Safe Routes Old Greenwich
Greenwich, Connecticut

FRANCISCO GOMES
ENVIRONMENTAL PLANNING & DESIGN

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A pedestrian safety plan by the Connecticut Bicycle Coalition

January 2004

The Connecticut Bicycle Coalition

Connecticut Bicycle Coalition
Advocates for bicycling, walking & sustainable development.

The Coalition is a 501c3 tax exempt organization founded in 1977.

Mission
The Connecticut Bicycle Coalition promotes bicycling and walking through education and advocacy.

Vision
We envision a state where bicycling and walking are an integral part of our transit system, with streets and communities designed to support and promote sustainable transportation, commerce, civic involvement and recreation.

Values
Agencies and officials who make thoughtful, well informed decisions that promote bicycling and walking in Connecticut; strong, diverse communities that support sustainable transportation; livable communities that are fully accessible to bicyclists and pedestrians.

Goals
Defending bicyclists 'and pedestrians rights and interests; increasing cooperation among cyclists, motorists and pedestrians to responsibly share the road; assisting local communities and government agencies in planning and designing sustainable, transit oriented communities; acting as a clearinghouse for Connecticut 's bicycling and walking communities, facilitating the exchange of information and ideas .

Project Sponsorship

Safe Routes Old Greenwich was funded through the generous contributions of local businesses and individuals. Special thanks to Dina Eberhard and Diana Klingler for organizing the Safe Routes Old Greenwich initiative.

Safe Routes tackles pedestrian worries in Old Greenwich

By Rachel Stockman
Special Correspondent

A new study conducted by the Safe Routes for Old Greenwich group found that residents are worried about high car speeds, a lack of crosswalks and sidewalks, and overgrown bushes that impede drivers' visibility.

Two hundred Old Greenwich residents filled out the survey, which was distributed at Porricelli's Food Mart this spring.

With the movement to encourage Old Greenwich School students to walk to school, parents are increasingly conscious of traffic safety, said Diana Klingner, co-organizer of Safe Routes, which was founded in April.

At a meeting Monday night, residents reiterated their safety concerns to public officials and members of Safe Routes for Old Greenwich.

Alana Moskowitz/Staff photo

Jerry Porricelli hands over a check to Safe Routes for Old Greenwich group members Dina Eberhard and Diana Klingner Tuesday at Porricelli's Food Mart.

Anne Lowe told other Safe Routes participants that she walks her dog up to four miles a day along Shore Road, and she is always nervous because of the lack of sidewalks and the dangerous curves, with bushes that impede sight lines.

Along with Shore Road, problem areas include Sound Beach and Tomac avenues, according to the survey.

Safe Routes organizers will raise $8,000 to pay the Connecticut Bicycle Coalition for a plan to improve safety in the neighborhood, Klingner said.

Once the plan is devised, it will go to the state government for consideration.

"We hope to get the Department of Motor Vehicles to use some of their budget to pay for new signs and paint for crosswalks," Klingner said. "We also hope to get state funds to pay for long-term measures like new sidewalks."

Safe Routes for Old Greenwich is part of a national movement that encourages states to allocate money for pedestrian safety, she said.

The Connecticut Bicycle Coalition 's

Safe Routes to School Program

Not long ago, the vast majority of children routinely roamed their neighborhoods on foot or bicycle almost as a rite of passage. Today, a new generation of moms and dads chauffeur their kids to nearly all their activities, fearing for their children 's safety due to perceived dangers from crime and traffic.

While more than two-thirds of all children walked or biked to school as little as thirty years ago, that number has now fallen to less than ten percent. (National Personal Transportation Survey, 1995) With fewer kids on foot, there are more cars on the road. Parents driving their children to school make up 20-25 percent of the morning commute. The more the traffic increases, the more parents decide it is unsafe for their children to walk, adding even more cars to the morning chaos.

A movement is emerging that focuses on getting kids back on their feet and their bikes again. CBC is bringing parent and neighborhood groups, school and local officials, and traffic engineers together to make streets safer for pedestrians and bicyclists along heavily traveled routes to school. At the same time, we are encouraging parents and their kids to take advantage of the many benefits of getting around on foot or by bike. Communities across Connecticut are discovering the many benefits of providing "Safe Routes to School."

Numerous Pedestrians Are Killed Each Year by Automobiles

Approximately 59 pedestrians die every year in Connecticut after being hit by cars. This is a significant public health and safety problem. And for every pedestrian who is killed by an automobile, more than 20 are injured, meaning that approximately 1,200 pedestrians are injured by automobiles each year. *(Source: Mean Streets 2003 www.ewg.org/pub/home/reports/meanstreets/states/CT.html)*

Children are losing their independence

- Children are less familiar with their neighborhoods, isolated from people and the environment.
- Children are not acquiring traffic skills critical to their own safety..
- Youngsters are unable to participate in supervised after school programs.

Children are less active.

- One out of three children report inadequate levels of physical activity ((2 hours or less per week).
- One out of five watch six hours or more of television per week.
- One in six children is now overweight, a 300% percent increase from 1970.

Our environment is degraded

- Auto emissions are the largest source of air pollution in Connecticut (55%).
- More than 75%%of all Connecticut residents live in areas with unhealthy levels of air pollution.
- Children 's respiratory systems are especially at risk.

Source:Centers for Disease Control and Prevention,National Center for Health Statistics;CT DOT Traffic Accident Facts,2000;Surface Transportation Policy Project,Mean Streets 2000;National Center for Health Statistics,National Health and Nutrition Examination Survey 1999;CDC,Pedestrian Injury Prevention fact sheet,webbery,US Environmental Protection Agency;Connecticut Governor 's Prevention Iniative for Youth,2000 Student Survey.

A Matter of Life and Death: 20 mph vs. 40 mph

A little extra speed can mean a world of difference for pedestrians and bicyclists. Pedestrians hit by a car traveling 40 mph have a 15% chance of survival. At 30 mph, their odds increase to 55%. By stark contrast, a pedestrian has a 95% chance of survival if hit by a car moving at 20 mph. (ITE Traffic Engineering Handbook)

An engineering technique with tremendous potential for cost-effective speed reduction is known as "traffic calming." This practice focuses on physical design changes to residential streets and intersections that can slow traffic to acceptable speeds and be er balance the needs of vehicle flow and traffic safety. The City of Seattle reported a 77-91% reduction in traffic collisions after it implemented a citywide traffic-calming program including 700 new residential traffic circles. (Victoria Transport Policy Institute, Traffic Calming)

Streets and neighborhoods also need to provide safety, access and mobility for pedestrians and bicyclists. With wider sidewalks, more visible pedestrian crossings, clearly marked bike lanes or separated pathways and trails, and slower traffic speeds, children have more independence to roam, parents are freed from chauffeur duty and adults venture out more often for their own recreation. Neighborhoods with high levels of pedestrian activity have more "eyes on the street " to protect against crime. (Livable Streets, Donald Appleyard)

Connecticut 's Home Grown Success Stories

Here in Connecticut, aggressive work by CBC staff and elected officials concerned about safety around Bishop 's Elementary School in Norwich resulted in securing a commitment from the Connecticut Department of Transportation to fund and construct some elements of their Safe Routes plan. Construction was completed for the beginning of the 2002-2003 school year. "Walk Your Child to School Day " is an international program promoted in the U.S. by Partnership for a Walkable America.

Dozens of Connecticut communities participate including the City of New Britain, which introduced the event as part of their participation in the Safe Routes to School program. Their Safe Routes plan has since been completed and is scheduled to be constructed over the next three years.

How Can I Get Our School Started?

Nominate your school for CBC 's Safe Routes to School program. Ultimately, if your school is selected, we will bring together the school district, city officials, parents and law enforcement as part of the collaborative process needed for a successful program. Visit our website **www.ctbike.org** for more details.

Walk to School Survey

In spring of 2003 students of Old Greenwich School were sent home with surveys so that they may document their pedestrian experience walking to school. The next day, with help from their parents, over one hundred children walked to schools and filled out their walking survey. Along their walk, students were asked to document hazardous conditions such as: speeding cars, no crosswalks, no sidewalks etc. The results of these surveys have been compiled within this report and have been used to guide the direction of this Safe Routes plan.

Survey Results

Survey information has been compiled and summarized in this report in a number of different ways. The first method includes compiling all of the walking routes on one map, hence a Walk to School map that reveals the walking routes children use to get to school. This map is also useful for defining the project boundaries and determining a focus area.

Student 's written comments were also compiled into categories such as: speeding, dangerous crossing,etc. These comments are summarized below as follows:

39% Of students identified speeding as a hazard

38% No crosswalk where needed

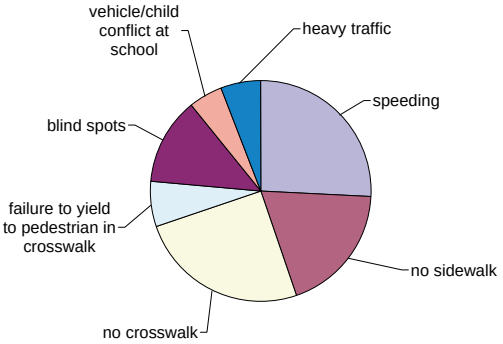
26% Noted the lack of a sidewalk in their walking route

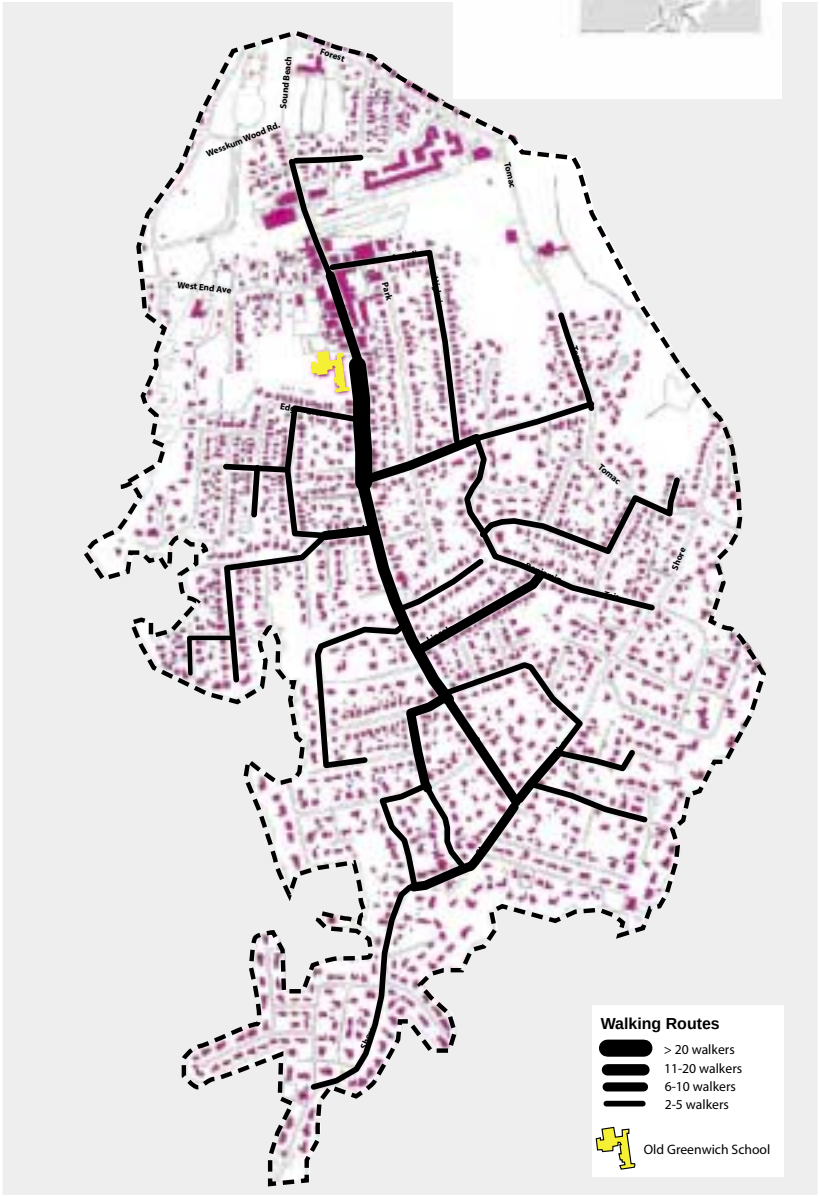
20% Blind spots (where cars can 't see pedestrians and vice-versa)

14% Heavy traffic

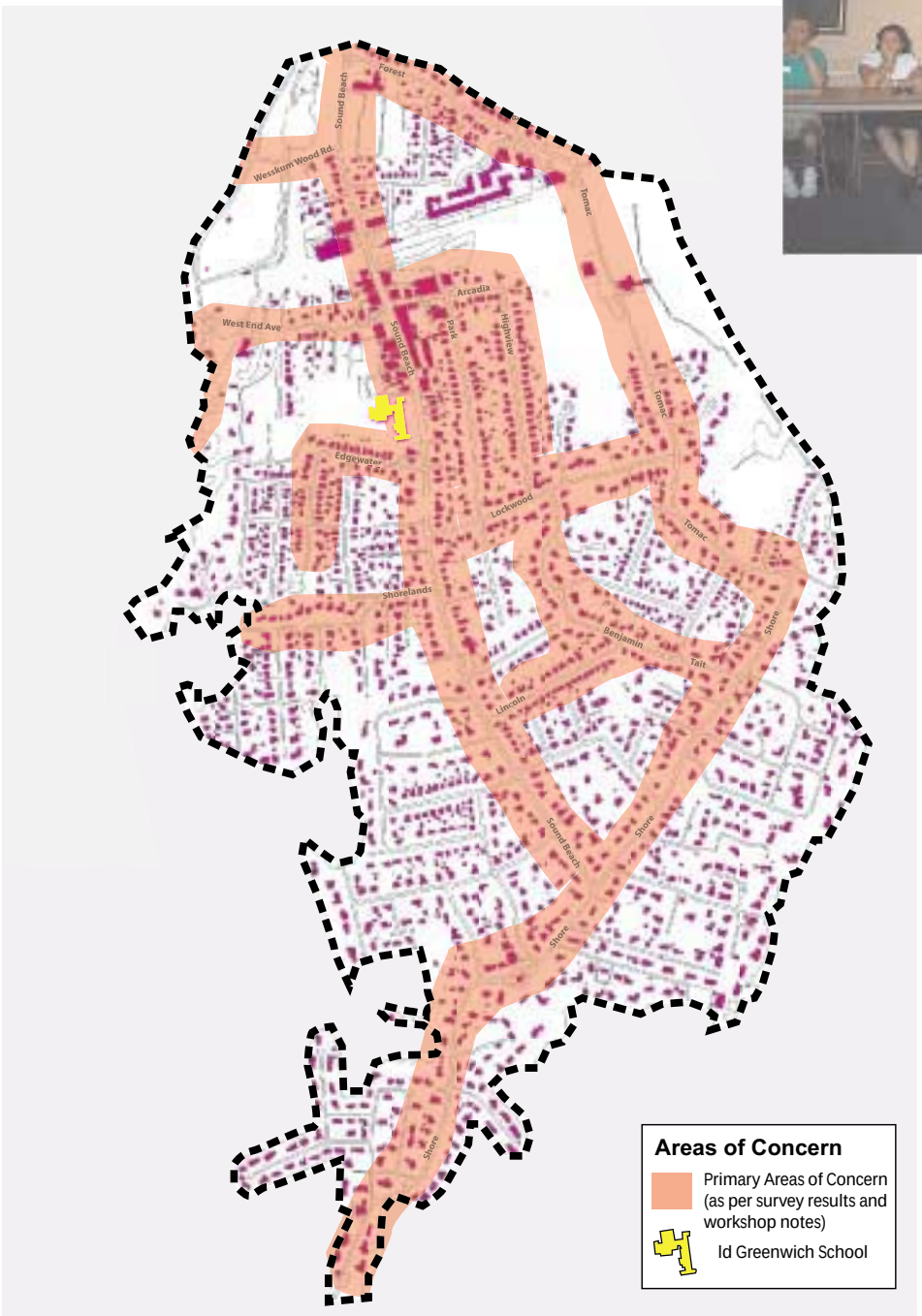
9% Failure (of drivers) to yield to pedestrians in crosswalk

8% Vehicle/child conflicts on school grounds (such as cars parked on sidewalks and kids crossing)





Workshop and Community Surveys



On July 14th and November 30th of 2003, officials of the Town of Greenwich and members of the Old Greenwich community convened for Safe Routes workshops. The first workshop included a brief presentation of the Safe Routes planning process, followed by a mapping session of dangerous walking areas in Old Greenwich. The second workshop focused on issues already identified, and potential solutions.

Primary issues included:

- Speeding
- Lack of sidewalks
- Lack of crosswalks
- Dangerous intersections
- Overgrown shrubs
- Failure of drivers to yield to pedestrians
- No room to operate a bicycles
- Lack of curb ramps

Streets of greatest concern:

Sound Beach Ave	Highview
Shore Road	Edgewater
Tomac Ave	West End Ave.
Lockwood Ave.	Benjamin
Forest Ave	Tait
Park	Arcadia

Dangerous Intersections:

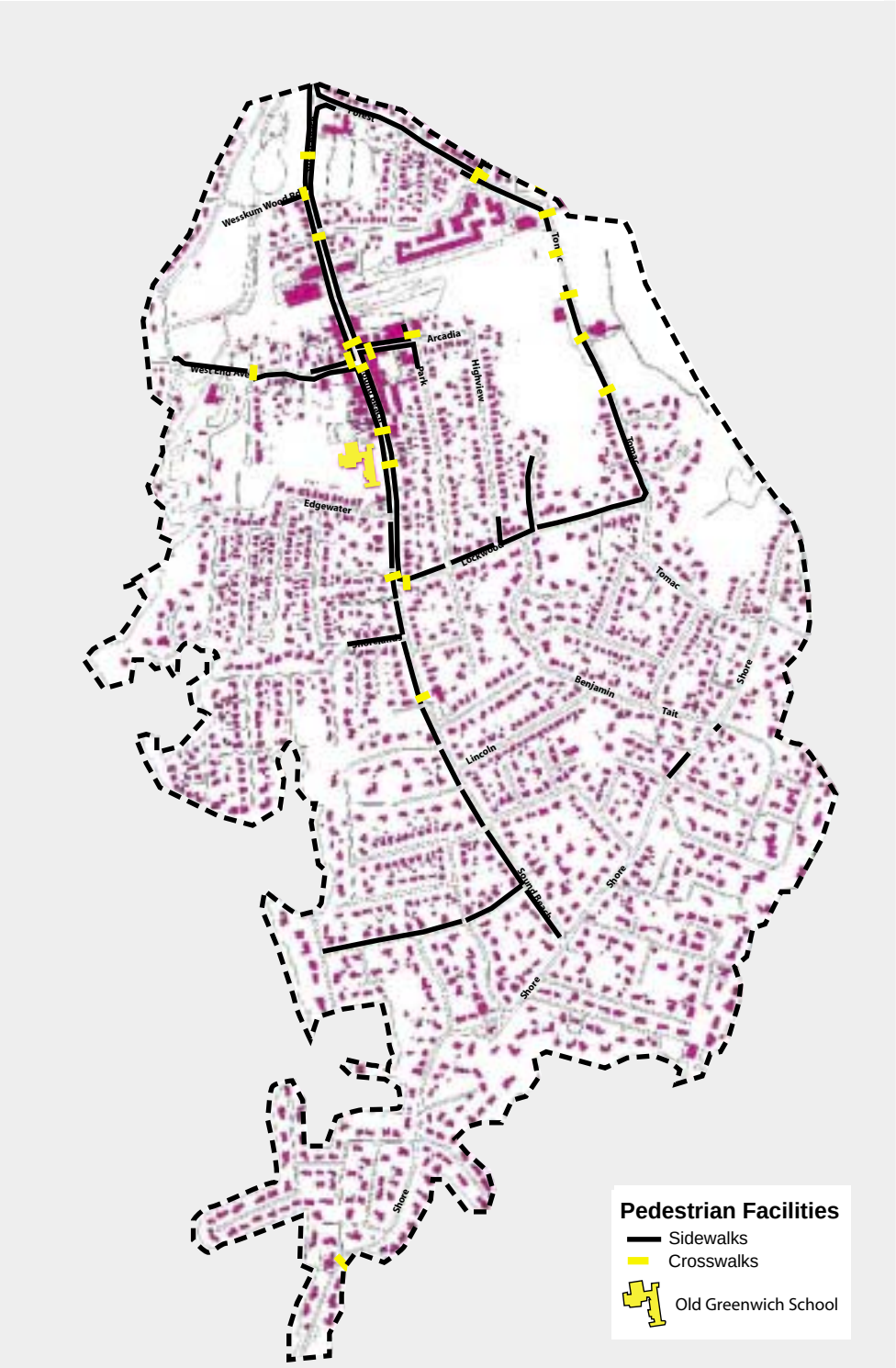
Sound Beach Ave & Shore Rd
Shore Rd. & Tomac Ave
Sound Beach/Arcadia/West End
Tomac & Lockwood

Arterial and Collector Streets

Arterial and collector streets generally carry the largest volume of traffic in a town or city. Compounding the traffic volume on these streets is the fact that these routes are designated and designed to move large volume of traffic, and are therefore guarded by relatively strict design standards. Often these design requirements preclude the installation of many traffic calming techniques. With that said, there are a number of traffic calming and pedestrian safety measures that can be used on arterial and collector streets.

Due to Old Greenwich's relatively isolated geographic position, there are no arterial roadways that travel through the study area. There are, however, several collector streets. These streets include:

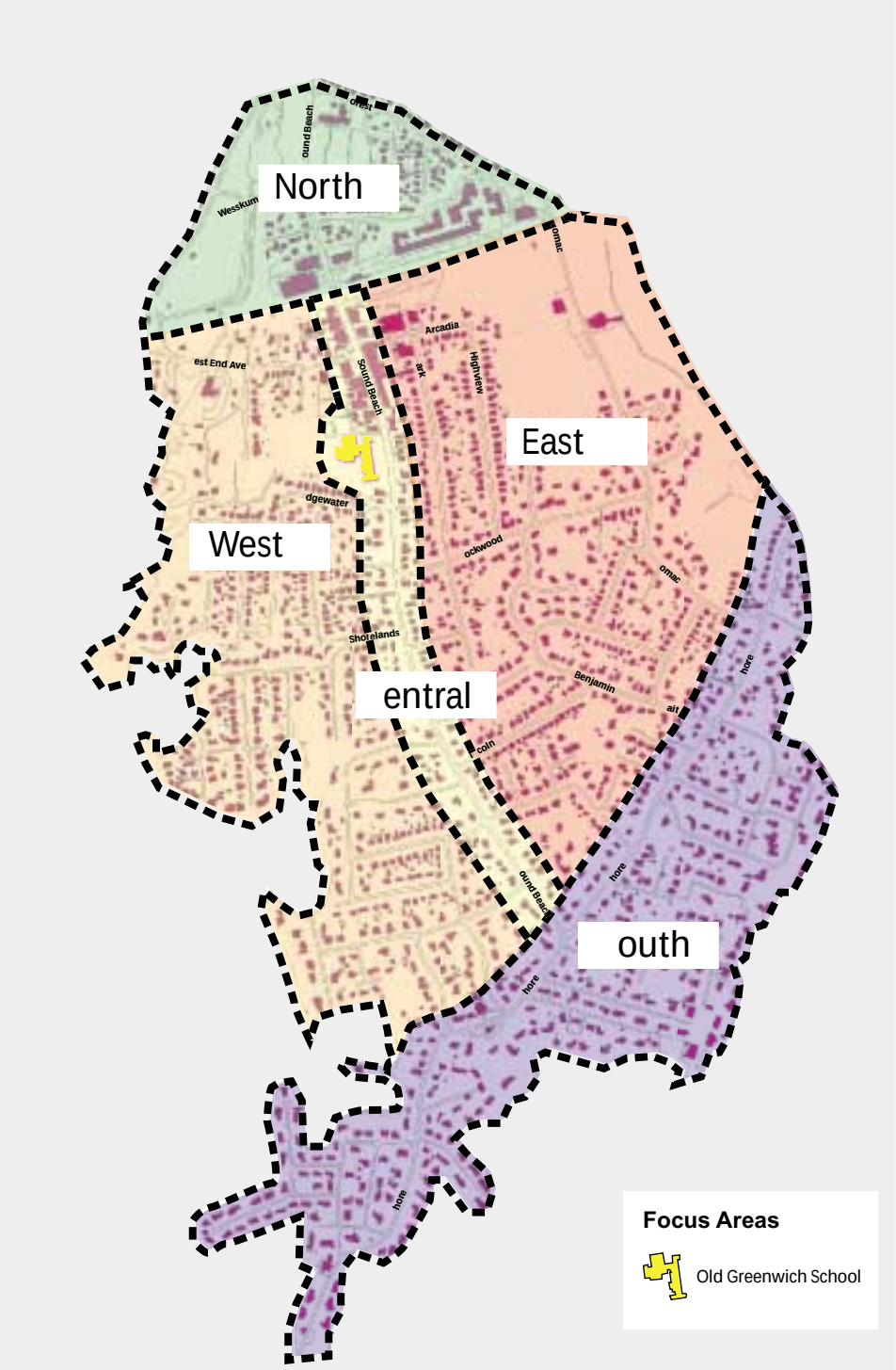
Forest Ave.
Lockwood Ave.
Shore Rd.
Sound Beach Ave.
Tod's Driftway
Tomac Ave.
Wesskum Wood Rd.



Pedestrian Facilities

Old Greenwich has an extremely limited network or sidewalks given the number of roadways and the volume of vehicle and pedestrian traffic in town. Sidewalks are, for the most part, limited to Sound Beach Ave, Arcadia, Tomac Ave, Lockwood Ave, Forest Ave, West End Ave, and Keofferam Road. Sidewalks are noticeably absent from many of the collector roadways such as Shore Road.

Focus Areas



The Old Greenwich study area was delineated in accordance with the Old Greenwich School attendance zone. Todd's Driftway was excluded from this plan as students from this area of the attendance zone are bused to school.

For the purpose of taking a closer look at issues that are specific to certain areas of Old Greenwich, this plan is divided into five focus areas: Central, North, East, South, and West.

Central: Sound Beach Avenue (south of train station) and immediate vicinity, including Old Greenwich School and Village.

North: areas north of train tracks

East: areas east of Sound Beach Avenue

South: Shore Rd and points southeast, stopping at Todd's Driftway.

West: areas west of Sound Beach avenue

Central Focus Area: Issues

The Central Focus Area extends the length of Sound Beach Ave. from the Train Station to Shore Road. This area is limited to Sound Beach and intersecting streets, Old Greenwich School being included in this area. Primary issues along the Sound Beach corridor include:

- Significant gaps in sidewalk network
- Lack of accessible curb ramps
- Long distances without marked crossings
- Long waits for pedestrian crossing signal
- Heavy traffic, speeding vehicles

1) Long wait for pedestrian crossing, drivers turn right on red from West End Ave while pedestrians are in crosswalk

8) Sound Beach & Train Station Drive: No crosswalk across Station parking lot entrance

7) Sound Beach: Drivers fail to yield to pedestrians at school crosswalk without presence of crossing guard

Soundbeach & Lockwood
9) Drivers don't yield to pedestrians in crosswalk. Conflict with turning vehicles.

Sound Beach & Edgewater
6) Hedges protrude into roadway, obstruct sight-line

2) Sidewalk discontinues on east side of Sound Beach, south of Lockwood

Sound Beach
5) No curb ramps at intersecting streets

Sound Beach
4) Long distance without crosswalks

3) No crosswalks, vehicles don't yield to pedestrians, yield sign allows drivers to roll through intersection

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

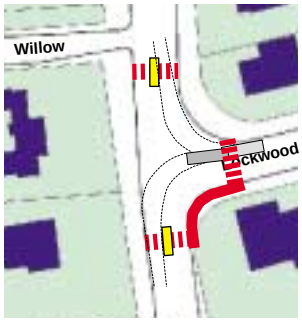
0' 500'

Central Focus Area: Recommendations

8a) Repaint crosswalk markings across Train Station parking lot entrance.

1a) Set pedestrian phase to follow West End or Arcadia green-phase upon actuation (in addition to pedestrian phase at the end of Sound Beach green-phase
b) Prohibit right hand turn on red from West End Ave to Sound Beach. Install no right turn on red sign.

7a) Install pedestrian actuated stop light and/or in pavement flashing beacons.



6a) Sound Beach at Edgewater: Trim hedges from right-of-way at southwest corner.

9a) Move crosswalk at Lockwood north, closer to Willow intersection. Install pedestrian refuge island. Install crosswalk and refuge island south of Lockwood. Construct sidewalk and curb ramps at southeast corner. Install crosswalk north/south across Lockwood.

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

0' 500'

Sound Beach
5a) Install accessible curb ramps at all intersection street corners

2a) Continue sidewalk on east side of Sound Beach Ave. south to Shore Road.

Sound Beach
4a) Install crosswalk between Clark and Shore Acre

3a) Convert intersection to three-way stop
b) Sound Beach and Shore Rd: Decrease curb return radius on northwest corner and extend sidewalk from Sound Beach around corner to Shore Rd.
c) Construct ramps and sidewalk segments at northeast corner and south side of Shore Rd. Install marked crosswalks between curb ramps and convert median island to pedestrian refuge

North Focus Area: Issues

The North Focus Area consists of areas north of the Old Greenwich Train Station and railroad tracks. This area represents the gateway to Old Greenwich and thus possesses several collector roadways and high traffic associated with such roads. Primary issues in this area include:

- Speeding
- Failure of drivers to yield to pedestrians in x-walk
- Lack of sidewalks on high traffic streets

5) Drivers don't yield to pedestrians in crosswalk.

1) Sound Beach at Forest: Faded crosswalk

2) Brownhouse & Forest: Overgrown vegetation at intersection

3) Drivers don't yield to pedestrians in crosswalk.

4) Narrow bridge though park, no sidewalks on bridge, no sidewalks on Wesskum Wood through park

6) Sidewalks through tunnel confined to widths as narrow as 3' by barriers (non-ADA compliant).

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

0' 500'

North Focus Area: Recommendations

1a) Install marked crosswalk on east side of Sound Beach across Forest.

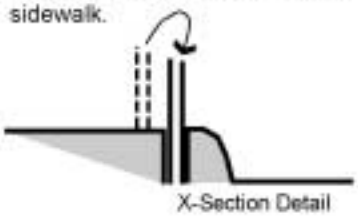
2a) Brownhouse & Forest: Trim vegetation encroaching upon right of way.

5a) Install in-street pedestrian crosswalk signage

3a) Install in-street pedestrian crosswalk sign (Improvement completed by Town of Greenwich as shown above)

4) Wesskum Wood:
a) Stripe 16' queing lane on bridge
b) Stripe edgeline 10' from centerline of roadway.
c) Construct sidewalk on north side of roadway

Tunnel
6a) Relocate barriers to outside of sidewalk and curb, protect base with bituminous curbing. Narrow bottom step from train platform so as not to project into sidewalk.



X-Section Detail

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

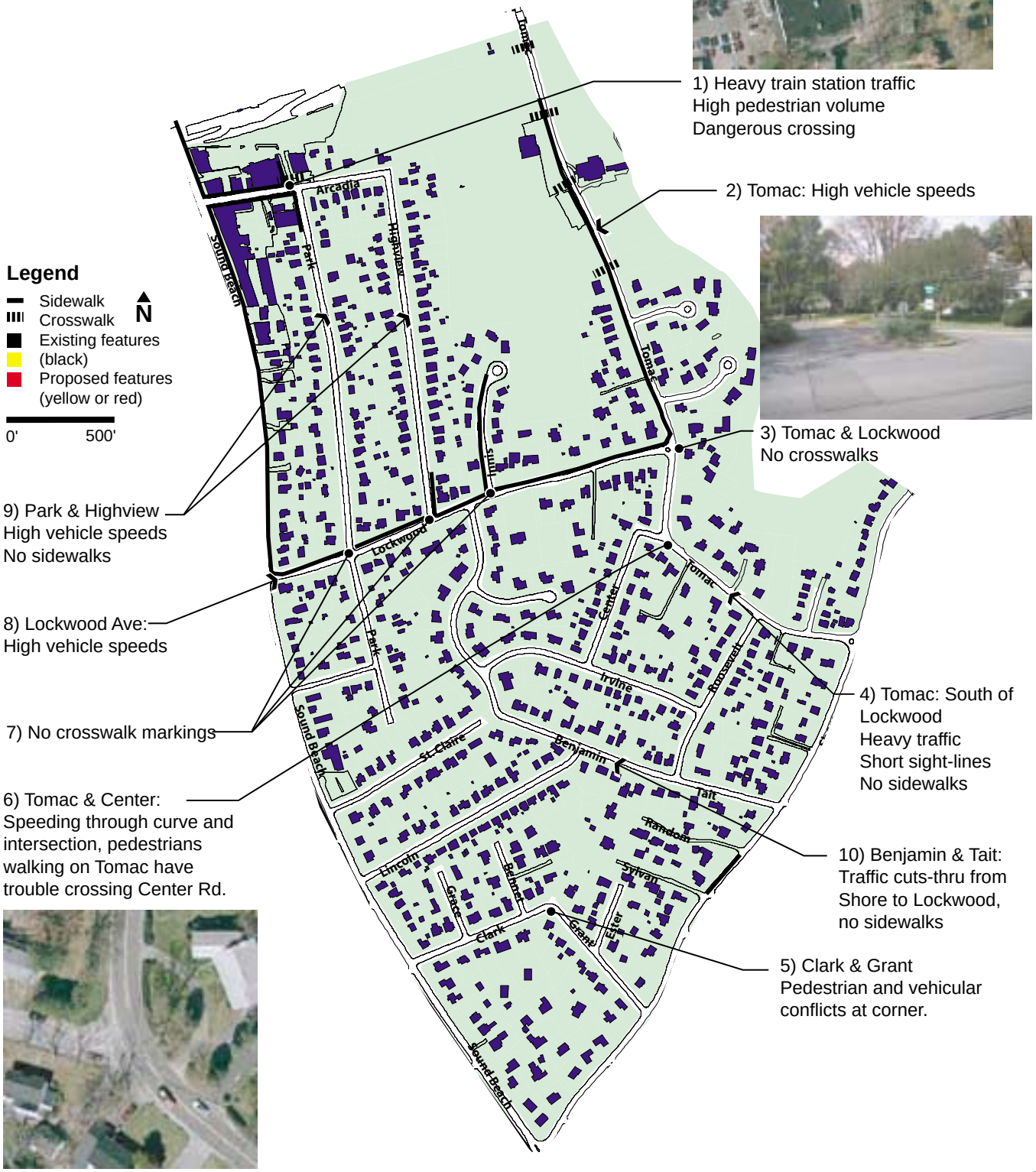
0' 500'

East Focus Area: Issues

The east focus area includes areas south of the Old Greenwich Train Station and tracks, east of Sound Beach Ave., and north of Shore Road. Primary issues in this area include:

- Cut-thru traffic
- Speeding
- Lack of marked crosswalks

1) Heavy train station traffic
High pedestrian volume
Dangerous crossing



2) Tomac: High vehicle speeds

3) Tomac & Lockwood
No crosswalks

9) Park & Highview
High vehicle speeds
No sidewalks

8) Lockwood Ave:
High vehicle speeds

7) No crosswalk markings

6) Tomac & Center:
Speeding through curve and intersection, pedestrians walking on Tomac have trouble crossing Center Rd.

4) Tomac: South of Lockwood
Heavy traffic
Short sight-lines
No sidewalks

10) Benjamin & Tait:
Traffic cuts-thru from Shore to Lockwood, no sidewalks

5) Clark & Grant
Pedestrian and vehicular conflicts at corner.

East Focus Area: Recommendations

1a) Install crosswalks at Park and Arcadia

1b) Continue sidewalk on south side of Arcadia from Park to Highview

2a) Lockwood: Install in-street crosswalk sign at all mid-block crosswalks. b) Install edge line 10' from roadway centerline.

3a) Lockwood and Tomac: Install crosswalks and curb ramps

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

0' 500'

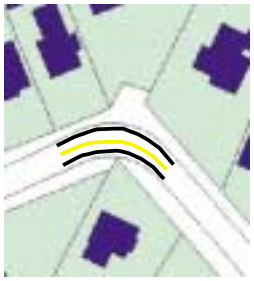
9a) Park & Highview Install chicanes, space approx. 150' apart.

8a) Lockwood Ave: Stripe edge line 10' from roadway centerline

7a) Lockwood Ave: Install crosswalk markings between sidewalks at intersection streets

4a) Tomac south of Lockwood: Construct sidewalk on south side of street

6a) Tomac and Center: Construct median island at intersection, install crosswalks and curb ramps



5a) Clark and Grant: Stripe intersection of roadway with centerline and edge stripes 11' from centerline

10a) Benjamin and Tait: Stripe edge line 10' from roadway centerline

South Focus Area: Issues

The South Focus Area includes Shore Road and all streets south and west of Shore Road. Key issues within this area include

- No sidewalks
- Minimal shoulder space for cyclists
- Overgrown vegetation
- Difficult crossings at intersections
- Lack of marked crosswalks
- Overgrown roadside vegetation

1) No crosswalks at intersection

2) Corner blocked by hedges

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

0' 500'

Sound Beach and Shore: see Central Focus Area

3) Hedges reduce sight-line, reduce roadside walking space

4) Shore Road: No sidewalks, high pedestrian demand, poor sight-lines

South Focus Area: Recommendations

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

0' 500'

1a) Install crosswalks and curb ramps at intersection, connect crosswalks and ramps on east side of Shore Rd. with sidewalk segment

2a) Tomac & Shore intersection: Trim and/or relocate vegetation that encroaches upon right of way

Sound Beach and Shore: see Central Focus Area

3a) Trim and/or relocate hedges that encroach upon right of way

4) Shore Road
a) Construct sidewalk on northwest side of Shore Road
b) Stripe edgelines 10' from center of roadway

West Focus Area Issues

The West focus area is bordered by the rail road to the north, Sound Beach Ave. to the east, and Willowmere to the west. Primary issues include:

- Lack of sidewalks
- High vehicle speeds
- Lack of marked crosswalks

2) No crosswalks, pedestrians often cross mid-circle.

1) Narrow tunnel, poor lighting

3) Vehicles don't yield to pedestrians in crosswalk

4) Speeding vehicles, no sidewalks

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

0' 500'

West Focus Area Recommendations

1) Tunnel
a) Add extra daytime lighting
b) Stripe a 16' queuing lane down center of tunnel

2a) Install crosswalk markings, ramps and sidewalk to connect crosswalks

3a) In street crosswalk signage

4a) Install chokers on Edgewater, Lockwood Dr. and Cove View to control vehicle speeds

Legend

- Sidewalk
- Crosswalk
- Existing features (black)
- Proposed features (yellow or red)

N

0' 500'

Summary of Recommendations

Phase I Recommendations

Focus Area	Item #	Description	Estimated Cost
Central	1a	Set pedestrian phase to follow West End or Arcadia green-phase upon actuation (in addition to pedestrian phase at the end of Sound Beach green-phase	-
Central	1b	Prohibit right hand turn on red from West End Ave to Sound Beach. Install no right turn on red sign.	$200
Central	3a	Convert intersection to three-way stop	$500
Central	4a	Install crosswalk between Clark and Shore Acre (install curb ramps with new crosswalk)	$7,000
Central	6a	Sound Beach at Edgewater: Trim and/or relocate vegetation that encroaches upon right-of-way at southwest corner of intersection.	-
Central	8a	Repaint crosswalk markings across Train Station parking lot entrance.	$500
North	2a	Brownhouse & Forest: Trim and/or relocate vegetation that encroaches upon right-of-way	-
North	1a	Sound Beach & Forest: Install crosswalk markings	$1,000
North	3a	Install in-street pedestrian crosswalk sign at mid-block crossing	$500
North	4a	Stripe shoulders on bridge, restrict to one 16' queuing lane	$500
North	4b	Stripe edgeline 10' from centerline of roadway.	$5,000
North	5a	Install in-street pedestrian crosswalk sign at Webb (item completed by Town of Greenwich)	-
North	6a	Tunnel Sidewalk: Relocate sidewalk barriers to outside of curb	$4000
East	1a	Install crosswalks at Park and Arcadia (install curb ramp with new crosswalk)	$5,000
East	2a	Lockwood: Install in-street crosswalk sign at all mid-block crosswalks.	$2,000
East	2b	Install edge line 10' from roadway centerline.	$10,000
East	5a	Clark and Grant: Stripe intersection of roadway with centerline and edge stripes 11' from centerline	$500
East	7a	Lockwood Ave: Install crosswalk markings between sidewalks at intersecting streets	$1,500
East	8a	Lockwood Ave: Stripe edge line 10' from roadway centerline	$5,000
East	10a	Benjamin & Tait: Stripe edge line 10’ from roadway centerline	$5,000
South	2a	Tomac & Shore intersection: Trim and/or relocate vegetation that encroaches upon right-of-way at southwest corner of intersection	-
South	3a	Trim and/or relocate vegetation that encroaches upon right-of-way	-
South	4b	Stripe edgelines 10' from center of roadway	$10,000
West	1a	Add extra daytime lighting	$3,000
West	1b	Stripe a 16' queuing lane down center of tunnel	$500
West	3a	In street crosswalk signage	$500
		Total Estimated Phase I Cost	**$62,200**

Phase II Recommendations

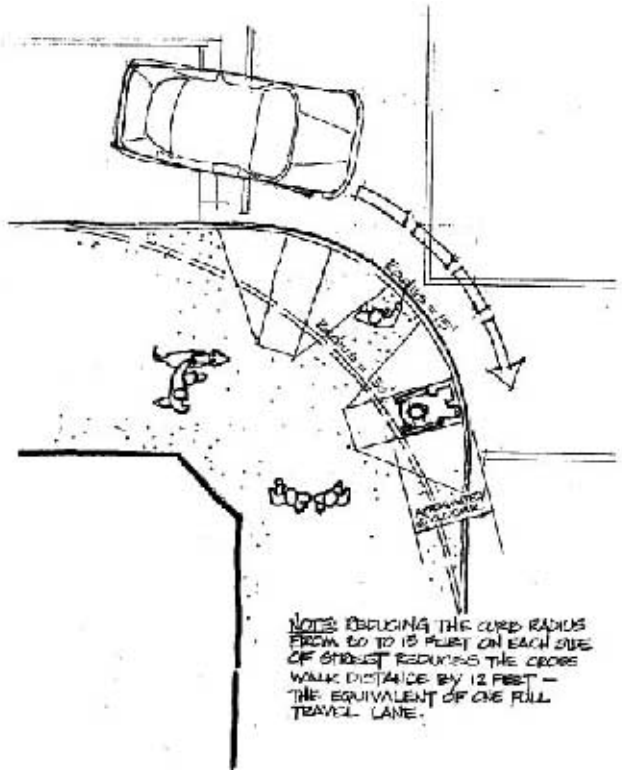
Focus Area	Item #	Description	Estimated Cost
Central	2a-1	Continue sidewalk on east side of Sound Beach Ave to St. Claire	$75,000-100,000
Central	3b	Sound Beach and Shore Rd: Decrease curb return radius on northwest corner and extend sidewalk from Sound Beach around corner to Shore Rd.	$10,000
Central	3c	Construct ramps and sidewalk segments at northeast corner and south side of Shore Rd. Install marked crosswalks between curb ramps and convert median island to pedestrian refuge	$15,000
Central	5a	Install accessible curb ramps at all intersection street corners (14 ramps x $3,000 each)	$42,000
Central	7a	Install pedestrian actuated stop light and/or in pavement flashing beacons.	$40,000
Central	9a	SB and Lockwood: Install refuge islands, install new crosswalks, install sidewalk & ramp	$20,000
East	1b	Continue sidewalk on south side of Arcadia from Park to Highview	$25,000
East	3a	Lockwood and Tomac: Install crosswalks and curb ramps	$10,000
East	4a	Tomac south of Lockwood: Construct sidewalk on south side of street (Project in design phase)	*Funding approved as of 2/12/04
East	6a	Tomac and Center: Construct median island at intersection, install crosswalks and curb ramps	$10,000
East	9a	Park & Highview Install chicanes, space approx. 150' apart	$22,000
South	1a	Install crosswalks and curb ramps at intersection, connect crosswalks and ramps on east side of Shore Rd. with sidewalk segment	$20,000
South	4b	Stripe edgelines 10' from center of roadway	$10,000
West	2a	Install crosswalk markings, ramps and sidewalk to connect crosswalks	$20,000
West	4a	Install chokers on Edgewater, Lockwood Dr. and Cove View to control vehicle speeds	$36,000
		Total Estimated Phase II Cost	**$355,000-$430,000**

Phase III Recommendations

Focus Area	Item #	Description	Estimated Cost
Central	2a-2	Continue sidewalk on east side of Sound Beach Ave. from St. Claire to Shore Road.	$75,000-100,000
North	6b	Wesskum Wood/Owenoke Way: Construct sidewalk on north side of roadway	$200,000-$300,000
South	4a-1	Construct sidewalk on northwest side of Shore Road from Sound Beach to Tomac	$250,000-$500,000
South	4a-2	Construct sidewalk on northwest side of Shore Road from Sound Beach to South Crossway	$250,000-$500,000
		Total Estimated Phase III Cost	**$775,000-$1,400,000**

Cost estimates may vary significantly (given site specific constraints) from actual cost of implementation/construction.

Pedestrian Safety Toolbox

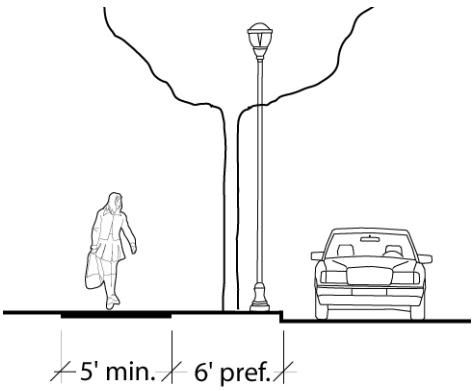


Sidewalks

"Sidewalks used for pedestrian access to schools, parks, shopping areas, and transit stops and placed along all streets in commercial areas should be provided along both sides of the street. In residential areas, sidewalks are desirable on both sides of the street but need to be provided on at least one side of all local streets." – *AASHTO*

A five foot wide sidewalk offset from the curb line by six feet provides a functional and comfortable walking environment.

"Sidewalks and walkways separate pedestrians from the roadway and provide places for children to walk, run, skate, ride their bikes, and play. Sidewalks have been found to be associated with significant reductions in pedestrian collisions with motor vehicles. Such facilities improve mobility for pedestrians and should be provided for all types of pedestrian travel: to or from home, work, parks, schools, shopping areas, transit stops, etc. Walkways should be part of every new and renovated facility and every effort should be made to retrofit streets that currently do not have sidewalks or walkways." -*ITE*[3]



Preferred sidewalk dimensions and offset.

Benefits

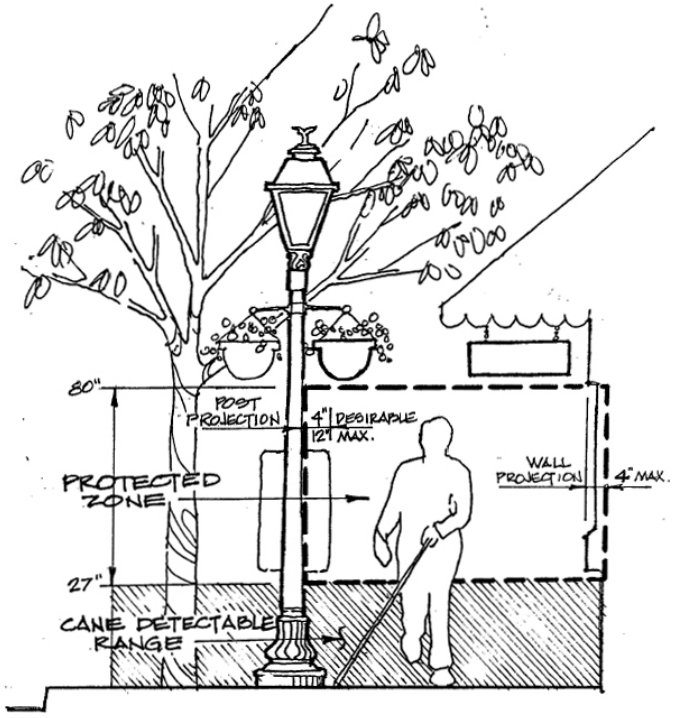
- Minimizes pedestrian exposure to vehicles by providing walking space off of roadway.
- Encourages walking trips

Application

- Minimum sidewalk width of 5-feet is necessary for two adults to comfortably walk side-by-side.
- Sidewalk most effective when separated from curb by a buffer space.
- Buffer provides space for street trees, utilities, & snow storage.
- Buffer most effective at 6' wide, thus allowing the placement of an accessible curb ramp between curb line and sidewalk.
- Maximum 2% cross-slope
- Sidewalk zone should be kept clear of obstructions, providing a minimum clear width of 32-inches at spot locations and 36-inches for the length of the walk.
- A protected zone of 27-inches to 80-inches in height must be kept clear of vegetation, signage, and other structures.

Cost

- $30 - $40 per linear foot for 5-foot wide asphalt walk
- $60 - $80 per linear foot for 5-foot wide concrete walk



Protected zone required by the Americans with Disabilities Act. This zone must be kept clear of vegetation, furniture, signs, and other possible obstructions. (Source: Access Board)

Accessible Curb Ramps

According to the Connecticut Highway Design Manual, when determining the need for a curb ramp, the designer should consider the following:

1. If at least one curb will be disturbed by construction at an existing intersection, then curb ramps shall be constructed at all crosswalks which extend from a paved sidewalk in that intersection.
2. For all projects, curb ramps will be constructed at all crosswalks which provide pedestrian access in that intersection and will be provided on all corners. At T-intersections, the designer must ensure that curb ramps are located on the side opposite the minor intersecting road.
3. Opposing ramps must always be provided on adjacent legs of an intersection even if outside project limits.
4. Curb ramps shall be positioned so as not to cause a safety hazard for blind pedestrians.
5. Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.
6. Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides.
7. A diagonal curb ramp shall be wholly contained within the painted markings, including any flared sides. There shall be at least 610 mm of full-height curb within the crosswalk. In addition, there shall be at least 1220 mm between the gutter line and the corner of the two intersecting crosswalks.
8. The function of the curb ramp must not be compromised by other highway features (e.g., guide rail, catch basins, utility poles, signs).
9. Curb ramps are required at all curbed intersections with sidewalks or along all accessible routes.
10. The location of the curb ramp must be consistent with the operation of pedestrian-actuated traffic signals, if present. In addition, a pedestrian push-button must be located so it can be reached by wheelchair-bound individuals.
11. The designer will provide the Division of Traffic Engineering with a set of plans at the preliminary design stage and before the preliminary design review. The Division of Traffic Engineering, in its review, will determine the need and location of mid-block curb ramps.

Benefits

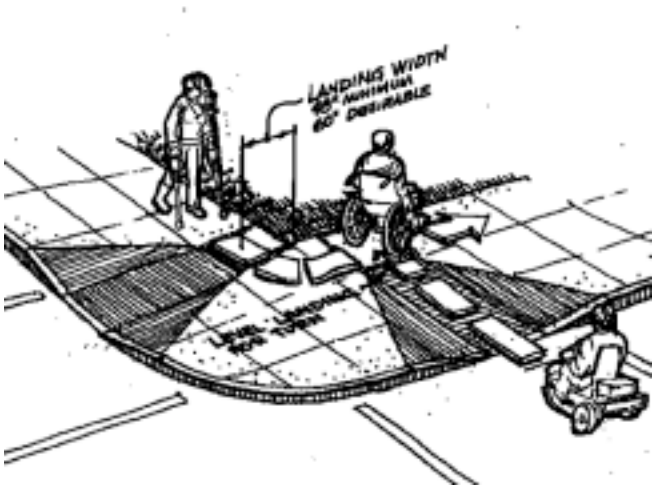
- Improves accessibility for people with mobility aids.
- Improves the mobility of people with carriages, strollers, carts, and children on bicycles.
- Encourages pedestrians to cross roadway at a fixed point.

Application

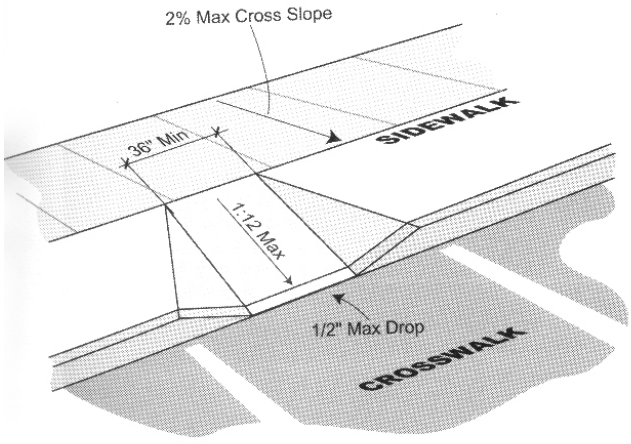
- Ramp perpendicular to curbline
- 1:12 maximum running slope
- 1:48 (2%) maximum cross slope
- 36" minimum width
- Level landing at top
- Landing 36" long if toe room available
- Landing 48" long if constrained
- Ramp within crosswalk at foot
- No exposure to moving traffic lane
- Flush (no lip) connection at street

Cost

- $1,000-2,000 per ramp



The function of properly designed curb ramps. (Source: Access Board)



Slope and dimensional requirements of a curb ramp. (Source: Urban Land Institute)

Crosswalks

"Pedestrians seek means to cross many streets without going more than 150 feet out of the way. For this reason, well-designed towns orchestrate convenient crossing points every 300 feet. This spacing is especially important on main streets. When fewer organized crossing points are established, sporadic or spontaneous street crossings by frustrated pedestrians create unsafe, unpredictable movements. One of the most serious omissions in traffic engineering since it was developed nearly 70 years ago, is the failure to address adequate street crossings." *-Burden*

"Crosswalk markings provide guidance for pedestrians crossing the roadway by defining and delineating the most appropriate crossing path. Crosswalk markings also alert road users to a pedestrian crossing point not controlled by traffic signals or stop signs. At non-intersection locations, these markings legally establish the crosswalk." *–ITE*[3]

"In general, crosswalk markings at unsignalized intersections appear to have several positive effects and no observed negative effects. Specifically, drivers appear to be aware that pedestrians are in a marked crosswalk and drive slightly slower. Crosswalks also have the positive benefit of channeling pedestrians to the intersection. Also, there appears to be no evidence to support the contention that pedestrians feel protected in marked crosswalks and act more carelessly. In conclusion, it appears that marking pedestrian crosswalks at relatively narrow, low-speed, unsignalized intersections is a desirable practice."- *FHWA-RD-00-103*

"Crosswalks can be raised or can be designed in conjunction with speed tables, medians, crossing islands, curb extensions, and other supplemental measures. With these measures, unsignalized crossings may be feasible at additional location types." *–ITE*[3]

"A 1988 FHWA study found that high-visibility/ladder-type crosswalk markings using a 12-inch (305-mm) stripe with 24-inch (610-mm) spacing had the highest level of motorist recognition."
–Access Board

Benefits

- Encourages pedestrians to cross the street at regular locations.
- Improves visibility of pedestrians, alerts drivers to the presence of pedestrian traffic.

Application

- Crosswalk locations should be located approximately 300' apart. Increased distances decrease pedestrian conformity, decreased distances may decrease driver conformity.
- Crosswalks should be a minimum 6' wide – 10' wide or width of sidewalk if greater
- Curb ramps, if present, should be aligned with crosswalk.
- Crosswalks are most effective when crossing roadway at a right angle.
- Crosswalk should be accompanied by signage or signalization where conditions warrant

Cost

- $100-$300 per crosswalk

Ladder type crosswalk, as shown here, is the most visible to motorists.

Crosswalk Signage

"Crossing signs shall be used adjacent to the crossing location. If the crossing location is not delineated by crosswalk pavement markings, the Crossing sign shall be supplemented with a diagonal downward pointing arrow plaque (W16-7P) showing the location of the crossing. If the crossing location is delineated by crosswalk pavement markings, the diagonal downward pointing arrow plaque shall not be required.

The crossing location may be defined with pavement markings. Pedestrian, Bicycle, School Advance Crossing, and School Crossing signs may have a fluorescent yellow-green background with a black legend and border.

When a fluorescent yellow-green background is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a selected site area should be avoided. Crossing signs should be used only at locations where the crossing activity is unexpected or at locations not readily apparent."

-MUTCD

Benefits

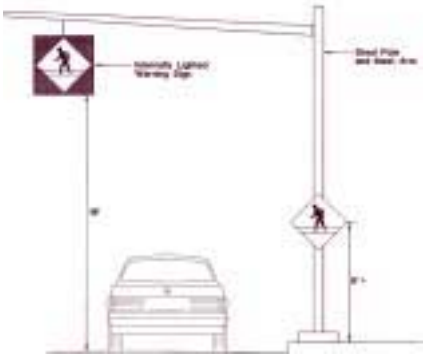
- Increases driver awareness
- Assists pedestrians in locating crosswalks

Application

- Signage typically used at mid-block crossing locations
- Signage must not interfere with sidewalk function
- Mast arm mounted signage should be used where sight line is limited, or pedestrian and vehicle volumes warrant such use

Cost

- $200-$500 per crosswalk for signage
- $3000 per mast arm



Placement of pedestrian signs on a mast arm above the roadway increases driver visibility. (Source: Washington DOT)

Madison's In-Street Crosswalk Signs

"Drivers failing to yield right-of-way to pedestrians at marked crosswalks is a common problem which is often not improved by use of standard pedestrian warning signs. Madison has shown a strong interest in improving pedestrian safety, especially at non-signalized street crossings. One technique being used in areas as diverse as Whitewater, Wisconsin and Boston, Massachusetts is an in-street "Yield to Pedestrian" (YTP) sign to remind drivers of their responsibility to yield to pedestrians in crosswalks."

Madison conducted a study of in-street crosswalks signs, observing that:
"…the occurrence of motorists yielding to pedestrians increased significantly".

(Source: City of Madison)

This sign combination has been effectively used in many Connecticut municipalities to mark crosswalks. Note, the downward pointing arrow (W167P) replaces the need for the traditional pedestrian sign with crosswalk stripes (W11-2a).

MUTCD signs W11-2 & W16-7P

In street pedestrian yield signs are highly visible to drivers. (Rt. 10 Farmington)

School Zone Signage & Markings

"Signs should be placed in positions where they will convey their messages most effectively without restricting lateral clearance or sight distances. Placement therefore should consider highway design, alignment, vehicle speed, and roadside development." - *MUTCD*

Benefits

- Increases driver awareness

Application

Application of school zone signage and markings are outlined in the Manual on Uniform Traffic Control Devices as follows:

School Advance Warning Sign

"The School Advance Warning (S1-1) sign shall be used in advance of any installation of the School Crossing sign. If used, the School Advance Warning sign shall be installed not less than 45 m (150 ft) nor more than 210 m (700 ft) in advance of the school grounds or school crossings."

"The School Advance Warning sign shall be used in advance of the first installation of the School Speed Limit sign assembly."

"The School Advance Warning (S1-1) sign should be installed in advance of locations where school buildings or grounds are adjacent to the highway."

School Speed Limit Assembly

"A School Speed Limit assembly or a School Speed Limit (S5-1) sign shall be used to indicate the speed limit where a reduced speed zone for a school area has been established (in accordance with law based upon an engineering study) or where a speed limit is specified for such areas by statute. The School Speed Limit assembly or School Speed Limit sign shall be placed at or as near as practical to the point where the reduced speed zone begins."

"The reduced speed zone should begin at a point either 60 m (200 ft) from the crosswalk, or 90 m (300 ft) from the school property line, whichever is encountered first as traffic approaches the school."

"A Speed Limit Sign Beacon also may be used, with a WHEN FLASHING legend, to identify the periods that the school speed limit is in effect. The lenses of the Speed Limit Sign Beacon may be positioned within the face of the School Speed Limit (S5-1) sign."

School Crosswalk Warning Assembly

"If used, the School Crosswalk Warning assembly shall be installed at the marked crosswalk, or as close to it as possible, and shall consist of a School Advance Warning (S1-1) sign supplemented with a diagonal downward pointing arrow (W16-7) plaque to show the location of the crossing."

"The School Crosswalk Warning assembly shall not be used at marked crosswalks other than those adjacent to schools and those on established school pedestrian routes."

"The School Crosswalk Warning assembly shall not be installed on approaches controlled by a STOP sign."

"The School Crosswalk Warning assembly should be installed at marked crosswalk(s), including those at signalized locations, used by students going to and from school as determined by an engineering study."

Pavement Word and Symbol Markings

"Word and symbol markings on the pavement are used for the purpose of guiding, warning, or regulating traffic."

Word and symbol markings shall be white. Word and symbol markings shall not be used for mandatory messages except in support of standard signs.

Cost

$100 - $200 per sign/marking

Narrow Travel Lanes

"Although lane widths of 3.6m (12') are desirable on both rural and urban facilities, there are circumstances that necessitate the use of lanes less than 3.6m (12') wide. In urban areas where right-of-way and existing development become stringent controls, the use of 3.3m (11') lanes is acceptable. Lanes 3.0 m (10') wide are acceptable on low-speed facilities. Lanes 2.7m (9') wide are appropriate on low-volume roads in rural and residential areas." *-AASHTO*

"The lane widths can be reduced (to 9, 10, or 11 ft.), with excess asphalt then striped with a bicycle lane or paved shoulders. Travel lanes cab be removed, and the street can be physically narrowed by extending sidewalks, landscaped areas, or by adding on-street parking within the former curb lines. This can often reduce vehicle speeds along a roadway section and enhance movement and safety for pedestrians." *-ITE*[3]

"To design for continuous opportunities for free-flowing vehicles (as is the case with 10 feet wide and greater travel lanes) is to create situations where most of the time passenger cars-far and away the predominant vehicle-will travel at speeds greater than are desirable for nearby pedestrians. This becomes a self-worsening situation of degradation of the pedestrian environment: faster vehicles are noisier and more dangerous to pedestrians; faster vehicles generally mean fewer pedestrians; and fewer pedestrians generally mean even faster vehicles." *–ITE*[4]

Benefits

- Reduces vehicle speed
- Provides additional space for medians, shoulders, or sidewalks

Application

- Use 10' – 11' travel lanes on high volume arterial and collector streets
- Use 9'-10' travel lanes on local streets and low volume collector streets

Cost

- Varies with treatment

On this New York State roadway just west of Ridgefield, CT the travel lane has been narrowed from 12 to 10 feet.

Excerpt from:
Traffic Fatalities and Injuries: Are Reductions the Result of "Improvements" in Highway Design Standards?
By Robert B. Nolan

As more arterial and collector lane widths are increased up to 12ft or more, traffic fatalities and injuries increase. […] These results are quite stunning as it is general practice to improve the safety of roads by increasing lane widths. Clearly these results suggest that drivers must react to increased lane widths, which can increase driver comfort, by reducing their caution, increasing their speeds and therefore off-setting expected safety benefits.

Excerpt from:
Residential Street Typology and Injury Accident Frequency
By Peter Swift

This study indicates a clear relationship between accident frequency and street width and curvature. The findings support the theory that narrower, so called "skinny" streets, are safer than standard width residential streets. Since municipal code generally mandates a minimum of 36 foot wide residential streets (planned unit developments may be an exception) the results from this study indicate that current street design standards are directly contributing to automobile accident. […] Using this regression, a typical 36 foot wide residential street has 1.21 a/m/y (accidents/mile-year as opposed to 0.32 for a 24 foot wide street, the street with the least a/m/y. This is about a 400 percent increase in accident rates. The a/m/y for a 30 foot wide street is 0.36. It appears that the group of streets with the safest results occur between 22 and 20 feet in curb face width.

Chokers & Chicanes

Chokers and Chicanes use small islands placed near the curb to slow traffic. Chokers use two islands, placed opposite one another in order to create a narrow opening that constricts traffic. When placed twelve feet apart, these islands only allow one vehicle through at a time, thereby stopping traffic in the opposite direction. Chicanes, however, typically allow traffic to continue moving in both directions. This is accomplished via staggered islands that create lateral shifts in the roadway, thus slowing drivers

Chokers are more effective on high volume streets where opposing traffic is more frequent. This includes streets that experience significant peak traffic times. Vehicle speeds at other times will be minimally impacted as vehicles are allowed to travel straight through the choker without being forced to yield to oncoming traffic.

"Chicanes create a horizontal diversion of traffic and can be gentler or more restrictive, depending on the design. Shifting of a travel lane will affect speeds as long as the taper is not so gradual that motorists can maintain speeds, the aim of traditional highway design. Shifts in travelways can be created by moving parking from one side to the other (if there is space for only one side of parking) or by building landscaped islands (islands can also effectively supplement the parking shift).

Diversion of the path of travel plus restriction of lanes is usually accomplished through a series of bulbouts or curb extensions that narrow the street to two narrow lanes or one lane at selected points, forcing motorists to slow down to maneuver between them. Such treatments are intended for use only on residential streets with low traffic volumes.

If there is no restrictions (i.e., the number of lanes is maintained), chicanes can be created on streets with higher volumes, such as collectors or minor arterials."

-ITE[3]

Benefits

- Reduces vehicle speed
- Can be used in conjunction with on-street parking
- Chokers may be used with a mid-block crosswalk

Application

- Residential streets and low volume collector and arterial roadways
- A minimum straight pathway 12' wide must be preserved for emergency vehicles
- Islands are placed 1– 2' from curb line so as not to obstruct drainage

Cost

- $2,000 to $5,000 per island

Islands are placed in this roadway to create a chicane, forcing traffic to slow down for the lateral roadway shift. Source: Batson

Two islands are placed directly opposite one another, allowing only one vehicle to pass at a time. Source: TrafficCalming.Org

Reduced Curb Return Radius

"Curb return radii are one design tool that can be used to slow vehicular speeds and to promote nonmotorists. The zoning, subdivision, and street design standards of many cities and other urban areas provide for curb radii of 5 to 30 feet, but most of which are between 10 and 15 feet." -*ITE*[4]

"One common type of pedestrian crash is the striking of pedestrians by right-turning vehicles at intersections. A wide curb radius typically results in high-speed turning movements by motorists. Reconstructing the turning radius to a tighter turn will reduce turning speeds, shorten the crossing distance for pedestrians, and improve sight distance between pedestrians and motorists." -*ITE*[3]

"With larger curb return radii, turning movements of right-turning vehicles are more easily accommodated, but the length of the crosswalk needed to cross the street for pedestrians at that point is also increased, sometimes dramatically. As the curb return radius increases, the likelihood of automobiles that stop to make a right turn decreases due to larger curb return radii creating essentially "free-right" turning lanes for automobiles (this typically happens with curb return radii at and above 30 feet)." -*ITE*[4]

Benefits

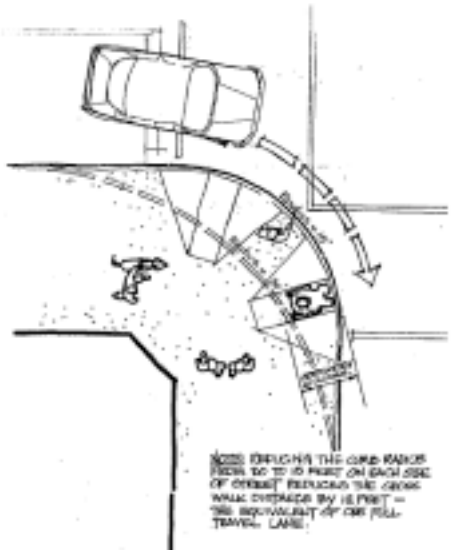
- Slows vehicle speeds
- Reduces pedestrian crossing distance
- Discourages illegal right turns on red
- Provides additional space for curb ramps

Application

- Curb return radii are unique to each intersection
- Curb returns should be designed to accommodate the minimum turning radii of the appropriate design vehicle
- For most local streets curb return radii of 15' or less are sufficient

Cost

- $5,000 to $10,000 per corner



Large curb return radius versus smaller radius (Source: Access Board)

EXAMPLE #	1	2	3	4	5	6	7	8	9	10
Sidewalk width	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'
Planting/buffer width (to curb)	0'	0'	0'	0'	0'	0'	0'	0'	0'	0'
Curb return radius	5'	8'	10'	12'	15'	20'	25'	30'	35'	40'
Crossing distance to be added to street width	1.3'	4.4'	**6.8'**	9.3'	**13.4'**	20.6'	28.2'	36.0'	44.0'	52.2'
Pedestrian crossing time to be added to street cross time (seconds)	0.4	1.3	1.9	2.7	3.8	5.9	8.1	10.3	12.6	14.9

Effects of curb return radius on pedestrian crossing times and distances (Source: ITE[4]*)*

Speed Humps

"Speed humps are paved (generally asphalt), approximately three to four inches high at their center, and extend the full width of the street. There are several designs for speed humps. The traditional 12-ft. hump has a design speed of 15 to 20 mph. The 14-ft. hump has a design speed of a few mph higher. A 22ft. table has a design speed of 25 to 30 mph. The longer humps are gentler for larger vehicles." *–ITE*[3]

"A speed table is an elongated speed hump or a flat topped speed hump. At the top of the flat version, a pedestrian crossing (sometimes with a marked crosswalk) is often provided for people to walk across the road." *–ITE*[3]

Benefits

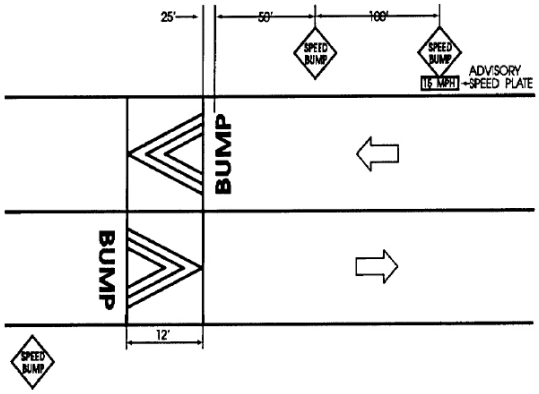
- Slows vehicle speeds
- Table provides crossing area for pedestrians
- Table discourages parking in crosswalk

Application

- No more than two travel lanes or 40-foot pavement width
- Horizontal curve of 300-foot radius or more
- Vertical curve with adequate stopping sight distance
- Grade of 8 percent or less
- Posted speed limit of 30 mph or less
- No more than 5 percent long-wheelbase vehicles
- Not a primary emergency response route or bus route
- Spacing: 150' - 600' apart
- Use 22' humps on high volume streets

Cost

- $2000 - $5000 each



Typical speed hump layout, markings, and signage. (Source: ITE[2]*)*

12 foot speed hump: West Hartford, CT

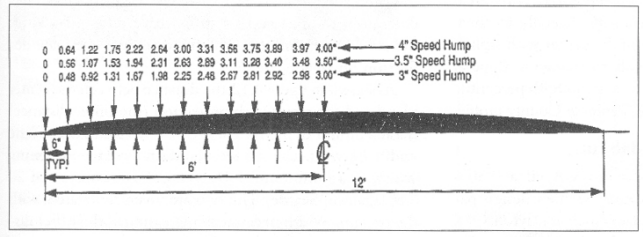


Figure 4.6. 12-foot Speed Hump Profile.

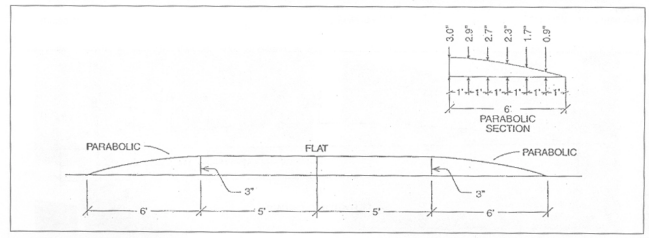


Figure 4.9. Original 22-foot Speed Table Profile. (Seminole County, FL)

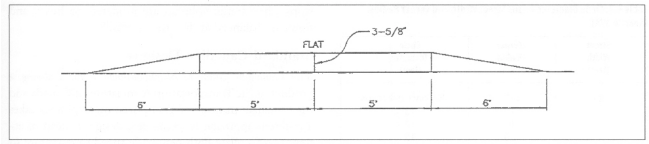


Figure 4.10. Alternative 22-foot Speed Table Profile. (Gwinnett County, GA)

From top to bottom: 12 foot speed hump; 22 foot speed hump; 22 foot speed table (Source: ITE[2]*)*

Speed hump and crosswalk (Source: Burden)

Mini-Traffic Circles

Mini circles are raised circular islands that are constructed in the center of residential street intersections to reduce vehicle speeds. They are sometimes used instead of stop signs. They force motorists to maneuver around them and have been found to reduce motor vehicle crashes. Drivers making left turns are directed to go on the far side of the circle (not the near side) before making the turn. Signs may be installed within the circle to direct motorists to proceed to the right of the circle before passing through or making a left turn.
-ITE[3]

Typical mini-circle
(Source: Batson)

Benefits

- Prevents red-light or stop sign running
- Slows vehicle speeds through intersection

Application

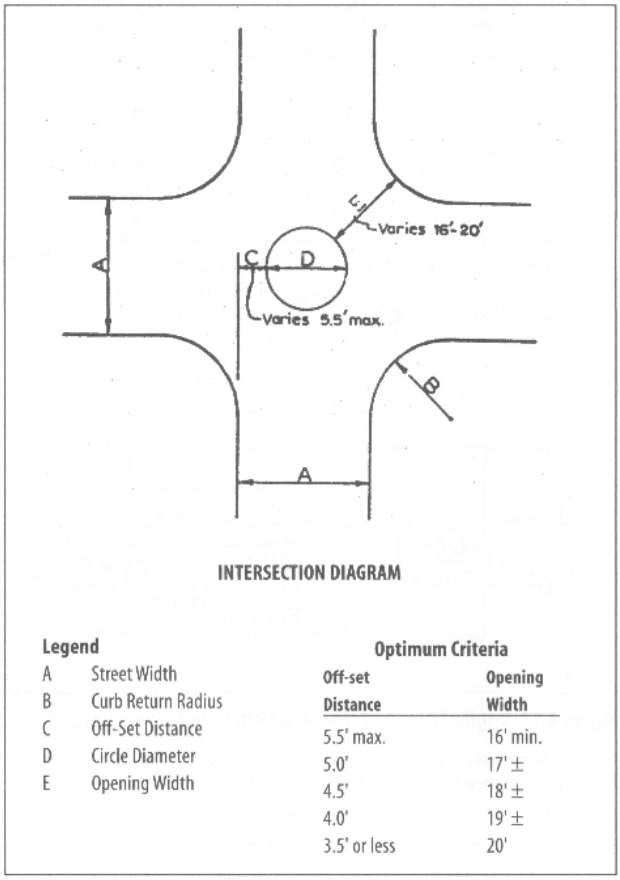
- For use on local streets and low volume collector streets
- Replaces four-way stop or low volume signalized intersection
- Landscaping cannot interfere with driver visibility, can be maintained by residents

Cost

- $5000-$15,000 per intersection

Street Width (feet)	Corner Radius (feet)	Circle Diameter (feet)
24	<12	Reconstruct curbs
	12	13
	15	14
	20	15
	25	17
30	10	19
	12	20
	15	20
	20	22
	25	24
36	10	26
	12	26
	15	27
	18	28
	20	29
	25	33

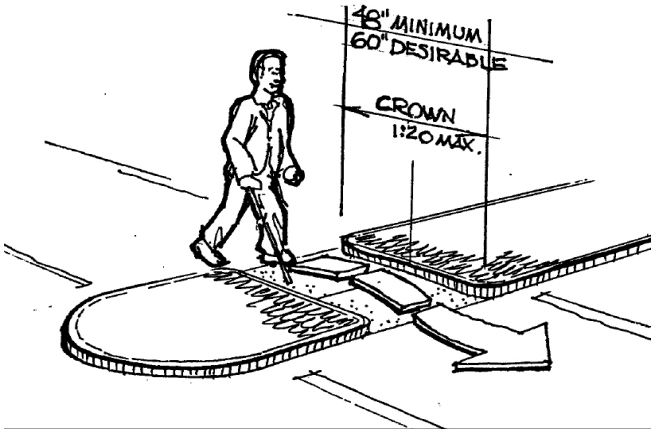
Typical layout of mini traffic circle
(Source: City of Seattle)



Typical layout of mini traffic circle
(Source: City of Seattle)

Pedestrian Refuge Island

"Cross islands, also known as center islands, refuge islands, or median slow points, are raised islands placed in the center of the street at intersection or midblock locations that help to protect pedestrians from motor vehicles. Crossing islands allow pedestrians to be concerned with only one direction of the street and wait for an adequate gap in traffic before crossing the second half of the street. Where midblock or intersection crosswalks are to be installed at uncontrolled locations (i.e., where no traffic signals or stop signs exist), crossing islands should be strongly considered as a supplement to the crosswalk. If there is sufficient width, crossing islands and curb extensions can be used together to create a highly improved pedestrian crossing." *-ITE*[3]



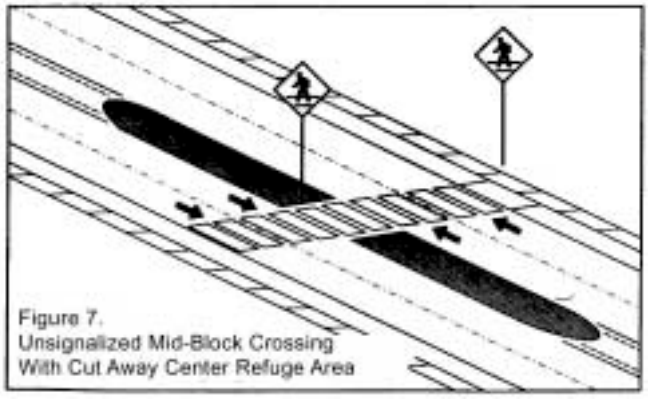
Minimum width for refuge islands (Source: Access Board)

Benefits

- Reduces vehicle speeds
- Decreases pedestrian crossing distance
- Increases visibility of crossing

Application

- For use at intersections or mid-block
- Use only on streets with speed limit below 45mph unless signalization is provided
- Mid-block island crossing should be located at least 300 feet from nearest crossings
- Appropriate signage required
- Adequate lighting required
- Minimum width of 4 feet



Typical pedestrian refuge island (Source: Washington DOT)

Cost

- $6,000 to $9,000 each

Pedestrian refuge island (Source: Batson)

Curb Extension

"Curb extensions, also known as bulbouts or neckdowns, involve extending the sidewalk or curb line into the street, reducing the effective width. Curb extensions significantly improve pedestrian crossings by reducing pedestrian crossing distance, improving the ability of pedestrians and motorist to see each other, and reducing the time that pedestrians are in the street. Curb extensions that are placed at an intersection essentially prevent motorists from parking in a crosswalk or blocking a curb ramp. Motor vehicles parked at corners present a serious threat to pedestrian safety because they block sight lines, hide pedestrians, and other vehicles, and make turning particularly difficult for emergency vehicles and trucks. Motorists are encouraged to travel more slowly at intersections or midblock locations with curb extensions, because the restricted street width sends them a visual cue. Turning speeds at intersections are reduced with curb extensions (curb radii should be as tight as practicable). Curb extensions are appropriate only where there is an on-street parking lane (curb extensions must not extend into travel lanes, bicycle lanes, or shoulders). -*ITE*[3]

Benefits

- Encourages pedestrian conformity to marked crosswalks
- Shortens crossing distance for pedestrians
- Provides additional space for curb ramps
- Improves pedestrian visibility of roadway by extending past parked vehicles
- Improves driver's visibility of pedestrians
- Slows turning vehicles
- Prevents parking at corner

Curb extension at intersection, New Haven, CT

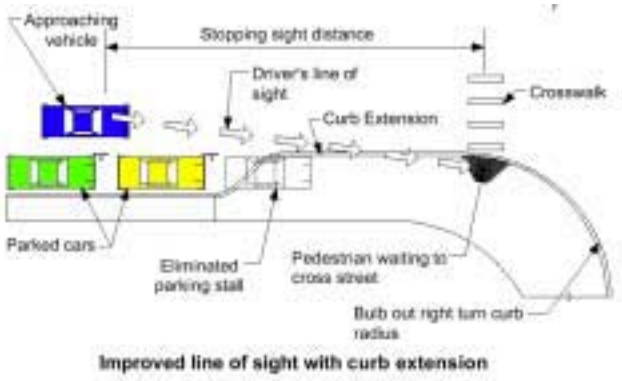
Application

- For use where wide curb lanes, shoulders, or on-street parking result in wide pavement widths.
- Curb may not extend into travel lane, bike lane, or functional width of shoulder.
- Adequate vehicle turning radii must be maintained (given street classification).

Cost

- $7,000 - $10,000 per extension
- Cost minimized when curb extended during street reconstruction

Mid-block curb extension (Source: Planning Magazine)



Curb extension improves visibility of pedestrians (Source: Washington DOT)

Striped Shoulders/Bike Lanes

"There is a growing need to accommodate bicycle and pedestrian commuters on arterial roadways in the State of Connecticut to reduce air pollution and traffic congestion. The increased popularity of bicycling and walking has necessitated the need, for Federal, State and Local governments, to take a stronger look at creating facilities for these purposes. One reason why people do not commute to work by bicycle or by walking (assuming they are within reasonable distance of their workplace), is because of a lack of relatively safe roads or paths in which to ride or walk."
-CT Bike & Pedestrian Plan

"It is possible to marginally improve some roadways for bicyclists—particularly group A riders—by providing as little as 2 ft (0.6 m) of usable riding surface to the right of the edge stripe. While this will not meet the design specifications necessary for a designated bicycle facility, it can provide an improved operating environment for both bicyclists and motor vehicles and will reduce the impact of bicycles on highway capacity."
-FHWA-RD-92-073

"Bike lane stripes are intended to promote the orderly flow of traffic, by establishing specific lines of demarcation between areas reserved for bicycles and lanes to be occupied by motor vehicles. This effect is supported by bike lane signs and pavement markings. Bike lane stripes can increase bicyclists' confidence that motorists will not stray into their path of travel if they remain in the bike lane. Likewise, with more certainty as to where bicyclists will be, passing motorists are less apt to swerve towards opposing traffic in making certain they will not hit bicyclists."
-California DOT

Benefits

Benefits of Shoulders –*ITE*[3]

- To provide a safe travel path outside of higher-speed traffic for bicycles
- To enhance the operational quality and capacity

Benefits of Bike Lanes -*City of Cambridge*

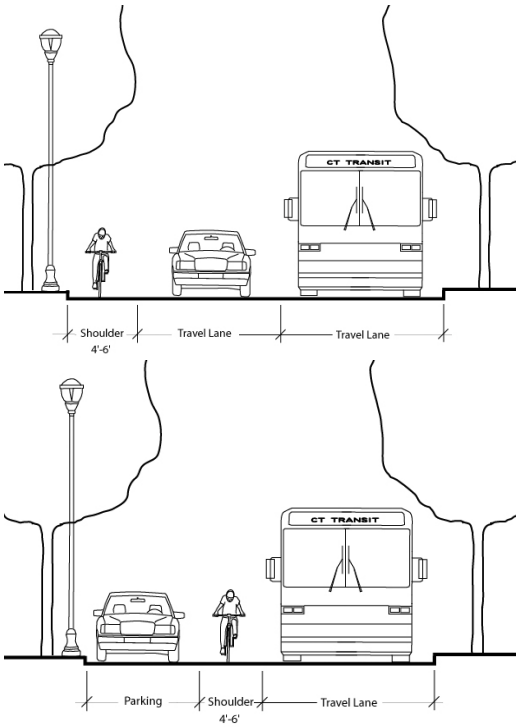
- Indicate the correct position and direction of travel of bicyclists on the roadway
- Promote an orderly flow of traffic
- Allow cyclists to pass queued motor vehicles stopped at a stop sign or traffic signal allowing cyclists to move to the head of the queue
- Send a message to motorists that bicyclists have a right to the roadway
- Remind motorists to look for bicyclists on the road
- Give bicyclists a clear place to be so they are not tempted to ride on the sidewalk

Application

- Edge striping improves safety of roadway under most conditions, but is most effective when shoulder or bike-lane is striped 4-feet to 5-feet wide.
- Shoulders and bike-lanes wider than 6' encourage parking in the shoulder or lane
- Stripe should be 4" wide, highly reflective
- Bike lanes should be properly marked and signed
- Rumble strips should not be used where they may conflict with cyclist travel

Cost

- $10,000 per mile for edge striping



Shoulder striping/ bike lane at road's edge & between parking lane and travel lane.

Typical bike lane