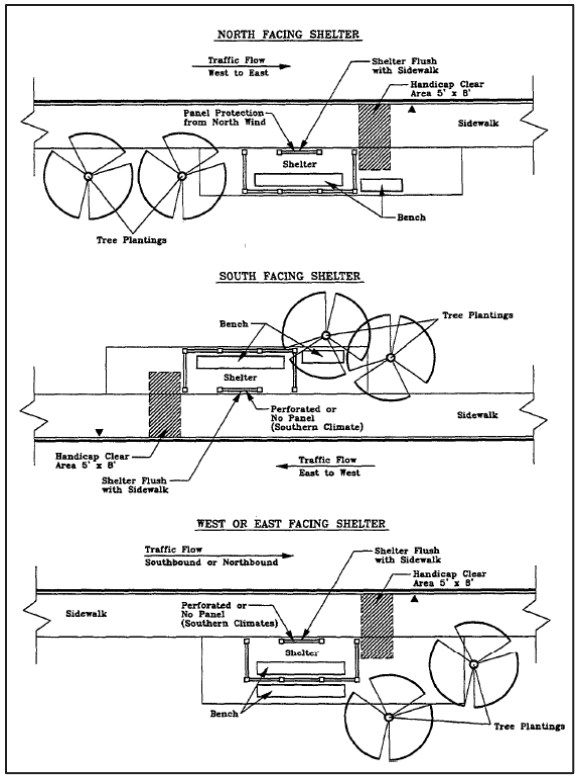
Public or development-funded bus shelters may be designed to satisfy more rigorous aesthetic or functional requirements. ***However, the provision of shade, during all times of day, always takes precedence over purely aesthetic design considerations.***

Source: South Mountain Studios



Coated, light color pa
attracts and retains le

Source:
http://emeraldcoolpaveme



Conceptual Shelter Design for Southern Climates

Source: [TCRP Report 19c - Guidelines for the Location and Design of Bus Stops]

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  - Transit service type and frequency
  - Available space
  - Adjacent land use compatibility

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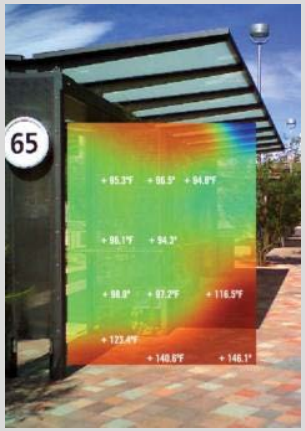
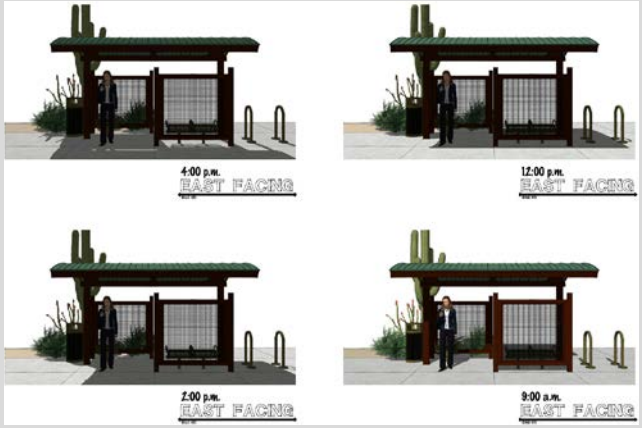
Shelter (2 of 2)



Prefabricated trellis panels may be used in the construction of transit shelters, offering aesthetic and thermal benefits.

Source: greenscreen.com



The City of Scottsdale conducted a sun exposure study as part of the conceptual design for standard bus shelters in the city. The resulting design is similar to concept designs included in TCRP Report 19c (referenced above).

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Shelter	Standard shelter w/ seating, lighting, bicycle rack, concrete pad, trash receptacle	Each	$16,000					
	Enhanced shelter w/ seating, side screens, lighting, bicycle rack, concrete pad, trash receptacle	Each	$25,000					
	Custom shelter w/ seating, side screens, interior lighting, stop area lighting, bicycle rack, concrete pad, trash receptacle	Each	$35,000					
	Sidewalk, concrete	Sq. Ft.	$4.00					
	Coated Pavement	Sq. Ft.	$1.50					
	Concrete pavers	Sq. Ft.	$7.00					

Shelter (2 of 2)

Prefabricated trellis panels may be used in the constru
thermal benefits.

Source: greenscreen.com

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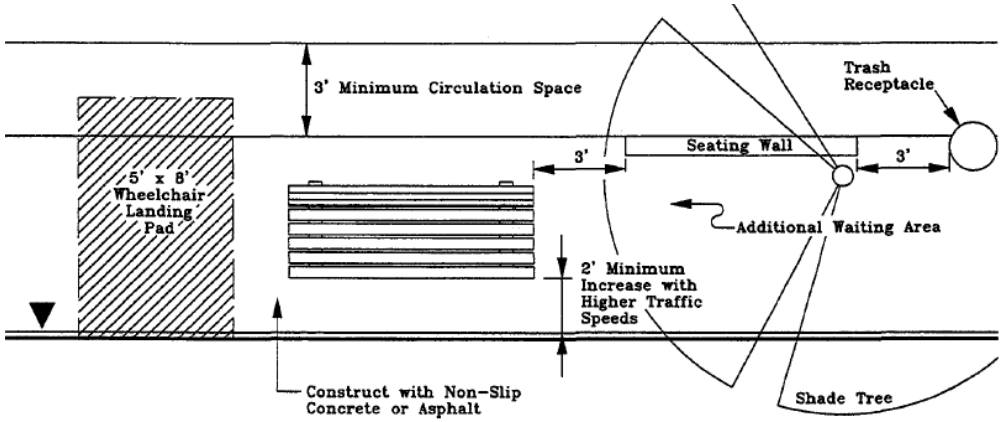
Feature	Des							
Shelter	Standard shelter w/ seating, lighting, bicycle							
	Enhanced shelter w/ seating, side screens, lig							
	Custom shelter w/ seating, side screens, inter concrete pad, trash receptacle							
	Sidewalk, concrete							
	Coated Pavement	Sq. Ft.	$1.50					
	Concrete pavers	Sq. Ft.	$7.00					

Shade (1 of 2)

Tree wells are typically used in urban areas or areas with high turnover of street parking.

A landscaped strip between the curb and sidewalk is more common in suburban settings.

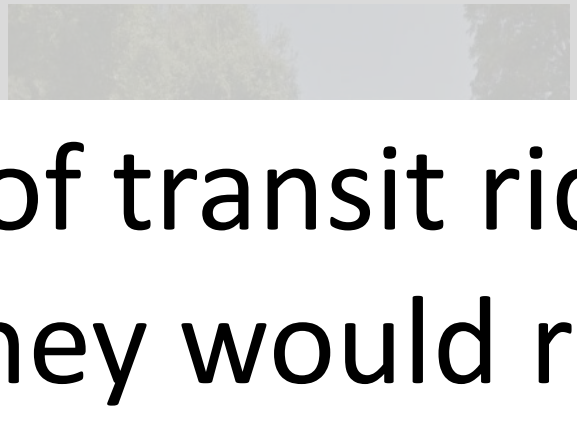


Conceptual Bench and Waiting Pad Design
Source: TCRP Report 19c - Guidelines for the Location and Design of Bus Stops

- **Planning/Policy Guidance**
- Some cost effective strategies for planting street trees include:
  - Siting bus stops in locations where they will benefit from existing shade trees; and
  - Prioritizing the planting of street trees that will serve existing bus shelters.
- Wide and/or detached sidewalks allow for a buffer zone that can include tree wells in urban areas or a continuous landscaped strip in more suburban settings.
- Shade can be a consideration during private development design and review and the implementation of public improvements within the public right-of-way. Identifying the appropriate strategy requires consideration of capital cost, maintenance and contextual factors such as aesthetics and the number of pedestrians and transit users who will actually benefit from the investment.

Shade (1 of 2)

Tree wells are typically us
with high turnover of stre



- 68% of transit riders said they would ride the bus more often if additional shade was provided

Conceptual Bench and Waiting Pad Design
Source: TCRP Report 19c - Guidelines for the Location and Design of Bus Stops

- Planning/Policy Guidance
- Some cost effective strategies for planting street trees include:
  - stops in locations where benefit from existing shade
  - g the planting of street will serve existing bus
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  - e a consideration during lopment design and review ementation of public ts within the public right- tifying the appropriate uires consideration of maintenance and contextual factors such as aesthetics and the number of pedestrians and transit users who will actually benefit from the investment.

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Shade (2 of 2)

The combination of tree wells and sidewalk-oriented buildings provides consistent shade throughout most of the day.

Canopies are typically used on private property. They may be erected to provide shade between the building entrance and the public sidewalk.

Shade at building entrance.

Source: City of Chandler, Green Building Program

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Landscape/Shade	Standard shelter w/ seating, lighting, bicycle rack, concrete pad, trash receptacle	Each	$16,000					
	Enhanced shelter w/ seating, side screens, lighting, bicycle rack, concrete pad, trash receptacle	Each	$25,000					
	Custom shelter w/ seating, side screens, interior lighting, stop area lighting, bicycle rack, concrete pad, trash receptacle	Each	$35,000					
	Shade tree (irrigated)	Each	$750					
	Landscape buffer w/ shade tree (irrigated)	Sq. Ft.	$3.00					
	Tree well with cover	Each	$250					
	Custom shade structure	Each	$5,000					

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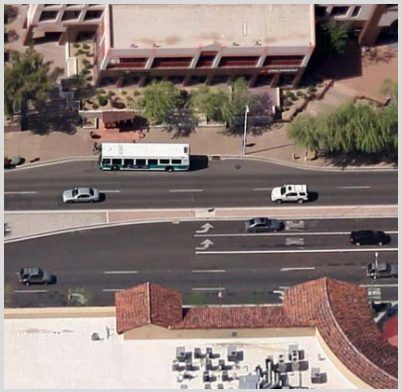
Adjacent Land Use (1 of 2)

Sidewalk-oriented development provides shade and direct access to building entrances.



In Metro core locations, a minimal setback is be encouraged, such as this example in Tempe.

Where setbacks are used, a clear path from the sidewalk to the building entrance is to be provided.

Pedestrian connection through a parking lot provides a solution for large setbacks and parking lots.

Source: City of Chandler, Green Building Program

Partial street closures act as "dead ends" for vehicles while allowing bicyclists and pedestrians to continue along the roadway. This is a good solution for subdivisions with cul-de-sac, hammerheads, and dead end streets.

- **Planning/Policy Guidance**
- Consideration should be given to locating bus stops opposite convenience stores wherever practical as these stores provide a quick stop for transit riders to grab a drink, snacks, or the newspaper.
- The best way to ensure adjacent land uses are compatible with transit stops is through the regulation of design or form of development. Two key urban design issues include:
  - Orientation of buildings relative to the sidewalk, and
  - Establishment of direct connections between the sidewalk and building entrances.
- Surface parking between the sidewalk and building entrances can be minimized or eliminated by locating surface parking lots at the rear or side of the building.

Adjacent Land Use (2 of 2)

Pedestrian-friendly Design Criteria for New Development
The City of Tempe Transportation Master Plan (pp. 2-2 & 2-3) includes design criteria for new development promoting pedestrian-friendly design: • Encourage pedestrian and transit-user access to buildings by locating buildings at the minimum setback for arterial and arterial to collector intersections. The distance between bus stops and building entrances shall be minimized by using minimum setback requirements for locations of buildings on the site. • Encourage pedestrian and bicycle access to the main building entrances from all sides of the site by providing more links to street frontages. • Encourage buildings to locate closer to street intersections by minimizing the amount of parking allowed at street frontages, or by locating all parking behind or to the side of buildings. • Encourage mixed-use development, allowing people to work where they live. • New and existing cul-de-sacs and dead-end streets can be enhanced by providing connecting pedestrian and bicycle paths to the major streets.

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Adjacent Land Use	Provide opening in street wall	Each	$1,000					
	Sidewalk (concrete)	Sq. Ft.	$4.00					
	Path (asphalt)	Sq. Ft.	$2.00					

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Bicycle Access (1 of 3)

Bicycle lanes on Southern Avenue in addition to vehicular travel lanes. Bicycle lanes can be installed by reducing the number of vehicular lanes from four to three or reducing vehicle travel lane widths.

Green paint denotes the "conflict zone" where buses and motorists will cross the bicycle lanes in order to pick up passengers or make right turns.

Buffered or protected bicycle lanes create greater separation between bicyclists and adjacent vehicular traffic and have been shown to attract new riders.

Bicycle paths will include lighting and landscaping wherever possible and have clearly marked and/or signalized crossings at major roadways.

Bicycle paths such as the Sun Circle Trail may facilitate access to transit if connections are made between the path and nearby transit stops. This bicycle and pedestrian crossing is signalized via a HAWK signal.

City of Scottsdale Restriping Program

As an example, the City of Scottsdale has been actively restriping major streets with maintenance overlays to add bicycle lanes where feasible. They generally allow 11 foot wide through lanes and 10 foot wide turn lanes to accomplish this. In some cases the City of Scottsdale will accept 10 foot wide through lanes, but only on streets with lower speed limits and limited truck traffic.

Bicycle Access (1 of 3)

22% of riders said they arrived by bicycle

When asked if certain improvements would increase their use of transit, 52% of riders indicated adding a bicycle lane would increase their use of the transit system.

Bicycle lanes on Southern Av
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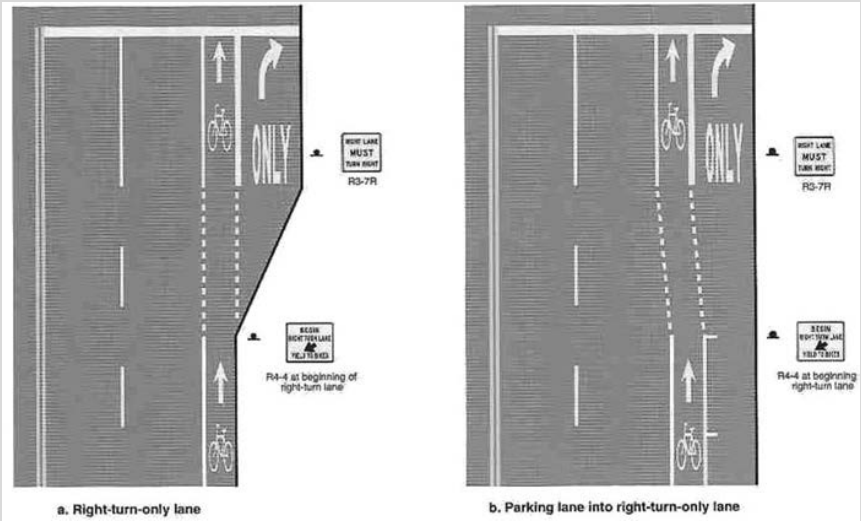
Bicycle Access (2 of 3)

Shared lane markings have been approved by FHWA and are included in the 2009 MUTCD.

Large custom bicycle boulevard pavement marking are used in some jurisdictions.



Source: AASHTO Guide for the Development of Bicycle Facilities, 4th Ed., 2012

- **Planning/Policy Guidance**
- Bicycle lanes or cycle tracks can be considered on arterial or urban roadways. The installation of bicycle lanes may be achieved most cost effectively through lane narrowing or lane removal. Lane removal can be considered in cases where a roadway is determined to have excess capacity.
- Bicycle lanes or shared lane markings can be considered on collector or local streets that connect neighborhoods and commercial areas to major transit corridors, particularly in cases where parallel arterial roadways cannot accommodate bicycle lanes. Shared lane markings do not require the narrowing or removal of travel lanes and are generally suitable for roadways with speed limits of 35 miles per hour or less.
- Traffic calming measures can be implemented in a way that discourages “cut-through” traffic by motorists, but facilitates bicycle through traffic. This strategy of implementing traffic calming improvements combined with bicycle-oriented improvements such as signage and pavement markings on local streets is often referred to as the development of “bicycle boulevards” or “neighborhood greenways.”

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Bicycle Access (3 of 3)

Speed lumps may be designed with a spacing that allows wide axle emergency vehicles to straddle the humps. Bicyclists may also ride through the gaps to avoid being impacted.	Mini traffic circles can be used to replace all-way stops, allowing cyclists to legally maintain momentum through minor intersections.	Traffic diverters reduce through traffic by forcing vehicles to turn at some intersections, while allowing bicyclist through movements. Sources: pedbikeimages.org	Partial street closures act as “dead ends” for vehicles while allowing bicyclists and pedestrians to continue along the roadway.

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Bicycle Access	Add bicycle lane by restriping travel lanes	Mile	$15,000					
	Bicycle path (asphalt)	Sq. Ft.	$2.00					
	Mid-block crossing	Each	$10,000					
	Mid-block crossing w/ flashing beacon	Each	$50,000					
	Mid-block crossing signal (HAWK)	Each	$100,000					
	Pavement markings (sharrow, Bicycle Blvd, etc)	Each	$300					
	Bicycle wayfinding sign	Each	$500					

1. Costs for real-time traveler information and CCTV does not include any necessary communications backbone or central processing system.

Bicycle Parking

Sidewalk bicycle racks.

Bicycle corrals.

- **Planning/Policy Guidance**
- Interior, on-board bicycle storage can be considered by the transit agency for routes that have high volumes of bicyclists and when exterior bicycle storage is at or near capacity. Such bus vehicle improvements would need to be properly marked and have fixtures used to secure bicycles which the bus is in motion.
- Bicycle parking on private property can be required by ordinance with clear guidance on design and siting. Design guidelines can promote use of racks similar to those used in the public right-of-way as this will facilitate standardization and ease of use. Siting guidelines can focus on visibility and the location of racks relative to main building entrances.
  - Bicycle parking should be clearly visible from the bus stop or building entrance.
  - The bicycle parking area should be located within 50 feet of the bus stop or building entrance it is intended to serve and no further than the closest (non-disabled) automobile parking space.
  - Under no circumstances should walls, fencing or landscaping be used to “screen” bicycle parking from view, as that will create an environment that facilitates bicycle theft.

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Bicycle Parking/ Storage	Bicycle rack	Each	$400					
	Bicycle lockers	Each	$2,500					
	Bicycle shelter	Each	$5,000					

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	Bicycle lockers	Each	$2,500					
	Bicycle shelter	Each	$5,000					

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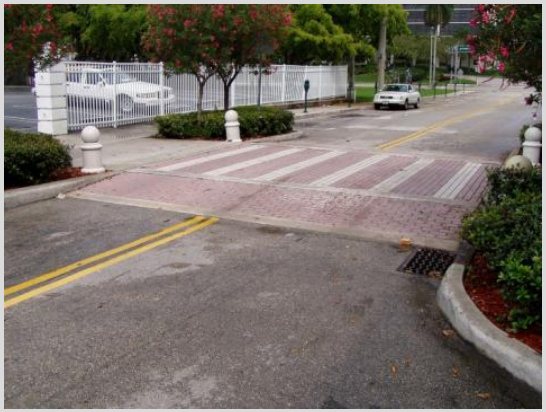
Pedestrian Crossing (1 of 2)

Curb extensions shorten crossing distances for pedestrians and can create additional space at street corners that can facilitate the installation of dual curb ramps.

This mid-block crossing includes a raised median refuge, high contrast crosswalk, and in-pavement flashers.

Source: pedbikeimages.org



Raised crosswalks may be appropriate at some locations where reducing traffic speed is desirable. The impact on drainage must be considered.

Source: pedbikeimages.org

- **Planning/Policy Guidance**
- Pedestrian safety cannot be compromised to accommodate greater auto volumes. Traffic engineering techniques such as double right-turn lanes and free right-turn lanes are discouraged along primary pedestrian routes and near bus stops.
- Bus stops at mid-block can be located based on an evaluation of ridership and crossing opportunities and should not be determined by the ¼ mile spacing distance as it is currently. Through collaboration with the community the local jurisdiction may be able to determine alternative options for bus stop placement or they may determine that the identified location is a critical need location.

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Pedestrian Crossing (1 of 2)

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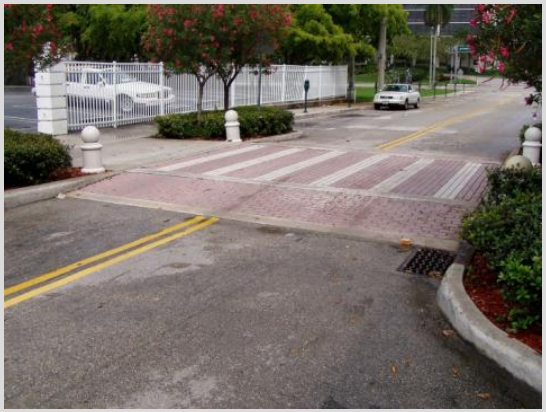

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Pedestrian Crossing (2 of 2)

Rapid rectangular flashing beacons.

Source: pedbikeimages.org

Scottsdale HAWK signal.

In-road flashing beacons.

Source: crosswalks.com

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Pedestrian Crossing	Mid-block crosswalk w/ pedestrian refuge	Each	$10,000					
	Mid-block crosswalk w/ flashers	Each	$50,000					
	Mid-block pedestrian signal	Each	$100,000					
	Sidewalk, concrete	Sq. Ft.	$4.00					
	Concrete pavers	Sq. Ft.	$7.00					
	Curb extension	Each	$5,000					

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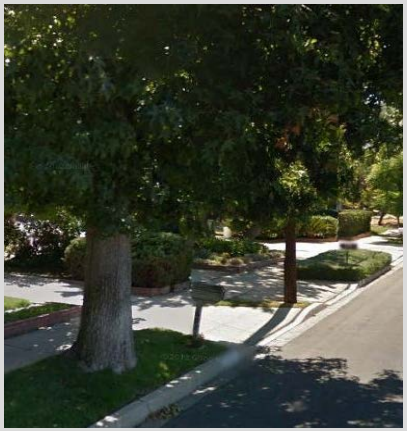
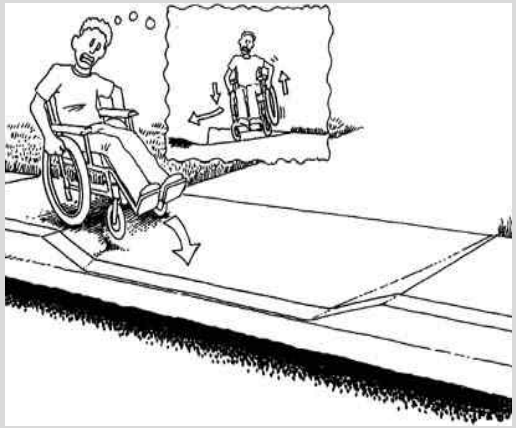
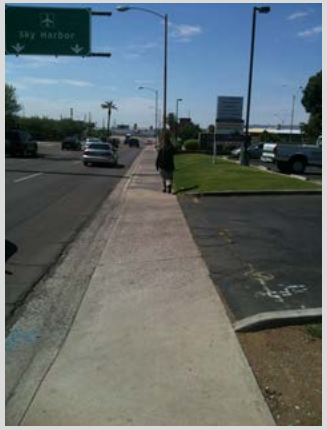
Sidewalk (1 of 2)

Urban area with sidewalk buffer zone.



Suburban area with landscape strip buffer zone.





When cross-slopes change rapidly over a short distance, wheelchair use becomes extremely unstable.

- **Planning/Policy Guidance**
- Consider 10-foot wide paved pedestrian surfaces when bus stops are present between the intersection/pedestrian crossing and the first driveway or bus stop, whichever is furthest from the intersection.
- Sidewalks can always be included in road construction projects. Stand-alone projects cost more than the same work performed as part of a larger project. Sidewalks can be piggybacked to projects such as surface preservation, water or sewer lines, or placing utilities underground. Besides the monetary savings, the political fallout is reduced, since the public doesn't perceive an agency as being inefficient. It is typically very noticeable if an agency works on a road, then comes back to do more work later. The reduced impacts on traffic are an additional bonus to integration.
- A cost-savings can be achieved by combining several small sidewalk projects into one big one. This can occur even if the sidewalks are under different jurisdictions, or even if different localities, if they are close to each other. The basic principle is that bid prices drop as quantities increase.

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Sidewalk (2 of 2)

Feature	Description	Unit	Unit Cost	Application for Prototypes				
				Urban Core	Urban Retail	Urban Res.	Sub. Retail	Sub. Res.
Enhanced Sidewalk	Sidewalk, concrete	Sq. Ft.	$4.00					
	Concrete pavers	Sq. Ft.	$7.00					
	Shade tree (irrigated)	Each	$750					
	Landscape buffer w/ shade tree	Sq. Ft.	$3.00					
	Tree well cover	Each	$250					
	Trash receptacle	Each	$500					
	Bench w/ concrete pad, shade	Each	$3,000					
	Bench w/ concrete pad, shade, lighting, trash receptacle	Each	$6,000					

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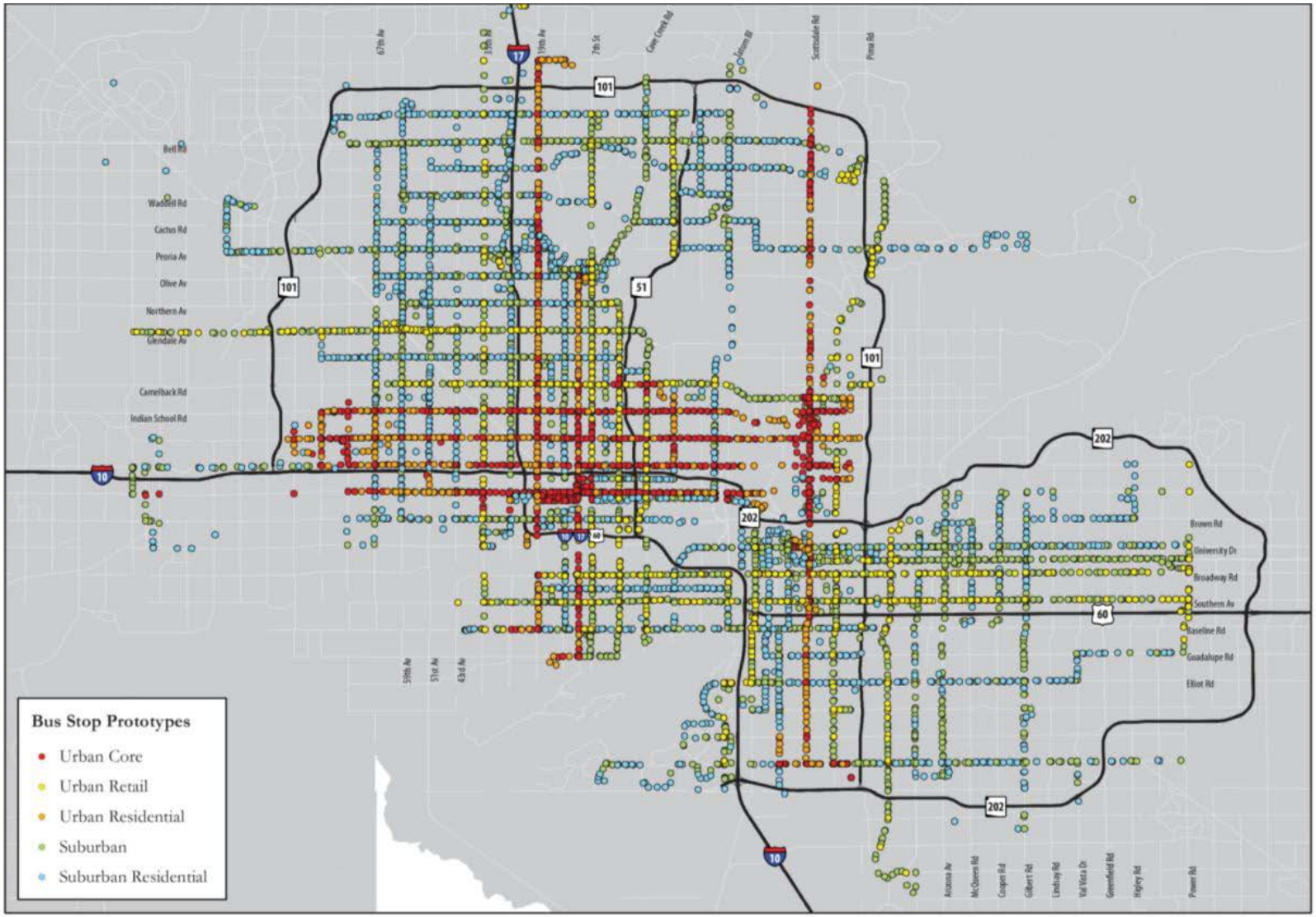
Prototype Costs

Prototype	Lower Cost	Moderate Cost	Higher Cost
Urban Core	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: no additional sidewalk **Lighting**: none added **Shade Tree**: none added **Cost: $19,800**	**Shelter**: enhanced **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: add sidewalk (500') **Lighting**: adjacent luminaire **Shade Tree**: shade trees **Cost: $60,600**	**Shelter**: custom **Information Signage**: real-time display **Bicycle Parking**: bicycle rack **Sidewalk**: add sidewalk (500'); **Lighting**: adjacent luminaire, CCTV camera **Shade Tree**: shade trees **Cost: $89,400**
Urban Retail	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: no additional sidewalk **Lighting**: none added **Shade Tree**: none added **Cost: $19,800**	**Shelter**: enhanced **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: add sidewalk (500') **Lighting**: adjacent luminaire **Shade Tree**: shade trees **Cost: $60,600**	**Shelter**: custom **Information Signage**: real-time display **Bicycle Parking**: bicycle rack **Sidewalk**: add sidewalk (500'); way finding signage **Lighting**: adjacent luminaire, CCTV camera **Shade Tree**: shade trees **Cost: $94,800**
Urban Residential	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: no additional sidewalk **Lighting**: none added **Shade Tree**: none added **Cost: $19,800**	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: added sidewalk (500'); mid-block cross walk **Lighting**: adjacent luminaire **Shade Tree**: shade trees **Cost: $61,800**	**Shelter**: enhanced **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: added sidewalk (500'); **Lighting**: pedestrian walkway lighting (500') **Shade Tree**: buffer (5000 sq ft) **Cost: $81,000**
Suburban Retail	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: no additional sidewalk **Lighting**: none added **Shade Tree**: none added **Cost: $19,800**	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: added sidewalk (500'); **Lighting**: adjacent luminaire **Shade Tree**: shade trees **Cost: $49,800**	**Shelter**: enhanced **Information Signage**: static display **Bicycle Parking**: bicycle lockers **Sidewalk**: added sidewalk (500'); wayfinding signage, mid-block cross walk **Lighting**: adjacent luminaire **Shade Tree**: buffer (5000 sq ft) **Cost: $90,000**
Suburban Residential	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: no additional sidewalk **Lighting**: none added **Shade Tree**: none added **Cost: $19,800**	**Shelter**: standard **Information Signage**: static display **Bicycle Parking**: bicycle rack **Sidewalk**: added sidewalk (500'); **Lighting**: adjacent luminaire **Shade Tree**: shade trees **Cost: $49,800**	**Shelter**: enhanced **Information Signage**: static display **Bicycle Parking**: bicycle lockers **Sidewalk**: added sidewalk (500'); mid-block crosswalk **Lighting**: pedestrian walkway lighting (500') **Shade Tree**: buffer (5000 sq ft) **Cost: $96,000**

Overview of Bus Stop Categories



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Overview of Bus Stop Categories

	Bus Stop Prototype	*Urban Core*	*Urban Retail*	*Urban Residential*	*Suburban*	*Suburban Residential*
Transit Supply Characteristics	**Bus Stop Category**	Urban Core Transit Corridor	Suburban Peak Hour Transit Corridor	Suburban Transit Corridor	Suburban Transit Connector	Low Suburban Transit Connector
	Level of Accessibility	High	Medium	Medium	Low	Low
	High Frequency Transit Service	Predominantly high, but also includes low frequency service	Peak Hour Service	Only One All-Day High Frequency	None	Limited Stop / Express Service/ No Local Service
	Street Network Type	Traditional Street Network	Traditional Street Network	Traditional Street Network	Conventional Suburban Street Network	Conventional Suburban Street Network
	Percent of Total Bus Stops	15.4%	14.8%	7.8%	22.3%	39.5%
Transit Demand Characteristics	**Mean Daily Transit Boardings**	69 boardings	50 boardings	27 boardings	24 boardings	12 boardings
	Neighborhood Type	Core Metropolitan	Central Metropolitan	Central Metropolitan	Suburban	Suburban
	Presence of Retail	Both	Yes	No	Yes	No
	Employment Density	High	Medium	Medium	Low	Low
	Population Density	Mixed	Medium	Medium	Low	Low

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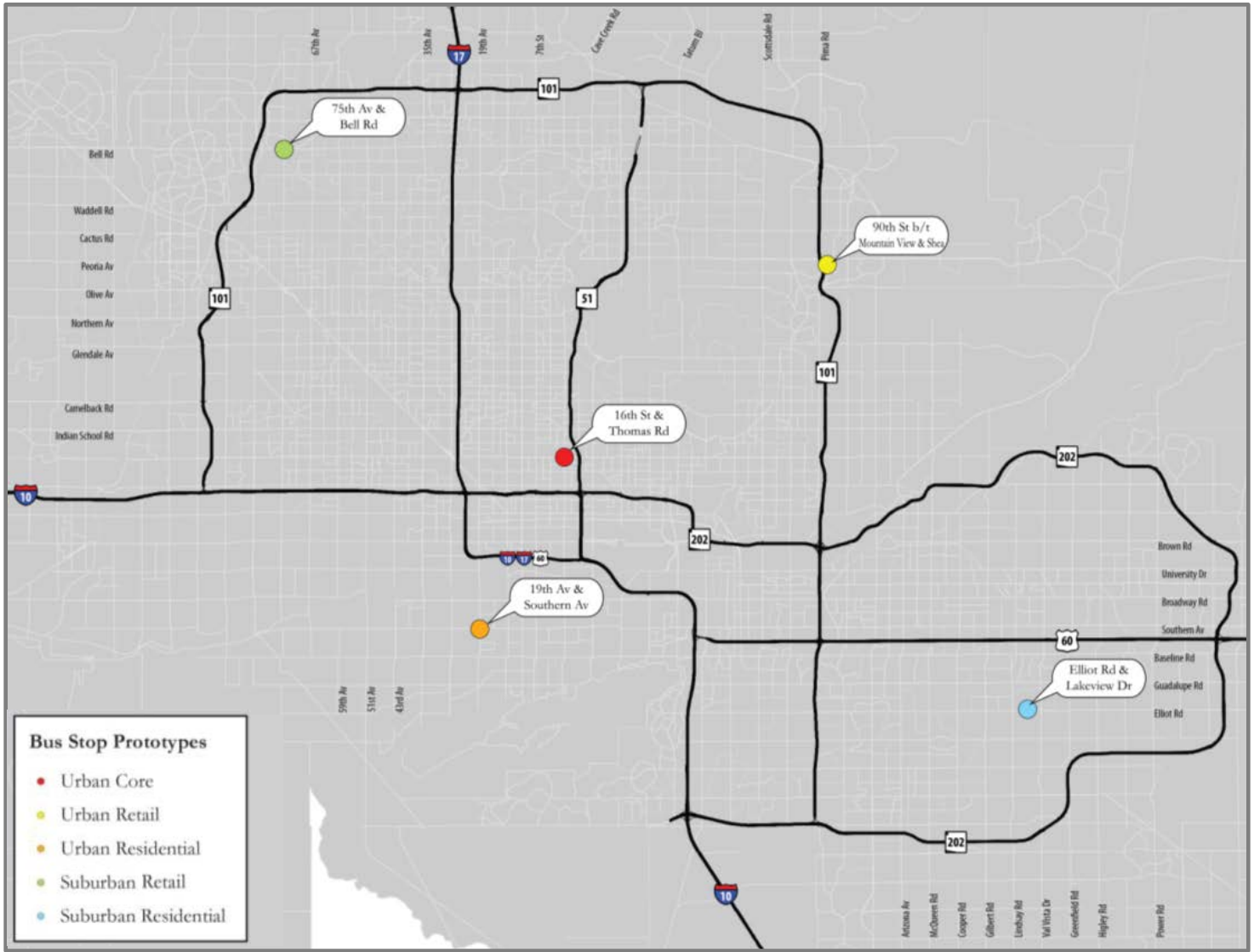
Overview of Case Study Locations



Surveys Collected

(April 2012)

Case Study Location	Number of "Arriving To" Surveys	Number of "Departing From" Surveys	Total Surveys
16th Street & Thomas Road	101	8	109
19th Avenue & Southern Avenue	45	10	55
90th Street, between Mountain View Road and Shea Boulevard	9	6	15
75th Avenue & Bell Road	26	8	34
Elliot Road & Lakeview Drive *(alternative locations at 46th & Broadway and 67th & Baywood)*	7	1	8
TOTAL SURVEYS	188	33	221

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Proposed Bus Stop Prototypes

Characteristics and Constraints

Improvement Considerations

Urban Core

Urban Retail

Urban Residential

Suburban Retail

Suburban Residential

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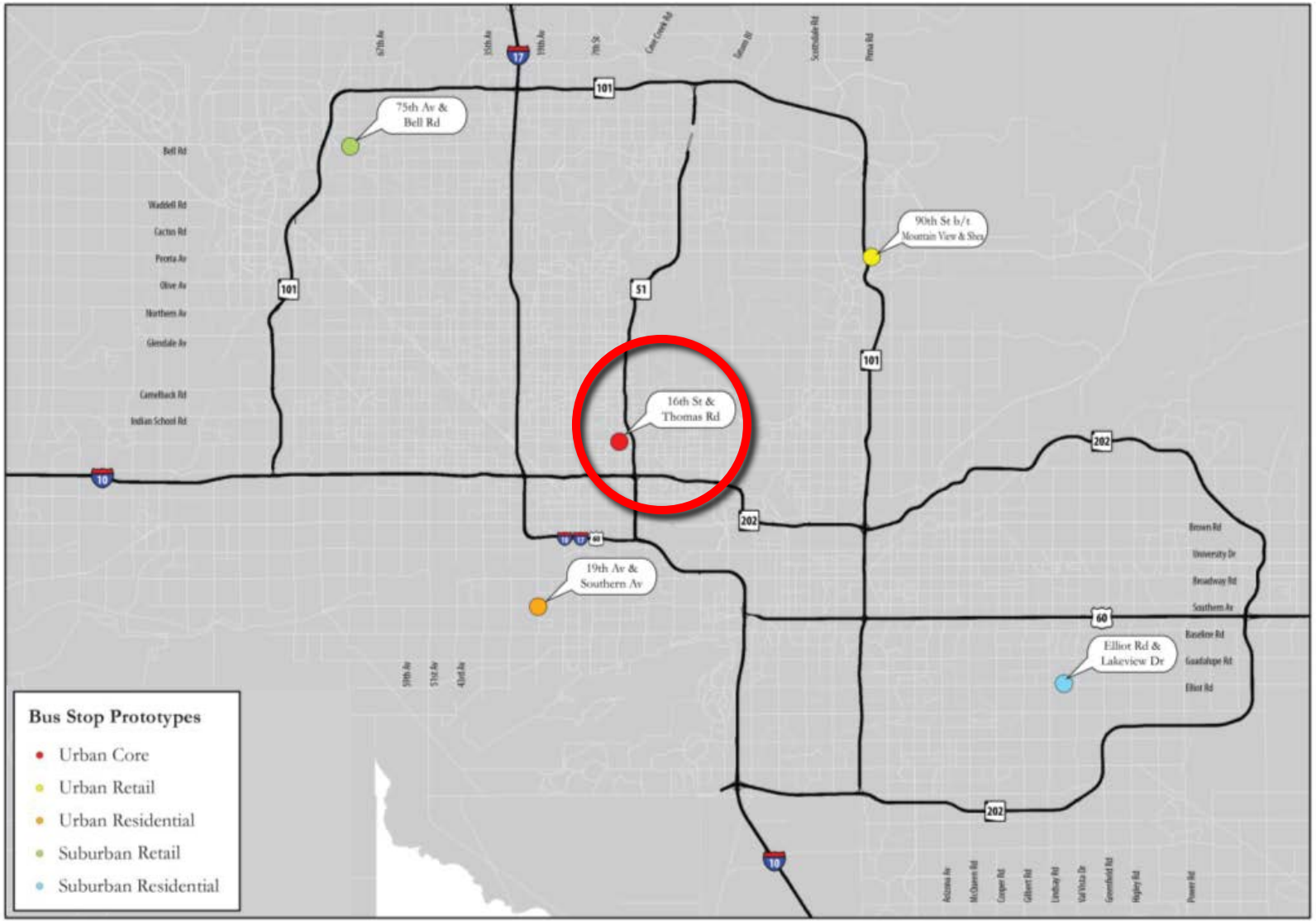
Urban Core Stop



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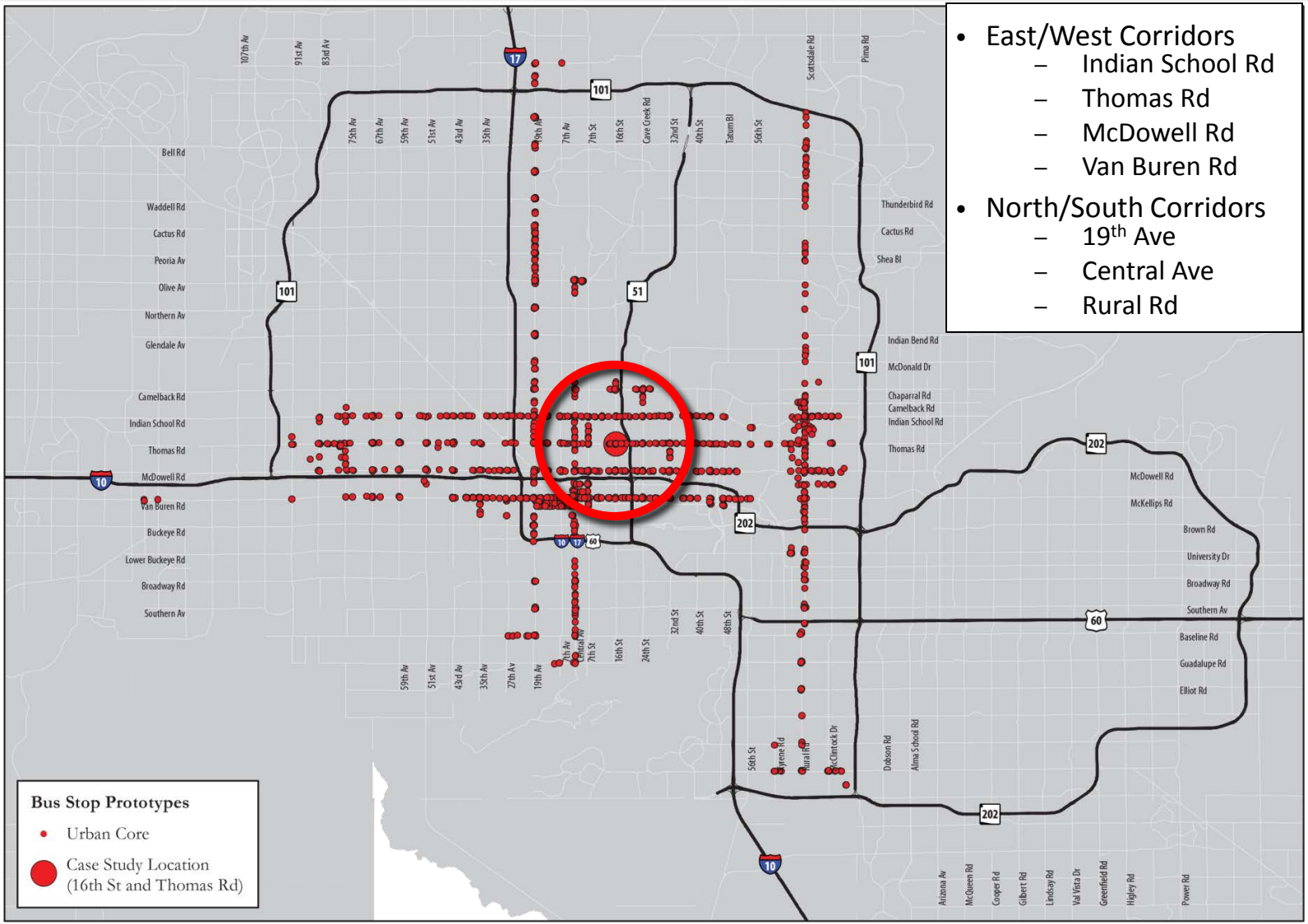
Urban Core Stop



- East/West Corridors
  - Indian School Rd
  - Thomas Rd
  - McDowell Rd
  - Van Buren Rd
- North/South Corridors
  - 19th Ave
  - Central Ave
  - Rural Rd

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Urban Core Stop

Characteristics & Constraints

Category	Characteristic	Constraint	Improvement Considerations
Roadway Cross Section	• 6 travel lanes including center left-turn lane. • Roadway width = 66'. • Bus bay/pull-out/acceleration lane.	• Constrained by adjacent development with small setbacks. • Wide cross-section. • No pedestrian refuge/median.	• Construct median for pedestrian refuge.
Lighting	• Street "cobra" lights only. • Indirect lighting from some adjacent land uses.	• Cost.	• Meet or update current lighting standards to reduce occurrence of dark spots and improve pedestrian safety. • Examine opportunities for pedestrian level lighting.
Information	• General passenger and route number information only. • No bus schedule or route destination information.	• Transit system information signage must compete with advertising space.	• Display schedule, route information, and full system map inside the stop shelter. • Install pedestrian/bicycle friendly route wayfinding signage for stop locations.
Seating	• Provided at shelter. • Not enough seating to accommodate high ridership volumes.	• Limited right-of-way (ROW) to accommodate additional seating.	• Develop process to request and evaluate additional stop seating.
Shelter	• Not enough shelter to accommodate high ridership volumes.	• Limited ROW to accommodate additional shelters.	• Install shelter adjacent to existing shelter as appropriate.
Shade	• Provided via shelters and few adjacent trees. • Little to no shade in catchment areas.	• Limited ROW to accommodate shade trees.	• Provide shade trees with grates to establish a larger sidewalk space for strollers and pedestrians. • Locate stops to take advantage of building structure or existing tree shade.

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Urban Core Stop

Characteristics & Constraints

Category	Characteristic	Constraint	Improvement Considerations
Adjacent Land Use	• Direct access. • Retail, service, and medium- to high-density residential nearby. • Parking conflicts with street and transit access. • Excessive litter.	• Limited access to adjacent land uses. • Limited cross access between adjacent land uses.	• Provide bicycle and pedestrian access to adjacent land uses and between adjacent land uses.
Bicycle Access	• No direct bicycle access to bus stop.	• Existing travel lanes are narrow. • High traffic volumes.	• Install wayfinding signage for stop locations.
Bicycle Parking	• None provided.	• Concerns regarding safety and monitoring bicycle parking and issues with bicycle theft.	• Install bicycle parking facilities in visible areas.
Crossings	• Signalized • Crossing distance = 66’ • Crosswalk striping is worn.	• Congested crossings. • Competition with turning vehicles. • No pedestrian refuge/median.	• Restripe pedestrian crossings. • Construct median for pedestrian refuge. • Examine opportunities for “all-pedestrian” traffic signal phase.
Sidewalk	• 4-5’ wide. • Pedestrian tripping hazards.	• Heavily utilized ROW by both pedestrians and bicyclists. • Limited ROW to accommodate a wider sidewalk.	• Maintain sidewalks. • Examine sidewalk widening opportunities between stop and crosswalks.

16th Street & Thomas Road

MARICOPA ASSOCIATION of GOVERNMENTS

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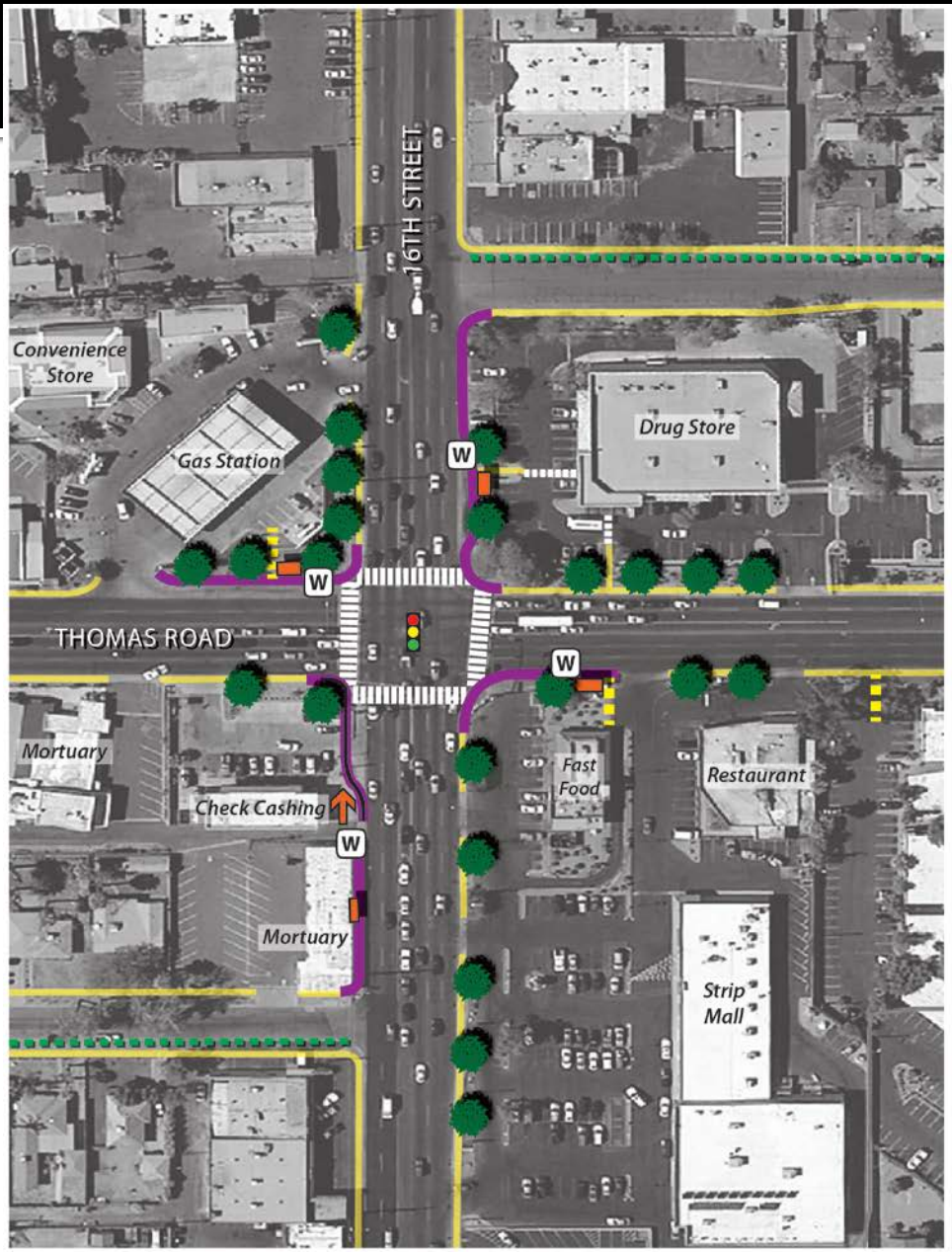
DESIGNING TRANSIT ACCESSIBLE COMMUNITIES STUDY



16TH/THOMAS

POTENTIAL TRANSIT ACCESSIBILITY IMPROVEMENTS

EXISTING

Existing Sidewalks
The existing grid street network and sidewalk facilities serves as a great pedestrian network.

Bicycle Access
Adjacent collector and local roadways provide an alternative route for bicyclists. These routes often have low travel speeds and low traffic volumes providing for a safe bicycling environment. A dedicated bicycling lane is not possible unless the number of lanes is reduced.

Bus Shelter
Bus shelters are provided with seating and shade at transit stops.

IMPROVEMENT CONSIDERATIONS

Enhanced Sidewalks
Provide 10' wide sidewalks to enhance pedestrian mobility at intersections and near bus stops.

Connection to Adjacent Land Use
Create pedestrian passageways that connect adjacent development to the primary street.

Acceleration Lane
Provide an acceleration lane to provide a bus bay for loading/unloading transit riders.

Crosswalks
Stripe and maintain crosswalks according to MUTCD standards and provide additional pedestrian signal crossing time at locations without medians.

Landscape Shading
Provide shade trees with ground grates near bus stops and along ROW-constrained pedestrian routes to provide shade while not reducing walking space.

Relocate Transit Stop
Relocate southbound 16th Street stop closer to the Thomas Road intersection in order to improve lighting, sidewalk width, and adjacent land use connectivity. This location can also provide an acceleration lane/bus bay.

Bicycle/Pedestrian Wayfinding
Install bicycle/pedestrian wayfinding signage near bus stops and along other bicycle/pedestrian friendly routes not only direct the bicyclist/pedestrian towards nearby destinations but indicate where nearby bicycle/pedestrian friendly routes are located.

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Urban Core Stop

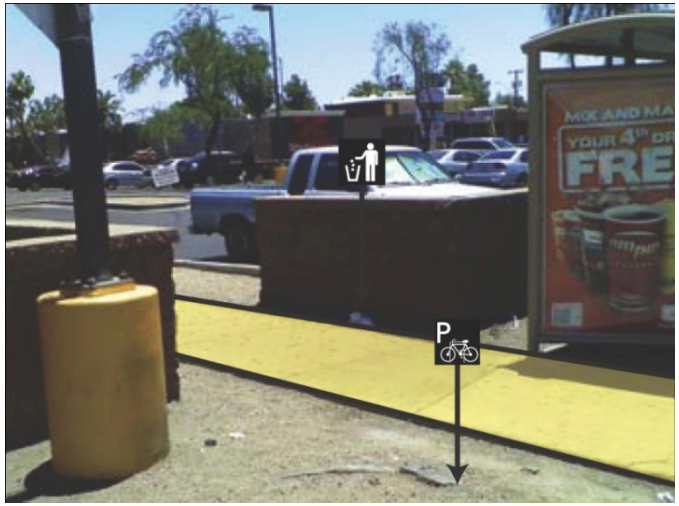
Improvement Considerations

	Connection to Adjacent Use	Create pedestrian passageways where the street network provides few pedestrian and bicycle connection opportunities.
	Enhanced Sidewalk	10’ wide sidewalks that are detached from driving lanes when adjacent to major street intersections or when adjacent to a bus stop provide greater mobility for pedestrians.
	Crosswalk/Reduced Corner Radii	Stripe crosswalks according to ADA standards and have a signalized crossing system, advanced yield lines, and wider cross walks that improve safety for pedestrians crossing the street. Reduce turning radius at intersection.
	Relocate Transit Stop	Relocate closer to Thomas Road to improve transit connections/ transfers and existing setback space.
	Seating	Seating under a nearby shade tree improves pedestrian comfort. Lower walls provide additional seating in high transit usage areas.
	Landscape Shading	Provide shade trees with grates to establish a larger sidewalk space for strollers and pedestrians.
	Bicycle Access	The addition of a bicycle lane would require further narrowing of travel lanes which is not feasible at this location. Wayfinding directs cyclists to low traffic volume roadways/ collector streets.
P	**Bicycle Parking**	Provide bicycle racks or other parking facilities where bicycle ridership is high.
W	**Bicycle/Pedestrian Wayfinding**	Wayfinding directs pedestrians or bicyclists to nearby destinations and pedestrian/bicycle friendly routes including nearby local/collector streets.
i	**Information Signage**	Install improved signage at bus stops to notify riders of the bus schedule and the bus routes.
	Maintenance	Additional improvements and repairs.

Urban Core Stop

Improvement Considerations

Northbound 16th Street Stop



Southbound 16th Street Stop

Northbound 16th Street Stop

16th Street & Thomas Road

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Next Steps

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Next Steps

- Complete Final Report: *Designing Transit Accessible Communities*
- Stakeholder Workshop
  - Tentatively scheduled for April 11 – afternoon of Transit Committee

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Email: achen@azmag.gov

http://www.azmag.gov/Projects/Project.asp?CMSID=4215