

**BRUNSWICK
BICYCLE & PEDESTRIAN IMPROVEMENT
PLAN**



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ADOPTED BY TOWN COUNCIL: MARCH 7, 2005

**PREPARED BY BRUNSWICK BICYCLE AND PEDESTRIAN ADVISORY
COMMITTEE**

EXECUTIVE SUMMARY

The Brunswick Bicycle and Pedestrian Advisory Committee (BBPAC) was formed by the Town Council in 1995 to offer advice on making the Town more bicycle and pedestrian friendly. The Committee is made up of nine citizens appointed by the Town Council. Staff support is provided by the Brunswick Planning Department.

Creating a safe and welcoming alternative to our current automobile-centered transportation system can have profound positive effects on the quality of life in our town. The Brunswick community can realize significant economic, environmental, and social benefits by becoming more bicycle and pedestrian-friendly.

A long-range goal of the BBPAC is that one day a middle-school-aged child will be able to walk or bicycle safely and comfortably anywhere in Town. The Committee has identified three areas of action for attainment of this goal - Education, Enforcement and Engineering/Planning - which it refers to as the Three E's.

While the *Bicycle and Pedestrian Improvement Plan* focuses on Engineering and Planning, the Committee also considers Education and Enforcement to be essential. Its work in those areas will continue.

The following are physical improvements the Committee considers to be most critical to the Town's bicycle and pedestrian infrastructure (refer to appendices for more information on each of these improvements):

Pedestrian	
Jordan Ave. Sidewalks	Federal to Lori
Mill St. Sidewalks	Pleasant to Bow/Union (including Swinging Bridge approach)
Mere Point Rd. Sidewalk	One side, Maine/Maquoit to Sandhill/Seguin
Harpswell Rd. Sidewalk	West side, near Harriets Way to Jonathan Court
Gurnet Rd. Sidewalks, Phase I	West side, Cooks Corner to Forrestal Drive
Stanwood St. Sidewalks, Phase I	East side, McKeen Street to railroad
Bicycle and Multi-Use	
Mere Point Rd. Bike Lanes	Maine/Maquoit to Middle Bay
Androscoggin to Kennebec Bike Path	Extend Androscoggin River Bike Path east to West Bath line
Jordan Ave. Wide Outside Lanes	Railroad bridge to Pine Tree
Jordan Ave. Shared Lanes	Federal to Railroad Bridge
McKeen St. Bike Lanes	Stanwood to Willow
McKeen St. Wide Outside Lanes	Willow to Church
Mere Point Rd. Shared Lanes	Middle Bay to end

Brunswick Bicycle and Pedestrian Improvements Plan

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I. Introduction

As in most American communities, the automobile dominates transportation in Brunswick. Often, the accommodation of cars in our public and private spaces creates obstacles to safe, efficient, and pleasurable walking and biking. Nevertheless, human-powered travel, whether by foot, bicycle, wheelchair or stroller remains an indispensable part of our daily lives. It is in the best interest of our community to accommodate and promote this type of travel, not only as a practical necessity but also in order to enjoy the important economic, environmental, and social benefits that come from increased bicycle and pedestrian activity.

The Economic Benefits of Making Our Community More Conducive to Bicycling and Walking

Bicycling and walking are inexpensive means of transportation. Walking is essentially free, and bicycles are readily available to most Brunswick residents. In contrast, owning and maintaining an automobile is very expensive. The average cost of operating a car for one year is about \$5,170; and families, on average, spend 13% of their income on owning and maintaining a single automobile.¹ The average family makes ten trips by car every day, and the average American spends the equivalent of 55 eight-hour workdays behind the wheel of a car every year.² Estimates by the U.S. General Accounting Office cite that highway congestion results in national productivity losses of more than \$100 billion a year.³ Brunswick's pattern of development is such that a car is a practical necessity for almost every family. Nevertheless, policies and improvements that make walking and bicycling more attractive can cut down on the number of car trips and can, in many instances, eliminate the need for a second car.

The economic benefit of providing safe and convenient access for customers to our commercial centers is self-evident. The quality of life that comes with enhanced bicycle and pedestrian activity are likely to produce various other indirect economic benefits. New businesses often consider quality of life issues when choosing new locations. Access to trails and greenways has been shown to have a positive effect on property values. Excellent bicycle and pedestrian facilities can draw tourists to Brunswick, both as a stop enroute and as an end destination.

The Environmental Benefits of a Bike and Pedestrian Friendly Community

Walking and bicycling are clean modes of transportation. Motor vehicles, on the other hand, are not. Reports show that motor vehicle emissions account for 31% of total carbon dioxide, 81% of

¹ www.bicyclinginfo.org/pp/benefits/econoben

² Benfield, F. Kaid; Raimi, Matthew D.; and Donald Chen. *Once There Were Greenfields*. New York: National Resources Defense Council, 1999. 36

³ Kunstler, James Howard. "Car Crazy: We can no longer afford a car dominated world." *Forum for Applied Research and Public Policy* Winter 1998: v13 i4 p108(7) Online. Infotrac. 20 February 2002.

carbon monoxide, and 49% of nitrogen oxides released into the atmosphere in the United States. Furthermore, studies indicate that short trips are disproportionately high polluting because pollution control devices do not have time to begin working effectively.⁴ Encouraging people to walk or bicycle when making short trips will help cut down on harmful auto emissions. In fact, substituting a four-mile round trip by bicycle or foot for one by car keeps about 15 pounds of pollutants out of the atmosphere.⁵ Decreasing the number of trips people make by car will also result in less wear and tear on their cars and the need for replacement of both parts and the car itself. Reduced traffic levels also reduce noise pollution.

The Social and Health Benefits of Promoting Walking and Bicycling in Our Community

The social benefits of an enhanced pedestrian and bicycle network, though more subjective, are no less compelling. Simply having more people outside in our public spaces gives the community a lively air that can generate more social and commercial activity. Sadly enough, in a community where the only option for transportation is the private automobile, contact between friends and neighbors is often limited to a wave through the windshield of a car. Increased walking and biking can also help people gain a deeper understanding and appreciation of the Town's built and natural environment. When driving, people often fail to notice many of the subtleties that make Brunswick so charming.

Increased walking and biking would have a positive effect on the overall health of the community. In a state where 57% of the adults are overweight and one out of five adults is more than 30 pounds overweight, the Town should be doing everything it can to encourage people to exercise.⁶ Increased fitness in the community would have the positive effect of cutting down on the growing health care costs that are plaguing so many areas. The obesity epidemic is hitting children especially hard. Living in a bicycle and pedestrian friendly community can play a significant part in leading children to exercise more and to develop healthy habits for life.

⁴ www.bicyclinginfo.org/pp/benefits/enviroben/index.htm

⁵ www.bicyclinginfo.org/pp/benefits/enviroben/index.htm

⁶ www.mcph.org/reports/Strategic%20Plan%20compiled.pdf

II. The BBPAC and its Mission

In 1995 the Town Council created the Brunswick Bicycle and Pedestrian Advisory Committee (BBPAC). BBPAC was charged with the tasks of evaluating existing bicycle and pedestrian conditions and recommending improvements to make the town more bicycle and pedestrian-friendly. After nearly three years of work the Committee produced its *Brunswick Bicycle & Pedestrian Improvements Plan* in October of 1998. While that plan was not formally endorsed, in the fall of 2002, the Town Council asked the Committee to update its plan.

About this Update and Future Updates

The Committee intends for this plan to be a resource for the Town Council, School Board, Planning Board, Recreation, Police, Public Works and Planning Departments, land developers, businesses, non-profit organizations, individual citizens and anyone else who is interested in how to promote human-powered transportation in Brunswick. The Committee understands that this plan can only reflect the conditions that exist at the time it is written - periodic reviews and amendments of the plan are necessary, desirable and expected.

While working on this plan update, the Committee formulated a simple but significant long-range goal – that a middle school aged child can walk or bicycle safely anywhere in town. For this goal to become a reality, the Committee has identified three areas of action: Education, Enforcement, and Engineering/Planning.

The Three E's: Education, Enforcement, and Engineering/Planning

Education

By teaching pedestrians, bicyclists, and motorists to practice safe behavior while out on the town's streets, roads, and paths we can effectively create a safer, more welcoming alternative transportation network. For example, educating pedestrians to stop, look, and wave before crossing the street or teaching bicyclists the proper hand signals when making maneuvers on the road may help increase and improve communication with motorists and reduce the chance of an accident. Encouraging motorists to drive within the speed limit and respect the space of pedestrians and bicyclists could also have positive results. BBPAC is committed to public education on bicycle and pedestrian issues. Current efforts include sponsorship of television programming on public access cable and an annual family bike ride. The Committee's work is ongoing in this area.

Enforcement

While it is important to educate citizens about safe biking, walking, and driving habits, there must be effective enforcement of the rules of the road. Motorists who exceed the speed limit or fail to stop for pedestrians in crosswalks should be penalized to discourage these dangerous actions. It is also necessary that bicyclists and pedestrians be held accountable for errors on their

part. BBPAC is committed to working with the Brunswick Police Department and Town Council to promote rules and enforcement measures that will foster a safe and comfortable walking and bicycling environment.

Engineering and Planning

Efficient land use patterns and appropriate infrastructure are necessary for frequent and widespread pedestrian and bicycle activity. The underlying reason behind many of our current transportation problems is the manner in which the town has grown over the last half century. Over the course of the last century, the availability of affordable automobiles and cheap fuel, coupled with some local, state and Federal policies, has encouraged a spread out, automobile-dependent pattern of development. BBPAC supports efforts of the Planning Board and Town Council to enact policies that tend to reverse this trend. In addition to providing the physical proximity necessary to encourage human-powered travel, greater concentration of new growth within and adjacent to existing urban areas can reduce the cost of municipal services and impacts to natural resources.

While good planning is critical to attaining the Committee's goals, Brunswick's existing infrastructure can be improved and augmented to help solve immediate alternative transportation problems. The remainder of the plan describes the Committee's recommendations for physical improvements to the Town's bicycle and pedestrian facilities. The Committee has based its suggestions on six criteria:

- 1.) Safety - The degree to which the existing condition poses a threat to public safety and the degree to which a proposed route or improvement will enhance public safety.
- 2.) Access - The degree to which a proposed route or improvement will provide or enhance access to and between significant destinations (e.g. schools, recreation facilities, parks, natural areas, major employers).
- 3.) Demand - The degree to which an existing route is used and degree to which a proposed improvement will result in increased use.
- 4.) Connectivity - The degree to which a proposed route or improvement will enhance connections within the larger network of bicycle/pedestrian facilities.
- 5.) Scenic/Cultural/Historic Values - The degree to which a proposed route or improvement will preserve, enhance or degrade the town's scenic, cultural and/or historic character.
- 6.) Economic Value - The degree to which a proposed route or improvement will preserve and enhance the economic vitality of the Town.

The recommendations include projects to upgrade existing bicycle and pedestrian facilities as well as the creation of new paved shoulders, sidewalks, paths, and striping in areas that currently have no provisions for bicyclists and pedestrians. The Committee also advocates traffic calming measures in certain areas in order to enhance safety and encourage biking and walking.

In considering improvements for the plan, the Committee used the following resources:

- *Bicycle and Pedestrian Improvement Plan, 1998*
- Field inventory of existing conditions
- Input from Town Staff

III. Completed Improvements

The Committee notes that a number of improvements recommended in the *1998 Bicycle and Pedestrian Improvement Plan* have been completed. Those completed improvements are as follows: (definitions of terms can be found on page 10)

Priority One

- 1.) Paved shoulder on Maine St. from Magean/Whittier to Richards
- 2.) Bike Lane on Maine St. from Richards to Maquoit
- 3.) Establishment of a crosswalk on Maine St. in the vicinity of “Spanish Square”
- 4.) Acquisition of rights-of-way and/or easements for the College-to-Commons-to-Middle Bay Trail (a.k.a. Brunswick-to-the-Ocean Trail)
- 5.) Wide Outside Lane on McKeen St. from Maine St. to Stanwood

Priority Two

- 1.) Wide Outside Lane on Pleasant Hill Rd. from Maine St. to Freeport line
- 2.) Sidewalk on Baribeau Dr. from Columbia St. to McKeen St.

Priority Three

- 1.) Paved Shoulder on Baribeau Dr. from McKeen to Pleasant Hill
- 2.) Wide outside lane on Bath Rd. from Maine St. to Federal/Sills
- 3.) Crosswalk on Maine St. from Ft. Andross to Anniversary Park
- 4.) Paved shoulder on Bath Rd. from Old Bath Rd. to the West Bath line

Priority Four

- 1.) Signing of the portage route from Mill Street Portage to Water Street boat ramp
- 2.) Paved shoulder on Sills Dr./Rt. 123 from Bath Rd. to College St.
- 3.) Paved shoulder on Harpswell Rd. from College St. to Longfellow Ave.
- 4.) Crystal Spring Farm multi-use path (constructed by Brunswick Topsham Land Trust)

IV. BICYCLE IMPROVEMENTS

Based on its research, the Committee has established six categories of roadway improvements for bicyclists:

- 1.) **Shared Lane** - A shared lane is a travel lane shared by bicyclists and motorists and designated with “Share the Road” signs and/or bicycle route signs .
- 2.) **Wide Outside Lane** - A wide outside lane is a wider paved travel lane with or without sideline striping.
- 3.) **Paved Shoulder** - A paved shoulder is a wider paved outside travel lane with striping at least three feet from the edge of pavement.
- 4.) **Bicycle Lane** - A bike lane is a portion of the paved road (min. 4 feet) that is designated by striping, signing and pavement marking for the preferential or exclusive use of bicyclists.
- 5.) **Multi-Use Path** - A multi-use path is a route, separated from other roads by a barrier or open space that is designed to accommodate a mix of non-automotive users (e.g. walkers, runners, strollers, wheelchair users, roller skaters and bicyclists).
- 6.) **Traffic Calming Devices** – Traffic calming devices are engineered features incorporated into the design of the roadway that serve to slow vehicular traffic. Typical traffic calming devices include speed humps, speed tables, center islands, roundabouts and road markings.

Each category serves a different range of rider types. Please see Appendix A for an illustration and further description of these roadway improvements. Following is a list of recommended improvements to the roads of Brunswick based on the six criteria established in section (Use of normal type face indicates improvement requiring signage and striping only. Use of **bold** type face indicates improvements requiring additional pavement width or other construction.):

Shared Lane (with New Signage)

Jordan Ave.	Federal to Railroad Bridge
Mere Point Rd.	Middle Bay to end
Rossmore Rd.	Maquoit to Mere Point
Casco Rd.	Pleasant Hill to Bunganuc
Union St.	Mill to McKeen
Woodside Rd.	Church to Maquoit

Wide Outside Lane and/or Traffic Calming

Jordan Ave.	Railroad bridge to Pine Tree
McKeen St.	Willow to Church
Church Rd.	McKeen to Pleasant
Church Rd.	Pleasant to Pleasant Hill
Old Bath Rd.	Grover Lane to Bath-West Bath town line
Greenwood Road	Church to Hillside (Deep Cut)
Maquoit Rd.	High School Entrance to Woodside

Paved Shoulder

Middle Bay Rd.	Mere Point to Harpswell
Federal St.	Railroad bridge to Mason
Harpswell Rd./Rt 123	Longfellow Harpswell line
Thomas Point Rd.	Bath to CMP R.O.W.
Old Portland Rd./Rt. 1	Greenwood to Freeport line
River Rd.	Patricia to Durham line
Gurnet Rd./Rt. 24	Cooks Corner to Harpswell line

Bike Lane

Mere Point Rd.	Maine/Maquoit to Middle Bay
Androscoggin to Kennebec Bike Path	Extend Androscoggin River Bike Path east to West Bath line
Cooks Corner Perimete Road	Thomas Point to Medical Center
McKeen St.	Stanwood to Willow

Multi-Use Paths

- 1.) **Develop a paved "Rail and Trail" path in the MDOT rail corridor from Church Road to the Water Street end of the Androscoggin River Bike Path with a connection via the MDOT "Rockland Branch" to Edwards Field.** (A "Rail and Trail" facility is designed to accommodate bicycle and pedestrian activity along an active rail line. Regional "Rail and Trail" connections to Lewiston, Augusta and Rockland and/or Portland remain future possibilities.)
- 2.) Collaborate with Harpswell to develop an unpaved trail on the pipeline easement running from the Brunswick Naval Air Station to the former Navy fuel depot in Harpswell. (This trail would provide an alternative to Rt. 123. Although not a public right of way, this easement is currently used by bicyclists and pedestrians.)
- 3.) Develop an unpaved path along the Androscoggin River from Mill Street Portage to Coffin Pond and possible points further upriver.
- 4.) Acquire easements and/or rights-of-way and develop multi-use bridge with connecting trails between Androscoggin River Bike Path and Topsham at the former Merrymeeting Park property.
- 5.) Explore acquisition of easements and/or rights-of-way and development of "loop" trail connecting the Town Commons, Mere Point Village, Brunswick High School, Crystal Spring Farm, Mid-Coast Hospital's "Par Course" and the pathway system at the Navy's Capehart housing development.
- 6.) Extend Androscoggin River Bike Path to Bath.
- 7.) Continue steps toward long-term development of Town-wide trail system as recommended in the **2002 Parks, Recreation and Open Space Plan.**

Traffic-Calming Devices

The quality and safety of a given road as a bicycle and pedestrian facility is directly impacted by the speed of vehicular traffic on that road. The higher the vehicle speeds, the less safe and enjoyable that road is for bicyclists and pedestrians. The Committee has identified a number of roads as needing either a wide outside lane or traffic-calming measures. In instances where the addition of width to one of these roads is not practical,

the Committee believes these streets can function well as bicycle and pedestrian facilities with a reduction in traffic speeds. The Committee anticipates other instances besides those listing where traffic calming can play a key role in improving the bicycle and pedestrian environment and it will continue to make recommendations for traffic-calming devices on a case-by-case basis. The uses and descriptions of these devices are found in Appendix B.

V. PEDESTRIAN IMPROVEMENTS

Due to its relatively high density and existing network of sidewalks and crosswalks, Brunswick's in-town neighborhoods afford many residents, visitors, students and employees the opportunity to conduct their daily lives without resorting to automotive transportation. While there are important improvements to be made to the system, the Committee considers the Town's regular maintenance program to be of the utmost importance. This program includes sidewalk snow plowing, resurfacing and reconstruction, semi-annual crosswalk striping and ongoing upgrades, such as installation of tip-down curbs, designed to bring Town facilities more into compliance with Americans with Disabilities Act standards. The Committee applauds the ongoing commitment of the Town Council, the Public Works Department and private sector partners to maintain and improve our existing pedestrian network.

Brunswick's Comprehensive Plan encourages new development within the Town's growth area. Most of the undeveloped land in this area is located in and around neighborhoods that have grown up since World War II. These neighborhoods often lack sidewalks. Many of the improvements recommended by the Committee are intended to connect these newer neighborhoods with the existing sidewalk network. The Committee also notes that many residents walk along Brunswick's rural roads. While the installation and maintenance of sidewalks along these roads may not be not feasible or desirable, the Committee will seek ways to promote pedestrian safety on rural roads through a reduction of unsafe vehicle speeds. To that end, the Committee will, on an ongoing basis, explore ways to calm traffic, raise driver awareness and improve enforcement of speed limits on rural roads.

In addition to reviewing the need for extension of sidewalks along existing roads, BBPAC has considered the incorporation of pedestrian and bicycle facilities along future roads. The Road Acceptance Policy Committee and the Planning Board have incorporated BBPAC's recommendations into the draft Road Acceptance Policy. That draft policy, which details standards for new public and private roads, is currently pending before the Town Council.

Following is the Committee's list of recommendations for new pedestrian facilities.

First Priority Sidewalk Improvements (in priority order)

Jordan Ave. Sidewalks	Federal to Lori
Mill St. Sidewalks	Pleasant to Bow/Union (including Swinging Bridge approach)
Mere Point Rd. Sidewalk	One side, Maine/Maquoit to Sandhill/Seguin
Harpswell Rd. Sidewalk	West side, near Harriets Way to Jonathan Court
Gurnet Rd. Sidewalks, Phase I	West side, Cooks Corner to Forrestal Drive
Stanwood St. Sidewalks, Phase I	East side, McKeen Street to railroad

Second Priority Sidewalk Improvements

Rossmore Rd. Shared Ln	Maquoit to Mere Point
Middle Bay Rd. Paved Shoulders	Mere Point to Harpswell
Casco Rd. Shared Lanes	Pleasant Hill to Bunganuc
Church Rd. Wide Outside Lanes	McKeen to Pleasant
Federal St. Paved Shoulder	Railroad bridge to Mason
Rossmore Rd. Shared Ln	Maquoit to Mere Point
Middle Bay Rd. Paved Shoulders	Mere Point to Harpswell
Bath Rd. Multi-use Path	South side, Merrymeeting Plaza crosswalk to Cooks Corner Mall
MDOT Rail Trail Feasibility Study	Church to Water

Third Priority Sidewalk Improvements

Bath Rd. Sidewalk	South side, Sills to Pine
Boody St. Sidewalk	North Side, Spring to Maine
Church Rd. Sidewalk	West side, Owen to McKeen
Magean St. Sidewalk	South side, Barrows to Maine
Pleasant St. Sidewalk	Both sides, west to Econolodge and Dexter Shoe
River Rd. Sidewalk	West side from current terminus at Coffin Pond to Fox Run Dr.
Bath Rd. Sidewalks, Phase I	South side, Cooks Corner Mall to Medical Center
Bath Rd. Sidewalks, Phase II	North side, Merrymeeting Plaza to Old Bath
Thomas Point Rd. Sidewalks	Bath to CMP R.O.W.
Gurnet Rd. Sidewalks Phase II	East side, Cooks Corner to Ward Circle
Androscoggin River Footpath	Mill St. Portage to Coffin Pond Recreation Area
Cooks Corner Perimeter Road Sidewalks	Thomas Point to Medical Center

VI. Areas Requiring Special Consideration

Maine Street and Inner Pleasant Street

Pedestrian issues. A safe pedestrian environment in downtown Brunswick is critical to the life of our downtown. The most critical and heavily used walking zone in Brunswick is Maine Street from Bath Rd. to the Topsham line and Pleasant St. from Cushing St. to Maine St. Cars, pedestrians, and bicyclists share this area. Cars and bicyclists must travel slowly for the safety of everyone. Many improvements have been made since the original *Bicycle and Pedestrian Improvement Plan* was issued. Sidewalks have been improved, crosswalks have been added, and the police have increased their efforts to enforce speed limits. Cars now generally stop for pedestrians in crosswalks. However, the area still remains intimidating for some, and the Committee proposes to continue to work for improvements in this area.

Bicycle issues. In its current conditions, maneuvering a bicycle through the downtown section of Maine Street is difficult and is only recommended for the experienced bicyclist. The Committee recognizes the value of less-traveled alternative routes in the downtown area, including Union Street, Federal Street and Park Row. At the same time, Maine Street businesses are a frequent destination for bicyclists and the Committee will continue to work for improvements in this area.

Future Review of Maine Street Pedestrian and Bicycle Issues. The Town Council has indicated its intention to create a Committee to address Maine Street issues and that BBPAC will be represented on this Committee along with other stakeholders. BBPAC enthusiastically supports this Council initiative and stands ready to actively participate in this effort.

Outer Pleasant St. (I-95 Ramp to Cushing St.)

Pedestrian Issues. For most of the length of Pleasant Street, there are sidewalks on both sides. Unfortunately, the condition of these sidewalks is poor in many places and the location of utility poles reduces the usable width in many places. In addition to repairs to the existing sidewalk, the Committee recommends extension of the sidewalk to the Econo Lodge on the south side and Dexter Shoe on the north side. In addition, the Committee recommends that, with the advice of a traffic engineer, pedestrian crosswalks and cross signals be located along the street and in particular, at the Pleasant Street / Stanwood Street / Mill Street intersection.

Bicycle Issues. While experienced cyclists can ride along the striped sides of Pleasant Street, less experienced riders are likely to prefer the sidewalks. In addition, the Committee recommends development of a “rail with trail” multi-use path along the State of Maine railroad tracks between Church Road and Maine Street (see, State of Maine Rail Lines, below). This path would provide a bicycle-friendly alternative that would parallel Pleasant Street.

Cooks Corner Area

The Committee has developed a special set of objectives for Cooks Corner. Those objectives are reflected in the Cooks Corner Design Standards, which were incorporated into the Zoning Ordinance by the Town Council on 5/20/2002.

Androscoggin River Bike Path

This multi-use path extends along the Androscoggin River, enabling cyclists to travel from Downtown to Cook's Corner along a beautiful stretch of riverfront land. This trail is part of a larger regional vision for bicycle travel. The BBPAC plan includes recommended improvements to enhance bicycle access to the ends of the Corridor at Water Street and Grover Lane. With these improvements in place, the Corridor establishes superior connections between Brunswick, Topsham and Bath. The Corridor is seen as the first step in establishing a viable regional system for bicyclists (see East Coast Greenway, below).

BBPAC supports efforts of the Town of Brunswick and City of Bath to extend the existing bike path to establish the Androscoggin-to-the-Kennebec Bike Path between the Merrymeeting Bridge in Brunswick and the Sagadahoc Bridge in Bath. The Committee hereby endorses the recommendations of the Feasibility Study performed by T.Y. Lin Associates and Terrance Dewan Associates for extension of the bike path along the north side of Route 1 from the current terminus at Grover Lane to Congress Street in Bath.

In addition, a multi-use bridge is proposed to allow crossing the river at the location of the former Merrymeeting Park (Ormsby property). This bridge is part of a greater vision for establishment of more parkland along the bike path route and creation of a loop trail system along the Brunswick and Topsham waterfronts.

East Coast Greenway

The East Coast Greenway establishes an inter-urban bicycle route along the East Coast from Calais, Maine to Key West, Florida. The following Brunswick Route has been designated by the East Coast Greenway Alliance:

- From Flying Point Road in Freeport, turn right onto Bunganuc Road
- Right onto Woodside Road
- Left onto Maquoit Road at Wharton Point
- Left onto Maine Street
- Right onto Upper Park Row
- Right onto College Street
- Left onto Sills Drive (Rt. 123)
- Straight through intersection with Bath Road (Rt. 24) onto Federal Street
- Straight through intersection with Mason Street onto Water Street
- Continue onto Androscoggin River Bike Path at end of Water Street

Inland Option:

- Take bicycle ramp onto Merrymeeting Bridge and proceed across river into Topsham

Coastal Option:

- Continue onto Grover Lane at end of Androscoggin River Bike Path
- Left onto Old Bath Road and proceed into Bath

State of Maine Rail Lines

Several state-owned rail lines converge in Brunswick (see map page 32). An east-west line parallels Pleasant Street/Route 1, passes through the undeveloped land referred to as Maine Street Station (adjacent to Hannaford Brothers), and continues out of downtown along the north side of Bath Road. A spur line, the “Lewiston Lower”, splits off the main line near Spring Street and runs north crossing out of Brunswick on the Black Bridge on its way to Lewiston. Another line, the “Back Road”, splits off near Federal Street and runs out of Brunswick on the railroad bridge at the end of Water Street on its way to Augusta and points north and east. The main line, the “Lower Road”, continues on to Bath and Rockland. In addition to rail services, these corridors present the potential for walking and bicycling trails, separate from Brunswick's heavily traveled streets.

For example, while outer Pleasant Street is the main route into town from the west, the heavy traffic and narrow right-of-way make bicycle access difficult, at best. A parallel path within the railroad corridor would create non-vehicular access to the Pleasant Street commercial area. Also, many children and parents travel to Jordan Acres School and to the recreational facilities at Edwards Field. A properly-constructed “rail-with-trail” would provide a safe alternative to walking and bicycling on the narrow and busy Jordan Avenue. Finally, the rail corridor could also provide a direct multi-use path connection between the Mall downtown and the westerly end of the Androscoggin River Bike Path.

Any proposal for a trail in an active rail corridor must, through its design and construction, address the all-important safety issues associated with any active rail line. The realization of trails along the rail line depends entirely on the willingness of the Maine Department of Transportation to accommodate such facilities.

Trails and Greenways

While the primary transportation and recreation system for walking and bicycling in Brunswick is and will continue to be paved roads and sidewalks, an off-road system of paths often distinguishes an average experience from an extraordinary one. Brunswick already has many paths through the woods and across blocks, providing people with safety and tranquility away from vehicular traffic. Ideally there would be such an experience close to home for every resident of Brunswick. This ideal is a goal adopted by the Town Council in the *2002 Parks, Recreation and Open Space Plan*. Members of the Committee served on the Trails and Greenways Subcommittee of the Open Space Task Force and its recommendations regarding trails and greenways, as reflected in the *2002 Parks, Recreation and Open Space Plan* are hereby incorporated into this document by reference.

Of particular note are the following Plan recommendations:

- Create a “Land for Brunswick’s Future” program for acquisition of open space and recreation land.
- Designate a local non-governmental organization (NGO) to work with BBPAC on development, implementation and maintenance of a town-wide trail system.
- Develop town-wide plan for trails, sidewalks and bicycle facilities.
- Create a full-time bicycle/pedestrian coordinator position within the Department of Planning and Development.
- Produce educational material on trail routes, etiquette and volunteer opportunities.

Mill Street

The Mill Street corridor is an important entryway to Brunswick’s Downtown area. It is also the portage route for canoeists moving down the Androscoggin River who must take out at the Mill Street Portage and put in below the Brunswick Hydroelectric Station. Mill Street also provides access to one of Brunswick’s most significant bicycle and pedestrian facilities – the Androscoggin Pedestrian Bridge. Efforts to restore this historic suspension bridge, which spans the river between Topsham and Brunswick, were recently bolstered by an MDOT Enhancement Grant. Users of the bridge approaching from the Brunswick side must cross Mill Street at a point where heavy Route 1 traffic volumes and turning movements create particular challenges. The Committee recommends the Town continue to work closely with MDOT to improve pedestrian and bicycle access to the bridge.

Brunswick Schools

The social, health and economic benefits of walking and bicycling discussed in Section I, above, are particularly valuable when it comes to Brunswick’s school children. Having our students walk and bike to school can begin to address several pressing problems including childhood obesity, vehicular congestion and rising school transportation budgets. The fostering of a walking and bicycling culture among our students, parents and school administrators requires establishment of safe, efficient and attractive routes to school. While both education and enforcement efforts are key to establishing these routes, physical improvements must be made. Jordan Acres School and the Brunswick Junior High / Coffin School campus deserve particular attention in this regard. The Committee has recommended improvements near some of our schools, but it also recommends that Town Staff work closely with the School Department and the Maine Department of Transportation to identify, prioritize and fund needed improvements through the MDOT Safe Routes to School program. A general review of school-related bicycle and pedestrian issues prepared by the Pedestrian and Bicycle Information Center is included in Appendix C.

New Development

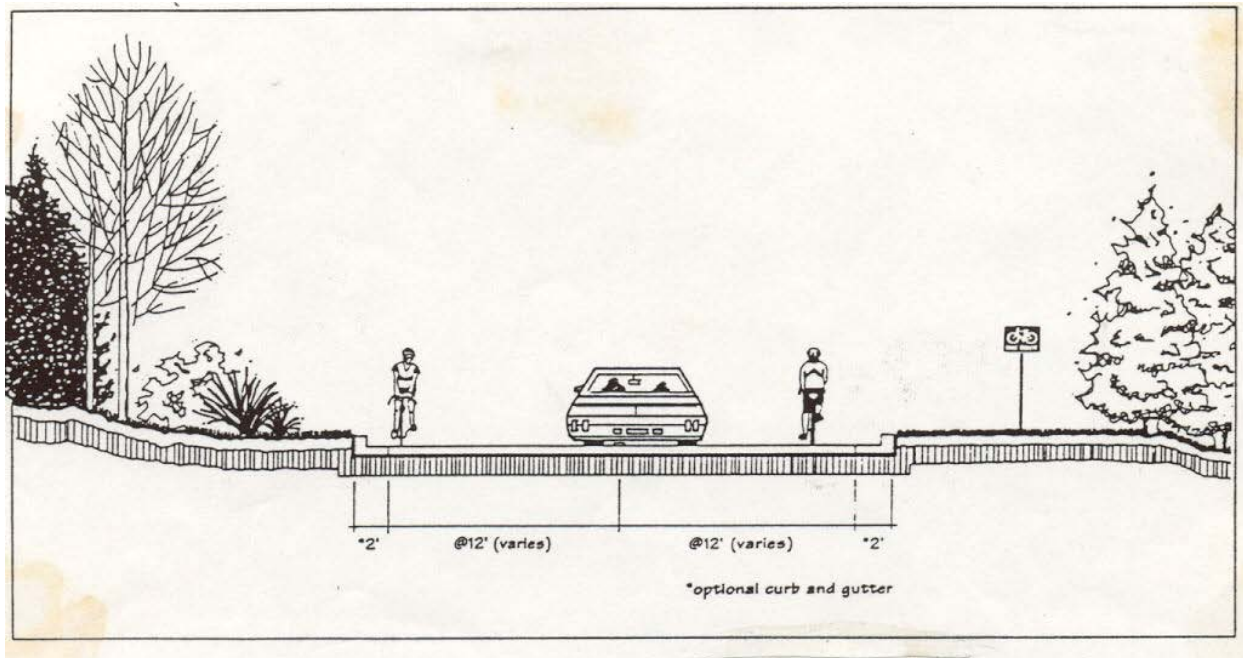
New development creates new patterns of bicycle and pedestrian traffic and new demands for bicycle and pedestrian facilities. Sometimes, new development threatens to destroy existing off-road trails that serve as important links within neighborhoods, between neighborhoods and to popular destinations such as schools and parks. The monetary, political and social costs of retrofitting bicycle and pedestrian facilities into an existing development are typically far greater than the costs of building them into the development from the start. Also, while the developer typically bears the cost of all infrastructure (including sidewalks, trails and roads) that are part of an approved subdivision or site plan, the Town is usually responsible for the cost of improvements that are made after the project is completed.

Often a proposed development will create new demands or aggravate existing problems that lie beyond the boundaries of the project. In these cases, the Planning Board can require the developer to construct, or contribute money towards a proportional share of the cost of needed improvements.

The cost to the Town of new bicycle and pedestrian improvements are great (see Appendix D) and the functional and aesthetic qualities of these facilities are superior when they are integrated into the original design of a new development. For these reasons, the Committee supports the efforts of the Planning Board to require appropriate bicycle and pedestrian facilities as part of its approval for all new subdivisions and site plans. This support extends to the imposition of impact fees or requirements for completion of off-site improvements, where applicable.

APPENDIX A: DESIGN AND ENGINEERING DETAILS

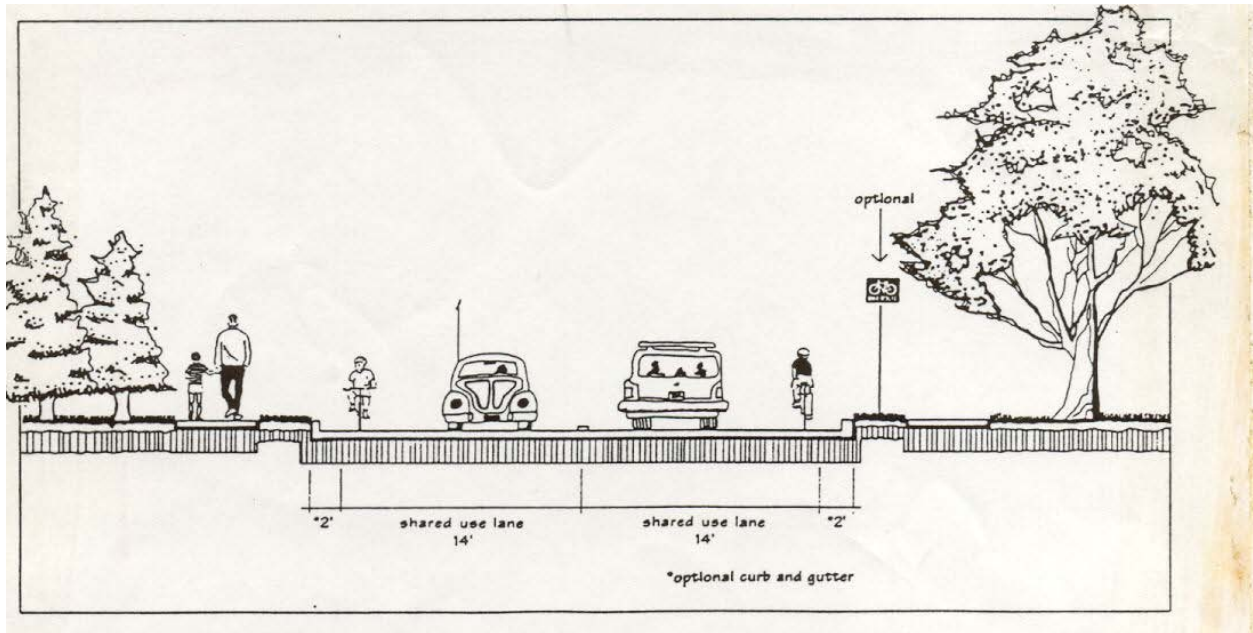
SHARED LANE



source: Portland Area Comprehensive Transportation Committee

- WHAT IS IT?** A shared lane is a travel lane shared by bicyclists and motorists and signed accordingly.
- WHERE FOUND?** Shared lanes are found on roads which cannot accommodate the separation of bicycles from automobiles. Roads chosen for shared lanes include in-town streets with narrow rights-of-way and rural roads which cannot be widened without destroying rural character and encouraging higher automobile speeds.
- WHAT CHARACTERISTICS?** Shared lanes are distinguished from all other roads by the judicious use of signage designed to heighten motorists' awareness of the presence of bicycles.
- FOR WHOM?** Shared lanes are recommended for experienced cyclists.

WIDE OUTSIDE LANE



source: Portland Area Comprehensive Transportation Committee

WHAT IS IT?

A wide outside lane is a wider paved travel lane with striping at least two feet from the edge of pavement.

WHERE FOUND?

Roads are evaluated for wide outside lanes on an individual basis. After determining the minimum width necessary for a safe auto travel lane, left over space is the wide outside lane. It should be noted that the lane should not be more than 15 feet as this allows motorists room to pass on the right. Also, greater widths encourage higher speeds so traffic calming measures (physical road improvements that tend to slow traffic) may need consideration.

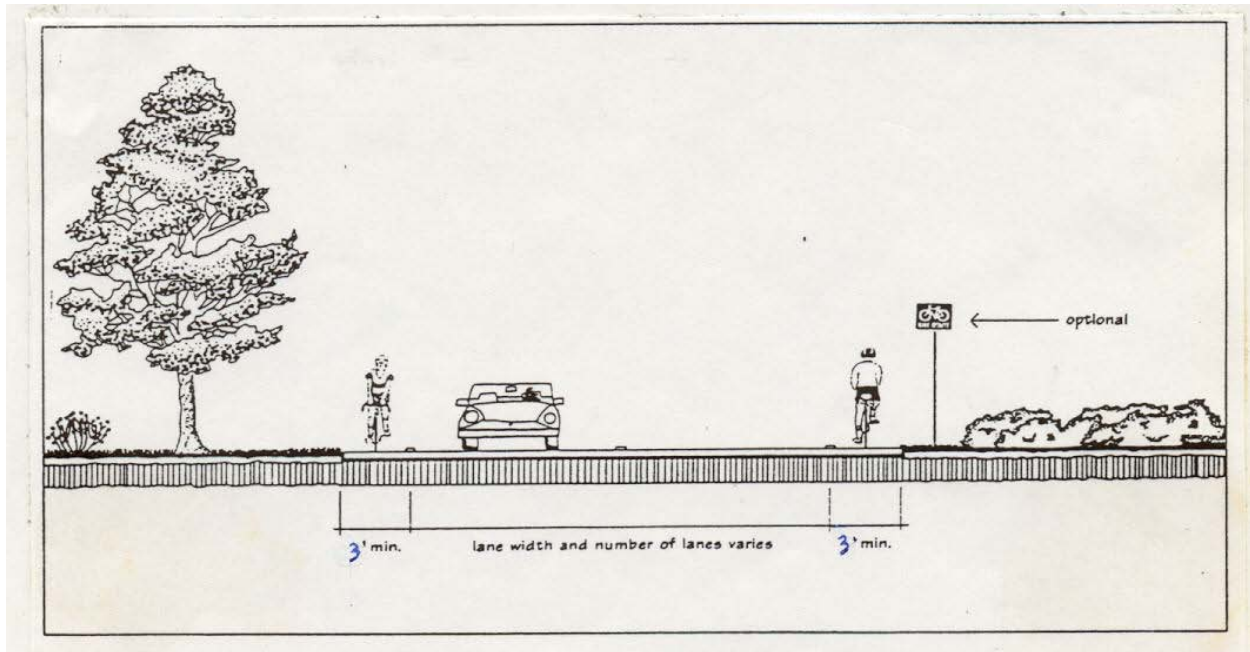
WHAT CHARACTERISTICS?

The added width (minimum 2') of a wide oversized lane is not for the exclusive use of the cyclist. Rather, it is an accommodating feature for experienced cyclists. Widths are determined in a flexible manner. In some cases, the plan recommends road widening to achieve this designation. Judicious use of appropriate signage is recommended to heighten motorists' awareness of the presence of bicyclists.

FOR WHOM?

Although wide outside lanes create a space, and a greater feeling of security, for the cyclist, they are recommended only for experienced cyclists.

PAVED SHOULDER



source: Portland Area Comprehensive Transportation Committee

WHAT IS IT?

A paved shoulder is a wider paved outside travel lane with striping at least three feet from the edge of pavement.

WHERE FOUND?

The paved shoulder is also used by cars as a breakdown lane and parking. While the safety of this treatment is questionable when cars are parked on the shoulder, there are situations where it is the only practical alternative.

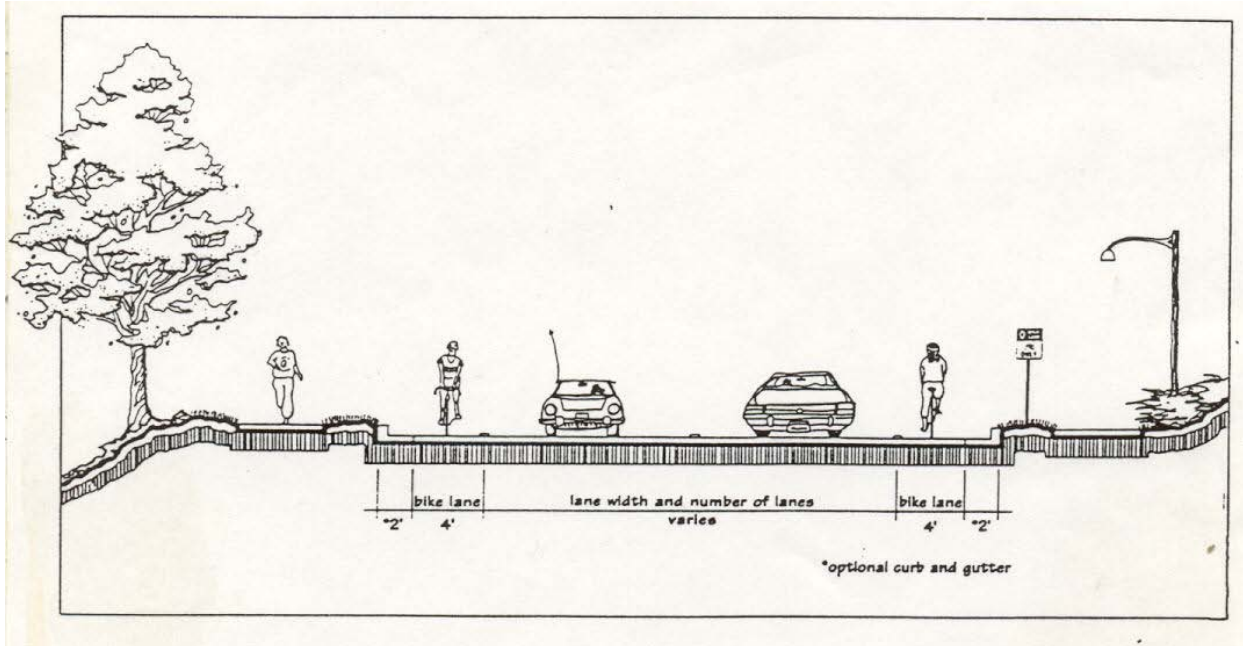
WHAT CHARACTERISTICS?

Paved shoulders provide a wider space and, therefore, a higher sense of security than the wide outside lane. However, like the wide outside lane, it is not for the exclusive use of bicyclists. Judicious use of appropriate signage is recommended to heighten motorists' awareness of the presence of bicyclists.

FOR WHOM?

Paved shoulders are recommended for experienced cyclists.

BIKE LANE



source: Portland Area Comprehensive Transportation Committee

WHAT IS IT?

A bike lane is a portion of the paved road (min. 4 feet) that is designated by striping, signing and pavement marking for the preferential or exclusive use of bicyclists.

WHERE FOUND?

Bike lanes are located on both sides of the street. Bike lanes are recommended on roads that are popular with cyclists due to their proximity to dense neighborhoods or popular destinations (e.g. schools, recreational facilities).

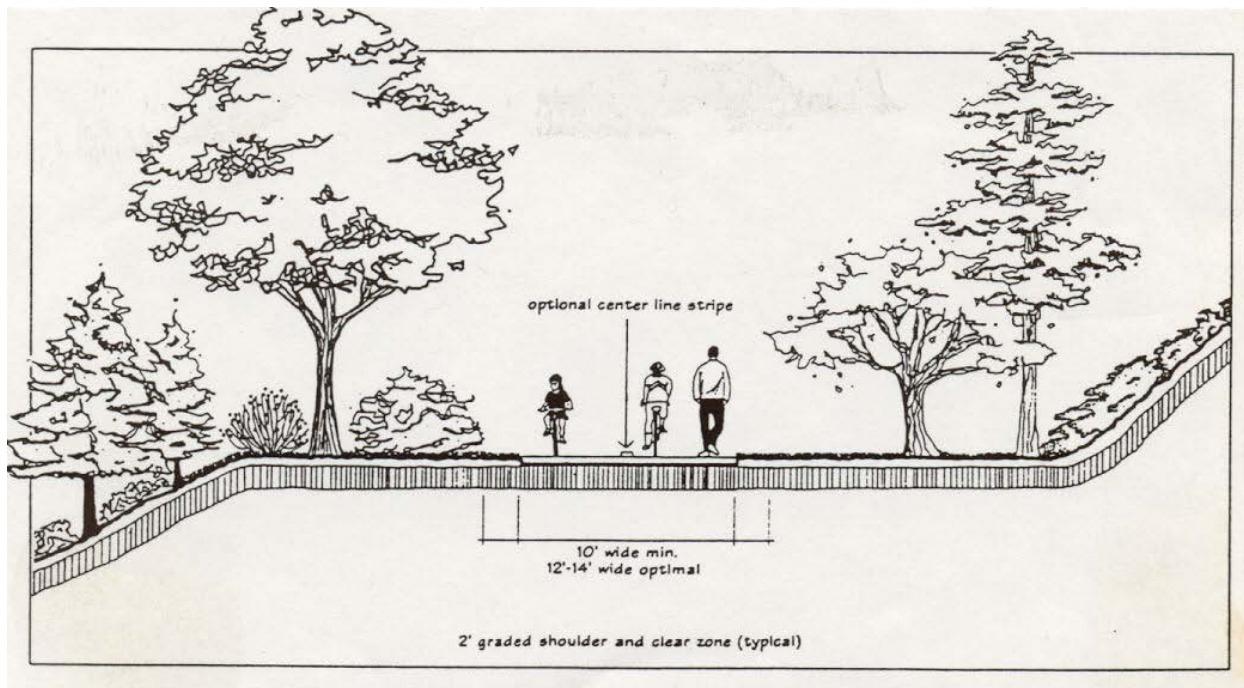
WHAT CHARACTERISTICS?

Some roads can accommodate bike lanes with the addition of striping and signage while others require pavement widening.

FOR WHOM?

The presence of bike lanes creates a high level of confidence for the bicyclist that a portion of the road is reasonably safe. Bike lanes will therefore accommodate a wide range of users and are especially recommended for intermediate cyclists

MULTI-USE PATH



source: Portland Area Comprehensive Transportation Committee

WHAT IS IT?

A multi-use path is a route, separated from other roads by a barrier or open space that is designed to accommodate a mix of non-automotive users (e.g. walkers, runners, strollers, wheelchair users, roller skaters and bicyclists).

WHERE FOUND?

Multi-use paths can be developed in a variety of settings, from railroad corridors to open space trail networks.

WHAT CHARACTERISTICS?

Multi-use paths are extremely popular exercise areas. Baxter Boulevard in Portland and the Brunswick Regional Alternative Transportation Corridor along the Androscoggin River are examples of this type of facility. Multi-use paths must have sufficient width to accommodate the variety of users.

FOR WHOM?

Education is essential to ensure a successful mix of bicycles and other users.

APPENDIX B: Traffic Calming Devices

As noted in Section IV, above, the Committee is making no specific recommendations for traffic calming devices at this time. The following information on various traffic calming measures is reprinted from the Pedestrian and Bicycle Information Center website (www.walkinginfo.org).

Traffic Calming:

Traffic calming is a way to design streets, using physical measures, to encourage people to drive more slowly. It creates physical and visual cues that induce drivers to travel at slower speeds. Traffic calming is self-enforcing. The design of the roadway results in the desired effect, without relying on compliance with traffic control devices such as signals, signs, and without enforcement. While elements such as landscaping and lighting do not force a change in driver behavior, they can provide the visual cues that encourage people to drive more slowly.

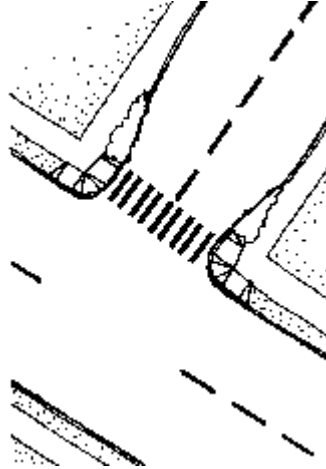
The reason traffic calming is such a powerful and compelling tool is that it has proven to be so effective. Some of the effects of traffic calming, such as fewer and less severe crashes, are clearly measurable. Others, such as supporting community livability, are less tangible, but equally important.

Treatments:

- Curb Extensions
- Choker
- Crossing Islands
- Chicanes
- Mini-Circles
- Speed Hump
- Speed Table
- Raised Intersection
- Raised Pedestrian Crossing
- Gateways
- Landscaping
- Specific Paving Treatments
- Serpentine Design
- Woonerf
- Road/Lane Narrowing

Curb Extensions:

Curb extensions — also known as bulb-outs or neckdowns — extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and reducing the time that pedestrians are in the street.



Curb extensions placed at an intersection essentially prevent motorists from parking in or too close to a crosswalk or from blocking a curb ramp or crosswalk. Motor vehicles parked too close to corners present a threat to pedestrian safety, since they block sightlines, obscure visibility of 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, as the restricted street width sends a visual cue to motorists. Turning speeds at intersections can be reduced with curb extensions (curb radii should be as tight as is practicable). Curb extensions also provide additional space for curb ramps and for level sidewalks where existing space is limited.

Curb extensions are only appropriate where there is an on-street parking lane. Curb extensions must not extend into travel lanes, bicycle lanes, or shoulders (curb extensions should not extend more than 1.8 m (6 ft) from the curb). The turning needs of larger vehicles, such as school buses, need to be considered in curb extension design.

■ Purpose

- Improve safety for pedestrians and motorists at intersections.
- Increase visibility and reduce speed of turning vehicles.
- Encourage pedestrians to cross at designated locations.
- Prevent motor vehicles from parking at corners.
- Shorten crossing distance and reduce pedestrian exposure.

■ Considerations

- Curb extensions can provide adequate space on narrow sidewalks for curb ramps and landings.
- Curb extensions should only be used where there is a parking lane, and where transit and bicyclists would be traveling outside the curb edge for the length of the street.
- Midblock extensions provide an opportunity to enhance midblock crossings. Care should be taken to ensure that street furniture and landscaping do not block motorists' views of pedestrians.
- Where intersections are used by significant numbers of trucks or buses, the curb extensions need to be designed to accommodate them. However, it is important to take into consideration that those vehicles should not be going at high speeds, and most can make a tight turn at slow speeds.

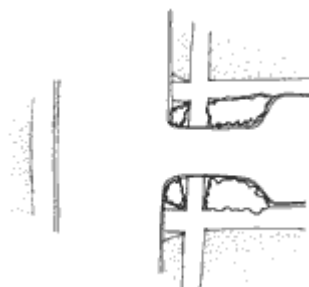
- It is not necessary for a roadway to be designed so that a vehicle can turn from a curb lane to a curb lane. Vehicles can often encroach into adjacent lanes safely where volumes are low and/or speeds are slow. Speeds should be slower in a pedestrian environment.
- Emergency access is often improved through the use of curb extensions if intersections are kept clear of parked cars. Fire engines and other emergency vehicles can climb a curb where they would not be able to move a parked car. At midblock locations, curb extensions can keep fire hydrants clear of parked cars and make them more accessible.
- Curb extensions can create additional space for curb ramps, landscaping, and street furniture that are sensitive to motorist and pedestrian sightlines; this is especially beneficial where sidewalks are otherwise too narrow.
- Ensure that curb extension design facilitates adequate drainage.

■ Estimated Cost

Curb extensions cost from \$2,000 to \$20,000 per corner, depending on design and site conditions. Drainage is usually the most significant determinant of cost. If the curb extension area is large and special pavement and street furnishings and planting are included, costs would also be higher. Costs can go up significantly if something major, such as a utility pole or controller box, is moved.

Chokers:

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



Chokers can have a dramatic effect by reducing a two-lane street to one lane at the choker point (or two narrow lanes), requiring motorists to yield to each other or slow down. In order for this to function effectively, the width of the travelway cannot be wide enough for two cars to pass: 4.9 m (16 ft) is generally effective (and will allow emergency vehicles to pass unimpeded). This kind of design is usually only appropriate for low-volume, low-speed streets.

■ Purpose

- Slow vehicles at a mid-point along the street.
- Create a clear transition between a commercial and a residential area.
- Narrow overly wide intersections and midblock areas of streets.
- Add room along the sidewalk or planting strip for landscaping or street furniture.

■ Considerations

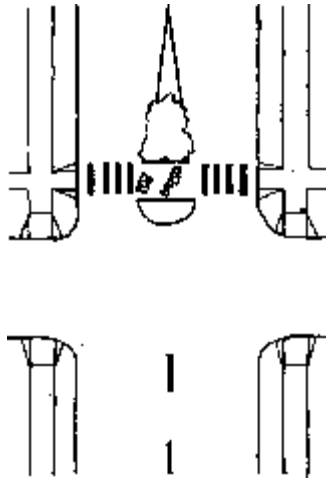
- If two travel lanes are maintained on a two-way street and/or the travel-lane widths are unchanged (at the location of the choker), it will have a minimal effect on speed.
- Consult with local fire and sanitation departments before setting minimum width.
- Ensure that bicyclist safety and mobility are not diminished.

■ Estimated Cost

\$5,000 to \$20,000, depending on site conditions and landscaping. Drainage may represent a significant cost.

Crossing Islands:

Crossing islands are also known as center islands, refuge islands, pedestrian islands, or median slow points. They are raised islands placed in the center of the street at intersections or midblock to help protect crossing pedestrians from motor vehicles.



Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and they enable them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. Where midblock or intersection crosswalks are installed at uncontrolled locations (i.e., where no traffic signals or stop signs exist), crossing islands should be considered as a supplement to the crosswalk. They are also appropriate at signalized crossings. If there is enough width, center crossing islands and curb extensions can be used together to create a highly improved pedestrian crossing. Detectable warnings are needed at cut-throughs to identify the pedestrian refuge area. This kind of facility has been demonstrated to significantly decrease the percentage of pedestrian crashes.⁽²⁾ The factors contributing to pedestrian safety include reduced conflicts, reduced vehicle speeds approaching the island (the approach can be designed to force a greater slowing of cars, depending on how dramatic the curvature is), greater attention called to the existence of a pedestrian crossing, opportunities for additional signage in the middle of the road, and reduced exposure time for pedestrians. Curb extensions may be built in conjunction with center crossing islands where there is on-street parking. Care should be taken to maintain bicycle access. Bicycle lanes (or shoulders, or whatever space is being used for bicycle travel) must not be eliminated or squeezed in order to create the curb extensions or islands.

■ Purpose

- Enhance pedestrian crossings, particularly at unsignalized crossing points.
- Reduce vehicle speeds approaching pedestrian crossings.
- Highlight pedestrian crossings.

■ Considerations

- Do not squeeze bicycle access.
- Illuminate or highlight islands with street lights, signs, and/or reflectors to ensure that motorists see them.
- Design islands to accommodate pedestrians in wheelchairs. A cut-through design such as depicted in the diagram works best if the pedestrian refuge area is identified by detectable

warnings.

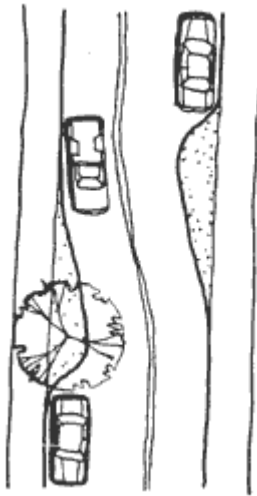
- Crossing islands at intersections or near driveways may affect left-turn access.

■ Estimated Cost

Costs range from \$4,000 to \$30,000. The cost for an asphalt island or one without landscaping is less than the cost of installing a raised concrete pedestrian island with landscaping.

Chicanes:

Chicanes create a horizontal diversion of traffic and can be gentler or more restrictive depending on the design.



Diverting the Path of Travel. Shifting a travel lane has an effect on speeds as long as the taper is not so gradual that motorists can maintain speeds. For traffic calming, the taper lengths may be as much as half of what is suggested in traditional highway engineering.

Shifts in travelways can be created by shifting parking from one side to the other (if there is only space for one side of parking) or by building landscaped islands (islands can also effectively supplement the parking shift).

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

■ Purpose

- Reduce vehicle speeds.
- Add more green (landscaping) to a street.

■ Considerations

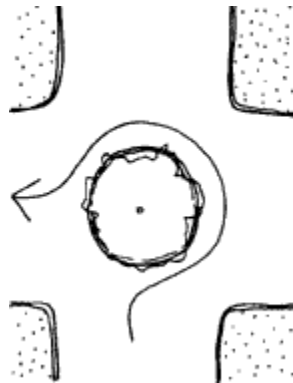
- Chicanes may reduce on-street parking.
- Maintain good visibility by planting only low shrubs or trees with high canopies.
- Ensure that bicyclist safety and mobility are not diminished.

■ Estimated Cost

Costs for landscaped chicanes are approximately \$10,000 (for a set of three chicanes) on an asphalt street and \$15,000 to \$30,000 on a concrete street. Drainage and utility relocation often represents the most significant cost consideration.

Mini Circles:

Mini-circles are raised circular islands constructed in the center of residential street intersections (generally not intended for use where one or both streets are arterial streets). They reduce vehicle speeds by forcing motorists to maneuver around them. Mini-circles have been found to reduce motor vehicle crashes by an average of 90 percent in Seattle, WA.(3) Drivers making left turns are directed to go on the far side of the circle (see diagram at right) prior to making the turn. Signs should be installed directing motorists to proceed around the right side of the circle before passing through or making a left turn. Mini-circles are commonly landscaped (bushes, flowers, or grass), most often at locations where the neighborhood has agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through specific pavement materials.



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

Mini-circles must be properly designed to slow vehicles and benefit pedestrians and bicyclists. Right-turning vehicles are not controlled at an intersection with a mini-circle, potentially putting pedestrians and bicyclists at risk. Therefore, short curb radii should complement this treatment to discourage fast right-turn maneuvers. Traffic circles with cuts in splitter islands make crossing easier for pedestrians, especially wheelchair users, and control vehicle movements entering the intersection, but require more space. Pedestrians with vision impairments will find fewer cues to identify a gap to cross when traffic does not stop.

The occasional larger vehicle going through an intersection with a traffic circle (e.g., a fire truck or moving van) can be accommodated by creating a mountable curb in the outer portion of the circle.

■ Purpose

- Manage traffic at intersections where volumes do not warrant a stop sign or a signal.
- Reduce crash problems at the intersection of two local streets.
- Reduce vehicle speeds at the intersection.

■ Considerations

- Do not make generous allowances for motor vehicles by increasing the turning radii — this compromises pedestrian and bicyclist safety.
- Larger vehicles that need access to streets (e.g., school buses and fire engines) may need to make lefthand turns in front of the circle.
- Use yield, not stop, controls.
- Mini-circle landscaping should not impede the sight distance.
- Treat a series of intersections along a local street as part of a neighborhood traffic improvement program.

■ Estimated Cost

The cost is approximately \$6,000 for a landscaped traffic mini-circle on an asphalt street and about \$8,000 to \$12,000 for a landscaped mini-circle on a concrete street.

Speed Hump:

Speed humps are paved (usually asphalt) and approximately 76 to 102 mm (3 to 4 in) high at their center, and extend the full width of the street with height tapering near the drain gutter to allow unimpeded bicycle travel. Speed humps should not be confused with the speed "bump" that is often found in mall parking lots. There are several designs for speed humps. The traditional 3.7-m (12-ft) hump has a design speed of 24 to 32 km/h (15 to 20 mi/h), a 4.3-m (14-ft) hump a few miles per hour higher, and a 6.7-m (22-ft) table has a design speed of 40 to 48 km/h (25 to 30 mi/h). The longer humps are much gentler for larger vehicles.

■ Purpose

- Reduce vehicle speeds. Raised measures tend to have the most predictable speed reduction impacts.
- Enhance the pedestrian environment at pedestrian crossings.

■ Considerations

- Do not use if on a sharp curve or if the street is on a steep grade.
- If the street is a bus route or primary emergency route, the design must be coordinated with operators. Usually, some devices are acceptable if used prudently — one device may be appropriate and may serve the primary need (e.g., if there is a particular location along a street that is most in need of slowing traffic and improving pedestrian conditions).
- The aesthetics of speed humps and speed tables can be improved through the use of color and specialized paving materials.
- Noise may increase, particularly if trucks use the route regularly.
- May create drainage problems on some streets.
- Speed humps and tables should be properly designed to reduce the chance of back problems or other physical discomfort experienced by vehicle occupants.

■ Estimated Cost

The cost for each speed hump is approximately \$1,000. Speed tables are \$2,000 to \$15,000, depending on drainage conditions and materials used.

Speed Table:

A "speed table" is a term used to describe a very long and broad speed hump, or a flat-topped speed hump, where sometimes a pedestrian crossing is provided in the flat portion of the speed table. The speed table can either be parabolic, making it more like a speed hump, or trapezoidal, which is used more

frequently in Europe. Speed tables can be used in combination with curb extensions where parking exists.

Purpose

- Reduce vehicle speeds. Raised measures tend to have the most predictable speed reduction impacts.
- Enhance the pedestrian environment at pedestrian crossings.

Considerations

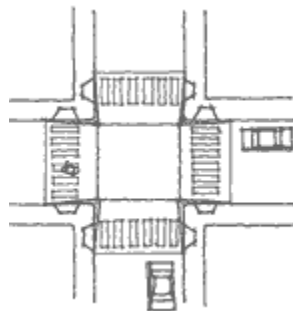
- Do not use if on a sharp curve or if the street is on a steep grade.
- If the street is a bus route or primary emergency route, the design must be coordinated with operators. Usually, some devices are acceptable if used prudently — one device may be appropriate and may serve the primary need (e.g., if there is a particular location along a street that is most in need of slowing traffic and improving pedestrian conditions).
- The aesthetics of speed humps and speed tables can be improved through the use of color and specialized paving materials.
- Noise may increase, particularly if trucks use the route regularly.
- May create drainage problems on some streets.
- Speed humps and tables should be properly designed to reduce the chance of back problems or other physical discomfort experienced by vehicle occupants.

Estimated Cost

The cost for each speed hump is approximately \$1,000. Speed tables are \$2,000 to \$15,000, depending on drainage conditions and materials used.

Raised Intersection:

A raised intersection is essentially a speed table (see, above) for the entire intersection. Construction involves providing ramps on each vehicle approach, which elevates the entire intersection to the level of the sidewalk. They can be built with a variety of materials, including asphalt, concrete, stamped concrete, or pavers. The crosswalks on each approach are also elevated as part of the treatment to enable pedestrians to cross the road at the same level as the sidewalk, eliminating the need for curb ramps. Use detectable warnings to mark the boundary between the sidewalk and the street.



Purpose

- Reduce vehicle speeds.
- Enhance the pedestrian environment at the crossings.

■ Considerations

- Don't use if on a sharp curve or if the street is on a steep grade.
- May not be appropriate if the street is a bus route or emergency route. One device may be necessary and serve the primary need. Several raised devices may be disruptive, so other measures should be considered.
- Speed tables and raised crosswalks and intersections can be an urban design element through the use of special paving materials.
- Detectable warning strips at edges enable pedestrians with vision impairments to detect the crossing.
- Care must be taken to manage drainage.

■ Estimated Cost

Raised crosswalks are approximately \$2,000 to \$15,000, depending on drainage conditions and material used. The cost of a raised intersection is highly dependent on the size of the roads. They can cost from \$25,000 to \$75,000.

Raised Pedestrian Crossing:

A raised pedestrian crossing is also essentially a speed table, with a flat portion the width of a crosswalk, usually 3.0 to 4.6 m (10 to 15 ft). Raised intersections and crosswalks encourage motorists to yield. On one street in Cambridge, MA, motorists yielding to pedestrians crossing at the raised devices went from approximately 10 percent before installation of the project to 55 percent after installation.

■ Purpose

- Reduce vehicle speeds.
- Enhance the pedestrian environment at the crossings.

■ Considerations

- Don't use if on a sharp curve or if the street is on a steep grade.
- May not be appropriate if the street is a bus route or emergency route. One device may be necessary and serve the primary need. Several raised devices may be disruptive, so other measures should be considered.
- Speed tables and raised crosswalks and intersections can be an urban design element through the use of special paving materials.
- Detectable warning strips at edges enable pedestrians with vision impairments to detect the crossing.
- Care must be taken to manage drainage.

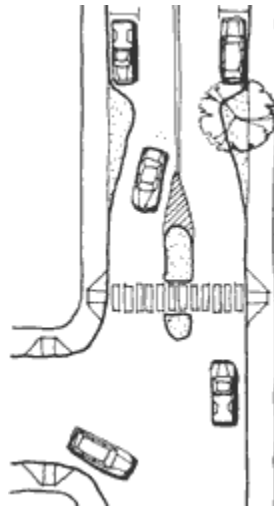
■ Estimated Cost

Raised crosswalks are approximately \$2,000 to \$15,000, depending on drainage conditions and material used. The cost of a raised intersection is highly dependent on the size of the roads. They can cost from \$25,000 to \$75,000.

Gateways:

A gateway is a physical or geometric landmark that indicates a change in environment from a higher speed arterial or collector road to a lower speed residential or commercial district. They often place a higher emphasis on aesthetics and are frequently used to identify neighborhood and commercial areas within a larger urban setting. Gateways may be a combination of street narrowing, medians, signing, archways, roundabouts, or other identifiable feature. Gateways should send a clear message to motorists that they have reached a specific place and must reduce speeds. This can help achieve the goal of

meeting expectations and preparing motorists for a different driving environment. Gateways are only an introduction and slower speeds are not likely to be maintained unless the entire area has been redesigned or other traffic-calming features are used.



Purpose

- Create an expectation for motorists to drive more slowly and watch for pedestrians when entering a commercial, business, or residential district from a higher speed roadway.
- Create a unique image for an area.

Considerations

- Traffic-slowing effects will depend upon the device chosen and the overall traffic-calming plan for the area.

Estimated Cost

Varies widely depending on the measures chosen.

Landscaping:

The careful use of landscaping along a street can provide separation between motorists and pedestrians, reduce the visual width of the roadway (which can help to reduce vehicle speeds), and provide a more pleasant street environment for all. This can include a variety of trees, bushes, and/or flowerpots, which can be planted in the buffer area between the sidewalk or walkway and the street.

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

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

Purpose

- Enhance the street environment.

- Calm traffic by creating a visual narrowing of the roadway.

■ Considerations

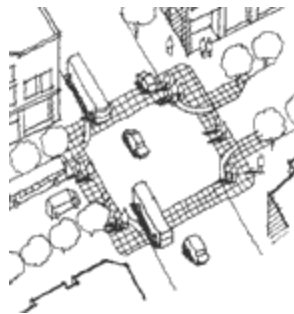
- Maintenance must be considered and agreed to up-front, whether it is the municipality or the neighborhood residents who will take responsibility for maintenance.
- Shrubs should be low-growing and trees should be trimmed up to at least 2.4 to 3.0 m (8 to 10 ft) to ensure that sight distances and head room are maintained and personal security is not compromised.
- Plants and trees should be chosen with care to match the character of the area; be easily maintained; and not create other problems, such as buckling sidewalks.

■ Estimated Cost

Opportunities for funding landscaping are often more flexible than for major street changes. For example, the cost of the actual landscaping may be paid for by the corresponding neighborhood or business groups. Often, municipalities will pay for the initial installation and homeowners associations, neighborhood residents, or businesses agree to maintain anything more elaborate than basic tree landscaping.

Specific Paving Treatments:

Paving materials are important to the function and look of a street, both in the road and on the sidewalk. Occasionally, paving materials in and of themselves act as a traffic-calming device (e.g., when the street is paved in brick or cobblestone). However, some of these materials may be noisy and unfriendly to bicyclists, pedestrians, wheelchairs, or snowplow blades. In particular, cobblestones should not be used in the expected pedestrian or bicycle path, although they may be used as aesthetic elements in a streetscape design. Smooth travel surfaces are best for all pedestrians.



The pedestrian walkway material should be firm, planar, and slip-resistant. Concrete is the preferred walking surface. A different look can be achieved by using stamped concrete or concrete pavers, which are available in a variety of colors and shapes; however, jointed surfaces may induce vibration, which can be painful to some pedestrians. They can also be used on the top of raised devices.

It is important to ensure crosswalk visibility. High visibility markings are often best. Textured crosswalks should be marked with reflective lines since these types of crosswalks are not as visible, especially at night or on rainy days.

Colored paving can often enhance the function of portions of the roadway, such as a colored bicycle lane. This can create the perception of street narrowing, in addition to enhancing the travel facility for bicyclists.

■ Purpose

- Send a visual cue about the function of a street.
- Create an aesthetic enhancement of a street.

- Delineate separate space for pedestrians or bicyclists.

■ Considerations

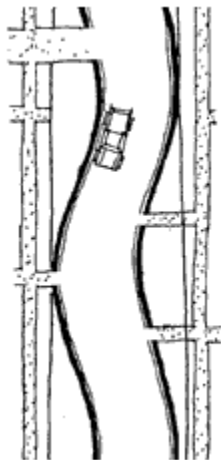
- Slippery surfaces, such as smooth granite and paint, and uneven surfaces, such as cobblestones and brick, should not be used in the primary pedestrian or bicycle travel paths. Bumpy surfaces may be especially uncomfortable for wheelchair users and a tripping hazard for all pedestrians.
- Coordinate choice and placement of materials with maintenance agencies.
- Design and maintenance must ensure crosswalk visibility over time.
- Using materials such as bricks and cobblestones may increase the cost of construction and maintenance.

■ Estimated Cost

Variable; materials requiring hand labor (cobblestones or pavers) have a higher cost.

Serpentine Design:

Serpentine design refers to the use of a winding street pattern with built-in visual enhancements through a neighborhood, which allow for through movement while forcing vehicles to slow. The opportunities for significant landscaping can be used to create a park-like atmosphere.



Such designs are usually implemented with construction of a new neighborhood street or during reconstruction of an existing street corridor. This type of design can be more expensive than other traffic-calming options and needs to be coordinated with driveway access.

■ Purpose

- Change to the entire look of a street to send a message to drivers that the road is not for fast driving.

■ Considerations

- Where costs are a concern, lower cost, equally effective traffic-calming strategies may be preferable.
- Most cost-effective to build as a new street or where a street will soon undergo major reconstruction for utility or other purposes.

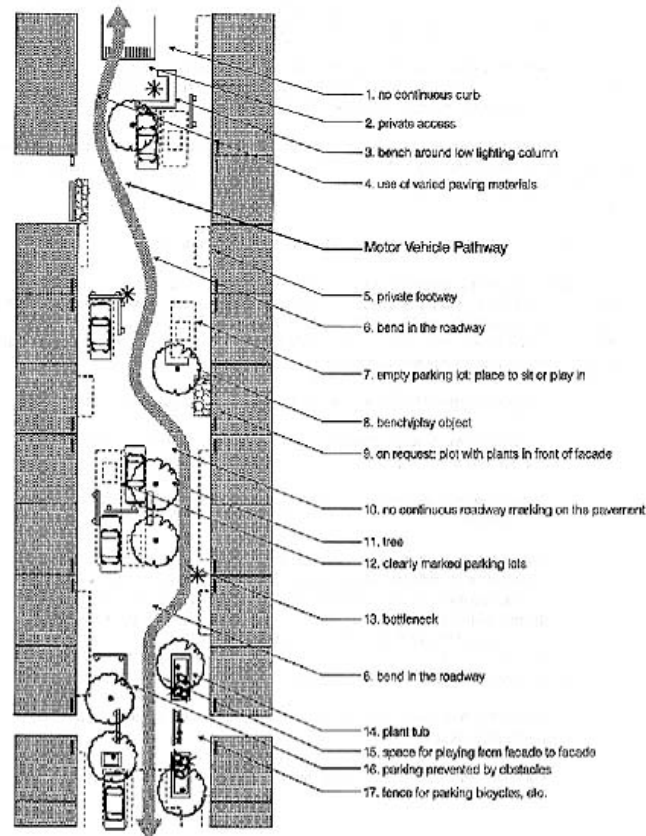
■ Estimated Cost

The cost can be high (\$60,000 to \$90,000 per block) to retrofit a street, but may be no extra to

build a new street with this design if adequate right-of-way is available.

Woonerf:

"Woonerf" ("Street for living") is a Dutch term for a common space created to be shared by pedestrians, bicyclists, and low-speed motor vehicles. They are typically narrow streets without curbs and sidewalks, and vehicles are slowed by placing trees, planters, parking areas, and other obstacles in the street. Motorists become the intruders and must travel at very low speeds below 16 km/h (10 mi/h). This makes a street available for public use that is essentially only intended for local residents. A woonerf identification sign is placed at each street entrance. Consideration must be given to provide access by fire trucks, sanitation vehicles and other service vehicles (school buses and street sweepers), if needed.



Purpose

- Create a very low automobile volume, primarily on local access streets.
- Create a public space for social and possibly commercial activities and play by area children.

Considerations

- A woonerf is generally not appropriate where there is a need to provide nonresident motorists with access to services or through travel.
- The design needs to keep vehicle speeds very low in order to make the streets safe for children.

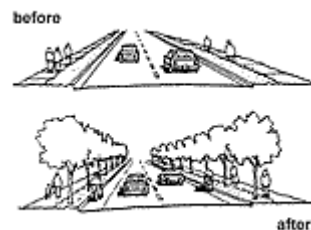
Estimated Cost

The cost to retrofit a woonerf may be quite high, but there would be no extra cost if designed into the original construction.

Roadway Narrowing:

Roadway narrowing can be achieved in several different ways:

- Lane widths can be reduced (to 3.0 or 3.4 m [10 or 11 ft]) and excess asphalt striped with a bicycle lane or shoulder.
- Travel lanes can be removed (see #10).
- The street can be physically narrowed by extending sidewalks and landscaped areas, or by adding on-street parking within the former curb lines.



This can reduce vehicle speeds along a roadway section and enhance movement and safety for pedestrians. Bicycle travel will also be enhanced and bicyclist safety improved when bicycle lanes are added.

Purpose

- Multiple benefits of lower vehicle speeds, increased safety, and redistributing space to other users.

Considerations

- Bicyclists must be safely accommodated. Bike lanes or wide curb lanes are needed if motor vehicle volumes and/or speeds are high.
- Road narrowing must consider school bus and emergency service access, and truck volumes.
- Evaluate whether narrowing may encourage traffic to divert to other local streets in the neighborhood.

Estimated Cost

Adding striped shoulders or on-street bike lanes can cost as little as \$620 per kilometer (\$1,000 per mile) if the old paint does not need to be changed. The cost for restriping a kilometer of street to bike lanes or reducing the number of lanes to add on-street parking is \$3,100 to \$6,200 (\$5,000 to \$10,000 per mile), depending on the number of old lane lines to be removed. Constructing a raised median or widening a sidewalk can cost \$62,000 or more per kilometer (\$100,000 or more per mile).

APPENDIX C:

School Zone Improvements

As noted in Section VI, above, the social, health and economic benefits of walking and bicycling are particularly valuable when it comes to Brunswick's school children. The fostering of a walking and bicycling culture among our students, parents and school administrators requires the establishment of safe, efficient and attractive routes to school. The following information on various school zone improvements is reprinted from the Pedestrian and Bicycle Information Center website (www.walkinginfo.org).

School Zone Improvements:

A variety of roadway improvements may be used to enhance the safety or mobility of children in school zones. The use of well-trained adult crossing guards has been found to be one of the most effective measures for assisting children in crossing streets safely. Sidewalks or separated walkways and paths are essential for a safe trip from home to school on foot or by bike. Adult crossing guards require training and monitoring and should be equipped with a bright and reflective safety vest and a STOP paddle. Police enforcement in school zones may be needed in situations where drivers are speeding or not yielding to children in crosswalks.

Other helpful measures include parking prohibitions near intersections and crosswalks near schools; increased child supervision; and the use of signs and markings, such as the school advance warning sign (which can be fluorescent yellow/green) and SPEED LIMIT 25 MPH WHEN FLASHING. Schools should develop "safe routes to school" plans and work with local agencies to identify and correct problem areas. Marked crosswalks can help guide children to the best routes to school. School administrators and parent-teacher organizations need to educate students and parents about school safety and access to and from school. Education, enforcement, and well-designed roads must all be in place to encourage motorists to drive appropriately.

One of the biggest safety hazards around schools is parents or caretakers dropping off and picking up their children. There are two immediate solutions: (1) there needs to be a clearly marked area where parents are permitted to drop off and pick up their children, and (2) drop-off/pick-up regulations must be provided to parents on the first day of school. Drop-off areas must be located away from where children on foot cross streets or access the school. Parent drop-off zones must also be separated from bus drop-off zones. If parents can be trained to do it right at the start of the school year, they are likely to continue good behavior throughout the year.

For a longer term solution, it is preferable to create an environment where children can walk or bicycle safely to school, provided they live within a suitable distance. One concept that has been successful in some communities is the concept of a "walking bus," where an adult accompanies children to school, starting at one location and picking children up along the way. Soon, a fairly sizeable group of children are walking in a regular formation, two by two, under the supervision of a responsible adult, who is mindful of street crossings. The presence of such groups affects drivers' behavior, as they tend to be more watchful of children walking. Parents take turns accompanying the "walking school bus" in ways that fit their schedules.

APPENDIX D:
Comprehensive List of Suggested Improvements

PROJECT	DESCRIPTION	LENGTH	COST
First Priority			
Pedestrian			
Jordan Ave.	Sidewalks Federal to Lori	4,700 lf.	\$141,000
Mill St.	Sidewalks Pleasant to Bow/Union (including Swinging Bridge approach)	2,400 l.f.	\$72,000
Mere Point Rd.	Sidewalk One side, Maine/Maquoit to Sandhill/Seguin	3,534 lf.	\$106,020
Harpswell Rd.	Sidewalk West side, near Harriets Way to Jonathan Court	2,256 lf.	\$73,500
Gurnet Rd.	Sidewalks, Phase I West side, Cooks Corner to Forrestal Drive	1,880 lf.	\$56,400
Stanwood St.	Sidewalks, Phase I East side, McKeen Street to railroad	1,410 lf.	\$42,300
Bicycle and Multi-Use			
Mere Point Rd.	Bike Lanes Maine/Maquoit to Middle Bay	4,211 lf.	\$189,495
Androscoggin to Kennebec Bike Path	Extend Androscoggin River Bike Path east to West Bath line	17,200 lf.	\$448,224 *
Jordan Ave.	Wide Outside Lanes Railroad bridge to Pine Tree	2000 l.f.	\$62,000
Jordan Ave.	Shared Lanes Federal to Railroad Bridge	1200 .f.	\$170
McKeen St.	Bike Lanes Stanwood to Willow	2600 l.f.	\$2,600
McKeen St.	Wide Outside Lanes Willow to Church	1600 l.f.	\$160
Mere Point Rd.	Shared Lanes Middle Bay to end	29,700	\$850
Second Priority			
Pedestrian			
Cumberland St.	Sidewalk One side, Cushing to Mill	930 lf.	\$27,900
Richards Dr.	Sidewalk North side, Barrows to Maine	1,500 lf.	\$45,000
Water St.	Sidewalk South side, Industry to Androscoggin River Bike Path	1,316 lf.	\$39,480
Spring St.	Sidewalk East side, Pleasant to Weymouth	1,410 lf.	\$42,300
Stanwood St.	Sidewalks, Phase II Both sides, Pleasant to McKeen	3,100 lf.	\$93,000
Gurnet Rd.	Crosswalk At Parkwood Inn		
Gurnet Rd.	Crosswalk At Perryman Drive		
McKeen St.	Crosswalk At Old Brunswick High School		
Hickory Dr.	Crosswalk At Basswood		
Bicycle and Multi-Use			
Rossmore Rd.	Shared Ln Maquoit to Mere Point	6,000 l.f.	\$170
Middle Bay Rd.	Paved Shoulders Mere Point to Harpswell	6,100 lf.	\$274,670
Casco Rd.	Shared Lanes Pleasant Hill to Bunganuc	10,000 l.f.	\$340
Church Rd.	Wide Outside Lanes McKeen to Pleasant	3,760 lf.	\$116,560
Federal St.	Paved Shoulder Railroad bridge to Mason	2,300 l.f.	\$230
Second Priority (cont')			
Bicycle and Multi-Use (cont')			
Bath Rd.	Multi-use Path South side, Merrymeeting Plaza crosswalk to Cooks Corner Mall	650 lf.	\$29,250
MDOT Rail Trail Feasibility Study	Church to Water	6,860 lf.	\$308,700
Third Priority			
Pedestrian			
Bath Rd.	Sidewalk South side, Sills to Pine	564 lf.	\$16,920
Boody St.	Sidewalk North Side, Spring to Maine	2,350 lf.	\$70,500
Church Rd.	Sidewalk West side, Owen to McKeen	3,572 lf.	\$107,160
Magean St.	Sidewalk South side, Barrows to Maine	1,690 lf.	\$50,700
Pleasant St.	Sidewalk Both sides, west to Econolodge and Dexter Shoe	800 lf.	\$48,000
River Rd.	Sidewalk West side from current terminus at Coffin Pond to Fox Run Dr.	1,880 lf.	\$56,400
Bath Rd.	Sidewalks, Phase I South side, Cooks Corner Mall to Medical Center	10,340 lf.	\$310,200
Bath Rd.	Sidewalks, Phase II North side, Merrymeeting Plaza to Old Bath	4,000 l.f.	\$120,000
Thomas Point Rd.	Sidewalks Bath to CMP R.O.W.	4,000 l.f.	\$120,000
Gurnet Rd.	Sidewalks Phase II East side, Cooks Corner to Ward Circle	6,768 lf.	\$203,040
Androscoggin River Footpath	Mill St. Portage to Coffin Pond Recreation Area	4,700 lf.	\$211,500
Cooks Corner Perimeter Road	Sidewalks Thomas Point to Medical Center	5,700 l.f.	\$171,000
Bicycle and Multi-Use			

Harpswell Rd/Rt 123 Paved Shoulder Longfellow Harpswell line 11,780 lf. \$530,355
 Church Rd. Wide Outside Lane Pleasant to Pleasant Hill 9,700 l.f. \$300,700
 Thomas Point Road Paved Shoulders Bath to CMP R.O.W. 4,000 l.f. \$180,000
 Old Bath Rd. Wide Outside Lane Grover Lane to Bath-West Bath town line 14,950 lf. \$463,790
 Old Portland Rd./Rt. 1 Paved Shoulder Greenwood to Freeport line 13,700 l.f. \$616,500
 River Rd. Paved Shoulder Patricia to Durham line 20,400 l.f. \$918,000
 Greenwood Road Wide Outside Lane Church to Hillside (Deep Cut) 5,600 .f. \$173,600
 BNAS-Harpswell Pipeline Path Multi-use path from BNAS to Harpswell line 2,820 lf. \$84,600
 Androscoggin Bike and Pedestrian Bridge Androscoggin River Bike Path to Topsham via Ormsby property
 2,000 l.f. n/a
 MDOT Rail Trail, Phase I Church to Maine 7,000 l.f. n/a
 MDOT Rail Trail, Phase II Maine to Water 5,2300 lf. n/a
 Gurnet Rd./Rt. 24 Paved Shoulder Cooks Corner to Harpswell line 19,280 lf. \$868,110
 Maquoit Rd. Wide Outside Lane High School Entrance to Woodside 7,000 l.f. \$217,000
 Union St Shared Lane Mill to McKeen 3,600 l.f. \$340
 Woodside Road Shared Lane Church to Maquoit 12,000 l.f. \$765
 Cooks Corner Perimeter Road Bike Lanes Thomas Point to Medical Center 5,700 l.f. \$256,500