APPENDIX D - RESIDENTIAL TRAFFIC MANAGEMENT

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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16. Abstract

This report provides a comprehensive reference on initiating and running a residential traffic management (RTM) program. Although aimed at smaller cities, towns and counties, the procedures are applicable in any jurisdiction. The Guidebook takes a "toolbox" approach to implementing traffic management projects, with various RTM devices and procedures being the "tools" in each box. Contents include: Introduction — a perspective on controlling traffic in residential areas; A Look at RTM — history, background and worldwide examples of RTM efforts; Getting Started — the first steps to take in starting an RTM program, and using involvement, learning and consensus building tools to build alliances; The RTM Toolboxes — a listing of RTM devices categorized by Speeding, Volume, Accidents and Miscellaneous Toolboxes; Common Design Issues — do's and don'ts for the design and installation of RTM devices; Legal Issues — authority for RTM programs under Washington state and federal statutes, regulations and case law; The Politics of RTM — a realistic look at how to make RTM a political as well as engineering success; and Concluding Thoughts — the author's view of the keys to success for an RTM program.

The Guidebook is illustrated with over 30 photographs of RTM devices in place, plus extensive references for further details.

The Guidebook includes a glossary of RTM terms, an annotated bibliography, a pictorial glossary of RTM devices excerpted from a report prepared by the City of Everett Department of Public Works, and an appendix on "Setting Up a Self-managed RTM Program in a Small Community."

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Chapter 1. Introduction

Throughout the United States citizens are asking their local officials to stop the decline in their residential environmental quality caused by excessive traffic volumes and speeding on their local streets. People are demanding actions that divert or slow the flow of cars on their streets. Many actions are available — and in choosing the best ones for an area, it is important that both local governments and citizens understand all of the issues involved.

Although many technical reports and professional references are available, they are not frequently used at the local level and their examples and recommendations are not always practical for smaller jurisdictions with limited resources.

This guidebook on residential traffic management (RTM) is intended to be an off-the-shelf resource for local jurisdictions that are looking for ways to address traffic issues on neighborhood streets. It presents a "state of the art" review of technical information in the field, and compiles key elements of successful residential traffic management programs used by local jurisdictions, primarily those in the Pacific Northwest. It is aimed at transportation professionals and citizens interested in learning more about neighborhood traffic management. As such, it functions as a "short course" on how to approach and resolve traffic problems in residential areas.

The goal of residential traffic management programs is to influence driver behavior through a variety of measures and devices, including physical, psychological, visual, social and legal means.

A Perspective on Residential Streets

The issues covered here arise from a desire for safe, functional and attractive streets in residential areas. In many communities, speeding, unnecessary through traffic, noise and air pollution, and parking problems threaten this vision. Residents also voice concerns about the safety of pedestrians, bicyclists and children. As traffic volumes grow and congestion increases on nearby through and arterial streets, these issues become more acute.

Residential streets become part of the neighborhood and are eventually used for a variety of purposes for which they were not designed. Residential streets provide direct auto access for the occupant to his home; they carry traffic past his home; they provide a visual setting, an entryway for each house; a pedestrian circulation system; a meeting place for the residents; a play area [whether one likes it or not] for the children, etc. (*Performance Streets*, Bucks County (PA) Planning Commission, Doylestown, Pa, 1980)

Residential streets do more than carry cars and provide access to homes; they are an integral part of the neighborhood environment. A residential street typically:

- provides vehicular access to abutting property,
- provides vehicular access within or through a local area,
- provides a means to enable social interaction within a neighborhood,
- often serves as a play area or as community open space,
- provides access for emergency and service vehicles, and
- contributes visually to the living environment[1].

Recognizing this multiplicity of functions, traffic engineers have developed design standards for new residential streets. Standard references emphasize that residential streets are inherently different from arterials, and they need different design and traffic control treatments. Some recent examples include *Residential Streets, Second Edition*[2], by the American Society of Civil Engineers, and the Institute of Transportation Engineers' *Residential Street Design and Traffic Control*[3] and *Traffic Engineering Handbook*[4] (citations are listed at the end of this chapter). Residential traffic management techniques have even been introduced into the standard traffic engineering curriculums[5].

Not a cure-all

RTM programs cannot solve all traffic problems in residential areas. Traffic circles, speed humps and other devices won't make up for problems caused by poor zoning and planning, or reckless driving. They also can't substitute for needed improvements on congested arterials.

Often, a residential street starts out serving a few homes in a sparsely developed area on the fringes of town, but they become a busy collector or minor arterial as development occurs. Without enough alternate routes, the through traffic on this residential street may not have anywhere else to go. A common complaint by residents in such situations is that they can't "back out onto the street from their driveway" as they did "when they first moved there."

Residential streets may also suffer from cut-through traffic trying to escape congestion on the major arterial routes nearby. While RTM techniques may slow cut-through traffic to more acceptable speeds, very little may be accomplished in terms of reducing actual traffic volumes.

Purpose of this guidebook

Technical reports and professional references on residential traffic management offer detailed and comprehensive discussions of the key issues that must be part of a RTM program. Most are technical and do not provide hands-on guidance in developing a community program.

The view of Paul C. Box, a consulting traffic engineer in Skokie, Illinois is shared by many in the profession: "I feel that the public agency should first strive to improve operation conditions [on the parallel arterials] and reduce the incentive for bypassing [congested areas] by use of local streets." (*ITE Journal*, August 1993; letter to the Editor)

Genre	Primary Functions
Home Owners	Vehicle access to abutting property.
	Vehicle access within or through local area.
Neighborhood	Provides a means to enable social interaction.
	Contributes visually to the living environment.
Children	Often serves as a play area or community open space.
Public Services	Provides access for emergency and service vehicles.

Table 1-1. Functions of a residential street

This guidebook was prepared to help transportation professionals, local jurisdictions and neighborhood residents who are looking for ways to reduce the impact of traffic in residential neighborhoods.

The guidebook covers:

- traffic control devices that can be applied to traffic problems on residential streets,
- what planning steps are needed to implement a successful RTM program,
- new developments in urban design that may affect neighborhood traffic,
- the planning and design aspects of traffic control devices as they affect traffic, emergency services, and other issues,
- the concept and practice of "traffic calming",
- the legal considerations of RTM programs, devices and systems,
- examples of Pacific Northwest RTM traffic control devices in place, and
- examples of effective RTM programs.

Starting an RTM program
Research and reference
Selecting an appropriate RTM device
Education about RTM

Table 1-2. Uses of this guidebook

Endnotes

[1] National Association of Australian State Road Authorities (NAASRA), *Traffic Engineering Practice Part 10*, "Local Area Traffic Management", Sydney, Australia, 1992.

[2] *Residential Streets, Second Edition*, ASCE, National Association of Homebuilders and the Urban Land Institute, Washington, D.C., 1990.

[3] Homburger, Wolfgang and Deakin, Elizabeth, et al., *Residential Street Design and Traffic Control*, Institute of Transportation Engineers, 1989; page 64.

[4] Institute of Transportation Engineers, *Traffic Engineering Handbook*, 5th Edition, Prentice-Hall, Englewood Cliffs, N.J., 1992.

[5] For example, see *Fundamentals of Traffic Engineering*, 12th Edition, which is a standard text for traffic engineering classes.

Chapter 2.
A Look At RTM

Programs and practices to manage traffic in residential areas have many names: neighborhood traffic control (NTC), traffic restraint, traffic calming, local area traffic management and environmental traffic management (ETM). The key words are "calming," "restraint", and "management." Nearly all RTM programs seek to make the residential streets safer and reduce traffic intrusion by reducing traffic speeds and, to a lesser extent, traffic volumes.

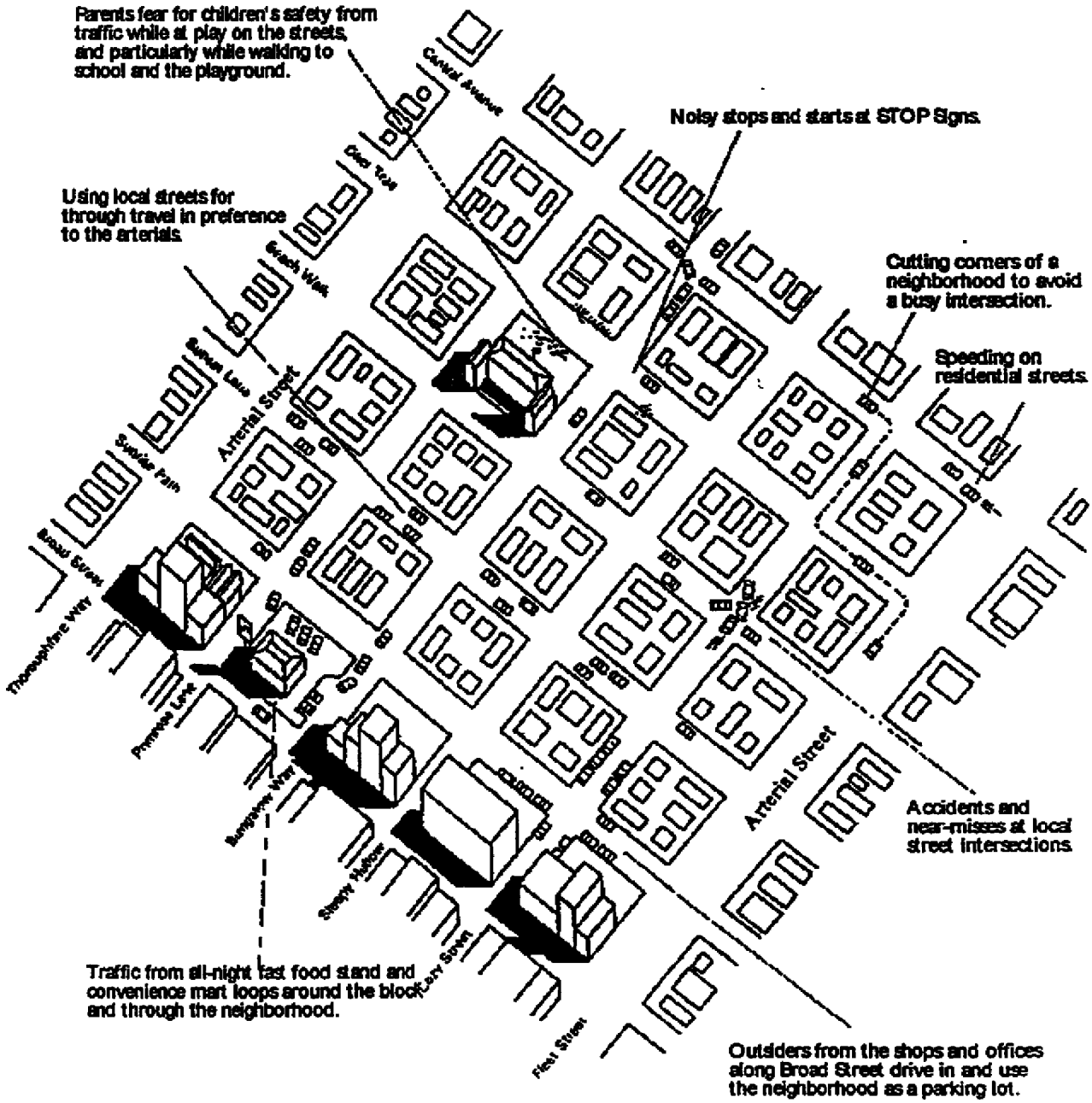
RTM – An Example

The problems with a high closely-spaced grid system in a high density urban area can be used to illustrate residential traffic management applications. As shown in Figure 2-1, cut-through traffic from the adjacent arterials (Thoroughfare Way, Fleet Street, Broad Street and Central Avenue) can impact streets designed to provide access to local residents only. The expectations of neighborhood residents to a quiet and safe environment conflict with those of motorists who believe they have the right to use any street available. In addition, commercial activities along the arterial create spill-over traffic and parking impacts on the nearby residential streets.

An example of a neighborhood traffic control plans to address these kinds of problems is illustrated in Figure 2-2. This example, from an early report on RTM techniques by Appleyard and Smith[1] for the Federal Highway Administration, shows how a series of RTM devices and control measures can work together to achieve the desired results. The resulting RTM system discourages cut-through traffic, reduces speeding and protects the residential streets from commercially-oriented traffic. Although smaller jurisdictions may not face the intensity of problems indicated in these illustrations, they provide a good overview of RTM applications.

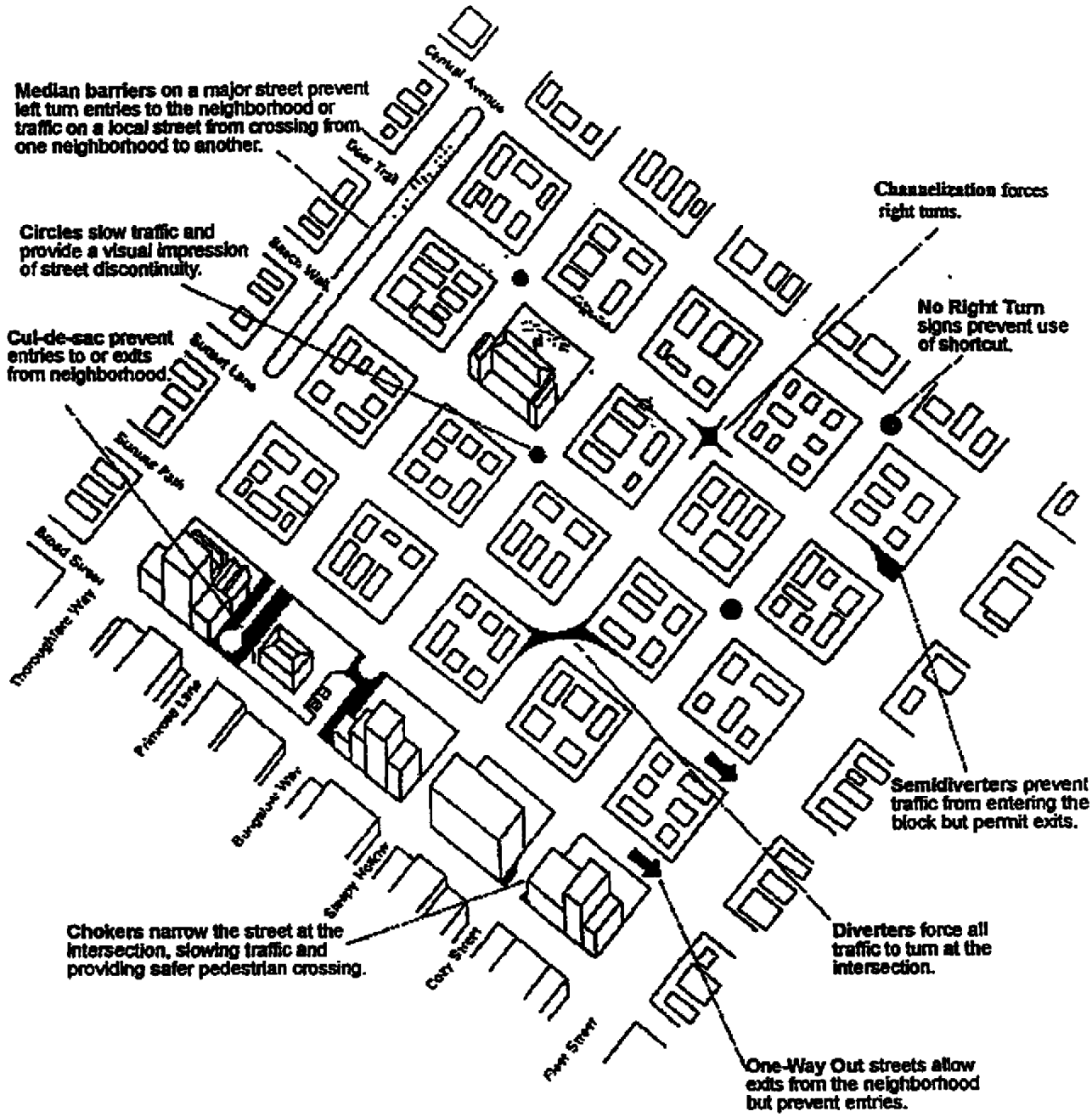
RTM – A Working Definition

Residential traffic management reduces traffic speeds, vehicle noise, visual impacts and through traffic volumes in residential neighborhoods by physical, psychological, visual, social and legal (regulatory and enforcement) means. Table 2-1 highlights some of the common actions of RTM programs.



Adapted from State of The Art Report: Residential Traffic Management; Federal Highway Administration, 1980.

Figure 2-1. Illustrative urban neighborhood and its traffic-related problems



Adapted from State of The Art Report: Residential Traffic Management, Federal Highway Administration, 1980

Figure 2-2. Illustrative residential traffic manegmment program applied to problems in Figure 2-1.

RTM programs are defined largely by their goals and objectives, and the tools used to achieve them. Typical goals are seen in the City of Portland, Oregon's, program, "Reclaiming Our Streets" which are listed below:

- **Reduce traffic speeds and volumes on neighborhood streets to make them safer for pedestrians, bicyclists and residents, with special regard for children.**
- **Increase bicyclist and pedestrian safety, and encourage cycling and walking as transportation modes.**
- **Reduce deaths, injuries and property damage resulting from driving under the influence of intoxicants and from failure to use safety restraints.**
- **Increase the use of alternative transportation while decreasing auto use.**

As summarized in Table 2-2, the tools for achieving these goals fall into four general categories:

Education, encouragement and enforcement programs such as "emphasis patrols" by local police to catch speeders, elementary school programs to teach and reinforce "defensive walking and biking habits" byschool children, or speed watch programs by residents.

Laws and ordinances - prohibiting through trucks in residential areas, posting speed limits in residential areas, on-street parking restrictions, etc.

Traffic control devices - ranging from turn prohibitions at key entry points to a succession of stop signs.

Reducing	By	Examples
Through Volumes	Physical Means	Traffic circles, speed humps
Vehicle Noise	Psychological Means	Variable-spaced paint stripes
Visual Impacts	Visual Means	Landscaping to block through views
Traffic Speeds	Social Means	Neighborhood "Speed Watch" program
Accidents	Legal means	Strict speed enforcement

Table 2-1. RTM Activities

Geometric design features - physical restrictions to induce low speed travel such as narrow streets, traffic circles or speed humps, and even traffic diverters and street closures.

Most RTM programs have similar goals and techniques, but different results are often expected. For example, European and Japanese cities strive to restrain vehicle speeds in RTM areas to 6 to 12 mph, while many communities in the US want to hold average speeds to 25 mph on local streets.

⇨ Education
⇨ Enforcement
⇨ Engineering
⇨ Enhancement

Table 2-2. The 4 E's of Residential Traffic Management

History

Traffic engineers have only recently begun to look at vehicle movements in residential areas differently than traffic flows on urban arterials. On arterial streets, the focus is on maintaining mobility for vehicles, mostly in terms of speed and efficiency of movement. Residential streets require a much different approach, with a focus on safety and access instead of through movements.

Even though they have different purposes, most residential streets were not planned much differently than the rest of the urban street system. Most streets in residential neighborhoods are laid out in either a grid or a curvilinear pattern. While curving streets are less than a century old, the grid has been around since antiquity. In the United States, the grid is the most common street pattern found in urban areas, although in some areas the natural landscape made the roads more easily laid out than built. However, a regular grid offers a potentially endless variety of alternative travel routes.

Not surprisingly, some people living within a grid system did not always like having so little control over access to their neighborhood. Looking to reduce unwanted traffic and to establish a sense of exclusivity and community, some neighborhoods in Philadelphia, Boston and New York began to put up walls and large gated entrances to set their blocks apart.

As cities grew and spread, and auto ownership increased, unwanted through traffic became more of an issue. In the late 1940s and early 1950s, Montclair, New Jersey, and Grand Rapids, Michigan, began to put in traffic diverters, and convert neighborhood access streets into cul-de-sacs. Urban redevelopment projects in the 1960s also worked to alter the grid system, often by closing streets, by rebuilding existing neighborhoods and by creating huge "superblocks" of development with few through streets.

On the other hand, the curvilinear pattern used in many subdivisions and newer neighborhoods also was having problems. The patterns varied from division to division and offered few connections to main access routes, making trips circuitous. Transit and other alternative modes proved difficult to implement and use in these neighborhoods. Bicycle and pedestrian travel also became more difficult since interconnecting paths, sidewalks and trails were not mandated in local zoning ordinances.

The First Studies

Planning guides and technical references specifically on the traffic problems of residential streets began first appearing in the early to mid 1960's. A seminal work, *Traffic in Towns*[2] by Colin Buchanan of the United Kingdom Ministry of Transport (1963), looked at the effect that suburban commuter traffic had on inner-city neighborhoods in England. Buchanan noted the threats to quality of life posed by greater congestion, air pollution, noise, and by the lower levels of safety and freedom of movement for local residents. Buchanan first introduced the concepts of "environmental traffic management" and the "environmental capacities" of residential streets.

By placing the traffic problems directly in the context of "life in the neighborhood," Buchanan pointed in the right direction. Later studies looked at the conflicts between urban mobility and neighborhood quality of life.

The Rise of Traffic Calming

"Traffic calming" for residential areas is a concept that seeks harmony between automobiles and people. Calming the traffic means to lower vehicle speeds and traffic volumes, usually through physical changes to the streets themselves and through laws on parking and speeds. With lower speeds and less through traffic, the street environment becomes more hospitable to residents, pedestrians, bicyclists and even playing children.

Traffic calming initially started out as a treatment for individual streets. However, the benefits of the managed traffic were limited mostly to those living on the affected street. Gradually, the concept was widened to include residential street networks and even main roads. Traffic calming has been applied the most in cities in Europe, and it is there that we find the broadest range of techniques.

Table 4-2
Speeding Tool Box
By Program Phase

Phase I Toolbox	Phase - II Toolbox (When Phase I Measures Fail)	
	Intersections & Entry Ways	Along the Street/Street Section
Warning, Caution Signs	Pavement pattern, texture, color variations (e.g. Cobblestone street section pseudo humps etc.)	Landscaping: foliated trees in planted strip, curb extensions, median islands. (shortens width, depth of view)
Speed limit, zone signs	Landscaping: foliated trees in circles, curb extensions, islands (Shortens width, depth of view)	Parking variants e.g. add parking, change parallel to diagonal, perpendicular, staggered, alternating
Pavement striping, marking, coloring	Raised street surface, e.g. Speed tables, thresholds of minor street	Curb extensions that don't alter number or width of lanes, e.g. protected parking
Rumble Strips	Chokers (half closures), using curb extensions to reduce turn/curb radii, lane width/number/access/egress	Median islands (lengths vary, may serve as turn barriers)
Speed Alert, (large, illuminated, roadside speed display in driver's view; shows driver's actual speed)	Traffic circles, rotaries, round-a-bouts	Raised Crosswalks
Police visibly present (enforcement)	Median islands, barriers, turn channeling	Speed humps,undulations, dips; speed tables/platforms
Speed watch/warning. Residents use radar, record license plate # of speeders, police send letter to alert/warn vehicle owners of observed vehicle speed, request compliance.	Diagonal diverters	Slow Points. Chokers, curb extensions that reduce number and or (less effectively) width of lanes; includes chicanes; are typically one lane two-way (Slow points may also be two lane two-way.)
Photo Radar. Police offsite, automatically issue tickets to owners of speeding vehicles. Photos contain pictures of license plate and occupants of the car.	Street closure	

Table 4-2. RTM Speeding Tools

Table 4-3
Volume/Cut-Through Traffic Tool Box
By Program Phase

Phase I Toolbox	Phase - II Toolbox (When Phase I Measures Fail)	
	Intersections & Entry Ways	Along the Street/Street Section
No Through Traffic signs (Traffic volume reduction is possible only if alternate routes exist)		Parking variants e.g. add parking, change parallel to diagonal, perpendicular, staggered, alternating
One-way Signs (Caution: May also increase cut-through volumes and speeding)	Chokers (half closures), using curb extensions to reduce turn/curb radii, lane width/number/access/egress	Speed humps, undulations, dips; speed tables/platforms
Speed watch/warning (effective only if cut-through time savings are related to excessive travel speeds)	Traffic circles, rotaries, round-a-bouts	Slow Points. Chokers, curb extensions
Police visibly present (enforcement)	Diagonal diverters	
Photo Radar. Police offsite, automatically issue tickets to owners of speeding vehicles. Photos contain pictures of license plate and occupants of the car.	Forced turn channelization	Median Barriers
Turn Prohibition Signs	Full Street Closure, Cul-De-Sacs	

Table 4-4
Accident Problem Tool Box
By Program Phase

Phase I Toolbox	Phase - II Toolbox (When Phase I Measures Fail)	
	Intersections & Entry Ways	Along the Street/Street Section
Speed limit, zone signs	Raised street surface, e.g. Speed tables, thresholds of minor street	Raised and landscaped crosswalks for pedestrian accidents)
Speed watch/warning. Residents use radar, record license plate # of speeders, police send letter to alert/warn vehicle owners of observed vehicle speed, request compliance	Chokers (half closures), using curb extensions to reduce turn/curb radii, lane width/number/access/egress	Speed humps, bumps, undulations, dips, speed tables/platforms (effective where accidents are speed related)
Police visibly present (enforcement)	Traffic circles, rotaries, round-a-bouts	Slow Points. Chokers, curb extensions
Warning signs	Diagonal diverters	
Stop signs	Forced turn channelization	Median Barriers
Yield signs	Full Street Closure, Cul-De-Sacs	
Turn Prohibition Signs	Flashing beacons	

Table 4-4, RTM Accident Tools

Chapter 5.
Common Design Issues

Local jurisdictions face many common issues in selecting and designing of a Residential Traffic Management program or device.

A successful RTM program and its devices should be:

- **Predictable: To ensure comparable types of traffic control devices over the entire transportation system.**
- **Based on Sound Engineering Standards: To ensure the safety of the public and limit the liability of the City.**
- **Equitable: To ensure a fair distribution of limited resources among the competing problems and among neighborhoods.**
- **Cost Effective: To get the greatest public benefit from the limited capital and maintenance dollars available to the City.**
- **Consistent: To ensure consistency with proven and accepted traffic engineering standards.**
- **Clear and concise: To be understood by the public, and easily administered by staff and officials.**

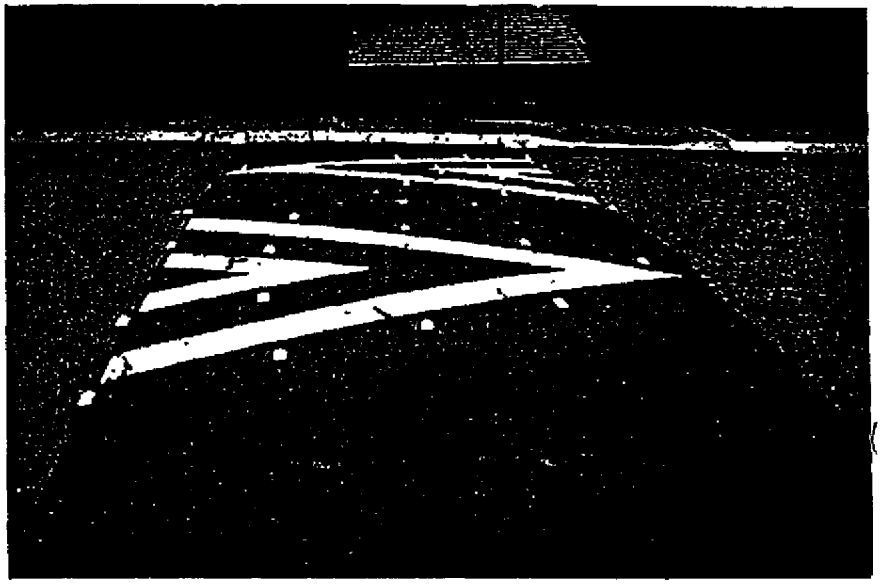


Figure 5-1a. Speed Hump Striping Pattern

Figure 5-1b. Speed Hump Edge Treatment

Guidelines

While efficiency and cost-effectiveness are important, safety is the overriding requirement in the design of local streets and RTM devices. The entire "streetscape" should create a safe environment for motorists, bicyclists, pedestrians and residents. The needs of each competing user group are balanced with the overall all goals for the street. Each element of the streetscape should contribute to the goal of maximizing personal safety, rather than the speed of car travel.

While many examples of successful RTM devices exist, a list of "off-the-shelf" devices and design standards will not produce a successful RTM program. Each situation is unique, and all design elements must be reviewed on a given street when considering RTM measures. As a minimum, the following items should be reviewed by the design professional for each RTM installation:

Geometrics

- Alignment
- Turning Radius
- Horizontal and Vertical Curves
- Superelevation
- Major geometric features such as sidewalks, curbs, etc.
- Lateral separation of modes
- Roadway Width
- Sight Distances

Safety

- Channelization
- Illumination
- Signing
- Safety Zone (clearance of obstructions from traveled roadway)
- Crosswalk Locations

Utilities

- Water and Sewer
- Franchise Utilities (such as gas, power, telephone, etc.)
- Storm Drainage
- Location of Fire Hydrants

Design vehicles

- Local emergency vehicle characteristics
- Minimum design vehicle - bus, single unit truck or passenger car
- Public transit and school bus stops and routes
- Bicycles, wheelchairs and other non-motorized devices

Other

- Landscaping
- Pedestrians and Bicycles
- Handicapped Access
- Parking
- Mail delivery routes
- Emergency Access

The requirements for these elements can be found in the design references listed in Table 5-1.

A Policy on Geometric Design of Highways and Streets, (commonly referred to as the AASHTO Green Book), American Association of State Highway and Transportation Officials.

Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration.

Washington State Department of Transportation:

- *Sign Fabrication Manual*
- *Standard Specifications for Road, Bridge, and Municipal Construction*
- *Standard Plans* for Road and Bridge Construction
- *Local Agency Guidelines*
- Local Supplements to the State's Standard Specifications and Standard Plans (varies by jurisdiction)

Table 5-1. RTM Design References

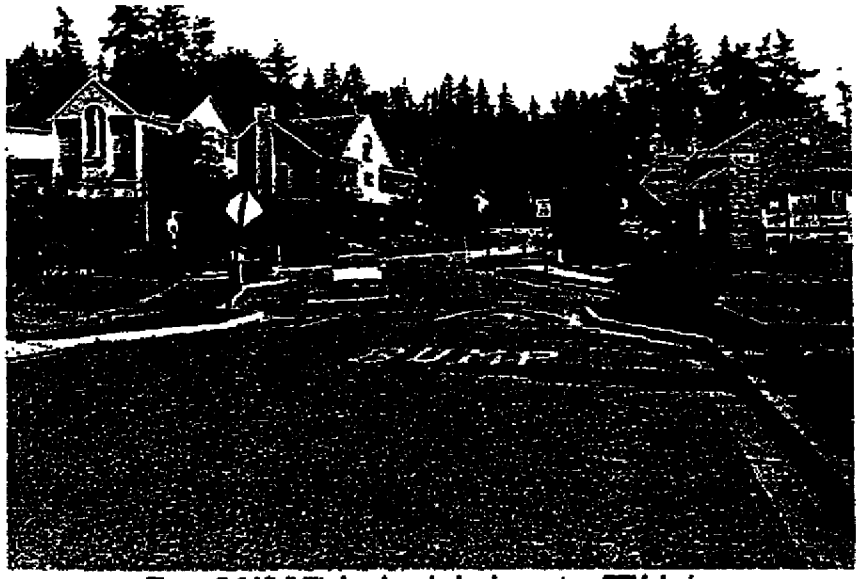


Figure 5-2 Visibility is a key design issue at an RTM device

Design Aspects of RTM Devices

This section discusses design issues related to specific RTM devices. Some common issues are:

- *Visibility.* Devices should be easily visible during day and night. Reflectors, buttons, highly reflective paint, or illumination should be used as appropriate to ensure visibility. Additionally, RTM devices should not be placed were drivers do not have adequate stopping sight distance for the desired deign speed.

- *Signage.* Advance signs should warn motorists of upcoming RTM devices and, to the extent possible, guide the motorists' response to such devices. For example, a curve sign should be placed upstream of diagonal diverters. A typical RTM warning sign is shown in Figure 5-3.

- *Streetscape.* RTM devices should blend naturally into the streetscape and enhance the appearance and "feel" of the street. They should alert drivers that they are in or entering a residential place.

- *Design vehicles.* RTM devices should be designed to accommodate emergency service and other large vehicles at an acceptable speed.

- *Maintenance.* As with any municipal project, the longer term maintenance needs should be anticipated in the design process and minimized to the extent possible. Some jurisdictions contract with the neighborhood to maintain plantings or simply eliminate planting and landscape in the absence of a willingness on the part of residents to participate.

- *Parking.* On-street parking in residential areas creates a sense of activity; some jurisdictions encourage on-street parking for this reason. However, in some instances, on-street parking also creates sight line restrictions which may be unsafe for drivers who are going too fast. Diagonal parking in selected areas can be used to slow traffic flow, since motorists must be alert to cars backing out at any time. Examples of parking options are given in Figure 5-4.

Figure 5-3. Advance warning sign

- *Speed control.* RTM devices should be located and designed to limit speeds in residential areas.

Landscaping

Neighborhood residents often insist on attractive landscaping as a component of RTM devices. Landscaping can enhance the effectiveness of traffic control devices and add to the living quality of the neighborhood. Figure 5-5 shows two approaches to landscaping traffic circles in the City of Seattle. The first, with a tree and well-established vegetation, contributes to the character of the neighborhood and reinforces the circle as an obstacle requiring low speeds to circumnavigate. The second, anchored by reflectors on a sign post, attracts little extra attention as evidenced by the dents in the guard rails and wheel marks on the curbing around the circle.

When planning landscaping, consider the following issues:

- Does the landscaping block vehicle and pedestrian sight lines?
- Does the landscaping hide pedestrians?
- Does the landscaping attract the driver's attention and induce the driver to negotiate the circle at low speed?
- Does the landscaping block illumination? The site should be visited at night to review the illumination and looking for shadows.
- How will the landscaping be maintained? Is irrigation required?

Many cities use a team approach where the neighborhood and city share the costs of installation and maintenance.

Figure 5-4a. Parallel parking on one side of the street

Figure 5-4b. Parallel parking on both sides of the street

Figure 5-4c. Diagonal parking on one side of the street.

INTERACTIVE SPEED WATCH

RUMBLE STRIPS

TRAVERSIBLE RUBBER DELINEATOR

FIGURE 1 Interactive speed watch
Bellevue, Washington

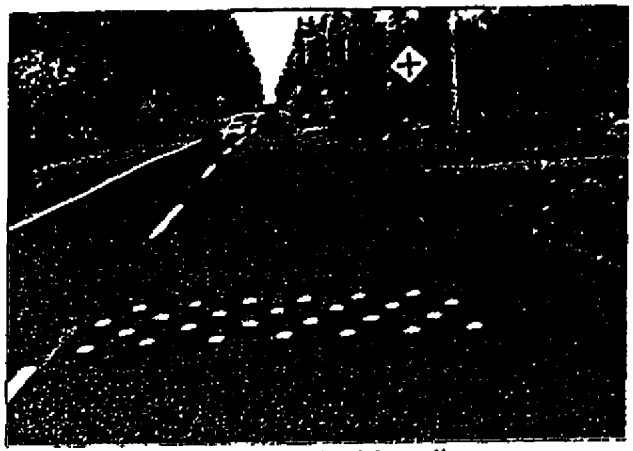


FIGURE 2 Rumble strip preceeding intersection
Bellevue, Washington

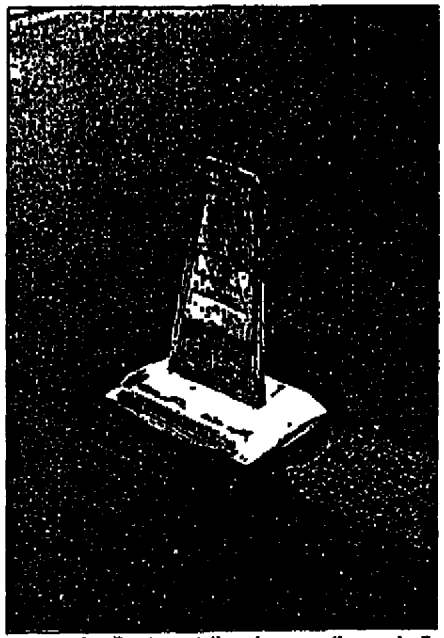


FIGURE 3 Rubber delineator on diagonal diverter
Vancouver, B.C.

Location

Bellevue, Washington
Vancouver, B.C.

Setting

Varies

TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Rumble Strips	Unlikely	Yes	Increase	Vehicles - Good Bicycles - Questionable	None	No Problems	Not Applicable	Low	Snowplow

ENTRY TREATMENT

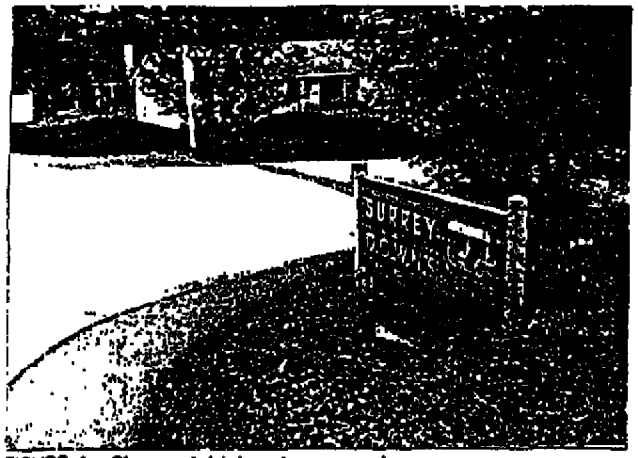


FIGURE 1 Sign and textured pavement
110th Ave. S.E. at Main St., Bellevue, Washington

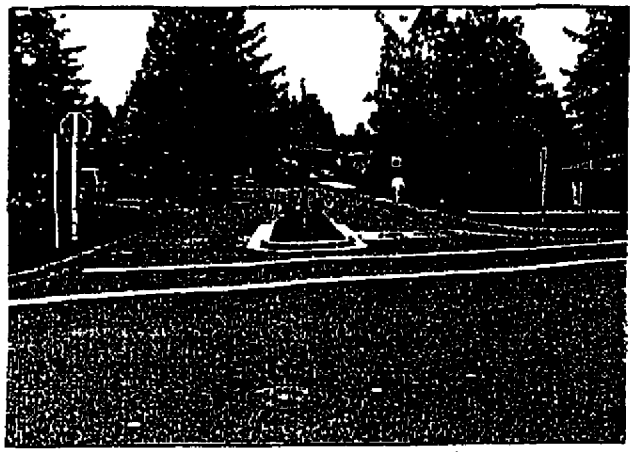


FIGURE 2 Median sign and textured pavement
S.E. 2nd Ave. at 100th Ave. S.E., Bellevue, Washington

FIGURE 3 Textured pavement, red "Bomanite"
110th Ave. S.E. at Main St., Bellevue, Washington

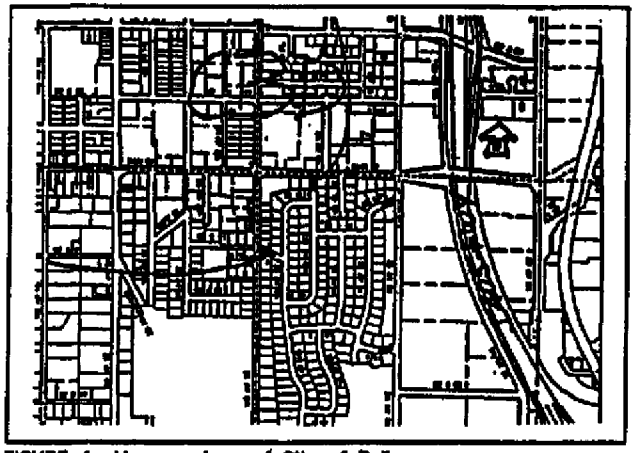


FIGURE 4 Map courtesy of City of Bellevue

Location

Surrey Downs Neighborhood
Bellevue, Washington

Setting

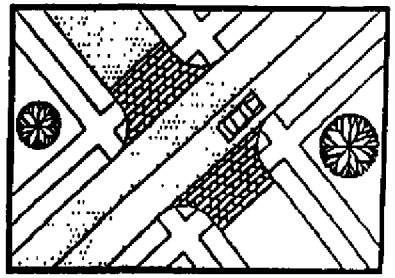
Fully developed, single family residential area, adjacent to downtown Bellevue.

Situation

Cut-thru traffic and excessive speeds. Neighbors seek to affect driver behavior by emphasizing that they are entering a "special" place.

Features

Textured, colored pavement, neighborhood identification sign, median, drought-resistant landscaping.



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST / COMPLEXITY	MAINTENANCE COST/PROBLEMS
Entry Treatment Surface & Median	Possible	Slight	No/Minor Change	Possibly Improved	None	No Problem	Not Applicable	Low to Moderate	Low to / Possible Moderate Vandalism

TRAFFIC CIRCLE

FIGURE 1 Circle sign indicates direction of travel Vancouver, B.C.

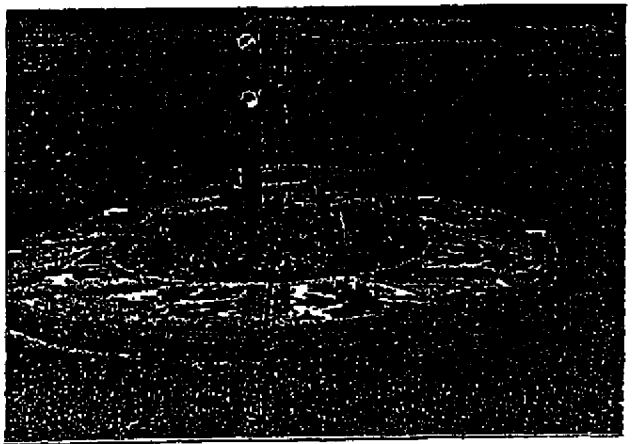


FIGURE 2 Circle detail "Mapleleaf" pavement design Mapleleaf Neighborhood, Seattle, Washington

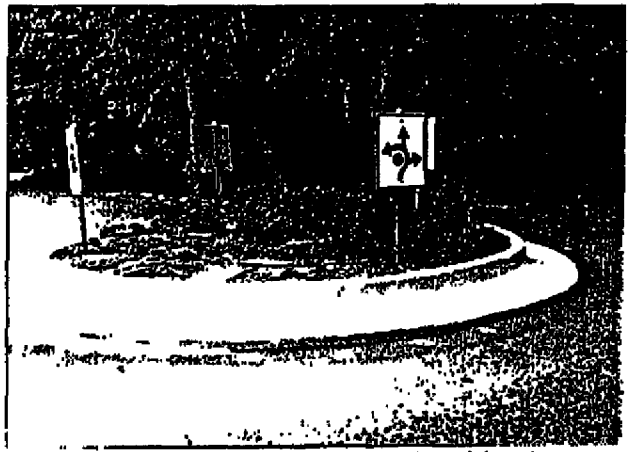


FIGURE 3 Circle sign clearly shows direction of travel N.E. area, Portland, Oregon

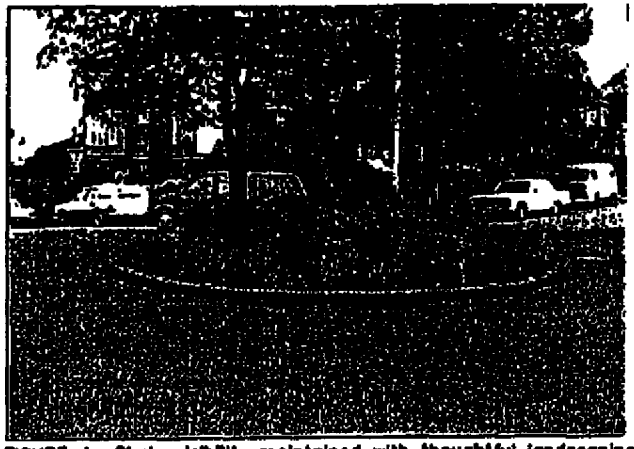


FIGURE 4 Circle visibility maintained with thoughtful landscaping, E. Highland Dr. at 16th St., Seattle, Washington

Location

Figure 1 Vancouver, B.C.
Figure 2,4 Seattle, Washington
Figure 3 Portland, Oregon

Setting

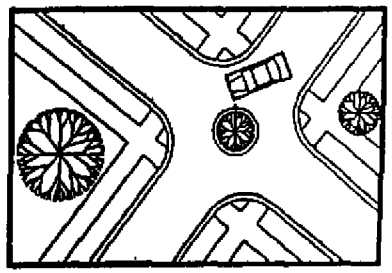
Fully developed residential areas in three Pacific Northwest cities.

Situation

All circles at intersections of local streets.
Diameter of circles varies to provide clearance.

Features

Portland and Vancouver both provide signs to indicate the desired direction of travel Seattle does not do this on local streets, but does sign for direction when circles are located on intersections of local and arterial/collector streets



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Traffic Circle	Possible	Likely	No Change	Improved	None	Some Constraint	Low	Low	Vandalism

FIGURE 1 18th Ave. E. at E. Roy St.
Capitol Hill, Seattle, Washington

FIGURE 3 Haro and Jervis
Vancouver, B.C., Canada

FIGURE 2 E Roanoke at 25th Ave. E. Eastbound
Mountlake District, Seattle, Washington

FIGURE 4 N.E. 24th Ave. at N.E. Tillamook
Portland, Oregon

TRAFFIC CIRCLES

In Three Cities

Location

Seattle, Washington
Portland, Oregon
Vancouver, B.C., Canada

Setting

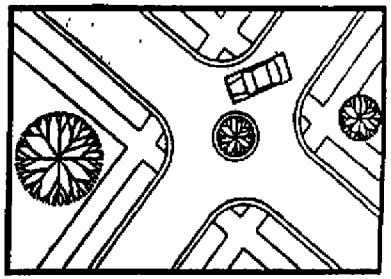
Figure 1 Old single family area near church and school; circle installed mid 1970's; Seattle, Washington
Figure 2 Affluent, single family area near Univ. of Washington and Lake Washington. Circle newly installed
Figure 3 High density, high rise near downtown Vancouver, B.C.
Figure 4 Mature, well-kept single family area; Portland, Oregon

Situation

The same problem in each city: speeding, cut-thru traffic, accidents. The circles are one of a number of devices and measures put in together to provide an area-wide remedy They are not "spot" improvements in these case

Features

All examples very well landscaped with both shrubs and trees.
Notice variation in signage, curb design, striping and use of reflectors See how shrubs are kept low and trees are pruned high to assure pedestrians and driver/auto visibility.



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST / COMPLEXITY	MAINTENANCE COST/PROBLEMS
Traffic Circle	Possible	Yes Near Circle	No Change	Improved	None	Some Constraint	Self Enforcing	Moderate to High	Moderate / Possible Vandalism

ROTARY

Moderate Size

FIGURE 1 Rotary N.E. Naomi at 17th Ave. and 63rd St. Looking east. Seattle, Washington

FIGURE 2 Rotary, N.E. Naomi at 17th Ave. and 63rd St. Seattle, Washington

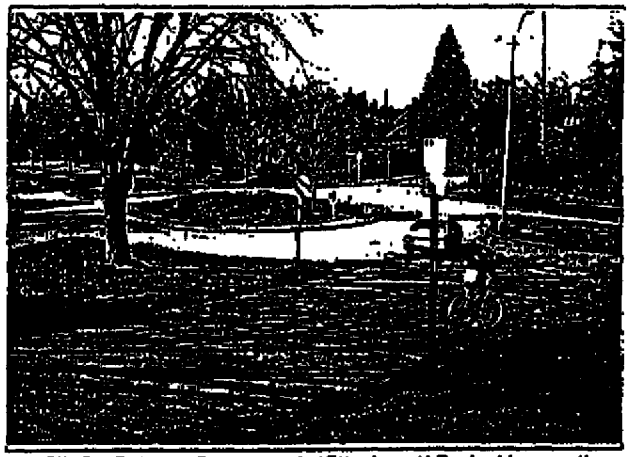


FIGURE 3 Rotary Ravenna at 17th Ave. N.E., looking north Seattle, Washington

FIGURE 4

Location

University neighborhood north of the University of Washington, Seattle, Washington

Setting

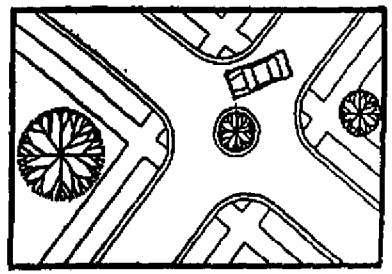
Fully developed, mature single family areas, N. Seattle.
Figure 2 Classic rotary in heavily landscaped boulevard of historic Olmsted design

Situation

Rotaries reduce head on conflicts by encouraging traffic to merge, flow in the same direction, and exit smoothly. Pedestrians must be alert to find gaps in which to cross if traffic volumes are high.

Features

Figure 1,2 Odd-shaped, landscaped rotary with walkways cutting across to accomodate pedestrians.
Figure 3 has a circumferential sidewalk It and the nearby median islands are wide and tastefully landscaped



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY AND COMPLEXITY	MAINTENANCE COST/PROBLEMS
Traffic Rotary	No	No	Mixed Results	Mixed Results	None	No Constraint	Low	High	Moderate to High / Possible Vandalism

* Rotaries are very large circles. They often substitute for traffic signals on major arterials if there is enough space available. In these neighborhood examples, however, some of the entering streets have stop signs; in many instances, rotaries function quite well without stop controls. Unfamiliar drivers discover that they take some getting used to.

FORCED TURN CHANNELIZATION

Right Turn In
Right Turn Out
Diverter

FIGURE 1 Barkley at Thurlow Looking west
Vancouver, B.C.

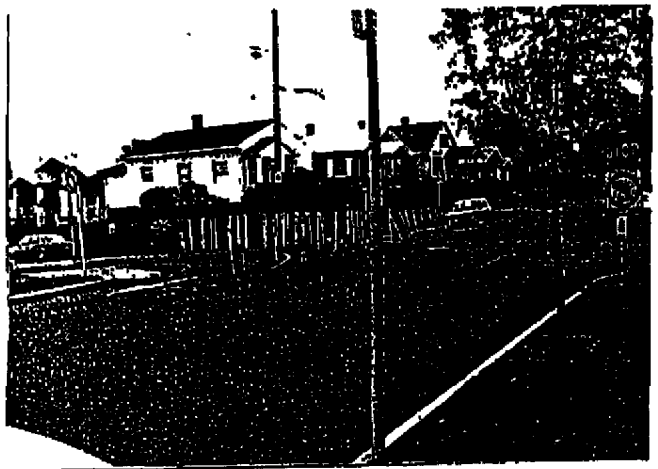


FIGURE 2 Test: Right turn in, right turn out island
N.E. Schulyer at E. 8th Ave, looking S.W.
Portland, Oregon

FIGURE 3 Barkley at Thurlow Looking east
Vancouver, B.C.

FIGURE 4 Test: Right turn in, right turn out island
N.E. Schulyer at E. 8th Ave., looking north
Portland, Oregon

Location

Westend area, Vancouver, B.C.
Northeast area, Portland, Oregon

Setting

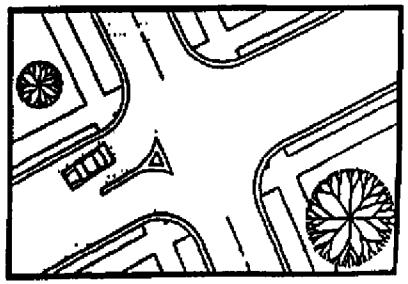
Two residential neighborhoods in two Pacific Northwest cities. In Vancouver, B.C., high population density in high and low rise buildings adjacent to downtown. In Portland, Oregon, mature urban single family area near major shopping center.

Situation

Vancouver, B.C.: High volume of cut-thru speeding traffic, often to/from hospital complex to east.
Portland, Oregon: Cut-thru, speeding traffic mostly to/from shopping complex to south

Features

Figure 1,3 raised island diverter with curb cuts, no landscaping, functional but unattractive.
Figure 2,4 Test case. Lack of bulk contributes to unappealing appearance.



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Forced Turn Channelization	Yes	Likely	Decrease	Improved	Some, No Left Turn	Minor Constraint	N/A	Potentially High	Vandalism

SPEED HUMP (BUMP)

ROAD UNDULATIONS
3 Humps In Series
With Curb Extensions

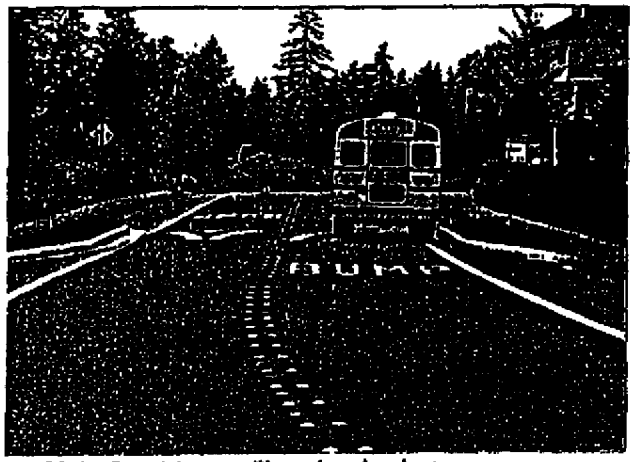


FIGURE 1 Speed hump with curb extensions
111th Ave. N.E. looking N.W., Bellevue, Washington

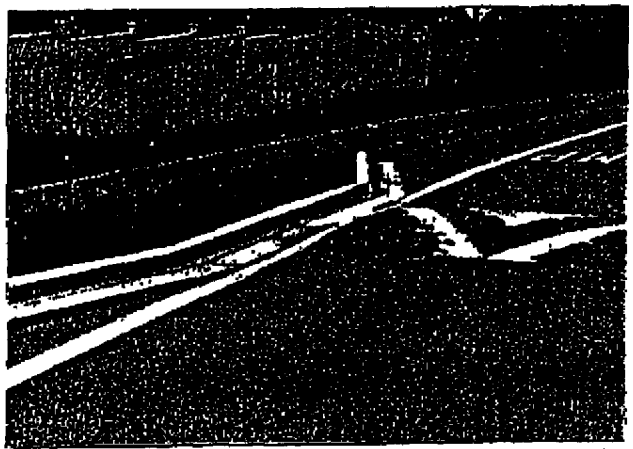


FIGURE 2 Detail curb extension to physically reduce traveled way. See tire marks on curb face.
111th Ave. N.E., Bellevue, Washington

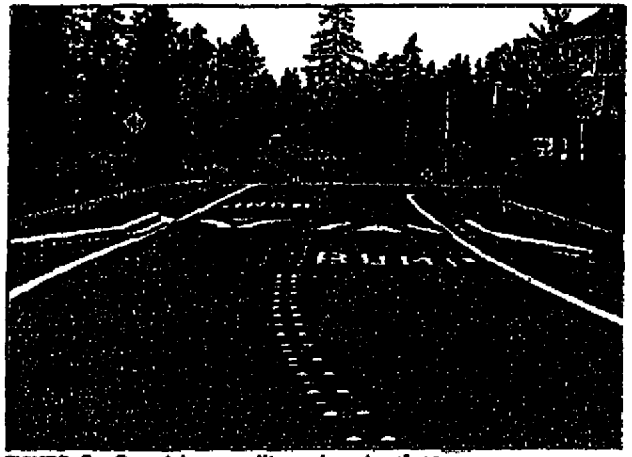


FIGURE 3 Speed hump with curb extensions
111th Ave. N.E. looking N.W., Bellevue, Washington

FIGURE 4 Grand Ave., Everett, Washington

Location

Yarrow Bay Development
Bellevue, Washington;
Grand Ave., Everett, Washington

Setting

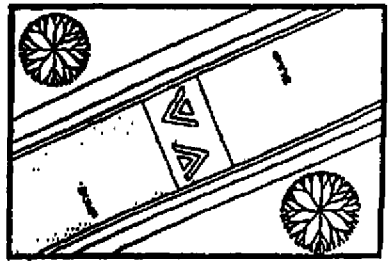
Newly developed, single family area. Condos and other multi-family dwellings along easterly portion of 111th Ave. N.E.

Situation

Cut-thru traffic, speeding
Wide street width and sweeping curves invited speeding. Rolling terrain and curves limit sight distance. Wide curb-to-curb places crossing pedestrians and school children at risk.
Speed reduced

Features

Extensive use of striping, reflectors, and buttons. Landscaped curb extensions include deciduous trees. Drought tolerant plantings maintained by neighbors Pedestrian crossing distance effectively reduced with striping.



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST / COMPLEXITY	MAINTENANCE COST/PROBLEMS
Speed Humps/ Undulations	Possible	Yes	No Change	Improved	None	Minor Constraint	Self Enforcing	Moderate	Low to / Moderate Possible Vandalism

ENTRY ISLANDS AND MID BLOCK SLOW POINT

FIGURE 1 Mid block slow point, one lane/two way
Dorffel Dr., Seattle, Washington

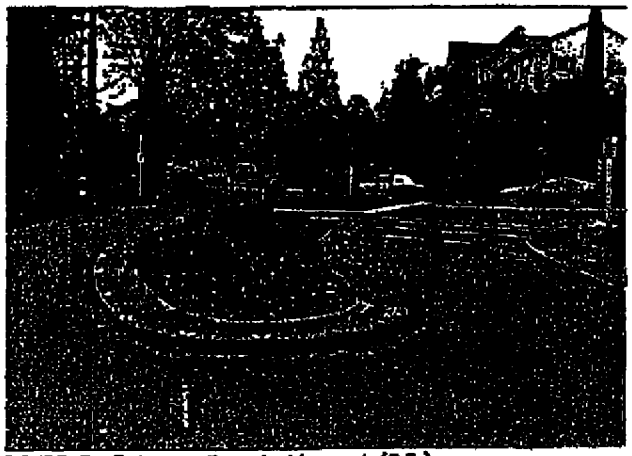


FIGURE 3 Entry median looking out (S.E.)
Dorffel Dr. at E. John and Malden Lane, Seattle, Washington

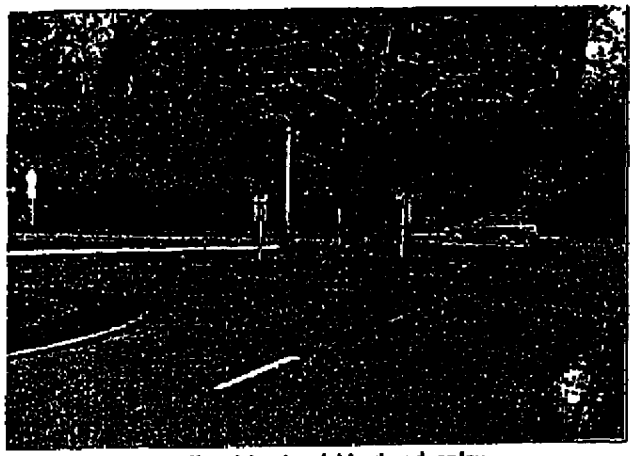


FIGURE 2 Intersection island neighborhood entry
Lake Washington Blvd. at Dorffel Dr.

FIGURE 4

Location

Lakeview Park area
Seattle, Washington

Setting

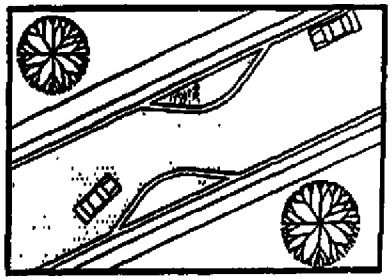
Fully developed, mature and single family residential neighborhood near Lake Washington.

Situation

Cut-thru traffic and excessive speed. Neighbors requested slow point to allow passage of only one car at a time, and the median at southeast entry to lessen collisions by slowing and guiding traffic flow.

Features

Offset slow point and entry islands, all landscaped.
Slow point and island have irrigation system



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS

CHICANE

Alternating Barriers

Reduce 2 Lane, 2 Way to 1 Lane, 2 Way

FIGURE 1 Approaching vehicle, requires driver decision. Who is to give way? 70th Ave., westbound

FIGURE 2 Open lane ahead; N.E. 70th St. west of 15th Ave. N.E., westbound

FIGURE 3 N.E. 70th St. at 15th Ave. N.E.; Looking west

FIGURE 4 N.E. 70th St. just west of 15th Ave. N.E., westbound

Location

North of the Univ. of Washington, east of I-5 freeway and the Green Lake area of Seattle, Washington.

Setting

Fully developed, urban area in corridor serving heavily traveled freeway.

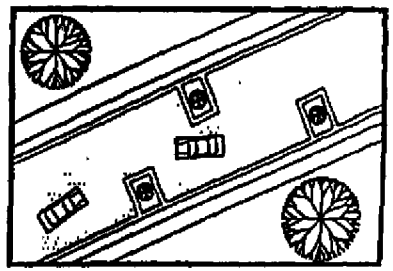
Situation

Three chicanes on 70th St. N.E. just west of 15th Ave. and another three farther down the street just east of 12th Ave. have been very effective in reducing cut-thru traffic volumes. Speeding has also diminished

70th Ave. to the west provides one of several I-5 freeway crossings in the vicinity It is fed by an I-5 off-ramp serving south, west, and eastbound freeway exits

Features

Basic landscaping and fencing (6x6 posts, 2x6 laterals), provided by the city is maintained by neighbors (who also painted fence). The solid appearance and use of reflectors and signs has proven effective, safe and popular with residents along the street. Boisterous negotiations between drivers going in opposing directions have been reported.



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Chicane (Fort)	Yes	Yes	Decrease	Mixed Results	None	Minor Constraint	Not Applicable	Moderate to High	Moderate / Possible Vandalism

CHOKERS
LANE REDUCTION

Passage For One Vehicle At A Time

FIGURE 1 Interlaken Blvd. east of 24th Ave. E. Bridge reduced to one lane

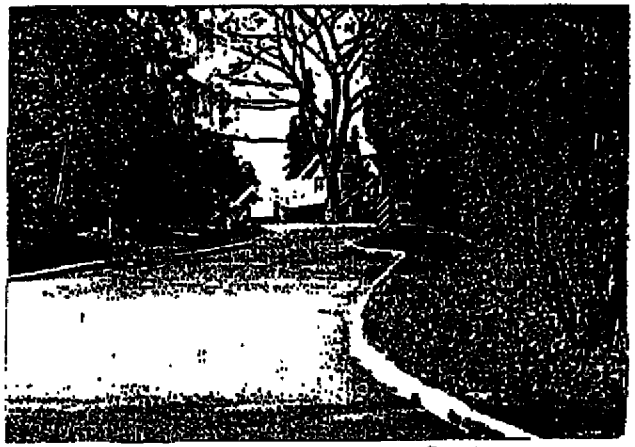


FIGURE 2 Interlaken Blvd. near 24th Ave. E., when southeast bound, entering series of choke points.

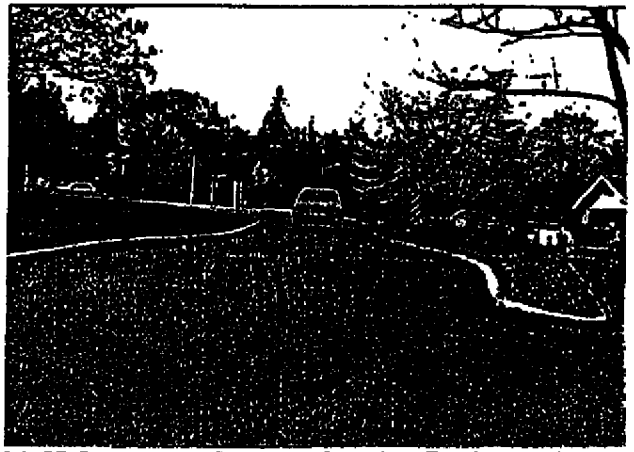


FIGURE 3 Interlaken Blvd. near 24th Ave. E., when northwest bound, exiting series of choke points

FIGURE 4 Interlaken Blvd.

Location

West of Washington Park
Seattle, Washington

Setting

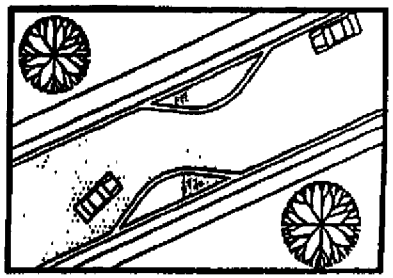
Fully developed, mature single family area. Houses abut linear parkway

Situation

Congestion on the few alternative routes attracted commuter cut-thru traffic
Series of chokers effectively reduced speed and volume of traffic. Strenuous opposition is slowly abating (1991), but drivers often "honk" (day and night) to warn opposing vehicles approaching single lane bridge. Honking upsets neighbors.
"Perfect" solution yet to be achieved

Features

Landscaping on chokers and bridge approaches retains flavor of original "Olmstead" boulevard design.



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Choker Lane Reduction	Possible	Yes	Decrease	Improved for Pedestrians	None	No Problems	Initially High Now Routine	Moderate to High	Possible Vandalism Moderate

HALF CLOSURE

Test Exit Only
Semi-Diverter/Choker

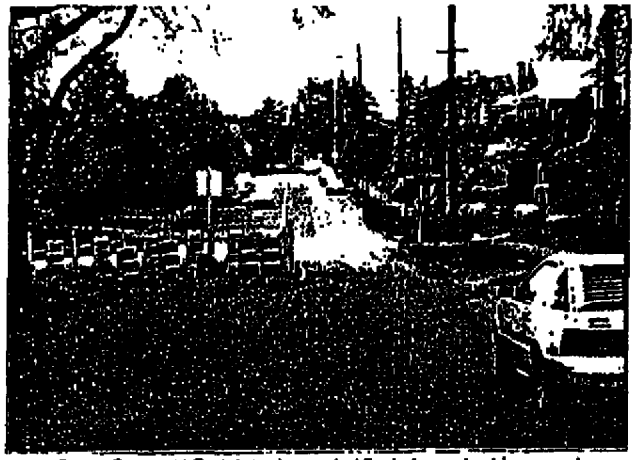


FIGURE 1 Test N.E. Wistaria and 42nd Ave., looking west

FIGURE 3 Test N.E. Wistaria and 42nd Ave., looking east

FIGURE 2 Test N.E. Knott at 42nd Ave., looking east

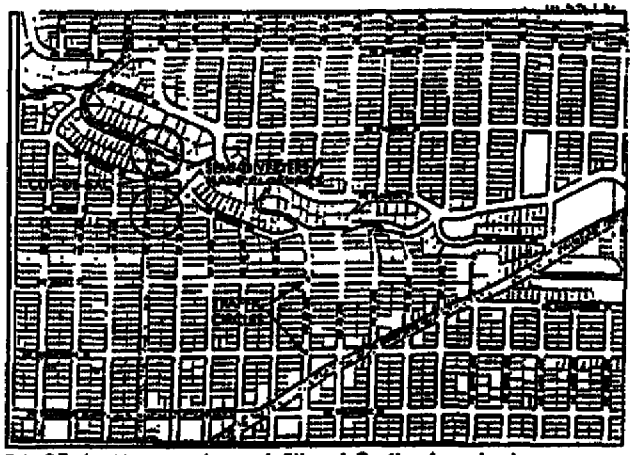


FIGURE 4 Map courtesy of City of Portland, revised

Location

Northeast Portland, Oregon

Setting

Fully developed, well maintained, single family residential area

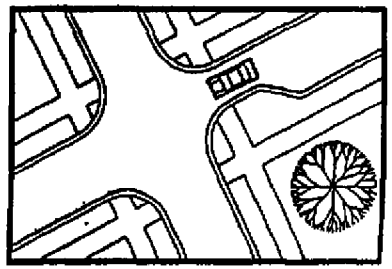
Situation

Cut-thru traffic uses local streets
Two half closures and one full closure/ cul-de-sac have been temporarily installed to assess their deterrent effect

Features

Highly visible, well signed barriers are successful in appearing both massive and temporary.

TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Half Closure (Semi-diverter)	Yes	Likely	Decrease	Improved	Restricted One Direction	Minor Constraint	Potentially High	Moderate	Low to Moderate / Possible Vandalism



HALF CLOSURE

EXIT ONLY
Semi-Diverter
/Choker

FIGURE 1 Half closure, 4th St. at 100th Ave. N.E., looking northwest, Bellevue, Washington

FIGURE 3 N.E. 4th St. at 100th Ave. N.E. looking east Bellevue, Washington

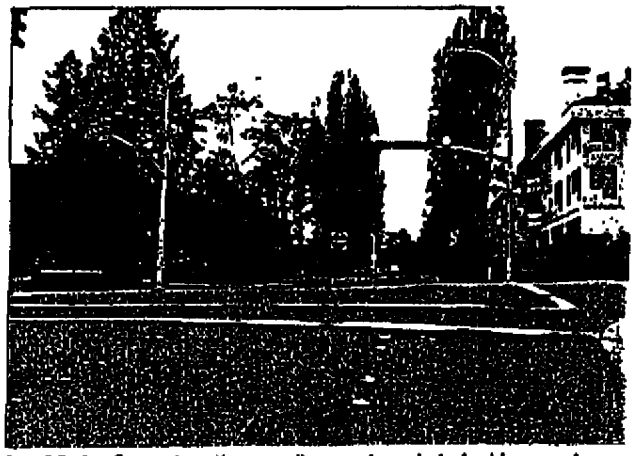


FIGURE 2 Same location as figures 1 and 4, looking west

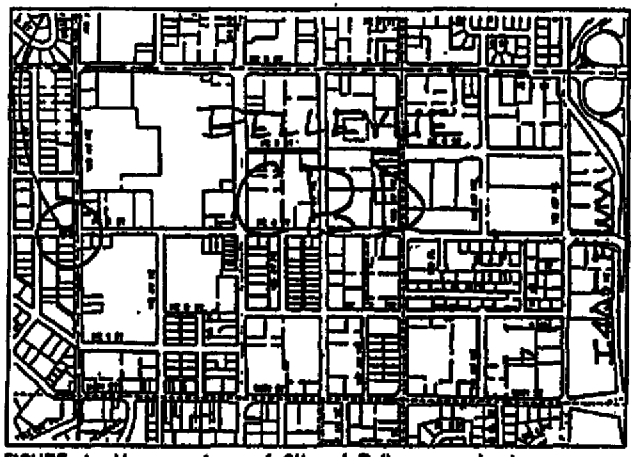


FIGURE 4 Map courtesy of City of Bellevue, revised

Location

West of downtown
Bellevue, Washington

Setting

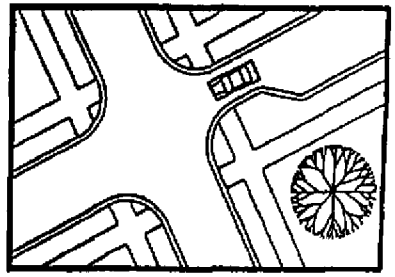
Transition block, senior housing condominiums and apartments between downtown Bellevue and single family area to west

Situation

Heavy two-directional traffic to and through neighborhood. Pedestrians at risk
Exit-only half closure installed
Reduced volume; shifted and split entering traffic among alternative routes nearby.
Pedestrians also benefit from reduced crossing distance on west side of 100th Ave

Features

Curb extended to close off entry lane
Irrigated landscaping, ample signage, pedestrian activated signal



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Half Closure/ Semi-Diverter	Yes	Likely	Decrease	Improved	Restricted to One Direction	Minor Constraint	Potentially High	Low to Moderate / Possible Vandalism	Moderate

SEMI-DIVERTER PARTIAL CLOSURE

Intersection Re-Design

Figure 1 N. Willamette Blvd. at N. Portland Blvd. Looking southwest

Figure 2 N. Willamette Blvd. at N. Portland Blvd. Looking northwest

Figure 3 N. Willamette Blvd. at N. Portland Blvd. Looking south

Figure 4

Location

Along bluff east of and above Swan Island Industrial Park and the Willamette River in the north area of Portland, Oregon

Setting

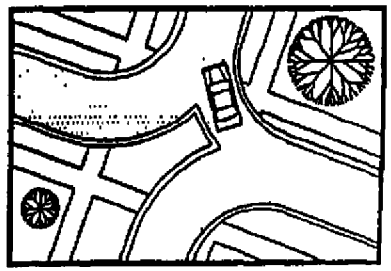
Mature, fully developed, mostly single family residential area Residences are on bluff on east side of street facing westerly view over the street toward Forest Park on the west Portland hills across the Willamette River below

Situation

Cut-thru and speeding traffic caused neighbors to south to seek remedy
The semi-diverter forces south bound traffic originating from the north to flow eastward toward the Portland Blvd interchange with the I-5 freeway.

Features

Dense, yet tasteful landscaping reinforces change of direction.
Curb cut walkway accesses blufftop trails



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Semi Diverter	Yes	Likely	Decrease	Improved	Restricted	No Problems	Moderate	Potentially High	Vandalism

DIAGONAL DIVERTER

FIGURE 1 Diagonal diverter at Gilford and Pendrell, looking east

FIGURE 2 Diagonal diverter at Bute and Pendrell, looking south on Bute

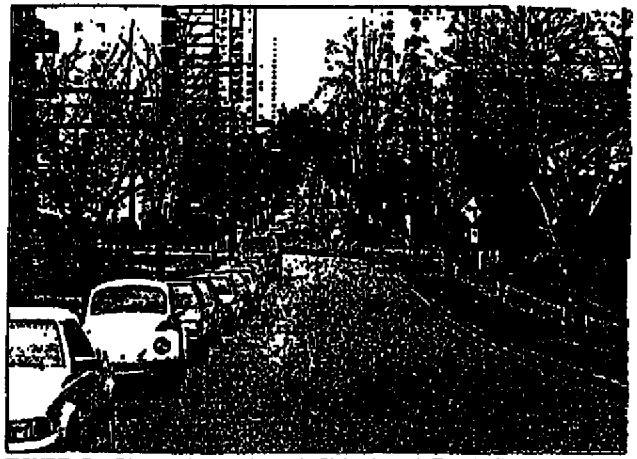


FIGURE 3 Diagonal diverter at Gilford and Pendrell, looking west

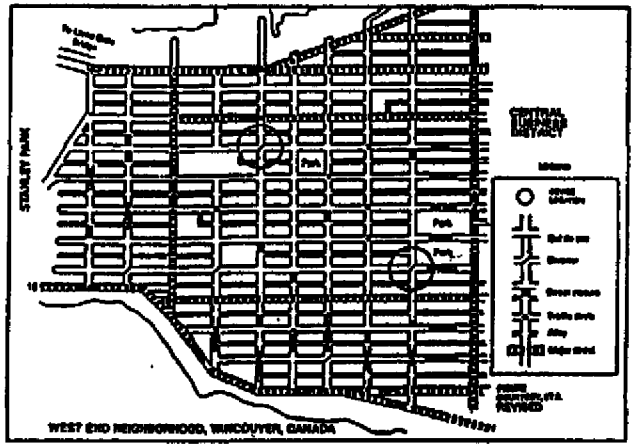


FIGURE 4 West End neighborhood, Vancouver, Canada (Courtesy of I.T.E.)

Location

West End Neighborhood
(Near Stanley Park)
Vancouver, B.C., Canada

Setting

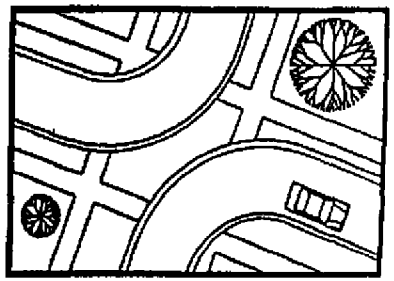
Fully developed, dense urban area mostly residential with high and low rise buildings.
Between downtown and major regional scale park.

Situation

High volumes of cut-thru traffic, speeding accidents.
Diagonal diverters one of several devices used to mitigate negative traffic impacts in this area.

Features

Very desirable, close-in living and working environment. Tasteful landscaping and surface treatment
Sparse appearance due to seasonal loss of leaves by deciduous trees
Traversable curbs allow passage of emergency vehicles.



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST / COMPLEXITY	MAINTENANCE COST/PROBLEMS
Diagonal Diverters	Yes	Likely	Decrease	Improved	Left or Right Turn Only	Some Constraint	Moderate	Potentially High	Vandalism

DIAGONAL DIVERTERS

Full and Partial

See Opening For Right Turns
(Figure 3 only)

Location

Capitol Hill Area
Seattle, Washington

Setting

Fully developed, older residential area of large, single family and apartment houses.

Situation

Cut-thru traffic, numerous accidents at local street intersections.
System of diverters, half closures, and circles lessened cut-thru volume and greatly reduced accidents

Features

Figure 1 diverter is cut to ease traffic access to elementary school on adjacent block. All diverters heavily landscaped Autos parked along diverter further slow traffic.

FIGURE 1 Diagonal diverter, E. Prospect at 18th Ave., Seattle, Washington

FIGURE 2 Diagonal diverter, E. 17th Ave. at Republican St., Seattle, Washington

FIGURE 3 Turn lane cut into partial diagonal diverter E. Highland Ave. at 18th Ave., Seattle, Washington

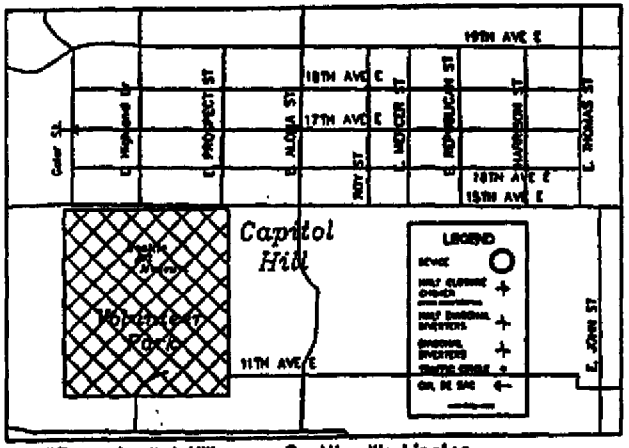
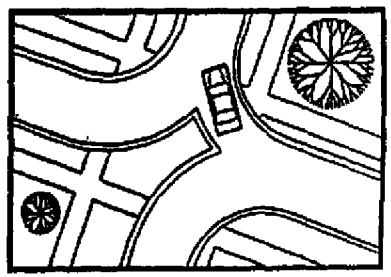


FIGURE 4 Capitol Hill area, Seattle, Washington

TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Full Diagonal Diverters	Yes	Likely	Decrease	Reduces Accidents	Left or Right Turn Only	Some Constraint	Low, Depends on Features	Moderate to High	Moderate / Possible Vandalism
Partial Diagonal Diverters	Yes	Likely	Decrease	Reduces Accidents (Less so than Full Diverter)	Left or Right Turn Only (Except at opening)	Some Constraint	Low, Depends on Features	Moderate to High	Moderate / Possible Vandalism



DIAGONAL DIVERTER

FIGURE 1 Diagonal diverter at Cadero and Haro, Vancouver, B.C.

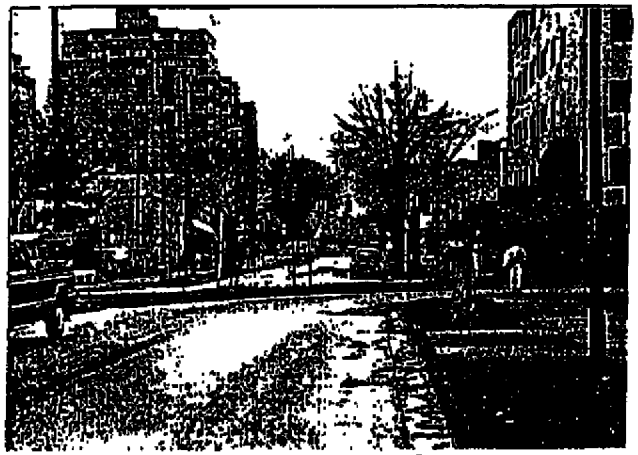


FIGURE 2 Diagonal diverter at Bute and Pendrell, Vancouver, B.C.

FIGURE 3 Diagonal diverter at Cadero and Haro, Vancouver, B.C.

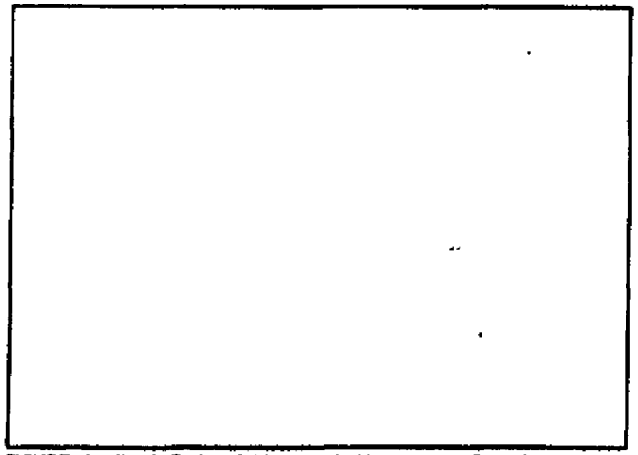


FIGURE 4 West End neighborhood, Vancouver, Canada Figure courtesy of I.T.E.

Location

West End Neighborhood
(Near Stanley Park)
Vancouver, B.C., Canada

Setting

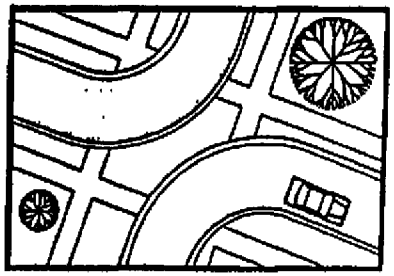
Fully developed, dense urban area mostly residential with high and low rise buildings.
Between downtown and major regional scale park.

Situation

High volumes of cut-thru traffic, speeding accidents.
Diagonal diverters one of several devices used to mitigate negative traffic impacts in this area.

Features

Very desirable, close-in living and working environment. Tasteful landscaping and surface treatment
Sparse appearance due to seasonal loss of leaves by deciduous trees
Traversable curbs allow passage of emergency vehicles.



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST / COMPLEXITY	MAINTENANCE COST/PROBLEMS
Diagonal Diverters	Yes	Likely	Decrease	Reduces Accidents	Left or Right Turn Only	Some Constraint	Low to High Depends on Features	Moderate to High	Possible Vandalism

DIAGONAL DIVERTER

FIGURE 1 Diagonal diverter at 15th Ave. and E. Prospect St.

FIGURE 2 Diagonal diverter at 15th Ave and E. Prospect St., looking south

FIGURE 3 Diagonal diverter at 16th Ave. and E. Prospect St.

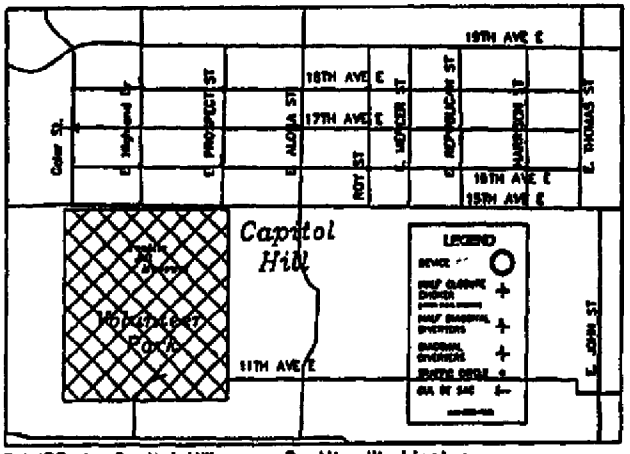


FIGURE 4 Capitol Hill area, Seattle, Washington

Location

Stevens neighborhood
(Capitol Hill)
Seattle, Washington

Setting

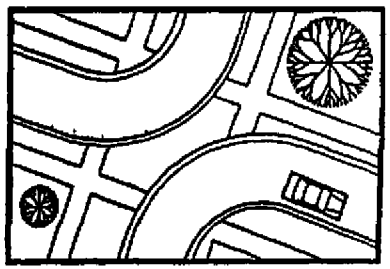
Fully developed, mature, single family residential neighborhood.
Some conversions to apartments

Situation

This diverter is one of a network of six devices put in place in 1974 following a test period. (See map, figure 4)
Thru traffic and accidents were reduced and have remained low since the devices were installed

Features

Seattle installs street lights, hydrants, on each side of diagonal diverters
Landscaped with trees and shrubs
Community bulletin board, stone bench, rock obstacles,and curb cuts



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST / COMPLEXITY	MAINTENANCE COST/PROBLEMS
Diagonal Diverters	Yes	Likely	Decrease	Reduces Accidents	Left or Right Turn Only	Some Constraint	Low, Self Enforcing	Moderate to High	Moderate / Vandalism

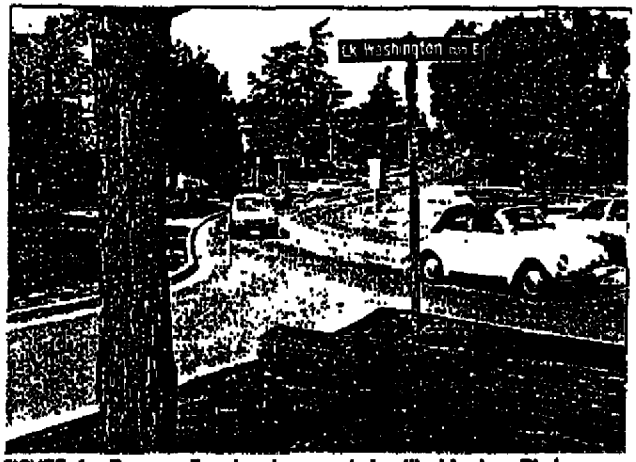


FIGURE 1 Two median barriers on Lake Washington Blvd. prohibit left turns into neighborhood.

FIGURE 2 No exit from neighborhood, 26th Ave.; right turn entry only. See SR520 off-ramp to Lake Washington Blvd. in background.

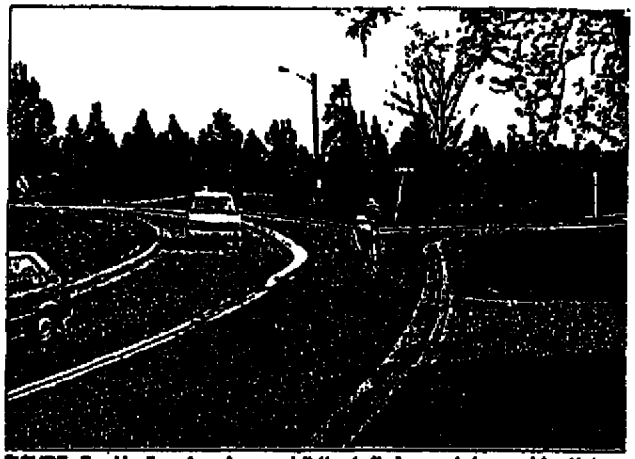


FIGURE 3 Median barrier prohibits left turns into residential area: no exit from 26th Ave.
Lake Washington Blvd. at 26th Ave., Seattle, Washington

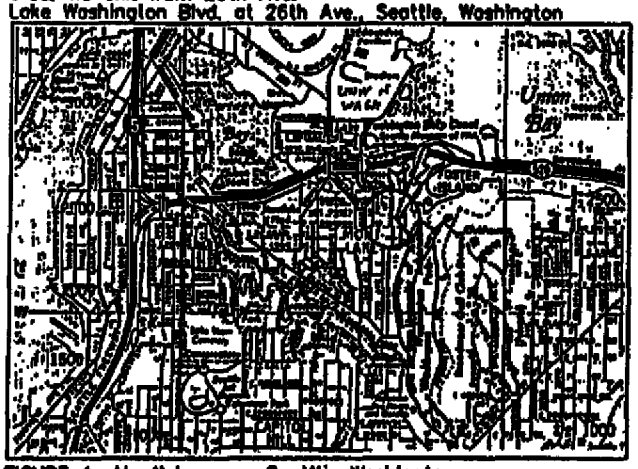


FIGURE 4 Montlake area, Seattle, Washington
Map courtesy of H.M. Gousha, Barrington, Ill., revised

TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Forced Turn Channelization Snake	Yes	Likely	Decrease	Improved	Some, No Left Turn	Minor Constraint	Potentially High	Low to Moderate	Vandalism
Half Closure Semi Diverter	Yes	Likely	Decrease	Improved	Restricted One Direction	Minor Constraint	Low	Moderate	Vandalism

HALF CLOSURE

Median Barriers
Turn Channelization

Location

Mountlake Neighborhood
Seattle, Washington

Setting

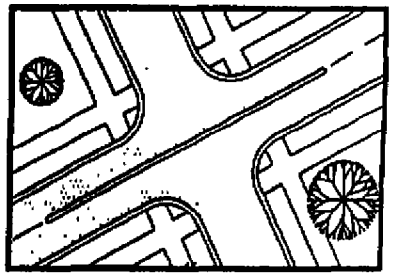
Urban, fully developed, single family area adjacent but separated from major lakeside park by Lake Washington Blvd

Situation

Lake Washington Blvd. provides route to and from park, Univ. of Washington, I-5, and SR520 bridge System of turn prohibitors, half closure, and traffic circles reduced cut-thru traffic volumes and reduced speed on local streets

Features

Lawn and tree landscaping blends half closure into park and adjacent residential area. Unattractive and very narrow median barriers are products of hard fought compromises. Barriers have many reflectors and are illuminated by street lights



STREET CLOSURE

Half Block
Full Closure

FIGURE 1 Half block, full closure; looking northeast along Gilford toward alley and Haro.

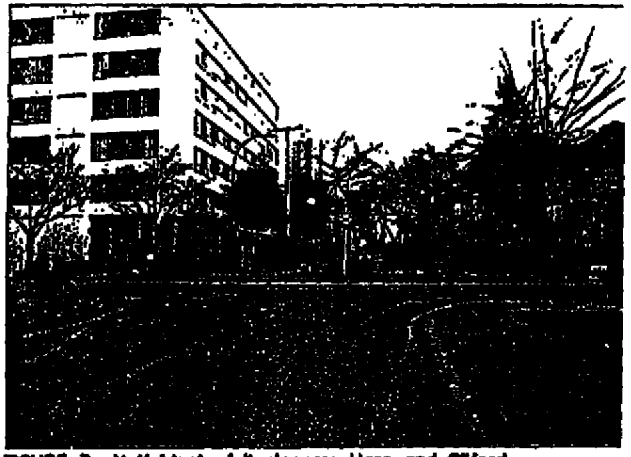


FIGURE 3 Half block, full closure; Haro and Gilford, looking southwest along Gilford.

FIGURE 2 Alley adjacent to half block, full closure on Gilford north of Haro.

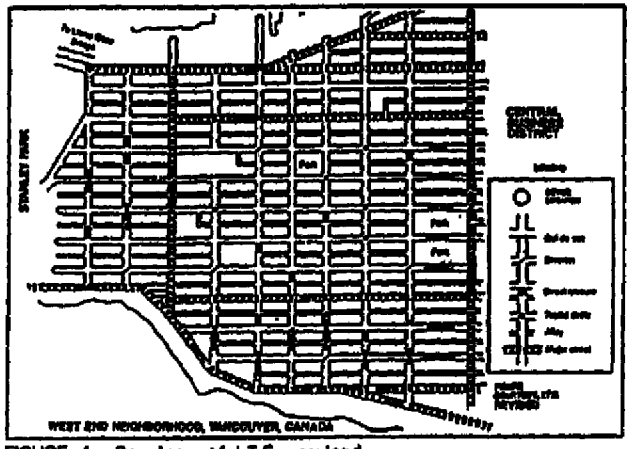


FIGURE 4 Courtesy of I.T.E., revised

Location

West End Neighborhood
(Near Stanley Park, west of downtown)
Vancouver, B.C., Canada

Setting

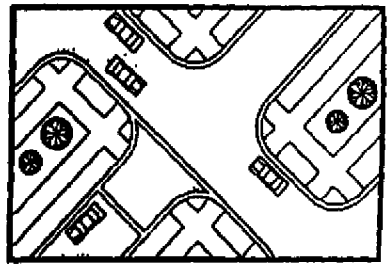
Fully developed dense urban area, mostly residential with high and low rise buildings just east of Stanley Park

Situation

Full closure one of a variety of traffic control devices located to discourage thru and speeding traffic; reduce accidents Devices are within residential areas bounded by major streets.

Features

Very desirable, close in living near downtown and regional scale park. Tasteful landscaping, attractive street furniture, permanent appearance and design



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Full Closure	Yes	Yes	Decrease	Improved	Yes	Some Constraint	Low	High/Moderate to High	Moderate/Possible to High Vandalism

STREET CLOSURE

Half Block
Full Closure

FIGURE 1 Half block, full closure
Cordero and alley south of Comox

FIGURE 3 Half block, full closure
Comox and Chilco, looking northeast along Chilco

FIGURE 2 Half block, full closure
Looking northeast along Broughton from Comox

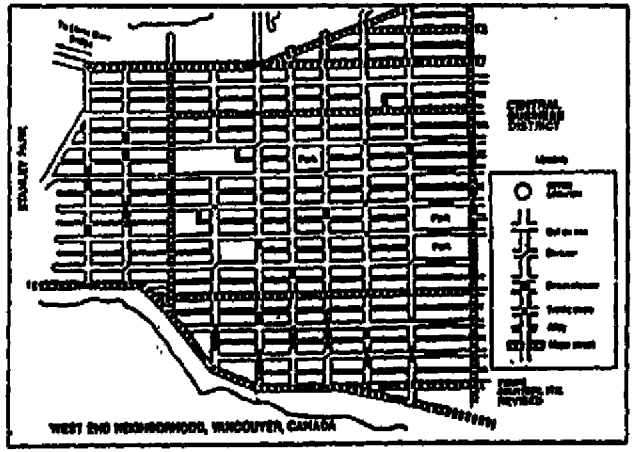


FIGURE 4

Location

West End Neighborhood
(Near Stanley Park)
Vancouver, B.C., Canada

Setting

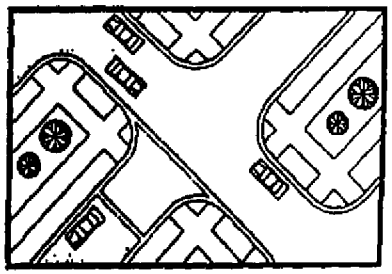
Fully developed, dense urban area
Mostly residential with high and low rise buildings.
Adjacent to downtown

Situation

High volumes of cut thru traffic, speeding, accidents; full closures just one of several types of control devices used in this area to control traffic.

Features

Very desirable, close-in living, tasteful landscaping, planters, street furniture and surface treatments
Permanent appearance and design
See mountable curb for emergency vehicle access.



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Full Closure	Yes	Likely	Reduced	Improved	Yes	Some Constraint	Low	Low	Vandalism

FIGURE 1 Chilco St. cul-de-sac looking southwest toward the intersection of Chilco, Robson, and Lagoon Dr.

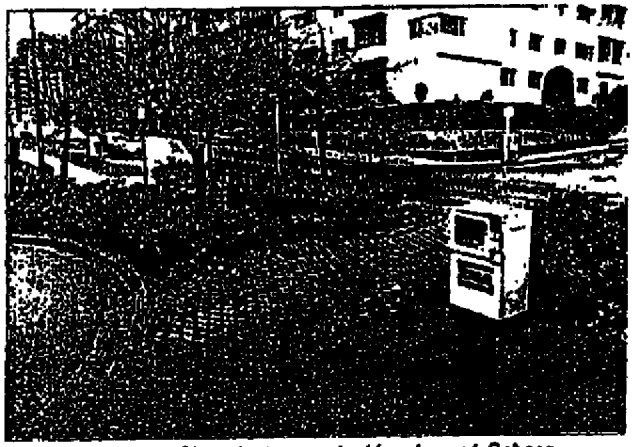


FIGURE 2 Chilco St. cul-de-sac looking toward Robson.

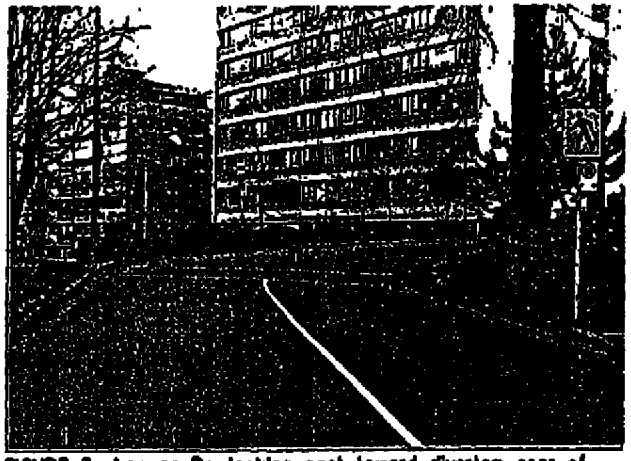


FIGURE 3 Lagoon Dr. looking east toward diverter; rear of cul-de-sac on Chilco.

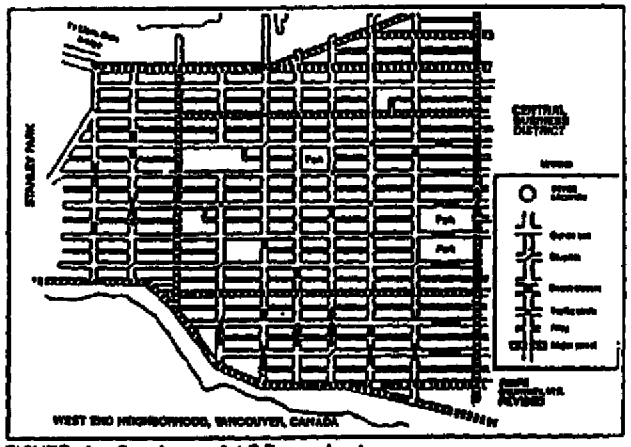


FIGURE 4 Courtesy of I.T.E., revised

FULL CLOSURE

Cul-de-Sac
Diverter
Combination

Location

West End Neighborhood
(Near Stanley Park)
Vancouver, B.C., Canada

Setting

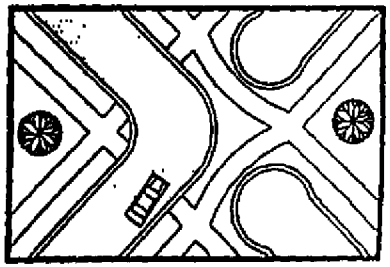
Fully Developed
Dense Urban Area
Mostly residential with high and low rise buildings.

Situation

Adjacent to downtown
Very desirable, close in living
Tasteful landscaping
Permanent appearance and design

Features

Very desirable, close in living near downtown and regional park.
Tasteful landscaping



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Diagonal Diverters	Yes	Likely	Decrease	Improved	Left or right turn only	Some Constraint	Low	Moderate to High	Moderate to High / Possible Vandalism
Cul-de-Sac	Yes	Yes	Decrease	Improved	Total	Some Constraint	Low		Moderate to High / Possible Vandalism

FULL CLOSURES TEST

Cul-de-Sac or Hammerhead

Depending upon design at street terminus

FIGURE 1 Test, Full Closure, looking west
N.E. Halsey St. at 28th Ave., Portland, Oregon

FIGURE 2 Test Full Closure looking west
N E Stanton at N.E. 42nd Ave., Portland, Oregon

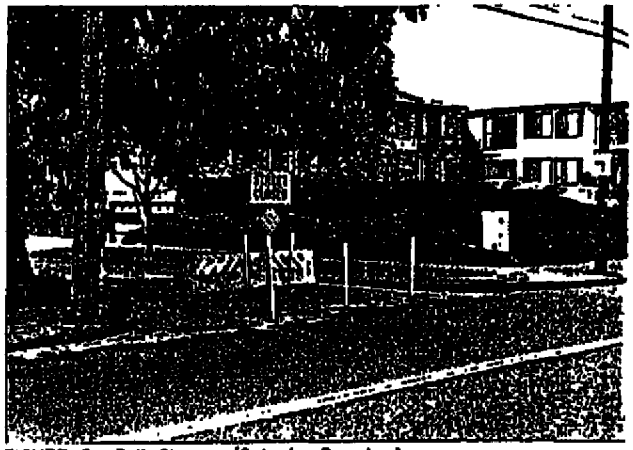


FIGURE 3 Full Closure/Cul-de-Sac test
N.E. 28th Ave. at Wasco St., Portland, Oregon

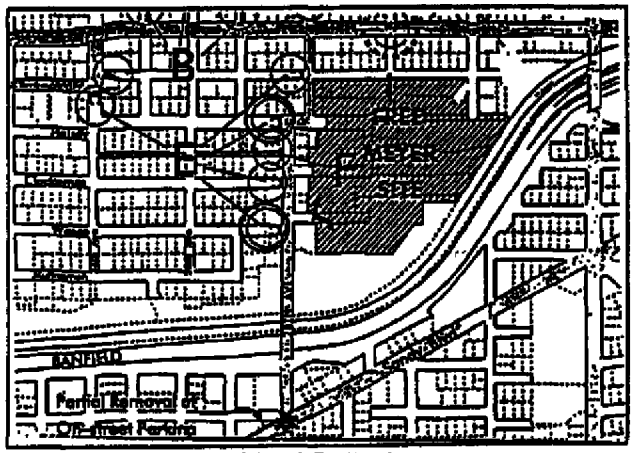


FIGURE 4 Courtesy of City of Portland

Location

Northeast area of Portland, Oregon

Setting

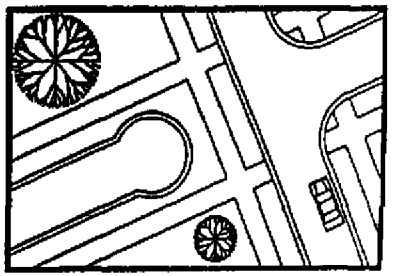
Two different residential neighborhoods both fully developed.
Figure 1 and 3 mixed multiple and single family near large (Fred Meyer) shopping center.
Figure 2 single family area

Situation

Excessive cut thru traffic
See "E" and "F" in figure 4 for series of five test closures near shopping center
Figure 2 reverts to play street One of three locations in test case

Features

Obvious temporary appearance, well signed, many reflectors.
Three to six month test period precedes decisions on suitability/acceptance
CAUTION: Concrete "Jersey" barriers are unforgiving if struck. Use in test requires careful and liberal use of reflectors, warning and control signs.



TRAFFIC MANAGEMENT DEVICE	VOLUME REDUCTION	SPEED REDUCTION	NOISE AND POLLUTION	SAFETY	ACCESS RESTRICTIONS	EMERGENCY VEHICLE ACCESS	DEPENDENCE ON POLICE ENFORCEMENT	CONSTRUCTABILITY COST/ COMPLEXITY	MAINTENANCE COST/PROBLEMS
Cul de Sac	Yes	Yes	Decrease	Improved	Total	Some Constraint	Low	Low to High (R.O.W. acquisition and landscaping)	Low to Moderate Possible Vandalism if landscaped