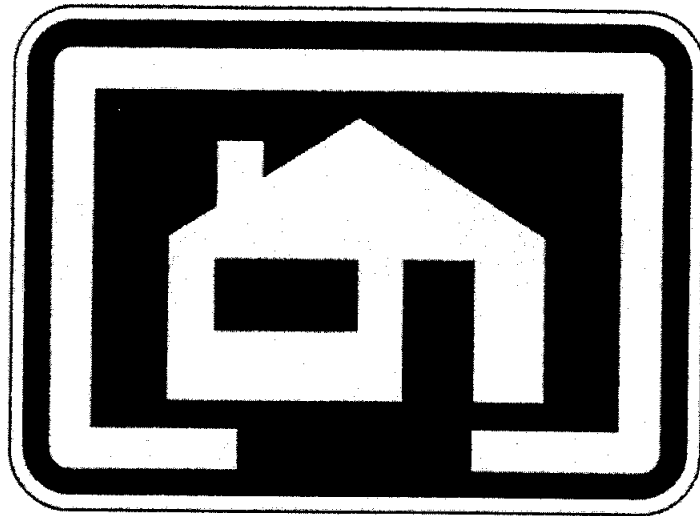


NEIGHBOURHOOD TRAFFIC CALMING

POLICY AND PROCEDURES

THE CORPORATION OF DELTA



The Corporation of Delta

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POLICY AND PROCEDURES

CORPORATION OF DELTA

BRITISH COLUMBIA

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

1.0	INTRODUCTION	
1.1	Commitment to Improving Neighbourhood Liveability	1
1.2	What is Traffic Calming?	2
1.3	Why is Traffic Calming Needed?	2
1.4	The Traffic Calming Process	4
1.5	Purpose and Content of this Report	5
1.6	Technical Advisory Committee	5
2.0	PROGRAMMING	
2.1	Initiating Traffic Calming Programs	7
2.2	Preliminary Screening and Verification	7
2.3	Study Areas	8
2.4	The Role of the Neighbourhood	9
2.5	The Role of Municipal Staff	9
2.6	The Role of Council	10
3.0	PLANNING PROCESS	
3.1	Understanding the Concerns of the Neighbourhood	11
3.2	Quantifying Existing Conditions	12
3.3	Developing the Solution Spectrum	14
3.4	Discerning a Preferred Solution	16
3.5	Council Consideration of Initiative	16
4.0	FINANCING THE INITIATIVE	
4.1	Funding by the Corporation of Delta	19
4.2	Specified Area (Petition Plan)	19
4.3	Specified Area (Initiative Plan)	20
4.4	Other Potential Sources of Funding	20
4.5	Combined Sources of Funding	20
5.0	IMPLEMENTATION AND PERFORMANCE MONITORING	
5.1	Public Awareness	21
5.2	Installation	21
5.3	Evaluating the Performance	23
	APPENDIX A – ANNOTATED BIBLIOGRAPHY	
	APPENDIX B – TRAFFIC CALMING DEVICES	
	APPENDIX C – PRIMARY EMERGENCY RESPONSE ROUTES	



LIST OF FIGURES

FIGURE 1.1	TRAFFIC CALMING FLOW CHART	4
FIGURE 2.1	INITIATING A TRAFFIC CALMING PROJECT	8
FIGURE 3.1	IDENTIFYING ISSUES AND CONCERNS	11
FIGURE 3.2	QUANTIFYING EXISTING CONDITIONS	12
FIGURE 3.3	DEVELOPING A TRAFFIC CALMING PLAN	17
FIGURE 5.1	IMPLEMENTING THE TRAFFIC CALMING PLAN	22
FIGURE 5.2	MONITORING THE TRAFFIC CALMING PLAN	24

LIST OF TABLES

TABLE 2.1	PRELIMINARY SCORING	7
TABLE 3.1	APPLICABILITY OF TRAFFIC CALMING MEASURES	15
TABLE 4.1	OPERATIONAL AND ENVIRONMENTAL THRESHOLDS	19



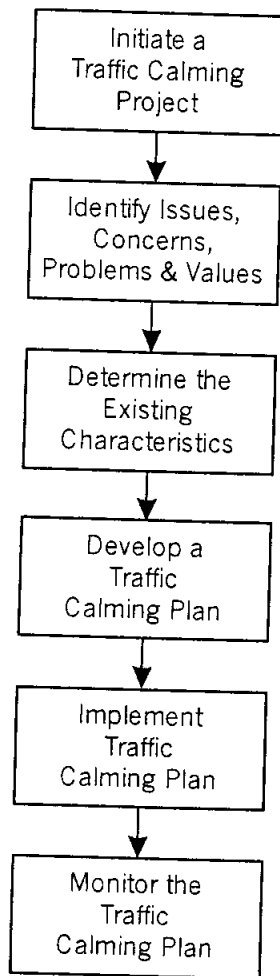
EXECUTIVE SUMMARY

The Corporation of Delta is committed to maintaining and enhancing neighbourhood liveability, retaining desirable characteristics of each neighbourhood and encouraging community-based solutions and decision-making. The Corporation of Delta employs a public involvement process to develop traffic calming plans for neighbourhoods which may be experiencing negative impacts from motor vehicle traffic. Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized road users. Traffic calming can be installed as a retrofit improvement to an existing neighbourhood or in newly constructed neighbourhoods as a design feature.

The Official Community Plan of the Corporation of Delta defines the roads in the urban transportation system. The roads are classified as arterial roads, collector roads, or local roads. Sometimes motorists can develop a pattern of using a road in a manner that was not intended, such as using a local road as a through route or traveling at excessive speeds. The purpose of traffic calming is to restore roads to their intended function and correct motorist behaviours to acceptable community norms.

The need for a traffic calming project can be identified either from studies by staff or directives from Council in pursuit of safety and operational objectives of the Municipality. It can also be identified through requests from residents who perceive traffic operations are negatively impacting the quality of life in their neighbourhood. Residents often have a greater knowledge of traffic problems in a neighbourhood than the Municipal staff. The residents have opportunity to observe traffic in the neighbourhood over extended periods, where as the Municipal staff must rely on short duration observational surveys that provide a snapshot of the situation.

The Traffic Calming Process involves public participation and group decision making to find solutions to concerns a neighbourhood may have about the negative effects of motor vehicle traffic. The Traffic Calming Process is an orderly process, which is comprised of six basic steps. The steps are shown in FIGURE ES-1.



A public awareness program will accompany a traffic calming project. Adequate advice to local and through traffic will be provided prior to the implementation of any traffic calming project. Traffic calming projects can be implemented in three ways:

- Trial or temporary installation;
- Staged or phased installation; and
- Full or permanent installation.

The Municipality will conduct a performance review of installed traffic calming plans. The review considers the operational, social and sometimes environmental aspects of the traffic calming installations.

FIGURE ES-1 TRAFFIC CALMING FLOW CHART



1.0 INTRODUCTION

1.1 Commitment to Improving Neighbourhood Liveability

The Corporation of Delta is committed to maintaining and enhancing neighbourhood liveability, retaining the desirable characteristics of each neighbourhood and encouraging community-based solutions and decision-making. This is evident by the goals of the Transportation Plan, which are:

- **Accessibility** – provide access to goods, services and recreation throughout Delta and the region, for all persons regardless of age, physical ability and financial means;
- **Quality** – maximize the safety, personal security, comfort, health and well-being of trip-makers within Delta;
- **Liveability** – enhance the liveability of Delta by ensuring that transportation facilities and services provide a net benefit to the community, and that adverse effects are minimized; and,
- **Affordability** – minimize the costs of transportation facilities and services borne by Delta taxpayers.

A liveability goal of the Transportation Plan is to improve safety, to encourage walking and cycling, and to preserve the liveability of neighbourhoods by discouraging regional and municipal through-traffic in residential neighbourhoods, and addressing operational and safety problems within neighbourhoods. It is for these reasons that the Corporation of Delta is employing a public involvement process to develop traffic calming plans for neighbourhoods which may be experiencing negative impacts from motor vehicle traffic.



1.2 What is Traffic Calming?

Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized road users. Traffic calming can be installed as a retrofit improvement to an existing neighbourhood or in newly constructed neighbourhoods as a design feature. The goals of traffic calming include:

- Improving the quality of life;
- Incorporating the preferences and requirements of residents;
- Creating safer streets;
- Creating attractive streets; and,
- Promoting pedestrian, cycle and transit use.

Traffic calming measures may include:

- Vertical changes in the road (speed humps, speed bumps, speed tables, raised intersections);
- Lateral changes in the road (chicanes, offset intersections, lateral shifts, traffic circles);
- Constrictions (narrowings, pinch points, islands, parking);
- Narrow pavement widths;
- Entrance features (gates, signs, narrowings, surface treatments); and/or
- Route changes (road closures, partial road closures, diverters, turn restrictions).

All selected traffic calming measures will be in general accordance with the Canadian Guide to Neighbourhood Traffic Calming (1998), by the Transportation Association of Canada and Canadian Institute of Transportation Engineers.

1.3 Why is Traffic Calming Needed?

The Corporation of Delta has an integrated hierarchy of roads. The roads are classified as arterial, collector or local roads. The road classification designates the intended function of the road. The function of an arterial road is to carry trips of longer duration, through traffic, and to accommodate significant volumes of traffic. The function of a collector road is to collect and distribute traffic into and out of a neighbourhood, and provide property access. The function of a local road is to provide property access.



Sometimes motorists can develop a pattern of using a road in a manner, which was not intended, such as using a local road as a through route or traveling at inappropriate speeds. The purpose of traffic calming is to restore roads to their intended function and correct motorist behaviours to acceptable community norms. For new land developments, the Municipality may foresee a potential for the misuse for roads and direct traffic calming measures to be installed as a requirement of development. The overall objectives of traffic calming include:

- Achieving slower speeds for motor vehicles;
- Reducing crash frequency and severity;
- Increasing safety for non-motorized users of the road;
- Reducing the need for police enforcement;
- Enhancing the road environment;
- Increasing access to all modes of transportation; and,
- Reducing through motor vehicle traffic.

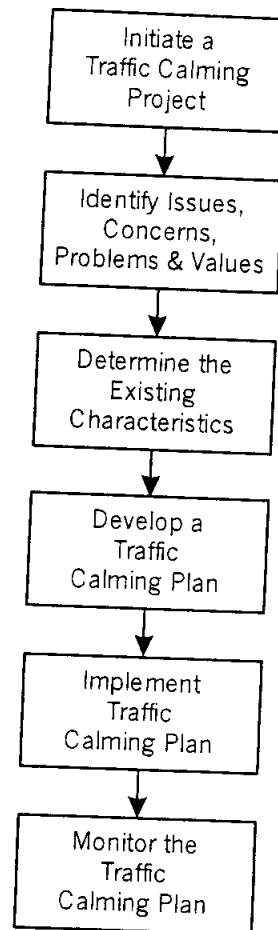
Traffic calming measures would generally only apply to local roads, as defined within the Schedules of the Official Community Plan, that are not bus routes or primary emergency response routes. If directed by Council, a collector road may be considered for traffic calming, but generally only with measures that do not involve vertical changes to the road or route changes, as described in Section 1.2 above. Generally, roads in rural or agricultural areas are not considered for traffic calming.



1.4 The Traffic Calming Process

The Traffic Calming Process involves public participation and group decision making to find solutions to concerns a neighbourhood may have about the negative effects of motor vehicle traffic. The Traffic Calming Process is an orderly process that is comprised of six basic steps. The steps are shown in FIGURE 1.1.

These steps will be discussed in greater detail in the remaining chapters of the report.



**FIGURE 1.1 TRAFFIC CALMING
FLOW CHART**



1.5 Purpose and Content of this Report

The purpose of this report is to outline the policies and procedures for Neighbourhood Traffic Calming in the Corporation of Delta. The report contains five chapters:

Chapter 1 Introduction - defines traffic calming and discusses why traffic calming is needed in the Corporation of Delta.

Chapter 2 Programming - describes the selection process for the neighbourhood traffic calming program and the roles of the neighbourhood, Municipal staff and Council in the process.

Chapter 3 Planning Process - outlines the steps of the traffic calming planning process from identifying and quantifying issues and concerns to inclusion in the Municipality's capital works budget.

Chapter 4 Financing the Initiative - describes the various methods through which traffic calming initiatives can be funded.

Chapter 5 Implementation and Performance Monitoring - discusses implementation, including public awareness, installation options and post performance evaluation.

1.6 Technical Advisory Committee

This policy document was prepared with the assistance of a Technical Advisory Committee. The purpose of the Committee was to capture and build on lessons learned from previous Neighbourhood Traffic Calming Projects, which have been undertaken in Delta over the past three years. The members of the staff Committee are:

- Tim Murphy, Transportation Manager (Facilitator)
- Traffic NCO, Delta Police
- Rene Payer, Manager of Engineering Operations
- Deputy Fire Chief Rick Lehbauer
- Ian Radnidge, Manager of Roads and Transportation
- Rick Walters, Roads and Transportation Technologist



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2.0 INITIATE

2.1 Initiating Traffic Calming Projects

The need for a traffic calming project can be identified either from studies by staff or directives from Council in pursuit of safety and operational objectives of the Municipality. It can also be identified through requests from residents who perceive traffic operations are negatively impacting the quality of life in their neighbourhood. Traffic calming will generally only apply to roads in urban areas and not roads in rural or agricultural areas.

2.2 Preliminary Screening and Verification

Requests for traffic calming on local roads will be subjected to a preliminary screening. The screening uses a minimum threshold and scoring procedure. The scoring will be based on the criteria shown in TABLE 2.1.

TABLE 2.1 PRELIMINARY SCORING FOR LOCAL ROADS

CRITERIA	POINTS	BASIS FOR POINT ASSIGNMENT
Speed	0 to 25	85 th percentile traffic speeds more than 5 km/h above the posted limit. (5 points for every km/h)
Volume	0 to 25	Average daily traffic volumes (1 point for every 100 vehicles)
Total Points Possible	50	

Traffic calming requests with a preliminary scoring of less than 25 points should not be considered. Candidate traffic calming projects will be prioritized for funding consideration by Council during the annual budget setting process.

For projects that achieve a score of 25 or more in the preliminary scoring, a survey will be sent to all households and businesses in the study area, (as defined in Section 2.3), to determine if there is sufficient support in the study area for a traffic calming study. At least 50 percent of the surveys must be returned and a majority of the responses must support a traffic calming study for the request to proceed to budget consideration.



Candidate traffic calming projects will be assessed to determine a priority relative to other requests for traffic calming. The assessment should consider the following criteria:

- Safety performance (crashes, crashes involving speed, perceived risk and exposure);
- Traffic characteristics (traffic volume, percent through traffic, road classification, pedestrian volume and cyclist volume);
- Physical characteristics (road width, alignment, pedestrian and cyclist facilities, parking facilities, sensitive frontages such as schools, playgrounds, store fronts); and/or,
- Environment (traffic noise, ambient noise, number of residents affected, setback of houses).

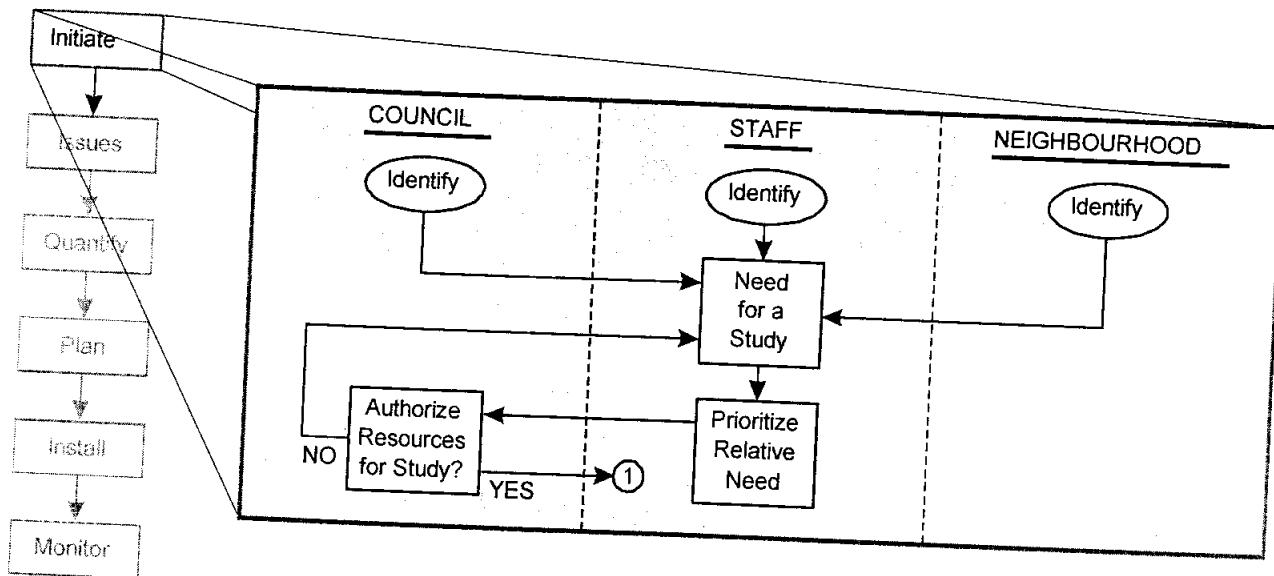


FIGURE 2.1 INITIATING A TRAFFIC CALMING PROJECT

2.3 Study Areas

The area of the study can be a single road, if the concerns are related to excessive speeds, or a whole neighbourhood, if the concerns are related to traffic infiltration. If a single road is proposed, the study area is defined as being all streets within one block of that road.

While the boundaries of a neighbourhood should generally follow the arterial and collector road system as well as other natural features, they will be designed to incorporate



those areas where the implementation of traffic management measures on a given road may impact residents on adjacent roads within the neighbourhood.

2.4 The Role of the Neighbourhood

The neighbourhood residents will be involved in the problem identification and the decision-making processes related to the existing and future management of traffic in their neighbourhood. The key responsibilities of the neighbourhood are to:

- Attend the organized public meetings for traffic calming studies;
- Identify traffic related issues in the neighbourhood;
- Respond to any surveys;
- Select from the options presented by staff, traffic calming concepts which address the identified issues;
- Choose a preferred traffic calming plan or course of action; and
- Consider local improvement initiatives or specified area bylaws where applicable.

2.5 The Role of Municipal Staff

The Municipal staff will prepare an assessment of potential traffic calming studies for presentation to Council prior to the budget deliberations for the coming year. Once Council has approved the budget and authorized selected traffic calming studies to proceed, staff will schedule and conduct the neighbourhood public processes. The key responsibilities of staff are:

- Develop terms of reference of the study;
- Develop and manage a public participation process;
- Facilitate the study process (may use outside facilitator for meetings);
- Define and quantify the nature and extent of traffic issues through discussions, perception surveys and data collection;
- Provide expertise and advice to generate possible solutions (may use outside consultant);
- Facilitate a consensus-building exercise with the neighbourhood to discern a preferred solution or course of action;
- Communicate the status and outcome of the study process to Council;
- Prepare budget submissions of Council-endorsed traffic calming initiatives;



- Prepare and conduct a public awareness campaign; and
- Implement and monitor Council-approved traffic calming projects.

2.6 The Role of Council

Council will direct the traffic calming program at a strategic level. The responsibilities of Council are:

- Based on an assessment from staff, consider funding and resource allocations in the annual budget to conduct traffic calming studies in selected neighbourhoods;
- Review and consider the preferred traffic calming plan initiatives as chosen by the neighbourhoods;
- Forward Council endorsed traffic calming initiatives to the annual budget deliberations for consideration;
- Allocate funding for selected traffic calming initiatives in the annual capital budget; and
- Review the performance of implemented traffic calming projects.



3.0 PLANNING PROCESS

3.1 Understanding the Concerns of the Neighbourhood

Residents often have a greater knowledge of traffic problems in a neighbourhood than Municipal staff. The residents have the opportunity to observe traffic in the neighbourhood over extended periods, whereas staff must rely on short duration observational surveys that provide a snapshot of the situation. For this reason, it is important for staff to conduct opinion surveys and meet with the residents to gain a full understanding of the issues, concerns and values of the neighbourhood. From this understanding, staff can derive a list of objectives for developing a traffic calming plan which will meet the aims of the neighbourhood.

For relatively large neighbourhoods, the Municipality may elect to appoint a traffic advisory committee to represent the neighbourhood in a traffic calming study. The committee members would be chosen from those individuals indicating a willingness to serve in this capacity from the responses to a social information survey (as described in Section 3.2B of this policy) of the neighbourhood.

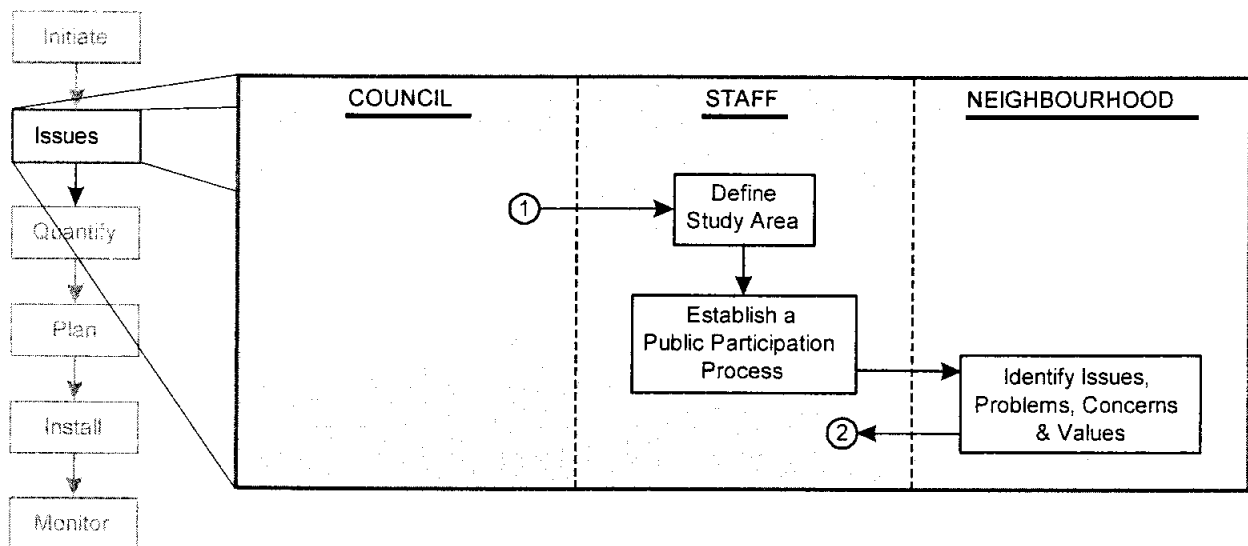


FIGURE 3.1 IDENTIFYING ISSUES AND CONCERNS



3.2 Quantifying Existing Conditions

Obtaining information about the existing conditions in the neighbourhood is important for the preparation and evaluation of traffic calming plans. This information is required for:

- Defining or quantifying the seriousness of the problem(s);
- Developing a plan of appropriate countermeasures; and
- Performing before and after evaluations of the traffic calming plan.

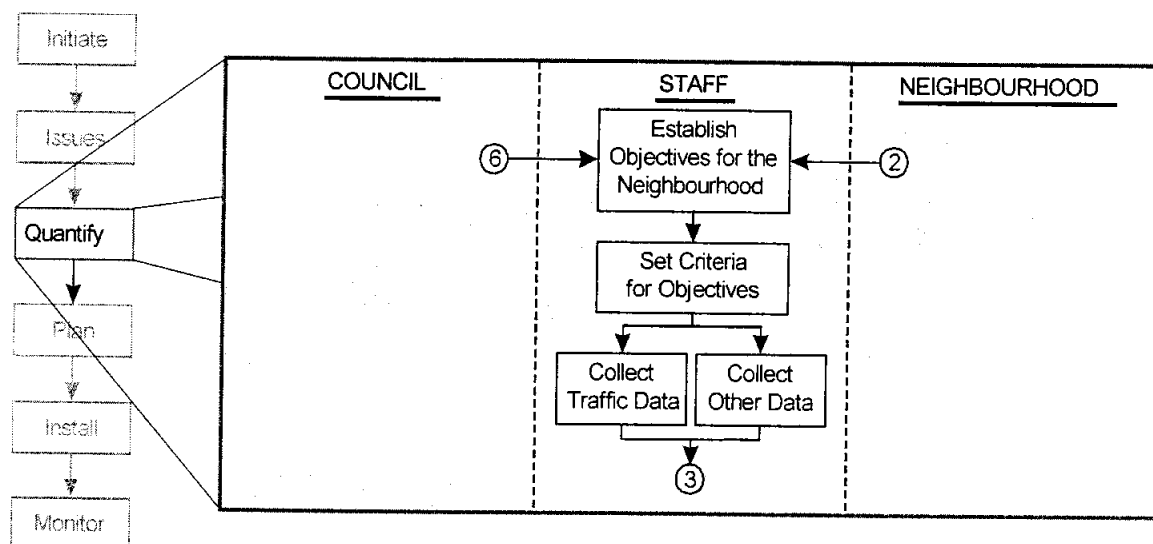


FIGURE 3.2 QUANTIFYING EXISTING CONDITIONS

The type of information collected will vary with the problems and concerns identified by the neighbourhood and the possible remedial measures proposed. The information is usually of three types:

- Operational;
- Social; and
- Environmental.



A. Operational Data

This data relates to the operating characteristics of the neighbourhood traffic. The data set usually includes some or all of the following information:

- Traffic volumes - 24 hour two-way mid-block traffic volumes and/or peak period turning movement counts at intersections;
- Traffic composition by vehicle types;
- Crash history - records from the Delta Police and/or ICBC;
- Origin and destination surveys;
- Traffic generation from existing and/or proposed developments;
- Travel time and delay surveys;
- Through traffic surveys;
- Pedestrian and cyclist desire lines;
- Parking surveys; and/or,
- Traffic speed surveys.

B. Social Data

Social information is needed to measure people's perceptions of the traffic issues, recent changes and impacts of proposed developments or improvements. This information can be obtained by surveys. However, the extent to which surveys are needed will decrease with increasing levels of public participation, as the information would be obtained during the process. Therefore, surveys for social information would likely only be used for processes that utilize an advisory committee made up of representatives from the different areas of very large neighbourhoods. Typical social information, which is required for traffic calming studies, includes:

- Age distribution;
- Proportion of rental accommodation;
- Level of residential mobility;
- Usage patterns of local facilities, such as schools, parks and open space;
- Willingness to serve on an advisory committee; and/or,
- Perceptions of traffic related impacts and needs, such as noise, safety and mobility.



C. Environmental Data

Environmental data would be obtained to meet a specific identified need for the neighbourhood and may not be required for all traffic calming studies. Environmental data includes:

- Noise measurements - typically before and after;
- Air quality measurements;
- Inventory of existing features, such as vegetation, trees, structures and adjacent land use; and/or,
- Road widths, location of accesses, pedestrian and cyclist facilities.

3.3 Developing the Solution Spectrum

Engineering Department staff and consultants (if applicable) in consultation with the transit authority, Delta Police staff, Fire and Emergency Services staff will formulate alternative traffic calming plans for the neighbourhood. Generally, traffic calming measures will be applied to the different road classes and route types as shown in TABLE 3.1. The traffic calming plans will consider the objectives of the neighbourhood, accessibility needs, safety and environmental standards. The spectrum of solutions should be as diverse as possible, providing high and low cost options that satisfy varying degrees of the neighbourhood objectives. Improvements to the arterial system surrounding the study area should be considered within the available options for traffic calming. Each alternative solution will include a statement of the effectiveness of meeting the objectives of the neighbourhood, any disbenefits to the neighbourhood, total project cost, annualized cost to the benefiting properties (if applicable) and the impacts to the larger community.



TABLE 3.1 – APPLICABILITY OF TRAFFIC CALMING MEASURES

TRAFFIC CALMING DEVICE	APPLICABLE TRAFFIC CALMING MEASURES				
	Road Classification			Other Considerations	
	Local Road	Collector Road	Arterial Road	Emergency Response Route	Transit Route
Vertical Deflection					
▪ Raised Crosswalk	✓	✓	x	x	✓
▪ Raised Intersection	✓	x	x	x	x
▪ Rumble Strip – Inverted	✓	✓	✓	✓	✓
▪ Sidewalk Extension	x	x	x	x	x
▪ Speed Hump	✓	✓	x	x	x
▪ Speed Cushion	x	✓	x	x	✓
▪ Textured Crosswalk	✓	✓	✓	✓	✓
Horizontal Deflection					
▪ 1-Lane Chicane	✓	x	x	x	x
▪ 2-Lane Chicane	✓	x	x	x	x
▪ Curb Extension	✓	✓	✓	✓	✓
▪ Curb Radius Reduction	✓	✓	x	✓	✓
▪ On-Street Parking	✓	✓	✓	✓	✓
▪ Raised Median Island	✓	✓	✓	✓	✓
▪ Traffic Circle	✓	✓	x	✓	✓
Obstruction					
▪ Directional Closure	✓	x	x	✓	✓
▪ Diverter	✓	x	x	✓	x
▪ Full closure	✓	x	x	x	x
▪ Intersection Channelization	✓	✓	✓	✓	✓
▪ Raised Median Through	✓	✓	✓	✓	✓
▪ Right-In/Right-out Island	✓	x	x	✓	x
Signage					
▪ Maximum Speed	x	x	x	x	x
▪ One Way	x	x	x	x	x
▪ Stop	x	x	x	x	x
▪ Through Traffic Prohibited	x	x	x	x	x
▪ Traffic Calmed	✓	✓	✓	✓	✓
▪ Turn Prohibited	x	✓	✓	✓	✓
▪ Yield	x	x	x	x	x

Notes:

- ✓ - Applicable for use in this road class or route type
- x - Not applicable for use in this road class or route type



3.4 Discerning a Preferred Solution

Municipal staff will facilitate meetings for the residents to discuss the alternative traffic calming plans. At the meetings, Municipal staff will present the range of solutions, provide the participants with information about each alternative and a relative comparison. The meetings should use group decision-making techniques to encourage consensus building toward the selection of a preferred solution or course of action.

For relatively large neighbourhoods, the Municipality may elect to use a public opinion survey to determine the support for a preferred solution. The design of the survey should follow the guidelines for measuring community support outlined in Section 2.6 of the Canadian Guide to Neighbourhood Traffic Calming (Transportation Association of Canada, 1998). Such a survey should always include the “Do Nothing” or “maintain status quo” option. The survey will be distributed to all the households and businesses in the study area. It should have a response rate of 50 percent and the preferred solution should be selected by at least 60 percent of the respondents.

3.5 Council Consideration of Initiative

Once a neighbourhood has selected a preferred traffic calming plan, staff will submit a report to Council on behalf of the neighbourhood. Council will consider the proposed neighbourhood traffic calming plan and either endorse or reject the plan. Council may reject the plan in one of two ways:

- Either refer the plan back to the process for developing a new option; or
- Reject the plan outright and end the process.

If Council endorses the plan, it will be forwarded to the annual budget deliberations so that Council can consider funding the plan comprehensively with other funding needs of the Municipality. If Council approves funding, then the plan will be implemented as part of the capital program.

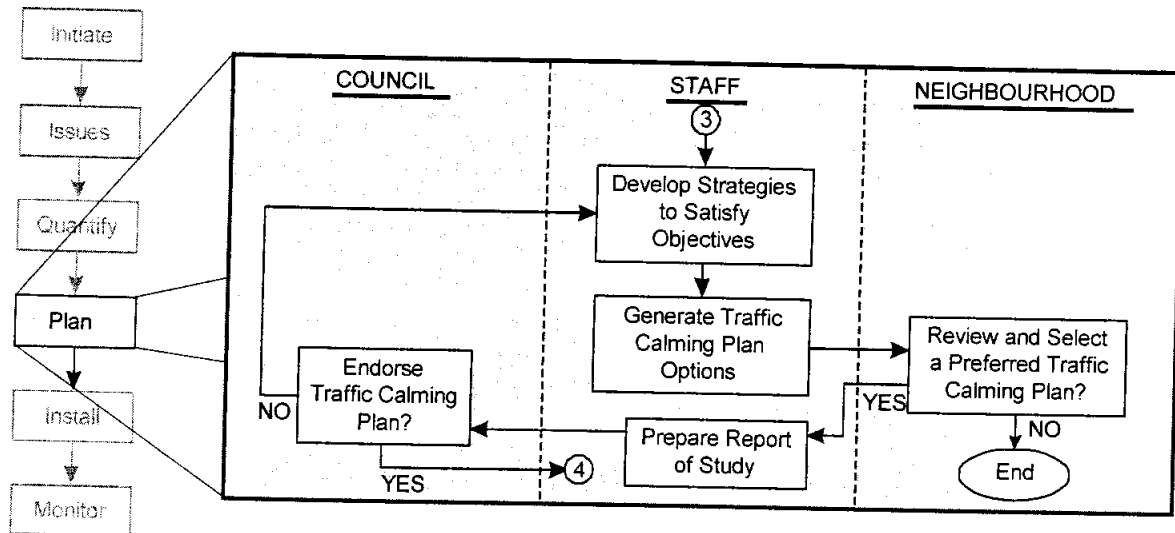


FIGURE 3.3 DEVELOPING A TRAFFIC CALMING PLAN



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4.0 FINANCING THE INITIATIVE

In general, four funding strategy options are available.

4.1 Funding by the Corporation of Delta

Generally, funding of traffic calming projects by the Municipality will only be considered for those projects where the existing conditions in the neighbourhood exceed at least one of the minimum operational thresholds shown in TABLE 4.1. Council will consider funding all or part of a traffic calming initiative that exceeds one of these thresholds and has prior endorsement from Council during the annual budget deliberations. Council may, at its discretion, choose to provide funding for other traffic calming initiatives as well. However, funding for traffic calming initiatives is constrained by the limits of the Municipality's revenue generation abilities and the competing needs for funding of other services and capital programs.

TABLE 4.1 OPERATIONAL THRESHOLDS

CHARACTERISTIC	MINIMUM THRESHOLD CONDITION	
	LOCAL ROADS	COLLECTOR ROADS
Traffic Infiltration	20 percent or more of all traffic is through traffic	60 percent or more of all traffic is through traffic
Excessive Travel Speeds	85th percentile operating speed is 10 km/h over the posted speed limit or greater	85th percentile operating speed is 15 km/h over the posted speed limit or greater
Traffic Volume	Traffic volume is greater than 1,000 vehicles per day	Traffic volume is greater than 4,000 vehicles per day

4.2 Specified Area (Petition Plan)

Even if a traffic calming project does not meet minimum operational thresholds for Delta funding, residents of a neighbourhood may elect to fund council-approved traffic calming plans using the Specified Area (Petition Plan) as described in the Local Government Act of British Columbia. The cost of the traffic calming plan would be amortized over a 15 year period and added to the property taxes of the benefiting properties. A Specified Area



(Petition Plan) requires a two-thirds majority approval of the benefiting property owners representing more than one-half of the assessed land value, and the approval of Council to proceed to implementation.

4.3 Specified Area (Initiative Plan)

Council may vote on a bylaw to establish an annual specified area tax on properties deemed to benefit by the implementation of a neighbourhood traffic calming plan. If more than 50 percent of the property owners in the area object, the bylaw is defeated. This method should only be used on traffic calming initiatives that involve measures on a single road.

4.4 Other Potential Sources of Funding

Partial funding for traffic calming plans may be available from the Insurance Corporation of British Columbia (ICBC). The ICBC Road Improvement Program currently provides partial funding for projects that result in a significant safety benefit as demonstrated by an expected reduction in crash claims. This funding will be subject to a favourable benefit-cost analysis by ICBC.

For new developments, where the neighbourhood design may result in speeding or infiltration issues, Council may request that the developer fund traffic calming initiatives as a preventative measure.

4.5 Combined Sources of Funding

For the funding methods described in Sections 4.2 and 4.3, the Municipality may consider the reasonableness and the ability of residents to pay. If the annualized costs of an initiative are deemed beyond the ability of residents to pay, the Corporation of Delta may elect to fund additional costs. It is also noted that the Municipality would have to fund any additional municipal operating and maintenance costs associated with the implementation of traffic calming measures.



5.0 IMPLEMENTATION AND PERFORMANCE MONITORING

5.1 Public Awareness

A public awareness program will accompany the traffic calming project. Adequate advice to local and through traffic will be provided prior to the implementation of any traffic calming project. The program will advise local residents of the details of the installation to minimize surprises or unexpected inconvenience to the neighbourhood.

For neighbourhood residents, the public awareness program will include a map of the neighbourhood showing the location of traffic calming device installations, a schedule of the installations, details of any local access disruptions and contact information for the project.

For through traffic and the larger community, the Municipality shall place notices in the local newspaper to raise awareness of the planned improvements and any need to modify travel routes. The notices will include a map showing the locations of improvements and the schedule of installation.

For transit services, emergency response services and Municipal operations, the Engineering Department shall provide written notice of the planned installations two weeks prior to the installation date. The notices shall advise of the need to modify routes and of any special provisions for emergency access.

5.2 Installation

Traffic calming projects can be implemented in three ways:

- Trial or temporary installation;
- Staged or phased installation; and
- Full or permanent installation.

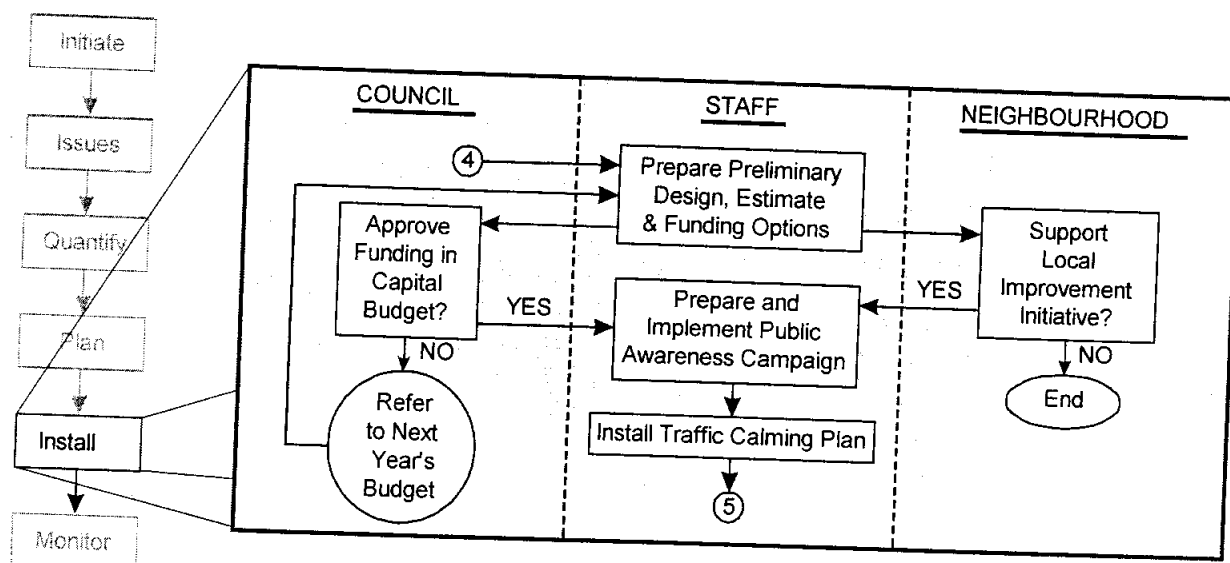


FIGURE 5.1 IMPLEMENTING THE TRAFFIC CALMING PLAN

A. Trial or Temporary Installation

Trial or temporary installations are used when there is uncertainty as to the effectiveness of the traffic calming plan to meet the objectives of the neighbourhood and Municipality. This uncertainty may rest with the neighbourhood or with Council.

Therefore, trial installations should usually be initiated in one of two ways. Trial installations can be requested by the neighbourhood as an aid to discerning a preferred solution and prior to Council's consideration of the plan. Conversely, Council may, on considering the preferred traffic calming plan of a neighbourhood, direct staff to perform a trial installation. In all cases, Council must approve a trial prior to installation. Trial installations will use materials that can be readily removed at the end of the trial period. Trial installations will be implemented for a minimum of six months.

B. Staged or Phased Installation

A traffic calming plan may use a staged or phased approach to implementation. This approach would typically apply to large neighbourhoods involving the installation of many traffic control devices. The staging usually takes one of three forms:

- Treat problem locations as a first priority;
- Treat the area from one end to the other in a systematic manner for construction efficiency; and,



- Treat from the circumference inwards.

Should the neighbourhood require a staged implementation; Municipal staff will recommend the appropriate form of phased installation. Staged installations will use materials that are permanently installed with appropriate landscaping and streetscaping features.

C. Full or Permanent Implementation

Full implementation involves installing all traffic control devices at once. The benefits of this approach is that the whole neighbourhood is treated at once so that motorists do not have to adapt to a changing road network and it avoids the costs of temporary works. A disadvantage of full implementation is that the traffic control devices would be expensive to remove should the plan prove to be unsuccessful or unwanted.

5.3 Evaluating Performance

Municipal staff will conduct a number of operational, social and perhaps environmental surveys to evaluate the performance of the traffic calming installations. The post-implementation performance evaluation could include some or all of the following:

- Collection of operating speed data;
- Collection of diversion effect data;
- Collection of traffic origin/destination data (through/local);
- Safety performance analysis (crashes, conflicts); and/or,
- Public acceptance surveys.

A report evaluating the performance of the neighbourhood traffic calming installations will be prepared and submitted to Council. Council may authorize a supplemental public process to study and modify the traffic calming installations should their performance prove to be unsatisfactory. The installation should be in place at least six months before monitoring is conducted.

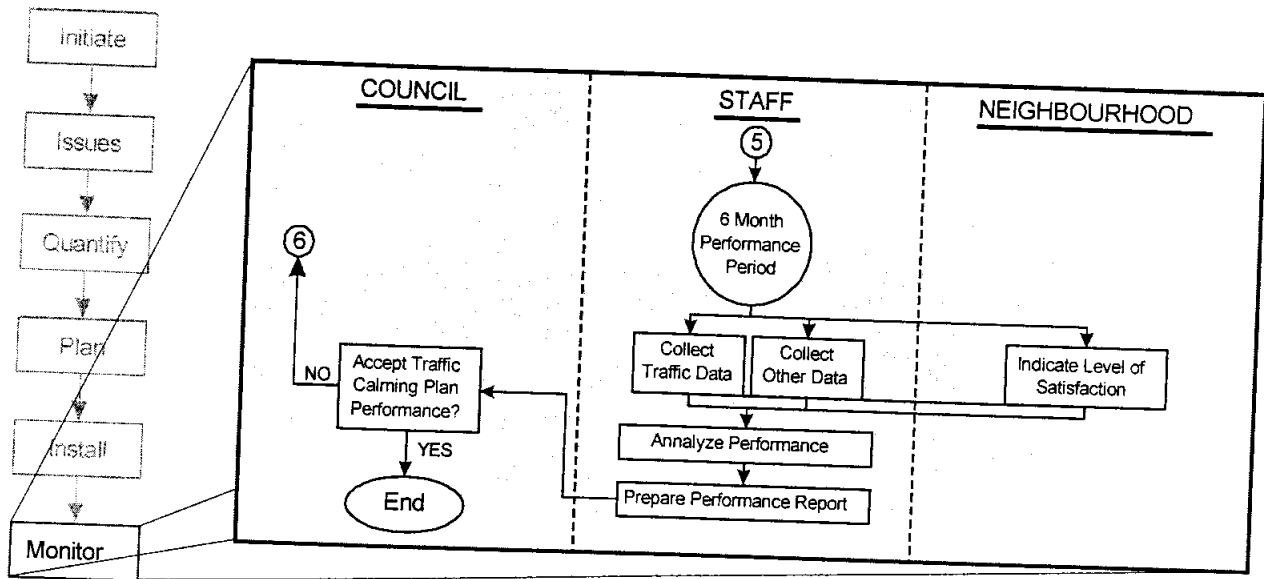


FIGURE 5.2 MONITORING THE TRAFFIC CALMING PLAN



APPENDIX A
ANNOTATED BIBLIOGRAPHY



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ANNOTATED BIBLIOGRAPHY

1. Adam, Ian, Guidelines for Public Involvement Process, A report to the Vancouver Traffic Commission, City of Vancouver, September, 1996

This report outlines the public communication guidelines for transportation projects in the City of Vancouver. The report primarily focuses on the methods of notification to the public for large and small projects.

2. Austroads, Guide to Traffic Engineering Practice, Part 10, Local Area Traffic Management, Austroads, 1988

This guide reflects experience gained in a number of Australian States as well as documented experience from other countries. It is concerned with planning the usage of road space within a neighbourhood to achieve goals, determined by affected parties, for the improvement of the residential environment. It defines a generic, systematic area-wide method for the treatment of problems, which can be tailored to the objectives and public consultation requirements of each community. Each step of the method is discussed in detail. The advantages and disadvantages of different approaches to each step are provided. Guidelines for public participation are provided.

3. Braaksma, John P., and Lockwood, Ian M., Calm the Traffic, Excite the People: A Process for Community-Based Transportation Planning, presented at 1996 Annual Conference of the Transportation Association of Canada.

This paper describes a community-based approach to traffic calming, with a significant public consultation process, including the use of a community based working group, and several public meetings and workshops. A high level of consensus building is required.

4. City of Bellevue, Neighbourhood Traffic Control Program, <http://www.ci.bellevue.wa.us>, 1997

This is a very brief document, which describes the Neighbourhood Traffic Control Program for the City of Bellevue. The City uses a two-phase approach to traffic calming. The first phase uses education, enforcement and updating the existing traffic controls to current standards. The second phase uses physical devices to control traffic such as: curb extensions, partial road closures, speed humps, traffic circles and medians. Some environmental thresholds for the phase two program are defined.



5. **City of Burnaby, South East Burnaby Community Transportation Plan, 995, various documents pertaining to a neighbourhood traffic calming initiative sponsored by the City.**

These documents include: internal reports to Council and the Traffic and Transportation Committee, before and after traffic volume surveys, public acceptance surveys, speed hump plan and a stop sign control scheme. The traffic calming plan was implemented in the neighbourhood. The speed hump installations were funded under a local improvement program.

6. **City of Portland, The Traffic Calming Program: Simplification and Enhancement of the Neighbourhood Traffic Management and Arterial Traffic Calming Programs, <http://www.trans.ci.portland.or.us>, September, 1994**

This document describes the objectives, policies and process of the Traffic Calming Program for the City of Portland. The Traffic Calming Program includes three types of projects: Neighbourhood Collector Street projects; Complex Local Service Street projects; and Simple Local Service Street projects. A process for each type of project is included in the document. The City funds most traffic calming projects, however a "Purchase Plan" for speed bumps and humps is also offered. Ranking criteria for City funded projects is included in the Appendix of the document.

7. **City of New Westminster, Neighbourhood Traffic Studies A Policy Paper, Engineering Department, April 16, 1991**

This is a brief document, which outlines the steps for conducting a neighbourhood traffic calming initiative in the City of New Westminster. It includes the public process, methods of communication to the neighbourhood, meeting format, implementation method and post performance analysis.

8. **County Surveyors Society et al, Traffic Calming in Practice, Landor Publishing Ltd., 1994**

This report describes the framework for traffic calming in the United Kingdom. The objectives, legislation, consultations and assessment of priorities are describes. Advice is provided on how to develop and implement a successful traffic calming scheme, and the importance of "before" and "after" studies. The need for public consultation, and



consideration of land use is stressed. Potential sources of funding are identified: the local authority, submissions to the Department of Transportation, from the private sector and occasionally from residents. Private sector contributors are suggested for traffic calming schemes near shopping centres, in conjunction with downtown revitalization, or in conjunction with a new residential development. Those projects, which address safety concerns, may be eligible for special funding.

The majority of the report is devoted to case studies which describe the location, need for measures, measures installed, special features, consultation process and results of monitoring and evaluation.

9. Ducote, Frank and Klimchuk, Don, Traffic Calming Toolkit - Existing Measures and Procedures for Local Streets, City of Vancouver, April 1997

This document describes the traffic calming measures approved for use in the City of Vancouver and the current Neighbourhood Traffic Plan Process and the Local Improvement process for Traffic Calming Measures. The City funds the Traffic Plan Process, while the neighbourhood funds the Local Improvement Process.

10. Homburger et al, Residential Street Design and Traffic Control, Institute of Transportation Engineers, Prentice Hall, 1989.

This report is a handbook for the design and retrofit of residential streets to address concerns regarding noise, safety and livability. Chapters address the function, planning objectives, design and redesign, of local streets. It describes tools for neighbourhood traffic control, and describes methods for implementing neighbourhood traffic controls. The implementation section addresses legal, process and maintenance issues as well as the need to evaluate and fine tune. Sources of funding include general revenues of the municipality, fuel taxes, motor vehicle taxes, parking revenues, or other transportation funds. Occasionally, elements of neighbourhood traffic control have been funded by commercial developments. Neighbourhood-based funding or community development grants maybe considered. Explicit budget should be considered for enforcement of new traffic requirements.



11. **Kanely, Brian, Neighbourhood Traffic Calming - Do We Need Warrants?, Institute of Transportation Engineers Resource Papers for the 1997 International Conference, 1997, pages 60-64**

The City of Gainesville reviewed traffic data obtained in Gainesville Florida neighbourhoods where traffic calming measures were installed on neighbourhood streets. The data that was collected varied considerably and trends were difficult to identify. Additionally, some of the goals of traffic calming such as maintaining access, encouraging vitality, improving appearance and improving livability are all subjective, and difficult to quantify. The paper concludes that warrants for neighbourhood traffic calming would be inappropriate, and would be difficult to formulate. The paper provides guidelines, which indicate when traffic calming may be appropriate.

12. **Kant Edward J. and Muller, Russell D., Neighbourhood Traffic Management: Development and Implementation, One County's Experience, Institute of Transportation Engineers Resource Papers for the 1997 International Conference, 1997, pages 21-24**

This paper describes the development of goals, objectives and policies relating to neighbourhood traffic management, and describes the agreed-upon thirteen-step program. The program includes definition of the study area, selection of a neighbourhood team, and monitoring and evaluation. The County has allocated \$50,000 in the fiscal year for construction costs. Initial requests have used 50/50 cost sharing with the benefiting neighbourhood.

13. **King County Traffic Engineering Section, Neighbourhood Traffic Safety Program - Working with Citizens to Improve Traffic Safety, a brochure.**

This brochure describes the two-phase program that King County uses to address concerns regarding through volumes, speeding, and drivers who ignore traffic signs. Phase One includes a radar/reader board, traffic safety improvements, visibility improvements, and distribution of traffic safety educational materials. If the problems are not addressed by the Phase One measures, the county moves on to Phase Two, which includes implementation of traffic calming devices.



14. Lockwood, Ian M., Do We Need Traffic Calming Warrants?, Institute of Transportation Engineers Resource Papers for the 1997 International Conference, 1997, pages 55-59.

This paper argues that traffic calming is appropriate for many reasons, and that traffic calming warrants, in the traditional sense, would be difficult to quantify. Exceptions would be the rule. For new streets, in-built traffic calming might be advantageous, but it would be difficult to apply warrants. The report recommends testing for appropriateness, and then prioritizing should be the key to initiating traffic calming on existing streets, not warrants. Tests of appropriateness include:

- Is the street in, or on the approach to, a built-up area?
- Do the land uses front the street, do vulnerable users use the street, and is the land use sensitive, e.g., tourist, historic, hospital zone?
- Is the community supportive?

Projects should be prioritized according to the severity of the problems, the filing date of the request, staff judgement, implementation costs and funding availability.

15. Mackie, Scott and Klassen, The Application of CONTRAM in Resolving Community Traffic Issues

This paper describes the City of Calgary Community Traffic Study Process. It then uses a case study to show how CONTRAM, a computer based traffic assignment model, can be used to assist in the assessment of alternatives.

16. Murphy, T., and Rocchi, S., Traffic Calming Policy and Procedures for the District of North Vancouver, B.C., 1999.

This document outlines a six-step public involvement process to develop traffic calming plans for neighbourhoods. It recommends a process, which involves public participation and group decision making to find solutions.

17. Murphy, T., Rocchi, S. and Volk, K., Neighbourhood Traffic Calming Policy and Procedures for the District of Pitt Meadows, B.C., 2001.

This policy and procedure document was prepared for the District as a deliverable for the Safer Community Initiative, a partnership project with the Insurance Corporation of



British Columbia. The policy covers programming, process and funding.

18. Murphy, T., Neighbourhood Traffic Calming Policy and Procedures for the City of Abbotsford, B.C., 2003.

This policy and procedure document was prepared for the City as a deliverable for the Safer Community Initiative, a partnership project with the Insurance Corporation of British Columbia. The policy covers programming, process and funding.

19. O'Brien, Andrew P., The Need for Warrants - The Australian Experience, Institute of Transportation Engineers Resource Papers for the 1997 International Conference, 1997, pages 55-59.

This paper describes the context for traffic calming in Canberra, Australia. It describes the importance of a policy context for warrants, acknowledging that the definition of a problem is relatively subjective, and that there are no absolute thresholds, which define a problem. It proposes that it is wrong in principle to apply the same level of acceptability across different types of locality, physical environment and local character, and that comparing one area with another, especially inner suburb with outer suburb, is unlikely to prove productive. It defines two types of warrants, action warrants and problems warrants, which indicate which problems must be addressed, and which could be addressed if funding were available, respectively.

Key features of other warrant systems are summarised, concluding that the best warrant systems incorporate a point scoring system with higher weighting to more important criteria, different street types and classifications are scored differently for the same data, a system that is readily understood and completely transparent. Typical parameters included traffic volume, 85th percentile traffic speed, non-local traffic volume, and collision data. Based on this survey, warrants are proposed for Canberra.

20. North Central Section Institute of Transportation Engineers, Neighbourhood Traffic Control, NCITE, 1994.

This report was prepared by committee and is a summary of neighbourhood traffic control techniques that have been implemented, particularly in the North Central section (Minnesota, North Dakota and South Dakota). This report briefly proposes a model process. It emphasizes that pedestrians, disabled, emergency vehicles and school buses should be accommodated. The majority of the report is a toolbox of traffic calming



measures. Each measure is described, and its impact on volumes, noise, complaints, accidents, enforcement, accessibility and community reaction is described.

21. Perone, Joseph P., Developing and Implementing Traffic Calming Warrants, ITE 1996 Compendium of Technical Papers.

This paper describes two sets of traffic calming warrants that have been developed for the City of Darebin in the State of Victoria, Australia. The first method, site analysis, considers reported accidents, heavy vehicles and speeds. The second method, environmental capacity, considers land use, building set backs, road geometry, public transport activity and pedestrian activity. Although both methods are equally valid, sites with demonstrated safety problems are given a higher priority for implementation.

22. Skene, Mike, Neighbourhood Transportation Management Program, A report to the Advisory Transportation Commission, City of Victoria, March 1992.

This report states the initial objectives and policies of a Neighbourhood Transportation Management Program for the City of Victoria. A procedural outline for developing a neighbourhood plan and a list of criteria for ranking and selecting neighbourhoods for the program is included.

23. Transportation Association of Canada (TAC)/Institute of Transportation Engineers, Canadian Guide to Neighbourhood Traffic Calming, TAC, December, 1998.

This guide is a result of input from transportation and planning professionals from across Canada. It focuses on traffic conditions and traffic calming measures on local and collector residential streets, primarily within urban areas. It defines traffic calming, explains its roles in transportation planning, and identifies issues related to designing and implementing traffic calming plans. Processes for involving the community in the development of a traffic calming plan are recommended and described in great detail. The guide provides a recommended policy in broad terms, including good practices. The majority of the report consists of a description of a wide range of traffic calming measures, with guidelines for their use and design. Funding issues are not discussed.

24. Tanda, Wayne, Traffic Calming - San Jose's Experience, Institute of Transportation Engineers International Conference, 1997 (not included in compendium).



This paper describes the key elements of San Jose's approach to neighbourhood traffic concerns, as follows:

- Provide arterials and alternatives such as light rail, so motorists do not feel the need to use residential streets;
- Mitigate the impacts of new developments on adjacent residential neighbourhoods;
- Try new residential street designs, such as narrower streets and roundabouts, to reduce traffic speeds;
- Penalize the small minority who are speeders through photo radar on residential streets, in contrast with methods such as speed humps, that penalize both good drivers and bad; and,
- Manage public expectations by instituting policies that define thresholds, which must be met, before a particular device is utilized or a process is undertaken.

The paper also describes the evolution of the present-day approach. The first approaches had included street-by-street mitigation, informational programs, design features and an appeals program. Next the City tried a Neighbourhood Traffic Management Program, which dealt with entire neighbourhoods on a priority basis. This program was lengthy and controversial, and was eventually cancelled for budgetary reasons; this led to the current approach of looking outside the neighbourhood. Lessons learned through this evolution included ensuring sufficient staff resources, managing expectations, involving the affected and setting realistic objectives.

25. Hall, Jim, Administrative Report to Standing Committee of Council on Transportation and Traffic of the City of Vancouver on Neighbourhood Traffic Calming Plans - Priorities and Process, 1999.

This report describes a process and method of establishing priorities for traffic calming. Proposals should be prioritized on objective criteria such as traffic speed, volumes, schools and other pedestrian generators.



26. Government of BC, Local Government Act, Part 19 – Local improvements and Specified Areas.

This document provides a description of the methods for municipal government to raise funds for local improvements, or for residents to initiate such improvements.

27. Ewing, Reid, Traffic Calming State of the Practise, ITE, 1999.

This report provides a state of the practise of traffic calming in the United States at the time of publication. A toolbox of traffic calming measures is provided. Issues such as emergency response and other agency concerns, warrants, project selection procedures and public involvement are discussed, with examples from featured programs in 20 communities.

28. City of Coquitlam, Traffic Calming Policy, Findings of the Traffic Calming Task Force, 1999.

This policy outlines guiding principles, methods for responding to initial public requests, prioritizing studies. It recommends study areas, funding strategies, study process and traffic calming measures for the City of Coquitlam.

29. Urbans Systems, Traffic Calming Program – Delta Transportation Plan, November 2000.

This report outlines a traffic calming program for the Corporation of Delta. The report recommend a process for conducting traffic calming projects and ranks neighbourhoods in terms of need. Typical project schedules and budgets are also discussed.

30. Urban Systems, City of Kamloops Traffic Calming Policy – Draft Report, November 2002.

This report proposes a traffic calming policy for the City of Kamloops. The policy document presents: goals and objectives, managing the process, principles of traffic calming and applicability. The document includes a sample terms of reference for a neighbour advisory group.



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APPENDIX B

TRAFFIC CALMING DEVICES

Summarized from Chapter 3.0

of the

Canadian Guide to Neighbourhood

Traffic Calming



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RAISED CROSSWALK



Description and Purpose

A raised crosswalk is a marked crosswalk at an intersection or mid-block location, which is constructed at a higher elevation than the road surface. The purpose of a raised crosswalk is to:

- Reduce vehicle speeds;
- Improve pedestrian visibility; and
- Reduce pedestrian-vehicle conflicts.

Benefits

Vehicle speeds:

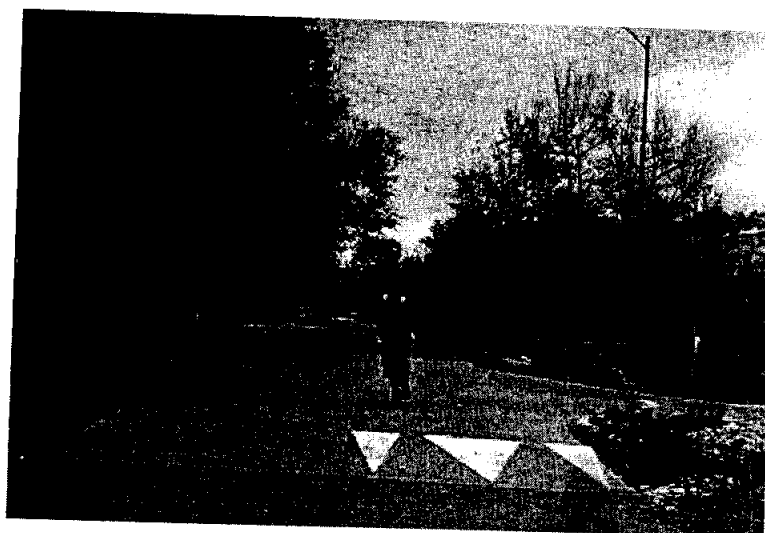
- Reductions in 85th percentile speeds from 54 km/h to 49 km/h at reported at some locations in Boulder, CO.
- Speeds reduced in area of crosswalk, as raised crosswalk is similar to a speed hump.

Disbenefits

Traffic may be diverted to parallel residential streets that do not have traffic calming measures.



RAISED INTERSECTION



Description and Purpose

A raised intersection is an intersection (including crosswalks) constructed at a higher elevation than the adjacent roadways. The purpose is of a raised intersection is to:

- Reduce vehicle speeds;
- Better define crosswalk areas; and
- Reduce pedestrian-vehicle conflicts

Benefits

Vehicle speeds:

- Vehicles forced to slow through intersection area;
- Reduction in 85th percentile speeds at mid-block location from 47 km/h to 36 km/h (Toronto, ON.)

Pedestrian area better defined.

Disbenefits

Disbenefits are:

- High cost;
- May divert traffic to parallel residential streets that do not have traffic calming;
- Slows emergency vehicles to approximately 25 km/h.



RUMBLE STRIP

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PICTURE TO BE ADDED PRIOR TO PRINTING)

Description and Purpose

Rumble strips are raised buttons, bars or grooves closely spaced at regular intervals on the roadway that create both noise and vibration in a moving vehicle. The purpose of a rumble strip is to alert motorists to unusual conditions ahead. With rumble strips:

- Motorists are alerted by minor vertical deflection vehicle wheels and audible warning created as vehicle wheels pass over; and
- The buttons and bars coloured white to provide visual identification.

Benefits

Vehicle speeds:

- Average reduction in vehicle speeds of 5 km/h (Burlington, ON).
- No significant effect on vehicle speeds, changes range from 5 km/h reduction to 8 km/h increase (Phoenix, AZ).

Disbenefits

Disbenefits are:

- Vehicles passing over rumble strip create loud, distinctive noise which may be an annoyance for occupants of adjacent buildings.
- Maintenance, 50% to 80% of rumble strips replaced every six months.



SPEED HUMP



Description and Purpose

A speed hump is a raised area of a roadway, which deflects both the wheels and frame of a traversing vehicle. The purpose of a speed hump is to reduce vehicle speeds. With speed humps the vertical deflection of vehicle wheels produces an uncomfortable sensation for vehicle occupants travelling at speeds higher than the design speed.

Benefits

Vehicle speeds reduced in relation to the spacing of the speed humps:

- 50 km/h with speed humps at 125 metre spacing;
- 40 km/h with speed humps at 80 metre spacing;
- 30 km/h with speed humps installed in pairs at 60 metre spacing.

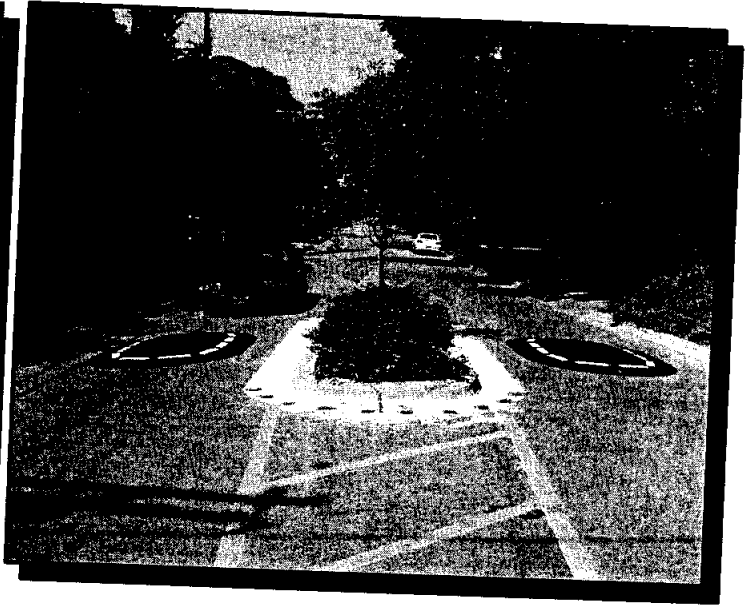
Disbenefits

Disbenefits are:

- Some traffic may be diverted to parallel streets that do not have traffic calming measures;
- Fire vehicles experience an 8 to 15 seconds delay per speed hump.



SPEED CUSHION



Description and Purpose

A speed cushion is a raised area of a roadway, which deflects both the wheels and frame of a traversing vehicle. Most cars will not be able to negotiate a speed cushion without having at least one side of the vehicle's wheels on the cushion. Most large vehicles such as trucks and buses can traverse the cushion without having a wheel on the cushion. The purpose of a speed cushion is to selectively reduce vehicle speeds passenger cars. With speed cushions the vertical deflection of vehicle wheels produces an uncomfortable sensation for vehicle occupants travelling at speeds higher than the design speed.

Benefits

Vehicle speeds reduced in relation to the spacing of the speed humps:

- 50 km/h with speed humps at 125 metre spacing;
- 40 km/h with speed humps at 80 metre spacing;
- 30 km/h with speed humps installed in pairs at 60 metre spacing.

Disbenefits

Disbenefits are:

- Some traffic may be diverted to parallel streets that do not have traffic calming measures;
- Fire vehicles experience an 8 to 15 seconds delay per speed cushion.



TEXTURED CROSSWALK



Description and Purpose

A textured crosswalk is a crosswalk incorporating a textured and/or patterned surface, which contrasts with the adjacent roadway. The purpose of a textured crosswalk is to better define the crossing location for pedestrians and to reduce pedestrian-vehicle conflicts.

Benefits

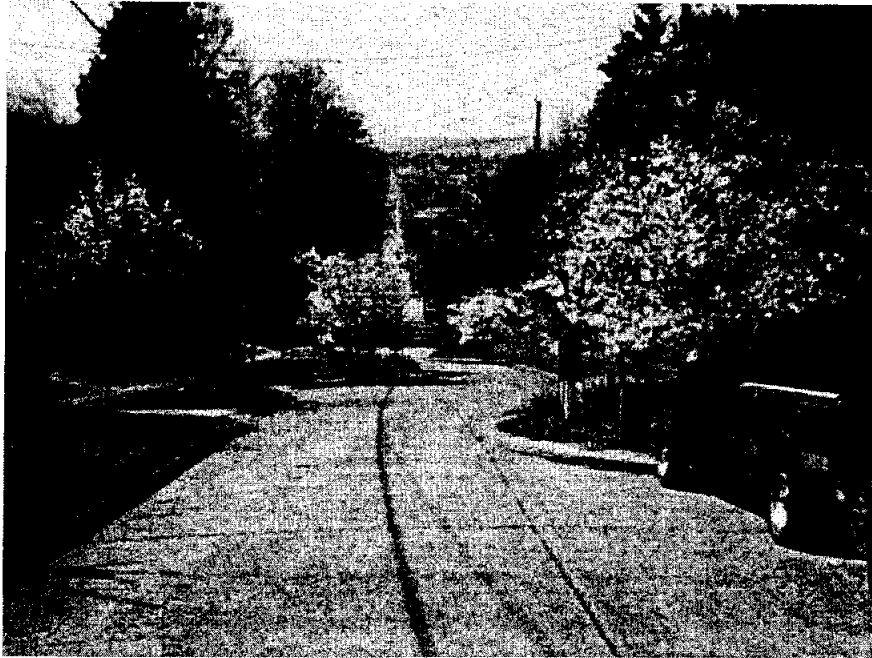
Improves visibility of crosswalk and may reduce vehicle-pedestrian conflicts. Textured crosswalk treatment enhances appearance of street.

Disbenefits

The crosswalk may have maintenance problems depending on stability of base and frequency of heavy vehicle traffic.



1 – LANE CHICANE



Description and Purpose

A chicane is a series of curb extensions on alternating sides of a roadway, which narrow the roadway and require drivers to steer from one side of the roadway to the other to travel through the chicane. Typically, a series of at least three curb extensions is used. The purpose of a chicane is to discourage shortcutting or through-traffic, and reduce vehicle speeds.

Benefits

Vehicle speeds reduced to 25 km/h through chicane and to 47 km/h between two chicane installations (Seattle, WA). Many sites experience a reduction in traffic volumes, such as in Seattle, WA, which measured a reduction from 1900 vehicles/day down to 1000 vehicles/day.

Disbenefits

On-street parking must be removed inside, and within 5 metres of the chicane. The chicane may divert significant volume of traffic to parallel streets without traffic calming.



2 – LANE CHICANE



Description and Purpose

A 2-Lane chicane is an abrupt horizon deflection in the roadway and requires drivers to slow their vehicle to travel through the chicane. The purpose of a chicane is to reduce vehicle speeds.

Benefits

Reductions in speed from 48 km/h to 37 km/h, and from 45 km/h to 34 km/h at chicanes (Nepean, ON).

Disbenefits

With 2-Lane chicanes, some motorists may attempt to travel at higher speeds through the chicane by crossing the centreline to maintain a straighter line of travel.



CURB EXTENSION



Description and Purpose

A curb extension is a horizontal intrusion of the curb onto the roadway resulting in a narrower section of roadway. The curb is extended on one or both sides of the roadway to reduce its width to as little as 6.0 metres for two-way traffic. The purpose of a curb extension is to:

- Reduce vehicle speeds;
- Reduce crossing distance for pedestrians;
- Increase pedestrian visibility; and
- Prevent parking close to an intersection.

Benefits

Vehicle speeds are typically reduced by 1 to 5 km/h. Reduced pedestrian crossing distance and improved visibility may reduce vehicle-pedestrian conflicts.

Disbenefits

Some cyclists on shared roadways may feel forced into path of motor vehicles. Requires the removal of on-street parking in location of curb extension.



CURB RADIUS REDUCTION

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PICTURE TO BE ADDED PRIOR TO PRINTING)**

Description and Purpose

A curb radius reduction is the reconstruction of an intersection corner with a smaller radius, usually a radius of 3.0 to 5.0 metres. The purpose of a reduced curb radius is to:

- Slow right-turning vehicles;
- Reduce crossing distance for pedestrians; and
- Improve pedestrian visibility.

Benefits

Speeds of right-turning vehicles reduced and improved pedestrian safety.

Disbenefits

Long trucks, buses and other large vehicles may need to cross into adjacent travel lanes in order to negotiate turns at the intersection.



ON – STREET PARKING

(NO PICTURE AT TIME OF REPORTING TO COUNCIL,
PICTURE TO BE ADDED PRIOR TO PRINTING)

Description and Purpose

On-street parking is the reduction of the roadway width available for vehicle movement by allowing motor vehicles to park adjacent and parallel to the curb. The effects of permitting on-street parking are:

- Reductions in vehicle speeds; and
- Possible reductions in short-cutting or through traffic.

Benefits

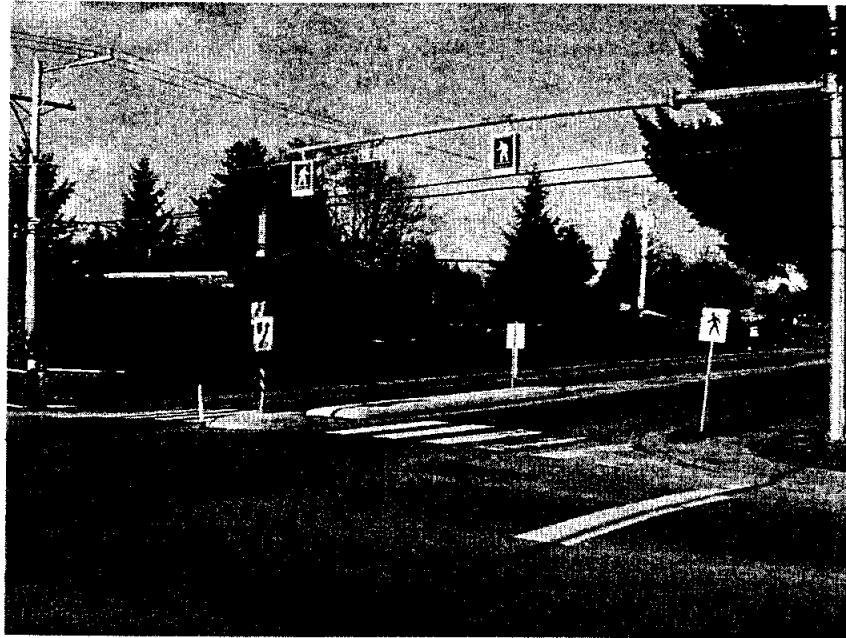
Parked vehicles provide a buffer between traffic and pedestrians on sidewalks. Traffic noise may be reduced due to a reduction in traffic volumes or speeds.

Disbenefits

On-street parking can reduce visibility of pedestrians crossing the roadway.



RAISED MEDIAN ISLAND



Description and Purpose

A raised median island is an elevated median constructed on the centreline of a two-way roadway to reduce the overall width of the adjacent travel lanes. The purpose of a raised island is to:

- Reduce vehicle speeds; and
- Reduce pedestrian-vehicle conflicts.

Benefits

Vehicles speeds are typically reduced by about 5 km/h near the raised median. The raised median can function as a pedestrian refuge improving pedestrian safety.

Disbenefits

Requires the removal of on-street parking in the area of the median. The median can restrict access to near by properties to right-in/right-out only.



TRAFFIC CIRCLE



Description and Purpose

A traffic circle is a raised circular island located in the centre of an intersection, which requires vehicles to travel through the intersection in a counter-clockwise direction around the island. The purpose of a traffic circle is to:

- Reduce vehicle speeds; and
- Reduce vehicle-vehicle conflicts at intersections.

Benefits

Reduction in vehicle speeds of about 10 to 15 km/h near the traffic circle. Typically, a 10% to 20% reduction in traffic volumes occurs with the installation traffic circles. Many installations also experience a significant reduction in the number of traffic crashes.

Disbenefits

Some pedestrians feel that traffic circles force vehicles into the unmarked crosswalk area, increasing the potential for pedestrian-vehicle conflicts. Traffic circles may require removal of some on-street parking. Also traffic circles may divert a significant volume of traffic to parallel streets without traffic calming measures. Fire emergency response vehicles can be delayed 5 to 10 seconds per traffic circle encountered while on route to an emergency.



DIRECTIONAL CLOSURE



Description and Purpose

A directional closure is a curb extension or vertical barrier extending to approximately the centreline of a roadway, effectively obstructing one direction of traffic. Bicycles are typically permitted to travel through a directional closure, gaps, or a contra-flow bicycle lane are used to provide bicycle access. The purpose of a directional closure is to obstruct short-cutting or through traffic.

Benefits

Directional closures typical result in about a 40% reduction in traffic volumes. Some streets may also experience a reduction in travel speeds.

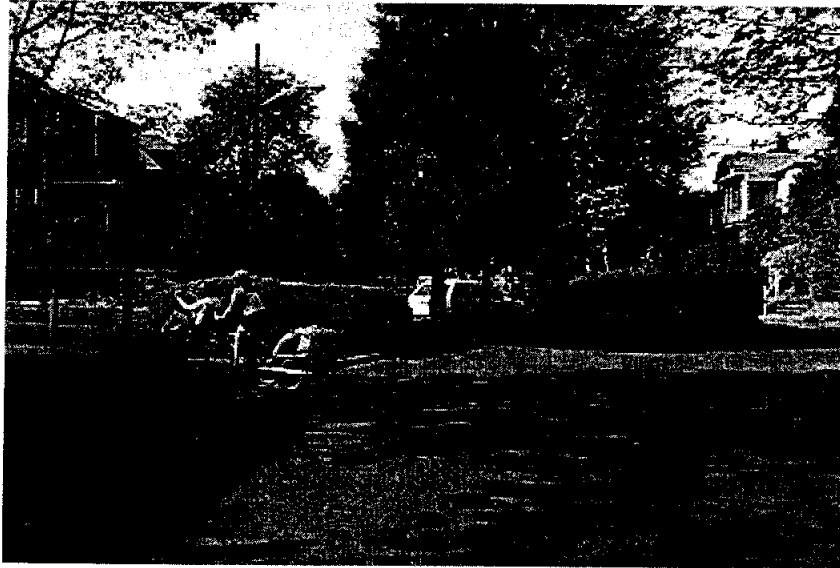
Disbenefits

Significant disbenefits are:

- Restricts resident access to the neighbourhood; and
- May divert significant volume of traffic to parallel streets without traffic calming measures.



DIVERTER



Description and Purpose

A diverter is a raised barrier placed diagonally across an intersection that forces traffic to turn and prevents traffic from proceeding straight through the intersection. Diverters can incorporate gaps for pedestrians, wheelchairs and bicycles and can be mountable by emergency vehicles. The purpose of a diverter is to obstruct short-cutting or through traffic.

Benefits

Diverters can result in a 20% to 70% reduction in area-wide traffic volumes, depending on extent of diverters used.

Disbenefits

Significant disbenefits are:

- Restricts resident access to the neighbourhood; and
- May divert significant volume of traffic to parallel streets without traffic calming measures.



FULL CLOSURE



Description and Purpose

A full closure is a barrier extending the entire width of a roadway, which obstructs all motor vehicle traffic along the roadway. A closure can change a four-way intersection to a three-way intersection, or a three-way intersection into a non-intersection. Gaps can be provided for cyclists and they are typically passable by emergency vehicles. The purpose of a full closure is to eliminate short-cutting or through traffic.

Benefits

Eliminates all short-cutting or through traffic.

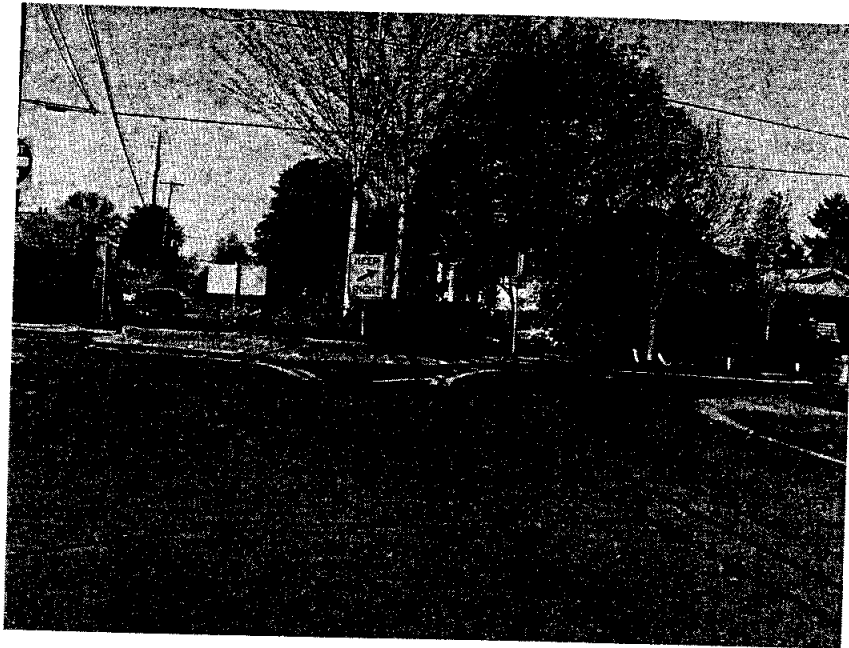
Disbenefits

Significant disbenefits are:

- Restricts resident access to the neighbourhood; and
- May divert significant volume of traffic to parallel streets without traffic calming measures.



INTERSECTION CHANNELIZATION



Description and Purpose

Intersection channelization is the use of raised islands located in an intersection to obstruct specific traffic movements and physically direct traffic through an intersection. The purpose of intersection channelization is to obstruct through traffic short cutting along a street by obstructing specific movements at an intersection.

Benefits

Unfortunately there is no information on the effectiveness of this device in reducing traffic volumes in Canada. However, it is likely this device will reduce traffic volumes on the restricted movement roadway.

Disbenefits

Significant disbenefits are:

- Restricts resident access to the neighbourhood; and
- May divert significant volume of traffic to parallel streets without traffic calming measures.



RAISED MEDIAN THROUGH

(NO PICTURE AT TIME OF REPORTING TO COUNCIL,
PICTURE TO BE ADDED PRIOR TO PRINTING)

Description and Purpose

A raised median through an intersection is an elevated median located on the centreline of a two-way roadway through an intersection, which prevents left turns and through movements to and from the intersecting roadways. It can create a refuge for pedestrians and cyclists, enabling them to cross one direction of travel at a time, thereby reducing waiting time for gaps when crossing a roadway. The purpose of a raised median through an intersection is to:

- Obstruct short-cutting or through traffic; and
- Reduce crossing distance for pedestrians.

Benefits

Installation of a raised median through an intersection has resulted in a 40 % traffic volume reduction on the crossing roadway.

Disbenefits

Significant disbenefits are:

- Restricts resident access to the neighbourhood; and
- May divert significant volume of traffic to parallel streets without traffic calming measures.



RIGHT-IN/RIGHT-OUT ISLAND



Description and Purpose

A right-in/right-out island is a raised triangular island at an intersection approach which obstructs left turns and through movements to and from the intersecting roadway or driveway. The purpose of a right-in/right-out island is to obstruct short-cutting or through traffic.

Benefits

Installation of a right-in/right-out island at an intersection has resulted in a 40 % traffic volume reduction on the restricted roadway.

Disbenefits

Significant disbenefits are:

- Restricts resident access to the neighbourhood; and
- May divert significant volume of traffic to parallel streets without traffic calming measures.



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APPENDIX C

**PRIMARY EMERGENCY
RESPONSES ROUTES**

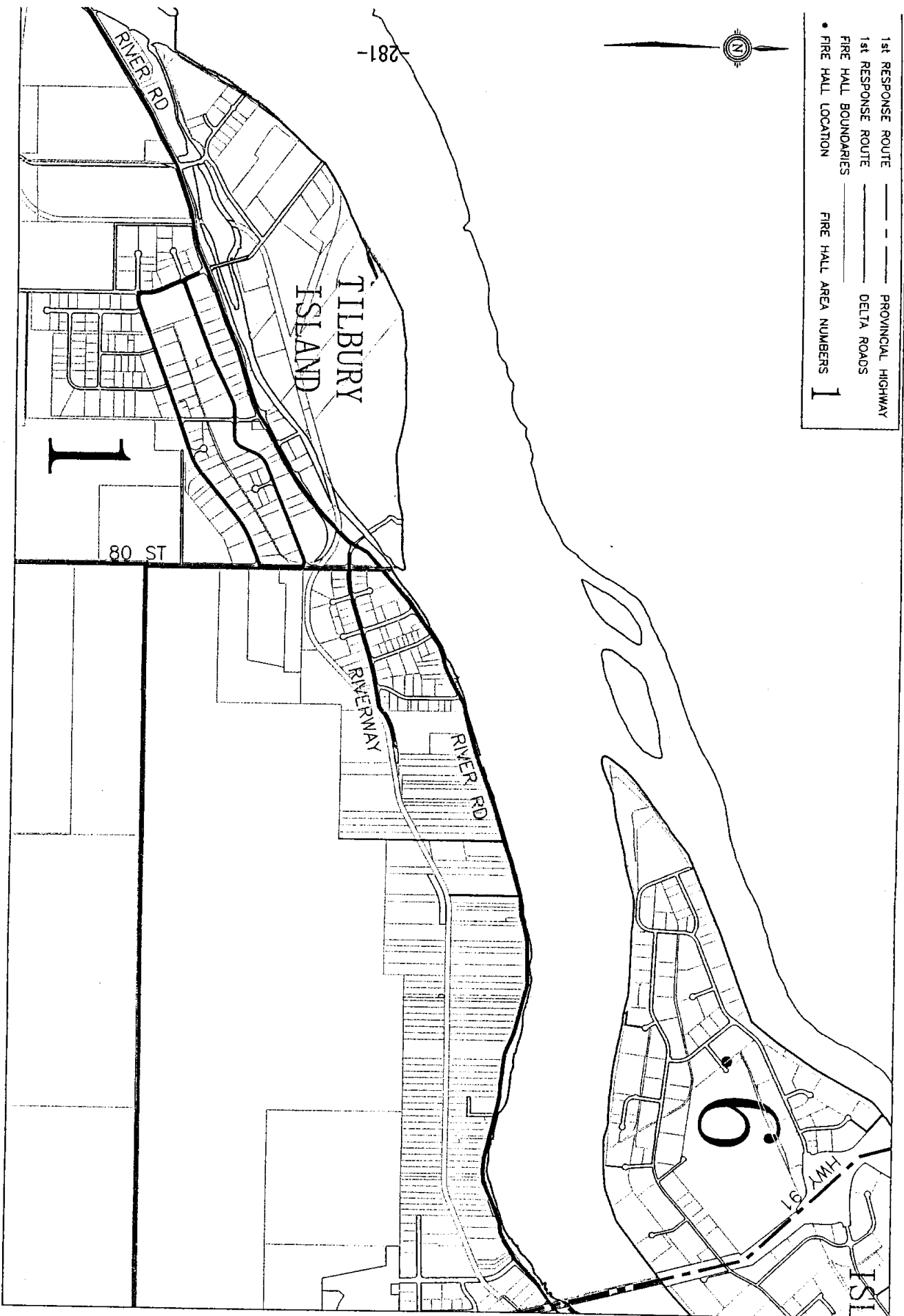
Provided by

Fire and Emergency Services



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- 1st RESPONSE ROUTE — — — — — PROVINCIAL HIGHWAY
- 1st RESPONSE ROUTE — — — — — DELTA ROADS
- FIRE HALL BOUNDARIES — — — — —
- FIRE HALL LOCATION •
- FIRE HALL AREA NUMBERS 1



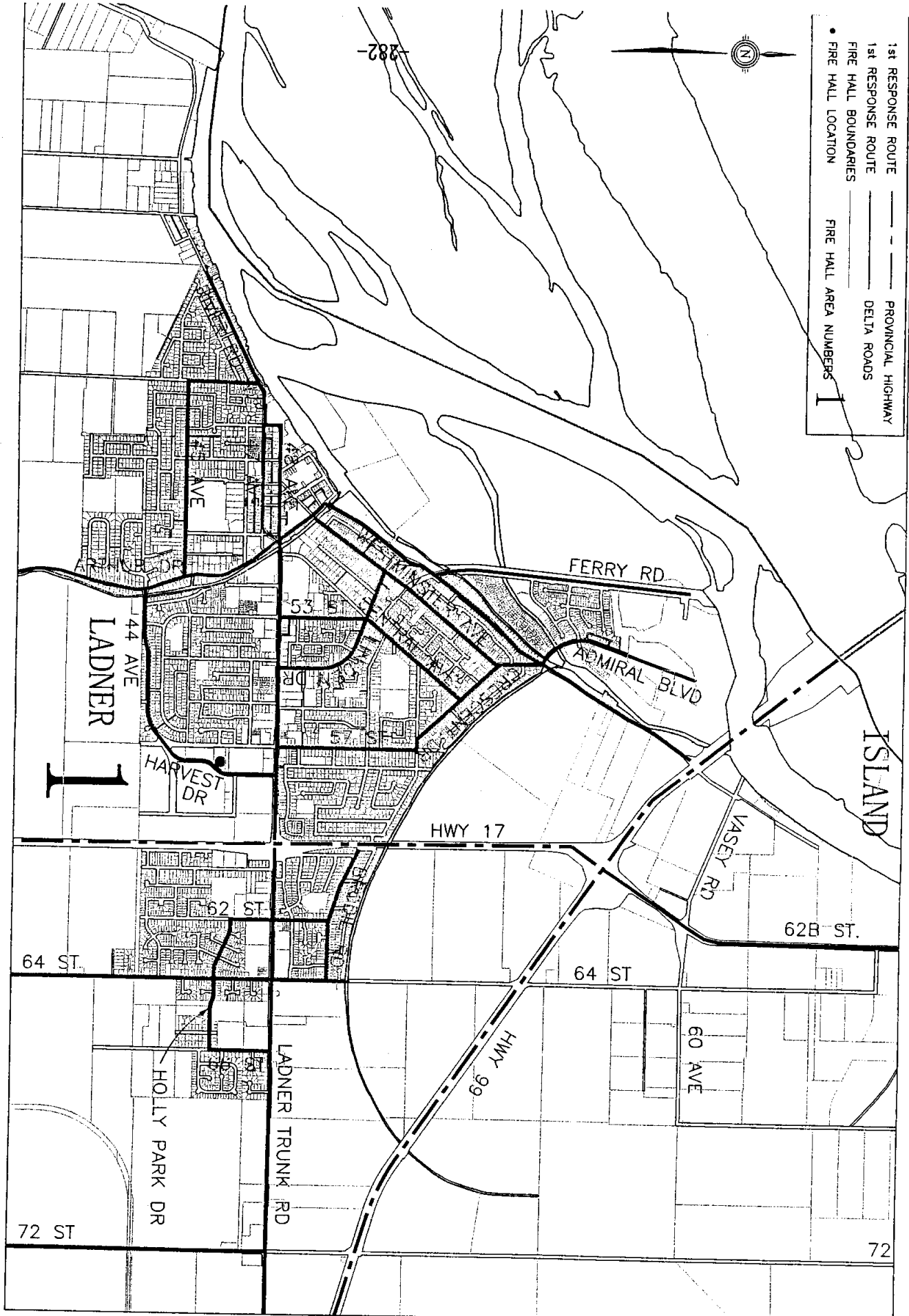
281-

TITLE
Delta Fire Department Response Routes

FILE 6.5.4.502.8
DATE 03_03_18

REFERENCE **TILBURY**
RIVER ROAD EAST

- 1st RESPONSE ROUTE ———
- 1st RESPONSE ROUTE - - - -
- FIRE HALL BOUNDARIES ———
- FIRE HALL LOCATION
- PROVINCIAL HIGHWAY ———
- DELTA ROADS ———
- FIRE HALL AREA NUMBERS |



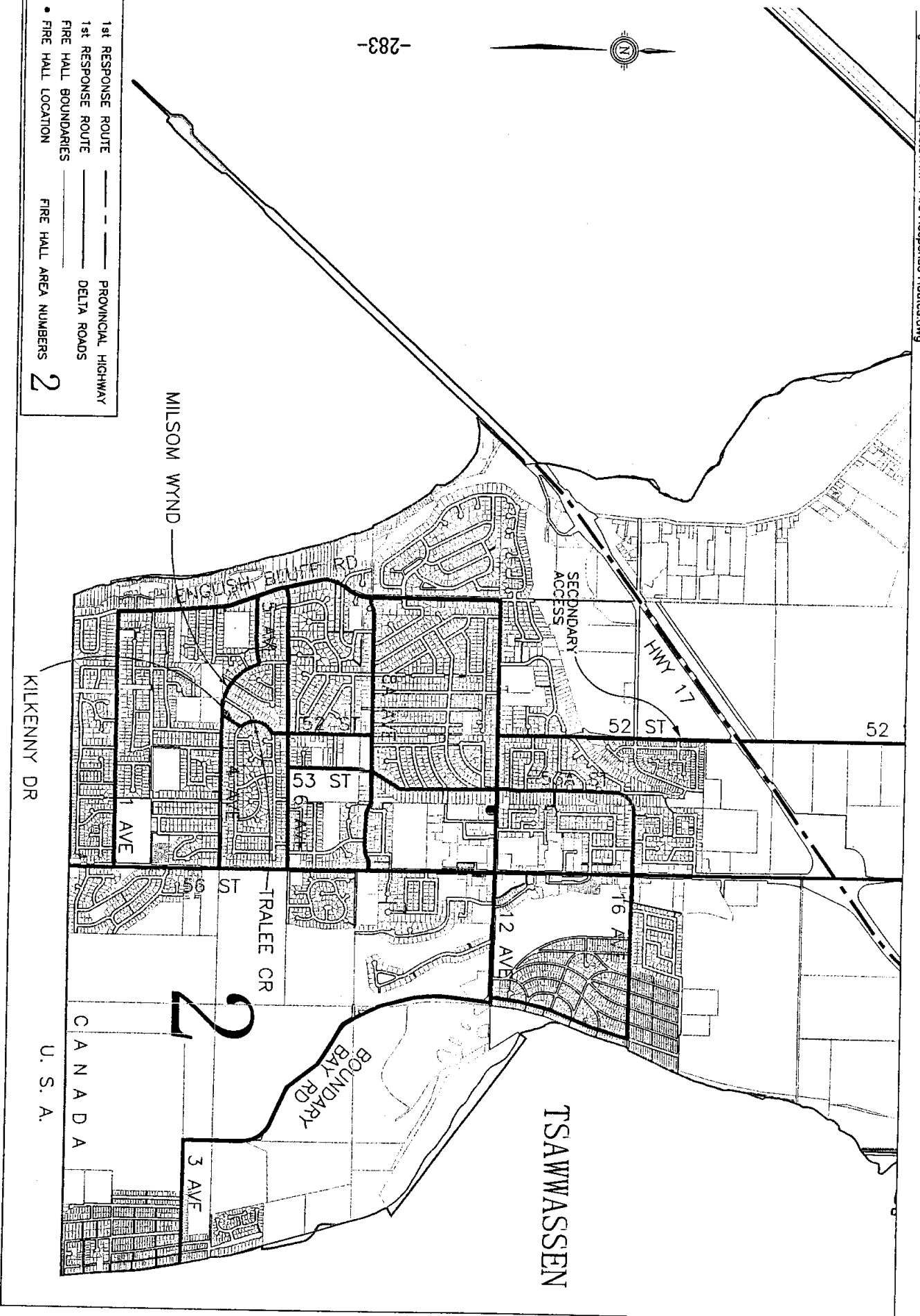
TITLE
Delta Fire Department Response Routes

FILE 6.5.4.502.8
DATE 03_03_18

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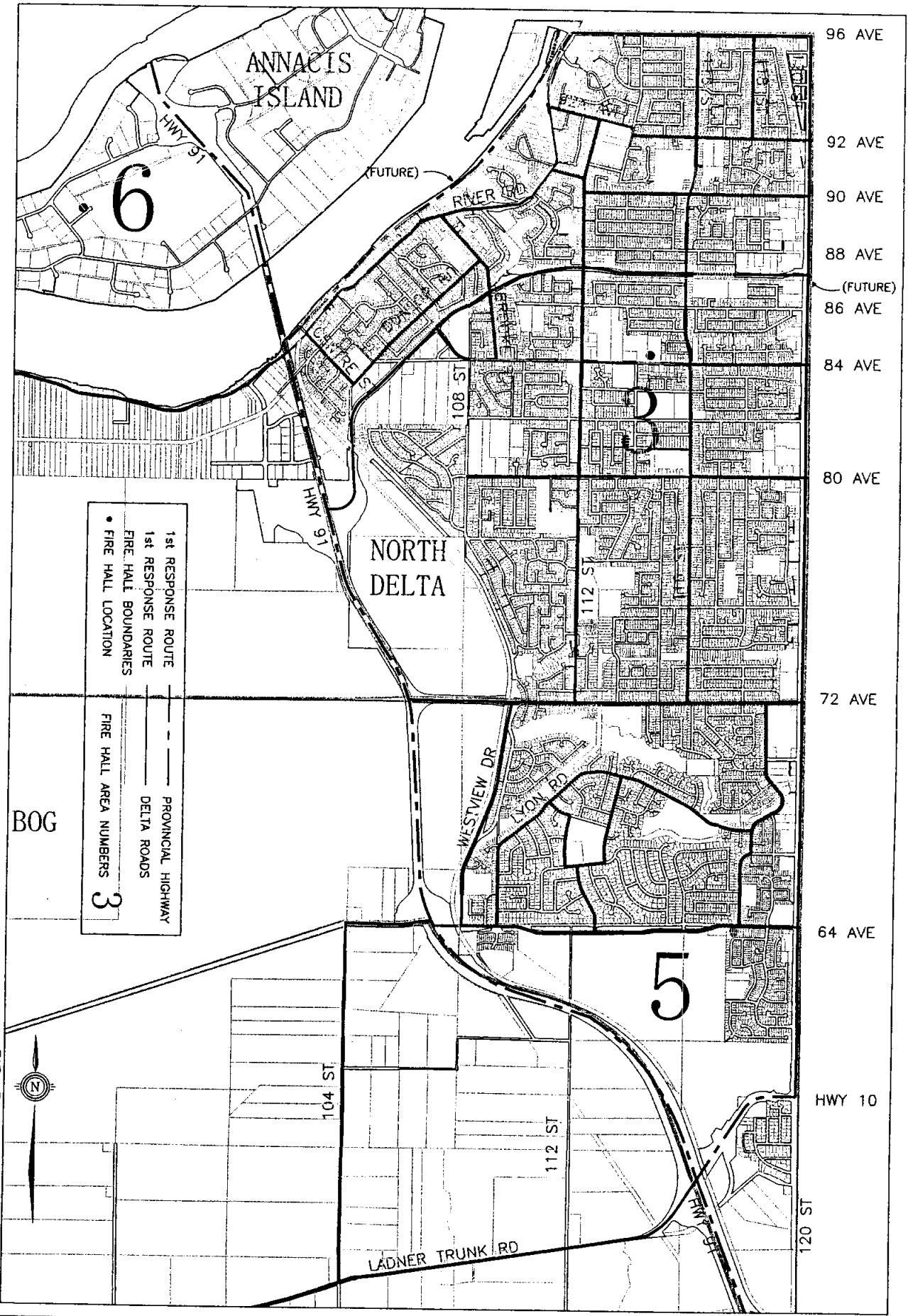
- 1st RESPONSE ROUTE ——— PROVINCIAL HIGHWAY
- 1st RESPONSE ROUTE - - - DELTA ROADS
- FIRE HALL BOUNDARIES ———
- FIRE HALL LOCATION FIRE HALL AREA NUMBERS **2**



TITLE
Delta Fire Department Response Routes

FILE 6.5.4.502.8
DATE 03_03_18

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TSAWWASSEN



1st RESPONSE ROUTE
 1st RESPONSE ROUTE
 FIRE HALL BOUNDARIES
 • FIRE HALL LOCATION
 3
 PROVINCIAL HIGHWAY
 DELTA ROADS
 FIRE HALL AREA NUMBERS

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TITLE
Delta Fire Department Response Routes

FILE 6.5.4.502.8
DATE 03_03_18

REFERENCE
NORTH DELTA